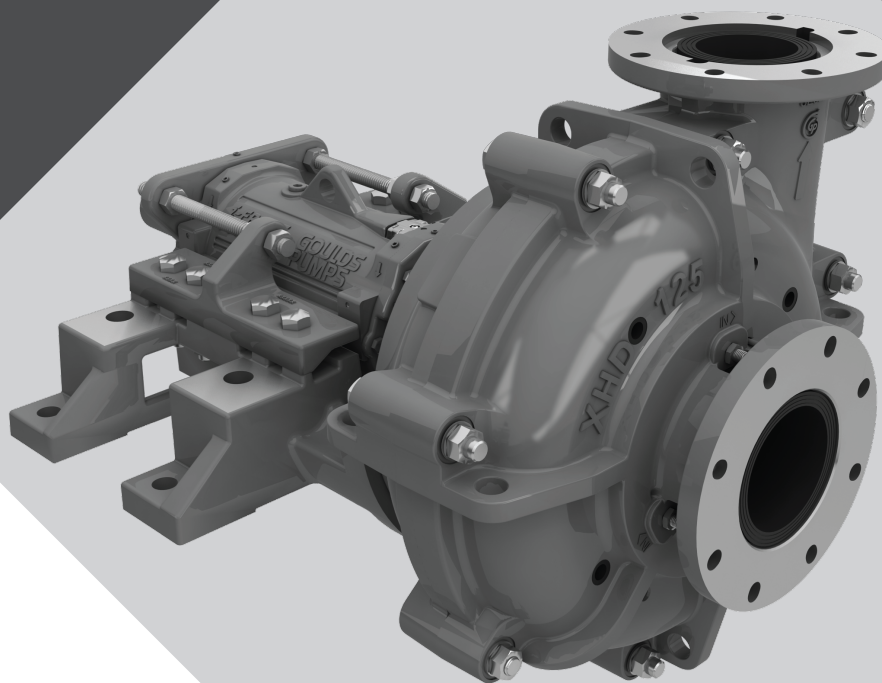




# Installation, Operation, and Maintenance Manual

XHD



**ITT**

ENGINEERED FOR LIFE



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# Introduction and Safety

## Introduction

### Purpose of this manual

The purpose of this manual is to provide necessary information for:

- Installation
- Operation
- Maintenance



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**CAUTION:**

Read this manual carefully before installing and using the product. Improper use of the product can cause personal injury and damage to property, and may void the warranty.

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**NOTICE:**

Save this manual for future reference, and keep it readily available at the location of the unit.

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### Requesting other information

Special versions can be supplied with supplementary instruction leaflets. See the sales contract for any modifications or special version characteristics. For instructions, situations, or events that are not considered in this manual or in the sales documents, please contact the nearest ITT representative.

Always specify the exact product type and identification code when requesting technical information or spare parts.

## Safety



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**WARNING:**

- The operator must be aware of safety precautions to prevent physical injury.
  - Any pressure-containing device can explode, rupture, or discharge its contents if it is over-pressurized. Take all necessary measures to avoid over-pressurization.
  - Operating, installing, or maintaining the unit in any way that is not covered in this manual could cause death, serious personal injury, or damage to the equipment. This includes any modification to the equipment or use of parts not provided by ITT. If there is a question regarding the intended use of the equipment, please contact an ITT representative before proceeding.
  - Do not change the service application without the approval of an authorized ITT representative.
  - Never operate the pump without safety devices installed.
  - Never operate the pump with the discharge valve closed.
- 




## Safety terminology and symbols

### About safety messages

It is extremely important that you read, understand, and follow the safety messages and regulations carefully before handling the product. They are published to help prevent these hazards:

- Personal accidents and health problems
- Damage to the product
- Product malfunction

## Hazard levels

Hazard level	Indication
 <b>DANGER:</b>	A hazardous situation which, if not avoided, will result in death or serious injury
 <b>WARNING:</b>	A hazardous situation which, if not avoided, could result in death or serious injury
 <b>CAUTION:</b>	A hazardous situation which, if not avoided, could result in minor or moderate injury
<b>NOTICE:</b>	<ul style="list-style-type: none"> <li>• A potential situation which, if not avoided, could result in undesirable conditions</li> <li>• A practice not related to personal injury</li> </ul>

## Hazard categories

Hazard categories can either fall under hazard levels or let specific symbols replace the ordinary hazard level symbols.

Electrical hazards are indicated by the following specific symbol:



**Electrical Hazard:**

These are examples of other categories that can occur. They fall under the ordinary hazard levels and may use complementing symbols:

- Crush hazard
- Cutting hazard
- Arc flash hazard

## Environmental safety

### The work area

Always keep the station clean to avoid and/or discover emissions.

### Waste and emissions regulations

Observe these safety regulations regarding waste and emissions:

- Appropriately dispose of all waste.
- Handle and dispose of the processed liquid in compliance with applicable environmental regulations.
- Clean up all spills in accordance with safety and environmental procedures.
- Report all environmental emissions to the appropriate authorities.



**WARNING:**

Do NOT send the product to the ITT manufacturer if it has been contaminated by any nuclear radiation. Inform ITT so that accurate actions can take place.

### Electrical installation

For electrical installation recycling requirements, consult your local electric utility.

## Recycling guidelines

Always follow local laws and regulations regarding recycling.

## User safety

### General safety rules

These safety rules apply:

- Always keep the work area clean.
- Pay attention to the risks presented by gas and vapors in the work area.
- Avoid all electrical dangers. Pay attention to the risks of electric shock or arc flash hazards.
- Always bear in mind the risk of drowning, electrical accidents, and burn injuries.

### Safety equipment

Use safety equipment according to the company regulations. Use this safety equipment within the work area:

- Helmet
- Safety goggles, preferably with side shields
- Protective shoes
- Protective gloves
- Gas mask
- Hearing protection
- First-aid kit
- Safety devices

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#### **NOTICE:**

Never operate a unit unless safety devices are installed. Also see specific information about safety devices in other chapters of this manual.

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### Electrical connections

Electrical connections must be made by certified electricians in compliance with all international, national, state, and local regulations. For more information about requirements, see sections dealing specifically with electrical connections.

### Precautions before work

Observe these safety precautions before you work with the product or are in connection with the product:

- Provide a suitable barrier around the work area, for example, a guard rail.
- Make sure that all safety guards are in place and secure.
- Allow all system and pump components to cool before you handle them.
- Make sure that you have a clear path of retreat.
- Make sure that the product cannot roll or fall over and injure people or damage property.
- Make sure that the lifting equipment is in good condition.
- Use a lifting harness, a safety line, and a breathing device as required.
- Make sure that the product is thoroughly clean.
- Make sure that there are no poisonous gases within the work area.
- Make sure that you have quick access to a first-aid kit.
- Disconnect and lock out power before servicing.
- Check the explosion risk before you weld or use electric hand tools.

## Precautions during work

Observe these safety precautions when you work with the product or are in connection with the product:

- Never work alone.
- Always wear protective clothing and hand protection.
- Stay clear of suspended loads.
- Always lift the product by its lifting device.
- Beware of the risk of a sudden start if the product is used with an automatic level control.
- Beware of the starting jerk, which can be powerful.
- Rinse the components in water after you disassemble the pump.
- Do not exceed the maximum working pressure of the pump.
- Do not open any vent or drain valve or remove any plugs while the system is pressurized. Make sure that the pump is isolated from the system and that pressure is relieved before you disassemble the pump, remove plugs, or disconnect piping.
- Never operate a pump without a properly installed v-belt or coupling guard.
- Always bear in mind the risk of drowning, electrical accidents, and burn injuries.
- Never heat the condition monitor to temperatures in excess of 300°F (149°C).
- Never expose the condition monitor to open flames.
- Do not use the condition monitor in atmospheres containing acetic acid.
- Always wear protective gloves. The pump and condition monitor can be hot.

## Hazardous liquids

The product is designed for use in liquids that can be hazardous to your health. Observe these rules when you work with the product:

- Make sure that all personnel who work with biologically hazardous liquids are vaccinated against diseases to which they may be exposed.
- Observe strict personal cleanliness.

## Wash the skin and eyes

1. Follow these procedures for chemicals or hazardous fluids that have come into contact with your eyes or your skin:

Condition	Action
Chemicals or hazardous fluids in eyes	<ol style="list-style-type: none"> <li>1. Hold your eyelids apart forcibly with your fingers.</li> <li>2. Rinse the eyes with eyewash or running water for at least 15 minutes.</li> <li>3. Seek medical attention.</li> </ol>
Chemicals or hazardous fluids on skin	<ol style="list-style-type: none"> <li>1. Remove contaminated clothing.</li> <li>2. Wash the skin with soap and water for at least 1 minute.</li> <li>3. Seek medical attention, if necessary.</li> </ol>

## Safety regulations for Ex-approved products in potentially explosive atmospheres

### Description of ATEX

The ATEX directives are a specification enforced in Europe for electrical and non-electrical equipment. ATEX deals with the control of potentially explosive atmospheres and the standards of equipment and protective systems used within these atmospheres. The relevance of the ATEX requirements is not limited to Europe. You can apply these guidelines to equipment installed in any potentially explosive atmosphere.

### Guidelines for compliance

Compliance is only fulfilled when the pump is operated within its intended use, for example within its intended hydraulic range. The conditions of the service must not be changed without approval of an authorized ITT representative. When installing or maintaining explosion-proof pumps, follow these guidelines:

- Always install ATEX-approved equipment in compliance with the directive and applicable standards (IEC/EN 60079–14).
- Do not install explosion proof products in locations that are classified as hazardous in the national electric code, ANSI/NFPA 70–2005.



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**WARNING:**

This manual clearly identifies accepted methods for disassembling units. These methods must be adhered to. Trapped liquid can rapidly expand and result in a violent explosion and injury. Never apply heat to impellers, propellers, or their retaining devices to aid in their removal.

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If there are any questions regarding these requirements, the intended use, or if the equipment requires modification, contact an ITT representative before you proceed.

### Personnel requirements

ITT disclaims all responsibility for work done by untrained and unauthorized personnel. These are the personnel requirements for Ex-approved products in potentially explosive atmospheres:

- All work on the product must be carried out by certified electricians and ITT-authorized mechanics. Special rules apply to installations in explosive atmospheres.
- All users must know about the risks of electric current and the chemical and physical characteristics of the gas and/or vapor present in hazardous areas.
- Any maintenance for Ex-approved products must conform to international and national standards (for example IEC/EN 60079-17).

### Product and product handling requirements

These are the product and product handling requirements for Ex-approved products in potentially explosive atmospheres:

- Only use the product in accordance with the approved motor data stated on the nameplates.
- The Ex-approved product must never run dry during normal operation. Dry running during service and inspection is only permitted outside the classified area.
- Never start a pump without the proper priming.
- Before you start working with the product, make sure that the product and the control panel are isolated from the power supply and the control circuit, so they cannot be energized.
- Do not open the product while it is energized or in an explosive gas atmosphere.
- Make sure that thermal contacts are connected to a protection circuit according to the approval classification of the product.
- Intrinsically safe circuits are normally required for the automatic level-control system by the level regulator if mounted in zone 0.
- The yield stress of fasteners must be in accordance with the approval drawing and the product specification.
- Make sure that the equipment is properly maintained:
  - Monitor the pump components and the end temperature of the liquid.
  - Maintain proper bearing lubrication.
- Do not modify the equipment without approval from an authorized ITT representative.
- Only use parts that have been provided by an authorized ITT representative.

## Equipment for monitoring

For additional safety, use condition-monitoring devices. Condition-monitoring devices include but are not limited to these devices:

- Pressure gauges
- Flow meters
- Level indicators
- Motor load readings
- Temperature detectors
- Bearing monitors
- Leak detectors
- PumpSmart control system

## Product approval standards

### Regular standards

All standard products are approved according to CSA standards in Canada and UL standards in USA. The drive unit degree of protection follows IP68. See the nameplate for maximum submersion, according to standard IEC 60529.

All electrical ratings and performance of the motors comply with IEC 600341.

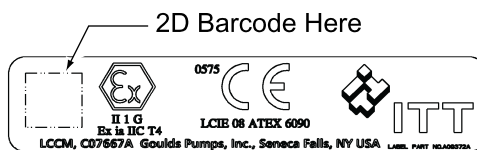
### Explosion-proofing standards

All explosion-proof products for use in explosive atmospheres are designed in compliance with one or more of the following approvals:

- EN, ATEX Directive 94/9/EC
- FM According to NEC
  - Class 1 Div 1 Groups “C”, and “D”
  - Class 2 Div 1 Groups “E”, “F”, and “G”
  - Class 3 Div 1 Hazardous Locations

#### ATEX/IECEx:

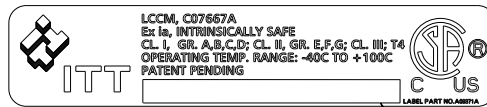
- Group: IIC
- Category: Ex ia
- Temperature Class: T4 (for ambients up to 100°C)
- ATEX Marking: Ex II 1 G



### CSA certification

Intrinsically safe for:

- Class I, Div. 1, Groups A, B, C, D
- Class II, Div. 1, Groups E, F, G
- Class III
- Certified to Canadian and US requirements



SERIAL NO& YEAR OF  
MANUFACTURE HERE.

## Product warranty

### Coverage

ITT undertakes to remedy faults in products from ITT under these conditions:

- The faults are due to defects in design, materials, or workmanship.
- The faults are reported to an ITT representative within the warranty period.
- The product is used only under the conditions described in this manual.
- The monitoring equipment incorporated in the product is correctly connected and in use.
- All service and repair work is done by ITT-authorized personnel.
- Genuine ITT parts are used.
- Only Ex-approved spare parts and accessories authorized by ITT are used in Ex-approved products.

### Limitations

The warranty does not cover faults caused by these situations:

- Deficient maintenance
- Improper installation
- Modifications or changes to the product and installation made without consulting ITT
- Incorrectly executed repair work
- Normal wear and tear

ITT assumes no liability for these situations:

- Bodily injuries
- Material damages
- Economic losses

### Warranty claim

ITT products are high-quality products with expected reliable operation and long life. However, should the need arise for a warranty claim, then contact your ITT representative.



# Transportation and Storage

## Inspect the delivery

### Inspect the package

1. Inspect the package for damaged or missing items upon delivery.
2. Note any damaged or missing items on the receipt and freight bill.
3. File a claim with the shipping company if anything is out of order.  
If the product has been picked up at a distributor, make a claim directly to the distributor.

### Inspect the unit

1. Remove packing materials from the product.  
Dispose of all packing materials in accordance with local regulations.
2. Inspect the product to determine if any parts have been damaged or are missing.
3. If applicable, unfasten the product by removing any screws, bolts, or straps.  
For your personal safety, be careful when you handle nails and straps.
4. Contact your sales representative if anything is out of order.

## Transportation guidelines

### Precautions



#### WARNING:

- Stay clear of suspended loads.
- Observe accident prevention regulations in force.

### Pump handling



#### WARNING:

- Make sure that the unit cannot roll or fall over and injure people or damage property.
- These pumps might use carbon or ceramic silicon carbide components. Do not drop the pump or subject it to shock loads as this can damage the internal ceramic components.

**NOTICE:** Use a forklift truck or an overhead crane with sufficient capacity to move the pallet with the pump unit on top. Failure to do so can result in equipment damage.

### Lifting methods



#### WARNING:

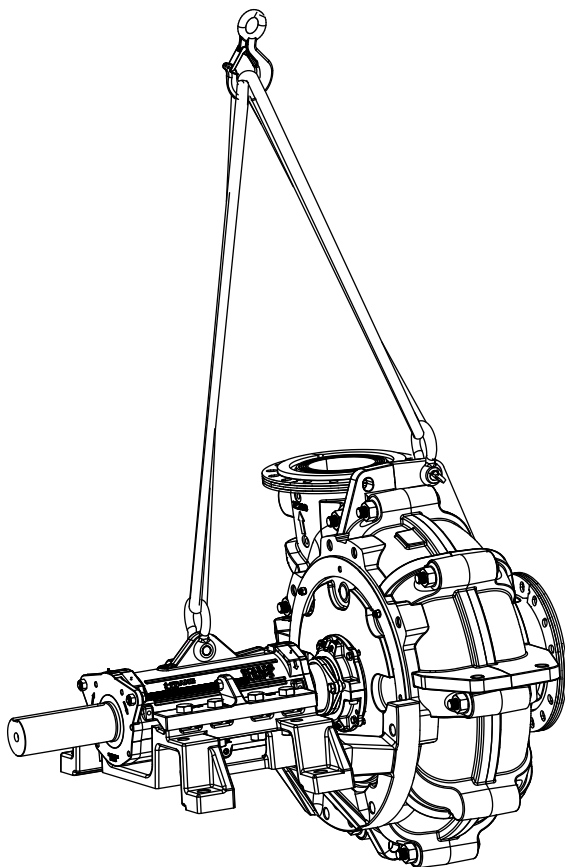
- Assembled units and their components are heavy. Failure to properly lift and support this equipment can result in serious physical injury and/or equipment damage. Lift equipment only at the specifically identified lifting points. Lifting devices such as eyebolts, slings, and spreaders must be rated, selected, and used for the entire load being lifted.
- Crush hazard. The unit and the components can be heavy. Use proper lifting methods and wear steel-toed shoes at all times.
- Do not attach sling ropes to shaft ends.

**Table 1: Methods**

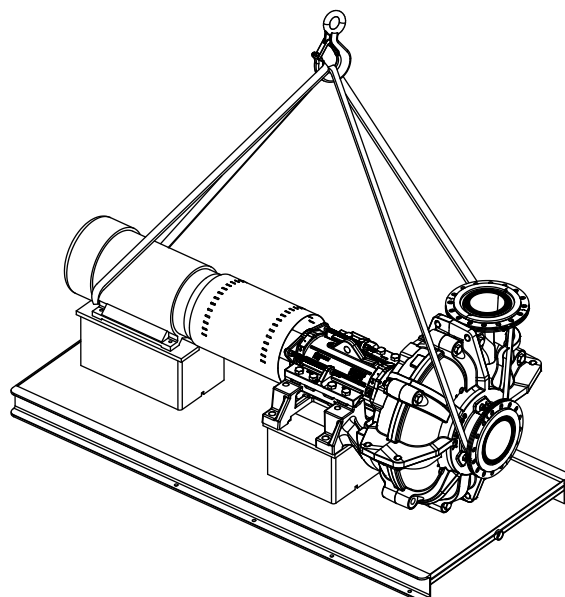
Pump type	Lifting method
A bare pump without lifting handles	Use a suitable sling attached properly to solid points like the casing, the flanges, or the frames.
A bare pump with lifting lugs	Use a suitable sling attached to the lifting lugs in the casing and bearing cartridge.

Pump type	Lifting method
A base-mounted pump	Use slings under the pump casing and the drive unit, under the base rails, or through lifting lugs, when provided.

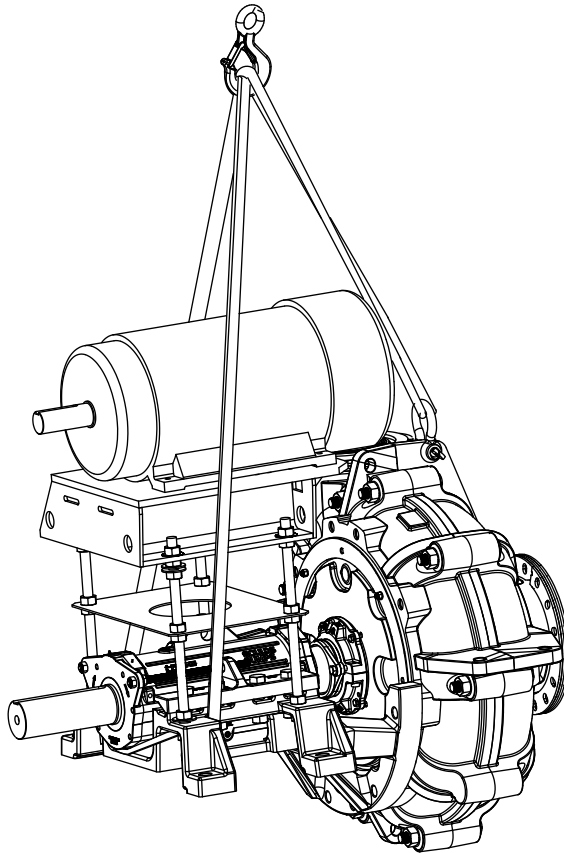
## Examples



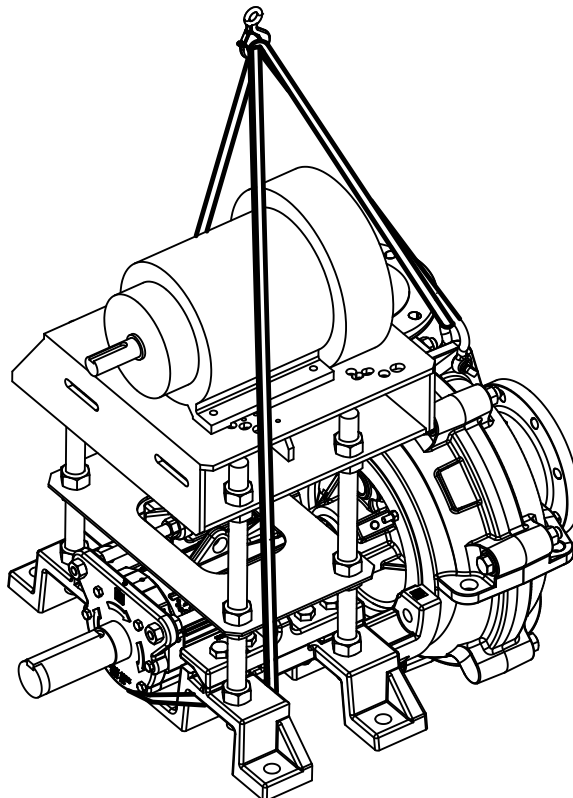
**Figure 1: Example of bare pump proper lifting method**



**Figure 2: Example of base mounted pump proper lifting method**



**Figure 3: Example of overhead mounted pump proper lifting method**



**Figure 4: Example of offset overhead motor mount pump proper lifting method**

# Storage guidelines

## Storage location

The product must be stored in a covered and dry location free from heat, dirt, and vibrations.

### NOTICE:

- Protect the product against humidity, heat sources, and mechanical damage.
- Do not place heavy weights on the packed product.

## Pump storage requirements

Storage requirements depend on the amount of time that you store the unit. The normal packaging is designed only to protect the unit during shipping.

Length of time in storage	Storage requirements
Upon receipt/short-term (less than six months)	<ul style="list-style-type: none"> <li>• Store in a covered and dry location.</li> <li>• Store the unit free from dirt and vibrations.</li> </ul>
Long-term (more than six months)	<ul style="list-style-type: none"> <li>• Store in a covered and dry location.</li> <li>• Store the unit free from heat, dirt, and vibrations.</li> <li>• Rotate the shaft by hand several times at least every three months.</li> </ul>

Treat bearing and machined surfaces so that they are well preserved. Refer to drive unit and coupling manufacturers for their long-term storage procedures.

You can purchase long-term storage treatment with the initial unit order or you can purchase it and apply it after the units are already in the field. Contact your local ITT sales representative.

## Frostproofing

This table shows to what degree the pump is frostproof:

When the pump is...	Then...
Operating	The pump is frostproof.
Immersed in a liquid	The pump is frostproof.
Lifted out of a liquid into a temperature below freezing	The impeller might freeze.
Sitting idle	The pump might freeze.

# Product Description

## General description

The XHD is a fully metric, frame-mounted, single stage, end suction extra heavy duty metal-lined slurry pump.

### Pump discharge diameter

The metric size designation represents the pump discharge diameter.

Metric size designation	Suction x discharge x impeller (mm)	Suction x discharge x impeller (inches)	Power frame size
XHD 80	100 x 80 x 298	4x3-11.7	PF2
XHD 125	150 x 125 x 412	6x5-16.2	PF3
XHD 150	200 x 150 x 530	8x6-20.9	PF4
XHD 200	250 x 200 x 684	10x8-27	PF4
XHD 250	300 x 250 x 800	12x10-31.5	PF5
XHD 300	350 x 300 x 1000	14x12-39.4	PF5

### Casing

Discharge	<p>Tangential with multiple positions for most pump and driver size combinations.</p> <ul style="list-style-type: none"> <li>Vertical up (0°)</li> <li>Between vertical up and top horizontal (45°)</li> <li>Top horizontal (90°)</li> <li>Bottom horizontal (270°)</li> <li>Between bottom horizontal and vertical up (315°)</li> </ul>
Mounting method	Overhung configuration with casing attached to the pedestal.
Flanges	<p>Flanges are slotted to meet these standards:</p> <ul style="list-style-type: none"> <li>ANSI</li> <li>DIN</li> <li>SABS</li> <li>Table D</li> <li>Other existing slurry pump standards</li> </ul> <p>Detachable split flanges for the XHD and XHD Value Option sizes 150 and above</p>
Outer casing halves	Outer suction and gland casing halves are constructed of ductile iron and designed to accommodate a standard rating of 250 PSIG at 20°C.
Liners and seal ring	<p>For the XHD and XHD Value Option:</p> <ul style="list-style-type: none"> <li>Replaceable HC600 casing volute and suction side liners</li> <li>Options for 1269, 1650 and CD4MCuN liners</li> </ul> <p>For the XHD:</p> <ul style="list-style-type: none"> <li>Adjustable HC600 suction seal ring for increased wear performance of the suction side liner and other wet end components</li> </ul>

### Impeller

The chrome iron impeller is:

- Enclosed with front and rear "pump out" vanes
- Threaded onto the shaft

The threads are sealed by an impeller hub o-ring on the sleeve side for the XHD and XHD Value Option.

Ease of impeller removal is facilitated by the two-piece knock-off collar seated on the shaft.

**Heaviest pump component weight**

Size	Item no.	Part name	Weight (lb)	Weight (kg)	Wet end weight lbs (kg)	Bare pump weight less motor base/ motor lbs (kg)
XHD80	100A	Suction half casing	131	60	473 (215)	938 (431)
XHD125	100A	Suction half casing	267	121	1063 (483)	1750 (796)
XHD150	100A	Suction half casing	611	277	2566 (1164)	4016 (1826)
XHD200	100A	Suction half casing	1210	549	4590 (2081)	2823 (6210)
XHD250	100A	Suction half casing	1764	800	7130 (3234)	9800 (4445)
XHD300	100A	Suction half casing	3221	1461	12348 (5600)	15107 (6866)

**Seal cover / stuffing box**

Both the XHD and XHD Value Option stuffing box are designed to accommodate multiple packing configurations (full and low flush) as well as most conventional slurry mechanical seals.

The XHD also features a fully detachable split stuffing box for ease of maintenance and replacement of packing and lantern rings.

Part	Description
Pedestal	The ductile iron pedestal has: <ul style="list-style-type: none"> <li>• A compact footprint that can be easily adapted to new or existing mounting requirements using a pedestal spacer.</li> <li>• Adjustment plates and hardware for ease of impeller clearance setting.</li> </ul>
Bearing housing	For the XHD and XHD Value Option: <ul style="list-style-type: none"> <li>• Oil lubrication is standard</li> <li>• No machining is required to convert from oil to grease lubrication.</li> <li>• Bellville washers and shims used to set bearing preload</li> </ul> For XHD: <ul style="list-style-type: none"> <li>• The power end is sealed with labyrinth seals</li> </ul> For XHD Value Option: <ul style="list-style-type: none"> <li>• The power end is sealed with grease-packed double lip seals.</li> </ul>
Shaft and shaft sleeve	<ul style="list-style-type: none"> <li>• The shaft has an API-style tapered rapid release impeller thread</li> <li>• The shaft is through-hardened 420 stainless steel providing 400 BHN</li> <li>• The shaft sleeve is sealed with an o-ring to provide a "dry shaft" design protecting the shaft from slurry exposure</li> </ul>
Bearings	The inboard and outboard bearings: <ul style="list-style-type: none"> <li>• Are single row, tapered roller design</li> <li>• Carry both radial and axial loads</li> <li>• Mounted back-to-back in an opposed pair configuration on the shaft shoulders</li> <li>• Are the same size and type for each power frame</li> <li>• Have L10 lives exceeding 100,000 hours</li> </ul>

**Hardware**

All fasteners and tapped connections are metric.

**Direction or rotation**

The direction of rotation is clockwise (right hand) when viewed from the driver end.

## General description i-ALERT™ Condition Monitor

### Description

The i-ALERT Condition Monitor is a compact, battery-operated monitoring device that continuously measures the vibration and temperature of the pump power end. The condition monitor uses blinking red LEDs to alert the pump operator when the pump exceeds pre-set vibration and temperature limits. This allows the pump operator to make changes to the process or the pump before a catastrophic failure occurs. The condition monitor is also equipped with a single green LED to indicate when it is operational and has sufficient battery life.

### Software License Agreement

BY USING THE i-Alert™ CONDITION MONITOR, YOU AGREE TO BE BOUND BY THE TERMS AND CONDITIONS OF THE FOLLOWING LICENSE AGREEMENT. PLEASE READ THIS AGREEMENT CAREFULLY.

ITT Corporation and its subsidiaries, affiliates, either directly, or through its authorized sublicensees ("ITT") grants you a limited, non-exclusive license to use the software embedded in this device ("Software") in binary executable form in the normal operation of the i-Alert™ condition monitor for monitoring the condition of an Goulds Pump Inc. model. Title, ownership rights, and intellectual property rights in and to the Software remain in ITT or its third-party providers. You agree that this license agreement does not need to be signed for it to take effect.

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### Alarm mode

The condition monitor enters alarm mode when either vibration or temperature limits are exceeded over two consecutive readings within a ten minute period. Alarm mode is indicated with two red flashing LEDs within two second intervals.

### Temperature and vibration limits

Variable	Limit
Temperature	195°F (91°C)
Vibration	100% increase over the baseline level

### Battery life

**The i-ALERT Condition Monitor battery is not replaceable.** You must replace the entire unit once the battery runs out of power.

The battery life is not covered as part of the standard five-year pump warranty.

This table shows the average condition monitor battery life under normal and alarm-mode operating conditions.

Condition monitor operational state	Battery life
Normal operating and environmental conditions	Three to five years
Alarm mode	One year

## Nameplate information

### Important information for ordering

Every pump has nameplates that provide information about the pump. The nameplates are located on the casing and the bearing frame.

When you order spare parts, identify this pump information:

- Model
- Size
- Serial number
- Item numbers of the required parts

Refer to the nameplate on the pump casing for most of the information. See Parts List for item numbers.

### Nameplate on the pump casing using English units

**Table 2: Explanation of nameplate on the pump casing**

Nameplate field	Explanation
IMPLR. DIA.	Impeller diameter, in inches
MAX. DIA.	Maximum impeller diameter, in inches
GPM	Rated pump flow, in gallons per minute
FT HD	Rated pump head, in feet
RPM	Rated pump speed, revolutions per minute
MOD.	Pump model
SIZE	Size of the pump
STD. NO.	Does not apply
MAT L. CONST.	Material of which the pump is constructed
SER. NO.	Serial number of the pump
MAX DSGN PSI @ 100F	Maximum pressure at 100°F according to the pump design

### Nameplate on the pump casing using metric units

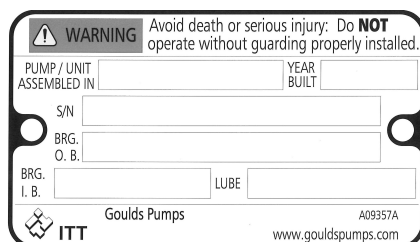
**Table 3: Explanation of the nameplate on the pump casing**

Nameplate field	Explanation
IMPLR. DIA.	Impeller diameter
MAX. DIA.	Maximum impeller diameter
M³/HR	Rated pump flow, in cubic meters per hour



Nameplate field	Explanation
M HD	Rated pump head, in meters
RPM	Rated pump speed, in revolutions per minute
MOD.	Pump model
SIZE	Size of the pump
STD. NO.	Does not apply
MAT L. CONST	Material of which the pump is constructed
SER. NO.	Serial number of the pump
MAX. DSGN KG/ CM <sup>2</sup> @20Â°C	Kilograms per square centimeter at 20Â°C

### Nameplate on the bearing frame



**Table 4: Explanation of the nameplate on the bearing frame**

Nameplate field	Explanation
MOD.	Pump model
SIZE	Size of the pump
SER. NO.	Serial number of the pump
LUBE	Lubricant, oil or grease

### ATEX nameplate



Nameplate field	Explanation
II	Group 2
2	Category 2
G/D	Pump can be used when gas and dust are present
T4	Temperature class

**NOTICE:** Make sure that the code classifications on the pump are compatible with the specific environment in which you plan to install the equipment. If they are not compatible, do not operate the equipment and contact your ITT representative before you proceed.

# Installation

## Preinstallation

### Precautions


**WARNING:**

- When installing in a potentially explosive environment, make sure that the motor is properly certified.
- You must earth (ground) all electrical equipment. This applies to the pump equipment, the driver, and any monitoring equipment. Test the earth (ground) lead to verify that it is connected correctly.

**NOTICE:** Supervision by an authorized ITT representative is recommended to ensure proper installation. Failure to do so may result in equipment damage or decreased performance.

### Pump location guidelines


**WARNING:**

Assembled units and their components are heavy. Failure to properly lift and support this equipment can result in serious physical injury and/or equipment damage. Lift equipment only at the specifically identified lifting points. Lifting devices such as eyebolts, slings, and spreaders must be rated, selected, and used for the entire load being lifted.

Guideline	Explanation/comment
Keep the pump as close to the liquid source as practically possible.	This minimizes the friction loss and keeps the suction piping as short as possible.
Make sure that the space around the pump is sufficient.	This facilitates ventilation, inspection, maintenance, and service.
If you require lifting equipment such as a hoist or tackle, make sure that there is enough space above the pump.	This makes it easier to properly use the lifting equipment and safely remove and relocate the components to a safe location.
Protect the unit from weather and water damage due to rain, flooding, and freezing temperatures.	This is applicable if nothing else is specified.
Do not install and operate the equipment in closed systems unless the system is constructed with properly-sized safety devices and control devices.	Acceptable devices: <ul style="list-style-type: none"> <li>• Pressure relief valves</li> <li>• Compression tanks</li> <li>• Pressure controls</li> <li>• Temperature controls</li> <li>• Flow controls</li> </ul> If the system does not include these devices, consult the engineer or architect in charge before you operate the pump.
Take into consideration the occurrence of unwanted noise and vibration.	The best pump location for noise and vibration absorption is on a concrete floor with subsoil underneath.
If the pump location is overhead, undertake special precautions to reduce possible noise transmission.	Consider a consultation with a noise specialist.

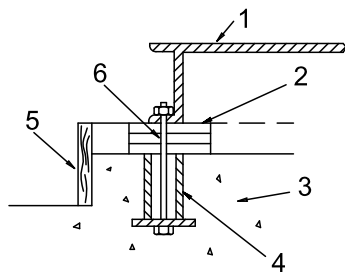
### Foundation requirements

#### Requirements

- The foundation must be able to absorb any type of vibration and form a permanent, rigid support for the unit.
- The location and size of the foundation bolt holes must match those shown on the assembly drawing provided with the pump data package.
- The foundation must weigh between two and three times the weight of the complete pump, baseplate, and drive assembly.
- Provide a flat, substantial concrete foundation in order to prevent strain and distortion when you tighten the foundation bolts.

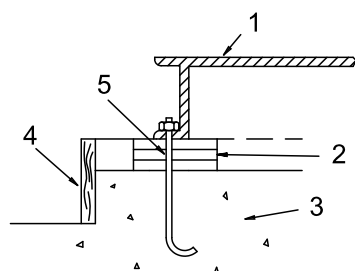
- Sleeve-type and J-type foundation bolts are most commonly used. Both designs allow movement for the final bolt adjustment.

### Sleeve-type bolts



1. Baseplate
2. Shims or wedges
3. Foundation
4. Sleeve
5. Dam
6. Bolt

### J-type bolts



1. Baseplate
2. Shims or wedges
3. Foundation
4. Dam
5. Bolt

**NOTICE:** Slurry Pumps are typically driven with motors mounted overhead, coupled with V-belts and sheaves. This configuration does not require the pump to be mounted and grouted into place. The pump pedestal can be bolted onto a concrete foundation using J-type bolts or Sleeve-type bolts, thru the pedestal or mounting feet.

## Baseplate-mounting procedures

### Prepare the baseplate for mounting

1. Remove all the attached equipment from the baseplate.
2. Clean the underside of the baseplate completely.
3. If applicable, coat the underside of the baseplate with an epoxy primer.  
Use an epoxy primer only if you used an epoxy-based grout.
4. Remove the rust-proofing coat from the machined mounting pads using an appropriate solvent.
5. Remove water and debris from the foundation-bolt holes.

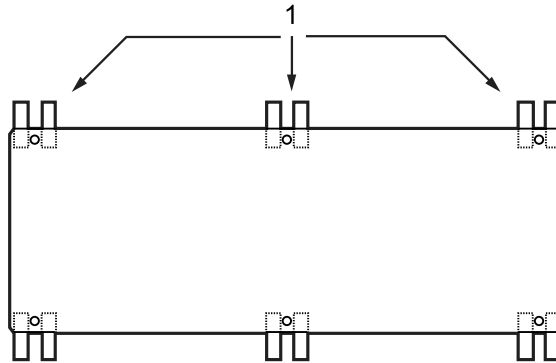
## Install the baseplate using shims or wedges

Required tools:

- Two sets of shims or wedges for each foundation bolt
- Two machinist's levels
- Baseplate-leveling worksheet

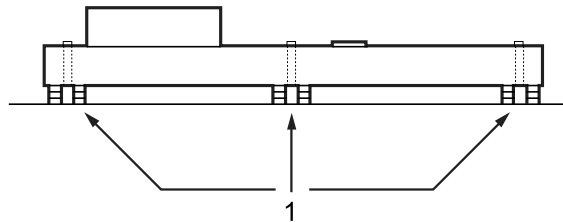
This procedure is applicable to cast iron and fabricated steel baseplates.

1. If you use sleeve-type bolts, fill the bolt sleeves with packing material or rags to prevent grout from entering the bolt holes.
2. Put the sets of wedges or shims on each side of each foundation bolt.  
The sets of wedges should have a height of between 0.75 in. (19 mm) and 1.50 in. (38 mm).



1. Shims or wedges

**Figure 5: Top view**



1. Shims or wedges

**Figure 6: Side view**

3. Lower the baseplate carefully onto the foundation bolts.
4. Put the machinist's levels across the mounting pads of the driver and the mounting pads of the pump.

**NOTICE:** Remove all dirt from the mounting pads in order to make sure that you achieve the correct leveling. Failure to do so can result in equipment damage or decreased performance.

5. Level the baseplate both lengthwise and across by adding or removing shims or moving the wedges.

These are the leveling tolerances:

- A maximum difference of 0.125 in. (3.2 mm) lengthwise
- A maximum difference of 0.059 in. (1.5 mm) across

You can use the baseplate-leveling worksheet when you take the readings.

6. Hand-tighten the nuts for the foundation.

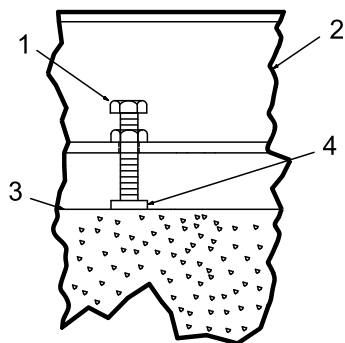
## Install the baseplate using jackscrews

Tools required:

- Anti-seize compound
- Jackscrews
- Bar stock
- Two machinist's levels
- Baseplate-leveling worksheet

This procedure is applicable to the feature-fabricated steel baseplate and the advantage base baseplate.

1. Apply an anti-seize compound on the jackscrews.  
The compound makes it easier to remove the screws after you grout.
2. Lower the baseplate carefully onto the foundation bolts and perform these steps:
  - a) Cut the plates from the bar stock and chamfer the edges of the plates in order to reduce stress concentrations.
  - b) Put the plates between the jackscrews and the foundation surface.
  - c) Use the four jackscrews in the corners in order to raise the baseplate above the foundation.  
Make sure that the distance between the baseplate and the foundation surface is between 0.75 in. (19 mm) and 1.50 in. (38 mm).
  - d) Make sure that the center jackscrews do not touch the foundation surface yet.

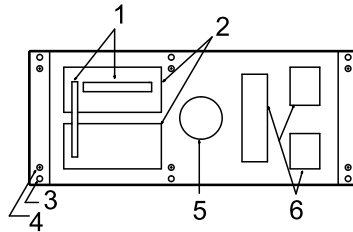


1. Jackscrew
2. Baseplate
3. Foundation
4. Plate

3. Level the driver mounting pads:

**NOTICE:** Remove all dirt from the mounting pads in order to make sure that you achieve the correct leveling. Failure to do so can result in equipment damage or decreased performance.

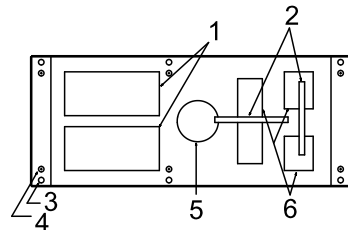
- a) Put one machinist's level lengthwise on one of the two pads.
- b) Put the other machinist's level across the ends of the two pads.
- c) Level the pads by adjusting the four jackscrews in the corners. Make sure that the machinist's level readings are as close to zero as possible, both lengthwise and across. Use the baseplate-leveling worksheet when you take the readings.



1. Machinist's levels
  2. Driver's mounting pads
  3. Foundation bolts
  4. Jackscrews
  5. Grout hole
  6. Pump's mounting pads
4. Turn the center jackscrews down so that they rest on their plates on the foundation surface.
  5. Level the pump mounting pads:

**NOTICE:** Remove all dirt from the mounting pads in order to make sure that you achieve the correct leveling. Failure to do so can result in equipment damage or decreased performance.

- a) Put one machinist's level lengthwise on one of the two pads.
- b) Put the other level across the center of the two pads.
- c) Level the pads by adjusting the four jackscrews in the corners. Make sure that the machinist's level readings are as close to zero as possible, both lengthwise and across.

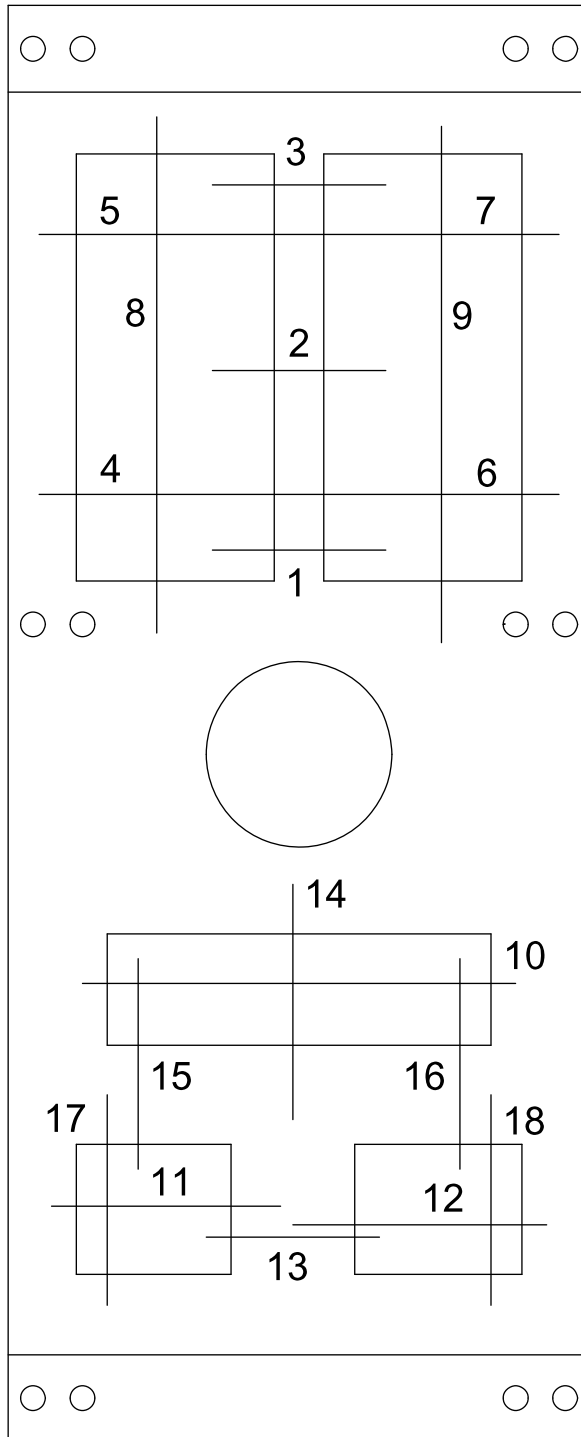


1. Driver's mounting pads
  2. Machinist's levels
  3. Foundation bolts
  4. Jackscrews
  5. Grout hole
  6. Pump's mounting pads
6. Hand-tighten the nuts for the foundation bolts.

7. Check that the driver's mounting pads are level and adjust the jackscrews and the foundation bolts if necessary.  
The correct level measurement is a maximum of 0.002 in./ft (0.0167 mm/m).

## Direct-coupled baseplate-leveling worksheet

### Level measurements



- 1) \_\_\_\_\_
- 2) \_\_\_\_\_
- 3) \_\_\_\_\_
- 4) \_\_\_\_\_
- 5) \_\_\_\_\_
- 6) \_\_\_\_\_
- 7) \_\_\_\_\_
- 8) \_\_\_\_\_
- 9) \_\_\_\_\_
- 10) \_\_\_\_\_
- 11) \_\_\_\_\_
- 12) \_\_\_\_\_
- 13) \_\_\_\_\_
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- 17) \_\_\_\_\_
- 18) \_\_\_\_\_

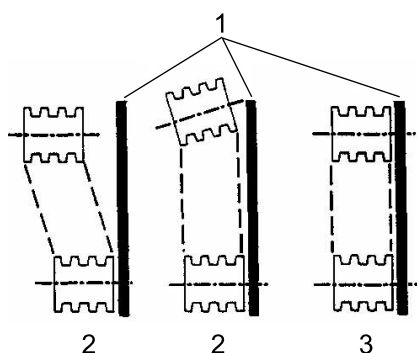


## Install pump, driver, and v-belt drive

### Install and align the sheaves

Before installing the driver onto an overhead motor mount or side-by-side base, ensure that Foundation requirements and baseplate mounting procedures sections are complete.

1. Mount and fasten the pump on the pedestal spacer, foundation, or baseplate as applicable. Use appropriate hardware.
2. For a motor that is mounted overhead, install the overhead motor mount.
3. For a motor that is mounted to the side of the pump, fasten the motor slide base on the baseplate or pump. Fasten the motor slide base on the baseplate or foundation, as applicable. Use appropriate hardware.
4. Mount the driver on the overhead motor mount or slide base, as applicable. Use appropriate hardware.
5. Install the v-belt drive bushings and sheaves. See the installation instructions from the v-belt drive manufacturer. After the v-belt drive bushings and sheaves are installed, check the sheave alignment using a straight edge as shown in the following diagram.



1. Straight edge
2. Incorrect
3. Correct

#### NOTICE:

Make sure that the sheaves are properly aligned. Proper alignment is necessary to guarantee the correct power transmission and speed ratio, and ensures minimum vibration and long drive life.

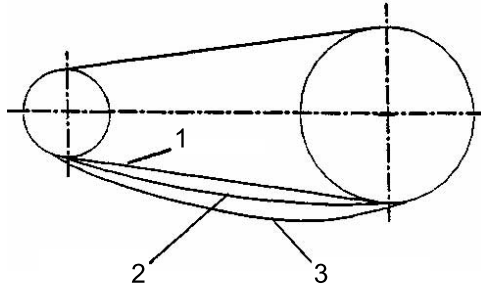
### Install and tension the belt

1. After alignment of the sheaves, reduce the center distance between the pump and motor shafts so that the belts can be easily mounted into the sheave grooves.

For...	Reduce the center distance by...
Overhead mounted motors	Adjusting the leveling nuts
Side mounted motors	Adjusting the motor slide base

Make sure that the center distance between the pump and motor shaft is reduced to the point where the belts can be put on the sheaves without the use of force. Never roll or pry the belts into place, as this could damage the belt cords.

- After the belts are seated in the sheave grooves, increase the center distance between the pump and motor shafts to tension the belts.  
Refer to pump general arrangement drawing for center distance ranges.



**Figure 7: V-belt tension**

Many v-belt drive manufacturers offer tension measurement tools that can aid in setting proper belt tension. Contact the v-belt drive manufacturer for more information.

- Secure the overhead motor mount on slide base in place once the belts are properly tensioned.
- Install the unit after installation to ensure that the belts and sheaves do not come into contact with the guard.



**CAUTION:**

The unit must not be operated without the proper drive guard in place. Operating the unit without the drive guard in place could result in personal injury to operating personnel.

## Install the pump, driver, and coupling

- Mount and fasten the pump on the baseplate. Use applicable bolts.
- Mount the driver on the baseplate. Use applicable bolts and hand tighten.
- Install the coupling.  
See the installation instructions from the coupling manufacturer.

## Pump-to-driver alignment

### Precautions



**WARNING:**

- Follow shaft alignment procedures in order to prevent catastrophic failure of drive components or unintended contact of rotating parts. Follow the coupling installation and operation procedures from the coupling manufacturer.
- Always disconnect and lock out power to the driver before you perform any installation or maintenance tasks. Failure to disconnect and lock out driver power will result in serious physical injury.

**NOTICE:** Proper alignment is the responsibility of the installer and the user of the unit. Check the pump-to-driver alignment before you operate the unit. Failure to do so can result in equipment damage or decreased performance.

**NOTICE:** Proper alignment is the responsibility of the installer and the user of the unit. Check the alignment of frame-mounted units before you operate the unit. Failure to do so can result in equipment damage or decreased performance.

## Alignment checks

### When to perform alignment checks

You must perform alignment checks under these circumstances:

- The process temperature changes.
- The piping changes.
- The pump has been serviced.

### Types of alignment checks

Type of check	When it is used
Initial alignment (cold alignment) check	Prior to operation when the pump and the driver are at ambient temperature.
Final alignment (hot alignment) check	After operation when the pump and the driver are at operating temperature.

### Initial alignment (cold alignment) checks

When	Why
Before you grout the baseplate	This ensures that alignment can be accomplished.
After you grout the baseplate	This ensures that no changes have occurred during the grouting process.
After you connect the piping	This ensures that pipe strains have not altered the alignment. If changes have occurred, you must alter the piping to remove pipe strains on the pump flanges.

### Final alignment (hot alignment) checks

When	Why
After the first run	This ensures correct alignment when both the pump and the driver are at operating temperature.
Periodically	This follows the plant operating procedures.

## Permitted indicator values for alignment checks

**NOTICE:** The specified permitted reading values are valid only at operating temperature. For cold settings, other values are permitted. You must use the correct tolerances. Failure to do so can result in misalignment and reduced pump reliability.

When dial indicators are used to check the final alignment, the pump and drive unit are correctly aligned when the total indicator runout is a maximum of 0.004 in. (0.10 mm) at operating temperature.

## Cold settings for parallel vertical alignment

### Introduction

This section shows the recommended preliminary (cold) settings for electric motor-driven pumps based on different temperatures of pumped fluid. Consult driver manufacturers for recommended cold settings for other types of drivers such as steam turbines and engines.

### Recommended settings for model XHD

Pumped fluid temperature	Recommended setting for driver shaft
50°F (10°C)	0.002 in. (0.05 mm), low
150°F (65°C)	0.001 in. (0.03 mm), high
250°F (120°C)	0.005 in. (0.12 mm), high

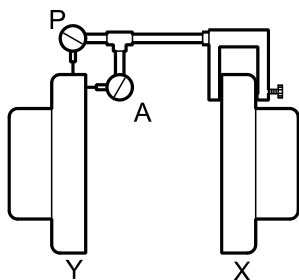
## Alignment measurement guidelines

Guideline	Explanation
Rotate the pump coupling half and the driver coupling half together so that the indicator rods have contact with the same points on the driver coupling half.	This prevents incorrect measurement.
Move or shim only the driver in order to make adjustments.	This prevents strain on the piping installations.
Make sure that the hold-down bolts for the driver feet are tight when you take indicator measurements.	This keeps the driver stationary since movement causes incorrect measurement.
Make sure that the hold-down bolts for the driver feet are loose before you make alignment corrections.	This makes it possible to move the driver when you make alignment corrections.
Check the alignment again after any mechanical adjustments.	This corrects any misalignments that an adjustment may have caused.

## Attach the dial indicators for alignment

You must have two dial indicators in order to complete this procedure.

1. Attach two dial indicators on the pump coupling half (X):
  - a) Attach one indicator (P) so that the indicator rod comes into contact with the perimeter of the driver coupling half (Y).  
This indicator is used to measure parallel misalignment.
  - b) Attach the other indicator (A) so that the indicator rod comes into contact with the inner end of the driver coupling half.  
This indicator is used to measure angular misalignment.



2. Rotate the pump coupling half (X) in order to check that the indicators are in contact with the driver coupling half (Y) but do not bottom out.
3. Adjust the indicators if necessary.

## Pump-to-driver alignment instructions

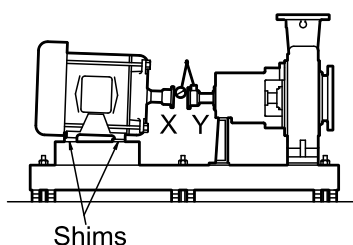
### Perform angular alignment for a vertical correction

Before you start this procedure, make sure that the dial indicators are set up correctly.

1. Set the angular alignment indicator to zero at the top-center position (12 o'clock) of the driver coupling half (Y).  
A unit is in angular alignment when the angular indicator (A) does not vary by more than 0.004 in (0.10 mm) as measured at 4 points 90° apart at the operating temperature.
2. Rotate the indicator to the bottom-center position (6 o'clock).

- Record the indicator reading.

When the reading value is...	Then...
Negative	The coupling halves are farther apart at the bottom than at the top. Perform one of these steps: <ul style="list-style-type: none"> <li>Add shims in order to raise the feet of the driver at the shaft end.</li> <li>Remove shims in order to lower the feet of the driver at the other end.</li> </ul>
Positive	The coupling halves are closer at the bottom than at the top. Perform one of these steps: <ul style="list-style-type: none"> <li>Remove shims in order to lower the feet of the driver at the shaft end.</li> <li>Add shims in order to raise the feet of the driver at the other end.</li> </ul>



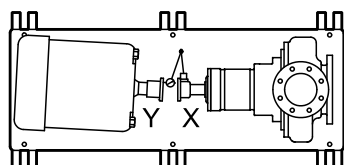
**Figure 8: Side view of an incorrect vertical alignment**

- Repeat the previous steps until the permitted reading value is achieved.

### Perform angular alignment for a horizontal correction

- Set the angular alignment indicator (A) to zero on left side of the driver coupling half (Y), 90° from the top-center position (9 o'clock).
- Rotate the indicator through the top-center position to the right side, 180° from the start position (3 o'clock).
- Record the indicator reading.

When the reading value is...	Then...
Negative	The coupling halves are farther apart on the right side than the left. Perform one of these steps: <ul style="list-style-type: none"> <li>Slide the shaft end of the driver to the left.</li> <li>Slide the opposite end to the right.</li> </ul>
Positive	The coupling halves are closer together on the right side than the left. Perform one of these steps: <ul style="list-style-type: none"> <li>Slide the shaft end of the driver to the right.</li> <li>Slide the opposite end to the left.</li> </ul>



**Figure 9: Top view of an incorrect horizontal alignment**

- Repeat the previous steps until the permitted reading value is achieved.

### Perform parallel alignment for a vertical correction

Before you start this procedure, make sure that the dial indicators are correctly set up.

A unit is in parallel alignment when the parallel indicator (P) does not vary by more than 0.004 in. (0.10 mm) as measured at four points 90° apart at the operating temperature.

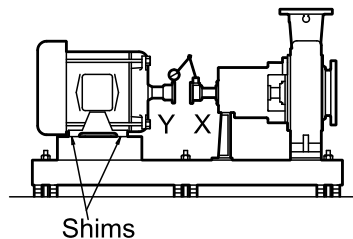
- Set the parallel alignment indicator (P) to zero at the top-center position (12 o'clock) of the driver coupling half (Y).
- Rotate the indicator to the bottom-center position (6 o'clock).

3. Record the indicator reading.

When the reading value is...	Then...
Negative	The pump coupling half (X) is lower than the driver coupling half (Y). Remove shims of a thickness equal to half of the indicator reading value under each driver foot.
Positive	The pump coupling half (X) is higher than the driver coupling half (Y). Add shims of a thickness equal to half of the indicator reading value to each driver foot.

**NOTICE:**

You must use an equal amount of shims with each driver foot to prevent misalignment. Failure to do so can result in equipment damage or decreased performance.



**Figure 10: Side view of an incorrect vertical alignment**

4. Repeat the previous steps until the permitted reading value is achieved.

**Perform parallel alignment for a horizontal correction**

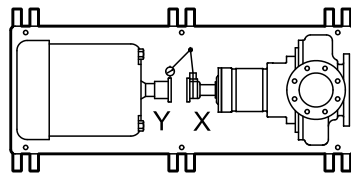
A unit is in parallel alignment when the parallel indicator (P) does not vary by more than 0.004 in. (0.10 mm) as measured at four points 90° apart at the operating temperature.

1. Set the parallel alignment indicator (P) to zero on the left side of the driver coupling half (Y), 90° from the top-center position (9 o'clock).
2. Rotate the indicator through the top-center position to the right side, 180° from the start position (3 o'clock).
3. Record the indicator reading.

When the reading value is...	Then...
Negative	The driver coupling half (Y) is to the left of the pump coupling half (X).
Positive	The driver coupling half (Y) is to the right of the pump coupling half (X).

4. Slide the driver carefully in the appropriate direction.

**NOTICE:** Make sure to slide the driver evenly. Failure to do so can negatively affect horizontal angular correction.



**Figure 11: Top view of an incorrect horizontal alignment**

5. Repeat the previous steps until the permitted reading value is achieved.

## Perform complete alignment for a vertical correction

A unit is in complete alignment when both the angular indicator (A) and the parallel indicator (P) do not vary by more than 0.002 in. (0.05 mm) as measured at four points 90° apart.

1. Set the angular and parallel dial indicators to zero at the top-center position (12 o'clock) of the driver coupling half (Y).
2. Rotate the indicators to the bottom-center position (6 o'clock).
3. Record the indicator readings.
4. Make corrections according to the separate instructions for angular and parallel alignment until you obtain the permitted reading values.

## Perform complete alignment for a horizontal correction

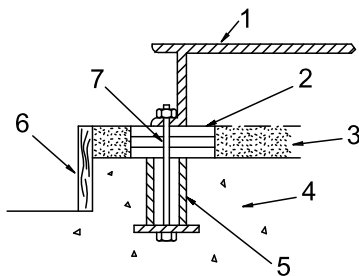
A unit is in complete alignment when both the angular indicator (A) and the parallel indicator (P) do not vary by more than 0.004 in. (0.10 mm) as measured at four points 90° apart.

1. Set the angular and parallel dial indicators to zero at the left side of the driver coupling half (Y), 90° from the top-center position (9 o'clock).
2. Rotate the indicators through the top-center position to the right side, 180° from the start position (3 o'clock).
3. Record the indicator readings.
4. Make corrections according to the separate instructions for angular and parallel alignment until you obtain the permitted reading values.

## Grout the baseplate

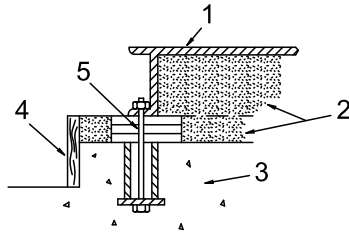
Required equipment:

- Cleaners: Do not use an oil-based cleaner because the grout will not bond to it. See the instructions provided by the grout manufacturer.
  - Grout: Non-shrink grout is recommended.
1. Clean all the areas of the baseplate that will come into contact with the grout.
  2. Build a dam around the foundation.
  3. Thoroughly wet the foundation that will come into contact with the grout.
  4. Pour grout through the grout hole into the baseplate up to the level of the dam.  
When you pour the grout, remove air bubbles from it by using one of these methods:
    - Puddle with a vibrator.
    - Pump the grout into place.
  5. Allow the grout to set.



1. Baseplate
2. Shims or wedges
3. Grout
4. Foundation
5. Sleeve
6. Dam
7. Bolt

6. Fill the remainder of the baseplate with grout, and allow the grout to set for at least 48 hours.



1. Baseplate
  2. Grout
  3. Foundation
  4. Dam
  5. Bolt
7. Tighten the foundation bolts.
  8. Recheck the alignment.

## Piping checklists

### General piping checklist

#### Precautions



#### CAUTION:

- Never draw piping into place by using force at the flanged connections of the pump. This can impose dangerous strains on the unit and cause misalignment between the pump and driver. Pipe strain adversely affects the operation of the pump, which results in physical injury and damage to the equipment.
- Vary the capacity with the regulating valve in the discharge line. Never throttle the flow from the suction side. This action can result in decreased performance, unexpected heat generation, and equipment damage.

#### Piping guidelines

Guidelines for piping are given in the Hydraulic Institute Standards available from the Hydraulic Institute at 9 Sylvan Way, Parsippany, NJ 07054-3802. You must review this document before you install the pump.

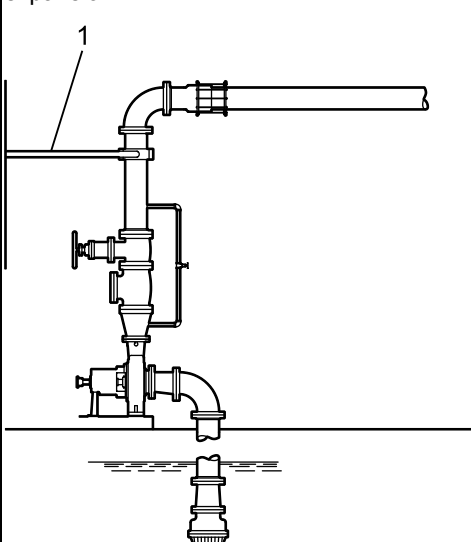
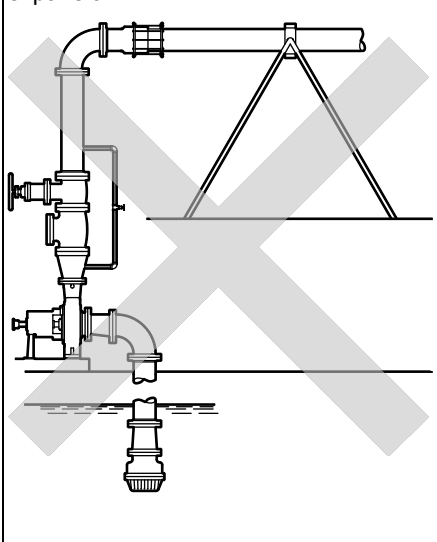
#### Checklist

Check	Explanation/comment	Checked
Check that all piping is supported independently of, and lined up naturally with, the pump flange.	This helps to prevent: <ul style="list-style-type: none"> <li>• Strain on the pump</li> <li>• Misalignment between the pump and the drive unit</li> <li>• Wear on the pump bearings and the coupling</li> <li>• Wear on the pump bearings, seal, and shafting</li> </ul>	
Keep the piping as short as possible.	This helps to minimize friction losses.	
Check that only necessary fittings are used.	This helps to minimize friction losses.	
Do not connect the piping to the pump until: <ul style="list-style-type: none"> <li>• The grout for the baseplate or sub-base becomes hard.</li> <li>• The hold-down bolts for the pump and the driver are tightened.</li> </ul>	—	



Check	Explanation/comment	Checked
Make sure that all the piping joints and fittings are airtight.	This prevents air from entering the piping system or leaks that occur during operation.	
If the pump handles corrosive fluids, make sure that the piping allows you to flush out the liquid before you remove the pump.	—	
If the pump handles liquids at elevated temperatures, make sure that the expansion loops and joints are properly installed.	This helps to prevent misalignment due to linear expansion of the piping.	

### Example: Installation for expansion

Correct	Incorrect
<p>This illustration shows a correct installation for expansion:</p>  <p>1. Expansion loop/joint</p>	<p>This illustration shows an incorrect installation for expansion:</p> 

## Suction-piping checklist

### Performance curve reference

### Suction-piping checks

Check	Explanation/comment	Checked
Check that the distance between the inlet flange of the pump and closest flow disruption (elbow, valve, strainer, or expansion joint) is at least five pipe diameters.	This minimizes the risk of cavitation in the suction inlet of the pump due to turbulence.	
Check that elbows in general do not have sharp bends.	See the Example sections for illustrations.	
Check that the suction piping is one or two sizes larger than the suction inlet of the pump. Install an eccentric reducer between the pump inlet and the suction piping. Suction pipe reducers should have no more than two pipe diameter changes per reducer.	The suction piping must never have a smaller diameter than the suction inlet of the pump. See the Example sections for illustrations.	
Check that the eccentric reducer at the suction flange of the pump has the following properties: <ul style="list-style-type: none"> <li>• Sloping side down</li> <li>• Horizontal side at the top</li> </ul>	See the example illustrations.	

Check	Explanation/comment	Checked
If suction strainers or suction bells are used, check that they are at least three times the area of the suction piping.	Suction strainers help to prevent clogging. Mesh holes with a minimum diameter of 1/16 in. (1.6 mm) are recommended.	
If more than one pump operates from the same liquid source, check that separate suction-piping lines are used for each pump.	This recommendation helps you to achieve a higher pump performance.	
If necessary, make sure that the suction piping includes a drain valve and that it is correctly installed.	—	

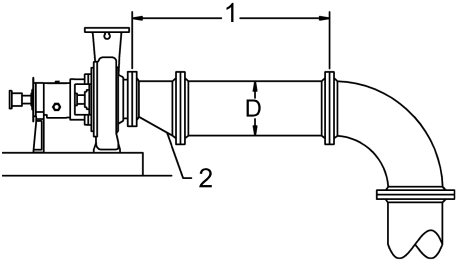
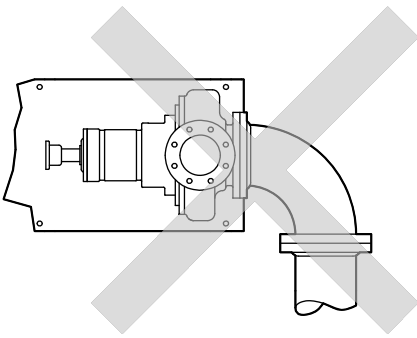
### Liquid source below the pump

Check	Explanation/comment	Checked
Make sure that the suction piping is free from air pockets.	This helps to prevent the occurrence of air and cavitation in the pump inlet.	
Check that the suction piping slopes upwards from the liquid source to the pump inlet.	—	
If the pump is not self-priming, check that a device for priming the pump is installed.	Use a foot valve with a diameter that is at least equivalent to the diameter of the suction piping.	

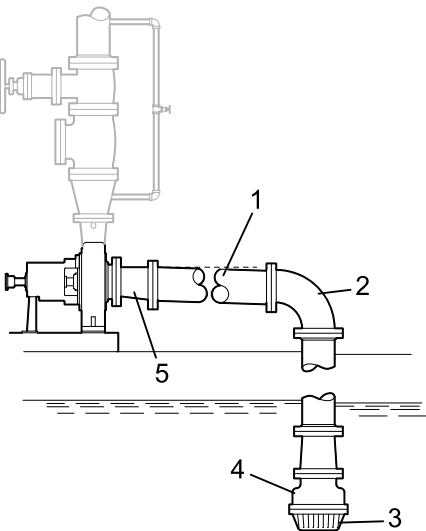
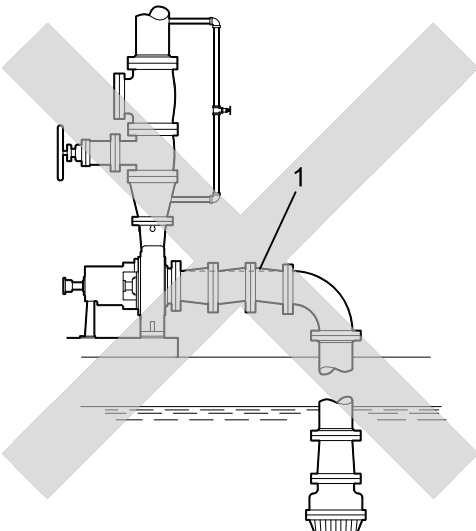
### Liquid source above the pump

Check	Explanation/comment	Checked
Check that an isolation valve is installed in the suction piping at a distance of at least two times the pipe diameter from the suction inlet.	This permits you to close the line during pump inspection and maintenance. Do not use the isolation valve to throttle the pump. Throttling can cause these problems: <ul style="list-style-type: none"> <li>• Loss of priming</li> <li>• Excessive temperatures</li> <li>• Damage to the pump</li> <li>• Voiding the warranty</li> </ul>	
Make sure that the suction piping is free from air pockets.	This helps to prevent the occurrence of air and cavitation in the pump inlet.	
Check that the piping is level or slopes downward from the liquid source.	—	
Make sure that no part of the suction piping extends below the suction flange of the pump.	—	
Make sure that the suction piping is adequately submerged below the surface of the liquid source.	This prevents air from entering the pump through a suction vortex.	

**Example: Elbow (or other flow disruption) close to the pump suction inlet**

Correct	Incorrect
<p>The correct distance between the inlet flange of the pump and the closest flow disruption (elbow, valve, strainer, or expansion joint) must be a least five pipe diameters.</p>  <p><b>NOTICE:</b> This illustration shows a correctly installed elbow.</p>	 <p><b>NOTICE:</b> This illustration shows an incorrectly installed elbow.</p>

**Example: Suction piping equipment**

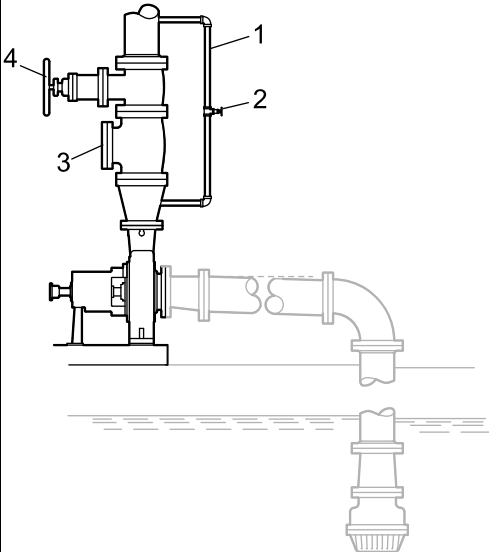
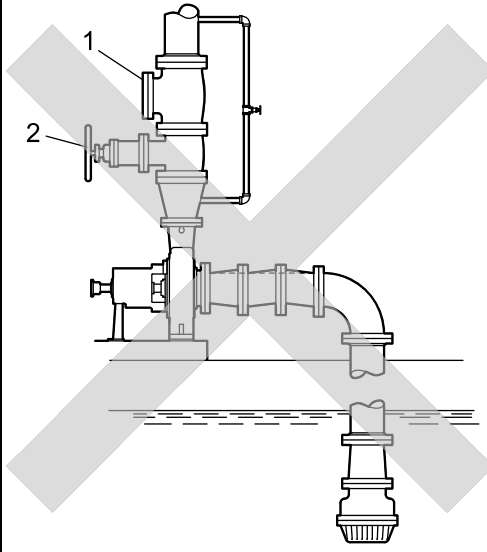
Correct	Incorrect
 <ol style="list-style-type: none"> <li>1. Suction pipe sloping upwards from liquid source</li> <li>2. Long-radius elbow</li> <li>3. Strainer</li> <li>4. Foot valve</li> <li>5. Eccentric reducer with a level top</li> </ol> <p><b>NOTICE:</b> This illustration shows correctly installed equipment for the suction piping.</p>	 <ol style="list-style-type: none"> <li>1. Air pocket, because the eccentric reducer is not used and because the suction piping does not slope gradually upward from the liquid source</li> </ol> <p><b>NOTICE:</b> This illustration shows incorrectly installed equipment for the suction piping.</p>

**Discharge piping checklist****Checklist**

Check	Explanation/comment	Checked
Check that an isolation valve is installed in the discharge line.	<p>The isolation valve is required for:</p> <ul style="list-style-type: none"> <li>• Priming</li> <li>• Regulation of flow</li> <li>• Inspection and maintenance of the pump</li> </ul> <p>See Example: Discharge piping equipment for illustrations.</p>	

Check	Explanation/comment	Checked
Check that a check valve is installed in the discharge line, between the isolation valve and the pump discharge outlet.	The location between the isolation valve and the pump allows inspection of the check valve. The check valve prevents damage to the pump and seal due to the back flow through the pump, when the drive unit is shut off. It is also used to restrain the liquid flow. See Example: Discharge piping equipment for illustrations.	
If increasers are used, check that they are installed between the pump and the check valve.	See Example: Discharge piping equipment for illustrations.	
If quick-closing valves are installed in the system, check that cushioning devices are used.	This protects the pump from surges and water hammer.	

### Example: Discharge piping equipment

Correct	Incorrect
 <ol style="list-style-type: none"> <li>1. Bypass line</li> <li>2. Shut-off valve</li> <li>3. Check valve</li> <li>4. Discharge isolation valve</li> </ol>	 <ol style="list-style-type: none"> <li>1. Check valve (incorrect position)</li> <li>2. The isolation valve should not be positioned between the check valve and the pump.</li> </ol>

## Bypass-piping considerations

### When to use a bypass line

Provide a bypass line for systems that require operation at reduced flows for prolonged periods. Connect a bypass line from the discharge side (before any valves) to the source of suction.

### When to install a minimum-flow orifice

You can size and install a minimum-flow orifice in a bypass line in order to prevent bypassing excessive flows. Consult your ITT representative for assistance in sizing a minimum-flow orifice.

### When a minimum-flow orifice is unavailable

Consider an automatic recirculation control valve or solenoid-operated valve if a constant bypass (minimum-flow orifice) is not possible.

## Auxiliary-piping checklist

### Precautions



#### WARNING:

- Cooling systems such as those for bearing lubrication and mechanical-seal systems must be operating properly to prevent excess heat generation, sparks, and premature failure.
- Sealing systems that are not self-purging or self-venting, such as plan 23, require manual venting prior to operation. Failure to do so will result in excess heat generation and seal failure.

#### NOTICE:

The mechanical seal must have an appropriate seal-flush system. Otherwise, excess heat generation and seal failure can occur.

### When to install

You may need to install auxiliary piping for bearing cooling, seal-chamber cover cooling, mechanical seal flush, or other special features supplied with the pump. Consult the pump data sheet for specific auxiliary piping recommendations.

### Checklist

Check	Explanation/comment	Checked
Check that the minimum flow for each component is 1 gpm (4 lpm). If the bearing and seal chamber cover cooling are provided, then the auxiliary piping must flow at 2 gpm (8 lpm).	—	
Check that the cooling water pressure does not exceed 100 psig (7.0 kg/cm <sup>2</sup> ).	—	

## Final piping checklist

Check	Explanation/comment	Checked
Check that the shaft rotates smoothly.	Rotate the shaft by hand. Make sure there is no rubbing that can lead to excess heat generation or sparks.	
Re-check the alignment to make sure that pipe strain has not caused any misalignment.	If pipe strain exists, then correct the piping.	

# Commissioning, Startup, Operation, and Shutdown

## Preparation for startup



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**WARNING:**

- Failure to follow these precautions before you start the unit will lead to serious personal injury and equipment failure.
  - Do not operate the pump below the minimum rated flows or with the suction or discharge valves closed. These conditions can create an explosive hazard due to vaporization of pumped fluid and can quickly lead to pump failure and physical injury.
  - Always disconnect and lock out power to the driver before you perform any installation or maintenance tasks. Failure to disconnect and lock out driver power will result in serious physical injury.
  - Operating the pump in reverse rotation can result in the contact of metal parts, heat generation, and breach of containment.
- 

## Precautions

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**NOTICE:**

- Verify the driver settings before you start any pump.
  - Make sure that the warm-up rate does not exceed 2.5°F (1.4°C) per minute.
  - Risk of damage to the mechanical seal or shaft sleeve on units supplied with cartridge mechanical seals. Prior to startup, make sure to tighten the set screws in the seal locking ring and remove the centering clips.
- 

You must follow these precautions before you start the pump:

- Flush and clean the system thoroughly to remove dirt or debris in the pipe system in order to prevent premature failure at initial startup.
- Bring variable-speed drivers to the rated speed as quickly as possible.
- If temperatures of the pumped fluid will exceed 200°F (93°C), then warm up the pump prior to operation. Circulate a small amount of fluid through the pump until the casing temperature is within 100°F (38°C) of the fluid temperature.

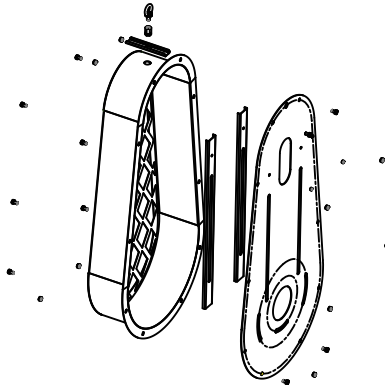
At initial startup, do not adjust the variable-speed drivers or check for speed governor or over-speed trip settings while the variable-speed driver is coupled to the pump. If the settings have not been verified, then uncouple the unit and refer to instructions supplied by the driver manufacturer.

After observing the precautions above, the v-belt or coupling guard must be removed to check driver rotation and set the impeller clearance. Refer to the appropriate guard removal instructions specific to your unit(s).

## Remove the V-belt drive guard

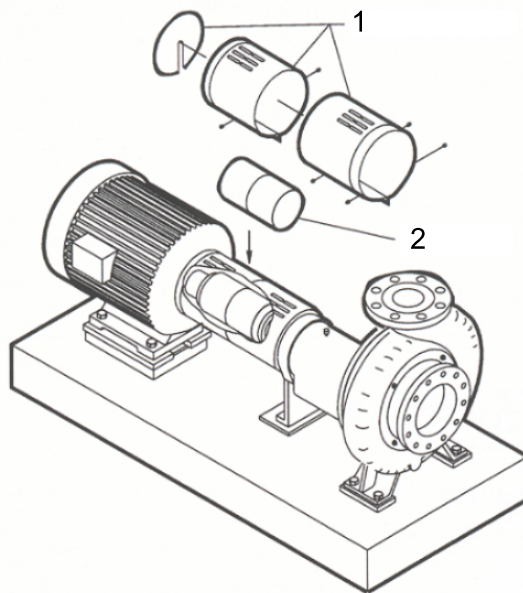
1. Remove the drive guard assembly hardware as appropriate.
2. Remove the hardware that secures the drive guard in place.

3. Disassemble and remove the drive guard assembly.



## Remove the coupling guard

1. Remove the nut, bolt, and washers from the slotted hole in the center of the coupling guard.
2. Slide the driver half of the coupling guard toward the pump.
3. Remove the nut, bolt, and washers from the driver half of the coupling guard.
4. Remove the driver-side end plate.
5. Remove the driver half of the coupling guard:
  - a) Slightly spread the bottom apart.
  - b) Lift upwards.
6. Remove the remaining nut, bolt, and washers from the pump half of the coupling guard. It is not necessary to remove the end plate from the pump side of the bearing housing. You can access the bearing-housing tap bolts without removing this end plate if maintenance of internal pump parts is necessary.
7. Remove the pump half of the coupling guard:
  - a) Slightly spread the bottom apart.
  - b) Lift upwards.



1. Coupling guard
2. Coupling

## Check the rotation


**WARNING:**

- Operating the pump in reverse rotation can result in the contact of metal parts, heat generation, and breach of containment.
- Always disconnect and lock out power to the driver before you perform any installation or maintenance tasks. Failure to disconnect and lock out driver power will result in serious physical injury.

1. Lock out power to the driver.
2. Make sure that the coupling hubs or v-belt sheaves are fastened securely to the shafts.
3. Make sure that the coupling spacer is removed, if applicable.  
The pump ships with the coupling spacer removed.
4. Unlock power to the driver.
5. Make sure that everyone is clear, and then jog the driver long enough to determine that the direction of rotation corresponds to the arrow on the bearing housing or casing.
6. Lock out power to the driver.

## Impeller-clearance check

The impeller-clearance check ensures the following:

- The pump turns freely.
- The pump operates at optimal efficiency for long equipment life and low energy consumption.

## Impeller axial clearances

### Total axial adjustment

The total axial adjustment of the impeller between the suction seal ring and the stuffing box cover should be as noted in the chart below.

### Impeller clearance (total travel)

Pump size	Impeller Maximum Total Clearance inches (mm)	Impeller Minimum Total Clearance inches (mm)
XHD80	0.37 (9.4)	0.10 (2.6)
XHD125	0.39 (9.8)	0.10 (2.6)
XHD150	0.43 (10.8)	0.13 (3.3)
XHD200	0.47 (11.8)	0.16 (4.1)
XHD250	0.47 (11.9)	0.16 (4.0)
XHD300	0.51 (12.8)	0.18 (4.6)

## Impeller-clearance setting

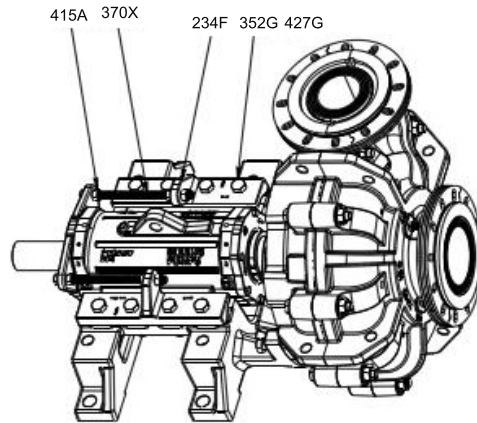
### Importance of a proper impeller clearance

A proper impeller clearance ensures that the pump runs at high performance.



**WARNING:**

- The pump should be run for a period of 15 minutes to verify the impeller is properly tightened onto the shaft. In addition to verifying the impeller is properly tightened, it is necessary to verify that the bearing frame adjustment plate bolts (352G) and nuts (427D) are properly secured and tight. Failure to check that the impeller is tight and the bearing frame adjustment plate bolts and nuts are properly tightened can result in the rotating element shifting during operation.



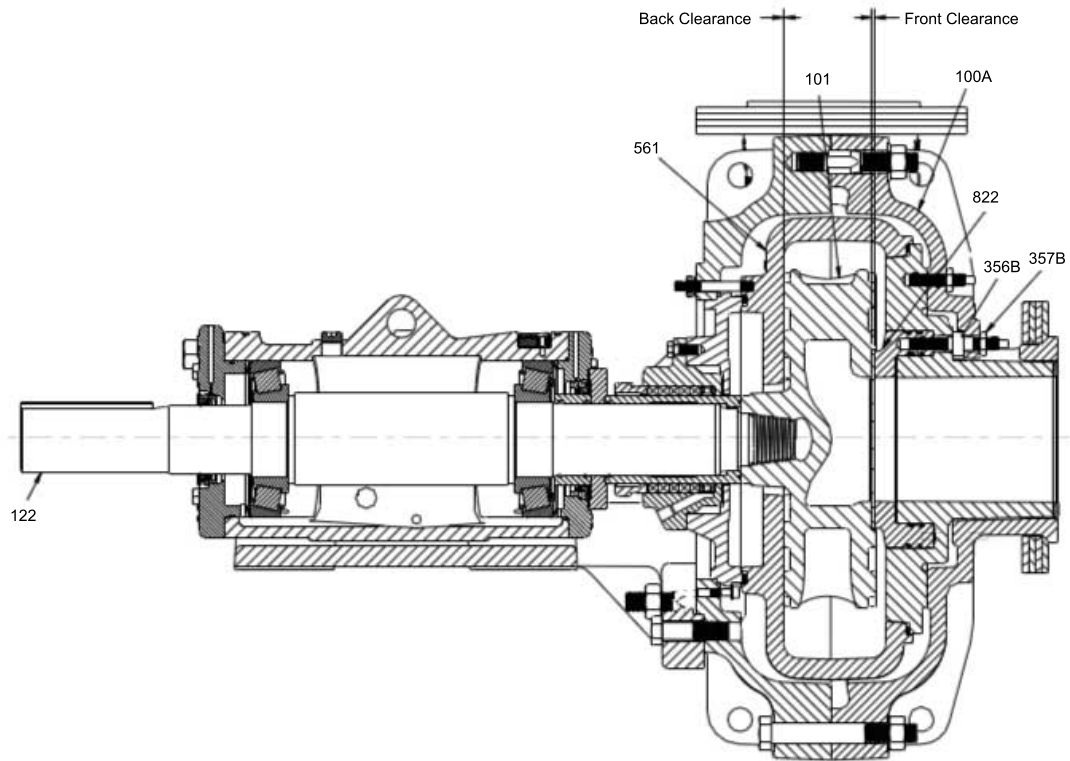
- The impeller clearance setting procedure must be followed. Improperly setting the clearance or not following any of the proper procedures can result in sparks, unexpected heat generation, and equipment damage.

The front clearance is set at .51 mm (0.020 in) at the factory but could change due to piping attachment during installation. A change in pump performance may be noted over time by a drop in head or flow or an increase in power required.

**Table 5: Impeller clearance methods**

The XHD and XHD Value Option models have different methods of setting the impeller clearance.

Pump Model	Method
XHD	<p>The impeller clearance is set by measuring the gap between the rear shroud of the impeller and the casing volute liner, and measuring the gap between the front of the impeller and the suction seal ring clearance.</p> <p>Skip to the "Set Impeller to Suction seal Ring Clearance Dial Indicator Method - XHD" step.</p> <p>After impeller rear clearance has been set on the XHD, the suction seal ring clearance must also be set.</p>
XHD Value Option	<p>The impeller clearance is set by measuring the gap between the front of the impeller and the suction side liner. Use the "Set the impeller clearance dial indicator method - XHD Value Option" step.</p>



## Set impeller to Suction Seal Ring Clearance Dial Indicator Method



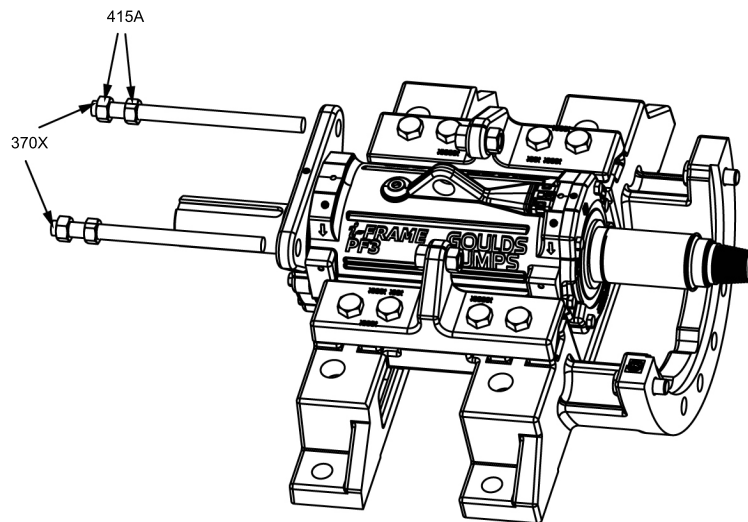
### **WARNING:**

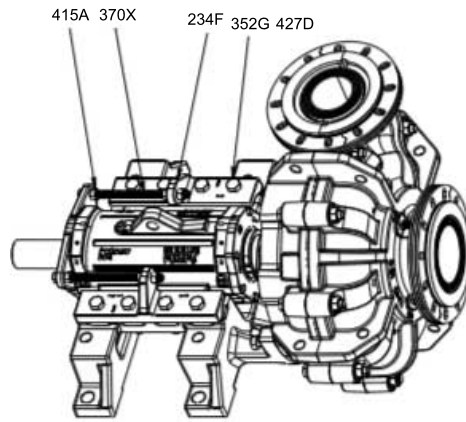
Always disconnect and lock out power to the driver before you perform any installation or maintenance tasks. Failure to disconnect and lock out driver power will result in serious physical injury.

All of the instructions that are stated in the following steps are based on viewing the unit from the rearward (drive) end.

1. Remove the coupling or v-belt guard.
2. Loosen the two adjusting nuts (415A) on the forward sides of the bearing frame adjustment plates (234F) by turning them counterclockwise.
3. Loosen but do not remove the adjustment plate hold-down bolts (352G) and nuts (427D) that clamp the bearing frame adjustment plates (234F) to the pedestal (131). Do not remove the adjustment plate hardware. Keep hardware finger tight to keep the power frame constrained to the pedestal.
4. Back up the Impeller: Turn the two adjusting nuts (415A) on the rearward sides of the bearing frame adjustment plates (234F) counterclockwise sequentially, 1/2 of a turn each at a time, to draw the power end and impeller (101) backward until the face of the rear pump out vanes of the impeller contacts the volute liner (561). Turn the shaft (122) clockwise to ensure that there is contact between the impeller (101) and volute liner (561). Stop turning the adjusting nuts (415A) when a firm drag is encountered.
5. Place and zero the indicator: Place the dial indicator so that the button contacts either the shaft end, face of the coupling, face of the sheave bushing, or on the face of the bearing end cover. Zero the indicator.
6. Loosen the two adjusting nuts (415A) on the rear sides of the bearing frame adjustment plates (234F) that were tightened in step 4 above by turning them counter clockwise.
7. Move Impeller forward the sum of impeller back clearance plus the impeller front clearance from table 7: Turn the two adjusting nuts (415A) on the forward sides of the bearing frame adjustment plates (234F) clockwise sequentially, 1/2 of a turn at a time, to draw the power end forward until there is a 2.54mm (.100 in) or 3.0 mm (.118 in) gap between the impeller (101) and suction volute liner (561) as measured on the dial indicator.

8. Tighten the adjustment plate hold-down bolts (352G) and nuts (427D) that clamp the bearing frame adjustment plates (234F) to the pedestal (131). Make sure that the dial indicator reading remains at the proper setting.
9. Loosen the three seal ring jam nuts (357B) by turning them counterclockwise.
10. Move Seal Ring to contact to the impeller: Turn the three square head adjusting bolts (356F) sequentially counter clockwise, 1/3 of a turn each at a time, until the seal ring (822) contacts the impeller (101) and is square with the wear surface of the impeller. Turn the shaft (122) clockwise while performing step 10 to ensure there is contact between the seal ring (822) and impeller (101). Stop turning the square head adjusting bolts (356F) when a firm drag is encountered.
11. Tighten the seal ring adjusting bolt jam nuts (357B) by turning counterclockwise until the nuts contact the suction casing (100A).
12. Loosen the adjustment plate hold down bolts (352G) and nuts (427D).
13. Loosen the two adjusting nuts (415A) on the forward sides of the bearing frame adjustment plates (234F) by turning them counterclockwise.
14. Back up the impeller .51mm (.020 in): Turn the two adjusting nuts (415A) on the rearward sides of the bearing frame adjustment plates (234F) sequentially clockwise, 1/2 of a turn each at a time, to draw the power end backward until the impeller (101) dial indicator measures the proper field setting impeller back clearance from table 7. To verify the correct impeller to suction seal ring clearance has been made, a feeler gage can be inserted thru the casing suction between the impeller (101) and seal ring (822) in 3 places to assure the seal ring is square to the impeller face.
15. Tighten the adjustment plate hold-down bolts (352G) and nuts (427D) that clamp the bearing frame adjustment plates (234F) to the pedestal (131). Make sure that the dial indicator reading remains at the proper setting.
16. Tighten the two adjusting nuts (415A) on the forward side of the bearing frame adjustment plates (234F) by turning counterclockwise until they contact the adjustment plates. This procedure should yield .51mm (.02in) gap between the impeller (101) and suction seal ring (822), and leave the approximate back clearance noted in table 7 gap between the rear shroud of the impeller (101) and the volute liner (561).



**Table 6: Impeller clearance**

Pump Size	Field Setting Impeller Back Clearance inches (mm)	Field Setting Impeller Front Clearance inches (mm)
XHD80	0.08 (2)	0.02 (.51)
XHD125	0.08 (2)	0.02 (.51)
XHD150	0.08 (2)	0.02 (.51)
XHD200	0.1 (2.5)	0.02 (.51)
XHD250	0.1 (2.5)	0.02 (.51)
XHD300	0.1 (2.5)	0.02 (.51)

## Set impeller clearance dial indicator method - XHD

**WARNING:**

Always disconnect and lock out power to the driver before you perform any installation or maintenance tasks. Failure to disconnect and lock out driver power will result in serious physical injury.

All of the instructions that are stated in the following steps are based on viewing the unit from the rearward (drive) end.

1. Remove the coupling or v-belt guard.
2. Loosen the two adjusting nuts (415A) on the forward sides of the bearing frame adjustment plates (234F) by turning them clockwise.
3. Loosen but do not remove the adjustment plate hold-down bolts (352G) and nuts (427D) that clamp the bearing frame adjustment plates (234F) to the pedestal (131). Do not remove the adjustment plate hardware. Keep hardware finger tight to keep the power frame constrained to the pedestal.
4. Turn the two adjusting nuts (415A) on the forward sides of the bearing frame adjustment plates (234F) sequentially clockwise, 1/2 of a turn each at a time, to draw the power end forward until the impeller (101) contacts the Suction Liner (562).
5. Turn the shaft (122) clockwise while performing step 4 above to ensure that there is contact between the impeller (101) and Suction Liner (562). Stop turning the forward adjusting nuts when a firm drag is encountered.
6. Place the dial indicator so that the button contacts either the shaft end, face of the coupling, or face of the sheave bushing or the face of the bearing end cover. Zero the indicator.
7. Turn the two adjusting nuts (415A) on the rear sides of the bearing frame adjustment plates (234F) sequentially counterclockwise, 1/2 of a turn each at a time, to draw the power end and impeller (101) backward until there is an approximate 0.02 inch (.50 mm) gap between the impeller (101) and suction liner (562) as measured on the dial indicator.
8. Tighten the adjustment plate hold-down bolts (352G) and nuts (427D) that clamp the bearing frame adjustment plates (234F) to the pedestal (131). Make sure that the dial indicator reading remains at the proper setting.

9. Tighten the two adjusting nuts (415A) on the rearward side of the bearing frame adjustment plates (234F) that were loosened in step 5 above by turning them clockwise. Make sure that the dial indicator reading remains at the proper setting.
10. Replace the coupling or v-belt guard.

## Suction seal ring clearance check - XHD only



### WARNING:

Always disconnect and lock out power to the driver before you perform any installation or maintenance tasks. Failure to disconnect and lock out driver power will result in serious physical injury.

In addition to checking the impeller clearance, the suction seal ring clearance on the XHD model must also be checked according to the following instructions for optimal efficiency and wear.

All of the instructions that are stated in the following steps are based on viewing the unit from the rearward (drive) end.

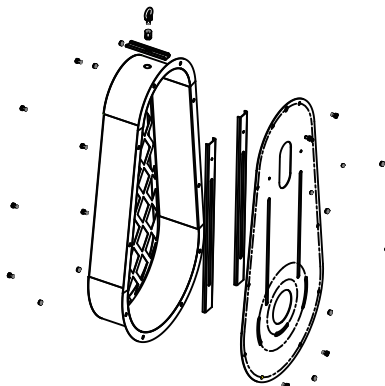
1. Loosen the three seal ring jam nuts (357B) by turning them counterclockwise.
2. Turn the three square head adjusting bolts (356F) sequentially clockwise, 1/3 of a turn each at a time, until the seal ring (822) contacts the impeller (101).
3. Turn the shaft (122) clockwise while performing step 2 above to ensure there is contact between the seal ring (822) and impeller (101). Stop turning the square head adjusting bolts when a firm drag is encountered.
4. Turn the three square head adjusting bolts (356F) sequentially counterclockwise, 1/3 of a turn each at a time, while measuring the gap between the impeller (101) and seal ring (822) using a set of feeler gauges inserted in the suction of the pump.
5. Continue adjusting the square head adjusting bolts as outlined in step 3 above until there is the appropriate gap from table 7 between the suction seal ring (822) and the impeller (101). The gap is properly established when a appropriate feeler gauge fits snugly into the space between the impeller (101) and seal ring (822).
6. Lock the square head adjusting bolts (356F) in place by turning the jam nuts (357B) clockwise until tightened against the suction half casing (100A).

After the clearances have been checked/set, the v-belt or coupling guard can be re-installed. Refer to the appropriate guard installation instructions specific to your unit(s).

Impeller to Suction liner / Seal Ring Front clearance
0.02 inches
0.50 mm

## Install the V-belt drive guard

1. Assembly the drive guard as necessary. Use appropriate hardware.
2. Secure the drive guard in place to the foundation or baseplate and pump as necessary. Use appropriate hardware.



## V-Belt drive operation

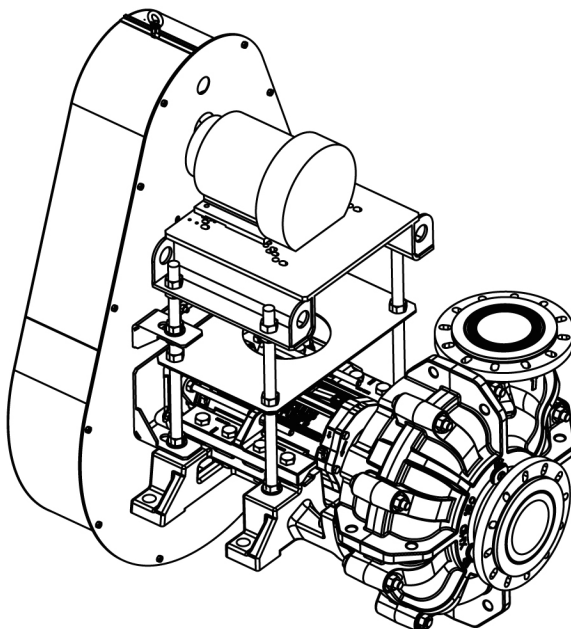
### V belt drive installation checks

Use the following steps and guidelines to make sure that the v-belt drive is properly installed and that the belts are properly tensioned.

1. Operate the drive for a few minutes as the belts seat into the sheave grooves.
2. Observe the operation of the drive under its highest load condition, which is usually at startup.
3. A slight bowing of the slack side of the drive indicates proper tension.
4. The following indicate improper belt tensioning:
  - a) If the slack side of the drive remains too taut during peak load, the drive is too tight.
  - b) Excessive bowing or slippage of the slack side indicates insufficient tension.
  - c) If the belts squeal as the motor is started, or at some subsequent peak load, the belts are not tight enough to deliver the torque that is demanded by the motor.
5. If any of the conditions that are listed under (4) are evident, stop the drive and readjust the belts.
6. If conditions persist, check the sheave alignment as outlined in the previous sections.
7. The belt tension on a newly installed drive should be checked throughout the first day of continuous operation by observing the slack side span. After a few days of operation, the belts will fully seat themselves in the sheave grooves, and further readjustment may be necessary. Use the steps and guidelines above as necessary.

### V-belt drive monitoring and protection

1. Use all of the information in these sections to ensure that the v-belt drive is properly installed for correct operation and long life.
2. Keep the v-belts clean. Exposure to dirt and grease can reduce belt life. Maintaining a clean drive is the one of the best practices a user can employ to ensure drive longevity.
3. Always follow safety procedures. Never adjust any components of the v-belt drive while the unit is in operation.
4. Always observe v-belt running operation through the mesh portions of the drive guard at a safe distance.
5. Always keep all appendages, clothing, and site tooling out of reach while the drive is running. Failure to do so could result in personal injury and unit damage.
6. Never run the unit without the drive guard in place.

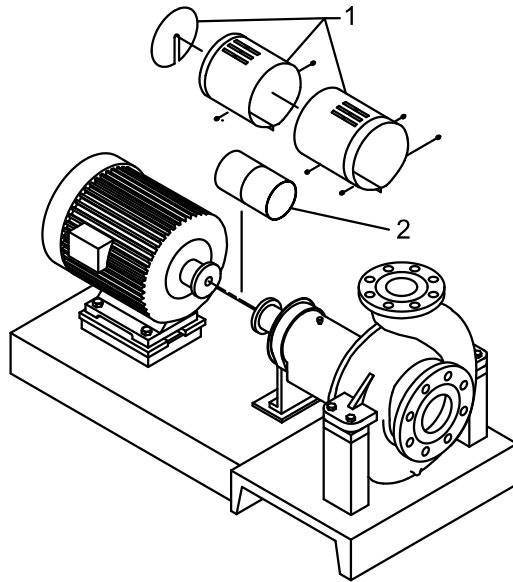


## Couple the pump and driver

**WARNING:**

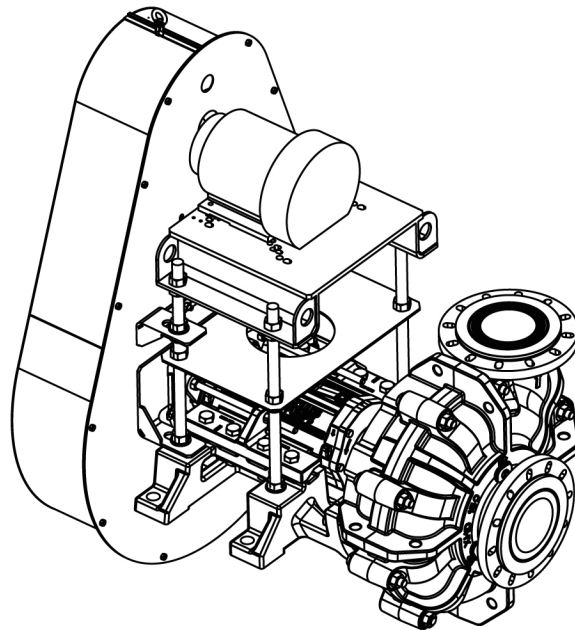
Always disconnect and lock out power to the driver before you perform any installation or maintenance tasks. Failure to disconnect and lock out driver power will result in serious physical injury.

Couplings must have proper certification to be used in an ATEX classified environment. Use the instructions from the coupling manufacturer in order to lubricate and install the coupling.



1. Coupling guard
2. Coupling

**Figure 12: Coupling guard assembly**



**Figure 13: Pump with OHMM and belt guard installed**

## Install the coupling guard

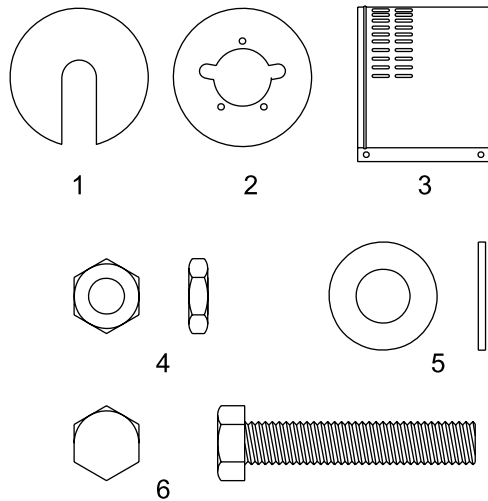


### WARNING:

- Never operate a pump without a properly installed coupling guard. Personal injury will occur if you run the pump without a coupling guard.
- Always disconnect and lock out power to the driver before you perform any installation or maintenance tasks. Failure to disconnect and lock out driver power will result in serious physical injury.
- The coupling used in an Ex-classified environment must be properly certified and must be constructed from a non-sparking material.

---

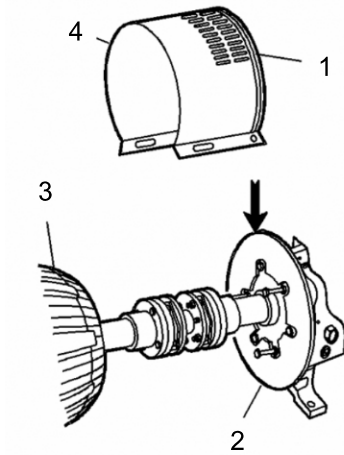
### Required parts:



1. End plate, drive end
  2. End plate, pump end
  3. Guard half, 2 required
  4. 3/8-16 nut, 3 required
  5. 3/8 in. washer
  6. 3/8-16 x 2 in. hex head bolt, 3 required
1. De-energize the motor, place the motor in a locked-out position, and place a caution tag at the starter that indicates the disconnect.

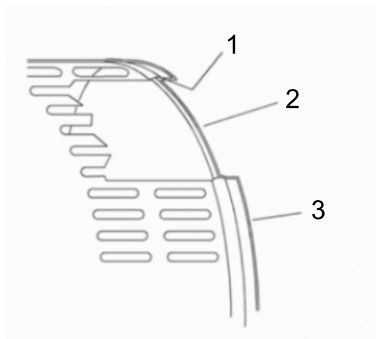


2. Put the pump-side end plate in place.  
If the pump-side end plate is already in place, make any necessary coupling adjustments and then proceed to the next step.
3. Put the pump-half of the coupling guard in place:
  - a) Slightly spread the bottom apart.
  - b) Place the coupling guard half over the pump-side end plate.



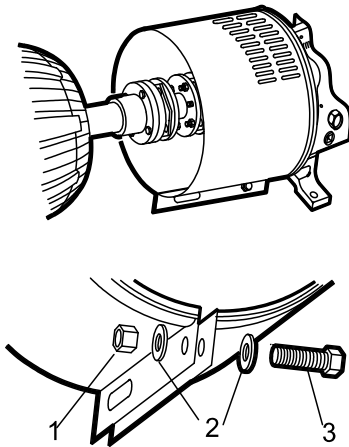
1. Annular groove
2. Pump-side end plate
3. Driver
4. Pump half of the coupling guard

The annular groove in the coupling guard half must fit around the end plate.



1. Annular groove
2. End plate (pump end)
3. Guard half

4. Use a bolt, a nut, and two washers to secure the coupling guard half to the end plate. Tighten securely.



1. Nut
  2. Washer
  3. Bolt
5. Put the driver half of the coupling guard in place:
    - a) Slightly spread the bottom apart.
    - b) Place the driver half of the coupling guard over the pump half of the coupling guard. The annular groove in the coupling guard half must face the motor.
  6. Place the driver-side end plate over the motor shaft.
  7. Place the driver-side end plate in the annular groove of the driver-half of the coupling guard.
  8. Use a bolt, a nut, and two washers to secure the coupling guard half to the end plate. Hand-tighten only. The hole is located on the driver-side of the coupling guard half.
  9. Slide the driver-half of the coupling guard towards the motor so that the coupling guard completely covers the shafts and coupling.
  10. Use a nut, a bolt, and two washers to secure the coupling guard halves together.
  11. Tighten all nuts on the guard assembly.



---

**WARNING:**  
Never operate the pump without the coupling guard correctly installed.

---

## Bearing lubrication



---

**WARNING:**  
Make sure to properly lubricate the bearings. Failure to do so can result in excess heat generation, sparks, and premature failure.

---

---

**NOTICE:** Be certain to check the greasing on a pump that has been out of service for a long period of time and re-grease if necessary.

---

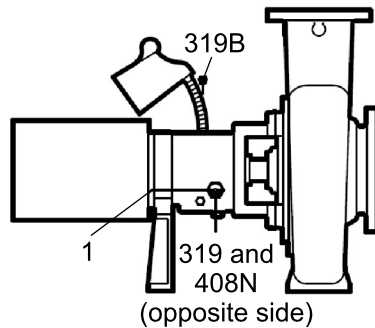
Pumps are shipped without oil. You must lubricate oil-lubricated bearings at the job site. Grease-lubricated bearings are lubricated at the factory.

## Lubricate the bearings with oil


**WARNING:**

Make sure to properly lubricate the bearings. Failure to do so can result in excess heat generation, sparks, and premature failure.

1. Remove the oil fill pipe plug (319B).
2. Fill the bearing frame with oil through the filler connection that is located on the top of the bearing frame.
3. Fill the bearing frame with oil until the oil level reaches the middle of the sight glass or opposite sight glass (319 or 408N).



1. Correct level

**Figure 14: Oil lubricated bearings**

4. Replace the oil fill pipe plug (319B).

## Shaft-sealing options

In most cases, the manufacturer seals the shaft before shipping the pump. If your pump does not have a sealed shaft, see the Shaft-seal maintenance section in the Maintenance chapter.

This model uses these types of shaft seals:

- Cartridge mechanical seal
- Packed-stuffing-box option

## Mechanical seal options

Pumps are usually shipped with mechanical seals installed. If they are not, then refer to the mechanical seal manufacturer's installation instructions.

These are the mechanical seal options for this pump:

- Cartridge mechanical seal

## Connection of sealing liquid for mechanical seals

### Seal lubrication is required

Seal faces must have liquid film between them for proper lubrication. Locate the taps using the illustrations shipped with the seal.

If a flushless slurry seal was ordered, then consult manufacturers instructions for seal lubrication.

### Seal flushing methods

You can use these methods in order to flush or cool the seal:

Method	Description
Product flush	Run the piping so that the pump pushes the pumped fluid from the casing and injects it into the seal gland. If necessary, an external heat exchanger cools the pumped fluid before it enters the seal gland.

Method	Description
External flush	Run the piping so that the pump injects a clean, cool, compatible liquid directly into the seal gland. The pressure of the flushing liquid must be 5 to 15 psi (0.35 to 1.01 kg/cm <sup>2</sup> ) greater than the seal chamber pressure. The injection rate must be 0.5 to 2 gpm (2 to 8 lpm).
Other	You can use other methods that employ multiple gland or seal chamber connections. Refer to the mechanical seal reference drawing and seal flush/cooling piping diagrams.

## Packed stuffing box option



### **WARNING:**

Packed stuffing boxes are not allowed in an ATEX-classified environment.

The factory does not install the packing, lantern ring, or split gland.

These parts are included with the pump in the box of fittings. Before you start the pump, you must install the packing, lantern ring, and split gland according to the Packed stuffing box maintenance section in the Maintenance chapter.

## Connection of sealing liquid for a packed stuffing box



### **WARNING:**

Packed stuffing boxes are not allowed in an ATEX-classified environment.

### **NOTICE:**

Make sure to lubricate the packing. Failure to do so may result in shortening the life of the packing and the pump.

You must use an external sealing liquid under these conditions:

- The pumped fluid includes abrasive particles.
- The stuffing-box pressure is below atmospheric pressure when the pump is running with a suction lift or when the suction source is in a vacuum. Under these conditions, packing is not cooled and lubricated and air is drawn into pump.

## Conditions for application of an external liquid

Condition	Action
The stuffing box pressure is above atmospheric pressure and the pumped fluid is clean.	Normal gland leaks of 40 to 60 drops per minute is usually sufficient to lubricate and cool the packing. You do not need sealing liquid.
The stuffing box pressure is below atmospheric pressure or the pumped fluid is not clean.	An outside source of clean compatible liquid is required.
An outside source of clean compatible liquid is required.	You must connect the piping to the lantern ring connection with a 40 to 60 drops-per-minute leak rate. The pressure must be 15 psi (1.01 kg/cm <sup>2</sup> ) above the stuffing box pressure.

## Seal the shaft with a packed stuffing box



### **WARNING:**

Packed stuffing boxes are not allowed in an ATEX-classified environment.



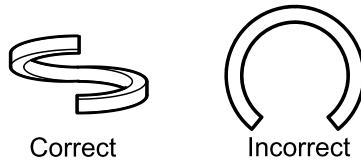
### **CAUTION:**

Never replace the packing until the driver is properly locked out and the coupling spacer is removed.

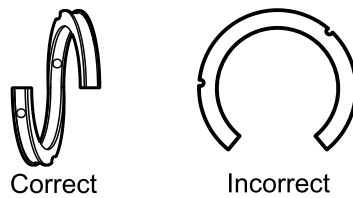
Pumps are shipped without the packing, lantern ring, or split gland installed. These parts are included with the box of fittings shipped with each pump and must be installed before startup.

1. Carefully clean the stuffing-box bore.
2. Twist the packing enough to get it around the shaft.

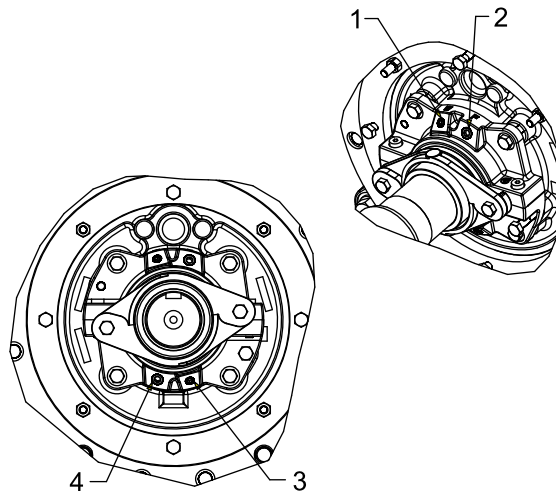
#### Packing Rings



#### Lantern Rings



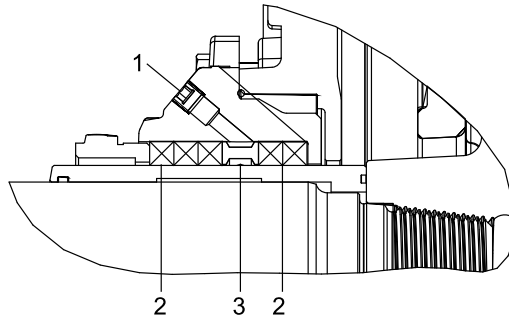
The XHD stuffing box is supplied with water connections for both the weep type and full flush configurations. The stuffing box cover is marked with an "F" and a "W" to show the proper locations for full flush or weep style connections.



1. Water flush (weep flush)
2. Water flush (full flush)
3. Water drain (weep flush)
4. Water drain (full flush)

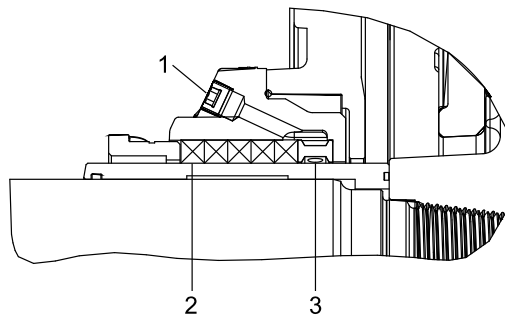
Make sure that the stuffing box and shaft sleeve are clean before packing a pump. Also verify that the lantern ring is properly positioned to accept the flush water as shown.

3. Insert the packing and stagger the joints in each ring by 90°. Install the stuffing box parts in this order:  
For weep flush setting (**2L3**):
- Two packing rings (106)
  - One lantern ring (105)
  - Three packing rings (106)



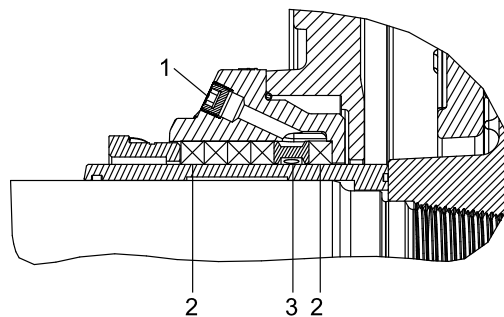
1. Flush connection
2. Packing rings
3. Lantern ring

- For full flush setting (**L5**):
- One lantern ring (105)
  - Five packing rings (106)



1. Flush connection
2. Packing rings
3. Lantern ring

- For full flush setting (**1L4**):
- One packing ring (106)
  - One lantern ring (105)
  - Four packing rings (106)



1. Flush connection
2. Packing rings
3. Lantern ring

4. Install the gland halves and evenly hand-tighten the nuts.  
Do not overtighten gland nuts. Overtightened packing causes excessive friction between packing and sleeve and will result in damaged components.

**Table 7: Flush water requirements**

The flush water requirements are listed for both the weep style and full flush packing arrangements.

Group	Size	(L5) Full Flush GPM (liters/ min)	Full Flush (1L4) GPM (litres/ min)	(2L3) Weep Flush GPM (liters/min)	Mechanical Seal Flush
PF2	XHD80	15 (57)	10 (38)	0.3 (1.1)	Consult Seal Mfg
PF3	XHD125	23 (87)	18 (68)	0.6 (2.3)	
PF4	XHD150,200	37 (140)	32 (121)	1.1 (4.2)	
PF5	XHD250,300	61 (231)	56 (212)	2.2 (8.3)	

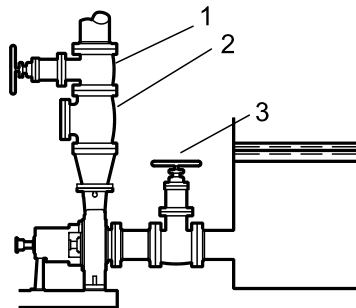
## Pump priming

**WARNING:**

These pumps are not self priming and must be fully primed at all times during operation. Loss of prime can lead to excessive heat and severe damage to the pump and seal.

### Prime the pump with the suction supply above the pump

1. Slowly open the suction isolation valve.
2. Open the air vents on the suction and discharge piping until the pumped fluid flows out.
3. Close the air vents.



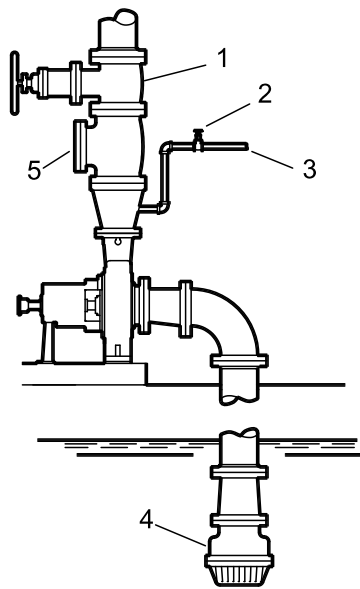
1. Discharge isolation valve
2. Check valve
3. Suction isolation valve

### Prime the pump with the suction supply below the pump

Use a foot valve and an outside source of liquid in order to prime the pump. The liquid can come from one of these sources:

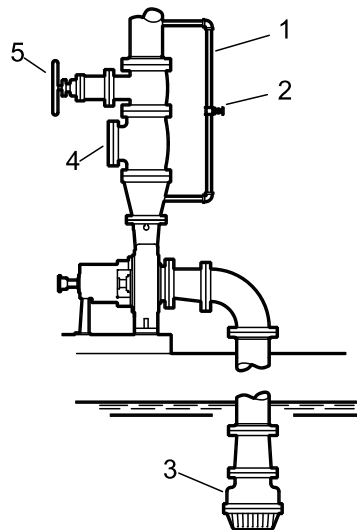
- A priming pump
  - A pressurized discharge line
  - Another outside supply
1. Close the discharge isolation valve.
  2. Open the air vent valves in the casing.
  3. Open the valve in the outside supply line until only liquid escapes from the vent valves.
  4. Close the vent valves.
  5. Close the outside supply line.

This illustration is an example of priming the pump with a foot valve and an outside supply:



1. Discharge isolation valve
2. Shutoff valve
3. From outside supply
4. Foot valve
5. Check valve

This illustration is an example of priming the pump with a foot valve using a bypass around the check valve:



1. By-pass line
2. Shutoff valve
3. Foot valve
4. Check valve
5. Discharge isolation valve



## Other methods of priming the pump

You can also use these methods in order to prime the pump:

- Prime by ejector
- Prime by automatic priming pump

## Start the pump



---

**CAUTION:**

- Immediately observe the pressure gauges. If discharge pressure is not quickly attained, stop the driver, reprime, and attempt to restart the pump.
  - Observe the pump for vibration levels, bearing temperature, and excessive noise. If normal levels are exceeded, shut down the pump and resolve the issue.
- 

Before you start the pump, you must perform these tasks:

- Open the suction valve.
  - Open any recirculation or cooling lines.
1. Fully close or partially open the discharge valve, depending on system conditions.
  2. Start the driver.
  3. Slowly open the discharge valve until the pump reaches the desired flow.
  4. Immediately check the pressure gauge to ensure that the pump quickly reaches the correct discharge pressure.
  5. If the pump fails to reach the correct pressure, perform these steps:
    - a) Stop the driver.
    - b) Prime the pump again.
    - c) Restart the driver.
  6. Monitor the pump while it is operating:
    - a) Check the pump for bearing temperature, excessive vibration, and noise.
    - b) If the pump exceeds normal levels, then shut down the pump immediately and correct the problem.

A pump can exceed normal levels for several reasons. See Troubleshooting for information about possible solutions to this problem.
  7. Repeat steps 5 and 6 until the pump runs properly.

## Activate the i-ALERT Condition Monitor



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**WARNING:**

Never heat the condition monitor to temperatures in excess of 300°F (149°C). Heating to these temperatures could result in death or serious injury.

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**CAUTION:**

Always wear protective gloves. The pump and condition monitor can be hot.

---

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**NOTICE:**

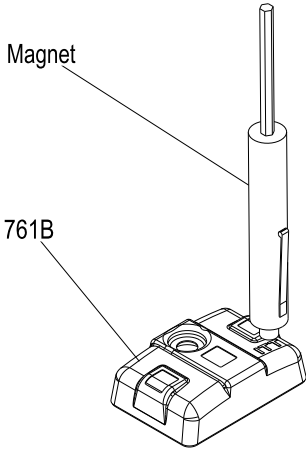
Do not use the condition monitor in atmospheres containing acetic acid.

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By using the i-Alert™ Condition monitor, you agree to be bound by the Terms and Conditions of the [Software License Agreement](#) (page 17)

The condition monitor is ready for activation when the pump is running and has reached a steady flow, pressure, and temperature. This process only takes a few minutes.

1. Place a small magnet on the condition monitor over the ITT logo and then remove it, as this example shows.



When the condition monitor is activated it:

1. Displays a series of red LEDs followed by a solid green LED.
2. Collects eight samples that are spaced one second apart.
3. Averages these readings to establish the baseline vibration level.
4. Flashes a green LED after approximately twelve seconds.

For the first ten minutes, the green LED flashes every second for five consecutive flashes and then pauses to take a vibration reading. More frequent measurements (every six seconds) are taken in this startup period so that an alarm can be immediately detected.

## i-ALERT™ Condition Monitor routine operation

### Measurement interval

This table shows the measurement intervals for the condition monitor during normal operation and when the monitor is in alarm mode.

Mode	Measurement interval
Normal operating mode	Five minutes
Alarm mode	Two minutes

When the condition monitor measures a reading beyond the specified temperature and vibration limits, the appropriate red LED flashes. After the process or pump condition that causes the alarm is corrected, the condition monitor returns to normal mode after one normal-level measurement.

### Alarm mode

When the condition monitor is in alarm mode, you should investigate the cause of the condition and make necessary corrections in a timely manner.

### Magnetic device considerations

Be careful when you use magnetic devices in close proximity of the condition monitor, such as magnetic vibration-monitoring probes or dial indicators. These magnetic devices can accidentally activate or deactivate the condition monitor resulting in improper alarm levels or loss of monitoring.

## Pump operation precautions

### General considerations

**CAUTION:**

- Vary the capacity with the regulating valve in the discharge line. Never throttle the flow from the suction side since this can result in decreased performance, unexpected heat generation, and equipment damage.
- Do not overload the driver. Driver overload can result in unexpected heat generation and equipment damage. The driver can overload in these circumstances:
  - The specific gravity of the pumped fluid is greater than expected.
  - The pumped fluid exceeds the rated flow rate.
- Make sure to operate the pump at or near the rated conditions. Failure to do so can result in pump damage from cavitation or recirculation.

### Operation at reduced capacity

**WARNING:**

Never operate any pumping system with a blocked suction and discharge. Operation, even for a brief period under these conditions, can cause confined pumped fluid to overheat, which results in a violent explosion. You must take all necessary measures to avoid this condition.

**CAUTION:**

- Avoid excessive vibration levels. Excessive vibration levels can damage the bearings, stuffing box or seal chamber, and the mechanical seal, which can result in decreased performance.
- Avoid increased radial load. Failure to do so can cause stress on the shaft and bearings.
- Avoid heat build-up. Failure to do so can cause rotating parts to score or seize.
- Avoid cavitation. Failure to do so can cause damage to the internal surfaces of the pump.

### Operation under freezing conditions

**NOTICE:**

Do not expose an idle pump to freezing conditions. Drain all liquid that is inside the pump and the cooling coils. Failure to do so can cause liquid to freeze and damage the pump.

## Shut down the pump

**WARNING:**

The pump can handle hazardous and toxic fluids. Identify the contents of the pump and observe proper decontamination procedures in order to eliminate the possible exposure to any hazardous or toxic fluids. Wear the proper personal protective equipment. Potential hazards include, but are not limited to, high temperature, flammable, acidic, caustic, explosive, and other risks. You must handle and dispose of pumped fluid in compliance with the applicable environmental regulations.

1. Slowly close the discharge valve.
2. Shut down and lock the driver to prevent accidental rotation.

## Deactivate the i-ALERT™ Condition Monitor

**NOTICE:** Always deactivate the condition monitor when the pump is going to be shut down for an extended period of time. Failure to do so will result in reduced battery life.

1. Touch and hold a small magnet to the condition monitor over the ITT logo until the red LEDs blink three times.  
This should take 10-15 seconds if the condition monitor is in normal operating mode and approximately five seconds if the condition monitor is in alarm mode.
2. Remove the magnet.  
If the deactivation is successful, solid red LEDs will be displayed.

## Reset the i-ALERT™ Condition Monitor

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**NOTICE:** Always reset the condition monitor when the pump is started after maintenance, system change, or down-time. Failure to do so may result in false baseline levels that could cause the condition monitor to alert in error.

---

1. Touch a magnet to the condition monitor over the ITT logo to turn the power on. The condition monitor begins to establish a new baseline vibration level.

## Make the final alignment of the pump and driver



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**WARNING:**

- Always disconnect and lock out power to the driver before you perform any installation or maintenance tasks. Failure to disconnect and lock out driver power will result in serious physical injury.
  - Follow shaft alignment procedures in order to prevent catastrophic failure of drive components or unintended contact of rotating parts. Follow the coupling or v-belt drive installation and operation procedures from the coupling or v-belt manufacturer.
- 

You must check the final alignment after the pump and driver are at operating temperature. For initial alignment instructions, see the Installation chapter.

1. Run the unit under actual operating conditions for enough time to bring the pump, driver, and associated system to operating temperature.
2. Shut down the pump and the driver.
3. Remove the coupling guard or v-belt drive.  
See Remove the coupling guard or Remove the v-belt drive guard section in this chapter.
4. Check the alignment while the unit is still hot.  
See Pump-to-driver alignment for either coupled or v-belt driven unit in the Installation chapter.
5. Reinstall the coupling guard or v-belt drive.
6. Restart the pump and driver.

# Maintenance

## Maintenance schedule

### Maintenance inspections

A maintenance schedule includes these types of inspections:

- Routine maintenance
- Routine inspections
- Three-month inspections
- Annual inspections

Shorten the inspection intervals appropriately if the pumped fluid is abrasive or corrosive or if the environment is classified as potentially explosive.

### Routine maintenance

Perform these tasks whenever you perform routine maintenance:

- Lubricate the bearings.
- Inspect the seal.

### Routine inspections

Perform these tasks whenever you check the pump during routine inspections:

- Check the level and condition of the oil through the sight glass on the bearing frame.
- Check for unusual noise, vibration, and bearing temperatures.
- Check the pump and piping for leaks.
- Analyze the vibration.
- Inspect the discharge pressure.
- Inspect the temperature.
- Check the seal chamber and stuffing box for leaks.
  - Ensure that there are no leaks from the mechanical seal.
  - Adjust or replace the packing in the stuffing box if you notice excessive leaking.

### Three-month inspections

Perform these tasks every three months:

- Check that the foundation and the hold-down bolts are tight.
- Check the packing if the pump has been left idle, and replace as required.
- Change the oil every three months (2000 operating hours) at minimum.
  - Change the oil more often if there are adverse atmospheric or other conditions that might contaminate or break down the oil.
- Check the shaft alignment, and realign as required.

### Annual inspections

Perform these inspections one time each year:

- Check the pump capacity.
- Check the pump pressure.
- Check the pump power.

If the pump performance does not satisfy your process requirements, and the process requirements have not changed, then perform these steps:

1. Disassemble the pump.
2. Inspect it.

3. Replace worn parts.

## Bearing maintenance

### Bearing lubrication schedule

Type of bearing	First lubrication	Lubrication intervals
Oil-lubricated bearings	Add oil before you install and start the pump. Change the oil after 200 hours for new bearings.	After the first 200 hours, change the oil every 1000 operating hours or every two months.
Grease-lubricated bearings	Grease-lubricated bearings are initially lubricated at the factory.	Regrease bearings every 500 operating hours or every month.

## Lubricating oil requirements

### Quality requirements

Use a high quality turbine oil with rust and oxidation inhibitors.

You can use an oil of ISO viscosity grade VG 220 (SAE grade 50W) for all bearing operation temperature ranges.

## Oil volumes

### Oil volume requirements

This table shows the required amount of oil for oil-lubricated bearings.

Frame	Quarts	Ounces	Milliliters
PF2	1.5	48	1400
PF3	1.7	54	1600
PF4	4.2	134	3975
PF5	4.9	157	4600

## Acceptable oil for lubricating bearings

### Acceptable lubricants

Brand	Lubricant type
Castrol	Hyspin R&O 220
Chevron	GST 220
Exxon	Teresstic 220
Mobil	DTE Oil BB SHC 630
Shell	Marlina 220 Tellus 220
Sunoco	Sunvis 9220
Texaco	Regal R&O 220 Rando HD 220
Royal Purple	Synfilm GT 220 Synergy 220

## Lubricating-grease requirements

### Precautions

#### NOTICE:

- Never mix greases of different consistencies (NLGI 1 or 3 with NLGI 2) or with different thickeners. For example, never mix a lithium-based grease with a polyurea-based grease. Doing so may result in decreased performance.
- Remove the bearings and old grease if you need to change the grease type or consistency. Failure to do so may result in equipment damage or decreased performance.

## Grease recommendations

Use a lithium-based mineral-oil grease with a consistency of NLGI 2 with EP additives. This table shows which brand and type of grease to use when lubricating the pump.

Brand	Grease type
Castrol	Castrol EPL2
Exxon	Unirex EP2
Lubriplate	SYN 1602
Mobil	Mobilux EP 2 Mobilux EP460
Shell	Alvania EP2
SKF	LGEP2 LGWA 2
Texaco	Multifak EP 2

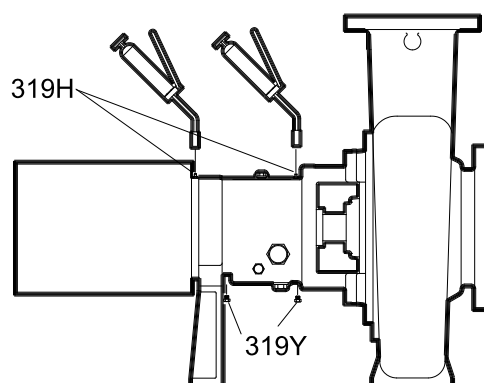
## Grease amounts

Size	Initial grease in ounces (grams) per bearing	Regrease amount in ounces (grams) per bearing
PF2 Outboard	107 (3.8)	27 (1.0)
PF2 Inboard	74 (2.6)	
PF3 Outboard	298 (10.5)	44 (1.6)
PF3 Inboard	175 (6.2)	
PF4 Outboard	1379 (48.6)	88 (3.1)
PF4 Inboard	1108 (39.1)	
PF5 Outboard	1408 (49.7)	122 (4.3)
PF5 Inboard	1408 (49.7)	

## Regrease the grease-lubricated bearings

### NOTICE:

Make sure that the grease container, the greasing device, and the fittings are clean. Failure to do this can result in impurities entering the bearing housing when you regrease the bearings.



1. Wipe dirt from the grease fittings(319H).
2. Fill both of the grease cavities through the fittings with a recommended grease until the fresh grease comes out of the relief fittings (319Y).
3. Make sure that the grease retention rings (253) are seated in the bearing housing. If they are not, press them in place with the drains located at the bottom.
4. Wipe off any excess grease.
5. Recheck the alignment.

The bearing temperature usually rises after you regrease due to an excess supply of grease. Temperatures return to normal in about two to four operating hours as the pump runs and purges the excess grease from the bearings.

## Lubricate the bearings after a shutdown period

1. Flush out the bearings and bearing frame with a light oil to remove contaminants. During flushing, make sure to rotate the shaft slowly by hand.
2. Flush the bearing housing with the proper lubricating oil to ensure oil quality after cleaning.

## Shaft-seal maintenance

### Mechanical-seal maintenance



---

**WARNING:**

The mechanical seal used in an Ex-classified environment must be properly certified. Prior to startup, make sure that all areas that could leak pumped fluid to the work environment are closed.

---



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**CAUTION:**

Never operate the pump without liquid supplied to mechanical seal. If you run a mechanical seal dry, even for a few seconds, this can cause seal damage. Physical injury can occur if a mechanical seal fails.

---

---

**NOTICE:**

- The mechanical seal must have an appropriate seal flush system or excess heat generation and seal failure can occur.
- 

### Reference drawing

The manufacturer supplies a reference drawing with the data package. Keep this drawing for future use when you perform maintenance and seal adjustments. The seal drawing specifies the required flush fluid and attachment points.

### Before you start the pump

Check the seal and all flush piping.

### Mechanical seal life

The life of a mechanical seal depends on the cleanliness of the pumped fluid. Due to the diversity of operating conditions, it is not possible to give definite indications as to the life of a mechanical seal.

## Packed stuffing-box maintenance



---

**WARNING:**

- Never attempt to replace the packing until the driver is properly locked out and the coupling spacer is removed.
- 

### Accepted leakage rate

It is not necessary to shut down or disassemble the pump to inspect the packing operation. During normal operation, the packing should leak approximately one drop per second.

### Adjustment of gland

Adjust the gland if the leakage rate is greater than or less than the specified rate.

Evenly adjust each of the two gland bolts with a one-quarter (1/4) turn until the desired leakage rate is obtained. Tighten the bolts to decrease the rate. Loosen the bolts to increase the rate.



---

## Tightening of packing

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**NOTICE:** Never over-tighten packing to the point where less than one drop per second is observed. Over-tightening can cause excessive wear and power consumption during operation.

---

If you cannot tighten the packing to obtain less than the specified leakage rate, then replace the packing.

## Dynamic seal maintenance

### Precautions



---

**WARNING:**

- Packed stuffing boxes are not allowed in an ATEX-classified environment.
  - Dynamic seals are not allowed in an ATEX-classified environment.
- 

### Dynamic seal parts

Dynamic seal parts normally do not wear enough to affect operation unless the service is particularly abrasive. The dynamic seal consists of two parts:

- The expeller seal prevents leakage during operation.
- The secondary seal prevents or minimizes leakage during shutdown of the unit. The seal can be either one of these types:
  - Graphite packing, which provides adequate life when it runs dry but can provide longer performance if it is lubricated with clean water or grease.

### Expeller seal maintenance

Some services might require a flush if solids have built up on the expeller. The unit contains a flush tap for that purpose. The unit also contains a drain tap in order to drain the expeller chamber if there is a danger that the unit might freeze.

### Graphite packing maintenance

Graphite packing requires the same maintenance as any other packing. When adjustments can no longer be made with the gland because it contacts the box face, perform these maintenance tasks:

- Shut down the pump.
- Relieve the pressure.
- Add another ring of packing to the box.

If the lantern ring connection is used but no longer lines up with the flush port, you need to clean and repack the stuffing box. The repacking procedure is the same as the procedure outlined in the Commissioning, Startup, Operation, and Shutdown chapter except this is the arrangement:

- One ring of packing
- The lantern ring
- Two rings of packing

### Acceptable leaks

Slight leaks can be considered normal, but excessive dripping or spray indicates a problem.

### Stuffing box cover

The stuffing box cover used with the dynamic seal option is equipped with two lantern ring connections:

- One expeller flush connection
- One expeller drain connection

The lantern ring connection can be used to inject flush liquid or grease when required on specific applications.

### Drain tap

The drain tap allows you to drain the liquid that remains in the expeller chamber upon pump shutdown. Consider removing this liquid before you service the pump in order to prevent it from hardening, or protect the pump during freezing weather. The flush tap allows injection of water or steam directly into the repeller chamber near the base of the repeller vanes.

### Injected liquid

Injected liquid can be used in conjunction with the drain in order to flush the chamber of solids or potentially harmful liquids.

## Disassembly

### Disassembly precautions



---

**WARNING:**

- This manual clearly identifies accepted methods for disassembling units. These methods must be adhered to. Trapped liquid can rapidly expand and result in a violent explosion and injury. Never apply heat to impellers, propellers, or their retaining devices to aid in their removal.
  - Always disconnect and lock out power to the driver before you perform any installation or maintenance tasks. Failure to disconnect and lock out driver power will result in serious physical injury.
  - Crush hazard. The unit and the components can be heavy. Use proper lifting methods and wear steel-toed shoes at all times.
  - The pump can handle hazardous and toxic fluids. Identify the contents of the pump and observe proper decontamination procedures in order to eliminate the possible exposure to any hazardous or toxic fluids. Wear the proper personal protective equipment. Potential hazards include, but are not limited to, high temperature, flammable, acidic, caustic, explosive, and other risks. You must handle and dispose of pumped fluid in compliance with the applicable environmental regulations.
- 

**NOTICE:**

Make sure that all replacement parts are available before you disassemble the pump for overhaul.

---

### Tools required

In order to disassemble the pump, you need these tools:

- Allen wrenches
- Metric stud drivers
- Cleaning agents and solvents
- Chisel
- Dial indicators
- Hoist and strap
- Pry bars
- Sockets
- Soft face hammer
- Spanner wrench
- Torque wrench
- Wrenches

### Typical disassembly

The XHD slurry pump is available in two models: the basic version, referred to as XHD and the XHD Value Option. The method of disassembly and assembly can vary between these models.

The XHD is a front pull out design. Typical disassembly steps can be followed for both the XHD and XHD Value Option.

The suction half casing and attached components can be removed for further disassembly and replacement of the suction side liner (562) and adjustable seal ring (822, XHD only) as necessary. After removing the impeller (101) by disengaging the knock-off ring (149), the gland half casing (100D) can remain mounted to the pedestal (131) and the casing volute liner (561) removed for replacement. Other components such as the gland, packing, seal cover etc. can also be removed in a methodical fashion as needed for inspection and replacement. In addition to traditional sequential disassembly methods, the entire wet end can be completely removed from the pedestal and bearing frame on the XHD model, as outlined in the following section: XHD Complete Wet End Disconnection.

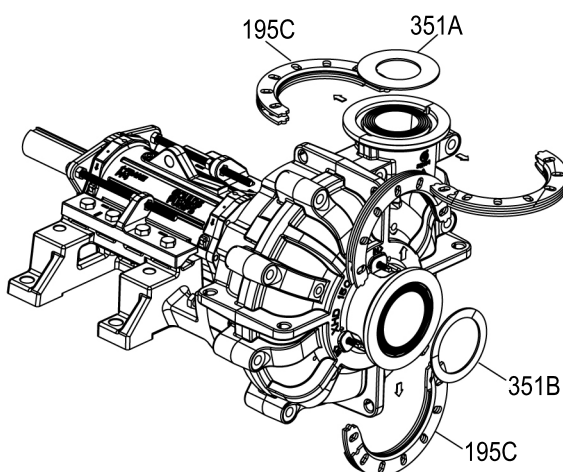
## Wet end disassembly instructions

Follow these precautions before disassembly:

- Remove the v-belt or coupling guard.
- For pumps that are coupled to the motor, uninstall the coupling.
- On a pump that is v-belt driven, the overhead mount or side-by-side slide base must be adjusted to loosen the belts.
- De-energize, lock-out, and tag-out the motor.
- Check to ensure that the pedestal frame is securely fastened to the foundation, base plate, or work surface, such as a workbench.

## Remove the joint gaskets and flanges

1. Remove the discharge joint flat gasket (351A).
2. Remove the suction flat gasket (351B).
3. Remove the two-piece suction and discharge flanges (195C, XHD sizes 150 and above only).

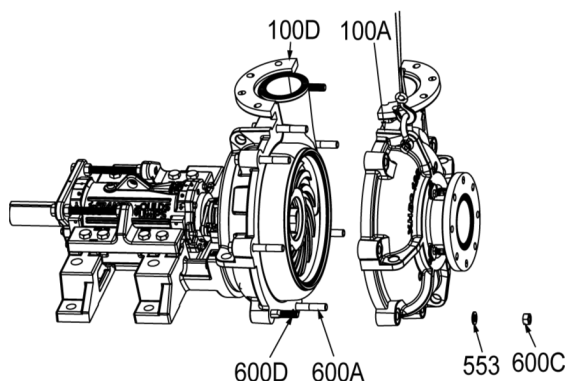


## Remove the suction half casing

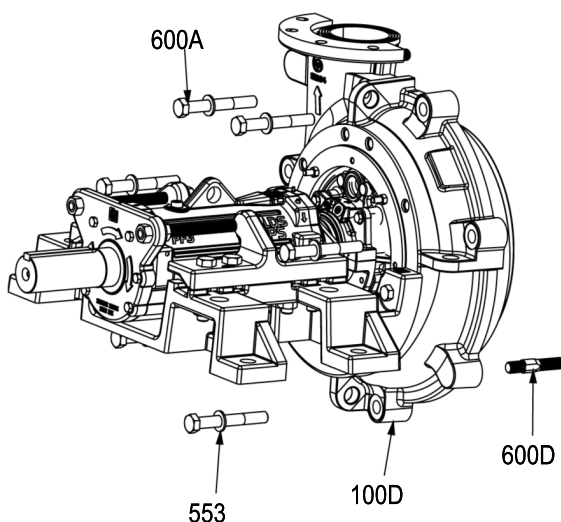
The following parts remain attached to the suction half casing when it is removed from the rest of the pump wet end:

Model	Parts that are still attached
XHD	<ul style="list-style-type: none"> <li>• Suction side liner (562)</li> <li>• Adjustable seal ring (822)</li> <li>• Hardware Square head adjusting bolts (356F) and hex jam nuts (357A)</li> </ul>
XHD Value Option	<ul style="list-style-type: none"> <li>• Suction side liner (562)</li> <li>• Hardware Hex head bolts/hex cap screws</li> </ul>

1. Support the suction half casing (100A) with a hoist hook through the lifting lug. Tension the hoist properly so the subassembly will be fully supported upon disengagement.
2. Remove the casing hex head nuts (600C) and flat washers (553) from the casing hex head bolts (600A) and tapered alignment studs (600D).
3. Leave the tapered alignment studs (600D) secured in place. The studs will provide guidance in removal of the subassembly.
4. Guide the suction half casing (100A, with attached components) free of tapered alignment studs.



5. Remove the hex head casing bolts (600A) from the gland half casing (100D).
6. Remove the tapered alignment studs from the gland half casing (100D) using a metric stud driver.



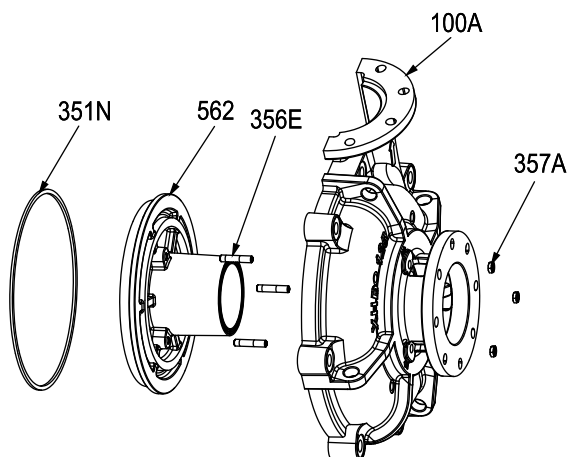
### Remove the remaining suction half components

Pump model	Next step to follow
XHD	<ul style="list-style-type: none"> <li>• Remove the suction side liner and adjustable seal ring</li> <li>• Remove the adjustable seal ring</li> </ul>
XHD Value Option	<ul style="list-style-type: none"> <li>• Remove the suction liner</li> </ul>

### Remove suction side liner - XHD Value Option

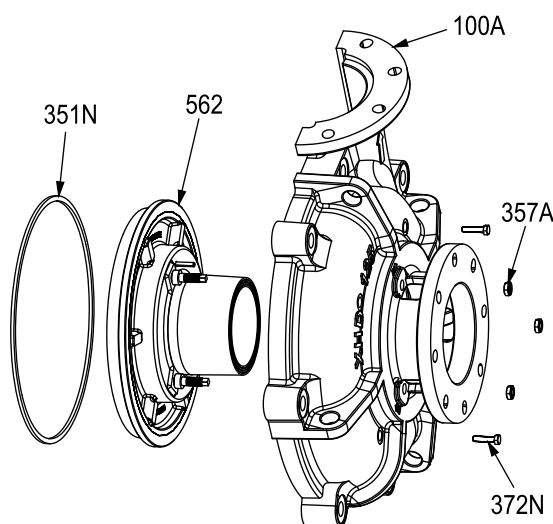
1. Remove the suction side liner retention nuts (357A).
2. Remove suction side liner (562) from suction half casing (100A).
3. Remove the suction side liner retentions studs (356E) from the suction side liner (562) using a metric stud driver.

4. Remove the suction side liner flat gasket (351N).



### Remove the suction side liner and adjustable seal ring - XHD

1. Remove the jam nuts (357A) that attach the adjustable seal ring (822) and the suction side liner (562) to the suction half casing (100A).
2. Remove the suction side liner holding bolts (372N, XHD sizes 150 and above only).
3. Move the suction side liner (562) with adjustable seal ring (822) inside free from the suction half casing (100A).
4. Remove the suction side liner front gasket (351N).

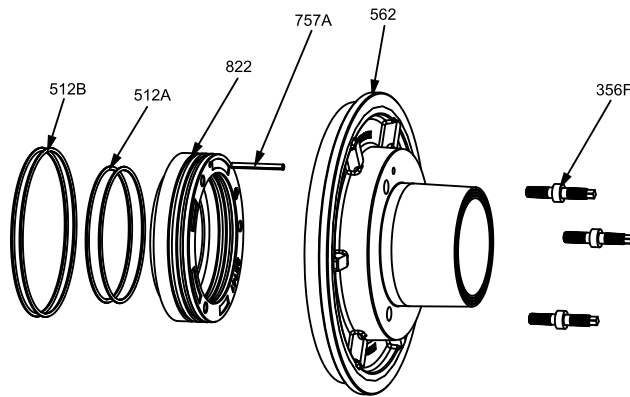


Suction side liner holding bolts on XHD sizes 150, 200, 250 and 300 only.

### Remove the adjustable seal ring - XHD

1. Slide the adjustable seal ring (822) free from the suction side liner (562).
2. Remove the square head adjusting bolts (356F) from the adjustable seal ring.

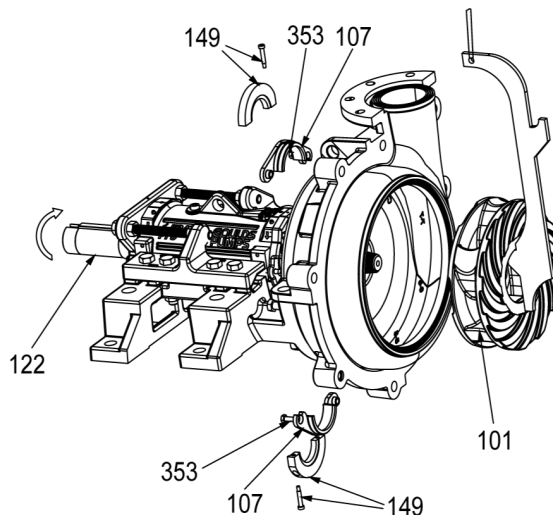
3. Remove the seal ring inner diameter o-rings (512A) and outer diameter o-rings (512B). The indicating roll pin (757A) can also be removed if necessary.



## Impeller removal

Two people should work together to remove the impeller for safety purposes.

1. Remove the gland assembly halves (107) by removing the gland adjusting bolts (353).
2. Loosen the bearing frame adjustment plate bolts (352G) and nuts (427D) but DO NOT remove hardware or adjustment plates (234F). Keep hardware finger-tight to keep the bearing frame constrained to the pedestal while allowing it to slide along the pedestal rails.
3. Slide the bearing housing and shaft assembly forward towards the suction side of the pump to allow better access to the impeller (101).
4. Remove the two-piece knock-off ring (149).
5. Support the impeller (101) using a Goulds-provided impeller hook attached to the hoist. An overhead hoist chain or sling can also be routed through a vane passage to support the impeller.
6. With one person holding the impeller (101) in place, the other person rotates the shaft (122) counterclockwise to unscrew the impeller. This step should take 4 to 5 complete shaft turns.
7. Guide the impeller (101) completely free of the shaft threads and casing volute liner (561).



## Stuffing box removal

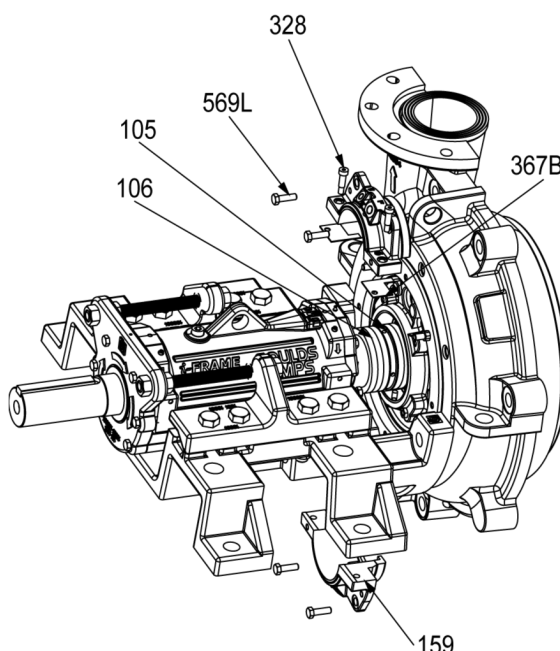
Pump Model	Next step to follow
XHD	<ul style="list-style-type: none"> <li>The stuffing box is split and can be disassembled prior to casing volute liner removal. Continue with the Remove the split stuffing box step below.</li> </ul>
XHD Value Option	<ul style="list-style-type: none"> <li>The stuffing box is integral to the seal cover. Skip to the Remove the seal cover step.</li> </ul>

## Remove the split stuffing box XHD

### NOTICE:

This section applies only to units equipped with a split stuffing box. If your unit is not equipped with a split stuffing box, the seal cover /chamber will be removed at a later step.

1. Remove the shoulder bolts (328) that hold the two halves together.
2. Remove the hex head bolts (569L) that attach the split stuffing box (159) to the seal cover (184).
3. Remove the split stuffing box halves (159).
4. Remove the split stuffing box gaskets (367B).
5. Remove the packing (106) and lantern ring (105). The lantern ring has a split cut that can be widened to accommodate removal without permanently deforming the part.

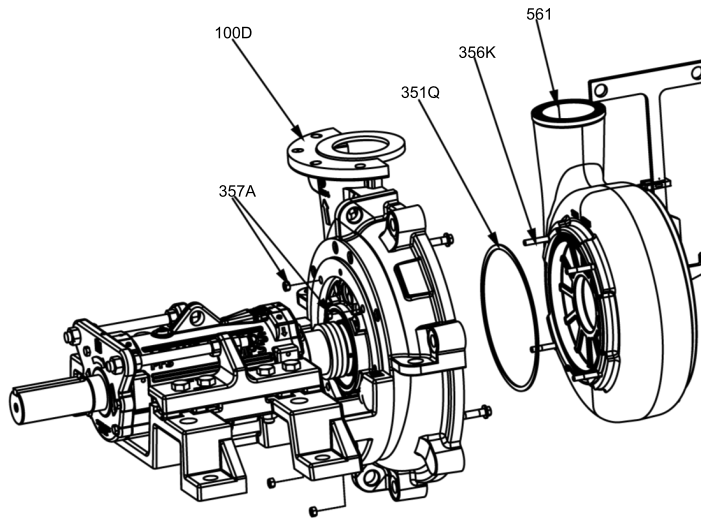


## Remove the casing volute liner

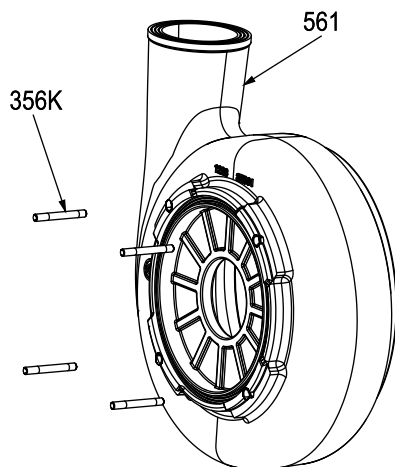
**NOTICE:** The casing volute liner can be removed individually using the following steps if there is an expeller installed or if there is no expeller, then the gland casing, volute liner, and seal cover can be removed as one assembly, using the instructions from the section [Optional disassembly of gland half casing, volute liner, and seal cover](#) (page 75)

1. Support the casing volute liner (561) with a Goulds-provided volute liner hook attached to the hoist.  
A sling can also be routed through and around the discharge opening of the casing volute liner for support for some discharge orientations.
2. Remove the casing volute liner retention nuts (357A) from the volute liner retention studs (356K) at the back of the gland half casing (100D).

3. Move the casing volute liner (561) out of and away from the gland half casing.

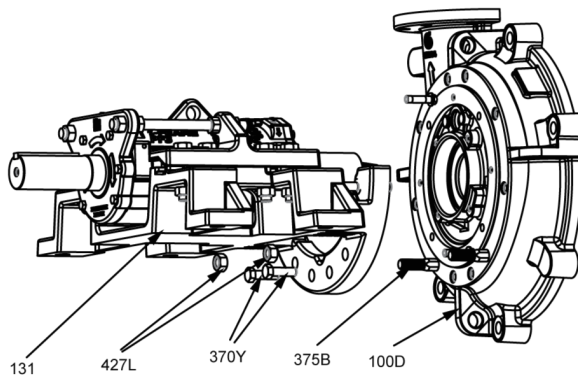


4. Remove the seal cover-to-volute liner gasket (351Q).
5. Remove the volute liner retention studs (356K) from the casing volute liner (561) using a metric stud driver.



### Remove the seal cover and gland half casing assembly

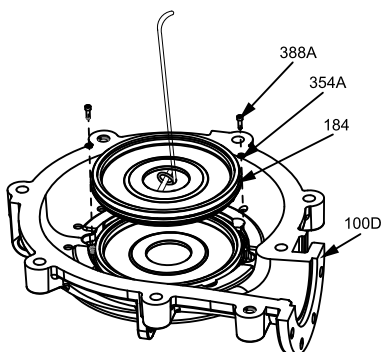
1. Remove the gland casing and seal cover assembly by supporting the casing assembly with a hoist hook through the lifting lug.



2. Remove the pedestal to casing (427L) and (3701) hardware.



3. Hoist the casing assembly to the ground so that the seal cover or stuffing box cover can be removed.



4. Remove the seal cover retention hex head cap screws (388A) and clipped washers (354A).
5. Remove the seal cover (184) from the gland half casing (100D). Use a short pry bar to gently and evenly facilitate disassembly if necessary.
6. Remove the seal cover o-ring (496R, XHD).

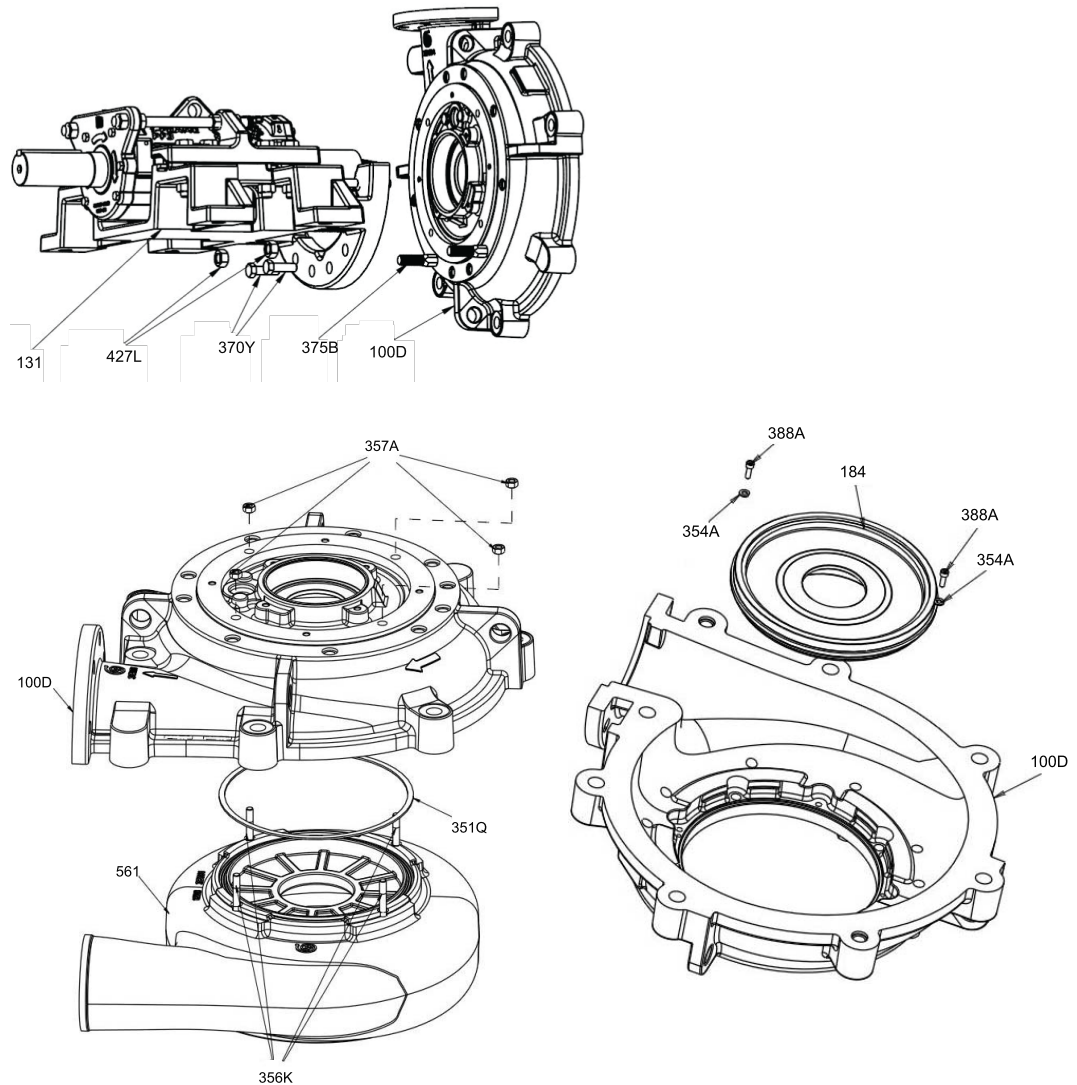
### Optional disassembly of gland half casing, volute liner, and seal cover

**NOTICE:** When there is no expeller assembly supplied, the Gland casing assembly can be removed and rebuilt as an assembly.

The gland half casing (100D), volute liner (561), seal cover (184), and/or split stuffing box assembly (159), can be removed as an entire assembly

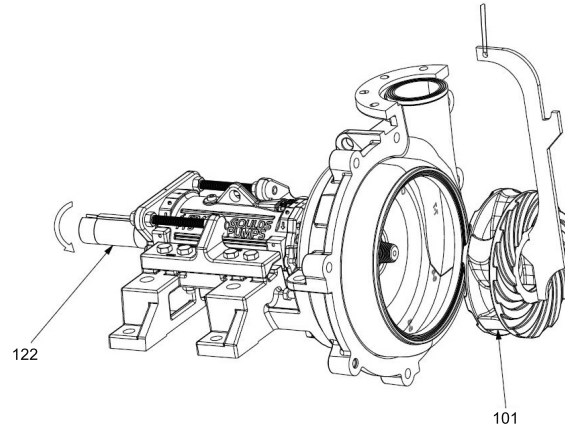
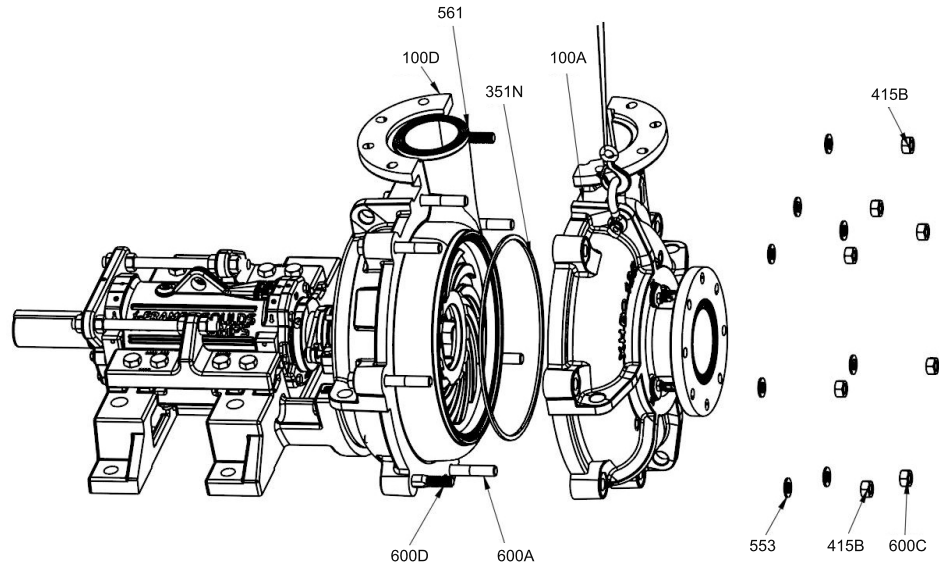
1. Once the impeller is removed from the shaft, support the entire gland casing assembly with a strap, located thru the appropriate gland half casing hoisting location.
2. Loosen and remove the casing to pedestal bolts (370Y) and nuts from the taper alignment studs (427L).

3. Carefully remove the assembly and hoist to the ground to disassemble as required, using the instructions in the related sections of this instruction manual.

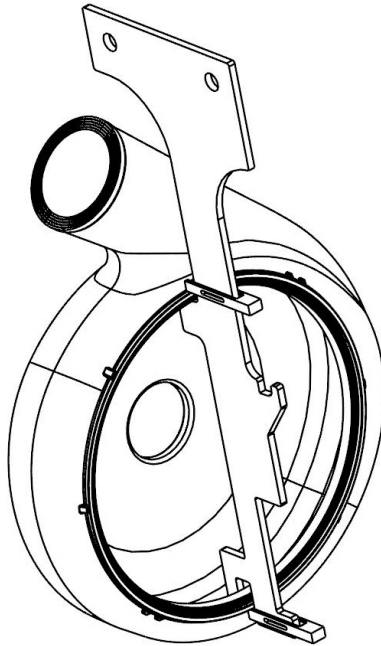


### Locate and lift the volute liner for optional discharge locations (field replacement)

1. Using the ITT approved volute liner and Impeller lifting device, the Volute Liner (561) can be installed into the Gland Casing (100D) the field in any of the optional discharge orientations.



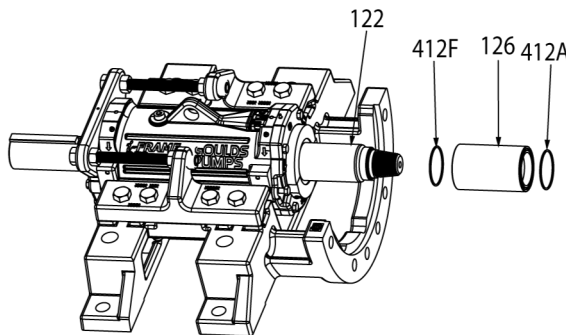
4. Secure the Volute Liner hook, to the Volute Liner (561) in the proper orientation, as illustrated below.



5. Lift the Hook and volute liner and crane into the Gland casing.
6. Be sure to locate the Volute Liner hook and upper and lower keys, and tighten the bolts thru the key to the hook. This will restrict movement of the volute liner on the hook. Failure to tighten the keys appropriately may allow the volute liner to rotate while being hoisted into the gland casing.

### Remove the shaft sleeve

1. Remove the shaft sleeve (126) from the shaft (122). Use a short pry bar to gently facilitate removal, if necessary.
2. Remove the impeller hub o-ring (412A) and shaft sleeve o-ring (412F).



### Remove the power end - quick disconnect option for XHD

The XHD power end can be removed when the entire liquid end is still attached to the pedestal by employing the components available with the XHD complete liquid end disconnect feature. Rather than removing any portion of the wet end, it can remain assembled to the pedestal and the power end can be removed as follows:

This procedure can also be employed to change out the entire wet end while not removing the power end.

1. Loosen the forward (wet end side) bearing frame adjusting nuts (415A) by turning them clockwise.
2. Loosen the hold-down bolts (352G) and nuts (427D) that clamp the adjustment plates (234F) to the bearing cartridge housing (228) but do NOT remove.

3. Move the impeller to the back of the volute liner: Turn the two rearward (drive end side) bearing frame adjusting nuts (415A) on either side of the power frame sequentially clockwise, 1/2 turn of each nut at a time, to draw the bearing frame and impeller (101) backwards toward the volute liner (561). Stop when the impeller is firmly seated against the volute liner.
4. Loosen the three adjustable seal ring jam nuts (357A) by turning them clockwise.
5. Move the suction seal ring towards the impeller: Turn the seal ring square head adjusting bolts (356F) sequentially, counterclockwise 1/3 of a turn at a time, to move the adjustable seal ring forward in the casing until it is firmly seated against the impeller, thereby pinching the impeller between the seal ring and the volute liner.
6. Lock the seal ring adjusting bolts (356F) in place by re-tightening the jam nuts (357A) against the suction half casing (100A).
7. Loosen the knock off ring bolts and disassemble the knockoff ring halves(149) from the shaft.
8. Turn the shaft (122) counterclockwise with a strap wrench or shaft wrench to disengage the shaft threads from the impeller. This will cause the bearing frame to move rearward on the pedestal until the shaft disengages from the impeller (101) which is held captive in the casing by the adjustable seal ring and casing volute liner. NOTE: This should take 4 to 5 complete shaft turns.
9. Slide the bearing frame backwards away from the liquid end until the shaft is completely free of the liquid end.
10. Insert hoist hook through the bearing cartridge housing (228) lifting lug.
11. Remove the bearing frame adjustment plate bolts (352G) and threaded adjustment rod nuts on the outer face of the adjustment plate (234F) ears.
12. Remove and set aside the bearing frame adjustment plates (234F).
13. Tension the hoist fully to lift and move the bearing frame to designated work area.

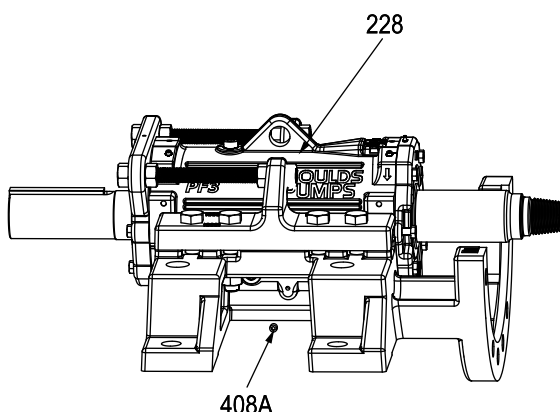
## Remove the power end- XHD and XHD Value Option

Before beginning removal of the power end, check to ensure that the pedestal (131) is securely fastened to the foundation, baseplate or work surface, such as a workbench.

When removing the power end, the coupling hub or V-belt sheave on the drive end of the shaft must also be removed.

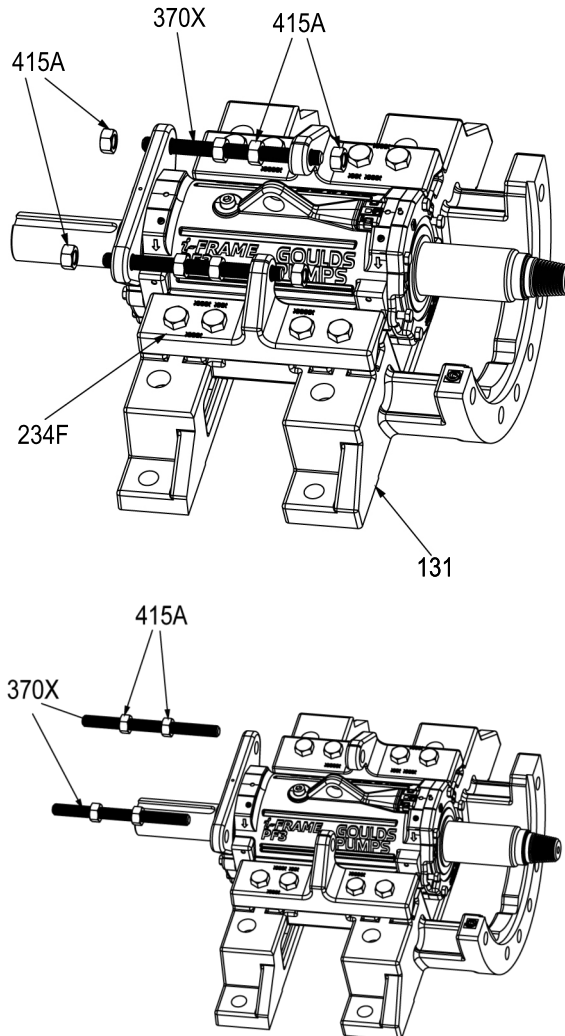
The power end of the XHD and XHD Value Option models can be removed during traditional liquid end disassembly when the suction half casing, suction side liner, adjustable seal ring (XHD only), knock off ring, impeller and gland (packing or mechanical seal) are removed. In this state, the gland half casing remains attached to the pedestal with the casing volute liner, seal cover and stuffing box still installed. Proceed as follows:

1. Drain the oil from the bearing cartridge housing (228) by removing the oil drain pipe plugs (408A).



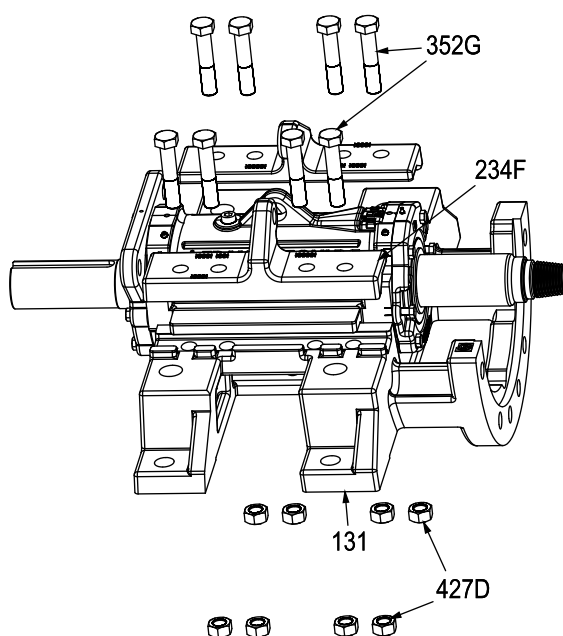
2. Loosen the power end adjustment plate bolts (352G) and nuts (427D) but do not remove.

3. Slide the power end backwards away from the liquid end until the shaft is completely free of the liquid end and pedestal (131) lower half-ring.
4. Remove the outer bearing frame adjustment rod nuts (415A) and threaded rods (370X).

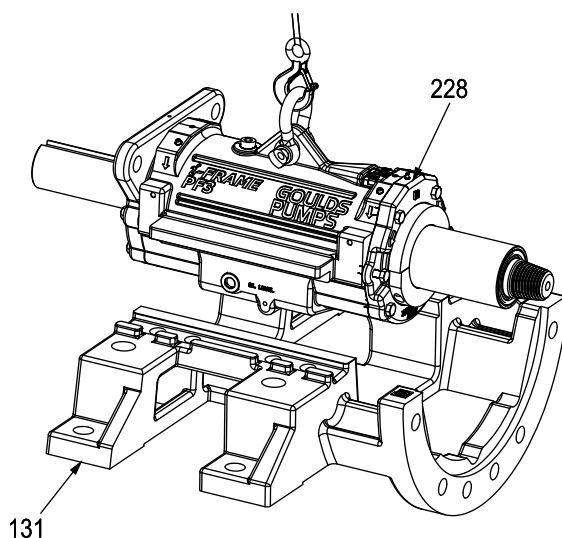


5. Insert hoist hook through the bearing cartridge housing (228) lifting lug.

6. Remove the bearing frame adjustment plate bolts (352G), nuts (427D) and bearing frame adjustment plates (234F).



7. Tension the hoist fully to lift and move the power end to designated work area.

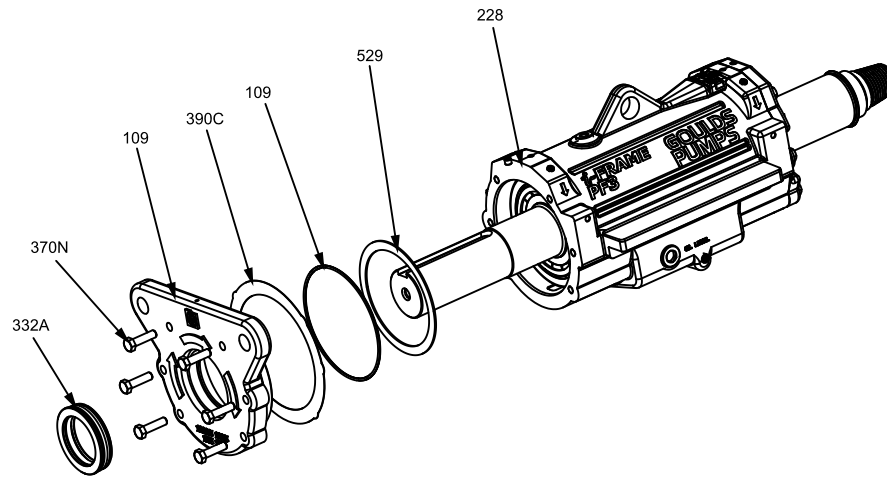


### Disassemble the power end - XHD, oil lubrication

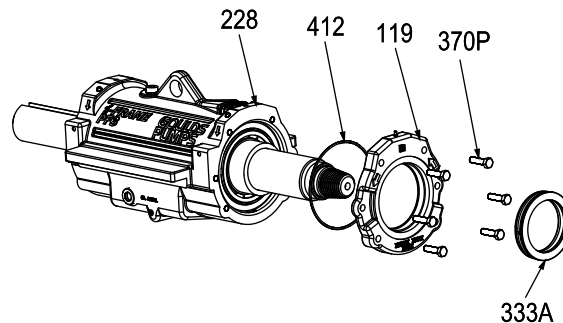
1. Remove the outboard bearing cover assembly hex head capscrews (370N).
2. Remove the outboard bearing cover (109) from the bearing cartridge housing (228) with the o-ring (412) and labyrinth seal (332A) still installed.
3. Remove the outboard labyrinth seal (332A) and o-ring (412).

4. Remove the Bellville preload washer (529).

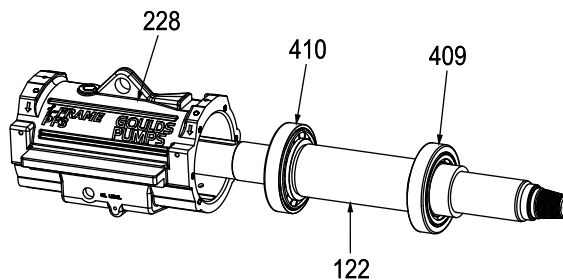
**Important:** Always remove the outboard bearing cover assembly and Bellville washer first. This will remove the preload from the rotating element assembly for easier removal of the remaining bearing frame components.



5. Remove the inboard bearing cover assembly hex head capscrews (370P).
6. Remove the inboard bearing cover (119) from the bearing cartridge housing (228) with the o-ring (412), labyrinth seal (333A) and shims (390C) still installed.
7. Remove the inboard labyrinth seal (333A) and o-ring (412).



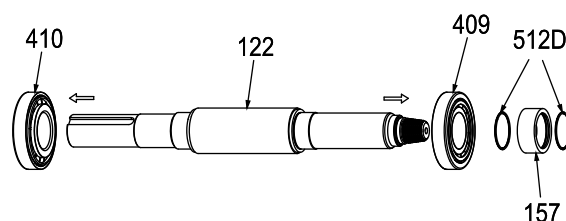
8. Slide the rotating element assembly out of the bearing cartridge housing.  
Note: The drive/outboard end of the shaft contains a threaded hole for eye bolt attachment which can aid in rotating element removal.



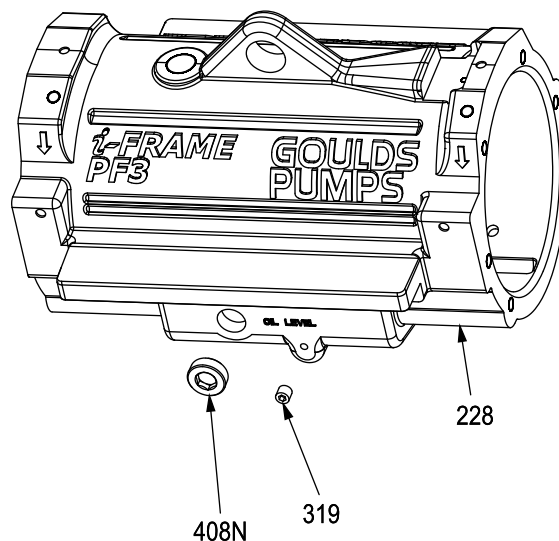
9. Remove the spacer sleeve (157) and spacer sleeve o-rings (512D).



10. Remove the inboard and outboard taper roller bearings (409 and 410) using a suitable puller that only contacts the inner races of the bearings.



11. Remove and clean or replace bulls eye sight glass (319) and opposite sight glass (408N) if necessary.



## Disassembly of other power end configurations

The disassembly of other available power end configurations is very similar to that of the XHD oil-lubricated power end. All of the major pieces of the power end (bearing cartridge, end covers, bearings, etc.) are designed for use with all options so only a few components will change regardless of the type of lubrication or isolators used.

The following subsections highlight the main differences in the disassembly of power end configurations other than the XHD oil-lubricated power end.

### Disassemble the power end XHD, grease lubrication

- Regardless of the type of lubrication, the XHD power end uses labyrinth (Inpro) seals as bearing isolators. Disassembly of the end covers and isolators will follow the same procedure as that of the XHD oil-lubricated version.
- The only major difference between oil and grease lubricated power ends for the XHD is the use of grease shields, as shown on the figure below. During disassembly these can be removed, inspected and replaced as necessary.
- There are also grease fitting plugs (319H) and grease relief plugs (319Y) installed into the bearing cartridge housing (228) used for purging and regreasing the grease lubricated XHD power end. During disassembly these fittings can be removed, inspected and replaced as necessary.
- There will be no sight glass (319) or opposite sight glass (408N) on the grease lubricated power end.

**Disassemble the power end XHD Value Option, oil lubrication**

- The XHD oil lubricated power end uses double lip seals as bearing isolators. Instead of pipe plugs, there will be grease fitting plugs in the bearing cartridge end covers for the addition of grease as necessary to maintain the double lip seal contaminant barrier.
- The double lip seals have the same fits as the labyrinth seal isolators used on the XHD power end. There is no difference in the end covers between these or any of the power ends, regardless of the type of lubrication and basic/fully featured model. The lip seals can be removed in the same manner as described for the XHD power end.

**Disassemble the power end XHD, grease lubrication**

- The XHD grease lubricated power end also uses double lip seals as bearing isolators. The same bearing shields employed on the XHD grease lubricated power end are used as well to properly maintain grease in the bearings. The bearing shields can be removed, inspected and replaced in the same manner as shown for the XHD grease lubricated power end.
- Because of the need to provide grease to both the double lip seal bearing isolators and the bearings themselves, there are grease fitting plugs (319H) installed in both the bearing cartridge housing (228) and the inboard and outboard bearing end covers (109 and 119). There are also grease relief plugs (319Y) installed in the bottom of the bearing cartridge housing (228) for purging and regreasing of the bearings.
- There will be no sight glass (319) or opposite sight glass (408N) on the grease lubricated power end.

## Preassembly inspections

### Replacement guidelines

**Casing and liners check and replacement**

Inspect the casing and liners for cracks and excessive wear or pitting. Thoroughly clean gasket surfaces and alignment fits in order to remove rust and debris.

- Localized wear or grooving that is greater than 1/8 in. (3.2 mm) deep
- Pitting that is greater than 1/8 in. (3.2 mm) deep
- Irregularities in the casing-gasket seat surface

**Impeller replacement**

This table shows the criteria for replacing the impeller:

Impeller parts	When to replace
Vane edges	When you see cracks, pitting, or corrosion damage

**Gaskets, O-rings, and seats replacement**

- Replace all gaskets and O-rings at each overhaul and disassembly.
- Inspect the seats. They must be smooth and free of physical defects.
- Replace parts if the seats are defective.

**Stuffing box cover and seal chamber replacement**

- Thoroughly clean the gasket surfaces and fits to remove rust and debris.
- Inspect surfaces for pitting, and excessive wear or corrosion damage.

## Power end inspection

**Checklist**

Check the bearing frame for these conditions:

- Visually inspect the bearing frame and frame foot for cracks.

- Check the inside surfaces of the frame for rust, scale, or debris. Remove all loose and foreign material.
- Make sure that all lubrication passages are clear.
- If the frame has been exposed to pumped fluid, inspect the frame for corrosion or pitting.
- Inspect the inboard-bearing bores.  
If any bores are outside the measurements in the Bearing fits and tolerances table, replace the bearing frame.
- Inspect the shafts and sleeves for wear.
- Inspect the labyrinth seal O-rings for cuts and cracks.

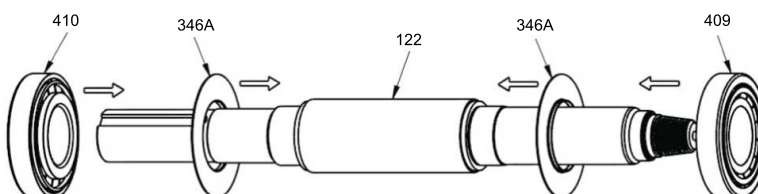
## Reassembly

### Assemble the power end- XHD, oil lubrication

#### NOTICE:

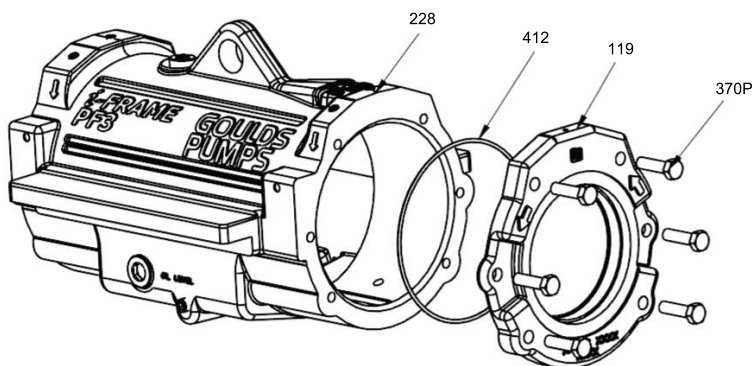
Do not use a flame to heat bearings. Doing so will damage the bearing surfaces.

1. Install the bearings onto the shaft (items 346A grease shields shown below are for grease lube only):
  - a) Use an induction bearing heater to heat the bearings to approximately 250°F (121°C). This expands the bearings to ease their installation on the shaft.
  - b) Install the inboard and outboard taper roller bearings (409 and 410) onto the shaft (122) in a face-to-face orientation.
  - c) Push the inner races firmly against the shaft shoulders until the bearings cool and are locked into place.



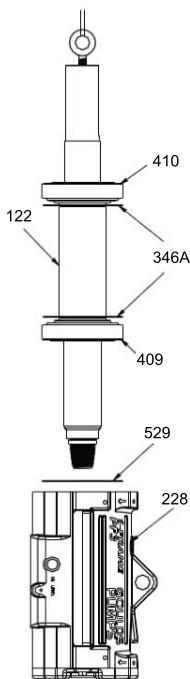
2. Lubricate and install the spacer sleeve o-rings (512D) into the spacer sleeve (157).
3. Slide the spacer sleeve (157) onto the inboard end of the shaft (122) until it is flush with the inner race of the inboard taper roller bearing (409). Use care when sliding the spacer sleeve onto the shaft to prevent o-ring damage.
4. Coat the outside bearing races with oil to ensure they float in the frame.
5. Insert the inboard Inpro labyrinth seal (333A) into the inboard bearing cover (119).
6. Lubricate the inboard bearing cover o-ring (412) and insert into the inboard bearing cover (119).
7. Insert the Bellville preload washer (529) into the inboard end of the bearing cartridge housing (228) so it is in contact with the inboard taper roller bearing (410).
8. Slide the inboard bearing cover (with Inpro seal and o-ring attached) into the bearing cartridge housing (228) carefully to avoid o-ring damage.

9. Secure the inboard cover assembly to the bearing cartridge housing (228) using the hex head cap screws (370P).



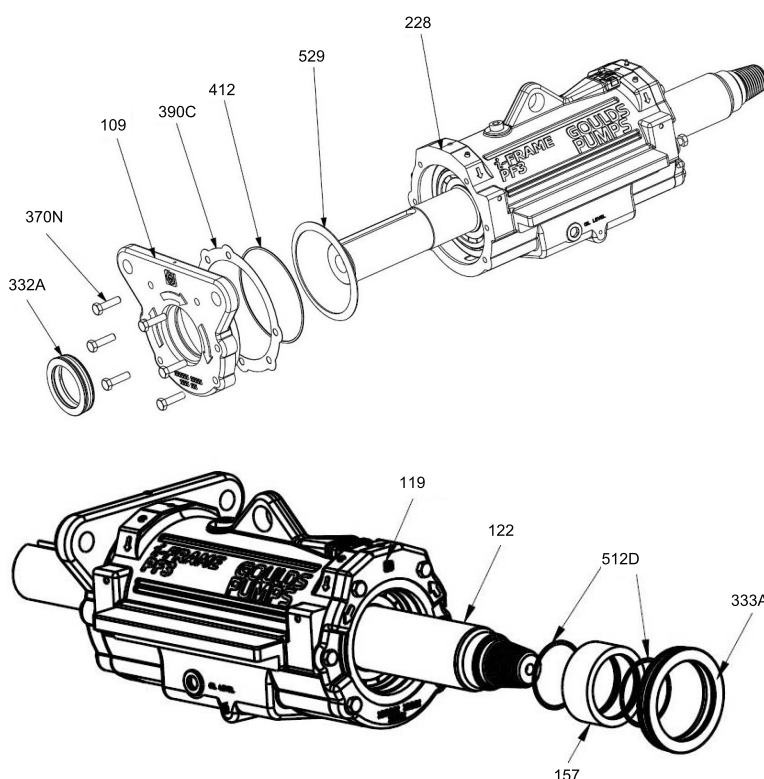
10. Slide the bellville washer (529) and outer race of the inboard bearing (409) into position inside the bearing frame (228).
11. Slide the rotating element assembly into the bearing cartridge housing (228), inboard end first using the lifting hoist in the coupling end of the shaft to lift the assembly until the inboard bearing (409) contacts the bellville washer (529). Lifting hole sizes are specified below.

Pump Size	Shaft lifting hole thread size	Shaft lifting hole thread size
XHD80	PF2	M16x2
XHD125	PF3	M16x2
XHD150	PF4	M24x3
XHD200	PF4	M24x3
XHD250	PF5	M24x3
XHD300	PF5	M24x3



12. Insert the Bellville preload washer (529) into the outboard end of the bearing cartridge housing (228) so it is in contact with the outboard taper roller bearing (410). Grease shield 346A shown above is for grease lube only.
13. Insert the outboard Inpro labyrinth seal (332A) into the outboard bearing cover (109).

14. Lubricate the outboard bearing cover o-ring (412) and insert into the outboard bearing cover (109).
15. Slide the outboard bearing cover (with Inpro seal and o-ring attached) into the bearing cartridge housing (228) carefully to avoid o-ring damage.
16. Hand tighten the outboard bearing cover assembly to the bearing cartridge housing (228) using the hex head cap screws (370N) until the shaft becomes difficult to rotate by hand.
17. Measure gap between face of bearing end cover (109) and the face of the frame with feeler gages.
18. Select and measure shim pack such that the thickness of the shims are equal to the gap measured in (17) above plus 0.020" added shim.
19. Remove the end cover (109) and add the shim pack (390C) noted above to the assembly.
20. Secure the outboard bearing cover assembly to the bearing cartridge housing (228) using the hex head cap screws (370N).

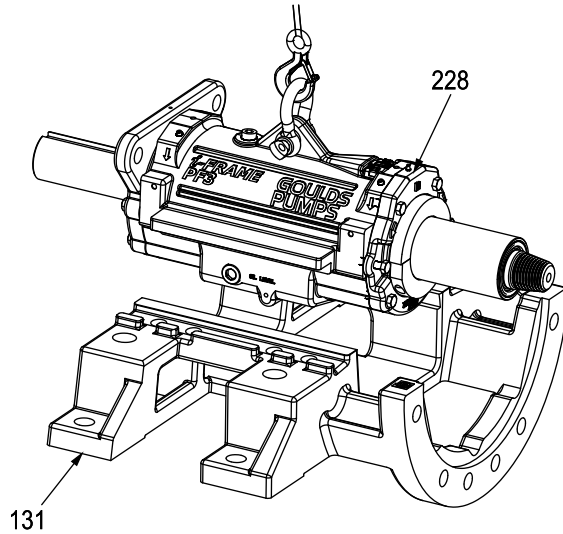


21. Insert the shaft key (400) into the keyway in the outboard end of the shaft (122).
22. Install the bulls eye sight glass (319) and plug, opposite (408N) into the bearing cartridge housing (228) if removed previously.
23. Insert the oil drain plugs (408A) and the oil fill pipe plug (319B) into the bearing cartridge housing (228).

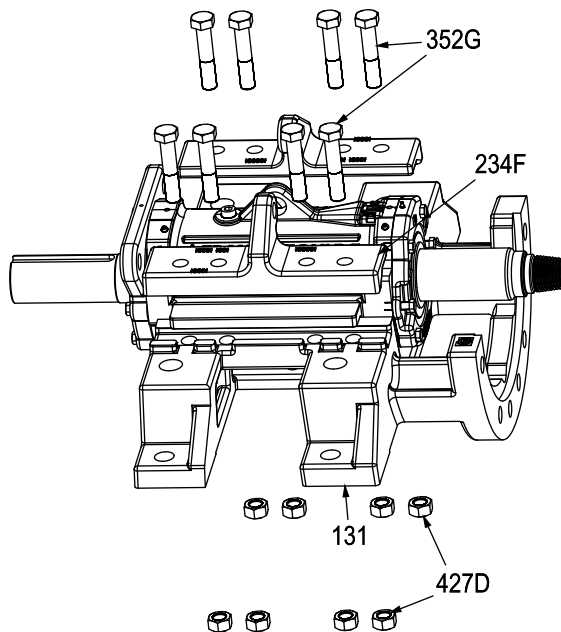
## Assemble the power end to the pedestal

1. Apply anti-seizing compound to the pedestal (131) rails that support the power end.
2. Attach the hoist hook to the bearing cartridge housing (228) lifting lug.

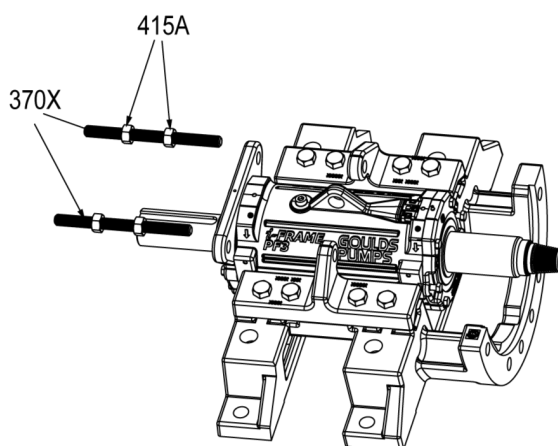
3. Place the power end into position on the pedestal (131).



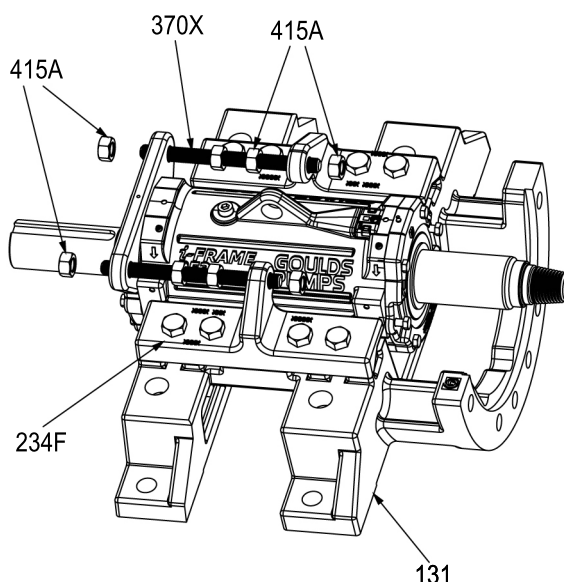
4. Place the bearing frame adjustment plates (234F) onto the pedestal (131) and bearing cartridge housing (228) rails.
5. Hand tighten the bearing frame adjustment plates (234F) to the pedestal (131) using the adjustment plate hex bolts (352G) and nuts (427D).



6. Insert the free ends of the threaded adjustment rods (370X) through the bearing frame adjustment plate (234F) and outboard end cover (109) ears.



7. Secure the threaded adjustment rods (370X) to the bearing frame adjustment plates (234F) and outboard end cover (109) by installing the hex nuts (415A) on the outer face of the adjustment plate and end cover ears.



8. Turn the inner threaded adjustment rod hex nuts (415A) until in place against the inner surfaces of the outboard bearing end cover (109) and adjustment plate (234F) ears.

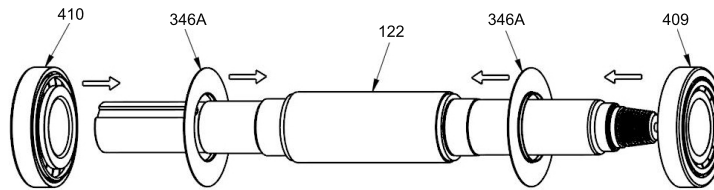
## Assembly of other power end configurations

The assembly of other available power end configurations is very similar to that of the XHD oil lubricated power end. All of the major pieces of the power end (bearing cartridge, end covers, bearings, etc.) are designed for use with all options so only a few components will change regardless of the type of lubrication or isolators used.

The following subsections highlight the main differences in the assembly of power end configurations other than the XHD oil lubricated power end.

### Assemble the power end - XHD, grease lubrication, isolators

- Regardless of the type of lubrication, the XHD power end uses labyrinth (Inpro) seals as bearing isolators. Assembling the end covers and isolators will follow the same procedure as that of the XHD oil lubricated version.
- The only major difference between oil and grease lubricated power ends for the XHD is the use of grease shields (346A), as shown on the figures below.



- There are also grease fitting plugs (319H) and grease relief plugs (319Y) installed into the bearing cartridge housing (228) used for purging and regreasing the grease lubricated XHD XL power end.
- There will be no sight glass (319) or opposite sight glass (408N) on the grease lubricated power end

#### Assemble the power end - XHD, oil lubrication, lip seals

- The XHD oil lubricated power end uses double lip seals as bearing isolators. Instead of pipe plugs, there will be grease fitting plugs in the bearing cartridge end covers for the addition of grease as necessary to maintain the double lip seal contaminant barrier.
- The double lip seals have the same fits as the labyrinth seal isolators used on the XHD power end. There is no difference in the end covers between these or any of the power ends, regardless of the type of lubrication or model.

#### Assemble the power end - XHD Value Option, grease lubrication, lip seals

- The XHD grease lubricated power end also uses double lip seals as bearing isolators. The same bearing shields employed on the XHD grease lubricated power end are used as well to properly maintain grease in the bearings.
- Because of the need to provide grease to both the double lip seal bearing isolators and the bearings themselves, there are grease fitting plugs (319H) installed in both the bearing cartridge housing (228) and the inboard and outboard bearing end covers (109 and 119). There are also grease relief plugs (319Y) installed in the bottom of the bearing cartridge housing (228) for purging and regreasing of the bearings.
- There is no sight glass (319) or opposite plug (408N) to install on the grease lubricated power end.

### Wet end assembly instructions



**WARNING:** Before assembling the pump wet end to pedestal and power end, check to ensure that the pedestal is securely fastened to the foundation, baseplate or work surface (such as a workbench). Also ensure that the bearing frame is securely assembled to the pedestal. Failure to do so could result in injury or part(s) damage.

In large part, steps taken to disassemble the wet end are used in reverse to reassemble the wet end to the pedestal and bearing frame, and are outlined here. In addition, an entire assembled wet end can be replaced on the XHD model as outlined in the section [Complete wet end connection - XHD](#) (page 90).

NOTICE: If you are reassembling an XHD Value Option model, skip the next section describing the complete wet end connection and move onto [Wet end assembly instructions](#) (page 91).

You can also skip the wet end connection section if you have an XHD, have disassembled the wet end piece-by-piece, and do not have a complete wet end to assemble to the pedestal and bearing frame.

### Complete wet end connection - XHD

The XHD model features a "quick connect" wet end option. If you have received a complete replacement wet end from the factory or your distributor, installation of the entire wet end to the pedestal and bearing frame can be performed as follows:

1. Coat the shaft (122) protuberance, including the threads, with an anti-seizing compound.
2. Loosen but do not remove the hex head screws holding the knock-off ring (149) halves together.



3. Position the knock-off ring onto the shaft (122). Make sure that the part is properly oriented. The larger diameter step of the knock-off ring should face the bearing cartridge housing (228).
4. Slide the knock-off ring towards the bearing cartridge housing until it is flush with the inboard end cover (160). The knock-off ring fits over the inboard Inpro seal (332A).
5. Tighten the knock-off ring hex cap screws to secure.
6. Prepare the shaft sleeve (126) by coating the sleeve o-ring (412F) and impeller hub o-ring (412A) with a lubricant and install into the inner diameter and impeller end o-ring grooves.
7. Slide the shaft sleeve with the impeller hub o-ring properly positioned (facing outward) onto the shaft. Use care when positioning the sleeve on the shaft to avoid ID o-ring damage.
8. Continue sliding the sleeve until it is fully seated in the knock-off ring. Use a soft blow mallet to gently tap the sleeve along the shaft if necessary.
9. Insert the tapered alignment studs (375B) into the rear of the gland half casing (100D) using a metric stud driver.
10. Attach the hoist hook to the gland half casing (100D) lifting lug and tension to support the wet end.
11. Lift the wet end into position against the pedestal (131). Guide the installed tapered alignment studs through the pedestal holes on the sides of the bearing frame.
12. Attach the wet end to the pedestal by installing and fully tightening the alignment stud hex nuts (427L).
13. Fully secure the wet end to the pedestal by installing the hex head capscrews (370Y) through the holes in the pedestal's lower front ring into the gland half casing (100D).
14. Loosen the bearing adjustment frame threaded rod nuts (415A) on the forward (wet end) side of the adjustment plates by turning them clockwise.
15. Loosen the hold-down bolts (352G) and nuts (427D) that clamp the adjustment plates (234F) to the bearing cartridge housing (228) but do NOT remove. Bolts should remain finger-tightened to keep the bearing frame constrained to the pedestal while allowing it to slide along the pedestal rails.
16. Slide the bearing frame forward until the shaft (122) threads are inside the wet end and engaged with the impeller (101).
17. Turn the shaft (122) clockwise to re-engage the shaft threads to the impeller. This will cause the bearing frame to move forward on the pedestal until the shaft is fully threaded to the impeller. Note: This will take 4 - 5 complete shaft turns.
18. Loosen the three adjustable seal ring jam nuts (357A) by turning them clockwise.
19. Turn the seal ring square head adjusting bolts (356F) sequentially, clockwise 1/3 of a turn at a time, to move the adjustable seal ring backward in the casing until it is firmly seated against the suction side liner (562).
20. Adjust the impeller gap (refer to the Maintenance section for instructions).
21. Fully tighten the hold-down bolts (352G) and nute (427D) that clamp the adjustment plates (234F) to the bearing cartridge housing (228).
22. Tighten the bearing adjustment frame threaded rod nuts (415A) on the forward (wet end) side of the adjustment plates by turning them counterclockwise.
23. Adjust the seal ring gap (refer to the Maintenance section for instructions).
24. Install the packing (106) and lantern ring (105).
25. Assemble and install the gland assembly (107) using the gland adjusting bolts (353).

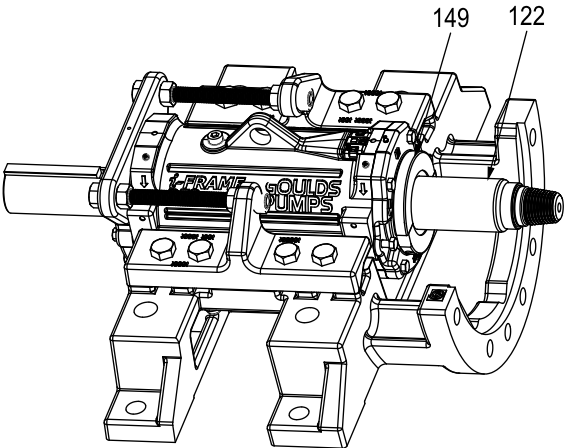
## Wet end assembly instructions

The following steps are used to assemble the wet end in sequential fashion for the XHD Value Option model, as well as the XHD model when the complete wet end connection option is not employed.

### Install the knock-off ring

1. Coat the shaft (122) protuberance with an anti-seize compound.
2. Loosen but do not remove the hex head screws holding the knock-off ring assembly (149) halves together.

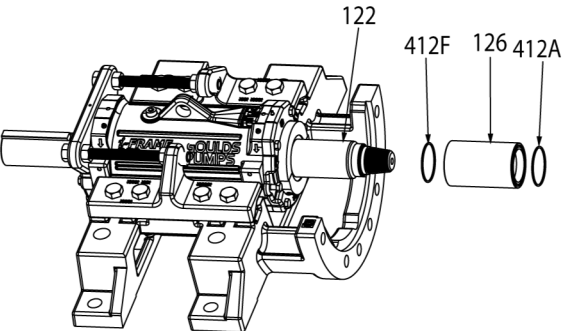
3. Position the knock-off ring onto the shaft (122) and make sure that the part is properly oriented. The side of the knock-off ring that should face the impeller is marked "THIS SIDE OUT".
4. Slide the knock-off ring towards the bearing cartridge housing until it is flush with the inboard end cover (119). Be sure to assemble the knock-off ring (149) such that the words "this side out" can be read from the threaded end of the shaft.



On the XHD model, the knock-off ring will fit over the inboard Inpro seal (332A).

**Install the shaft sleeve**

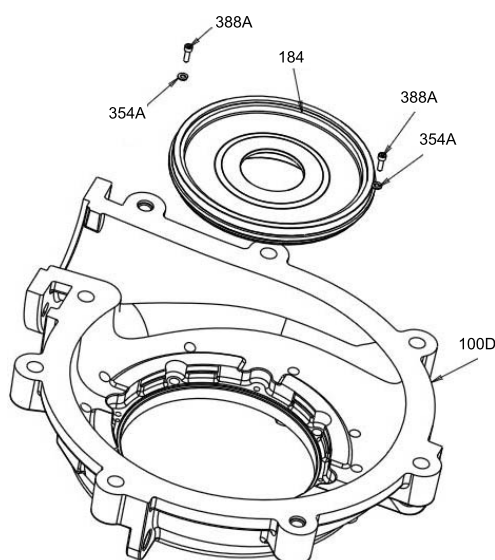
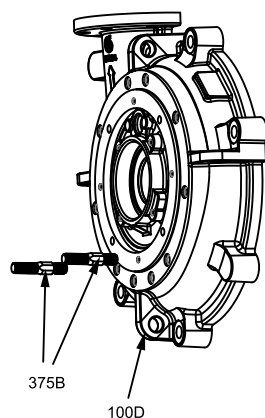
1. Prepare the shaft sleeve (126) by coating the shaft sleeve o-ring (412F) and impeller hub o-ring (412A) with a lubricant and installing the o-rings into the sleeve.
2. Slide the shaft sleeve (126) with the impeller hub o-ring (412A) properly positioned (facing outward) onto the shaft. Use care positioning the sleeve on the shaft to avoid any o-ring damage.
3. Continue sliding the sleeve until it is fully seated in the knock-off ring. Use a soft blow mallet to gently tap the sleeve along the shaft if necessary.



Pump model	Next step to follow
XHD	<ul style="list-style-type: none"><li>• You will need to assemble the two split stuffing box halves before attaching the stuffing box to the seal cover. Start with the next step, Assemble the split stuffing box.</li></ul>
XHD Value Option	<ul style="list-style-type: none"><li>• Go to Install the seal cover instructions.</li></ul>

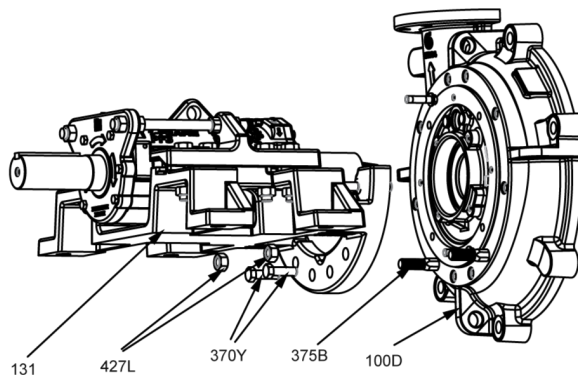
## Install the gland half casing and seal cover

1. Install the tapered alignment studs (375B) into the gland half casing (100D) using a metric stud driver.



- a) Install the seal cover into the casing.
  - b) With bolts and clipped washers (354A) (388A).
2. Attach the hoist hook to the gland half casing (100D) lifting lug, such that the casing discharge will be oriented properly for the application.
  3. Lift the gland half casing (100D) into position and move forward until it is flush with the pedestal (131) by guiding the tapered alignment studs through the pedestal flanges.
  4. Install the hex nuts (427D) onto the tapered alignment studs (375B).

5. Install the hex head capscrews (370Y) through the pedestal flange into the gland half casing (100D) to complete assembly.

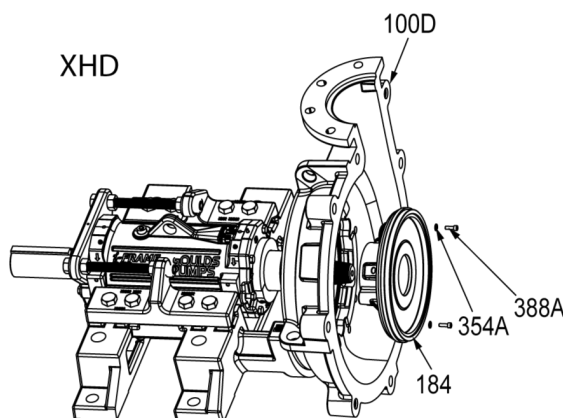


## Stuffing box assembly and installation

Pump model	Next step to follow
XHD	<ul style="list-style-type: none"> <li>• Go to Install the seal cover instructions.</li> </ul>
XHD XL	<ul style="list-style-type: none"> <li>• You will need to assemble the two split stuffing box halves before attaching the stuffing box to the seal cover. Start with the next step, Assemble the split stuffing box.</li> </ul>

## Install the seal cover

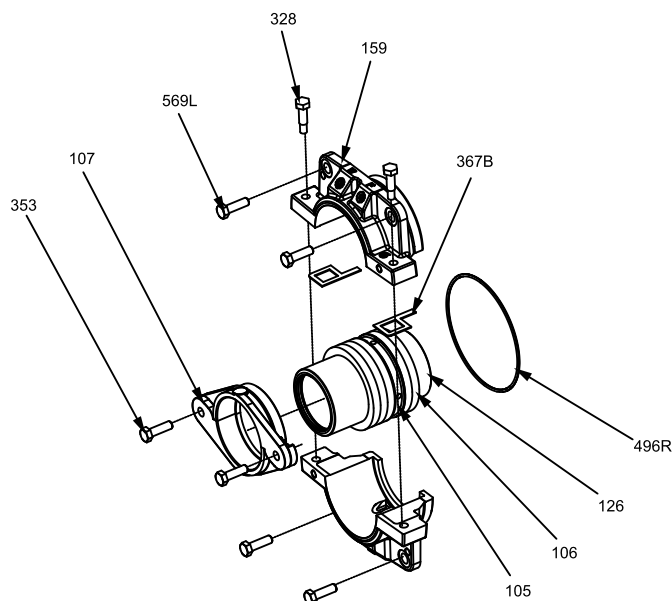
1. Lubricate and install the seal cover-to-casing volute liner gasket (351Q) onto the seal cover (184).
2. Attach the seal cover (184) to the gland half casing (100D) using the seal cover retention socket head cap screws (388A) and clipped washers (354A).



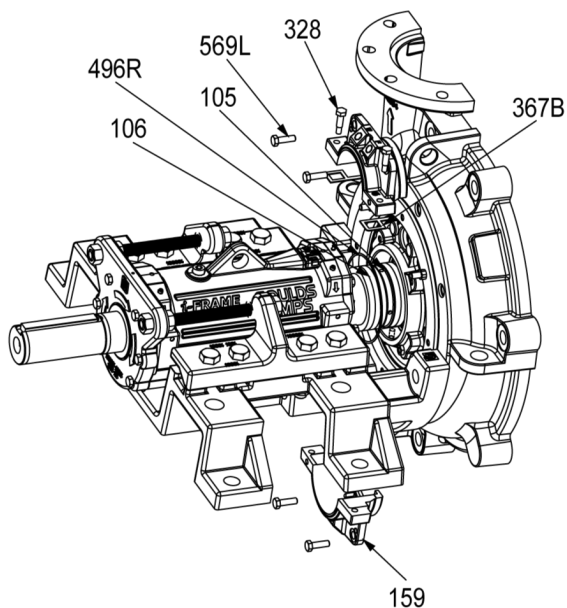
## Assemble the split stuffing box - XHD

1. Position the flat gaskets (367B) between the two halves of the split stuffing box (159).
2. Assemble the two halves of the split stuffing box (with gaskets in place) using the stuffing box shoulder bolts (328). Apply a liberal coating of silicone sealant to both faces of the split stuffing box before the gasket is installed.

3. Attach the stuffing box (159) to the seal cover (184) using the stuffing box-to-seal cover hex head cap screws (569L).



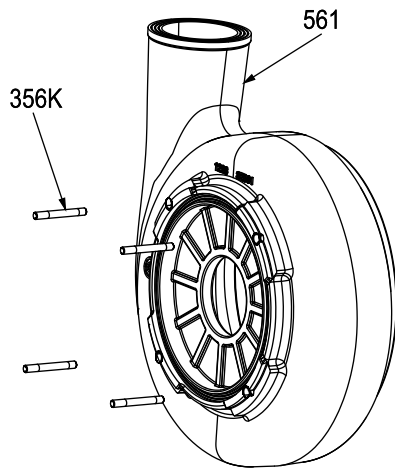
4. Trim edges of the stuffing box gasket such that they will not interfere with the stuffing box oring.
5. Lubricate and install the seal cover-to-stuffing box o-ring (496R) into the seal cover (184).
6. Attach the stuffing box (159) to the seal cover (184) using the stuffing box-to-seal cover hex head cap screws (569L).



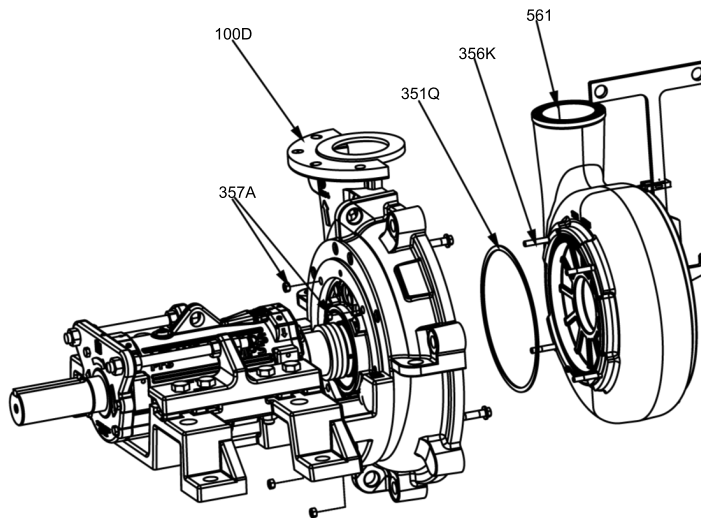
### Install the casing volute liner

1. Coat the threads of the casing volute liner retention studs (356K) that will be inserted into the casing volute liner (561) with anti-seize compound.

2. Insert the casing volute liner retention studs into the casing volute liner (561) using a metric stud driver.



3. Coat the seal cover-to-volute liner gasket (351Q) with lubricant and install into the casing volute liner (561).
4. Support the casing volute liner (561) using the proper end of the Goulds-provided impeller/casing volute hook tool.
5. Lift the liner into position and insert into the gland half casing (100D) using the installed retention studs (353K) as a guide.



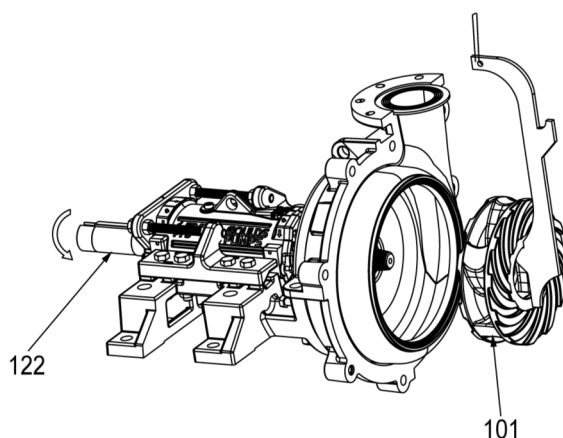
6. Secure the casing volute liner (561) to the gland half casing (100D) by installing and fully tightening the volute liner retention hex nuts (355C).

## Install the impeller

Two (2) people should work together to install the impeller for safety purposes.

1. Loosen the adjustment plate bolts (352G) and nuts (427D) but DO NOT remove bolts or adjustment plates (234F). Bolts should remain finger-tightened to keep rotating assembly constrained to the pedestal.
2. Slide the power end forward towards the suction side of the pump to allow better access to the shaft (122) impeller threads.
3. Apply anti-seize compound to the shaft (122) impeller threads.
4. Lift the impeller (101) using a Goulds-provided impeller hook or a chain/sling threaded through a vane passage attached to the hoist.
5. Guide the impeller (101) into position to engage with the shaft impeller threads.

6. With one person holding the impeller steady, the other should turn the shaft (122) clockwise to screw the shaft into the impeller. Begin this operation by hand and finish with an adjustable spanner wrench.



7. After the shaft (122) has been tightly screwed into the impeller (101), the bearing frame can be slid backwards toward the drive end until the impeller sits completely recessed in the casing volute liner (561).
8. Re-secure the bearing frame adjustment plates (234F) by tightening the hold down bolts (352G) and nuts (427D).

### Suction side assembly

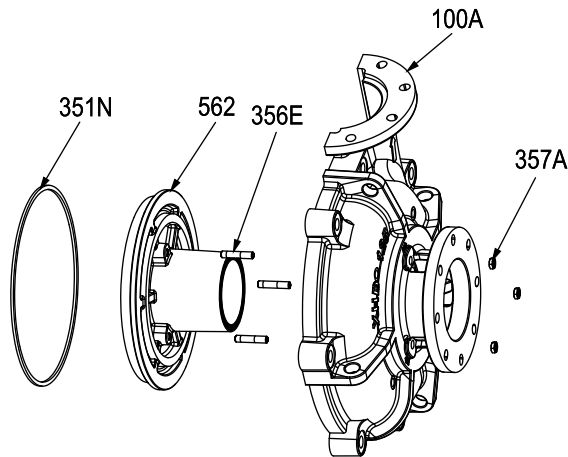
Wet end components on the suction side of the pump need to be assembled to the suction half casing (100A) before they can be attached to the rest of the assembled wet end already mounted on the bearing frame and pedestal.

Pump model	Follow this step
XHD	Install both the suction side liner and adjustable seal ring into the suction half casing before assembling the casing halves. Begin with the Install the adjustable seal ring and suction side liner into the suction half casing step.
XHD Value Option	Attach the suction liner to the suction half casing before assembling the casing halves. Use the Install the suction side liner into the suction half casing step.

### Install suction side liner into suction half casing - XHD Value Option

1. Position the suction side liner (562) inside the suction half casing (100A) so that the tapped holes in the liner are aligned with the thru-holes in the casing.
2. Insert the suction side liner retention studs (356E) through the suction half casing (100A) thru-holes into the threaded holes of the suction side liner (562) and secure with the retention stud nuts (357B).

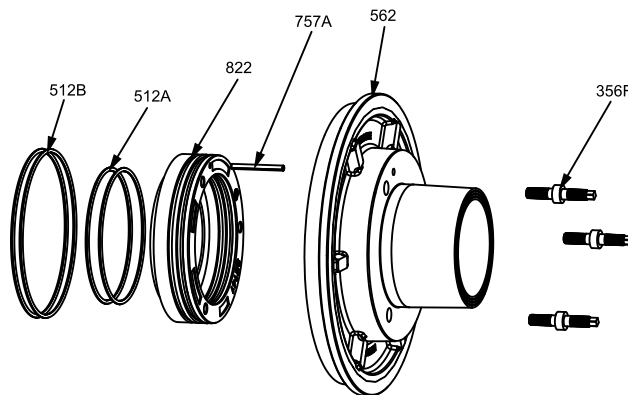
3. Lubricate and install the volute liner-to-suction side liner gasket (351N).



After completion, skip the next step listed for the XHD and move onto the Install the suction half casing step.

### Install adjustable seal ring and suction side liner into suction half casing - XHD

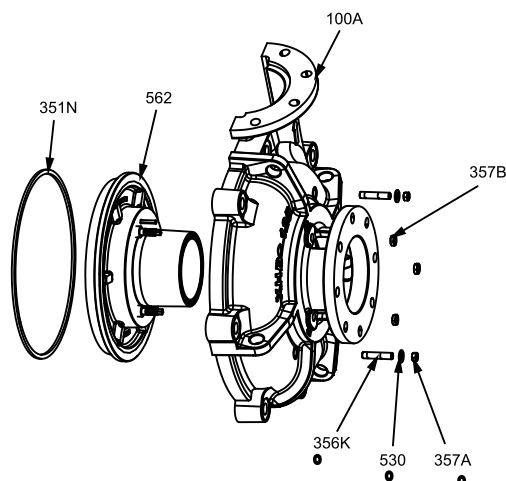
1. Coat the seal ring ID o-rings (512A) and OD o-rings (512B) with lubricant and install into the adjustable seal ring (822).
2. Install the seal ring indicator roll pin (757A) into the adjustable seal ring (822).
3. Align the three evenly spaced tapped holes in the adjustable seal ring (822) with the three thru-holes of the suction side liner (562).
4. Slide the adjustable seal ring into the suction side liner (562) slowly, keeping the holes aligned while being care not to damage or shear the seal ring OD o-rings (512B).
5. Install the seal ring adjusting bolt onto the adjusting bolts (356F).



6. Coat the non-driving end threads of the square head adjusting bolts (356F) with an anti-seize compound and insert through the suction side liner into the tapped holes of the seal ring.
7. Tighten the square head adjusting bolts (356F) fully using a metric driver. This will fully seat the adjustable seal ring (822) in the suction side liner (562).
8. Using proper support, lift the suction side liner (562) with the adjustable seal ring (822) installed into position and insert into the suction half casing, using the square head adjusting bolts (356F) as a guide.



9. Install the seal ring hex jam nuts (357B) on the square head adjusting bolts (356F) that now protrude from the suction half casing (100A). Fully tighten to complete assembly.



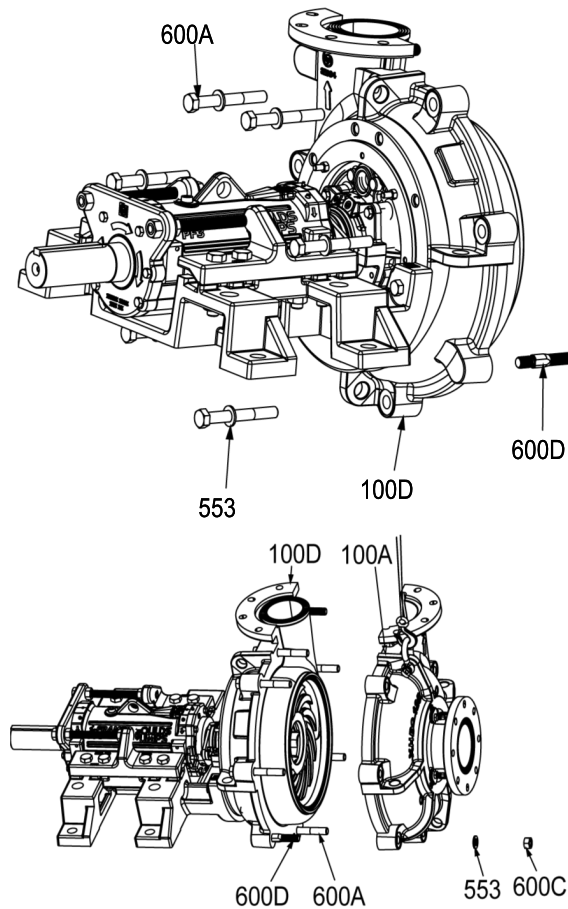
10. Coat the volute liner-to-suction side liner flat gasket (351N) with lubricant and install into the suction side liner (561).
11. Install the suction side liner holding threaded rod and nut (372N, sizes 150 and above only).

### Install suction half casing with other suction half components attached

During assembly, the casing bolts are typically inserted from the gland side of the wet end. This methodology can ease installation and tightening of flat washers and hex nuts when completing assembly of the suction and gland halves of the wet end.

1. Install the tapered alignment studs (600D) into the gland half casing (100D) in the locations shown.
2. Attach the hoist hook to the suction half casing (100A) lifting lug.
3. Lift the suction half casing (with other installed components) into place and move forward until the casing halves are flush, using the tapered alignment studs (600D) as a guide.
4. Install the flat washers (533) and tapered stud hex nuts (415B) on the forward face of the suction half casing (100A).
5. Insert the casing bolts (600A) into the remaining casing holes.

6. Install the flat washers (553) and casing bolt hex nuts (600C) onto the casing bolts (600A) to complete assembly of the casing halves.



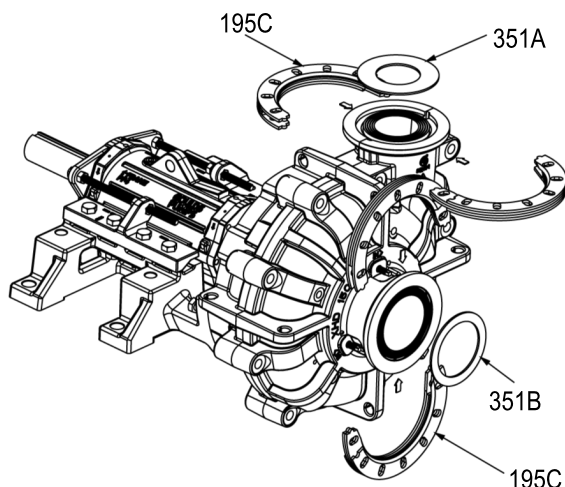
### Install packing, lantern ring, and gland

1. Measure the appropriate length of packing (106) strips by wrapping packing around the shaft sleeve (126) to estimate the desired length. Carefully cut each strip that is needed  $\frac{1}{4}$ " shorter than circumference of the shaft sleeve.
2. Install packing (106) and lantern ring (105) in the appropriate order that based upon the service dilution requirements. See the Maintenance – Packing section for details.
3. Position the two halves of the gland assembly (107) around the shaft sleeve (126). Assemble the gland assembly (107) and attach to the stuffing box using the gland adjusting bolts (353).

### Install the flanges and joint gaskets

1. Install the two-piece suction and discharge flanges (195C, sizes 150 and above only).
2. Install the discharge joint flat gasket (351A).

3. Install the suction joint flat gasket (351B).



## Assembly references

### Spare parts

#### Recommended spare parts

In order to prevent a long and costly downtime period, especially on critical services, it is advisable that you have these spare parts on hand:

- Casing volute liner (561)
- Suction side liner (562)
- Suction side liner holding rod and nut (372N, sizes 150 and above only)
- Adjustable seal ring (822, XHD only)
- Adjustable seal ring hardware (XHD only)
  - Square head adjusting bolts (356F)
  - Seal ring adjusting bolt o-rings (512C)
  - Seal ring jam nuts (357B)
  - Seal ring inner diameter o-rings (512A)
  - Seal ring outer diameter o-rings (512B)
- Suction and discharge flanges (196C, sizes 150 and above)
- Impeller (101)
- Impeller hub o-ring (412A)
- Shaft sleeve (126)
- Lantern ring (105, packed pump only)
- Gaskets
  - Suction joint flat gasket (351A)
  - Discharge joint flat gasket (351B)
  - Casing volute liner to suction side liner flat gasket (351N, XHD only)
- Inboard taper roller bearing (409)
- Outboard taper roller bearing (410)
- Shaft (122)
- Inboard double lip seals (332) (XHD Value Option only)
- Outboard double lip seals (333) (XHD Value Option only)
- Spacer sleeve o-ring (512D)
- Inboard and outboard bearing cover o-rings (412)

**Bearing bore fits and tolerances**

Group	Bearing	Maximum bearing frame bore in inches (millimeters)
PF2	Inboard	5.1197 (130.040)
	Outboard	
PF3	Inboard	7.4821 (190.046)
	Outboard	
PF4	Inboard	10.2383 (260.052)
	Outboard	
PF5	Inboard	11.4193 (290.052)
	Outboard	

## Bolt torques for XHD80

Option	Item number	Description	Thread size	Torque (N-m) Lubricated (k=.15)	Torque (ft-lbs) Lubricated (k=.15)
Standard	600A	Hex bolt, casing	M20x2.5	117	87
Standard	600C	Hex nut, casing			
Standard	600D	Taper stud, casing alignment	M20x2.5	458	339
Standard	415B	Hex nut, taper stud			
Standard	356K	Stud, volute liner retention	M10x1.5	54	40
Standard	357A	Hex nut, volute liner retention			
Standard	356E	Stud, suction side liner	M12x1.75	94	70
Standard	357J	Hex nut, suction side liner			
Standard	356F	Adjusting bolt, square head (seal ring)	M12x1.75	94	70
Standard	357B	Hex nut, jam (seal ring)			
Standard	388A	Screw, socket head (seal cover retention)	M6x1	11	8
Split box	328	Screw socket head	M10x1.5	62	46
Split box	596L	Hex head cap screw, chamber to cover	M12x1.75	94	70
Standard	353	Bolt, glad adjusting			
Standard	352G	Hex cap screw, plate	M16x2	235	174
Standard	427D	Hex nut, plate to pedestal			
Standard	370X	Threaded rod, housing adjustment	M20x2.5	458	339
Standard	415A	Hex nut, threaded rod			
Standard	375B	Taper stud, pedestal to gland half casing	M16x2	235	174
Standard	427L	Hex nut, taper stud (pedestal to gland half casing)			
Standard	370Y	Hex cap screw, pedestal to gland half casing	M16x2	235	174
Standard	370N	Hex head cap screw, outboard bearing cover	M8x1.25	27	20
Standard	370P	Hex cap screw, inboard bearing cover			
Standard	791B	Bolt, shoulder (chamber, split packing)	M5x.8	8	6

## Bolt torques for XHD125

Option	Item number	Description	Thread size	Torque (N-m) Lubricated (k=.15)	Torque (ft-lbs) Lubricated (k=.15)
Standard	600A	Hex bolt, casing	M24x3	211	156
Standard	600C	Hex nut, casing			
Standard	600D	Taper stud, casing alignment	M24x3	791	585
Standard	415B	Hex nut, taper stud			
Standard	356K	Stud, volute liner retention	M12x1.75	94	70
Standard	357A	Hex nut, volute liner retention			
Standard	356E	Stud, suction side liner	M16x2	235	174
Standard	357J	Hex nut, suction side liner			
Standard	356F	Adjusting bolt, square head (seal ring)	M16x2	235	174
Standard	357B	Hex nut, jam (seal ring)			
Standard	388A	Screw, socket head (seal cover retention)	M8x1.25	27	20
Split box	328	Screw socket head	M10x1.5	63	46
Split box	596L	Hex head cap screw, chamber to cover	M12x1.75	94	70
Standard	353	Bolt, glad adjusting			
Standard	352G	Hex cap screw, plate	M24x3	791	585
Standard	427D	Hex nut, plate to pedestal			
Standard	370X	Threaded rod, housing adjustment	M24x3	791	585
Standard	415A	Hex nut, threaded rod			
Standard	375B	Taper stud, pedestal to gland half casing	M24x3	791	585
Standard	427L	Hex nut, taper stud (pedestal to gland half casing)			
Standard	370Y	Hex cap screw, pedestal to gland half casing	M24x3	791	585
Standard	370N	Hex head cap screw, outboard bearing cover	M12x1.75	94	70
Standard	370P	Hex cap screw, inboard bearing cover			
Standard	791B	Bolt, shoulder (chamber, split packing)	M10x1.5	63	47

## Bolt torques for XHD150

Option	Item number	Description	Thread size	Torque (N-m) Lubricated (k=.15)	Torque (ft-lbs) Lubricated (k=.15)
Standard	600A	Hex bolt, casing	M30x3.5	377	279
Standard	600C	Hex nut, casing			
Standard	600D	Taper stud, casing alignment	M30x3.5	1571	1163
Standard	415B	Hex nut, taper stud			
Standard	356K	Stud, volute liner retention	M16x2	235	174
Standard	357A	Hex nut, volute liner retention			
Standard	356E	Stud, suction side liner	M20x2.5	458	339
Standard	357J	Hex nut, suction side liner			
Standard	356F	Adjusting bolt, square head (seal ring)	M20x2.5	458	339
Standard	357B	Hex nut, jam (seal ring)			
Standard	356E	Stud, volute liner retention	M16x2	235	174 20
Standard	357J	Hex nut, volute liner retention			
Standard	388A	Screw, socket head (seal cover retention)	M8x1.25	27	
Split box	328	Screw socket head	M10x1.5	63	46
Split box	596L	Hex head cap screw, chamber to cover			
Standard	353	Bolt, glad adjusting			
Standard	352G	Hex cap screw, plate	M30x3.5	1571	1163
Standard	427D	Hex nut, plate to pedestal			
Standard	370X	Threaded rod, housing adjustment	M24x3	791	585
Standard	415A	Hex nut, threaded rod			
Standard	375B	Taper stud, pedestal to gland half casing	M30x3.5	1571	1163
Standard	427L	Hex nut, taper stud (pedestal to gland half casing)			
Standard	370Y	Hex cap screw, pedestal to gland half casing	M30x3.5	1571	1163
Standard	370N	Hex head cap screw, outboard bearing cover	M16x2	235	174
Standard	370P	Hex cap screw, inboard bearing cover			
Standard	791B	Bolt, shoulder (chamber, split packing)	M10	63	47

## Bolt torques for XHD200

Option	Item number	Description	Thread size	Torque (N-m) Lubricated (k=.15)	Torque (ft-lbs) Lubricated (k=.15)
Standard	600A	Hex bolt, casing	M36x4	692	512
Standard	600C	Hex nut, casing			
Standard	600D	Taper stud, casing alignment	M36x4	1571	1163
Standard	415B	Hex nut, taper stud			
Standard	356K	Stud, volute liner retention	M16x2	235	174
Standard	357A	Hex nut, volute liner retention			
Standard	356E	Stud, suction side liner	M20x2.5	458	339
Standard	357J	Hex nut, suction side liner			
Standard	356F	Adjusting bolt, square head (seal ring)	M20x2.5	458	339
Standard	357B	Hex nut, jam (seal ring)			
Standard	356E	Stud, volute	M16x2	235	174
Standard	357J	Hex nut, volute			
Standard	388A	Screw, socket head (seal cover retention)	M8x1.25	27	20
Split box	328	Screw socket head	M12x1.75	90	66
Split box	596L	Hex head cap screw, chamber to cover	M16x2	235	174
Standard	353	Bolt, glad adjusting			
Standard	352G	Hex cap screw, plate	M30x3.5	1571	1163
Standard	427D	Hex nut, plate to pedestal			
Standard	370X	Threaded rod, housing adjustment	M24x3	791	585
Standard	415A	Hex nut, threaded rod			
Standard	375B	Taper stud, pedestal to gland half casing	M30x3.5	1571	1163
Standard	427L	Hex nut, taper stud (pedestal to gland half casing)			
Standard	370Y	Hex cap screw, pedestal to gland half casing	M30x3.5	1571	1163
Standard	370N	Hex head cap screw, outboard bearing cover	M16x2	235	174
Standard	370P	Hex cap screw, inboard bearing cover			
Standard	791B	Bolt, shoulder (chamber, split packing)	M10	63	47



## Bolt Torques for XHD250

Option	Item number	Description	Thread size	Torque (N-m) Lubricated (k=.15)	Torque (ft-lbs) Lubricated (k=.15)
Standard	600A	Hex bolt, casing	M42x4.5	1141	844
Standard	600C	Hex nut, casing			
Standard	600D	Taper stud, casing alignment	M42x4.5	1571	1163
Standard	415B	Hex nut, taper stud	M20x2.5	458	339
Standard	356K	Stud, volute liner retention			
Standard	357A	Hex nut, volute liner retention	M24x3	791	585
Standard	356E	Stud, suction side liner			
Standard	357J	Hex nut, suction side liner	M24x3	791	585
Standard	356F	Adjusting bolt, square head (seal ring)			
Standard	357B	Hex nut, jam (seal ring)	M20x2.5	458	339
Standard	356E	Stud, volute			
Standard	357J	Hex nut, volute	M10x1.5	54	40
Standard	388A	Screw, socket head (seal cover retention)	M16x2	269	198
Split box	328	Screw socket head	M20x2.5	458	339
Split box	596L	Hex head cap screw, chamber to cover			
Standard	353	Bolt, glad adjusting	M42x4.5	1571	1163
Standard	352G	Hex cap screw, plate			
Standard	427D	Hex nut, plate to pedestal	M36x4	1571	1163
Standard	370X	Threaded rod, housing adjustment	M24x3	791	585
Standard	415A	Hex nut, threaded rod			
Standard	375B	Taper stud, pedestal to gland half casing	M36x4	1571	1163
Standard	427L	Hex nut, taper stud (pedestal to gland half casing)			
Standard	370Y	Hex cap screw, pedestal to gland half casing	M30x3.5	1571	1163
Standard	370N	Hex head cap screw, outboard bearing cover	M16x2	235	174
Standard	370P	Hex cap screw, inboard bearing cover			
Standard	791B	Bolt, shoulder (chamber, split packing)	M12	110	81

## Bolt torques for XHD300

Option	Item number	Description	Thread size	Torque (N-m) Lubricated (k=.15)	Torque (ft-lbs) Lubricated (k=.15)
Standard	600A	Hex bolt, casing	M48x5	1659	1221
Standard	600C	Hex nut, casing			
Standard	600D	Taper stud, casing alignment	M48x5	1571	1163
Standard	415B	Hex nut, taper stud			
Standard	356K	Stud, volute liner retention	M20x2.5	458	339
Standard	357A	Hex nut, volute liner retention			
Standard	356E	Stud, suction side liner	M24x3	791	585
Standard	357J	Hex nut, suction side liner			
Standard	356F	Adjusting bolt, square head (seal ring)	M24x3	791	585
Standard	357B	Hex nut, jam (seal ring)			
Standard	356E	Stud, volute liner retention	M20x2.5	458	339
Standard	357J	Hex nut, volute liner retention			
Standard	388A	Screw, socket head (seal cover retention)	M10x1.5	54	40
Split box	328	Screw socket head	M16x2	269	198
Split box	596L	Hex head cap screw, chamber to cover	M20x2.5	458	339
Standard	353	Bolt, glad adjusting			
Standard	352G	Hex cap screw, plate	M42x4.5	1571	1163
Standard	427D	Hex nut, plate to pedestal	M36x4	1571	1163
Standard	370X	Threaded rod, housing adjustment	M24x3	791	585
Standard	415A	Hex nut, threaded rod			
Standard	375B	Taper stud, pedestal to gland half casing	M36x4	1571	1163
Standard	427L	Hex nut, taper stud (pedestal to gland half casing)			
Standard	370Y	Hex cap screw, pedestal to gland half casing	M30x3.5	1571	1163
Standard	370N	Hex head cap screw, outboard bearing cover	M16x2	235	174
Standard	370P	Hex cap screw, inboard bearing cover			
Standard	791B	Bolt, shoulder (chamber, split packing)	M12	110	81

# Troubleshooting

## Operation troubleshooting

Symptom	Cause	Remedy
The pump is not delivering liquid.	The pump is not primed.	Re-prime the pump and check that the pump and suction line are full of liquid.
	The suction line is clogged.	Remove the obstructions.
	The impeller is clogged.	Back-flush the pump in order to clean the impeller.
	The shaft is rotating in the wrong direction.	Change the rotation. The rotation must match the arrow on the bearing housing or pump casing.
	The foot valve or suction pipe opening is not submerged enough.	Consult an ITT representative for the proper submersion depth. Use a baffle in order to eliminate vortices.
	The suction lift is too high.	Shorten the suction pipe.
The pump is not producing the rated flow or head.	The gasket or O-ring has an air leak.	Replace the gasket or O-ring.
	The stuffing box has an air leak.	Replace or readjust the mechanical seal.
	The impeller is partly clogged.	Back-flush the pump in order to clean the impeller.
	The clearance between the impeller and the pump casing is excessive.	Adjust the impeller clearance.
	The suction head is not sufficient.	Make sure that the suction-line shutoff valve is fully open and that the line is unobstructed.
	The impeller is worn or broken.	Inspect and replace the impeller if necessary.
The pump starts and then stops pumping.	The pump is not primed.	Re-prime the pump and check that the pump and suction line are full of liquid.
	The suction line has air or vapor pockets.	Rearrange the piping in order to eliminate air pockets.
	The suction line has an air leak.	Repair the leak.
The bearings are running hot.	The pump and driver are not aligned properly.	Realign the pump and driver.
	There is not sufficient lubrication.	Check the lubricant for suitability and level.
	The lubrication was not cooled properly.	Check the cooling system.
The pump is noisy or vibrates.	The pump and driver are not aligned properly.	Realign the pump and driver.
	The impeller is partly clogged.	Back-flush the pump in order to clean the impeller.
	The impeller or shaft is broken or bent.	Replace the impeller or shaft as necessary.
	The foundation is not rigid.	Tighten the hold-down bolts of the pump and motor. Make sure the baseplate is properly grouted without voids or air pockets.
	The bearings are worn.	Replace the bearings.
	The suction or discharge piping is not anchored or properly supported.	Anchor the suction or discharge piping as necessary according to recommendations in the Hydraulic Institute Standards Manual.
	The pump is cavitating.	Locate and correct the system problem.
The stuffing box is leaking excessively.	The packing gland is not adjusted properly.	Tighten the gland nuts.
	The stuffing box is not packed properly.	Check the packing and repack the box.
	The mechanical seal parts are worn.	Replace the worn parts.
	The mechanical seal is overheating.	Check the lubrication and cooling lines.
	The shaft or shaft sleeve is scored.	Machine or replace the shaft sleeve as necessary.
The motor requires excessive power.	The discharge head has dropped below the rated point and is pumping too much liquid.	Install a throttle valve. If this does not help, then trim the impeller diameter. If this does not help, then contact your ITT representative.
	The liquid is heavier than expected.	Check the specific gravity and viscosity.
	The stuffing-box packing is too tight.	Readjust the packing. If the packing is worn, then replace the packing.
	Rotating parts are rubbing against each other.	Check the parts that are wearing for proper clearances.
	The impeller clearance is too tight.	Adjust the impeller clearance.

## Alignment troubleshooting

Symptom	Cause	Remedy
Horizontal (side-to-side) alignment cannot be obtained (angular or parallel).	The driver feet are bolt-bound.	Loosen the pump's hold-down bolts, and slide the pump and driver until you achieve horizontal alignment.
	The baseplate is not leveled properly and is probably twisted.	<ol style="list-style-type: none"> <li>1. Determine which corners of the baseplate are high or low.</li> <li>2. Remove or add shims at the appropriate corners.</li> <li>3. Realign the pump and driver.</li> </ol>
Vertical (top-to-bottom) alignment cannot be obtained (angular or parallel).	The baseplate is not leveled properly and is probably bowed.	<ol style="list-style-type: none"> <li>1. Determine if the center of the baseplate should be raised or lowered.</li> <li>2. Level screws equally at the center of the baseplate.</li> <li>3. Realign the pump and driver.</li> </ol>

## Assembly troubleshooting

Table 8: Troubleshooting procedure

Symptom	Cause	Remedy
There is excessive shaft end play.	The internal clearance of the bearings is excessive.	Replace the bearings with a bearing of the correct type.
	The thrust-bearing end cover is loose.	Tighten the screws.
	There are too many shims under the thrust bearing end cover.	Remove the individual shims to obtain the proper thickness.
The runout for the shaft is excessive.	The shaft is bent.	Replace the shaft.
The runout for the bearing-frame flange is excessive.	The shaft is bent.	Replace the shaft.
	The flange of the bearing frame is distorted.	Replace the bearing-frame flange.
The runout for the seal-chamber cover is excessive.	The seal-chamber cover is improperly seated on the frame.	Replace or re-machine the seal-chamber cover.
	There is corrosion or wear on the seal-chamber cover.	Replace the seal-chamber cover.
The runout for the impeller wear ring is excessive.	The shaft is bent.	Replace the shaft.
	The wear ring was machined improperly.	Replace or re-machine the impeller.

## i-ALERT™ Condition Monitor troubleshooting

Symptom	Cause	Remedy
There are no green or red flashing LEDs.	The battery is dead.	Replace the condition monitor.
	The unit is deactivated.	Activate the condition monitor.
	The unit is malfunctioning.	Consult your ITT representative for a warranty replacement.
The red LEDs are flashing, but the temperature and vibration are at acceptable levels.	The baseline is bad.	Check the temperature and vibration levels and reset the condition monitor.
	The unit is malfunctioning.	Consult your ITT representative for a warranty replacement.



Item	Description	High Chrome HC600	High Chrome w/DI Seal Cover HC600/DI	Endura- Chrome Special HC	Ultra High Chrome 35% Cr
100D	Gland half casing	1018			
101	Impeller	1228		1269	1650
105	Lantern ring	6308			
106	Packing	5026			
107	Gland half	1203			
109	Bearing cover, outboard	1018			
113	Fitting, grease relief	-			
119	Bearing cover, inboard	1018			
122	Shaft	2251			
126	Sleeve, shaft	2222			
131	Pedestal	1018			
149	Ring, knockoff	1203			
157	Sleeve, spacer	1203			
159	Chamber, split packing assembly	1018			
184	Cover, seal	1228	1018	1269	1650
193B	Fitting, grease	-			
193L	Fitting, grease (bearing covers)	-			
195C	Flange, split	Optional on drawing			
228	Frame, bearing	1018			
234F	Plate, bearing frame adjustment	1018			
263	Expeller	1228		1269	1650
297B	Rupture disc assembly				
319	Sight glass	-			
319B	Plug, pipe (oil fill)	2472			
319H	Plug, pipe (grease fittings, frame)	2472			
327U	Screw, Hex Cap (shaft guard)	2472			
328	Bolt, hex shoulder	2473			
332A	Lip seal, inpro outboard (inside)	-			
332A	Seal, inpro outboard	-			
332C	Lip seal, outboard (outside)	-			
333A	Lip seal, inboard (inside)	-			
333A	Seal, inpro inboard	-			
333C	Lip seal, inboard (outside)	-			
346A	Shield, grease	3201			
351A	Gasket, discharge	5206			
351B	Gasket, suction	5206			
351N	Gasket, volute liner to suction side liner	5206			
351Q	Gasket, seal cover to volute liner	5206			
352G	Screw, hex cap (plate)	2472			
352H	Screw, hex cap (rupture disc)	2472			
353	Screw, hex cap (gland adjusting)	2472			
354A	Washer, clipped (seal cover retention)	5429			
356E	Stud, suction side liner	2472			
356F	Adjusting bolt, square head (seal ring)	2472			
356K	Stud, suction side liner	2472			
357A	Nut, hex (volute liner retention)	2472			
357B	Nut, hex jam (seal ring)	2472			
357J	Nut, hex (suction side liner)	2472			
358B	Plug, pipe (chamber)	2472			

Item	Description	High Chrome HC600	High Chrome w/ DI Seal Cover HC600/DI	Endura-Chrome Special HC	Ultra High Chrome 35% Cr
367B	Gasket, chamber	5145			
370N	Screw, hex cap (outboard bearing cover)	2472			
370P	Screw, hex cap (inboard bearing cover)	2472			
370Y	Screw, hex cap (pedestal to gland half casing)	2472			
370W	Screw, hex cap (inboard bearing cover)	2472			
370X	Threaded rod, frame adjustment	2472			
372T	Screw, i-Alert	2367			
375B	Taper stud, pedestal to gland half casing	2472			
388A	Screw, socket head (seal cover retention)	2472			
390C	Shim pack (outboard bearing cover)	non-metallic			
400	Key, shaft	2213			
408A	Plug, pipe (oil drain)	2472			
408N	Plug, pipe (opposite sight glass)	2472			
409	Taper roller bearing, inboard	-			
410	Taper roller bearing, outboard	-			
412	O-ring, inboard bearing cover	5302			
412	O-ring, outboard bearing cover	5302			
412A	O-ring, impeller hub	5302			
412F	O-ring, shaft sleeve	5302			
414C	Screw, tapping (splash guard)	2472			
415A	Nut, hex (threaded rods)	2472			
415B	Nut, hex (taper stud, casing alignment)	2472			
427D	Nut, hex (plate to pedestal)	2472			
496R	O-ring, chamber	5302			
501D	Guard, cover	3201			
501M	Guard, adjustable shaft (frame end)	3201			
501N	Guard, adjustable shaft (gland end)	3201			
512B	O-ring, seal ring OD	5302			
512A	O-ring, seal ring ID	5302			
512C	O-ring, adjusting bolt (seal ring)	5302			
512D	O-ring, spacer sleeve	5302			
529	Bellville washer	1392			
530	Washer, plan (suction side liner)	5429			
553	Washer, plain (casing)	5429			
561	Volute liner, casing	1228	1269	1650	
562	Suction side liner	1228	1269	1650	
569L	Screw, hex cap (casing)	2472			
600A	Screw, hex cap (casing)	2472			
600C	Nut, hex (casing)	2472			
600D	Taper stud, casing alignment	2472			
757A	Roll pin, seal ring indicator	5429			
761B	i-Alert, conditional monitor	-			
791B	Bolt, shoulder (knockoff ring)	2473			
791Z	Lifting hook	-			
822	Seal ring	1228	1269	1650	

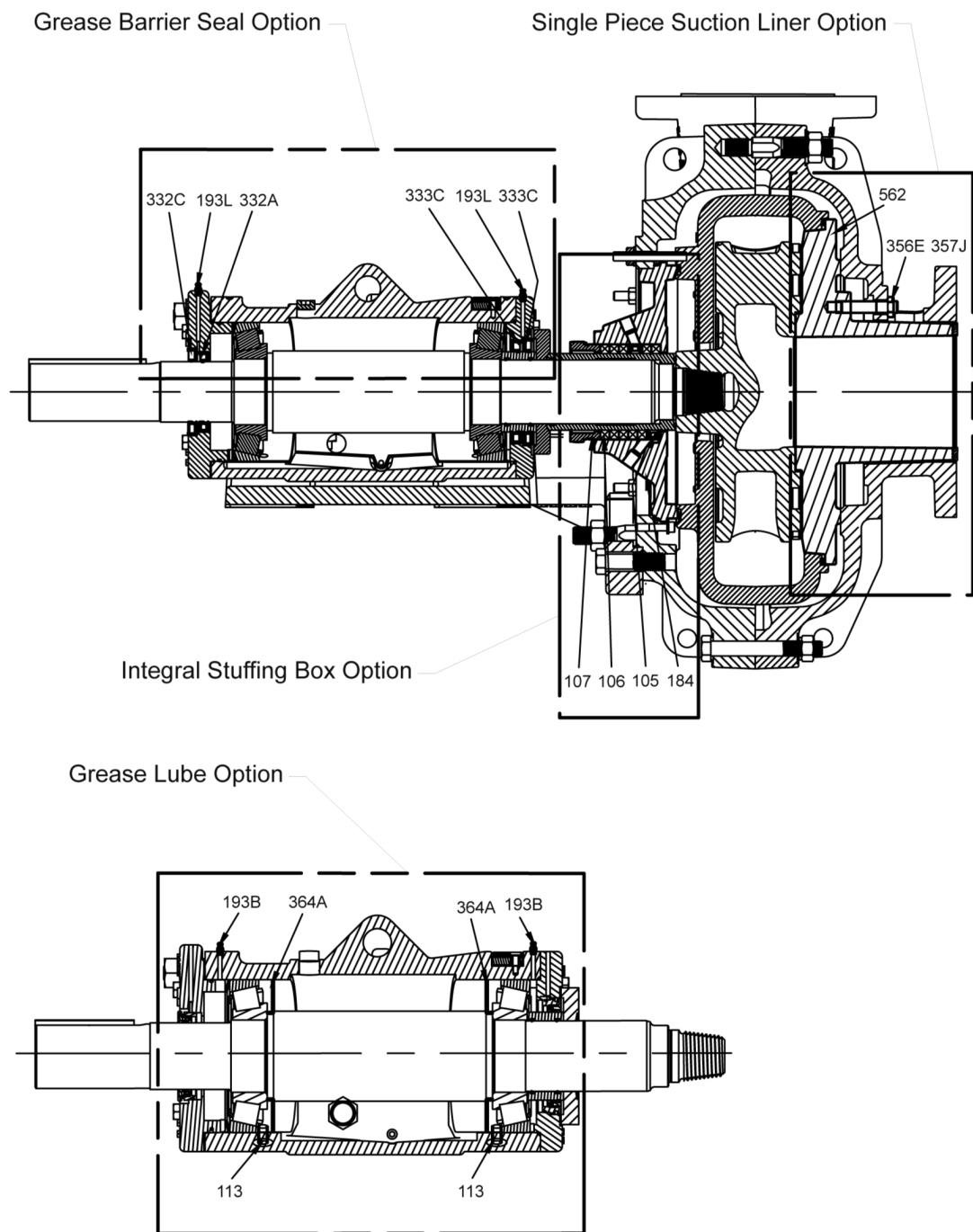


Figure 16: Optional features



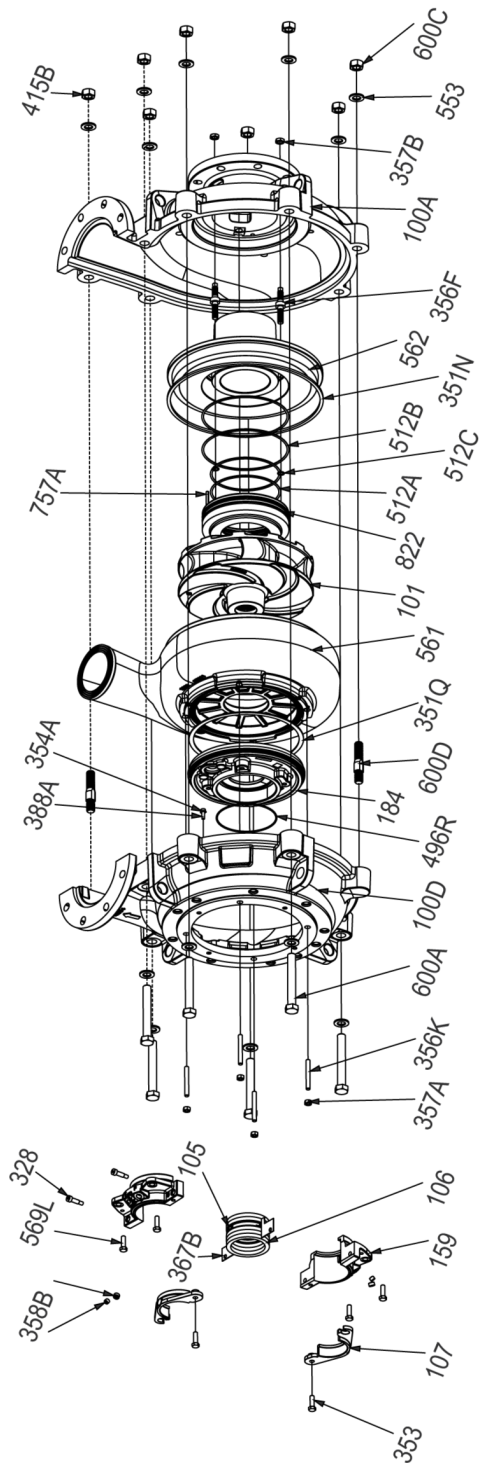


Figure 17: XHD Liquid end

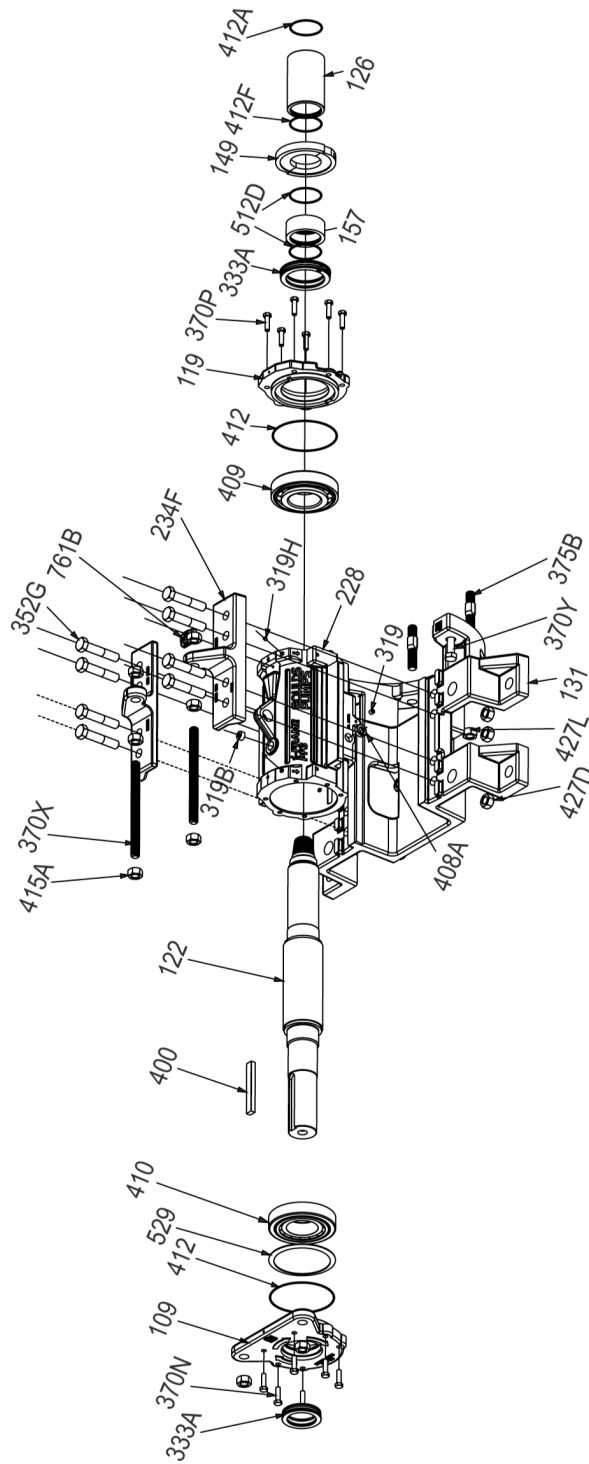





Figure 18: XHD Oil lube power end

# Certification: CE or CE ATEX

## Certificates of conformance

### CSA Certificate

	
<h2 style="color: blue;">Certificate of Compliance</h2>	
Certificate:	1992883
Master Contract:	236924
Project:	2254252
Date Issued:	2009/12/16
Issued to:	ITT Corporation
	240 Fall St
	Seneca Falls, NY 13148
	USA
	Attention: Anthony Stavale
<p><i>The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US or with adjacent indicator 'US' for US only or without either indicator for Canada only.</i></p>	
	
D. Simpson, Certifier Issued by: D. Simpson, Certifier	
<b>PRODUCTS</b>	
CLASS 2258 03	- PROCESS CONTROL EQUIPMENT - Intrinsically Safe and Non-Incendive Systems - For Hazardous Locations
CLASS 2258 83	- PROCESS CONTROL EQUIPMENT-Intrinsically Safe and Non-Incendive - Systems-For Hazardous Locations-Certified to U.S. Standards
Class I, Division 1, Group A, B, C and D; Class II, Group E, F and G; Class III: - Condition Monitor, Model LCCM, p/n C07667A, battery operated (non-replaceable, non-rechargeable), intrinsically safe, temperature code T4 (at max ambient of 100C).	
<b>APPLICABLE REQUIREMENTS</b>	
CAN/CSA-C22.2 No. 0-M91	- General Requirements - Canadian Electrical Code, Part II
CAN/CSA-C22.2 No.157-92	- Intrinsically Safe and Non-Incendive Equipment for Use in Hazardous Locations
UL Std No.913, Ed. 7	- Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II and III, Division 1, Hazardous Locations
<small>EQD 507 Rev. 2009-05-01</small>	

 CSA INTERNATIONAL	
<b>Certificate:</b> 1992883	<b>Master Contract:</b> 236924
<b>Project:</b> 2254252	<b>Date Issued:</b> 2009/12/16

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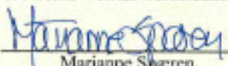


UL Std No. 969, 4th Edition - UL standard for safety marking and labeling systems

**MARKINGS**

- submitter's identification
- model designation
- date code or serial number
- Hazardous Location designations
- temperature code rating
- maximum ambient temperature
- the CSA Mark, with the C/US indicator
- the warning, WARNING: NOT FOR USE IN ATMOSPHERES CONTAINING ACETIC ACID
- the words "Ex ia" and "Intrinsically safe"


DQD 507 Rev. 2009-09-01

# ATEX notification

 	
<b>DET NORSKE VERITAS</b> <b>PRODUCTION QUALITY ASSURANCE NOTIFICATION</b>	
[2]	<b>EQUIPMENT OR PROTECTED SYSTEM INTENDED FOR USE IN POTENTIALLY EXPLOSIVE ATMOSPHERES DIRECTIVE 94/9/EC</b>
[3]	Notification Number: <b>DNV-2008-OSL-ATEX-30303Q</b> Rev. 1
[4]	Equipment or Protective Systems or components as listed: <b>Intrinsically safe equipment</b>  (The EC-Type Examination Certificates based on this notification are listed by the notified body)
[5]	Applicant –Manufacturer or Authorized Representative in the Community: <b>ITT Industries, Goulds Pumps</b> <b>204 Fall St.,</b> <b>Seneca Falls, New York 13148 USA</b>
[6]	Manufacturer: <b>ITT Industries, Goulds Pumps</b>
[7]	DNV, notified body number 0575 for Annex IV in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, notifies to the applicant that the actual manufacturer has a production quality system which complies to Annex IV of the Directive.
[8]	This notification is based on audit report: <b>2008-3354</b> This notification can be withdrawn if the manufacturer no longer satisfies the requirements of Annex IV  <b>Results of periodical re-assessment of the manufacturing process is a part of this notification.</b>
[9]	This notification is valid until <b>2011-06-25</b> and can be withdrawn if the manufacturer does not satisfy the production quality re-assessment.
[10]	According to article 10[1] of the Directive 94/9/EC the CE marking shall be followed by the identification Number 0575 identifying the notified body involved in the production control stage.
<p>Høvik, 2008-09-05 for Det Norske Veritas Certification AS</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">   <b>Marianne Spæren</b>  <i>Certification Manager</i> </div> <div style="text-align: center;">   <small>NOTIFIED BODY ACCREDITED BY PRIME REG</small> </div> <div style="text-align: center;">   <b>Bjørn Spangsvæen</b>  <i>Technical Reviewer</i> </div> </div>	
<small>Notice: This notification may only be reproduced in its entirety and without any change          If any person suffers loss or damage which is proved to have been caused by any negligence, act or omission of Det Norske Veritas, then Det Norske Veritas shall pay compensation to such person for the proved direct loss or damage. However, the compensation shall not exceed an amount equal to the fees for the service in question, provided that the maximum compensation shall never exceed USD 340 000. In this provision "Det Norske Veritas" shall mean the Det Norske Veritas Group as well as its subsidiaries, divisions, offices, departments, agents and any other entities on behalf of Det Norske Veritas.</small>	

## IECEx Certificate of Conformity


 <h1>IECEx Certificate of Conformity</h1>	
<b>INTERNATIONAL ELECTROTECHNICAL COMMISSION</b> <b>IEC Certification Scheme for Explosive Atmospheres</b> <small>for rules and details of the IECEx Scheme visit <a href="http://www.iecex.com">www.iecex.com</a></small>	
Certificate No.:	IECEx LCI 08.0038
Issue No.:	0
Certificate history:	
Status:	Current
Date of Issue:	2008-09-16
Page 1 of 3	
Applicant:	<b>ITT Corp.</b> Goulds pumps 240 Fall Street Seneca Falls, NY 13148 United States of America
Electrical Apparatus:	Condition Monitor
Optional accessory:	
Type of Protection:	ia
Marking:	ITT Corp. Goulds pumps 240 Fall Street Seneca Falls, NY 13148 U.S.A. Condition Monitor Type : LCCM, p/n C07667A Ex ia IIC T4 Tamb : -40°C à 100°C
Approved for issue on behalf of the IECEx Certification Body:	Marc Giffaux
Position:	Ex Certification Manager
Signature: (for printed version)	
Date:	16 September 2008
	
1. This certificate and schedule may only be reproduced in full. 2. This certificate is not transferable and remains the property of the issuing body. 3. The Status and authenticity of this certificate may be verified by visiting the Official IECEx Website.	
Certificate issued by: <b>Laboratoire Central des Industries Electriques (LCIE)</b> 33 Avenue du General Leclerc FR-92260 Fontenay-aux-Roses France	
	

 <h1>IECEx Certificate of Conformity</h1>	
Certificate No.:	IECEx LCI 08.0038
Date of Issue:	2008-09-16
Issue No.:	0
	Page 2 of 3
Manufacturer:	<b>ITT Corp.</b> Goulds pumps 240 Fall Street Seneca Falls, NY 13148 United States of America
Manufacturing location(s):	
<p>This certificate is issued as verification that a sample(s), representative of production, was assessed and tested and found to comply with the IEC Standard list below and that the manufacturer's quality system, relating to the Ex products covered by this certificate, was assessed and found to comply with the IECEx Quality system requirements. This certificate is granted subject to the conditions as set out in IECEx Scheme Rules, IECEx 02 and Operational Documents as amended.</p>	
<p><b>STANDARDS:</b>            The electrical apparatus and any acceptable variations to it specified in the schedule of this certificate and the identified documents, was found to comply with the following standards:</p>	
IEC 60079-0 : 2004 Edition: 4.0	Electrical apparatus for explosive gas atmospheres - Part 0: General requirements
IEC 60079-11 : 2006 Edition: 5	Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "I"
<p><i>This Certificate does not indicate compliance with electrical safety and performance requirements other than those expressly included in the Standards listed above.</i></p>	
<p><b>TEST &amp; ASSESSMENT REPORTS:</b>            A sample(s) of the equipment listed has successfully met the examination and test requirements as recorded in</p>	
<p><u>Test Report:</u>            FRLC/ExTR08.0043/00</p>	
<p><u>Quality Assessment Report:</u>            NQ/DNVQAR08.0006/00</p>	



## Chinese Certificate of Conformity



**CONFORMITY CERTIFICATE OF EXPLOSION-PROOF**

 Certificate No.: **CE082171**





**Name of Product:** Condition Monitor  
**Type of Product:** LCCM, p/n C07667A  
**Marking:** **Exia II CT4**  
**Technical Documents:** /  
**Drawing No.:** C07667A  
**Note (s):**  
1.The power is supplied by PANASONIC battery.  
The battery type is BR2477A 3V.  
2.The manufacturer address: Goulds pumps, 240  
Fall Street, Seneca Falls, NY 13148, U.S.A.

By verifying the drawings and technical documents and checking samples, the product  
complies with the following standards currently valid in P.R.China:  
GB3836.1-2000 GB3836.4-2000

**Issued to:** ITT Corp.  
**Date of Expire:** 2013-12-22  
**Date of Issue:** 2008-12-22

**Center seal**  **Director**   
**Xu Gang**

**Supervision & Test Center of Ex- products of China**  
**Petroleum & Chemical Industry**

PCEC has been approved by  
   

注: 本证书对与送检样品一致的产品有效。  
Note: This certificate is only valid for the products that are in accord with sample(s) tested and verified.  
中心地址: 中国天津市丁字路三号院 85 号  
Center Add: No.85 No.3 Road DingZiGu Tianjin China Post code: 300131  
E-mail: ccc@pcec.com.cn  
邮政编码: 300131 电话/传真: 022-26651066/26689116  
Tel/ Fax: 022-26651066/26689116  
<http://www.pcec.com.cn>



# Other Relevant Documentation or Manuals

## For additional documentation

For any other relevant documentation or manuals, contact your ITT representative.

# Local ITT Contacts

## Regional offices

Region	Address	Telephone	Fax
North America (Headquarters)	ITT - Goulds Pumps USA	+1 315-568-2811	+1 315-568-2418
Asia Pacific	ITT Industrial Process 10 Jalan Kilang #06-01 Singapore 159410	+65 627-63693	+65 627-63685
Europe	ITT - Goulds Pumps Millwey Rise Industrial Estate Axminster, Devon, England EX13 5HU	+44 1297-630250	+44 1297-630256
Latin America	ITT - Goulds Pumps Camino La Colina # 1448 Condominio Industrial El Rosal Huechuraba Santiago 8580000 Chile	+562 544-7000	+562 544-7001
Middle East and Africa	ITT - Goulds Pumps Achileos Kyrrou 4 Neo Psychiko 115 25 Athens Greece	+30 210-677-0770	+30 210-677-5642



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document and more information:**

<http://www.gouldspumps.com>



**ENGINEERED FOR LIFE**

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