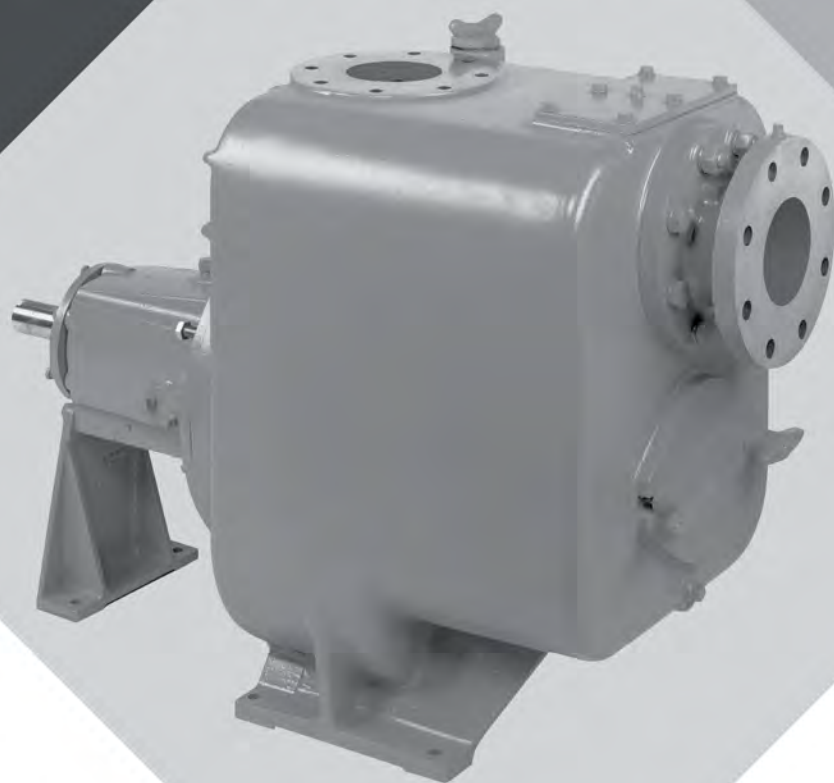




Installation, Operation, and Maintenance Manual

Model Trash Hog II



ITT

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1 Introduction and Safety

1.1 Introduction

Purpose of this manual

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

- Installation
- Operation
- Maintenance



CAUTION:

Failure to observe the instructions contained in this manual could result in personal injury and/or property damage, and may void the warranty. Read this manual carefully before installing and using the product.

NOTICE:

Save this manual for future reference and keep it readily available.

1.1.1 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 serial number when requesting technical information or spare parts.

1.1.2 Safety



WARNING:

- The operator must be aware of the pumpage and take appropriate safety precautions to prevent physical injury.
- Risk of serious injury or death. If any pressure-containing device is over-pressurized, it can explode, rupture, or discharge its contents. It is critical to take all necessary measures to avoid over-pressurization.
- Risk of death, serious personal injury, and property damage. Installing, operating, or maintaining the unit using any method not prescribed in this manual is prohibited. Prohibited methods include any modification to the equipment or use of parts not provided by ITT. If there is any uncertainty regarding the appropriate use of the equipment, please contact an ITT representative before proceeding.
- Risk of serious personal injury. Applying heat to impellers, propellers, or their retaining devices can cause trapped liquid to rapidly expand and result in a violent explosion. This manual clearly identifies accepted methods for disassembling units. These methods must be adhered to. Never apply heat to aid in their removal unless explicitly stated in this manual.
- Risk of serious personal injury or property damage. Dry running may cause rotating parts within the pump to seize to non-moving parts. Do not run dry.

- Running a pump without safety devices exposes operators to risk of serious personal injury or death. Never operate a unit unless appropriate safety devices (guards, etc.) are properly installed. See specific information about safety devices in other sections of this manual.
- Risk of death, serious personal injury, and property damage. Heat and pressure buildup can cause explosion, rupture, and discharge of pumpage. Never operate the pump with suction and/or discharge valves closed.
- Precautions must be taken to prevent physical injury. The pump may handle hazardous and/or toxic fluids. Proper personal protective equipment should be worn. Pumpage must be handled and disposed of in conformance with applicable environmental regulations.
- If the pump or motor is damaged or leaking, electric shock, fire, explosion, liberation of toxic fumes, physical harm, or environmental damage may result. Do not operate the unit until the problem has been corrected or repaired.



CAUTION:

Risk of injury and/or property damage. Operating a pump in an inappropriate application can cause over pressurization, overheating, and/or unstable operation. Do not change the service application without the approval of an authorized ITT representative.

1.1.2.1 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
<p>DANGER:</p>	A hazardous situation which, if not avoided, will result in death or serious injury
<p>WARNING:</p>	A hazardous situation which, if not avoided, could result in death or serious injury
<p>CAUTION:</p>	A hazardous situation which, if not avoided, could result in minor or moderate injury
<p>NOTICE:</p>	<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

1.1.2.2 Environmental safety

The work area

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



WARNING:

If the product has been contaminated in any way, such as from toxic chemicals or nuclear radiation, do NOT send the product to ITT until it has been properly decontaminated and advise ITT of these conditions before returning.

Recycling guidelines

Always recycle according to these guidelines:

1. If the unit or parts are accepted by an authorized recycling company, then follow local recycling laws and regulations.
2. If the unit or parts are not accepted by an authorized recycling company, then return them to the nearest ITT representative.

Waste and emissions regulations

Observe these safety regulations regarding waste and emissions:

- Dispose appropriately of all waste.
- Handle and dispose of the pumped fluid 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.

Reference for electrical installation

For electrical installation requirements, consult your local electric utility.

1.1.2.2.1 Recycling guidelines

Always follow local laws and regulations regarding recycling.

1.1.2.3 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:

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

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.

Noise



WARNING:

Sound pressure levels may exceed 80 dbA in operating process plants. Clear visual warnings or other indicators should be available to those entering an area with unsafe noise levels. Personnel should wear appropriate hearing protection when working on or around any equipment, including pumps. Consider limiting personnel's exposure time to noise or, where possible, enclosing equipment to reduce noise. Local law may provide specific guidance regarding exposure of personnel to noise and when noise exposure reduction is required.

Temperature



WARNING:

Equipment and piping surfaces may exceed 130°F (54°C) in operating process plants. Clear visual warnings or other indicators should alert personnel to surfaces that may reach a potentially unsafe temperature. Do not touch hot surfaces. Allow pumps operating at a high temperature to cool sufficiently before performing maintenance. If touching a hot surface cannot be avoided, personnel should wear appropriate gloves, clothing, and other protective gear as necessary. Local law may provide specific guidance regarding exposure of personnel to unsafe temperatures.

1.1.2.4 Precautions before work

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

- Provide a suitable barrier around the work area, for example, a guard rail.
- Make sure that all safety guards are in place and secure.
- Recognize the site emergency exits, eye wash stations, emergency showers and toilets.
- Allow all system and pump components to cool before you handle them.
- Make sure that you have a clear path of retreat.

- Make sure that the product cannot roll or fall over and injure people or damage property.
- Make sure that the lifting equipment is in good condition.
- Use a lifting harness, a safety line, and a breathing device as required.
- Make sure that the product is thoroughly clean.
- Make sure that there are no poisonous gases within the work area.
- Make sure that you have quick access to a first-aid kit.
- Disconnect and lock out power before servicing.
- Check the explosion risk before you weld or use electric hand tools.

1.1.2.5 Precautions during work

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



CAUTION:

Failure to observe the instructions contained in this manual could result in personal injury and/or property damage, and may void the warranty. Read this manual carefully before installing and using the product.

- Never work alone.
- Always wear protective clothing and hand protection.
- Stay clear of suspended loads.
- Always lift the product by its lifting device.
- Beware of the risk of a sudden start if the product is used with an automatic level control.
- Beware of the starting jerk, which can be powerful.
- Rinse the components in water after you disassemble the pump.

1.1.2.6 Hazardous liquids

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

- Make sure that all personnel who work with biologically hazardous liquids are vaccinated against diseases to which they may be exposed.
- Observe strict personal cleanliness.
- A small amount of liquid will be present in certain areas like the seal chamber.

1.1.2.7 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.

1.1.3 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.

2 Transportation and Storage

2.1 Inspect the delivery

2.1.1 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.

2.1.2 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.

2.2 Transportation guidelines

2.2.1 Precautions



WARNING:

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

2.2.2 Pump handling



WARNING:

Dropping, rolling or tipping units, or applying other shock loads, can cause property damage and/or personal injury. Ensure that the unit is properly supported and secure during lifting and handling.



CAUTION:

Risk of injury or equipment damage from use of inadequate lifting devices. Ensure lifting devices (such as chains, straps, forklifts, cranes, etc.) are rated to sufficient capacity.

2.2.3 Lifting Methods



WARNING:

- All lifting must be done in compliance with all applicable regulations/standards.

- Safe lifting points are specifically identified in this manual. It is critical to lift the equipment only at these points. Integral lifting eyes or eye bolts on pump and motor components are intended for use in lifting the individual components only.
- Lifting and handling heavy equipment poses a crush hazard. Use caution during lifting and handling and wear appropriate Personal Protective Equipment (PPE, such as steel-toed shoes, gloves, etc.) at all times. Seek assistance if necessary.
- Do not attach sling ropes to shaft ends.

Table 1: Methods

Pump type	Lifting method
A bare pump without lifting handles	Use a suitable sling attached properly to solid points like the casing, the flanges, or the frames.
A bare pump with lifting lugs	Use a suitable sling attached to the lifting lugs in the casing and bearing cartridge.
A base-mounted pump	Use slings under the pump casing and the drive unit, under the base rails, or through lifting lugs, when provided.

Figure 1: Example of a proper lifting method

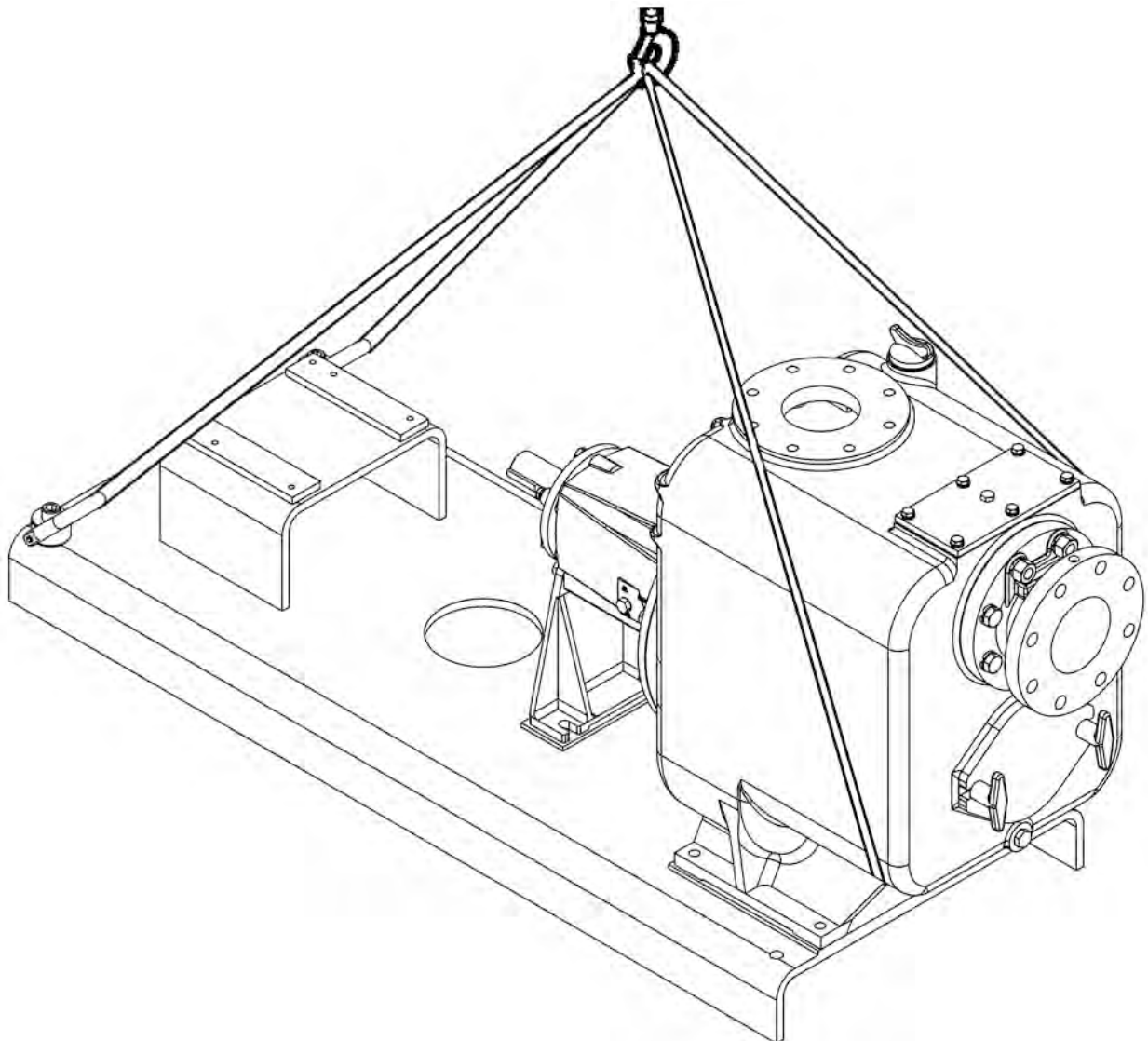
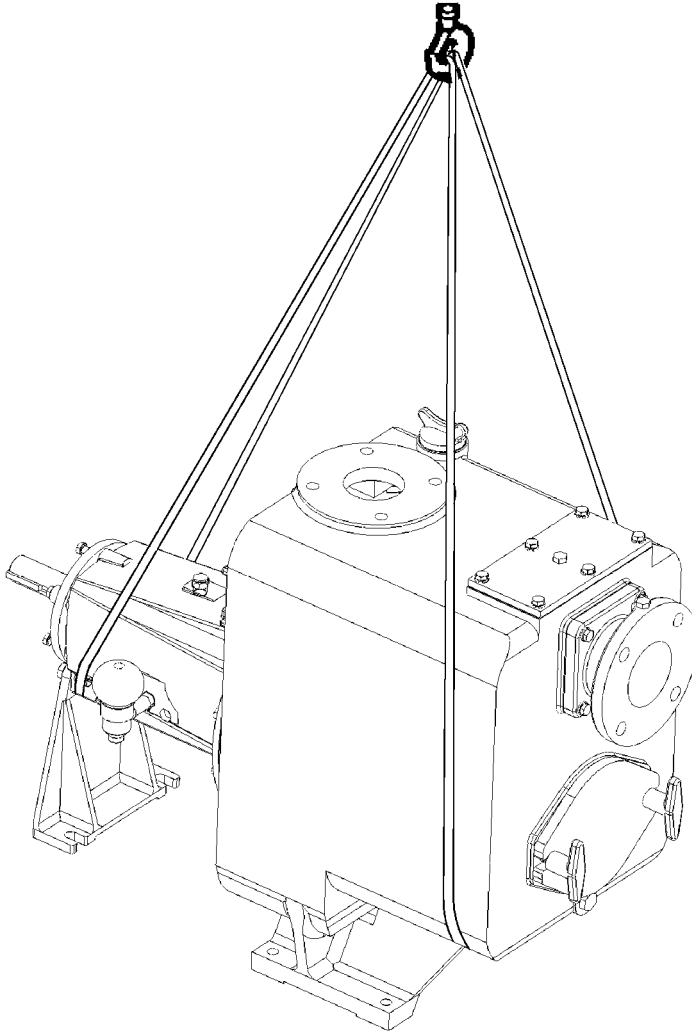


Figure 2: Example of a proper lifting method

2.3 Storage guidelines

2.3.1 Storage location

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

NOTICE:

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

2.3.2 Pump storage requirements

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

2.3 Storage guidelines

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

2.3.3 Frostproofing

This table shows to what degree the pump is frostproof:

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

3 Product Description

4 Installation

4.1 Pre-installation

Precautions



WARNING:

- When installing in a potentially explosive environment, ensure that the motor is properly certified.
 - All equipment being installed must be properly grounded to prevent unexpected discharge. Discharge can cause equipment damage, electric shock, and result in serious injury. Test the ground lead to verify it is connected correctly.
-

NOTICE:

- Electrical connections must be made by certified electricians in compliance with all international, national, state and local regulations.
 - Supervision by an authorized ITT representative is recommended to ensure proper installation. Improper installation may result in equipment damage or decreased performance.
-

4.1.1 Pump location guidelines

4.1.2 Foundation requirements

Requirements

- Provide a flat, substantial concrete foundation in order to prevent strain and distortion when you tighten the foundation bolts.

4.1.3 Baseplate-mounting procedures

4.1.3.1 Prepare the baseplate for mounting

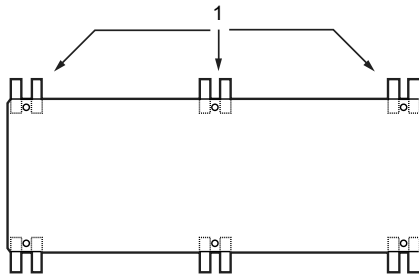
1. Remove all the attached equipment from the baseplate.
2. Clean the underside of the baseplate completely.
3. If applicable, coat the underside of the baseplate with an epoxy primer. Use an epoxy primer only if using an epoxy-based grout.
4. Remove the rust-proofing coat from the machined mounting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

4.1.3.2 Install the baseplate using shims or wedges

Required tools:

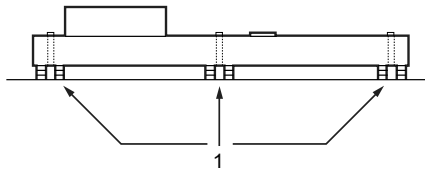
- Two sets of shims or wedges for each foundation bolt
 - Two machinist's levels
 - Baseplate-leveling worksheet
1. If you use sleeve-type bolts, fill the bolt sleeves with packing material or rags to prevent grout from entering the bolt holes.

- Put the sets of wedges or shims on each side of each foundation bolt.



- Shims or wedges

Figure 3: Top view



- Shims or wedges

Figure 4: Side view

- Lower the baseplate carefully onto the foundation bolts.
- 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 ensure that the correct leveling is achieved. Failure to do so can result in equipment damage or decreased performance.

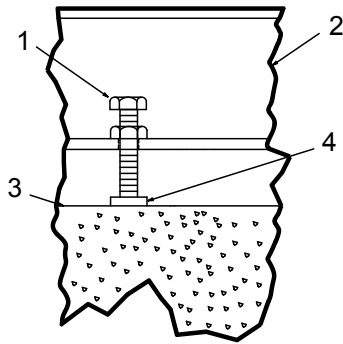
- Level the baseplate both lengthwise and across by adding or removing shims or moving the wedges.
- You can use the baseplate-leveling worksheet when you take the readings.
- Hand-tighten the nuts for the foundation.

4.1.3.3 Install the baseplate using jackscrews

Tools required:

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

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



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

Figure 5: Jackscrews

3. Level the driver mounting pads:

NOTICE:

Remove all dirt from the mounting pads in order to ensure that the correct leveling is achieved. 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:

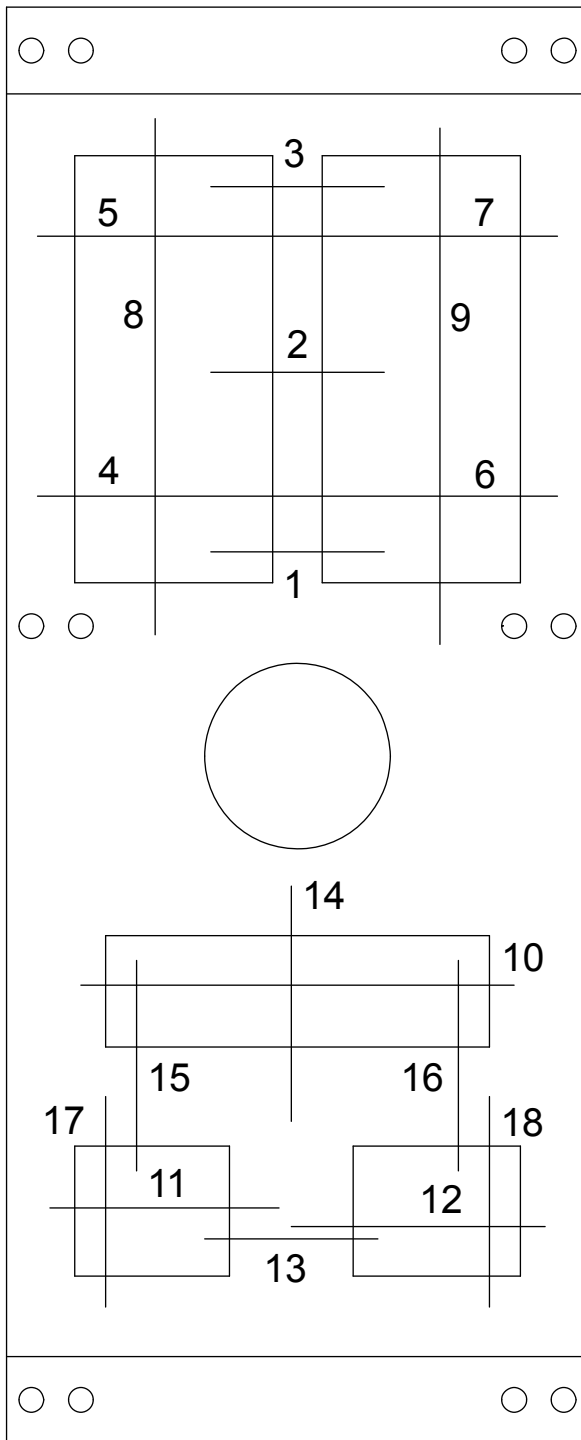
NOTICE:

Remove all dirt from the mounting pads in order to ensure that the correct leveling is achieved. 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.

4.1.3.4 -leveling worksheet

Level measurements



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

4.1.3.5 Install the pump, driver, and coupling

1. Mount the driver on the . Use applicable bolts and hand tighten.
2. Install the coupling.
See the installation instructions from the coupling manufacturer.

4.1.3.6 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	This ensures that alignment can be accomplished.
After you	This ensures that no changes have occurred during the .
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.
Periodically	This follows the plant operating procedures.

4.1.3.7 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 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 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.

4.1.3.8 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 6: 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.

4.1.3.9 Pump-to-driver alignment instructions

4.1.3.10 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	The coupling halves are farther apart at the bottom than at the top. Perform one of these steps: <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.
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.

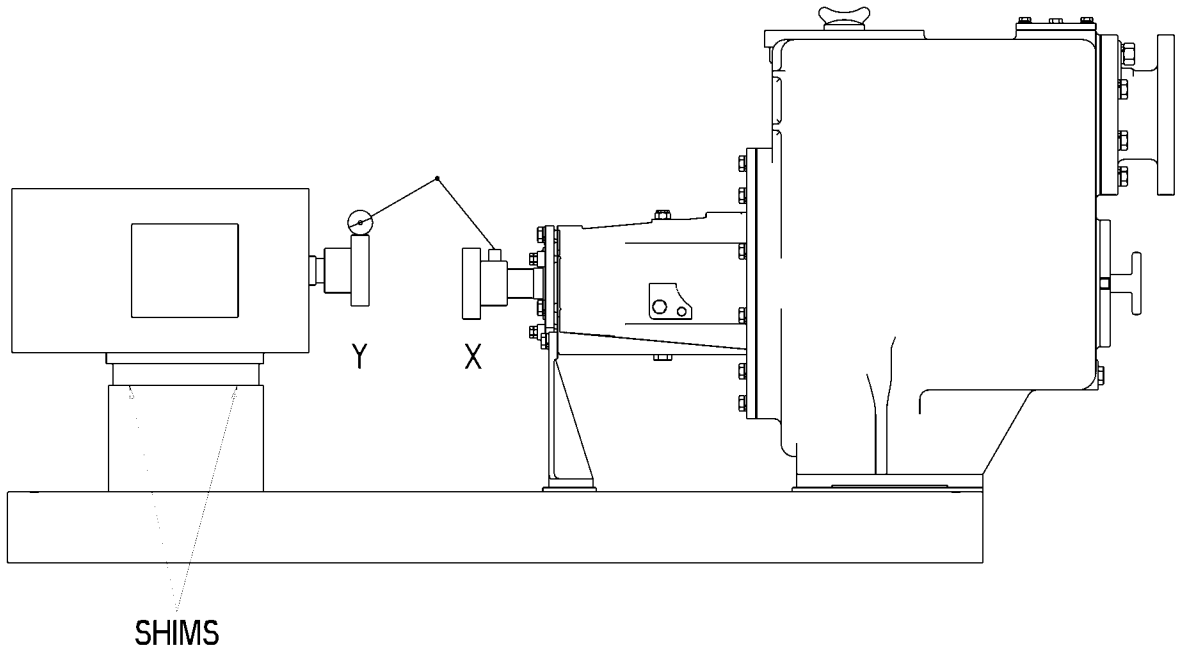


Figure 7: Vertical correction of the motor

4.1.3.11 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.

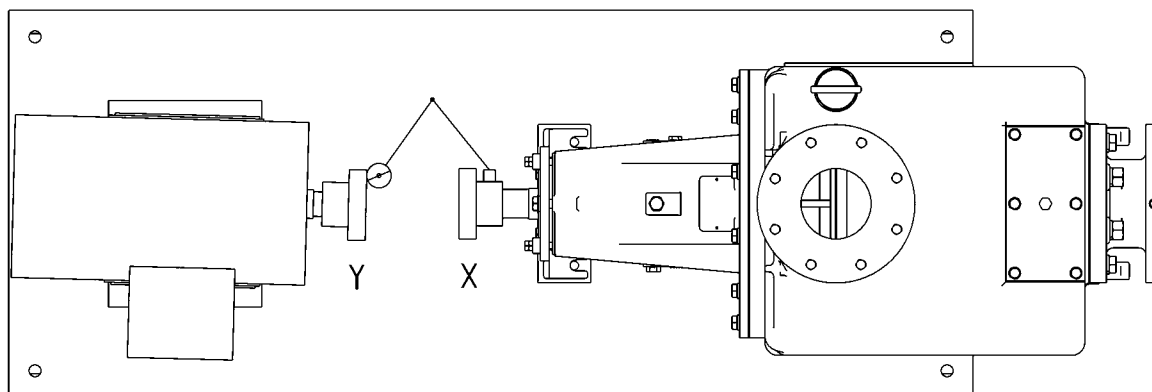


Figure 8: Horizontal correction of the motor

4.1.3.12 Perform parallel alignment for a vertical correction

Refer to the alignment table in "Permitted indicator values for alignment checks" (see Table of Contents for location of table) for the proper cold alignment value based on the motor temperature rise and the pump operating temperature.

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.

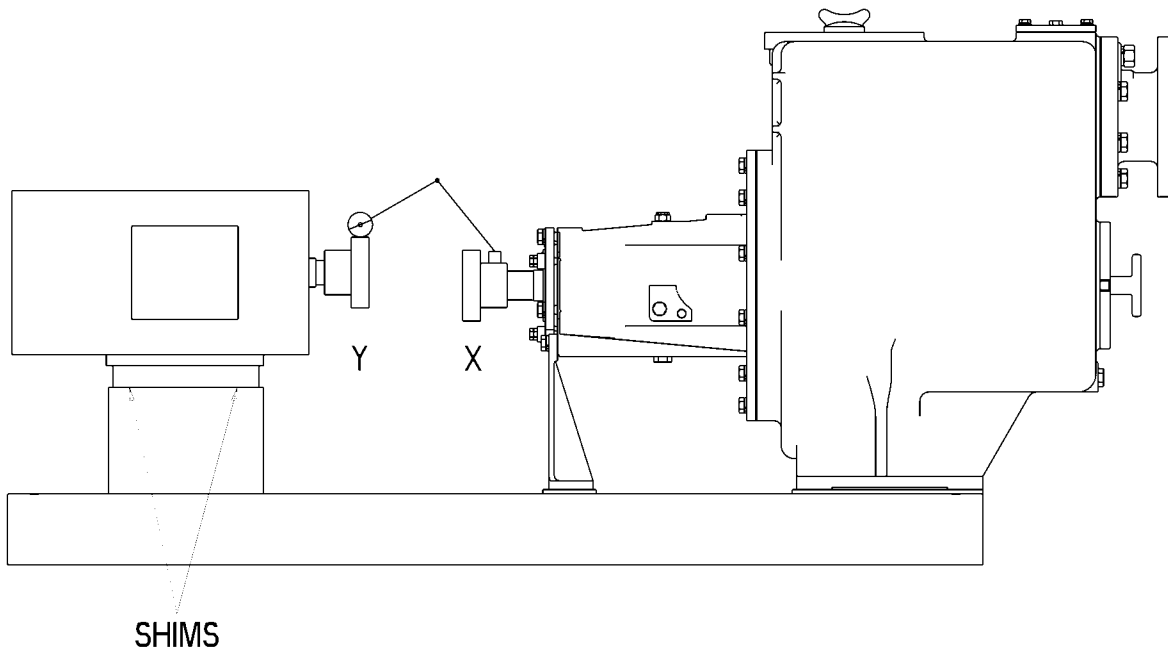


Figure 9: Vertical correction of the motor

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

NOTICE:

The specified permitted reading values are valid only at operating temperature. For cold settings, other values are permitted. The correct tolerances must be used. Failure to do so can result in misalignment. Contact ITT for further information.

4.1.3.13 Perform parallel alignment for a horizontal correction

Refer to the alignment table in "Permitted indicator values for alignment checks" (see Table of Contents for location of table) for the proper cold alignment value based on the motor temperature rise and the pump operating temperature.

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.

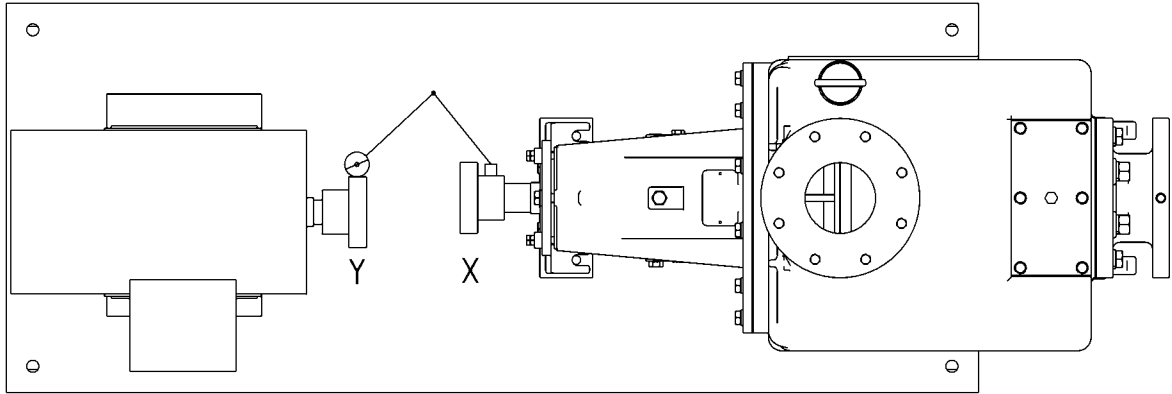


Figure 10: Horizontal correction of the motor

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

4.1.3.14 Perform complete alignment for a vertical correction

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

4.1.3.15 Perform complete alignment for a horizontal correction

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

4.1.3.16 V-Belt Drive Installation Checks

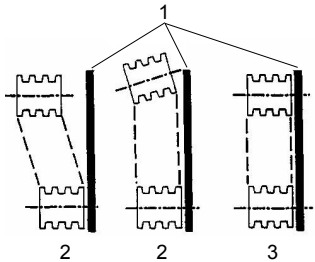
Use the following steps and guidelines to make sure that the v-belt drive is properly installed and that the belts are properly tensioned.



CAUTION:

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

1. Alignment must be maintained for full power transmission, minimum vibration, and long drive life. A dial indicator can be used to check runout on the periphery and face of each sheave. A straight edge can be used to check the alignment of pump and drive sheaves.



1. Straight edge
2. Incorrect
3. Correct

Figure 11: V-belt alignment

2. When installing new belts, shorten center distance between sheaves so that belts can be put on without the use of force. NEVER "roll" or "pry" the belts into place, as this could damage the belt cords.
3. Regardless of the belt section used, the belt should never be allowed to bottom in the groove. This will cause the belts to lose their wedging action and slippage can occur. Sheaves or belts that permit such a condition to occur should be changed.
4. Proper belt tension is the primary reason for long belt life. Improper tension could cause belt fatigue and/or hot bearings.

The general method for tensioning belts is given below, and should satisfy most drive requirements.

- a) Reduce the center distance so that the belts may be placed over the sheaves and in the grooves without forcing them over the sides of the grooves. Arrange the belts so that both the top and bottom spans have about the same sag. Apply tension to the belts by increasing the center distance until the belts are snug.

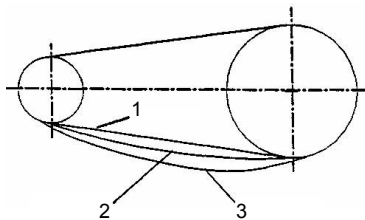


Figure 12: V-belt tension

- b) Operate the drive a few minutes to seat the belts in the sheave grooves. Observe the operation of the drive under its highest load condition (usually starting). A slight bowing of the slack side of the drive indicates proper tension. If the slack side remains taut during the peak load, the drive is too tight. Excessive bowing or slippage indicates insufficient tension. If the belts squeal as the motor comes on or at some subsequent peak load, they are not tight enough to deliver the torque demanded by the drive motor. The drive should be stopped and the belts tightened.
 - c) Check the tension on a new drive frequently during the first day by observing the slack side span. After a few days' operation the belts will seat themselves in the sheave grooves and it may become necessary to readjust the drive to show a slight bow in the slack side.
- Other methods of determining proper belt tension can be obtained from the drive manufacturer.
5. Belt guards protect personnel from danger and the drive from contamination. Inspect periodically to assure that belts do not rub against guard.
 6. Dirt and grease reduce belt life. Belt dressing affects performance only temporarily and is NEVER recommended. Maintaining a clean drive is better practice.
- If any questions arise pertaining to the drive limitations, consult the drive manufacturer.

4.1.3.17 V-Belt Alignment

Although alignment is not as critical in V-belt drives as in others, proper alignment is essential for long belt and sheave life. First, make sure that drive shafts are parallel. The most common causes of misalignment are non-parallel shafts and improperly located sheaves. Where shafts are not parallel, belts on one side are drawn tighter and pull more than their share of the load. As a result, these belts wear out faster requiring the entire set to be replaced before it has give maximum service. If misalignment is in the sheave, belts will enter and leave the grooves at an angle, causing excessive belt cover and sheave wear.

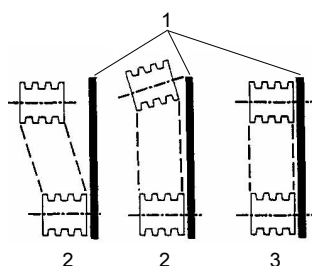


Figure 13: V-belt alignment

4.1.3.18 Check Sheave Mounting and Alignment

"V"-Belt drives do not require alignment to as close tolerances as most other types of drives-but unless the belts enter and leave the sheaves in a relatively straight line, wear is accelerated.

The two most common causes of misalignment are shown: (a) the shafts of the driver and driven machines are not parallel, and (b) the sheaves are not located properly on the shafts. To check alignment, all you need is a straight-edge or, for drives with longer centers, a steel tape. If these aren't available, you can, as a last resort, even use heavy string. Just line the straight edge or tape along the outside face of both sheaves as shown in the illustration. Misalignment will show up as a gap in between the sheave face and straight edge, or perhaps as a "break" in the tape or string. Make sure that the width of the outside land is equal on both sheaves, when using this method.

4.1.3.19 V-Belt Drive Tensioning Method

Before attempting to tension any drive it is important that the sheaves be properly installed and aligned. The V-belts should be placed over the sheaves and in the grooves without forcing them over the sides of the grooves

1. With all belts in their proper groove adjust the centers to take up all slack and until the belts are fairly tight.
2. Start the drive and continue to adjust until the belts have only a slight bow on the slack side of the drive while operating under load. See sketch.
3. After a few days operation the belts will seat themselves in the sheave grooves and it may become necessary to readjust so that the drive again shows a slight "bow" in the slack side.

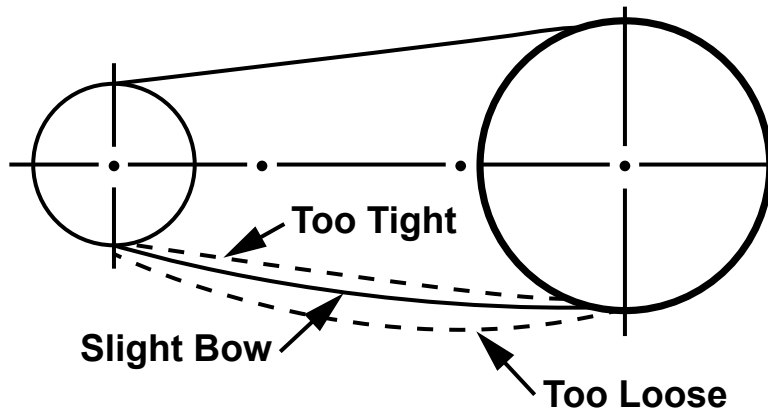


Figure 14: V-belt tensioning

The drive is now properly tensioned and should operate satisfactorily with only an occasional readjustment to compensate for belt and groove wear.

4.1.4 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.
1. Clean all the areas of the baseplate that will come into contact with the grout.
 2. Build a dam around the foundation.
 3. Thoroughly wet the foundation that will come into contact with the grout.
 4. Allow the grout to set.

4.1.5 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.

4.1.6 Suction Piping

1. Suction piping should be as short as possible using the fewest number of elbows and fittings possible to reduce friction loss and avoid priming problems.
2. The designer of the piping system must be sure that the available NPSH of the system exceeds the required NPSH of the pump. (Refer to pump performance curve for the value of the NPSH required by the pump at the operating point).
3. Suction piping should be the same size as the pump inlet.

4. Any reducer should be of the eccentric type. If a reducer is used in the horizontal run of suction piping, it must be used with flat part of reducer on the top to avoid air pockets.
5. A horizontal portion of the suction line must have a gradual rise to the pump from the source of the liquid being pumped. Any high point in the suction line will create an air pocket, and will prevent proper pump operation and inhibit priming capability.
6. An installation requiring long pipe lines handling hot or chilled liquids, requires provisions for relieving the expansion and contraction of the pipe to eliminate any pipe stress from acting on the pump casing.
7. It is recommended to use long radius elbows and eccentric reducers whenever possible. These types of fittings reduce friction loss. Tapered reducers should only be used in vertical suction piping.
8. If a suction strainer is used, it should have mesh size equal to or less than the solid handling capability of the pump, and open mesh area equivalent to a minimum of eight times the area of the suction pipe size.
9. The size and length of the suction pipe, the number and type of pipe fittings, and the height of the static suction lift will determine the total dynamic suction lift of each piping system. This system characteristic should be calculated so that it does not exceed the design capacity of the pump causing reduced flow and/or cavitation.
10. Before tightening the suction pipe connection flange, align it exactly with the pump suction flange. Do not pull a pipe into place by tightening the flange bolts and/or couplings. All pipe lines near the pump must be rigidly supported to avoid strain on the pump, which may cause excessive vibration, decreased bearing life and/or increased shaft deflection and seal wear.
11. Leaks in the suction line can adversely affect both the pump's priming, and performance; especially when the pump is operating at high suction lift. To prevent leaks, make sure all piping connections are tightly sealed. The piping gasket sealant used should be compatible with the liquid being pumped.
12. If a single suction line is installed into a sump, it should be installed away from the sump wall at a minimum distance equal to 1Y:z times the diameter of the suction line. If more than one suction line is installed in the same sump, separate the suction lines from each other by a minimum distance equal to three times the diameter of the largest suction line.
13. If there is a discharge from an open pipe into the sump, the flow should be kept away from the pump's suction pipe. This inflow usually carries air down into the sump with the liquid. Liquid with entrained air will increase pumping time and reduce pump efficiency. If the discharge into the sump is close to the suction pipe, install a baffle between the inflow and suction pipe at a distance of at least six times the diameter of suction pipe away from the suction pipe. The baffle will allow the air to escape from liquid before it is drawn into the suction pipe.
14. Recommended is the use of bell type increasers at the bottom of the suction pipe to reduce inlet velocity. If this can't be done, cut the bottom of the suction pipe at a 45° angle to avoid swirling of liquid.
15. Refer to Hydraulic Institute Standards general guideline for sump design.

4.1.6.1 Valves

ITT does not recommend the use of a valve on the suction line EXCEPT:

- a) In case where positive suction heads are present in the line EXCEPT:
- b) Where it is possible for a positive head to develop due to flooding conditions.
- c) Sometimes it is advisable to have valves on suction and discharge so that the pump may be isolated during repair.

In any case, if suction valve is used, install with stems in horizontal position to avoid air pockets.

1. If throttling valves are necessary in the discharge line, use a valve size equivalent to the largest pipe size in the line to minimize friction loss. Never install a throttling valve in the suction line.

2. Gate and check valves may be used on the discharge side, but it is not necessary in low discharge head applications.
3. It is recommended to use a throttling valve and check valve in the discharge line to protect the pump from excessive shock or water hammer and reversed rotation when pump is stopped.

4.1.7 Discharge Piping

1. To minimize piping friction losses:
 - Keep discharge line as straight as possible.
 - Use the minimum number possible of elbows and other pipe fittings.
 - Use long radius elbows and/or eccentric reducers.
2. Do not terminate the discharge line at a level lower than that of the liquid being pumped, unless a siphon breaker is used in the discharge line. Siphoning action may cause damage to the pump.
3. If there is a high discharge head, slow re-priming may be encountered requiring the use of an air venting device. If a discharge check valve is used an air release line must be incorporated between the discharge check valve and pump to insure priming.
4. If the system has a long discharge line it is recommended to install a siphon breaker to avoid siphoning out the liquid from pump casing.

4.1.8 Piping checklists

4.1.8.1 Suction-piping checklist

Suction-piping checks

Check	Explanation/comment	Checked
	This minimizes the risk of cavitation in the suction inlet of the pump due to turbulence.	
Check that elbows in general do not have sharp bends.	—	
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 		
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 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.	

4.1.8.2 Auxiliary-piping checklist**Precautions****NOTICE:**

Auxiliary cooling and flush systems must be operating properly to prevent excess heat generation, sparks, and/or premature failure. Ensure auxiliary piping is installed as specified on the pump data sheet prior to startup.

4.1.8.3 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.	
	If pipe strain exists, then correct the piping.	

4.2 Air Release Line

It is essential to allow the air to escape from the discharge line to atmosphere during the initial priming and re-priming cycle. In systems with high discharge heads, it may be advisable to install an air release line between the pump casing and discharge check valve to aid their venting. The size of the air release line is selected such that it does not significantly affect the discharge capacity. You may install an air release line through the filler plug hole if necessary. However, the preferred location is in the discharge line-between the pump and the discharge check valve-as close to the discharge check valve as possible. We recommend the following line sizes for the following ITT pumps.

3DTH & 4DTH	3/4" Line
6ETH	1" Line
BGTH & 10GTH	1-1/4" Line

NOTICE:

1. This line size may be increased or decreased depending on application.
2. Direct the air release line back into the sump (not into the pump suction line). Leave the end of the line open to atmosphere. Do not submerge into the liquid being pumped.
3. The air release line may clog, particularly if a shut off valve is installed in the line and is closed during operation. If this condition occurs, either use a larger line or leave the shut off valve open during pumping operation. To aid in maintaining air release lines, fit them with crosses instead of elbows.

5 Commissioning, Startup, Operation, and Shutdown

5.1 Starting



DANGER:

All openings (e.g. pipe connections, flanges) must be sealed off with proper fitting and material prior to filling pump. Failure to plug all openings will result in personal injury.

Prior to starting pump, ensure all flush and cooling systems are operating.

Follow the motor manufacturer's instructions carefully. Before starting fill the pump casing with liquid through the priming plug provided. Your pump has been designed to prime itself in a few minutes. High suction lifts require additional time and reduce the performance of the pump. Should you have difficulty, refer to the "Trouble Guide" paragraph.

ITT self priming pumps prime and reprime themselves providing the casing is filled with liquid. Should you lose this liquid from the casing accidentally or by draining purposely, it will be necessary to fill casing with liquid before starting.

Check oil level in bearing housing cavity. Units are shipped without oil. Fill bearing housing oil cavity with proper grade of oil. (Refer to "Lubrication" for proper oil level).

Check drive coupling and "V" belt alignment. (Refer "coupling alignment" for instructions).

Check motor wiring.

5.2 Warnings



WARNING:

1. All electrical work must be done by a licensed electrician.
2. Before working on pump and/or motor be certain that the electrical power is off at the main junction box.
3. Disconnect the fuse or circuit breaker and have the main switch tagged "DO NOT ENERGIZE THIS SWITCH PERSONNEL WORKING ON EQUIPMENT."
4. Some motors are equipped with built-in thermal overloads to shut off the motors in the event the temperature becomes excessive (as a result of low voltage, poor ventilation, overloaded lines, etc.) These motors will restart automatically as the motor cools down. For safety sake, DO NOT work on any motor without shutting off the electricity.
5. Never operate an electric motor driven pump without properly grounding the motor frame. Serious injury or death by electrocution could result.
6. Drain pump casing completely before taking pump apart. It is advisable to flush the inside of the casing with water before taking pump apart.
7. Never start pump before putting back all necessary guards such as coupling guard and/or belt guard.

8. Foreign objects in the pumped liquid or piping system can block the flow and cause excess heat generation, sparks and premature failure. Make sure that the pump and systems are free of foreign objects before and during operation.
9. Electrical connections must be made by certified electricians in compliance with all international, national, state and local regulations.
10. 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. If pump becomes plugged, shut down and unplug prior to restarting pump.

5.3 Install the coupling guard



WARNING:

- Running a pump without safety devices exposes operators to risk of serious personal injury or death. Never operate a unit unless appropriate safety devices (guards, etc.) are properly installed.
- Failure to disconnect and lock out driver power may result in serious physical injury or death. Always disconnect and lock out power to the driver before performing any installation or maintenance tasks.
 - Electrical connections must be made by certified electricians in compliance with all international, national, state, and local rules.
 - Refer to driver/coupling/gear manufacturer's installation and operation manuals (IOM) for specific instructions and recommendations.

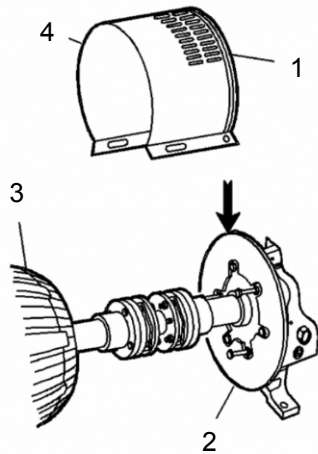


WARNING:

The coupling guard used in an ATEX classified environment must be properly certified and constructed from a spark resistant material.

Required parts:

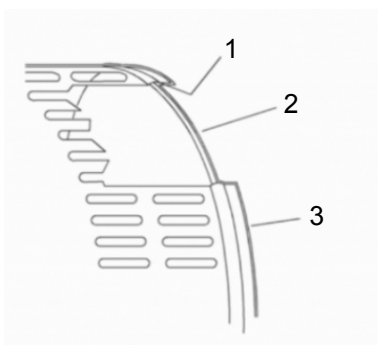
1. De-energize the motor, place the motor in a locked-out position, and place a caution tag at the starter that indicates the disconnect.
2. Put the pump-side end plate in place.
If the pump-side end plate is already in place, make any necessary coupling adjustments and then proceed to the next step.
3. Put the pump-half of the coupling guard in place:
 - a) Slightly spread the bottom apart.
 - b) Place the coupling guard half over the pump-side end plate.



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

Figure 15: Guard half installation

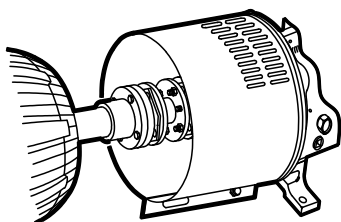
The annular groove in the coupling guard half must fit around the end plate.

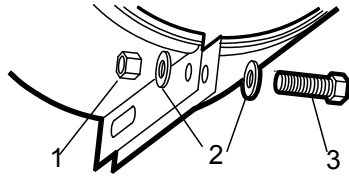


Item	Description
1.	Annular groove
2.	End plate (pump end)
2.	Guard half

Figure 16: Annular groove in coupling guard

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





Item	Description
1.	Nut
2.	Washer
3.	Bolt

Figure 17: Secure coupling guard half to end plate

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

5.4 Lubrication

A. BEARING LUBRICATION: (Refer to drawing)

Use good grade SAE #30 non-detergent motor oil. Units are shipped 30TH 40TH 6ETH 8GTH 10GTH :20 fl. oz. minimum :20 fl. oz. minimum :20 fl. oz. minimum :20 fl. oz. minimum :20 fl. oz. minimum without oil and must be filled before starting. Fill bearing housing oil cavity with oil through "filter" provided on top of bearing housing nearest motor until oil starts to drip out of "oil level" hole. ("Oil Level" cast on housing). Install breather to vent any oil vapor.

Also, provision is made on the housing to install "constant level oiler" ("Oiler" cast on housing.) This oiler can be supplied as an optional item.

Under normal service, drain and refill housing cavity oil yearly. However, oil level should be checked regularly.

If pump is oil mist lubrication, check that the mist is flowing properly prior to starting pump.

Bearing Cavity Oil Capacity

30TH &40TH	56 fl. oz.
6ETH	68 fl. oz.
8GTH	68 fl. oz.
10GTH	68 fl. oz.

B. SEAL CAVITY LUBRICATION:

If pump is oil mist lubrication, check that the mist is flowing properly prior to starting pump.

Use good grade SAE #30 non-detergent motor oil. Units are shipped without oil but should be checked before starting.

Fill seal cavity with oil through hole provided on top of bearing housing nearest pump casing, until you see oil through hole opening. Install breather to vent any oil vapor.

NOTICE:

It is recommended that the seal cavity oil be drained (through the drain hole) and replaced with clean grade SAE #30 non-detergent motor oil every 6 months.

The mechanical shaft seal is a wearing part that will eventually need to be replaced. A leaky seal must be replaced quickly to prevent damage to the pump. Any overflow of liquid through the breather (vented plug) is an indication of a possible seal failure.



CAUTION:

At the first sign of overflow from the cavity vent, the oil drain plug should be removed from the seal cavity chamber to drain the pumpage and remaining oil. The cavity can remain opened until the pump can be shut down and the mechanical seal checked or replaced. Failure to do so may contaminate the bearing housing and void warranty

OIL CAPACITY OF SEAL CAVITY	
30TH	20 fl. oz. minimum
40TH	20 fl. oz. minimum
6ETH	20 fl. oz. minimum
8GTH	20 fl. oz. minimum
10GTH	20 fl. oz. minimum

C. MOTOR BEARING LUBRICATION:

Follow motor manufacturer's specification.

5.5 Impeller Running Clearance

The impeller running clearance, the distance between the impeller vanes and wear plate, is adjusted at the factory prior to shipment to .020"-.030". To adjust this clearance in the field, shut down the pump, disconnect power supply to the pump and use the following instructions.

1. Drain pump casing (1) completely by removing drain plugs (2) from both suction and discharge chamber.
2. Remove clean-out cover (83) by unscrewing the two hand knobs (81).
3. Reach inside the pump casing through the clean-out hole with a feeler gage and measure the gap between the impeller vanes and wear plate (89). Measure this gap at each impeller vane. If this gap is not within the allowable limits of .020"-.030", adjust this clearance as follows:
 - a) Unscrew the three jack-screws (112) and jam nuts (111). Partially loosen the bearing carrier capscrews (45).
 - b) Adjust the jack-screws (112) and capscrews (45) until the front clearance between the impeller vanes and wear plate falls within the allowable range of .020"-.030". Tightening the jack-screws (112) will increase the front clearance and tightening the capscrews (45) will decrease the front clearance.

- c) Tighten one set of screws and loosen the other to go in the direction required. Tighten locknut (111).
-

NOTICE:

Maximum allowable bearing carrier (110) pull back movement is 1/8", (i.e. from the condition when impeller is "just" touching the wearplate you can push back the bearing carrier assembly by 1/8").

6 Maintenance

6.1 Shaft and Bearing Replacement

If shaft or bearing replacement is necessary, follow these instructions. (Shut down the pump and disconnect power supply to the pump before working on pump.)

1. Install the front (impeller end) bearing (36) on the shaft (38).
2. Slide the carrier retaining ring (106) onto the shaft (38).
3. Install the rear (coupling end) bearing (117) on the shaft (38).
4. Install the retaining ring (108) onto the shaft (38). Add shims (107) between the retaining ring (108) and the bearing (117) if required to lock the bearing (117) on to the shaft axially.
5. Install "O" ring (109) into the bearing carrier groove.
6. Slide the bearing carrier (110) with "O" ring over the rear bearing such that rear bearing slides into the bearing carrier (110). Install the retaining ring (106) in place.
7. Insert shaft assembly with bearings and carrier into the housing (31).

6.2 Cleaning or Replacing Check Valve

(Shut down the pump and disconnect power supply to the pump before working on the pump.)

1. Drain pump casing (1) completely by removing drain plugs (2). Access to suction check valve can be made by removing the check valve cover plate (76) from the top of the suction chamber of pump casing.
2. Reaching through the check valve cover plate hole, remove the two shoulder screws (118) and check valve keeper plate (53). Now slide off check valve (51). Pull the check valve assembly out of the pump casing through the cover plate hole. Inspect the sealing surface of the check valve and make sure it is in good condition and free of debris.

6.3 Cleaning Impeller

1. Drain pump casing completely by removing drain plugs (2).
2. Remove handknobs (81), remove clean-out cover (83) and using coat hanger remove debris from the impeller eye area and if necessary wash it off with garden hose.
3. Check 11011 ring (84) on the clean-out cover-replace it if necessary.

6.4 Hydrotest

NOTICE:

If hydrostatic test is required in the field, it must be performed with suction check valve removed or with partially open suction check valve.

1. The maximum allowable hydrotest pressure for these pumps is:

Option	Description
3DTH	EL & EM 130 psi
4DTH	EL & EM 130 psi
6ETH	EL & EM 130 psi
8GTH	EL & EM 85 psi
10GTH	EL & EM 85 psi

2. Before hydrotesting the pump all air must be removed from the suction priming chamber. This is done by:
 - a) Removing pipe plug from check valve cover plate (76).
 - b) Installing a pet cock valve (not supplied by ITT) in place of pipe plug.
 - c) With pet cock open fill casing (1) with fluid being pumped through filler plug (98) provided on top of casing. Do not close pet cock until all air is out of casing (as shown by a solid stream of liquid coming out of pet cock).
 - d) Close pet cock, reinstall filler plug. Unit is now ready for hydrotest.

6.5 Disassembly

6.5.1 Disassembly precautions



WARNING:

- Failure to disconnect and lock out driver power may result in serious physical injury or death. Always disconnect and lock out power to the driver before performing any installation or maintenance tasks.
 - Electrical connections must be made by certified electricians in compliance with all international, national, state, and local rules.
 - Refer to driver/coupling/gear manufacturer's installation and operation manuals (IOM) for specific instructions and recommendations.
- Risk of serious personal injury. Applying heat to impellers, propellers, or their retaining devices can cause trapped liquid to rapidly expand and result in a violent explosion. This manual clearly identifies accepted methods for disassembling units. These methods must be adhered to. Never apply heat to aid in their removal unless explicitly stated in this manual.
- Handling heavy equipment poses a crush hazard. Use caution during handling and wear appropriate Personal Protective Equipment (PPE, such as steel-toed shoes, gloves, etc.) at all times.
- Precautions must be taken to prevent physical injury. The pump may handle hazardous and/or toxic fluids. Proper personal protective equipment should be worn. Pumpage must be handled and disposed of in conformance with applicable environmental regulations.
- Risk of serious physical injury or death from rapid depressurization. Ensure pump is isolated from system and pressure is relieved before disassembling pump, removing plugs, opening vent or drain valves, or disconnecting piping.
- Risk of serious personal injury from exposure to hazardous or toxic liquids. A small amount of liquid will be present in certain areas like the seal chamber upon disassembly.



CAUTION:

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

6.5.2 Tools required

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

- Lifting eyebolt (dependent on pump / motor size)

6.5.3 Drain the pump

6.5.4 Disassembly

If you need to replace impeller, wear plate, shaft seal, front oil lip seal, bearing or check valve, follow these steps:

1. Drain pump casing completely by removing drain plug (2) from both suction and discharge chamber.
2. Drain seal cavity oil by removing drain plug (27) from bearing housing.

NOTICE:

A mixture of oil and water does not necessarily indicate a seal failure. Inspect seal for damage and replace if needed.

3. Drain bearing cavity oil by removing drain plug (28).

NOTICE:

If oil is mixed with water, shaft seal and front oil lip seal must be inspected for failure.

4. Remove bearing housing support (35) capscrews from base.
5. Disconnect coupling or 11V11 Belt.
6. Remove capscrews (102) which holds seal plate (10) to casing (1).
7. Pull complete assembly including bearing housing assembly, seal plate and impeller (91) from pump casing.
8. Remove impeller nut (4) & impeller washer (5) from the shaft (38). Pry out the impeller (91) using wedges behind the impeller.

NOTICE:

Check impeller for any broken vanes or wear. If it is necessary, replace it.

Refer to impeller-nut torque value before reinstalling impeller nut.

9. Remove wear plate (89) by removing locknut (116) through the clean-out cover (83) hole. Check wear plate for wear. Replace if required.
10. Remove seal assy. (17) from seal well as follows:
 - a) Remove spring and rotating element of the seal.
 - b) Pry out the stationary element gently from the seal cavity by using screw driver. OR if seal plate is removed from the shaft, the stationary seal will slide out off the shaft along with seal plate. Be careful not to damage stationary element by letting it hit the shaft.

NOTICE:

Please refer to seal re-assembly section before reinstalling the seal. If the seal appears damaged in any way, replace with new seal assembly.

11. Remove capscrews (33) to disassemble bearing housing from seal plate.

NOTICE:

Check gasket (105)--if worn, replace it.

12. Remove the shaft assembly with bearings and bearing carrier out of the bearing housing (31).
13. Check both lip seals (42), replace if necessary.
14. Remove the snap ring (106) from the bearing carrier (110) which will allow the bearing carrier (110) to slide off the shaft (38), along with 11011 ring (109).
15. Remove snap ring (108) from the shaft (38).

16. Check the bearings. If they feel rough when turning by hand, replace the bearings. Remove bearings (36 & 117) from the shaft (38) using a hydraulic press.
17. If your pump is supplied with a shaft sleeve (24), the sleeve is locked in place with a roll pin (101) and an a ring (104) to prevent leakage under the shaft. To remove shaft sleeve, push the roll pin into the shaft (shaft has a drilled through hole) and pull the sleeve from the shaft along with the "O" ring. Push the roll pin out of the shaft. Pump with slotted shaft sleeve, pull the sleeve along with "O" Ring from the shaft. If roll pin is damaged, pull Roll pin out of shaft. Replace shaft sleeve, "O" Ring and Roll pin if necessary.

Check "O" ring and shaft sleeve. If damaged, replace as necessary.

When reinstalling the sleeve onto the shaft, make sure that the roll pin is installed flush or max. .005" under the sleeve O.D.

Follow the above procedure in reverse to reassemble the pump.

NOTICE:

1. Make sure all gaskets, "O" rings, and sealing surfaces of the check valve are in good condition before reassembly. Replace as is necessary.
 2. Make a heavy bead of "GASKET ELIMINATOR" loctite #518 or equivalent all around the outer edge, inner edge and around the mounting holes on the wear plate (89) before reinstalling wear plate onto the pump casing (1) for sealing.
-

Inspect all gasket / o-ring / sealing surfaces before reassembly.

6.6 Preassembly inspections

6.6.1 Replacement guidelines

Casing check and replacement



WARNING:

Risk of death or serious injury. Leaking fluid can cause fire and/or burns. Inspect and ensure gasket sealing surfaces are not damaged and repair or replace as necessary.

Gaskets, O-rings, and seats replacement



WARNING:

Risk of death or serious injury. Leaking fluid can cause fire and/or burns. Replace all gaskets and O-rings at each overhaul or disassembly.



WARNING:

Risk of serious personal injury or property damage. Fasteners such as bolts and nuts are critical to the safe and reliable operation of the product. Ensure appropriate use of fasteners during installation or reassembly of the unit.

- Use fasteners of the proper size and material only.
 - Replace all corroded fasteners.
 - Ensure that all fasteners are properly tightened and that there are no missing fasteners.
-

6.6.2 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.

6.7 Reassembly

6.7.1 Reassembly

Follow "Disassembly" in reverse order.

6.8 Impeller Nut Installation Torque

Use following impeller nut (4) torque value during installation:

Pump Model	Nut Size	Torque Value
3DTH	1"-14 Esna Nut (Short)	125-150 ft. lbs
4DTH	1"-14 Esna Nut (Short)	125-150 ft. lbs
6ETH26	1"-14 Esna Nut (Short)	125-150 ft. lbs
8GTH8	1"-14 Esna Nut (Short)	125-150 ft. lbs
10GTH9	1"-14 Esna Nut (Short)	125-150 ft. lbs
6ETH28	1 1/4"-12 Esna Nut	150-175 ft. lbs
8GTH14	1 1/4"-12 Esna Nut	150-175 ft. lbs

NOTICE:

Before installing impeller (91) onto the shaft (38), apply coat of loctite grade 242 into the impeller bore to help prevent corrosion.

6.9 Winter Storage

1. Wash off exterior of pump.
2. Flush suction line, discharge line, pump casing, and impeller of all solids by pumping clear liquid for a short time.
3. Drain pump casing, suction line & discharge line.
4. If complete draining is impossible, add small amount of antifreeze into the pump casing. Rotate shaft for mixing.
5. Drain the old oil from bearing housing cavity and seal cavity and refill both cavities with proper grade of oil. (Refer to lubrication section).
6. Seal off suction and discharge ports.
7. Store the units in clean & dry area if possible.
8. Motor windings should be protected from excessive moisture. Follow motor manufacturer's instructions.
9. Spray interior of pump casing with commercially available anti-rust and anti-corrosion petroleum aerosol.

6.9 Winter Storage

10. Once a month rotate the pump shaft during the storage period to avoid freeze up and to lubricate the bearings.

7 Troubleshooting

7.1 Troubleshooting Guide

NOTICE:

Should pump be handling a harmful liquid, make sure necessary safety precautions are undertaken before implementing any recommended action in the accompanying Trouble Guide. The following are some common causes of problems that may arise:

Table 2: Trouble Guide

Symptoms	Probable Cause	Recommended Action
Will not prime.	<ol style="list-style-type: none"> No liquid in pump casing. Loose suction inlet (50) and/or suction check valve cover plate (76). Worn suction inlet gasket (49) and/or cover plate gasket (77). Loose suction chamber drain plug (2). Worn pump shaft seal assy. (17). Loose clean-out cover (83) and/or worn clean-out gasket (84). Air release line clogged. 	<ol style="list-style-type: none"> Fill pump casing with liquid being pumped. Tighten bolts (57). Replace with new gaskets. Tighten plug, use pipe dope or PTFE Tape. Install new seal. Replace with new gasket and tighten hand-knobs (81). Clean air release line.
Suddenly stops pumping.	Clogged suction line or suction strainer (if used).	Clean suction line & strainer.
Stops pumping until motor is stopped and re-started.	Collapsing suction hose lining.	Replace suction line & strainer.
Slowly stops pumping.	<ol style="list-style-type: none"> Clogged impeller, volute, suction line or check valve. Loose clean-out cover (83). 	<ol style="list-style-type: none"> Clean-out debris from impeller eye area, suction check valve. (Follow instructions on other pages) Clean sealing surface & "O" ring gasket and tighten hand knobs.
Excessive leakage (oil+ liquid being pumped) thru seal cavity vented hole.	Worn pump shaft seal (17).	Replace seal (follow instructions on other page).
Will not hold prime.	<ol style="list-style-type: none"> Dislodged or worn check valve (51). Loose clean out cover (83). Loose check valve cover plate (76). 	<ol style="list-style-type: none"> Clean or replace check valve - clean sealing surface. Check gasket (84), replace if necessary. Tighten cover plate. Check gasket (77). Replace if necessary. Tighten cover plate screws.
Poor Performance.	<ol style="list-style-type: none"> Worn impeller, seal or wear plate (89). Motor not up to speed: <ul style="list-style-type: none"> low voltage 	<ol style="list-style-type: none"> Install new impeller, seal or wear plate. <ul style="list-style-type: none"> Larger lead wires req'd.

7.1 Troubleshooting Guide

Symptoms	Probable Cause	Recommended Action
	<ul style="list-style-type: none"> • worn bearings <ol style="list-style-type: none"> 3. Excessive clearance between impeller and wear plate. 	<ul style="list-style-type: none"> • Replace or rebuild <ol style="list-style-type: none"> 3. Adjust to .020" to .030" clearance. (Follow instructions on other pages.)
Noisy Operation.	<ol style="list-style-type: none"> 1. Worn motor bearings. 2. Low discharge head. 3. Impeller clogged. 4. Worn coupling or misalignment. 5. Units operating at extreme left or right end of performance curve (capacity too high or too low). 	<ol style="list-style-type: none"> 1. Replace. 2. Throttle discharge. 3. Remove clean-out cover and clean impeller. 4. Replace or realign coupling. 5. Adjust for best performance point of operation.

8 Pump Spare Parts List

Key	Description	Key	Description
1	Casing	58	Lockwasher
2	Pipe Plug	59	Lockwasher
*4	Locknut, Impeller	60	Bushing
*5	Washer, Curved	74	Hexnut
*7	Gasket, DiecuUMolded	75	Stud
*8	Gasket, Diecut	76	Cover, Check Valve
10	Cover, Stuffing Box	*77	Gasket, Diecut
11	Stud	79	Lockwasher
12	Lockwasher	81	Handknob
***17	Seal, Single Mech.	82	Stud
19	Capscrew	83	Cover, Clean Out
*24	Sleeve, Shaft	*84	Gasket, Molded
27	Pipe Plug	**89	Plate, Wear
28	Pipe Plug	*91	Impeller, Open
29	Oiler (Optional)	98	Plug, Wing
30	Vent, Filter	*99	Gasket, Molded
31	Housing, Bearing	100	Elbow
32	Lockwasher	*101	Pin, Roll
33	Capscrew	102	Capscrew
34	Capscrew	*104	Gasket, Molded
35	Foot, Mounting	*105	Gasket, Diecut
*36	Bearing	106	Ring, Retaining
*37	Key, Impeller	107	Shim, Beraing
38	Shaft	108	Ring, Retaining
39	Key, Coupling	*109	Gasket, Molded
42	Retainer	110	Carrier, Bearing
44	Lockwasher	111	Hexnut, Jam
45	Capscrew	112	Capscrew
*49	Gasket, Diecut	114	Vent, Filler
50	Inlet, Suction	116	Locknut
***51		*117	Bearing
57		118	Screw, Shoulder

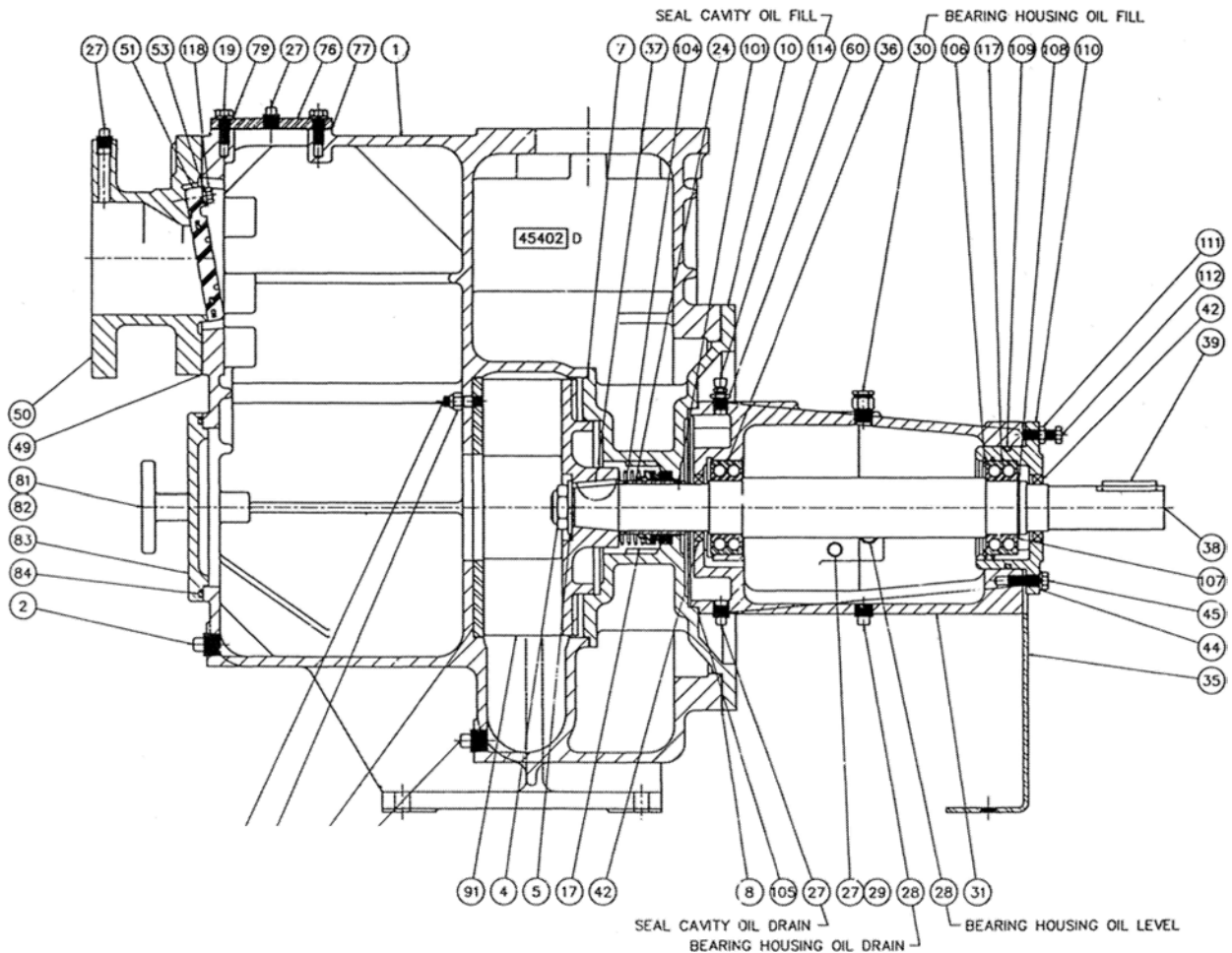
* Recommended spare parts

** Recommended distributor stock, export spares, and critical service

*** Recommended spare parts and Recommended distributor stock, export spares, and critical service

Only replace bearings with manufacturers specified part number.

8.1 Trash Hog II Type EL Long Coupled



Text of first paragraph.

Table 3: Pump Parts List for Section Drawing

Key	Description	Key	Description	Key	Description
1	Casing Pipe Plug	37	Key, Impeller	91	Impeller, Open
2	Pipe Plug	38	Shaft	100	Elbow
4	Locknut, Impeller	39	Key, Coupling	101	Pin, Roll Gasket
5	Washer, Curved	42	Retainer Lock	104	Molded Gasket
7	Gasket, DiecuUMolded	44	Washer	105	Diecut Ring
8	Gasket, Diecut	45	Capscrew	106	Retaining Shim
10	Cover, Stuffing Box	49	Gasket, Diecut	107	Shim, bearing
11	Stud	50	Inlet, Suction	108	Ring, Retaining
17	Seal, Single Mech.	51	Valve, Check	109	Gasket, Molded
24	Sleeve, Shaft	60	Bushing	110	Carrier, Bearing
27	Pipe Plug	76	Cover, Check Valve	111	Hexnut, Jam
28	Pipe Plug	77	Gasket, Diecut	112	Capscrew
29	Oiler (Optional)	81	Handknob	114	Vent, Filler
30	Vent, Filter	82	Stud	115	Gasket, Wearplate
31	Housing, Bearing	83	Cover, Clean Out	116	Locknut

Key	Description	Key	Description	Key	Description
35	Locknut, Impeller	84	Gasket, Molded	117	Bearing
36	Bearing	89	Plate, Wear	118	Screw, Shoulder

8.2 Pump Spare Parts List

Key	Description	Key	Description
1	Casing	58	Lockwasher
2	Pipe Plug	59	Lockwasher
*4	Locknut, Impeller	60	Bushing
*5	Washer, Curved	74	Hexnut
*7	Gasket, DiecuUMolded	75	Stud
*8	Gasket, Diecut	76	Cover, Check Valve
10	Cover, Stuffing Box	*77	Gasket, Diecut
11	Stud	79	Lockwasher
12	Lockwasher	81	Handknob
***17	Seal, Single Mech.	82	Stud
19	Capscrew	83	Cover, Clean Out
*24	Sleeve, Shaft	*84	Gasket, Molded
27	Pipe Plug	**89	Plate, Wear
28	Pipe Plug	*91	Impeller, Open
29	Oiler (Optional)	98	Plug, Wing
30	Vent, Filter	*99	Gasket, Molded
31	Housing, Bearing	100	Elbow
32	Lockwasher	*101	Pin, Roll
33	Capscrew	102	Capscrew
34	Capscrew	*104	Gasket, Molded
35	Foot, Mounting	*105	Gasket, Diecut
*36	Bearing	106	Ring, Retaining
*37	Key, Impeller	107	Shim, Beraing
38	Shaft	108	Ring, Retaining
39	Key, Coupling	*109	Gasket, Molded
42	Retainer	110	Carrier, Bearing
44	Lockwasher	111	Hexnut, Jam
45	Capscrew	112	Capscrew
*49	Gasket, Diecut	114	Vent, Filler
50	Inlet, Suction	116	Locknut
***51		*117	Bearing
57		118	Screw, Shoulder

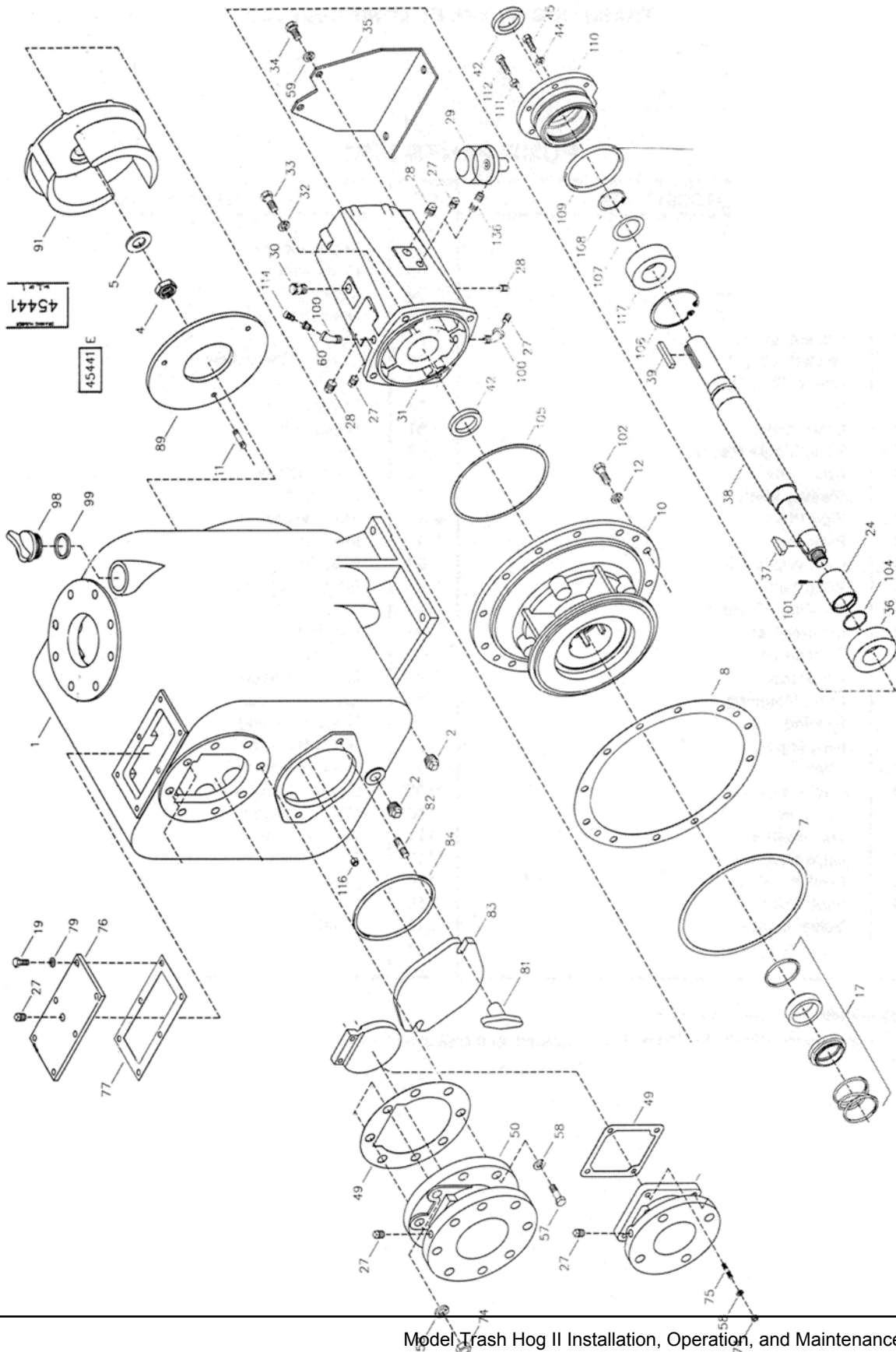
* Recommended spare parts

** Recommended distributor stock, export spares, and critical service

*** Recommended spare parts and Recommended distributor stock, export spares, and critical service

Only replace bearings with manufacturers specified part number.

8.3 Trash Hog II Type EL Long Coupled





ITT

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The original instruction is in English. All non-English instructions are translations of the original instruction.