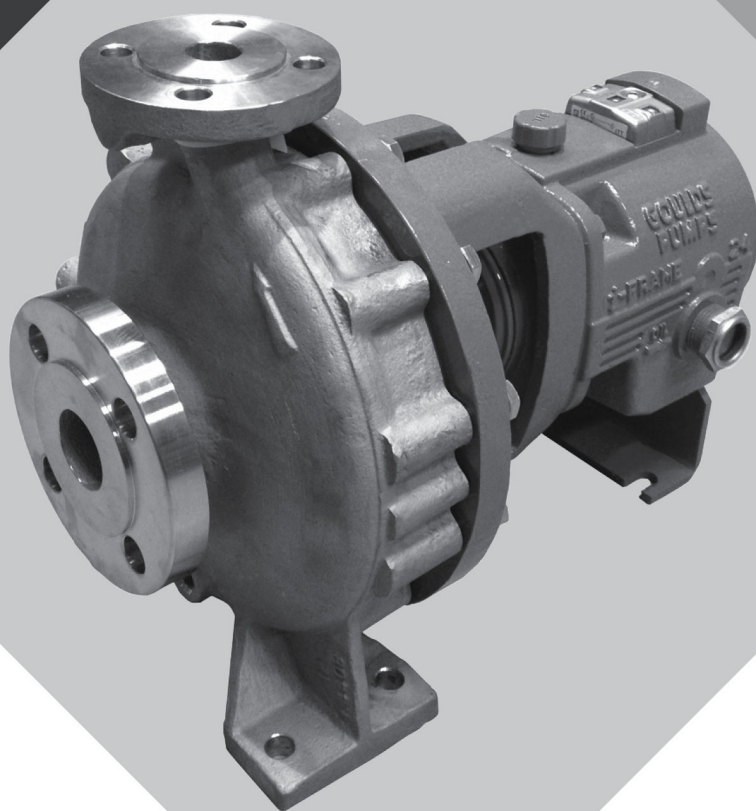




Installation, Operation, and Maintenance Manual

Model IC i-FRAME, ICI i-FRAME, ICH i-FRAME,
ICIH i-FRAME



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



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.

NOTICE:

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

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



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.
 -  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 unless explicitly stated in this manual.
 - If the pump/motor is damaged or leaking, do not operate as it may cause an electric shock, fire, explosion, liberation of toxic fumes, physical harm, or environmental damage. Correct/repair the problem prior to putting back in service.
 - Do not change the service application without the approval of an authorized ITT representative.
-

**CAUTION:**

You must observe the instructions contained in this manual. Failure to do so could result in physical injury, damage, or delays.

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

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

The Ex symbol

The Ex symbol indicates safety regulations for Ex-approved products when used in atmospheres that are potentially explosive or flammable.



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 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

NOTICE:

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

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.

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

Ex-approved products

Follow these special handling instructions if you have an Ex-approved unit.

Personnel requirements

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, the vapor, or both present in hazardous areas.
- Any maintenance for Ex-approved products must conform to international and national standards (for example, IEC/EN 60079-17).

ITT disclaims all responsibility for work done by untrained and unauthorized personnel.

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.
- The Ex-approved product must never run dry during normal operation. Dry running during service and inspection is only permitted outside the classified area.
- Before you start work on 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, and that they are in use.
- 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.
- Do not modify the equipment without approval from an authorized ITT representative.
- Only use parts that are provided by an authorized ITT representative.

Description of ATEX

The ATEX directives are a specification enforced in Europe for electrical and non-electrical equipment installed in Europe. ATEX deals with the control of potentially explosive atmospheres and the standards of equipment and protective systems used within these atmos-

pheres. 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 fulfilled only when you operate the unit within its intended use. Do not change the conditions of the service without the approval of an ITT representative. When you install or maintain explosion proof products, always comply with the directive and applicable standards (for example, IEC/EN 60079–14).

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

Pump handling and lifting

Precautions for moving the pump

Use care when moving pumps. Consult with a lifting and rigging specialist before lifting or moving the pump to avoid possible damage to the pump or injury to personnel.



WARNING:

Make sure that the unit cannot roll or fall over and injure people or damage property.

NOTICE:

Use a forklift truck with sufficient capacity to move the pallet with the pump unit on top.

Precautions for lifting the pump



WARNING:

NOTICE:

- Make sure that the lifting equipment supports the entire assembly and is only used by authorized personnel.
 - Do not attach sling ropes to shaft ends.
-

Lifting the pump

Baseplate-mounted units have lifting points for use with proper lifting devices.

Storage guidelines

Long-term storage

If the unit is stored for more than 6 months, these requirements apply:

- Store in a covered and dry location.
- Store the unit free from heat, dirt, and vibrations.
- Rotate the shaft by hand several times at least every three months.

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

For questions about possible long-term storage treatment services, please contact your local ITT sales representative.

Product Description

General description

The model IC is a single-stage volute casing pump. Hydraulic design and dimensions comply with ISO 2858/ EN 22858. The technical design complies with ISO 5199/EN 25199. The model ICI additionally has an inducer. Models ICH and ICIH additionally have cooling or heating of the casing cover and/or the volute casing.



Casing

- Heavy-duty, top centerline discharge
- Integral cast feet
- Back pullout design
- Standard 3/8 in. NPT casing drain
- Optional renewable wear ring

Impeller

The impeller is fully enclosed and key driven by the shaft. Standard back vanes or balance holes reduce axial thrust and seal chamber pressures.

Seal chamber

- Wide choice of sealing arrangements for maximum sealing flexibility
- Patented “cyclone” seal chamber for improved lubrication, heat removal, and solids handling
- Confined casing gasket

Power end

- Redesigned i-FRAME large capacity oil sump reduces oil temperature for extended bearing life.
- Heavy-duty cast iron frame gives rigid support to the shaft and bearings for longer service.
- Magnetic drain plug maintains a clean oil environment for extended bearing life.
- Standard hybrid stainless steel/bronze labyrinth oil seals at the pump and coupling end maintain a seal tight, clean operating environment.
- O-ring seal between the frame and adapter for optimized alignment and sealing.

Frame adapter

- Provides safe and accurate alignment for the liquid end to the bearing frame.
- Large access windows make installation and maintenance of seal and auxiliary support systems trouble-free.

Bearings

Heavy-duty ball bearings provide L10 bearing life in excess of 17,500 hours. The size of the bearing bracket is shown in the data sheet and/or order confirmation.

Bearing bracket Pump side	Bearing type	
	Drive side	
24	6307 - C3	3307A - C3
32	6309 - C3	3309A - C3
42	6311 - C3	3311A - C3
48	6313 - C3	3313A - C3

Shaft

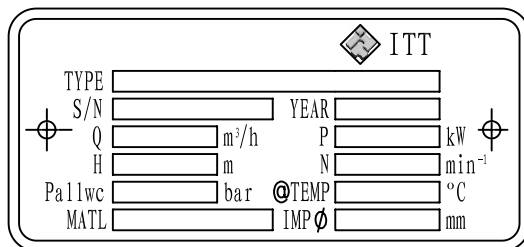
Rigid shaft designed for less than 0.05 mm shaft deflection. Standard 400 series stainless steel shaft (1.4021) provides reliable power transmission and corrosion resistance at both the pump and coupling ends.

Intended applications

- ISO chemical process
- Industrial process

Nameplate information

Pump nameplate

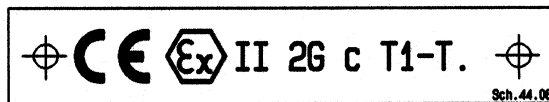


Nameplate field	Explanation
Type*	Type of pump
S/N*	Serial number
Q	Rated pump flow, in cubic meters per hour
P	Rated pump power, in kilowatts
H	Rated pump head, in meters
n	Rated pump speed, in min ⁻¹
P _{all w c}	Maximum permitted casing-operation-pressure (Highest discharge pressure at the rated operating temperature to which the pump casing can be used)
t _{max op}	Maximum permitted operating temperature of pumped liquid
Item No	Customer-related order number
Imp Ø	Outer diameter of the impeller
MATL	Material of construction

*All details of design and materials are defined with this information. You must specify these details when you order spare parts.

ATEX nameplate

The conformity with the EC directive 94/9/EG "Appliances and Protection Systems for designated use in areas endangered to explosion" is declared by the issue of the EC Declaration of Conformity and the attachment of the ATEX label on the bearing bracket of the pump. The ATEX label is also attached to the pump nameplate.



Nameplate field	Explanation
CE	Marking of compliance with the EC directive 94/9/EG
Ex	Specific marking for explosion protection
II	Appliance group
2G	Category (2) and explosive atmosphere due to gases, vapors, or mist (G)
c	ignition protection in use: constructual safety (c)
T1-T.	Classification of the theoretically available range of the temperature classes

Installation

Preinstallation

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 hoist rings, shackles, slings and spreaders must be rated, selected, and used for the entire load being lifted.

Foundation requirements

Requirements

- The foundation must be able to absorb any type of vibration and form a permanent, rigid support for the unit.
- Provide a flat, substantial concrete foundation in order to prevent strain and distortion when you tighten the foundation bolts.

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.

Prepare the foundation for mounting

1. Chip the top of the foundation to a minimum of 1.0 in. (25.0 mm) in order to remove porous or low-strength concrete.
If you use a pneumatic hammer, make sure that it does not contaminate the surface with oil or other moisture.

NOTICE:

Do not chip the foundation using heavy tools such as jackhammers. This can damage the structural integrity of the foundation.

2. Remove water or debris from the foundation bolt holes or sleeves.
3. If the baseplate uses sleeve-type bolts, then fill the sleeves with a non-binding, moldable material. Seal the sleeves in order to prevent the grout from entering.
4. Coat the exposed portion of the anchor bolts with a non-bonding compound such as paste wax in order to prevent the grout from adhering to the anchor bolts.
Do not use oils or liquid wax.
5. If recommended by the grout manufacturer, coat the foundation surface with a compatible primer.

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
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.

1. Shims or wedges

Figure 1: 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:

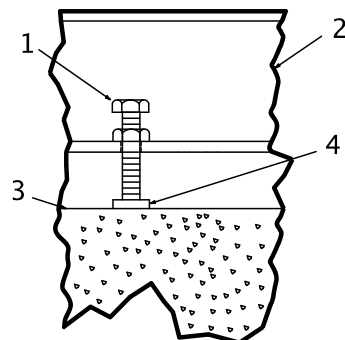
Remove all dirt from the mounting pads in order to make sure that you achieve the correct leveling. Failure to do so can result in equipment damage or decreased performance.

5. Level the baseplate both lengthwise and across by adding or removing shims or moving the wedges.
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
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.
 - d) Make sure that the center jackscrews do not touch the foundation surface yet.



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

Figure 2: Jackscrews

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.
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.
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.

Install the baseplate using spring mounting

NOTICE:

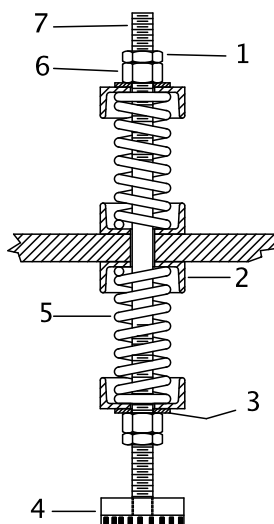
The spring-mounted baseplate is designed only to support piping loads from thermal expansion. You must support the suction and discharge piping individually. Failure to do so may result in equipment damage.

The foundation pads are not provided with the baseplate. Make sure that the foundation pads are 316 stainless-steel plates, which have a 16-20 micro-inch surface finish.

Before you start this procedure, make sure that the foundation pads are correctly installed on the foundation/floor (see the manufacturer's instructions).

1. Put the baseplate on a support above the foundation/floor.
Make sure that there is enough space between the baseplate and the foundation/floor in order to install the spring assemblies.
2. Install the lower part of the spring assembly:
 - a) Screw the lower jam nut onto the spring stud.
 - b) Screw the lower adjusting nut onto the spring-stud, on top of the jam nut.
 - c) Set the lower adjusting nut to the correct height.
The correct height depends on the required distance between the foundation/floor and the baseplate.
 - d) Put a washer, a follower, a spring, and one more follower onto the lower adjusting nut.
3. Install the spring assembly on the baseplate:
 - a) Insert the spring assembly into the baseplate's anchorage hole from below.
 - b) Put a follower, a spring, another follower, and a washer onto the spring stud.
 - c) Fasten the spring assembly with the upper adjusting nut by hand.
4. Thread the upper jam nut onto the spring stud by hand.
5. Repeat steps 2 through 4 for all the spring assemblies.

6. Lower the baseplate so that the spring assemblies fit into the foundation pads.
7. Level the baseplate and make the final height adjustments:
 - a) Loosen the upper jam nuts and adjusting nuts.
 - b) Adjust the height and level the baseplate by moving the lower adjusting nuts.
 - c) When the baseplate is level, tighten the top adjusting nuts so that the top springs are not loose in their followers.
8. Fasten the lower and upper jam nuts on each spring assembly.



1. Upper jam nut
2. Follower
3. Washer
4. Foundation pads
5. Spring
6. Upper adjusting nut
7. Spring stud

Figure 3: Example of an installed spring assembly

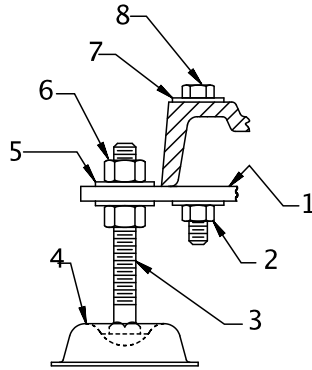
Install the baseplate using stilt mounting

NOTICE:

The stilt-mounted baseplate is not designed to support static piping loads. Make sure to individually support the suction and discharge piping. Failure to do so may result in equipment damage.

1. Put the baseplate on a support above the foundation/floor.
Make sure that there is enough space between the baseplate and the foundation/floor to install the stilts.
2. Install the lower part of the stilt assembly:
 - a) Screw the lower jam nut and adjusting nut onto the stilt.
 - b) Set the lower adjusting nut to the correct height.
The correct height depends on the required distance between the foundation/floor and the baseplate.
 - c) Put a washer onto the lower adjusting- nut.
3. Install the stilt assembly on the baseplate:
 - a) Insert the stilt assembly into the baseplate's anchorage hole from below.
 - b) Put a washer onto the stilt.
 - c) Fasten the stilt assembly with the upper adjusting nut by hand.
4. Screw the upper jam nut onto the stilt by hand.

5. Repeat steps 2 through 4 for all the stilt assemblies.
6. Lower the baseplate so that the stilts fit into the foundation cups.
7. Level the baseplate and make the final height adjustments:
 - a) Loosen the upper jam nuts and adjusting nuts.
 - b) Adjust the height and level the baseplate by moving the lower adjusting nuts.
 - c) When the baseplate is level, tighten the top adjusting nuts.
8. Fasten the lower and upper jam nuts on each stilt.

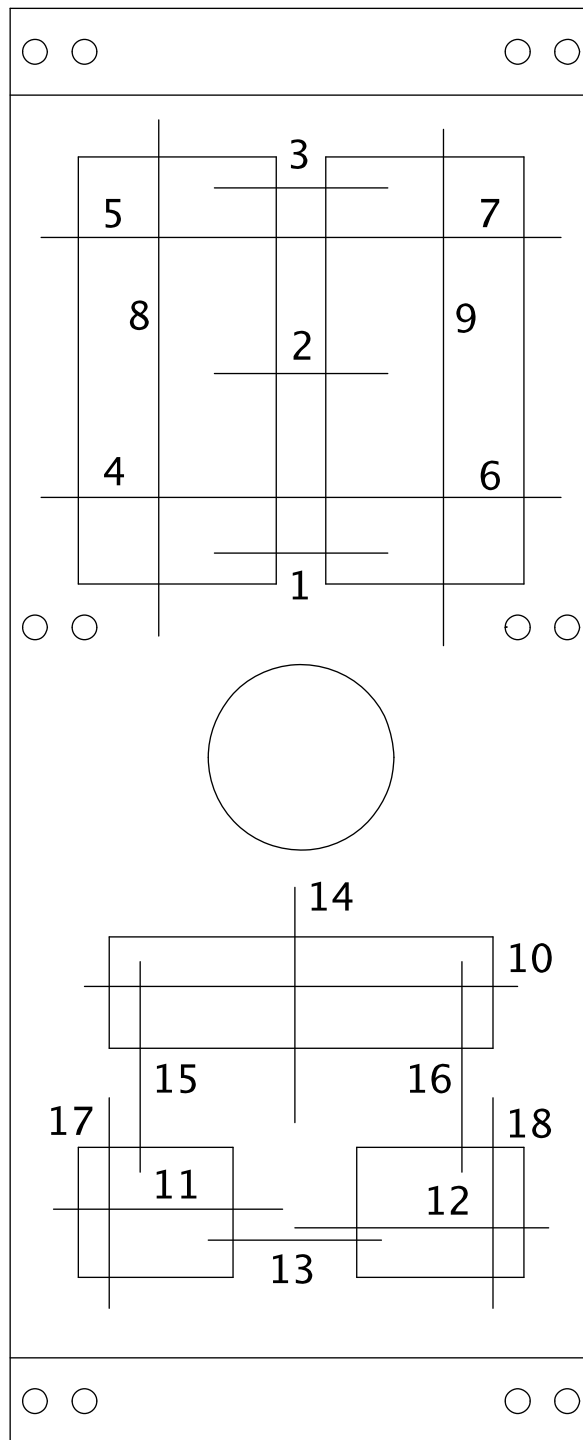


1. Mounting plate
2. Mounting nut
3. Stilt bolt
4. Foundation cups
5. Washer
6. Upper adjustment nut
7. Mounting washer
8. Mounting bolt

Figure 4: Example of an installed stilt assembly

-leveling worksheet

Level measurements



- 1) _____
- 2) _____
- 3) _____
- 4) _____
- 5) _____
- 6) _____
- 7) _____
- 8) _____
- 9) _____
- 10) _____
- 11) _____
- 12) _____
- 13) _____
- 14) _____
- 15) _____
- 16) _____
- 17) _____
- 18) _____

Install the pump, driver, and coupling


1. Mount and fasten the pump on the baseplate. Use applicable bolts.
2. Mount the driver on the baseplate. Use applicable bolts and hand tighten.
3. 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.
 - Electrical connections must be made by certified electricians in compliance with all international, national, state, and local rules.
 - Refer to driver/coupling/gear manufacturers installation and operation manuals (IOM) for specific instructions and recommendations.

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.

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.

When	Why
Periodically	This follows the plant operating procedures.

Permitted indicator values for alignment checks

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.

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.

Figure 5: Dial indicator attachment

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

1. Set the angular alignment indicator to zero at the top-center position (12 o'clock) of the driver coupling half (Y).
2. Rotate the indicator to the bottom-center position (6 o'clock).
3. Record the indicator reading.

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

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

Perform angular alignment for a horizontal correction

1. 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).
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 coupling halves are farther apart on the right side than the left. Perform one of these steps: <ul style="list-style-type: none"> • Slide the shaft end of the driver to the left. • Slide the opposite end to the right.
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"> • Slide the shaft end of the driver to the right. • Slide the opposite end to the left.

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 as measured at four points 90° apart at the operating temperature.

1. Set the parallel alignment indicator (P) to zero at the top-center position (12 o'clock) of the driver coupling half (Y).
2. 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.

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 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.

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

Perform complete alignment for a vertical correction

- Set the angular and parallel dial indicators to zero at the top-center position (12 o'clock) of the driver coupling half (Y).
- Rotate the indicators to the bottom-center position (6 o'clock).
- Record the indicator readings.
- 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

- 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).
- Rotate the indicators through the top-center position to the right side, 180° from the start position (3 o'clock).
- Record the indicator readings.
- 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.
- Clean all the areas of the baseplate that will come into contact with the grout.
 - Build a dam around the foundation.
 - Thoroughly wet the foundation that will come into contact with the grout.
 - Allow the grout to set.

Figure 6: Pour grout into baseplate

Piping checklists

General piping checklist

Precautions

Checklist

Check	Explanation/comment	Checked
	This helps to prevent: <ul style="list-style-type: none"> Strain on the pump Misalignment between the pump and the drive unit Wear on the pump bearings, seal, and shafting 	
Check that only necessary fittings are used.	This helps to minimize friction losses.	
Do not connect the piping to the pump until:	—	
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.		

Check	Explanation/comment	Checked
If the pump handles liquids at elevated temperatures, make sure that the expansion loops and joints are properly installed.		

Permitted nozzle loads and torques at the pump nozzles

Designing suction and discharge piping

The suction and discharge piping must be designed so that a minimum of forces affect the pump. Do not exceed the force and torque values as shown in the following table. The values are valid for when the pump is operating or when it is idle.

About the data in the table

The data in the following table has the following characteristics:

- The data complies with the Europump Recommendation for pumps according to ISO 5199.
- The data is only valid for static piping loads.
- The values are valid for pump units with standard IC base frames (ungrouted).
- All of the values refer to standard materials EN-GJS400-18LT and 1.4408.

Permitted nozzle loads and torques at the pump nozzles

These nozzle loads and torques follow the Europump recommendations for this pump according to ISO 5199.

Table notes:

- The data for forces and torques are only valid for static piping loads.
- The values in these tables are valid for pump units with standard IC-base frames (not grouted).
- All values for forces and torques refer to standard materials EN-GJS400-18LT and 1.4408.

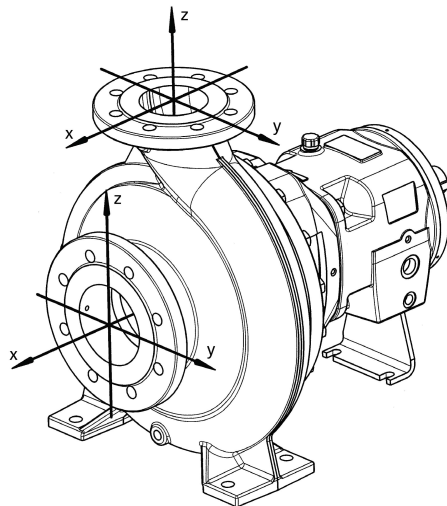


Table 1: Suction nozzle

Sizes	ØDN	Forces in lbf (N)				Torques in ft-lb (Nm)			
		Fx	Fy	Fz	ΣF	Mx	My	Mz	ΣM
40-25-160	40	198 (880)	173 (770)	157 (700)	308 (1,370)	663 (900)	465 (630)	546 (740)	981 (1,330)
40-25-200	40	198 (880)	173 (770)	157 (700)	308 (1,370)	663 (900)	465 (630)	546 (740)	981 (1,330)
40-25-250	40	198 (880)	173 (770)	157 (700)	308 (1,370)	663 (900)	465 (630)	546 (740)	981 (1,330)
50-32-160	50	259 (1,150)	236 (1,050)	214 (950)	409 (1,820)	723 (980)	516 (700)	590 (800)	1,069 (1,450)
50-32-200	50	259 (1,150)	236 (1,050)	214 (950)	409 (1,820)	723 (980)	516 (700)	590 (800)	1,069 (1,450)
50-32-250	50	259 (1,150)	236 (1,050)	214 (950)	409 (1,820)	723 (980)	516 (700)	590 (800)	1,069 (1,450)

Sizes	ØDN	Forces in lbf (N)				Torques in ft-lb (Nm)			
		Fx	Fy	Fz	ΣF	Mx	My	Mz	ΣM
50-32-315	50	259 (1,150)	236 (1,050)	214 (950)	409 (1,820)	723 (980)	516 (700)	590 (800)	1,069 (1,450)
65-40-160	65	330 (1,470)	292 (1,300)	270 (1,200)	517 (2,300)	774 (1,050)	568 (770)	620 (840)	1,143 (1,550)
65-40-200	65	330 (1,470)	292 (1,300)	270 (1,200)	517 (2,300)	774 (1,050)	568 (770)	620 (840)	1,143 (1,550)
65-40-250	65	330 (1,470)	292 (1,300)	270 (1,200)	517 (2,300)	774 (1,050)	568 (770)	620 (840)	1,143 (1,550)
65-40-315	65	330 (1,470)	292 (1,300)	270 (1,200)	517 (2,300)	774 (1,050)	568 (770)	620 (840)	1,143 (1,550)
80-50-160	80	393 (1,750)	355 (1,580)	324 (1,440)	620 (2,760)	826 (1,120)	590 (800)	671 (910)	1,217 (1,650)
80-50-200	80	393 (1,750)	355 (1,580)	324 (1,440)	620 (2,760)	826 (1,120)	590 (800)	671 (910)	1,217 (1,650)
80-50-250	80	393 (1,750)	355 (1,580)	324 (1,440)	620 (2,760)	826 (1,120)	590 (800)	671 (910)	1,217 (1,650)
80-50-315	80	393 (1,750)	355 (1,580)	324 (1,440)	620 (2,760)	826 (1,120)	590 (800)	671 (910)	1,217 (1,650)
100-65-160	100	528 (2,350)	472 (2,100)	427 (1,900)	825 (3,670)	907 (1,230)	649 (880)	752 (1,020)	1,342 (1,820)
100-65-200	100	528 (2,350)	472 (2,100)	427 (1,900)	825 (3,670)	907 (1,230)	649 (880)	752 (1,020)	1,342 (1,820)
100-65-250	100	528 (2,350)	472 (2,100)	427 (1,900)	825 (3,670)	907 (1,230)	649 (880)	752 (1,020)	1,342 (1,820)
100-65-315	100	528 (2,350)	472 (2,100)	427 (1,900)	825 (3,670)	907 (1,230)	649 (880)	752 (1,020)	1,342 (1,820)
125-80-160	125	622 (2,765)	559 (2,485)	504 (2,240)	978 (4,350)	1,084 (1,470)	774 (1,050)	981 (1,330)	1,578 (2,140)
125-80-200	125	622 (2,765)	559 (2,485)	504 (2,240)	978 (4,350)	1,084 (1,470)	774 (1,050)	981 (1,330)	1,578 (2,140)
125-80-250	125	622 (2,765)	559 (2,485)	504 (2,240)	978 (4,350)	1,084 (1,470)	774 (1,050)	981 (1,330)	1,578 (2,140)
125-80-315	125	622 (2,765)	559 (2,485)	504 (2,240)	978 (4,350)	1,084 (1,470)	774 (1,050)	981 (1,330)	1,578 (2,140)
125-80-400	125	622 (2,765)	559 (2,485)	504 (2,240)	978 (4,350)	1,084 (1,470)	774 (1,050)	981 (1,330)	1,578 (2,140)
125-100-200	125	622 (2,750)	562 (2,500)	504 (2,240)	978 (4,350)	1,084 (1,470)	774 (1,050)	981 (1,330)	1,578 (2,140)
125-100-250	125	622 (2,750)	562 (2,500)	504 (2,240)	978 (4,350)	1,084 (1,470)	774 (1,050)	981 (1,330)	1,578 (2,140)
125-100-315	125	622 (2,750)	562 (2,500)	504 (2,240)	978 (4,350)	1,084 (1,470)	774 (1,050)	981 (1,330)	1,578 (2,140)
125-100-400	125	622 (2,750)	562 (2,500)	504 (2,240)	978 (4,350)	1,084 (1,470)	774 (1,050)	981 (1,330)	1,578 (2,140)
150-125-250	150	787 (3,500)	708 (3,150)	641 (2,850)	1,236 (5,500)	1,291 (1,750)	907 (1,230)	1,069 (1,450)	1,888 (2,560)
150-125-315	150	787 (3,500)	708 (3,150)	641 (2,850)	1,236 (5,500)	1,291 (1,750)	907 (1,230)	1,069 (1,450)	1,888 (2,560)
150-125-400	150	787 (3,500)	708 (3,150)	641 (2,850)	1,236 (5,500)	1,291 (1,750)	907 (1,230)	1,069 (1,450)	1,888 (2,560)
200-150-250	200	1,057 (4,700)	944 (4,200)	850 (3,780)	1,652 (7,350)	1,682 (2,280)	1,187 (1,610)	1,364 (1,850)	2,471 (3,350)
200-150-315	200	1,057 (4,700)	944 (4,200)	850 (3,780)	1,652 (7,350)	1,682 (2,280)	1,187 (1,610)	1,364 (1,850)	2,471 (3,350)
200-150-400	200	1,057 (4,700)	944 (4,200)	850 (3,780)	1,652 (7,350)	1,682 (2,280)	1,187 (1,610)	1,364 (1,850)	2,471 (3,350)

Table 2: Discharge nozzle

Sizes	ØDN	Forces in lbf (N)				Torques in ft-lb (Nm)			
		Fx	Fy	Fz	ΣF	Mx	My	Mz	ΣM
40-25-160	25	119 (530)	110 (490)	135 (600)	207 (920)	465 (630)	310 (420)	361 (490)	679 (920)
40-25-200	25	119 (530)	110 (490)	135 (600)	207 (920)	465 (630)	310 (420)	361 (490)	679 (920)
40-25-250	25	119 (530)	110 (490)	135 (600)	207 (920)	465 (630)	310 (420)	361 (490)	679 (920)

Sizes Fx	ØDN		Forces in lbf (N)				Torques in ft-lb (Nm)			
	Fy	Fz	ΣF	Mx	My	Mz	ΣM			
50-32-160	32	142 (630)	135 (600)	166 (740)	261 (1,160)	568 (770)	391 (530)	443 (600)	826 (1,120)	
50-32-200	32	142 (630)	135 (600)	166 (740)	261 (1,160)	568 (770)	391 (530)	443 (600)	826 (1,120)	
50-32-250	32	142 (630)	135 (600)	166 (740)	261 (1,160)	568 (770)	391 (530)	443 (600)	826 (1,120)	
50-32-315	32	142 (630)	135 (600)	166 (740)	261 (1,160)	568 (770)	391 (530)	443 (600)	826 (1,120)	
65-40-160	40	173 (770)	157 (700)	198 (880)	308 (1,370)	664 (900)	465 (630)	546 (740)	981 (1,330)	
65-40-200	40	173 (770)	157 (700)	198 (880)	308 (1,370)	664 (900)	465 (630)	546 (740)	981 (1,330)	
65-40-250	40	173 (770)	157 (700)	198 (880)	308 (1,370)	664 (900)	465 (630)	546 (740)	981 (1,330)	
65-40-315	40	173 (770)	157 (700)	198 (880)	308 (1,370)	664 (900)	465 (630)	546 (740)	981 (1,330)	
80-50-160	50	236 (1,050)	214 (950)	259 (1,150)	409 (1,820)	723 (980)	516 (700)	590 (800)	1,069 (1,450)	
80-50-200	50	236 (1,050)	214 (950)	259 (1,150)	409 (1,820)	723 (980)	516 (700)	590 (800)	1,069 (1,450)	
80-50-250	50	236 (1,050)	214 (950)	259 (1,150)	409 (1,820)	723 (980)	516 (700)	590 (800)	1,069 (1,450)	
80-50-315	50	236 (1,050)	214 (950)	259 (1,150)	409 (1,820)	723 (980)	516 (700)	590 (800)	1,069 (1,450)	
100-65-160	65	292 (1,300)	270 (1,200)	330 (1,470)	517 (2,300)	774 (1,050)	568 (770)	620 (840)	1,143 (1,550)	
100-65-200	65	292 (1,300)	270 (1,200)	330 (1,470)	517 (2,300)	774 (1,050)	568 (770)	620 (840)	1,143 (1,550)	
100-65-250	65	292 (1,300)	270 (1,200)	330 (1,470)	517 (2,300)	774 (1,050)	568 (770)	620 (840)	1,143 (1,550)	
100-65-315	65	292 (1,300)	270 (1,200)	330 (1,470)	517 (2,300)	774 (1,050)	568 (770)	620 (840)	1,143 (1,550)	
125-80-160	80	355 (1,580)	324 (1,440)	393 (1,750)	620 (2,760)	826 (1,120)	590 (800)	671 (910)	1,217 (1,650)	
125-80-200	80	355 (1,580)	324 (1,440)	393 (1,750)	620 (2,760)	826 (1,120)	590 (800)	671 (910)	1,217 (1,650)	
125-80-250	80	355 (1,580)	324 (1,440)	393 (1,750)	620 (2,760)	826 (1,120)	590 (800)	671 (910)	1,217 (1,650)	
125-80-315	80	355 (1,580)	324 (1,440)	393 (1,750)	620 (2,760)	826 (1,120)	590 (800)	671 (910)	1,217 (1,650)	
125-80-400	80	355 (1,580)	324 (1,440)	393 (1,750)	620 (2,760)	826 (1,120)	590 (800)	671 (910)	1,217 (1,650)	
125-100-200	100	472 (2,100)	427 (1,900)	528 (2,350)	825 (3,670)	907 (1,230)	649 (880)	752 (1,020)	1,342 (1,820)	
125-100-250	100	472 (2,100)	427 (1,900)	528 (2,350)	825 (3,670)	907 (1,230)	649 (880)	752 (1,020)	1,342 (1,820)	
125-100-315	100	472 (2,100)	427 (1,900)	528 (2,350)	825 (3,670)	907 (1,230)	649 (880)	752 (1,020)	1,342 (1,820)	
125-100-400	100	472 (2,100)	427 (1,900)	528 (2,350)	825 (3,670)	907 (1,230)	649 (880)	752 (1,020)	1,342 (1,820)	
150-125-250	125	562 (2,500)	504 (2,240)	618 (2,750)	978 (4,350)	1,084 (1,470)	774 (1,050)	981 (1,330)	1,578 (2,140)	
150-125-315	125	562 (2,500)	504 (2,240)	618 (2,750)	978 (4,350)	1,084 (1,470)	774 (1,050)	981 (1,330)	1,578 (2,140)	
150-125-400	125	562 (2,500)	504 (2,240)	618 (2,750)	978 (4,350)	1,084 (1,470)	774 (1,050)	981 (1,330)	1,578 (2,140)	
200-150-250	150	708 (3,150)	641 (2,850)	787 (3,500)	1,236 (5,500)	1,291 (1,750)	907 (1,230)	1,069 (1,450)	1,888 (2,560)	
200-150-315	150	708 (3,150)	641 (2,850)	787 (3,500)	1,236 (5,500)	1,291 (1,750)	907 (1,230)	1,069 (1,450)	1,888 (2,560)	
200-150-400	150	708 (3,150)	641 (2,850)	787 (3,500)	1,236 (5,500)	1,291 (1,750)	907 (1,230)	1,069 (1,450)	1,888 (2,560)	

Suction-piping checklist

Suction-piping checks

Check	Explanation/comment	Checked
Check that elbows in general do not have sharp bends.		

Check	Explanation/comment	Checked
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.	The suction piping must never have a smaller diameter than the suction inlet of the pump.	
Check that the eccentric reducer at the suction flange of the pump has the following properties: <ul style="list-style-type: none"> • Sloping side down • Horizontal side at the top 		
Suggested suction strainers are used. Check that they are at least three times the area of the suction piping. Monitor the pressure drop across the suction strainer. An increased pressure drop across the strainer of 5 psi (34.5 kPa) indicates that the strainer should be removed and cleaned. After a period of time (24 hours minimum) system flushing should be complete and the suction strainer can be removed.	Suction strainers help to prevent debris from entering the pump. Liquids with specific gravity less than 0.60 a pressure drop across the suction strainer may be due to ice buildup. Ice buildup can cause turbulence, low pressure areas and pumpage vaporization.	
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 and prevent vapor locking especially with specific gravity of liquid less than 0.60.	
If necessary, make sure that the suction piping includes a drain valve and that it is correctly installed.	—	
Assure adequate insulation is applied for liquids with specific gravity less than 0.60.	To assure sufficient NPSHa.	

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"> • Loss of priming • Excessive temperatures • Damage to the pump • Voiding the warranty 	
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	Explanation/comment	Checked
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.	

Discharge piping checklist

Checklist

Check	Explanation/comment	Checked
Check that an isolation valve is installed in the discharge line. distance from pump discharge.	The isolation valve is required for: <ul style="list-style-type: none"> • Priming • Regulation of flow • Inspection and maintenance of the pump 	
Check that a is installed in the discharge line, between the isolation valve and the pump discharge outlet.		

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. Failure to do so will result in excess heat generation and seal failure.

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




DANGER:

Avoid death or serious injury. Explosion and/or seizure of pump can cause fire and/or burns. Never operate pump past the pressure and temperature limits shown on the nameplate on the pump.



WARNING:

- Failure to follow these precautions before you start the unit will lead to serious personal injury and equipment failure.
 - Avoid death or serious injury. Leaking fluid can cause fire and/or burns. Operating the pump above maximum rated flow shown on the pump curve leading to an increase in horsepower and vibration along with an increase in NPSHr resulting in mechanical seal and/or shaft failure and/or loss of prime.
 -  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.
 - Electrical connections must be made by certified electricians in compliance with all international, national, state, and local rules.
 - Refer to driver/coupling/gear manufacturers installation and operation manuals (IOM) for specific instructions and recommendations.
 - Operating the pump in reverse rotation can result in the contact of metal parts, heat generation, and breach of containment.
 - Avoid death or serious injury. Explosion and/or seizure of pump can cause fire and/or burns. Assure balance line is installed and either piped to the pump suction or back to the suction vessel to avoid vaporization of pumped fluid.
-



DANGER:

Avoid death or serious injury. Leaking fluid can cause fire and/or burns. Assure all openings are sealed off prior to filling pump.

Precautions

NOTICE:

- Verify the driver settings before you start any pump.
-

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.

Remove the coupling guard

1. Slide the driver half of the coupling guard toward the pump.
2. Remove the driver-side end plate.
3. Remove the driver half of the coupling guard:
 - a) Slightly spread the bottom apart.


- b) Lift upwards.
4. Remove the pump half of the coupling guard:
 - a) Slightly spread the bottom apart.
 - b) Lift upwards.

Figure 7: Coupling guard removal

Check the rotation - Frame Mounted



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.
 - Electrical connections must be made by certified electricians in compliance with all international, national, state, and local rules.
 - Refer to driver/coupling/gear manufacturers installation and operation manuals (IOM) for specific instructions and recommendations.
-

1. Lock out power to the driver.

Couple the pump and driver



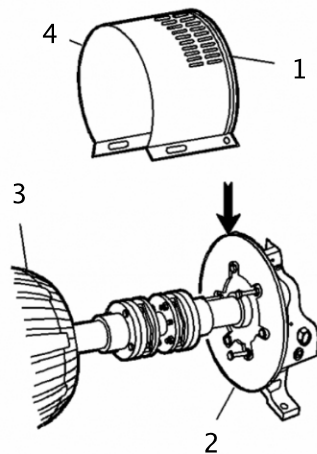
WARNING:

-  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.
 - Electrical connections must be made by certified electricians in compliance with all international, national, state, and local rules.
 - Refer to driver/coupling/gear manufacturers installation and operation manuals (IOM) for specific instructions and recommendations.
-

Install the coupling guard

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-half of the coupling guard in place:
 - a) Slightly spread the bottom apart.

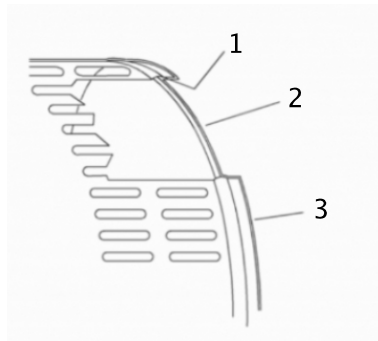
b) Place the coupling guard half over the pump-side end plate.



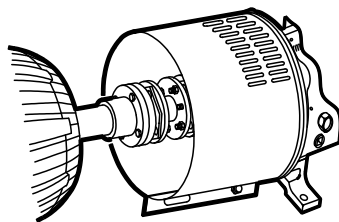
1. Annular groove
2. Pump-side end plate
3. Driver
4. Pump half of the coupling guard

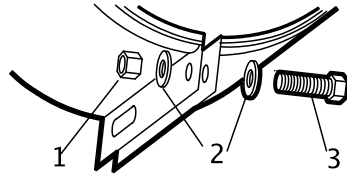
Figure 8: Guard half installation

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
3. 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

Figure 9: Securing the guard to the endplate

4. 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.
5. Place the driver-side end plate over the motor shaft.
6. Place the driver-side end plate in the annular groove of the driver-half of the coupling guard.
7. 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.
8. Slide the driver-half of the coupling guard towards the motor so that the coupling guard completely covers the shafts and coupling.
9. Use a nut, a bolt, and two washers to secure the coupling guard halves together.
10. 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.

Lubricating oil requirements

Oil quality requirements

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

Lubricating oil type	<ul style="list-style-type: none"> • CLP46 • DIN 51517 • HD 20W/20 SAE
Symbol	DIN 51502
Kinematic viscosity at 104°F (40°C)	0.0713 ±0.006 in. ² /sec (46 ±4 mm ² /sec)

Flash point (Cleveland)	347°F (175°C)
Setting point (Pourpoint)	5°F (-15°C)
Application temperature (Contact your ITT representative to determine a suitable type of lubrication if ambient temperatures are below 14°F [-10°C].)	Higher than permitted bearing temperature


Oil quantity requirements

Bearing frame size	Oil quantity in liters (quarts)
24 i-FRAME	0.5 (0.53)
32 i-FRAME	1.1 (1.16)
42 i-FRAME	1.5 (1.58)
48 i-FRAME	2.1 (2.21)

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.

NOTICE:

The pump is not filled with oil when delivered. Fill with oil before operating the pump.

_____ Determine which procedure to use in order to fill the bearing frame with oil:

If...	Then...
The pump has an oil level sight glass (standard design)	Use the "Fill the bearing frame with oil" procedure.
The pump has a constant level oiler (optional)	Use the "Fill the bearing frame with an optional oiler" procedure.

Fill the bearing frame with oil

NOTICE:

Maintain an exact oil level. If the oil level is too high, the bearing temperature can increase. If the oil level is too low, the bearing will not be properly lubricated and could cause operational problems.

1. Remove the oil filling plug.
2. Pour oil into the opening.
3. Fill until the oil level rises to the center of the oil level sight glass.



Fill the bearing frame with an optional oiler

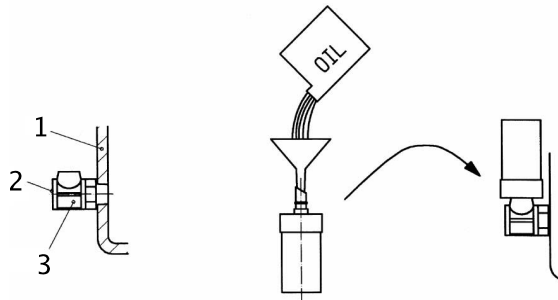
NOTICE:

Maintain an exact oil level. If the oil level is too high, the bearing temperature can increase. If the oil level is too low, the bearing will not be properly lubricated and could cause operational problems.

The constant level oiler is supplied loose.

1. Unscrew the reservoir from the main body (right-threaded) and set aside.

2. Seal the main body to the bearing frame at the connection for the constant level oiler, using PTFE sealing tape.
3. Tighten until the threaded boss is in a vertical position.
4. Remove the oil filling plug near the upper side of the bearing frame.
5. Fill with oil by pouring into the connection opening until the oil level almost reaches the middle of the oil level sight glass in the main body.
6. Fill the reservoir using a funnel.



1. Bearing frame
2. Oil level sight glass
3. Main body

7. Place the O-ring on the reservoir spout.
8. Place your thumb over the reservoir spout.
9. Invert the spout and insert it into the internal threaded boss on the main body.
10. Tighten the reservoir.
The oil then flows from the reservoir into the bearing chamber.
11. Repeat steps 6 through 10 until the reservoir remains two-thirds full.
Refill with oil whenever the oil level in the reservoir drops below one-third full.

Lubricating-grease requirements

Grease quality requirements

Use a high-quality grease lubricant corresponding to NLGI Grade 2.

Grease lubrication

Consider this information when you lubricate with grease:

- Pumps are delivered from the manufacturer with lubricated bearings and are ready to be used.
- The bearings are filled with lithium-based grease, which is suitable for a temperature range from -22°F to 194°F (-30°C to 90°C) when measured at the surface of the bearing frame.
- Make sure that bearing temperatures, measured at the bearing frame, are no more than 122°F (50°C) above the ambient temperature and never exceed 194°F (90°C) when checked weekly.

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

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.

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.
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 ²) greater than the seal chamber pressure. The injection rate must be 0.5 to 2 gpm (2 to 8 lpm).
Other	

Packed stuffing box option



WARNING:

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

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 ²) above the stuffing box pressure.

Pump priming

Prime the pump with the suction supply above the pump

1. Slowly open the suction isolation valve.
2. Close the air vents.

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.

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



WARNING: Immediately observe the pressure gauges. If discharge pressure is not quickly attained, stop the driver immediately, reprime, and attempt to restart the pump.



CAUTION:

- Observe the pump for vibration levels, bearing temperature, and excessive noise. If normal levels are exceeded, shut down the pump and resolve the issue.
 - On pure or purge-oil mist-lubricated units, remove the viewing port plugs to verify that oil mist flowing properly. Replace the plugs.
 - On frame mounted units, ensure that the oil level is correct prior to starting pump. Close coupled pumps do not have oil lubricated bearings.
 - Ensure all flush and cooling systems are operating correctly prior to starting pump.
-

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) 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.
7. Repeat steps 5 and 6 until the pump runs properly.

Limits of operation

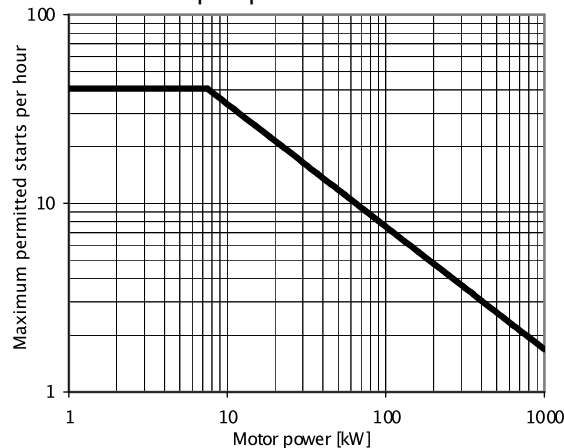
Flow limits

These flow limits are valid unless other data is available in the curves or data sheets:

$Q_{\min} = 0.1 \times Q_{\text{BEP}}$	Short-term operation
$Q_{\min} = 0.3 \times Q_{\text{BEP}}$	Continuous operation
$Q_{\max} = 1.2 \times Q_{\text{BEP}}$	Short-term operation as long as $\text{NPSH}_{\text{facility}} > \text{NPSH}_{\text{pump}} + 1.64 \text{ ft (0.50 m)}$

Permitted number of starts

Do not start the pump more than the number of times shown in this chart:



For pumps that use electric motors, do not start the motor more than the number of times listed in the motor operation instructions. If two different numbers are shown, the lower number of starts is the limit.

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.
- Do not operate pump past the maximum flow. For maximum flow refer to the pump performance curve.
- 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.
- Do not operate pump below hydraulic or thermal minimum flow. For hydraulic minimum flows refer to technical manual and pump performance curve. To calculate thermal minimum flow, refer to HI Centrifugal Pumps for Design and Application ANSI/HI 1.3-2000.
- 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. If pump becomes plugged shut down and unplug prior to restarting pump.



CAUTION:

- The pump and system must be free of foreign objects. If pump becomes plugged, shut down and unplug prior to restarting pump.
 - 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:

Shut down the pump

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.

Make the final alignment of 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.
 - Electrical connections must be made by certified electricians in compliance with all international, national, state, and local rules.
 - Refer to driver/coupling/gear manufacturers installation and operation manuals (IOM) for specific instructions and recommendations.
 -  Alignment procedures must be followed to prevent unintended contact of rotating parts. Follow coupling manufacturer's installation and operation procedures.
-

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.
4. Check the alignment while the unit is still hot.
See Pump-to-driver alignment in the Installation chapter.
5. Reinstall the coupling guard.
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 inspections

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

- Check for unusual noise, vibration, and bearing temperatures.
- Check the pump and piping for leaks.
- Analyze the vibration.

Three-month inspections

Perform these tasks every three months:

- Check that the foundation and the hold-down bolts are tight.

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

These bearing lubrication sections list different temperatures of pumped fluid. If your pump is ATEX certified and the pumped fluid exceeds the permitted temperature values, then consult your ITT representative.

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 200-300 hours of operation, depending on bearing temperature.	See the Oil change schedule table.
Grease-lubricated bearings	N/A	Every 4000 hours of operation or once a year, whichever comes first Every two years if the pump is left idle

Oil change schedule

Oil must be changed at least once a year.

Bearing temperature	First oil change	Subsequent oil changes
Up to 140°F (60°C)	After 300 hours of operation	Every 8760 hours of operation
140°F to 176°F (60°C to 80°C)	After 300 hours of operation	Every 4000 hours of operation
176°F to 212°F (80°C to 100°C)	After 200 hours of operation	Every 3000 hours of operation

NOTICE:

- Strictly maintain the oil changing schedule if the pump is operating in an potentially explosive environment.
- Change the oil every two years if the pump is left idle.
- Dispose of used oil in accordance with local environmental regulations.

Lubricating oil requirements

Oil quality requirements

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

Lubricating oil type	<ul style="list-style-type: none"> • CLP46 • DIN 51517 • HD 20W/20 SAE
Symbol	DIN 51502
Kinematic viscosity at 104°F (40°C)	0.0713 ±0.006 in. ² /sec (46 ±4 mm ² /sec)
Flash point (Cleveland)	347°F (175°C)
Setting point (Pourpoint)	5°F (-15°C)
Application temperature (Contact your ITT representative to determine a suitable type of lubrication if ambient temperatures are below 14°F [-10°C].)	Higher than permitted bearing temperature

Oil quantity requirements

Bearing frame size	Oil quantity in liters (quarts)
24 i-FRAME	0.5 (0.53)
32 i-FRAME	1.1 (1.16)
42 i-FRAME	1.5 (1.58)
48 i-FRAME	2.1 (2.21)

Change the oil

1. Remove the oil drain plug (903.51).
2. Drain the oil.
3. Flush the pump with fresh oil.
4. Clean the oil drain plug.
5. Close the oil drain.
6. Fill the pump with new oil. See Lubricate the bearings with oil in the Commissioning, Startup, Operation, and Shutdown chapter.

Dispose of used oil in accordance with local environmental regulations.

Lubricating-grease requirements

Grease quality requirements

Use a high-quality grease lubricant corresponding to NLGI Grade 2.

Grease lubrication

Consider this information when you lubricate with grease:

- Pumps are delivered from the manufacturer with lubricated bearings and are ready to be used.
- The bearings are filled with lithium-based grease, which is suitable for a temperature range from -22°F to 194°F (-30°C to 90°C) when measured at the surface of the bearing frame.
- Make sure that bearing temperatures, measured at the bearing frame, are no more than 122°F (50°C) above the ambient temperature and never exceed 194°F (90°C) when checked weekly.

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.
2. Fill the grease cavities through the fittings with a recommended grease.
3. Wipe off any excess grease.
4. Recheck the alignment.

The bearing temperature usually increases by 9°F to 18°F (5°C to 10°C) 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.

Shaft seal maintenance

Mechanical-seal maintenance



WARNING:



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.

Cartridge-type mechanical seals

Cartridge-type mechanical seals are commonly used. Cartridge seals are preset by the seal manufacturer and require no field settings. Cartridge seals installed by the user require disengagement of the holding clips prior to operation, allowing the seal to slide into place. If the seal has been installed in the pump by ITT, these clips have already been disengaged.

Other mechanical seal types

For other types of mechanical seals, refer to the instructions provided by the seal manufacturer for installation and setting.

Before you start the pump

Check the seal and all flush piping.

Packed stuffing-box maintenance



WARNING:

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

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

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.

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 unless explicitly stated in this manual.
-  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.
 - Electrical connections must be made by certified electricians in compliance with all international, national, state, and local rules.
 - Refer to driver/coupling/gear manufacturers installation and operation manuals (IOM) for specific instructions and recommendations.
- Crush hazard. The unit and the components can be heavy. Use proper lifting methods and wear steel-toed shoes at all times.
- A small amount of liquid will be present in certain areas like the seal chamber.

NOTICE:

- Avoid injury. Worn pump components can have sharp edges. Wear appropriate gloves while handling these parts.
- 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:

- Lifting eyebolt (dependent on pump size)

Drain the pump



CAUTION:

- Allow all system and pump components to cool before you handle them to prevent physical injury.
-

1. Close the isolation valves on the suction and discharge sides of the pump.
You must drain the system if no valves are installed.
2. Open the drain valve.
Do not proceed until liquid stops coming out of the drain valve. If liquid continues to flow from the drain valve, the isolation valves are not sealing properly and you must repair them before you proceed.
3. Drain the liquid from the piping and flush the pump if it is necessary.
4. Disconnect all auxiliary piping and tubing.

Remove the coupling

Remove the back pull-out assembly



CAUTION:

Never remove the back pull-out assembly without assistance.

1. Remove the casing .
-



WARNING:

2. Tighten the jackscrews evenly, using an alternating pattern, in order to remove the back pull-out assembly.
You can use penetrating oil if the adapter to the casing joint is corroded.
3. Remove and discard the casing gasket.
You will insert a new casing gasket during reassembly.
4. Remove the jackscrews.
5. Clean all gasket surfaces.
Clean surfaces prevent the casing gasket from partially adhering to the casing due to binders and adhesives in the gasket material.

Remove the coupling hub

Remove the impeller



WARNING:

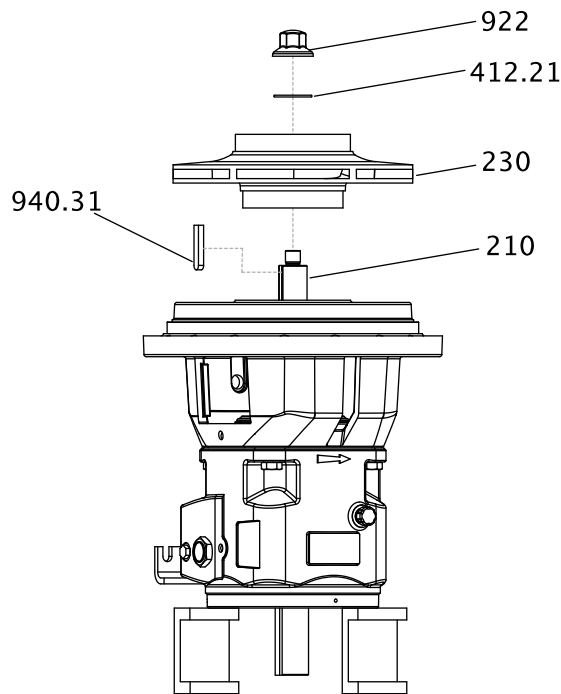
Never apply heat to remove an impeller. The use of heat may cause an explosion due to trapped liquid, resulting in severe physical injury and property damage.



CAUTION:

Wear heavy work gloves when you handle impellers. The sharp edges can cause physical injury.

- Place the back pull-out assembly in a vertical position before you proceed with the disassembly.



NOTICE:

Crush hazard. Make sure that the back pull-out assembly cannot tip over.

Remove the seal-chamber cover

- Remove the gland stud nuts.
- Remove the seal-chamber stud nuts.
- Remove the seal chamber .
- Remove the shaft sleeve if it is used.
The mechanical seal is attached to the sleeve.

NOTICE:

Be careful with the stationary portion of the mechanical seal that is either clamped between the backplate and the gland or seated in the seal-chamber bore. Failure to do so may result in equipment damage.

- Remove the rotary portion of the seal from the sleeve by loosening the setscrews and sliding it off the sleeve.
Refer to the mechanical-seal instructions for more information.
- Remove the gland , the stationary portion of the seal, and the O-ring .

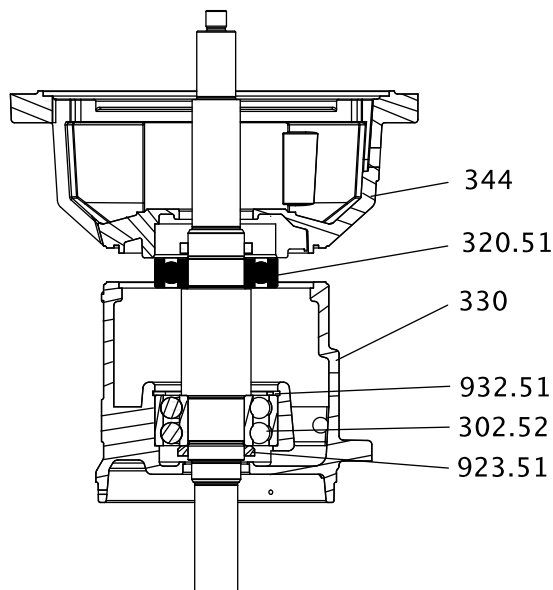
Remove the stuffing-box cover

- Remove the gland nuts and the gland .
- Remove the stuffing-box-cover nuts.
- Remove the stuffing-box cover .
- Remove the shaft sleeve .
- Remove the packing and lantern ring from the stuffing-box cover .

A lantern ring does not come with self-lubricating graphite packing.

Disassemble the power end

1. Loosen and remove the hexagon bolts (901.41) that hold the frame adapter to the bearing frame.
2. Remove the frame adapter (344) from the bearing frame (330).

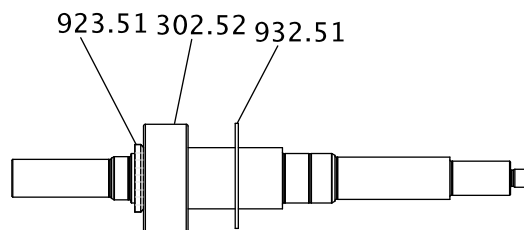


3. Reach inside the frame and remove the snap ring (932.51) using the designated snap ring pliers.

Use snap ring pliers according to DIN 5256-C. Refer to this table for the correct size:

Bearing frame size	Pliers size	Minimum length of pliers
24	94/C 40	8 in. (200 mm)
32, 42	94/C 85	10 in. (250 mm)
48	94/C 85	12 in. (300 mm)

4. Remove the shaft (210), with the radial and thrust bearings (320.51 and 320.52) and the bearing nut (923.51) attached, from the bearing frame (330).



5. Remove the bearing nut (923.51).
The bearing nut is right-hand threaded and is self-locking. It can be reused up to five times, if handled properly.
6. Use a hydraulic press or bearing puller in order to remove the radial and thrust bearings (320.51 and 320.52) from the shaft.

Pre-assembly inspections

Guidelines

Before you assemble the pump parts, make sure you follow these guidelines:

- Inspect the pump parts according to the information in these pre-assembly topics before you reassemble your pump. Replace any part that does not meet the required criteria.
- Make sure that the parts are clean. Clean the pump parts in solvent in order to remove oil, grease, and dirt.

NOTICE:

Protect machined surfaces while you clean the parts. Failure to do so may result in equipment damage.

Replacement guidelines

Gaskets, O-rings, and seats replacement



WARNING:

Avoid death or serious injury. Leaking fluid can cause fire and/or burns. Replace any damaged or worn gaskets/o-rings.

- 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.

Shaft and sleeve replacement guidelines

Straightness check

Replace the shaft if runout exceeds the values in this table:

Table 3: Shaft runout tolerances for sleeve fit and coupling fit

	Sleeve fit in inches (millimeters)	Coupling fit in inches (millimeters)
With sleeve	0.001 (0.025)	0.001 (0.025)
Without sleeve	0.002 (0.051)	0.001 (0.025)

Shaft and sleeve check

- Check the shaft and sleeve surface for grooves and pitting.
- Replace the shaft and sleeve if any grooves or pits are found.

Bearing-frame 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.
- Inspect the inboard-bearing bores.

Seal chamber and stuffing box cover inspection

Checklist

Perform these checks when you inspect the seal chamber and stuffing box cover:

- Make sure that these surfaces are clean:

- Seal chamber and stuffing box cover
- Mounting
- Make sure there is no pitting or wear greater than 1/8 in. (3.2 mm) deep. Replace the seal chamber and stuffing box cover if pitting or wear exceeds this measurement.
- Inspect the machined surfaces and mating faces noted in the figures.

These images point to the areas to inspect:

Bearings inspection

Condition of bearings

Do not reuse bearings. The condition of the bearings provides useful information on operating conditions in the bearing frame.

Checklist

Perform these checks when you inspect the bearings:

- Inspect the bearings for contamination and damage.
- Note any lubricant condition and residue.
- Inspect the ball bearings to see if they are loose, rough, or noisy when you rotate them.
- Investigate any bearing damage to determine the cause. If the cause is not normal wear, correct the issue before you return the pump to service.

Reassembly

Assemble the rotating element and bearing frame



CAUTION:

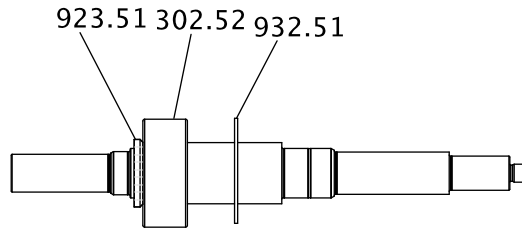
Wear insulated gloves when you use a bearing heater. Bearings get hot and can cause physical injury.

NOTICE:

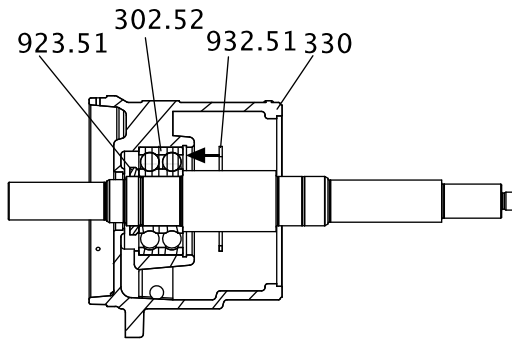
- Make sure that the pipe threads are clean, and that you apply thread sealant to the plugs and fittings.
 - Use an induction heater that heats as well as demagnetizes the bearings when you install bearings.
-

1. Install the bearings:
 - a) Heat the bearings to 100°C (212°F) in an oil bath or with a bearing heater.
 - b) Clamp the shaft (210) in a bench vise with the thrust bearing surface extending beyond the end of the vise. Use soft jaws to protect the shaft surface.
 - c) Install the properly-heated thrust bearing (320.52) onto the shaft.
If necessary, position a tube against the inner ring of the bearing and gently tap the tube with a hammer in order to force the bearing onto the shaft. Hold the outer ring of the bearing in order to prevent vibration damage to the bearing.
 - d) Apply Thread-EZE to the bearing locknut threads on the shaft.
 - e) Thread the bearing locknut (923.51) onto the thrust end of the shaft.
The bearing nut is right-hand threaded and is self-locking. It can be reused up to five times, if handled properly.

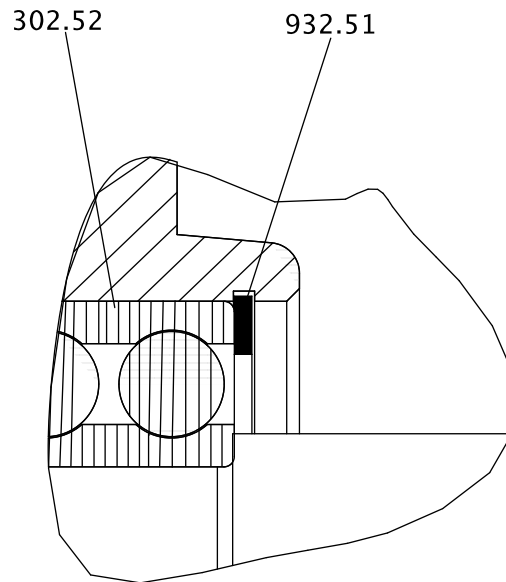
- f) Allow the bearing to cool for 10 minutes and retighten.



- 2. Install the shaft assembly into the bearing frame:
 - a) Coat the outside of the bearings with oil.
 - b) Coat all the internal surfaces of the bearing frame (330) with oil.
 - c) Turn the bearing frame (330) vertically with the larger open end pointing up.
 - d) Install the shaft assembly into the bearing frame (330). Make sure that the shaft rotates freely.

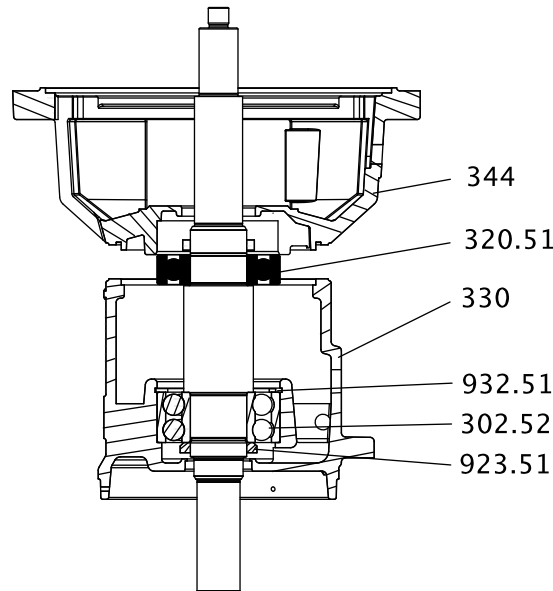


- e) Slide the snap ring (932.51) onto the shaft. Use the designated snap ring pliers to compress the snap ring and place it into the locking groove in the bearing frame (330). Make sure that the snap ring is properly seated in the groove by pressing on the snap ring with a flat head screwdriver.



- f) As a recommendation, thread a stud into one of the four threaded bolt holes in the frame adapter (344), and finger tighten only. The stud must be between 40 and 50 mm in length. This helps you to align the adapter bolt holes to the frame bolt holes during assembly.
- g) Slide the properly heated radial bearing (320.51) onto the shaft. The bearing slides easily into place against the shoulder on the shaft.
- h) Place the frame adapter (344) over the radial bearing. Allow the radial bearing to cool for at least 10 minutes.

- i) When bearing is cool, gently tap the frame adapter until the radial bearing is properly seated in the frame adapter. Make sure that the bolt holes are aligned.



- j) Remove the stud that was used to align frame adapter and frame. Bolt the bearing frame (330) to the frame adapter (334) with the hexagon head bolts (901.41). Make sure to position the bolts in the center of the drilled holes in order to ensure the proper oil settings. Tighten according to the Bolt torque values table.
- k) Press the inboard (421.41) labyrinth oil seal into the Lantern (344) and the outboard (421.51) labyrinth oil seal into the Bearing Bracket (330). Ensure that the oil return slot in both seals is positioned in the bottom (6 o'clock) position when the pump is horizontal. Refer to Assemble the INPRO labyrinth oil seal installation.

Shaft sealing



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.

NOTICE:

⚠ The mechanical seal must have an appropriate seal-flush system. Failure to do so will result in excess heat generation and seal failure.

Seal the shaft with a packed stuffing box



WARNING:

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

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.

- Twist the packing enough to get it around the shaft.

Packing Rings

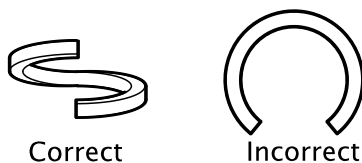


Figure 10: Packing rings

Lantern Rings

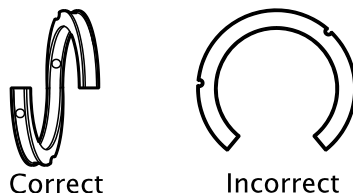


Figure 11: Lantern rings


Figure 12: Stuffing box water connections

- Install the gland halves and evenly hand-tighten the nuts.


Seal the shaft with a cartridge mechanical seal



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.

NOTICE:


 The mechanical seal must have an appropriate seal-flush system. Failure to do so will result in excess heat generation and seal failure.

- Slide the cartridge seal onto the shaft or sleeve until it contacts the inboard labyrinth oil seal.
- Assemble the seal chamber.
- Slide the cartridge seal into the seal chamber and secure using the four studs and nuts.
- Continue with the pump reassembly.
- Tighten the setscrews in the seal locking ring in order to secure the seal to the shaft.
- Remove the centering clips from the seal.


Seal the shaft with a conventional inside-component mechanical seal



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.

NOTICE:

 The mechanical seal must have an appropriate seal-flush system. Failure to do so will result in excess heat generation and seal failure.

- Assemble the seal chamber:

- a) Install a seal-chamber cover and fasten with .
- b) Install the shaft sleeve .
2. Mark the shaft and sleeve at the face of the seal chamber.
3. Continue the complete reassembly of the pump, except for the mechanical seal.
4. Scribe a line on the marked shaft and sleeve at the face of the seal chamber.
5. Remove the casing, the impeller, and the seal chamber.
6. If applicable, slide the gland, with the stationary seat and gland gasket installed, onto the shaft until it contacts the inboard labyrinth oil seal.
7. Install the mechanical-seal rotary unit according to the manufacturer's instructions. Use the scribed line and the seal-reference dimension.
8. Reinstall the seal chamber.
9. Slide the gland on the seal-chamber studs and secure them with the gland nuts. Tighten the nuts evenly so that the gland is seated on the seal-chamber pilot and is perpendicular to the shaft.
10. Complete the reassembly of the pump.

Install the impeller



CAUTION:

Wear heavy work gloves when you handle impellers. The sharp edges can cause physical injury.

For the fitting threads and for tight tolerances, use a suitable anti-seize compound. Use this, for example, between the shaft sleeve and the shaft or between the impeller and the shaft. This makes the assembly and the next disassembly easier to perform.

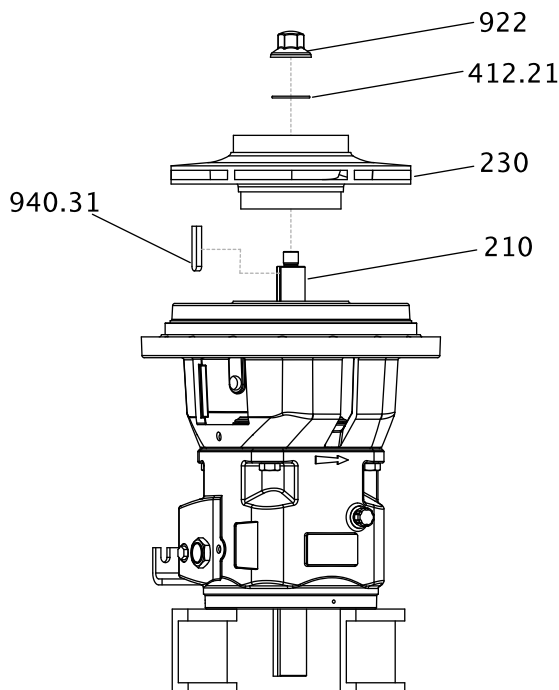
NOTICE:

Anti-seize compounds must be compatible with the pumped fluid.

Perform these steps in order to install the impeller:

1. Insert the impeller key (940.31) in the shaft (210).
2. Slide the impeller (230) onto the shaft.
3. Secure the rotor at the coupling end and tighten the impeller nut (922) (right-threaded).

4. Tighten the impeller nut to the torques listed in the Torque values table.

**NOTICE:**

Crush hazard. Make sure that the back pull-out assembly cannot tip over.

Install the back pull-out assembly

**CAUTION:**

Never remove the back pull-out assembly without assistance.

1. Clean the casing fit and install the casing gasket on the seal chamber and stuffing-box cover.
2. Install the back pull-out assembly in the casing.
3. Install and then hand-tighten the casing bolts .
Refer to the bolt torque values for information on how to tighten the casing bolts.
4. Install and tighten the casing jackscrews.

NOTICE:

Do not overtighten the casing jackscrews. Doing so may result in equipment damage.

5. Reinstall the shims under the frame foot and tighten the frame foot to the baseplate. Make sure that you use the proper shim. Mount a dial indicator in order to measure the distance between the top of the frame and the baseplate. Make sure that the distance does not change as you tighten the frame-foot bolts.
6. Replace the auxiliary piping.
7. Fill the pump with the proper lubricant. See Lubricating-oil requirements.
8. Reinstall the coupling guard.
See Install the coupling guard for more information.

Post-assembly checks

Perform these checks after you assemble the pump, then continue with pump startup:

- Rotate the shaft by hand in order to make sure that it rotates easily and smoothly and that there is no rubbing.
- Open the isolation valves and check the pump for leaks.

Assembly references

Sound pressure levels

Sound pressure levels L_{pA} in dB(A)

Nominal power P_N in kW	2950 min ⁻¹	Pump			Pump and motor		
		1450 min ⁻¹	975 min ⁻¹	2950 min ⁻¹	1450 min ⁻¹	975 min ⁻¹	
0,55	50,0	49,5	49,0	58,0	52,0	51,5	
0,75	52,0	51,0	50,5	59,0	54,0	53,0	
1,1	54,0	53,0	52,5	60,0	55,5	54,5	
1,5	55,5	55,0	54,5	63,5	57,0	56,0	
2,2	58,0	57,0	56,5	64,5	59,0	58,5	
3,0	59,5	58,5	58,0	68,5	61,0	62,0	
4,0	61,0	60,0	59,5	69,0	63,0	63,0	
5,5	63,0	62,0	61,5	70,0	65,0	65,0	
7,5	64,5	63,5	63,0	70,5	67,0	67,0	
11,0	66,5	65,5	65,0	72,0	69,0	68,5	
15,0	68,0	67,0	66,5	72,5	70,0	70,5	
18,5	69,0	68,5	68,0	73,0	70,5	74,0	
22,0	70,5	69,5	69,0	74,5	71,0	74,0	
30,0	72,0	71,0	70,5	75,0	72,0	73,0	
37,0	73,0	72,0	71,5	76,0	73,5	73,5	
45,0	74,0	73,0	72,5	77,0	74,5	73,5	
55,0	75,5	74,5	74,0	78,0	75,5	75,0	
75,0	77,0	76,0	75,5	80,0	76,5	76,0	
90,0	78,0	77,0	—	80,5	77,5	—	
110,0	79,0	78,0	—	82,5	78,5	—	
132,0	80,0	79,0	—	83,0	79,5	—	
160,0	81,0	80,0	—	83,5	80,5	—	

Table notes:

- Sound pressure level L_{pA} measured in 1 m distance from the pump surface according to DIN 45635, part 1 and 24.
- Room and foundation influences are not considered.
- The tolerance for these values is +/-3 dB(A).
- Addition with 60 Hz operation:
 - Pump: —
 - Pump with motor: +4 dB(A)

Bolt torque values

Screw torque values

This table provides the recommended screw torque values.

Location	Bolt size	Torque for lubricated threads in lb-ft (Nm)	Torque for dry threads in lb-ft (Nm)
Casing screws	M12	26 (35)	37 (50)
	M16	77 (105)	111 (150)
	M20	155 (210)	225 (305)

Location	Bolt size	Torque for lubricated threads in lb-ft (Nm)	Torque for dry threads in lb-ft (Nm)
All other screws	M10	30 (40)	37 (50)
	M12	44 (60)	66 (90)
	M16	111 (150)	162 (220)

Nut torque values

This table provides the recommended nut torque values.

Location	Frame size	Torque for lubricated threads in lb-ft (Nm)	Torque for dry threads in lb-ft (Nm)
Impeller nut	24	26 (35)	33 (45)
	32	77 (105)	96 (130)
	42	155 (210)	192 (260)
	48	280 (380)	350 (475)

Bearing types

Use this table in order to determine the correct bearings for the pump. You can find the size of the bearing frame in the data sheet or the order confirmation.

Bearing frame size	Radial bearing	Thrust bearing
24	6307 - C3	3307A - C3
32	6309 - C3	3309A - C3
42	6311 - C3	3311A - C3
48	6313 - C3	3313A - C3

Spare parts

Spare pumps kept for stand-by usage

When you stock spare, stand-by pumps, consider these guidelines:

- In plants where failure of a pump could endanger human life or cause damage to property or high costs, you must keep a sufficient number of stand-by pumps in stock.
- Store stand-by pumps according to the instructions in Transportation and Storage.

Spare parts stock guidelines

When you stock spare parts, consider these guidelines:

- Stock spare parts in order to ensure two years of continuous operation.
- If no other guidelines apply, stock the recommended number of parts listed in the spare parts table.
- Make sure that you maintain an adequate number of spare parts, especially parts that require longer delivery times:
 - Mechanical seals
 - Parts made from special materials
 - Parts that need to be specially sized
- Store spare parts in dry, clean areas in their original packaging until you need them.

Number of spare parts to keep in stock

Component	Number of Pumps (includes stand-by pumps)						
	3	4	5	6/7	8/9	10+	
2	Number of Spare Parts						
Impeller	1	1	1	2	2	2	20% (see calculation note)
Wear ring	2	2	2	3	3	4	50% (see calculation note)
Shaft with key and nuts	1	1	1	2	2	2	20% (see calculation note)
Ball bearing set	1	1	2	2	2	3	25% (see calculation note)
Shaft sleeve	2	2	2	3	3	4	50% (see calculation note)
Lantern ring	1	1	2	2	2	3	30% (see calculation note)

Component 2	Number of Pumps (includes stand-by pumps)						
	3	4	5	6/7	8/9	10+	
Number of Spare Parts							
Packing ring	16	16	24	24	24	32	100% (see calculation note)
Casing gaskets	4	6	8	8	9	12	150% (see calculation note)
Other gaskets	4	6	8	8	9	10	100% (see calculation note)
Mechanical seals	1	1	2	2	2	3	25% (see calculation note)
Power end (bearing frame, adapter, shaft, bearings, and other parts)	—	—	—	—	—	—	2

Calculation note

In order to determine the number of spare parts to stock for a part used on 10 or more pumps, use this calculation:

1. Count the number of times the part is used for one pump.
2. Multiple that number by the number of pumps.
3. Multiple the result by the percentage listed in the table for that part.

Spare parts order

Provide this information when you order spare parts. You can find the required information in the data sheet and the relevant sectional drawing:

- Pump model and size
- Serial number (order number)
- Part name
- Sectional drawing, item number

Troubleshooting

Operation troubleshooting

Alignment troubleshooting

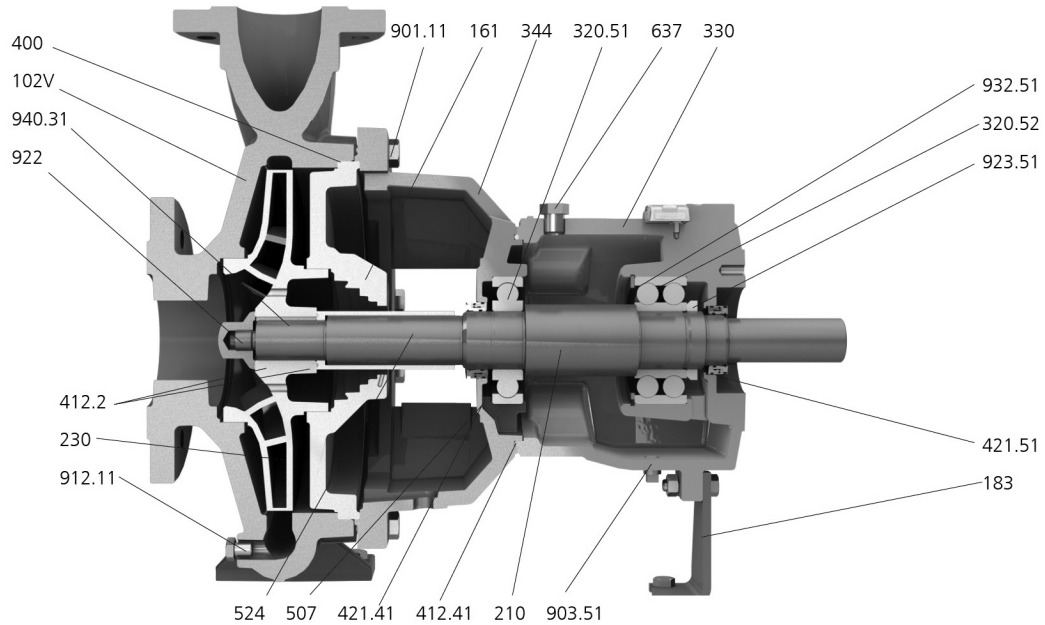
Symptom	Cause	Remedy
Horizontal (side-to-side) alignment cannot be obtained (angular or parallel).	The driver feet are bolt-bound.	Loosen the pump's hold-down bolts, and slide the pump and driver until you achieve horizontal alignment.
	The baseplate is not leveled properly and is probably twisted.	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

Assembly troubleshooting

Parts Listings and Cross-Sectionals

Parts list

Cross-sectional drawing



Parts list and materials of construction

Item	Part name	Pump material					
		Ductile iron (NL)	316 SS (VV)	Duplex (WW)	Alloy 20 (AA)	Hastelloy (BB/CC)	Titanium (TT)
102V	Casing	Ductile iron	316 SS	Duplex SS	Alloy 20	Hastelloy	Titanium
161	Seal chamber / stuffing box cover	Ductile iron	316 SS	Duplex SS	Alloy 20	Hastelloy	Titanium
183	Support foot	Carbon steel					
210	Shaft	Stainless steel (1.4021)					
230	Impeller	Cast iron	316 SS	Duplex SS	Alloy 20	Hastelloy	Titanium
320.51	Radial bearing	Single row ball bearing					
320.52	Thrust bearing	Double row, angular contact ball bearing					
330	Bearing frame	Cast iron					
344	Frame adapter	Ductile iron					
400	Casing gasket	Non-asbestos aramid fiber					
412.21	O-ring, shaft sleeve and impeller nut	Teflon					
412.41	O-ring, bearing frame	Viton					
421.41	Oil seal, inboard	Lip seal (buna and steel)					
421.51	Oil seal, outboard	Lip seal (buna and steel)					
507	Flinger	Noryl 66					
524	Shaft sleeve	Duplex SS (1.4462)			Alloy 20	Hastelloy	Titanium
637	Oil vent	Steel					
901.11	Casing bolts, hexagon head cap-screws	Stainless steel (A2)					
903.51	Drain plug	Steel, magnet-tipped					
912.11	Casing drain plug	316 SS			Alloy 20	Hastelloy	Titanium
922	Impeller nut	Duplex SS			Alloy 20	Hastelloy	Titanium
923.51	Bearing locknut	Steel/nylon					
932.51	Snap ring / circlip	Carbon steel					

Item	Part name	Pump material					
		Ductile iron (NL)	316 SS (VV)	Duplex (WW)	Alloy 20 (AA)	Hastelloy (BB/CC)	Titanium (TT)
940.31	Impeller key	Carbon steel					


Parts not shown

Item	Part name	Pump material					
		Ductile iron (NL)	316 SS (VV)	Duplex (WW)	Alloy 20 (AA)	Hastelloy (BB/CC)	Titanium (TT)
236	Inducer (optional)	Duplex SS (1.4462)	Alloy 20	Hastelloy	Titanium		
452	Packing gland	316 SS					
458	Lantern ring	Glass-filled PTFE					
461	Packing	PTFE impregnated					
502.11	Wear ring (optional)	316 SS (1.4410)		Duplex SS	Alloy 20	Hastelloy	Titanium
642	Oil level sight glass	Glass/plastic					

Certification: CE or CE ATEX

Certificates of conformance

CSA Certificate



Certificate of Compliance

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	

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.



D. Simpson, Certifier

Issued by: D. Simpson, Certifier

PRODUCTS

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).

APPLICABLE REQUIREMENTS

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

DQD 507 Rev. 2009-05-01



Certificate: 1992883

Master Contract: 236924

Project: 2254252

Date Issued: 2009/12/16



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

DET NORSKE VERITAS

PRODUCTION QUALITY ASSURANCE NOTIFICATION

[2] **EQUIPMENT OR PROTECTED SYSTEM INTENDED FOR USE IN POTENTIALLY EXPLOSIVE ATMOSPHERES DIRECTIVE 94/9/EC**

[3] Notification Number: **DNV-2008-OSL-ATEX-30303Q** Rev. 1

[4] Equipment or Protective Systems or components as listed: **Intrinsically safe equipment**
 (The EC-Type Examination Certificates based on this notification are listed by the notified body)

[5] Applicant –Manufacturer or Authorized Representative in the Community: **ITT Industries, Goulds Pumps
 204 Fall St.,
 Seneca Falls, New York 13148 USA**

[6] Manufacturer: **ITT Industries, Goulds Pumps**


[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: **2008-3354**
 This notification can be withdrawn if the manufacturer no longer satisfies the requirements of Annex IV
Results of periodical re-assessment of the manufacturing process is a part of this notification.


[9] This notification is valid until **2011-06-25** 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.

Høvik, 2008-09-05
 for Det Norske Veritas Certification AS



Marianne Spæren
Certification Manager






Bjørn Spongsveen
Technical Reviewer

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IECEx Certificate of Conformity

		IECEx Certificate of Conformity	
INTERNATIONAL ELECTROTECHNICAL COMMISSION IEC Certification Scheme for Explosive Atmospheres <small>for rules and details of the IECEx Scheme visit www.iecex.com</small>			
Certificate No.:	IECEx LCI 08.0038	Issue No.:	0
Status:	Current	Certificate history:	
Date of Issue:	2008-09-16	Page 1 of 3	
Applicant:	ITT Corp. Goulds pumps 240 Fall Street Seneca Falls, NY 13148 United States of America		
Electrical Apparatus: Optional accessory:	Condition Monitor		
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 Ex Certification Manager		
Signature: (for printed version)			
Date:	16 September 2008		
			
<p>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.</p>			
Certificate issued by:	Laboratoire Central des Industries Electriques (LCIE) 33 Avenue du General Leclerc FR-92260 Fontenay-aux-Roses France		
			

		<h2 style="margin: 0;">IECEX Certificate of Conformity</h2>	
Certificate No.:	IECEX LCI 08.0038	Issue No.:	0
Date of Issue:	2008-09-16	Page 2 of 3	
Manufacturer:	ITT Corp. 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>STANDARDS: 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	Electrical apparatus for explosive gas atmospheres - Part 0: General requirements		
Edition: 4.0			
IEC 60079-11 : 2006	Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "I"		
Edition: 5			
<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>TEST & ASSESSMENT REPORTS: 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**

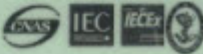
Name of Product: Condition Monitor
Type of Product: LCCM, p/n C07667A
Marking: **Exia II CT4**
Technical Documents: /
Drawing No.: C07667A
Note (s): 1. The power is supplied by PANASONIC battery.
The battery type is BR2477A 3V.
2. The manufacturer address: Goulds pumps, 240
Fall Street, Seneca Falls, 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: 中国天津市丁字路二号路85号
Center Addr: No.85 No.2 Road DingZiGuo Tianjin China Post code: 300131
E-mail: ccc@pccc.com.cn
邮政编码: 300131
Tel/ Fax: 022-26651066/26689116
http://www.pccc.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

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Middle East and Africa	ITT - Goulds Pumps Achileos Kyrrou 4 Neo Psychiko 115 25 Athens Greece	+30 210-677-0770	+30 210-677-5642

Visit our website for the latest version of this document and more information:

<http://www.gouldspumps.com>



ENGINEERED FOR LIFE

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