

 **GOULDS PUMPS**

Installation, Operation, and Maintenance Manual

Model SRL, SRL-C, and SRL-XT



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.

1.2 Safety



WARNING:

- 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.
- 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.
- 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.
- 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.
- 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.

- 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.



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.

1.2.1 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
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

1.2.2 Environmental safety

The work area

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



WARNING:

Move equipment to a safe/non Ex environment for repairs/adjustments or use spark resistant tools and work methods.

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:

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.

Electrical installation

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

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.

1.2.3.1 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.
- 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.
- Allow all system and pump components to cool before you handle them.
- Make sure that the product has been thoroughly cleaned.
- Disconnect and lock out power before you service the pump.
- Check the explosion risk before you weld or use electric hand tools.

1.2.3.2 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.
- Do not exceed the maximum working pressure of the pump.
- Do not open any vent or drain valve or remove any plugs while the system is pressurized. Make sure that the pump is isolated from the system and that pressure is relieved before you disassemble the pump, remove plugs, or disconnect piping.
- Never operate a pump without a properly installed coupling guard.

1.2.3.3 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.

1.3 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

1.3 Product warranty

- 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 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.

2.2.1 Lifting methods



WARNING:

- Risk of serious personal injury or equipment damage. Proper lifting practices are critical to safe transport of heavy equipment. Ensure that practices used are in compliance with all applicable regulations and standards.
 - 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.
-

Table 1: Methods

Pump type	Lifting method
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 handles	Lift the pump by the handles.

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

2.3 Pump storage requirements

If you do not plan to install and operate the unit soon after arrival, adhere to these storage requirements:

- Store the unit in a cool, dry, and dark place. The ideal temperature range is 50° to 70°F (10° to 21°C) with a maximum of 100°F (38°C).

If you store the unit below 32°F (0°C), some rubber products can become stiff and need to be warmed before you return them to service.

- Do not store the unit near electrical equipment that can generate ozone or in areas of known high ozone.
- Avoid direct or reflected sunlight.
- Protect rubber components from insects and rodents.
- Do not store rubber components in areas of high or low humidity.
- Protect rubber components from oils, solvents, corrosive liquids, and fumes that could adversely affect the rubber.
- Rotate the shaft periodically in order to coat the bearings with lubricant and to retard oxidation and corrosion.

3 Product Description

3.1 General description of the SRL

The SRL is a horizontal, rubber-lined, end-suction centrifugal pump. This pump meets Hydraulic Institute standards and is available in four wet end configurations:

- SRL – open impeller
- SRL-C – closed impeller
- SRL-XT – thick rubber-lined
- SRL-S – Shearpeller

Table 2: Hydraulic sizes

This table shows the number of hydraulic sizes available for each wet end configuration:

Wet end configuration	Number of hydraulic sizes
SRL	4
SRL-C	8
SRL-XT	4
SRL-S	8

Table 3: Casing

This table describes the pump casing parts:

Part	Description
Discharge	Tangential
Mounting method	Pedestal mounted
Pump flange	Flat-faced reducing type
Special companion required flange (optional)	The customer is required to use a special companion flange in order to bolt to the pump flange.

3.2 Nameplate information

Important information for ordering

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

When you order spare parts, identify this pump information:

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

Item numbers can be found in the spare parts list.

Refer to the nameplate on the bearing housing for most of the information. See Assembly drawings (exploded views) for item numbers.

Nameplate on the pump casing using English units

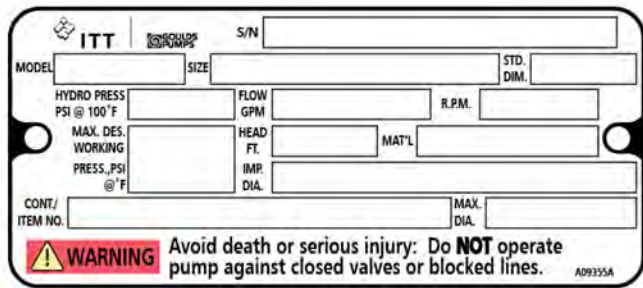


Figure 1: Nameplate on the pump casing using English units

Table 4: Explanation of nameplate on the pump casing

Nameplate field	Explanation
S/N	Serial number of the pump
MODEL	Pump model
SIZE	Size of the pump
STD. DIM.	Standard ANSI dimensional code
HYDRO PRESS PSI	Hydrostatic pressure at 100 °F, in PSI
FLOW	Rated pump flow in GPM
R.P.M.	Rated pump speed, revolutions per minute
MAX. DES. WORKING PRESS., PSI	Maximum working pressure at 100 °F, in PSI
HEAD	Rated pump head, in feet
MAT'L.	Material of which the pump is constructed
IMP. DIA.	Impeller diameter, in inches
CONT./ITEM NO.	Customer contract or item number
MAX. DIA.	Maximum impeller diameter, in inches

Nameplate on the pump casing using metric units

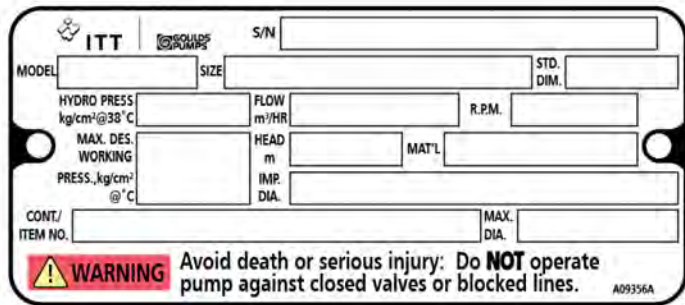


Figure 2: Nameplate on pump casing using metric units

Table 5: Explanation of nameplate on the pump casing

Nameplate field	Explanation
S/N	Serial number of the pump
MODEL	Pump model
SIZE	Size of the pump
STD. DIM.	Standard ANSI dimensional code

Nameplate field	Explanation
HYDRO PRESS	Hydrostatic pressure at 20 °C, in kg/cm ²
FLOW	Rated pump flow in m ³ /hr
R.P.M.	Rated pump speed, revolutions per minute
MAX. DES. WORKING PRESS. @°C	Maximum working pressure at 20 °C, in kg/cm ²
HEAD	Rated pump head, in m
MAT'L.	Material of which the pump is constructed
IMP. DIA.	Impeller diameter, in millimeters
CONT./ITEM NO.	Customer contract or item number
MAX. DIA.	Maximum impeller diameter, in millimeters

4 Installation

4.1 Installation

4.1.1 Foundation

The foundation should be sufficiently substantial to absorb any vibration, and to form a permanent rigid support for the pump. A concrete foundation, with foundation bolts of the proper size grouted in place to drawing dimensions, is recommended.

4.1.2 Mount the pump

1. On the foundation surface, position the baseplates under the frame at the foundation bolts. The baseplates support the pump.
2. Set the baseplates in a puddle of grout, and level them in all directions and in relation to each other. This ensures a minimum amount of shimming necessary in order to completely level the pump.
3. Tighten the foundation bolts evenly.
4. Check that the pump is level.
5. Tighten the foundation bolts evenly and recheck pump levelness.

4.1.3 Piping

NOTICE:

The piping should not be connected to pump until unit has been set per instructions and grouted in.

1. Support piping close to, but independently of pump.
2. Keep piping as straight as possible, with few or no bends and fittings.
3. Remove burrs, sharp edges, ream pipe cuts, and make joints air tight.
4. Do not "spring" pipes to make connection. Strain must not be transmitted to pump.

4.1.4 Suction pipe

1. The suction pipe should be as short as possible, containing a minimum number of fittings. It should be so arranged that one section may be readily removed to allow the dismantling of the suction half casing. Victaulic or similar type couplings are recommended for this section of the pipe to facilitate dismantling. The suction pipe should slope upwards to the pump nozzle.
2. Suction line inlet in the sump must be flooded at all times, even if it necessary to install the pumps so that a suction lift is involved. The pump must never be throttled by the use of a valve on the suction side of the pump. It is advisable to have a shut-off valve in the suction line so that the pump can be isolated while repairs are being made, but this valve should never be used to control the capacity of the pump by throttling.

4.1.5 Discharge pipe

On long horizontal runs, it is desirable to maintain as even a grade as feasible. Avoid high spots, such as loops, which will collect air and throttle the system or lead to erratic pumping or surging.

5 Commissioning, Startup, Operation, and Shutdown

5.1 Preparation for startup



WARNING:

- Risk of serious physical injury or death. Exceeding any of the pump operating limits (e.g. - pressure, temperature, power, etc.) could result in equipment failure, such as explosion, seizure, or breach of containment. Assure that the system operating conditions are within the capabilities of the pump.
 - Risk of death or serious injury. Leaking fluid can cause fire and/or burns. Ensure all openings are sealed prior to filling the pump.
 - Breach of containment can cause fire, burns, and other serious injury. Failure to follow these precautions before starting the unit may lead to dangerous operating conditions, equipment failure, and breach of containment.
 - Risk of explosion and serious physical injury. Do not operate pump with blocked system piping or with suction or discharge valves closed. This can result in rapid heating and vaporization of pumpage.
 - Risk of breach of containment and equipment damage. Ensure the pump operates only between minimum and maximum rated flows. Operation outside of these limits can cause high vibration, mechanical seal and/or shaft failure, and/or loss of prime.
-



WARNING:

- 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.
 - 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.
-

Precautions



WARNING:

The mechanical seal used in an Ex-classified environment must be properly certified.



CAUTION:

When a cartridge mechanical seal is used, ensure that the set screws in the seal locking ring are tightened and that the centering clips have been removed prior to startup. This prevents seal or shaft sleeve damage by ensuring that the seal is properly installed and centered on the sleeve.

NOTICE:

- Verify the driver settings before you start any pump. Refer to the applicable drive equipment IOMs and operating procedures.
-

NOTICE:

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.
-

5.2 Check the rotation



WARNING:

- Starting the pump in reverse rotation can result in the contact of metal parts, heat generation, and breach of containment. Ensure correct driver settings prior to starting any pump.
 - 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.
-

1. Disconnect the coupling from the driver or the belts from the drive. Make sure no parts are loose.
2. Lock out power to the driver.
3. Reinstall the coupling or the belts.
4. Reinstall the coupling or belt drive guard.

5.3 Lubricate the bearings



CAUTION:

Risk of bearings overheating and failing.

- Do not over oil the bearings.
 - The maximum operating temperature for ball bearings is 82°C | 180°F.
 - If the temperature of the bearing frame exceeds 82°C | 180°F (measured by thermometer), shut down the pump to determine the cause.
 - Do not mix oils from different suppliers.
-

All horizontal SRL, SRL-C, and SRL-XT pumps have anti-friction bearings that must be lubricated with oil before you start the pump.

1. Flush the cylinder or frame liner with oil in order to remove any grit or dirt that might have entered the bearing housing during shipment or installation.
2. Refill with the proper lubricating oil until it reaches the line on the oil sight glass.
For more information, refer to Lubricating oil requirements and Oil volumes sections.
3. On the bearing cover, use the grease fitting in order to fill the cavity with grease.
This seals the cover and prevents foreign matter from entering the bearing housing. For information about the correct grease to use for the seal, see Grease seal requirements.

5.3.1 Lubricating oil requirements

It is the responsibility of the oil vendor to supply a suitable lubricant. Make sure that the oil has these qualities:

- Well-refined, premium to heavy duty type (API)
- Filtered mineral oil with non-foaming characteristics
- Free from water, sediment, resin, soaps, acid, and fillers of any kind
- Contains a protective agent against rust and wear

An SAE-20 to 30 grade with these characteristics is recommended:

Table 6: Oil specifications

Quality	Requirement
Saybolt viscosity at 100°F (38°C)	300 SSU to 650 SSU
Saybolt viscosity at 210°F (99°C)	50 SSU to 70 SSU
Viscosity index	90 to 100
API gravity	28 to 30
Pour point	-5°F to 25°F (-21°C to -4°C)
Flash point	430°F to 485°F (221°C to 252°C)
Additives	Rust and oxidation inhibitors

5.3.2 Oil volumes

Size	Model	Liters	Imperial quarts	US quarts
1.5x1.5-8	SRL	0.36	0.31	0.38
2x2x10	SRL	0.36	0.31	0.38
3x3x10	SRL	0.45	0.40	0.48
3x3x10	SRL-C	0.45	0.40	0.48
5x4x14	SRL-C	0.68	0.60	0.72
5x5x14	SRL	0.68	0.60	0.72
6x6x15	SRL	0.68	0.60	0.72
8x6x18	SRL-C	2.84	2.50	3.00
10x8x21	SRL-C	2.84	2.50	3.00
12x10x25	SRL-C	6.08	5.35	6.43
14x12x29	SRL-C	6.25	5.50	6.61
16x14x34	SRL-C	9.77	8.60	10.33
20x18x40	SRL-C	15.68	13.80	16.57
6x6x21	SRL-XT	2.84	2.50	3.00
8x8x25	SRL-XT	6.08	5.35	6.43

Size	Model	Liters	Imperial quarts	US quarts
10x10x28	SRL-XT	6.25	5.50	6.61
14x12x36	SRL-XT	10.11	8.90	10.69

5.3.3 Grease seal requirements

Make sure that the grease you use in order to seal the bearing housing has these characteristics:

- 30° to 300°F (-1° to 149°C) temperature range of about 1500 SSU at 100°F (38°C) (base oil viscosity)
- High quality
- Shear stability
- Controlled adhesiveness
- Rust preventive additives

5.4 Pump priming

5.4.1 Prime the pump with the suction supply above the pump

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

5.4.2 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.

5.4.3 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

5.5 Install the shaft guard - if provided



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.

Exposed rotating shaft between pump seal and bearing frame. Avoid contact and/or install proper guarding. If guarding is not provided with the pump, contact Goulds for price and availability of proper guarding.

5.6 Start the pump

1. Check the direction of the driver rotation.
SRL, SRL-C, and SRL-XT pumps are designed for clockwise rotation when you look at the pump from the drive end. The impellers are held in place by right-hand threads. Incorrect rotation of the motor can cause the impeller to unscrew and jam against the casing liner, which causes severe damage to the pump. See [5.2 Check the rotation on page 16](#).
2. Make sure the driver and driver sheaves are properly aligned, parallel, and square.
On V-belt applications, the tension of the belts should be adjusted periodically. It is very important that you tension the belts properly per the belt manufacturer's recommendations. Belts that are not tensioned sufficiently can slip and belts that are over-tensioned put undue forces on the shaft and bearings.
3. Mount the coupling or belt guard.

NOTICE:

Safety guards are mandatory for this equipment. It is the owner's responsibility to provide, and/or alter and maintain these guards in accordance with local safety code regulations.

4. Turn the shaft by hand to be sure that no solid material is impeding the impeller from rotating. This is particularly important if the pump has been idle with slurry in the casing. Solids can settle so that the shaft can not be turned by hand. If this occurs, open the casing and clear out the solids.
5. Turn on the sealing water supply to the stuffing box, per the instructions in [6.2 Stuffing box maintenance on page 22](#).
6. Slowly admit slurry into the pump, and prime the unit by flooding the entire casing.
7. If a valve is installed in the discharge line, close the valve to reduce the initial load on the motor.
8. Start the motor.
9. Open discharge valve slowly.
10. Check the stuffing box to ensure there is a slight leakage of clear water.
The gland bolts should not be much more than finger tight for proper operation.
11. Check the sump to be sure the suction pipe is flooded with slurry.

5.7 Pump operation precautions

General considerations



WARNING:

- 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.
- Risk of explosion and serious physical injury. Do not operate pump with blocked system piping or with suction or discharge valves closed. This can result in rapid heating and vaporization of pumpage.

NOTICE:

Operation at reduced capacity



WARNING:

- Risk of breach of containment and equipment damage. Excessive vibration levels can cause damage to bearings, stuffing box, seal chamber, and/or mechanical seal. Observe pump for vibration levels, bearing temperature, and excessive noise. If normal levels are exceeded, shut down and resolve.
-
-

NOTICE:

- Cavitation can cause damage to the internal surfaces of the pump. Ensure net positive suction head available ($NPSH_A$) always exceeds NPSH required ($NPSH_R$) as shown on the published performance curve of the pump.
 -
-

Operation under freezing conditions

NOTICE:

Do not expose an idle pump to freezing conditions. Drain all liquid that will freeze that is inside the pump and any auxiliary equipment. Failure to do so can cause liquid to freeze and damage the pump. Note that different liquids freeze at different temperatures. Some pump designs do not drain completely and may require flushing with a liquid that doesn't freeze.

5.8 Shut down the pump



WARNING:

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.

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

6 Maintenance

6.1 Maintenance schedule

Maintenance inspections

A maintenance schedule includes these types of inspections:

- Routine inspections
- Three-month inspections
- Annual inspections

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

Routine maintenance



WARNING:

Move equipment to a safe/non Ex environment for repairs/adjustments or use spark resistant tools and work methods.

- Lubricate the thrust bearings.
- Inspect the seal or packing, if present.

Routine inspections

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



WARNING:

Move equipment to a safe/non Ex environment for repairs/adjustments or use spark resistant tools and work methods.

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

NOTICE:

*If equipped, temperature and vibration levels can be retrieved by using your i-ALERT® monitoring sensor and app.

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.

Three-month maintenance

Drain oil and flush oil reservoir and bearings. Refill to proper level with recommended grade of lubricant

Six-month maintenance

- Check the packing and replace if necessary. Use the packing grade recommended.
- Check shaft sleeve for scoring. Scoring accelerates packing wear, so do not install new packing on scored sleeves.
- Check alignment of pump. Shim up units if necessary. If misalignment recurs frequently, inspect the entire piping system. Unbolt piping at suction and discharge flanges to see if it springs away, thereby indicating strain on the casing. Inspect all piping supports for soundness and effective support of load.

Annual maintenance

- Remove the rotating element. Inspect thoroughly for wear, and order replacement parts if necessary.
- Remove any deposit or scaling. Clean out stuffing box piping.

6.2 Stuffing box maintenance

Arrangements

Arrangement	Service type	Availability
A	Normal	Supplied standard
B	Low dilution	Supplied upon request

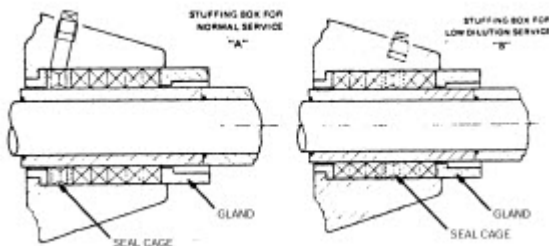


Figure 3: Stuffing box arrangements

Contaminants

You must not allow contaminants in the pumped liquid to enter the packing space. These contaminants cause:

- Severe abrasion or corrosion of the shaft sleeves
- Rapid packing deterioration
- Packing runs hot because the stuffing box flushing and lubrication system become plugged

Water requirements

- Constantly supply the stuffing box with a source of clean, clear water in order to flush and lubricate the packing.
- Supply the sealing water at about 10 psig above the discharge pressure of the pump, in quantities shown in [Table 7: Gland water requirements on page 23](#).
- When the pump is shut down, leave the sealing water on unless the casing is relieved of the discharge pressure by isolating it from the static head in the discharge pipe.
- The stuffing box should weep slightly, and only clear solution should appear at the gland.

Packing requirements

- Cut the packing into proper lengths with square ends just short of touching.
- Install the packing with staggered joints, and place each ring in position before you install the succeeding ring.
- Do not put too much tension on the gland bolts.
- The standard packing is made from resilient non-asbestos fibers encapsulated by a protective TFE coating with break-in lubricant.

Recommended packing replacement

A soft well-lubricated packing reduces stuffing box resistance and prevents excessive wear on the shaft or shaft sleeve. Many brands of packing have these desired qualities. Consider the packing in this table as typical rather than specific recommendations for replacement:

Paperpack 5801	Garlock Packing Company
#1335	John Crane Canada Inc.

6.3 Gland water requirements

Table 7: Gland water requirements

Pump size		Flow	NPT connection
SRL/SRL-C	SRL-XT	liters per minute US gallons per minute	Inches
1.5x1.5-8	-	4 1	0.375
2x2x10	-	4 1	0.375
3x3x10	-	8 2	0.375
5x4x14	-	15 4	0.375
5x5x14	-	15 4	0.375
6x6x15	-	23 6	0.375
8x6x18	-	34 9	0.375
10x8x21	6x6x21	45 12	0.375
12x10x25	8x8x25	53 14	0.50
14x12x29	10x10x28	61 16	0.50
16x14x34	14x12x36	76 20	0.75
20x18x40	—	95 25	0.75

- The values in this table are for new pumps with new parts that handle clear water at 85°F (30 C).
- The values in this table are for the high dilution arrangement ("A"). For the low dilution arrangement ("B"), reduce quantities by 50%.
- The seal water should be supplied at about 10 PSI above the discharge pressure of the pump.

- When you design the gland system, size it for 50% to 100% higher flows in order to allow for wear in the stuffing box bushing and increased flow due to fluctuations in the pressure differential between gland water systems and pump discharge pressure.

6.4 Disassembly

6.4.1 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.
-

6.4.2 Tools required

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

- Lifting eyebolt (dependent on pump / motor size)

6.4.3 Drain the pump

1. Leave the suction pipe drain valve open to drain the pump casing as much as possible.

6.4.4 Disassemble the pump for size 1.5x1.5-8 and 2x2x10-SRL

See [Figure 15: Sectional assembly 1.5x1.5-8 on page 51](#) and [Figure 16: Sectional assembly 2x2-10 on page 52](#)

1. Open the casing:
 - a) Remove a section of the suction pipe.
 - b) Disconnect the discharge pipe.
 - c) While supporting the discharge pipe and suction side casing, loosen and remove the bolts that hold the casing halves together.
 - d) Remove the suction half of the casing (100A).
 - e) Remove the suction side liner (rubber-lined, 600R) by using the jackscrew provided.
2. Remove the impeller (101):

The impeller is mounted with a right hand thread. The rotation is clockwise when viewed from the drive end.

 - a) Hold the shaft to keep it from rotating.
 - b) Hold a hardwood block against the impeller vane at the periphery and strike the block in a counterclockwise direction.
 - c) Remove the sleeve washer at the impeller hub.
3. Remove the gland side liner (rubber-lined, 600T) from the casing.

NOTICE:

For the 1.5x1.5-8 SRL, the rubber liners are integral with casing halves 100A and 100D.

4. Remove the gland (107) and slide the deflector (123) back toward the stuffing box.
5. Drain the oil from the pedestal reservoir by removing the side pipe plug.
6. Disassemble the shaft guard - if provided.
 - a) Remove the bolt for each shaft guard half that mounts the halves to each side of the frame.
 - b) Do not remove the clip that retains the bolt on the guard to maintain a captive fastener.
 - c) Retain each guard half for reinstallation.

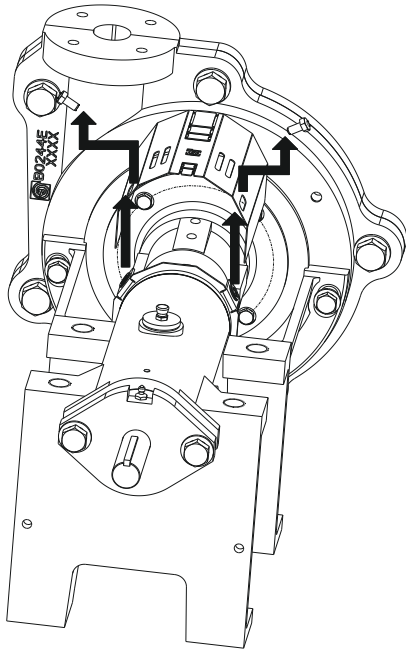


Figure 4: Shaft guard disassembly

7. Remove the shaft assembly from the pedestal:
 - a) Remove the bearing housing adjusting bolts and nuts at the outboard end.
 - b) Remove the shaft (122), bearings (112C and 168C), and bearing housing (134) from the pedestal (228) using a drift pin and hammer or a hydraulic press.
8. Remove the packing arrangement:

Note the order in which you remove parts in this arrangement. See [6.2 Stuffing box maintenance on page 22](#).

 - a) Remove the packing (106) from the casing.
 - b) Remove the half seal cage (105) and bushing (125Z).
 - c) Remove the shaft sleeves (157 and 126) by sliding them off the shaft.
 - d) Remove the O-ring (412A).
 - e) Remove the deflector (123).
9. Disassemble the shaft assembly:
 - a) Place the shaft assembly in a bench vise.
 - b) Remove the bearing retaining ring from the housing (361).
 - c) Clean the shaft.
 - d) Slide the bearing housing (134) from the outboard bearing.
 - e) Remove the O-ring (496).
 - f) Inspect the outboard bearing seal (332) and remove it if necessary.
 - g) Remove the bearing retaining ring from the shaft (122).
10. Remove the inboard and outboard bearings (168 and 112C) from the shaft using a hydraulic press or suitable bearing puller.
11. Remove the bearing cover (119B) and the accompanying gasket (360F).
12. Inspect the inboard bearing seal (333) and remove it if necessary.

6.4.5 Disassemble the midsize pump

Use these instructions if your pump is one of these sizes:

- 3x3x10 SRL (see [Figure 17: Sectional assembly 3x3-10 on page 53](#))
- 5x5x14 SRL (see [Figure 18: Sectional assembly 5x5-14 on page 54](#))
- 6x6x15 SRL (see [Figure 19: Sectional assembly 6x6-15 on page 55](#))
- 3x3x10 SRL-C (see [Figure 20: Sectional assembly 3x3-10 C on page 56](#))
- 5x4x14 SRL-C (see [Figure 21: Sectional assembly 5x5-14 C on page 57](#))
- 8x6x18 SRL-C (see [Figure 22: Sectional assembly 8x6-18 C on page 58](#))
- 10x8x21 SRL-C (see [Figure 23: Sectional assembly 10x8-21 on page 59](#))
- 6x6x21 SRL-XT (see [Figure 28: Sectional assembly 6x6-21 XT on page 64](#))

1. Open the casing:
 - a) Remove a section of the suction pipe.
 - b) Disconnect the discharge pipe.
 - c) While you support the discharge pipe and suction-side casing, loosen and remove the bolts that hold the casing halves together.
 - d) Remove the suction half of the casing (101A).
 - e) For pump sizes 8x6x18, 10x8x21 SRL-C, and 6x6x21 SRL-XT, remove the casing sideplate (600S).
 - f) Remove the suction-side liner (rubber-lined, 600R) by using the jackscrew provided.
2. Disassemble the shaft guard - if provided.

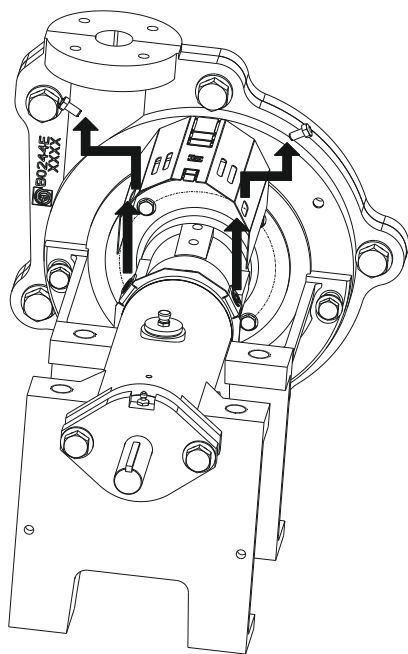


Figure 5: Shaft guard disassembly

- a) Remove the bolt for each shaft guard half that mounts the halves to each side of the frame.
 - b) Do not remove the clip that retains the bolt on the guard to maintain a captive fastener.
 - c) Retain each guard half for reinstallation.
3. Remove the impeller (101):

The impeller is mounted with a right hand thread. The rotation is clockwise when viewed from the drive end.

- a) Hold the shaft in order to keep it from rotating.
- b) Hold a hardwood block against the impeller vane at the periphery and pound on the block in a counterclockwise direction (when viewed from the impeller end).
- c) Remove the sleeve washer at the impeller hub.
4. Remove the gland side liner (rubber-lined, 600T) from the casing.
5. Remove the gland (107).
6. Remove the shaft sleeve (126) by prying it loose at the stuffing box and sliding it off the shaft.
7. For all pump sizes except 6x6x21 SRL-XT, remove the sleeve O-ring.
8. Remove the bearing cylinder assembly:
 - a) Remove both bearing cylinder straps from the top of the pedestal (228).
 - b) Remove the bottom pipe plug in order to drain the oil from the bearing cylinder (134).
 - c) Remove the adjusting screw mechanism which includes the cotter pin, castle nut, and washer from the bearing cylinder (134).
 - d) Rotate the bearing cylinder assembly so that the cylinder lug does not damage the pedestal (228) when removing the bearing cylinder assembly.
 - e) Place the bearing cylinder assembly on the workbench and, if possible, hold the cylinder in a fixed position.
9. Remove the packing (106), half seal cage (105), and waterseal bushing (125Z) from the casing.

Note the order in which parts are removed in this arrangement. Refer to Stuffing box maintenance.

Also note that 6x6x21 SRL-XT does not have a half seal cage.

10. Remove the deflector (123) from the shaft (122).
11. Remove the inboard bearing cover (119B) and the accompanying gasket (360F).
12. Inspect the bearing seal (333) and remove it if necessary.

With the sheave and key removed, the outboard bearing cover (119Z) slides off the shaft after the removal of the bolts.
13. Clean the shaft and then remove the bearing cover. Remove the accompanying gasket (412Y), inspect the bearing seal (333), and remove it if necessary.
14. Remove the shaft (122) and bearing (112C and 168C) from the bearing cylinder using a drift pin and hammer, or a hydraulic press if available.
15. Remove the bearing locknut (136) and lockwasher (382).
16. Remove the bearings by using a hydraulic press or suitable bearing puller.

6.4.6 Disassemble the large pump

Use these instructions if your pump is one of these sizes:

- 12x10x25 SRL-C (see [Figure 24: Sectional assembly 12x10-25C on page 60](#))
 - 14x12x29 SRL-C (see [Figure 25: Sectional assembly 14x12-29 C on page 61](#))
 - 16x14x34 SRL-C (see [Figure 26: Sectional assembly 16x14-34 C on page 62](#))
 - 20x18x40 SRL-C (see [Figure 27: Sectional assembly 20x18-40 C on page 63](#))
 - 8x8x25 SRL-XT (see [Figure 29: Sectional assembly 8x8-25 XT on page 65](#))
 - 10x10x28 SRL-XT (see [Figure 30: Sectional assembly 10x10-28 XT on page 66](#))
 - 14x12x36 SRL-XT (see [Figure 31: Sectional assembly 14x12-36 XT on page 67](#))
1. Open the casing:
 - a) Remove a section of the suction pipe.
 - b) Disconnect the discharge pipe.

- c) While you support the discharge pipe and suction-side casing, loosen and remove the bolts that hold the casing halves together.
 - d) Remove the suction half of the casing (100A).
 - e) Remove the suction sideplate (600S) by using a jackscrew.
 - f) Remove the suction-side liner (600R) by using a jackscrew.
2. Remove the impeller (101):
The impeller is mounted with a right hand thread. Rotation is clockwise when viewed from the drive end.

If your pump size is...	Then...
12x10x25 SRL-C, 14x12x29 SRL-C, 16x14x34 SRL-C, or 20x18x40 SRL-C	<ol style="list-style-type: none"> 1. Hold the shaft to keep it from rotating 2. Apply an adequate shock load on the impeller in a counterclockwise direction (viewed from impeller end) to unscrew it.
8x8x25 SRL-XT, 10x10x28 SRL-XT, or 14x12x36 SRL-XT	<ol style="list-style-type: none"> 1. Remove the two socket heads in order to remove the shaft sleeve nut (130). 2. Use one of the sleeve nuts as a jackscrew in the tapped hole at the crown of the nut in order to force the joints apart enough to lever one nut half clear from the shaft shoulder. 3. Remove the other half by hitting the nut with either a wooden mallet or a similar soft material in order to prevent damage to the nut half. 4. Remove the impeller from the shaft by applying a counterclockwise shock load (when viewed from the impeller end) while you also hold the shaft in order to prevent rotation.

- 3. Remove the gland (107) and then slide the shaft sleeve (157) off of the shaft.
- 4. For pump sizes 16x14x34 SRL-C and 20x18x40 SRL-C, remove the rear sideplate (600U) by using the jackscrews provided for this purpose.
- 5. Remove gland side liner (600T) by using the jackscrew provided.
- 6. Disassemble the shaft guard - if provided.

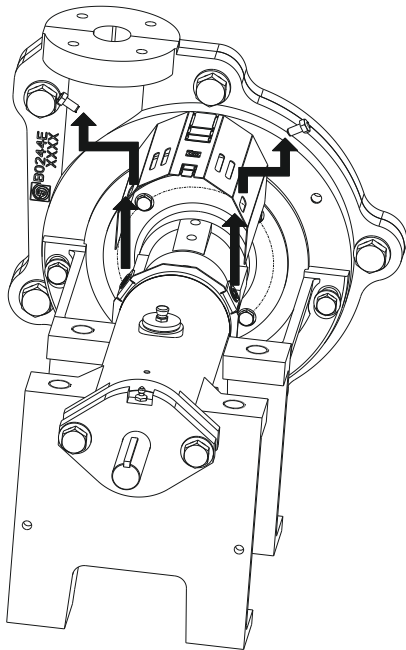


Figure 6: Shaft guard disassembly

- a) Remove the bolt for each shaft guard half that mounts the halves to each side of the frame.

- b) Do not remove the clip that retains the bolt on the guard to maintain a captive fastener.
 - c) Retain each guard half for reinstallation.
7. Remove the bearing cylinder assembly:
- a) For all pump sizes except 20x18x40 SRL-C, remove both bearing cylinder straps.
 - b) For pump size 20x18x40 SRL-C, remove the bolts that hold down the bearing cylinder.
 - c) Remove either the side or bottom pipe plug in order to drain the oil from the bearing cylinder.
 - d) Loosen the adjusting screws.
 - e) Rotate the bearing cylinder assembly so that the cylinder lugs do not damage the pedestal (228).
 - f) Place the bearing cylinder assembly on a workbench and, if possible, hold the cylinder in a fixed position.
8. Remove the packing (106) and waterseal bushing (125Z) from either the casing or stuffing box, depending on your pump size.
Note the order in which you remove the parts in this arrangement. Refer to [6.2 Stuffing box maintenance on page 22](#).
9. If necessary, remove the stuffing box (220):
Normally, the stuffing box is not removed unless the water seal bushing (125Z) needs replacement.

If your pump size is...	Then...
12x10x25 SRL-C, 14x12x29 SRL-C, 16x14x34 SRL-C, or 20x18x40 SRL-C	<ol style="list-style-type: none"> 1. Unscrew the retaining nuts and removing the tapered dowel pins. 2. Remove the O-ring (351).
8x8x25 SRL-XT, 10x10x28 SRL-XT, or 14x12x36 SRL-XT	<ol style="list-style-type: none"> 1. Unscrew the four retaining socket capscrews. 2. Use two jackscrews in the tapped holes in order to remove the stuffing box from the casing.

10. For pump size 16x14x34 SRL-C, remove the shaft sleeve nut (130).
11. Remove either the water slinger (123) or deflector (123) from the shaft, depending on your pump size.
12. Remove the inboard bearing cover (119B) and either the accompanying gasket (360F) or O-ring (412Y).
Remove the cover carefully so that you do not damage the bearing seal.
13. Inspect the bearing seal (333) and remove it if necessary.
14. Remove the outboard bearing cover (119C):
- a) With the key removed from the shaft, the outboard bearing cover (119C) slides off the shaft after you remove the bolts.
 - b) Clean the shaft before you remove the bearing cover.
 - c) Remove either the accompanying gasket or O-ring (412Y), depending on your pump size.
 - d) Inspect the bearing seal (332) and remove it if necessary.
15. Remove the shaft and bearing assemblies:
Take care not to damage the shaft surfaces.

If the pump size is...	Then...
12x10x25 SRL-C, 8x8x25 SRL-XT, 10x10x28 SRL-XT, 14x12x29 SRL-C, or 14x12x36 SRL-XT	Remove the shaft (122) and bearing (112C and 168C) from the bearing cylinder by supporting the shaft and pushing or pulling it out from the cylinder.
16x14x34 SRL-C	<ol style="list-style-type: none"> 1. Support the shaft. 2. Use the bearing housing (119C) tap holes and jack the rotating element out of the bearing cylinder.

If the pump size is...	Then...
	3. Remove the bearing housing O-ring (496).
20x18x40 SRL-C	1. Hold the bearing cylinder in a vertical position using cylinder body pads. 2. Place a shoulder type eyebolt in the end of the shaft (122) and pull out from the cylinder.

16. Remove the inboard roller bearings by using a suitable bearing puller.
17. For pump size 20x18x40 SRL-C, remove the spring retainer (443V) and springs.
18. Remove the bearing locknut (136) and lockwasher (382).
19. Remove the outboard roller bearings by using a suitable bearing puller.
20. For pump sizes 10x10x28 SRL-XT, 14x12x36 SRL-XT, and 20x18x40 SRL-C, remove the bearing spacer (443X).
21. For pump sizes 10x10x28 SRL-XT, 14x12x29 SRL-C, and 20x18x40 SRL-C, remove the thrust bearing (112C) by using a suitable bearing puller.
22. Remove these parts based on your pump size:
 - For pump sizes 10x10x28 SRL-XT and 14x12x29 SRL-C, remove the spring retainer (443V) and accompanying springs.
 - For pump size 20x18x40 SRL-C, slide the thrust bearing spacer ring off the shaft.

6.5 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.

Bearing housings

Perform these checks when you inspect the bearing housings:

- Check that the bearing housings are very clean, with no burrs.
- Remove all loose and foreign material.
- Repair or replace housings as necessary.

6.6 Reassembly

6.6.1 Reassemble the pump for size 1.5x1.5-8 and 2x2x10 SRL

Before you reassemble the unit:

- Thoroughly clean all parts.
- Maintain a clean and dust free environment when you handle the rotating element and bearings.
- Do not unwrap new bearings prior to their installation.

- New bearings are coated with a rust preventative that has good lubricating qualities. Do not remove this coating unless the bearings have become dirty while in storage.
1. Mount the bearings (112C and 168C) on the shaft (shrink fit):
 - a) Heat the bearings in hot oil at approximately 150°F (66°C) for sufficient expansion.
 - b) Mount the bearings on the shaft and make sure that the inner race of the bearings contacts the shaft shoulder.
 - c) Replace the bearing retaining ring (361).
 - d) Dry and cool the bearings to room temperature.
 2. Assemble the bearing housing:
 - a) Position the O-ring on the outside diameter of the bearing housing (134) and fit the bearing seal (332) in the bearing housing.
 - b) Slide the bearing housing over the outboard bearing (112C) and replace the bearing retaining ring (361).
 - c) Mount the bearing seal (333) in the bearing cover (119B).
 - d) Replace the gasket (360F).
 - e) Bolt the bearing cover to the pedestal (228).
 3. Assemble the shaft, bearings, and bearing housing into the pedestal:
 - a) Make sure that the deflector (123), seal cage (105), and waterseal bushing (125Z) are located on the shaft between the stuffing box and the bearing cover.
 - b) Fit the adjusting bolts and nuts at the outboard end to the bearing housing and pedestal.
 4. Install these parts on the shaft:
 - a) Install O-rings on the spacer portion of the shaft sleeve (157) and the stuffing box portion of the shaft sleeve (126).
 - b) Position the deflector (123) on the shaft sleeve (spacer).
 - c) Make sure that the deflector does not rub against the bearing cover.
 5. Assemble the shaft guard - if provided.



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.
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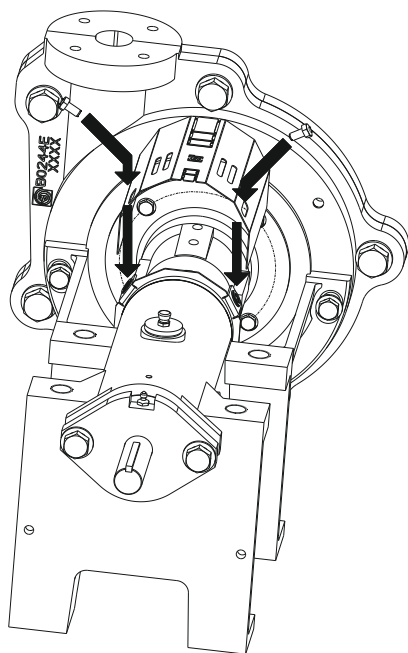


Figure 7: Shaft guard assembly

6. Install the waterseal bushing (125Z) and half seal cage (105) into the stuffing box.
7. Replace the packing (106) and the gland (107).
8. Check if the waterseal bushing is concentric with the sleeve.
9. Replace the gland-side liner (600T). Do not use excessive force on the liner stud nuts.

NOTICE:

For the 1.5x1.5-8 SRL, the rubber suction and gland liners are integral with the casing halves 100A and 100D.

10. Position the sleeve washer and the O-ring on the shaft at the shaft sleeve (126) and then tighten the impeller (101).
11. Replace the suction-side liner (600R).
Do not use excessive force on the liner stud nuts.
12. Bolt the two casing halves together and check the liner stud nuts for tightness.
13. Set the impeller clearance and secure the locking nuts.
See Adjust the impeller clearance for pump size 2x2x10 SRL.
14. Fill the pedestal reservoir with oil to the proper level and pack the bearing cover and bearing housing seals with high temperature grease through the connections that are provided.
Refer to Lubricate the bearings.
15. Reconnect the suction and discharge piping.

6.6.2 Reassemble the midrange pump

Use these instructions if your pump is one of these sizes:

- 3x3x10 SRL (see [Figure 17: Sectional assembly 3x3-10](#) on page 53)
- 5x5x14 SRL (see [Figure 18: Sectional assembly 5x5-14](#) on page 54)
- 6x6x15 SRL (see [Figure 19: Sectional assembly 6x6-15](#) on page 55)
- 3x3x10 SRL-C (see [Figure 20: Sectional assembly 3x3-10 C](#) on page 56)
- 5x4x14 SRL-C (see [Figure 21: Sectional assembly 5x5-14 C](#) on page 57)
- 8x6x18 SRL-C (see [Figure 22: Sectional assembly 8x6-18 C](#) on page 58)
- 10x8x21 SRL-C (see [Figure 23: Sectional assembly 10x8-21](#) on page 59)

- 12x10x25 SRL-C (see [Figure 24: Sectional assembly 12x10-25C on page 60](#))
- 6x6x21 SRL-XT (see [Figure 28: Sectional assembly 6x6-21 XT on page 64](#))
- 8x8x25 SRL-XT (see [Figure 29: Sectional assembly 8x8-25 XT on page 65](#))

Before you reassemble the unit:

- Thoroughly clean all parts.
 - Maintain a clean and dust free environment when you handle the rotating element and bearings.
 - Do not unwrap new bearings prior to their installation.
 - New bearings are coated with a rust preventative that has good lubricating qualities. Do not remove this coating unless the bearings have become dirty while in storage.
1. Mount the bearings (112C and 168C) on the shaft (shrink fit):
 - a) Heat them in hot oil at approximately 150°F (66°C) for sufficient expansion.
 - b) Make sure that the inner race of the bearings contacts the shaft shoulder.
 - c) Dry and cool the bearings to room temperature.
 2. Assemble the locknut (136) and lockwasher (382).
 3. Assemble the shaft and bearings into the cylinder or frame liner (134).
You can do this either horizontally or vertically.
 - a) Make sure that the outer race of the inboard bearing (168C) is parallel and square to the shaft during assembly.
 - b) Hold the shaft securely while you guide it into the cylinder and take care not to damage the shaft surfaces.
 4. Mount the seals (332 and 333) into the bearing covers (119C and 119B) and replace the gaskets (360F and 412Y).
 5. Bolt the covers to the bearing cylinder (134C).
 6. Install the deflector (123).
 7. For all sizes except 12x10x25 SRL-C and 8x8x25 SRL-XT, install the water seal bushing (125Z) and half seal cage (105) into the stuffing box.
Note that 6x6x21 SRL-XT does not have a half seal cage.
 8. For 12x10x25 SRL-C and 8x8x25 SRL-XT, install the stuffing box if it was removed:

If your pump size is...	Then...
12x10x25 SRL-C	<ol style="list-style-type: none"> 1. Install the stuffing box (220) with O-ring (351). 2. Replace the taper dowels. 3. Install the water seal bushing (125Z).
8x8x25 SRL-XT	<ol style="list-style-type: none"> 1. Install the stuffing box (184). 2. Install the water seal bushing (125Z). 3. Mount the stuffing box in the gland half casing (100D), using two straight dowels to locate the stuffing box.

9. Place either the bearing cylinder or frame liner on the pedestal (228) and bolt the bearing cylinder straps into place.
Leave the bolts slightly loose for later adjustment.
10. Assemble the shaft sleeve, based on your pump size:

If your pump size is...	Then...
All sizes except 12x10x25 SRL-C and 8x8x25 SRL-XT	<ol style="list-style-type: none"> 1. Reassemble the adjusting screw mechanism. 2. Mount the shaft sleeve (126). 3. Replace the packing (106) and gland (107). 4. Check if the waterseal bushing (125Z) is concentric with the sleeve. 5. Replace the gland side liner (600T).

If your pump size is...	Then...
	Do not use excessive force on the liner stud nuts.
12x10x25 SRL-C	<ol style="list-style-type: none"> 1. Install the gland side liner (600T). 2. Mount the shaft sleeve (126). 3. Replace the packing (106) and gland (107).
8x8x25 SRL-XT	<ol style="list-style-type: none"> 1. Install the gland side liner (600T). 2. Reassemble the sleeve nut (149) and mount it against the shaft shoulder. 3. Mount the shaft sleeve (126). 4. Replace the packing (106) and gland (107).

11. For pump sizes 3x3x10 SRL, 5x5x14 SRL, 6x6x15 SRL, 3x3x10 SRL-C, and 5x4x4 SRL-C, locate the sleeve washer (199) and O-ring on the shaft at the shaft sleeve (126).
12. Assemble the shaft guard - if provided.



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.

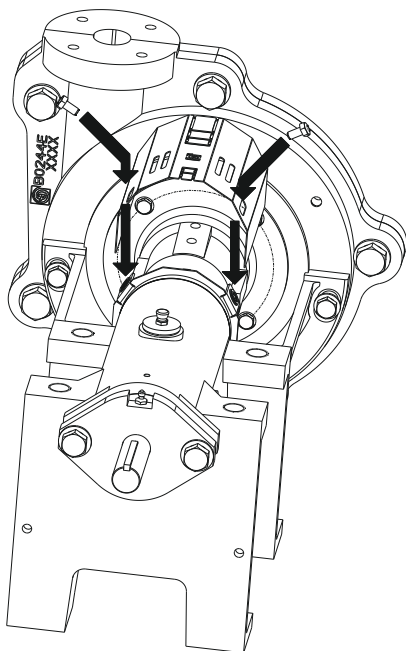


Figure 8: Shaft guard assembly

13. Tighten the impeller (101).
14. Replace the suction side liner (600R), based on your pump size:

If your pump size is...	Then...
All sizes except 8x8x25 SRL-XT	Replace the suction side liner and then the suction sideplate. Do not use excessive force on liner stud nuts or casing sideplate stud nuts.
8x8x25 SRL-XT	<ol style="list-style-type: none"> 1. Replace the suction side liner (600R) and replace the retaining studs. Finger tighten. 2. Replace the suction cover (182) complete with suction sideplate (600S). 3. Secure the cover to the casing and tighten the side liner and sideplate retaining stud nuts.

15. Assemble the casing halves:
 - a) Bolt the two casing halves together.
 - b) Check the liner stud nuts and the casing sideplate stud nuts for tightness.
 - c) Set the impeller clearance.
See Adjust the impeller clearance for all pump sizes except 2x2x10 SRL.
 - d) Secure all bolts on the bearing cylinder straps.
 - e) For all sizes except 12x10x25 SRL-C, reconnect the suction and discharge piping.
16. Lubricate the pump, based on your pump size:

If your pump size is...	Then...
All sizes except 12x10x25 SRL-C and 8x8x25 SRL-XT	<ol style="list-style-type: none"> 1. Fill the cylinder or frame liner with oil to the proper level. 2. Pack both bearing cover seals with high temperature grease through the grease connections provided.
12x10x25 SRL-C or 8x8x25 SRL-XT	<ol style="list-style-type: none"> 1. Fill the bearing cylinder with oil using the oil cap (360I) to the proper level (see the sight glass). The cylinder must be horizontal and level so that both sight glass oil readings are identical. 2. Pack both bearing cover seals with high temperature grease through the grease fittings.

6.6.3 Reassemble the pump for sizes 14x12x29 SRL-C, 20x18x40 SRL-C, 10x10x28 SRL-XT, and 14x12x36 SRL-XT

Before you reassemble the unit:

- Thoroughly clean all parts.
 - Maintain a clean and dust free environment when you handle the rotating element and bearings.
 - Do not unwrap new bearings prior to their installation.
 - New bearings are coated with a rust preventative that has good lubricating qualities. Do not remove this coating unless the bearings have become dirty while in storage.
1. Mount the inboard roller bearing (168C) on the shaft (shrink fit) by first heating it in hot oil at approximately 150°F (66°C) for sufficient expansion.
Make sure that the inner race of the bearing contacts the shaft shoulder. Allow the bearings to dry and cool to room temperature.
 2. Install the spring retainer on the shaft:

If your pump size is...	Then...
14x12x29 SRL-C, 20x18x40 SRL-C, or 10x10x28 SRL-XT	Place the spring retainer (443V) on the shaft.
14x12x36 SRL-XT	Place the spring retainer (443V) on the shaft and the outer race of the thrust bearing.

3. Assemble the shaft:
 - a) Mount the thrust bearing spacer ring (443X) on the shaft (122) so that it contacts the shoulder.
 - b) Mount the thrust bearing (112V) on the shaft (shrink fit) by heating it in hot oil at approximately 150°F (66°C) for sufficient expansion.
Make sure that the inner race of the bearing contacts the spacer ring.
 - c) Allow the bearings to cool to room temperature.
4. Mount the bearings:
 - a) Mount the bearing spacer (443X) with the largest diameter adjacent to the thrust bearing.
 - b) Mount the outboard roller bearing (112C) on the shaft using the same method as the thrust bearing (112D).
The inner race of the bearing must contact the spacer.
 - c) Mount the lockwasher (382) and locknut (136).
5. Install the shaft and bearings into the cylinder (5-084-0):

If your pump size is...	Then...
14x12x29 SRL-C or 10x10x28 SRL-XT	<ol style="list-style-type: none"> 1. Place springs into the spring retainer (443V) and align the retainer with the outer race of the thrust bearing (112D) so that both enter the bearing cylinder bore. 2. Make sure that the inboard bearing (168C) outer race is parallel and square to the shaft at assembly. 3. Put the shaft and bearings into the cylinder.
20x18x40 SRL-C or 14x12x36 SRL-XT	<ol style="list-style-type: none"> 1. Hold the bearing cylinder and shaft securely in a vertical position. 2. Lower the shaft in the cylinder and make sure that the outer race of the inboard bearing (168C) is parallel and square to the shaft during assembly. 3. Place the springs in the spring retainer (443V) and fit them into the cylinder bore while you make sure that the outer race of the thrust bearing (168C) is adjacent to the retainer. 4. Place the shaft and bearings into the cylinder.

6. Install the bearing seal (332):
 - a) Assemble the bearing seal (333) and O-ring (360F) in the cover (119B) and mount them to the bearing cylinder (134C).
 - b) Tighten the screws.
 - c) Use the hole on top of the bearing cylinder to verify that there is an axial clearance of 0.004 to 0.015 in. (0.010 to 0.038 cm) between the outer race of the thrust bearing (112D) and the spring retainer (443V).
 - d) Mount the bearing seal (332) and O-ring (412Y) in the cover (119C) and bolt them to the bearing cylinder.
 - e) Mount these parts:
 - For pump sizes 14x12x29 SRL-C and 20x18x40 SRL-C, mount the water slinger (123).
7. If necessary, install the stuffing box (184):

If your pump size is...	Then...
14x12x29 SRL-C or 20x18x40 SRL-C	<ol style="list-style-type: none"> 1. Install the stuffing box (184) with O-ring (360F). 2. Replace the taper dowels. 3. Install the water seal bushing (125Z).
10x10x28 SRL-XT or 14x12x36 SRL-XT	<ol style="list-style-type: none"> 1. Reinstall the stuffing box (184) if it was removed from the casing. 2. Install the water seal bushing (125Z). 3. Mount the stuffing box in the gland half of the casing (100D) using two straight dowels to locate the stuffing box.

8. Place the bearing cylinder (134C) on the pedestal (228) and bolt the straps into place. Leave the bolts slightly loose for later adjustment.
9. Install the gland side liner (600T).
10. For pump sizes 10x10x28 SRL-XT and 14x12x36 SRL-XT, reassemble the sleeve nut (149) and mount it against the shaft shoulder.
11. For pump size 20x18x40 SRL-C, mount the rear sideplate (600U).
12. Mount the shaft sleeve (126) and replace the packing (106) and gland (107).
13. Assemble the shaft guard - if provided.



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.

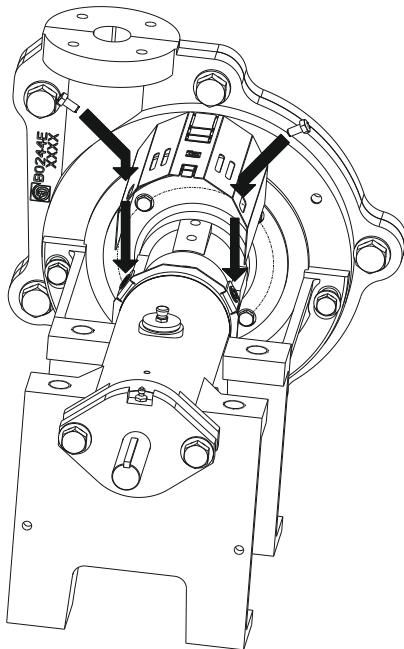


Figure 9: Shaft guard assembly

14. Tighten the impeller (101).
15. Connect the two casing halves:

If your pump size is...	Then...
14x12x29 SRL-C and 20x18x40 SRL-C	<ol style="list-style-type: none"> 1. Replace the suction side liner (600R) and then the suction sideplate (600S). 2. Bolt the two casing halves together. 3. Check the sideplate stud nuts for tightness.

If your pump size is...	Then...
10x10x28 SRL-XT and 14x12x36 SRL-XT	<ol style="list-style-type: none"> 1. Replace the suction side liner (600R) and the retaining studs. Finger tighten. 2. Replace the suction cover (182) complete with the suction sideplate (600S). 3. Secure the cover to the casing and tighten the side liner and sideplate retaining stud nuts. 4. Bolt the casing halves together and then recheck the nuts for tightness.

16. Establish the impeller clearance, secure all bolts on the bearing cylinder straps, and secure the adjusting screws.
17. Reconnect the suction and discharge piping.
18. Lubricate the bearing cylinder and bearing cover seals:
 - a) Fill the bearing cylinder with oil using the oil cap (360I) to the proper level (see the sight glass). The cylinder must be horizontal and level so that both sight glass oil readings are identical.
 - b) Pack both bearing cover seals with high temperature grease through the grease fittings.

6.6.4 Reassemble the pump for size 16x14x34 SRL-C and 20x18-40

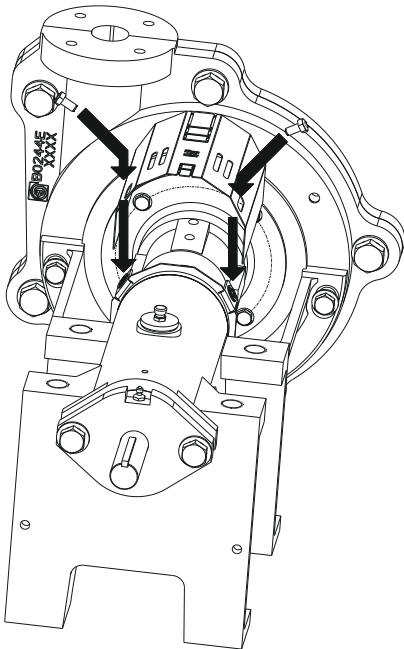
Before you reassemble the unit:

- Thoroughly clean all parts.
 - Maintain a clean and dust free environment when you handle the rotating element and bearings.
 - Do not unwrap new bearings prior to their installation.
 - New bearings are coated with a rust preventative that has good lubricating qualities. Do not remove this coating unless the bearings have become dirty while in storage.
1. Mount the thrust bearings on the shaft:
 - a) Mount the thrust bearing spacer ring on the shaft (443V) and contact shoulder.
 - b) Mount thrust bearing (112V) on shaft (shrink fit) by first heating it in hot oil at approximately 150° F (66° C) for sufficient expansion.
 - c) The inner race of the bearing must contact the spacer ring.
 - d) Dry and cool the bearing to room temperature.
 2. Mount the withdrawal sleeve:
 - a) Mount the bearing spacer with the largest diameter adjacent to the thrust bearing.
 - b) Place the withdrawal sleeve (130) and the outboard roller bearing (112C) on the shaft. The inner race of the bearing must contact the spacer.
 - c) Mount the lockwasher (382) and locknut (136).
 - d) Use the locknut in order to drive the withdrawal sleeve in the outboard roller bearing so that the thrust bearing total clearance between the rollers and the outer race is set at 0.005 to 0.007 in. (0.013 to 0.018 cm).
Note that a withdrawal sleeve movement of 0.015 in. (0.038 cm) reduces the radial clearance of the thrust bearing by 0.001 in. (0.003 cm).
 - e) Lock in the proper clearance position.
 3. Install the bearing housing:
 - a) Place the four springs in the bearing housing (443X) and slide the housing on the shaft and over the bearings.
 - b) Assemble the bearing seal (332) and O-ring (496) in the cover (119C) and mount them to the bearing housing using the three tapped holes in the housing.
 - c) Tighten the screws until you have an axial clearance of 0.005 to 0.030 in. (0.013 to 0.076 cm) between the outer race of the thrust bearing and the bearing housing.
Check this clearance by using the cored hole for the oil return at the bottom of the housing.

- d) Mount the oil slinger (248).
4. Mount the inboard roller bearing (168C) on the shaft (shrink fit) by heating it in hot oil at approximately 150°F (66°C) for sufficient expansion. The inner race of bearing must contact shaft shoulder. Dry and cool the bearing to room temperature.
5. Install the shaft and bearings into the bearing cylinder:
 - a) Mount the O-ring (496) on the housing.
 - b) Assemble the shaft and bearings into the bearing cylinder (134C) by holding the shaft securely and taking care not to damage the shaft surfaces. You can do this either horizontally or vertically. Make sure that the outer race of the inboard bearing (168C) is parallel and square to the shaft.
6. Assemble the shaft guard - if provided.

**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.

**Figure 10: Shaft guard assembly**

7. Bolt the bearing housing and cover assembly (119C) and (134) to the bearing cylinder (134C).
8. Mount the bearing seal (332) in the cover (119C) and use the gasket (412Y) to bolt the bearing cover to the bearing cylinder.
9. Mount the water slinger (123) and install the shaft sleeve nut (130).
10. If required, install the stuffing box (220) with the O-ring (351).

11. Replace the taper dowels and install the water seal bushing (125Z).
12. Position the bearing cylinder (134) on the pedestal (228) and bolt the straps into place. Leave the bolts slightly loose for later adjustment.
13. Install the gland side liner (600T) and the rear sideplate (600U). Then mount the shaft sleeve (126) and replace the packing (106) and gland (107).
14. Assemble the casing:
 - a) Install the impeller (101).
 - b) Tighten the shaft sleeve nut (130).
 - c) Replace the suction side liner (600R) and the suction sideplate (600S).
 - d) Bolt the two casing halves together.
 - e) Check the sideplate stud nuts for tightness.
 - f) Set the impeller clearance.
See Adjust the impeller clearance for all pump sizes except 2x2x10 SRL.
 - g) Secure the bolts on the bearing cylinder straps and secure the adjusting screws.
15. Reconnect the suction and discharge piping.
16. Lubricate the pump:
 - a) Fill the bearing cylinder with oil using the oil cap (360I).
Use the sight glass to determine the proper level. The cylinder must be horizontal and level so that both sight glass oil readings are identical.
 - b) Pack both bearing cover seals with a high temperature grease through the grease fittings on each end cover.

6.7 Adjust the impeller clearance for pump size 1.5x1.5-8 and 2x2x10 SRL

1. Adjust the impeller clearance by means of the adjusting bolt and nut located at the outboard end.
2. Move the bearing assembly forward until the impeller touches the suction side liner.
This is tested when you rotate the shaft by hand.
3. Bring the bearing assembly back 0.06 in. (0.15 cm) so that the impeller does not rub on the suction liner.
4. Check the rotating element by hand for freedom of rotation.
5. Tighten the locking nut on the adjusting bolt.
If you periodically make this adjustment, depending on the rate of wear, you can maintain the original pump efficiency.

6.8 Adjust the impeller clearance for all pump sizes except 1.5x1.5-8 and 2x2x10 SRL

1. Loosen the bolts that fasten down the bearing cylinder or frame liner straps.
2. Use the adjusting screw in order to move the bearing cylinder forward until the impeller touches the suction side liner or suction sideplate.
Rotate the shaft by hand in order to test this.
3. Bring the bearing cylinder or frame liner back according to the measurements in this table so that the impeller does not rub on the suction liner:

Pump size	Measurement
3x3x10 SRL	0.03 in. (0.076 cm)
5x5x14 SRL	

Pump size	Measurement
6x6x15 SRL	0.03 in. (0.076 cm)
5x4x14 SRL-C	
8x6x18 SRL-C	
10x8x21 SRL-C	
12x10x25 SRL-C	0.04 in. (0.10 cm)
14x12x29 SRL-C	
16x14x34 SRL-C	
20x18x40 SRL-C	
6x6x21 SRL-XT	0.05 in. (0.13 cm)
8x8x25 SRL-XT	
10x10x28 SRL-XT	
14x12x36 SRL-XT	

4. Check the rotating element by hand for freedom of rotation.
5. Retighten the bearing cylinder straps.
If you periodically make this adjustment, depending on the rate of wear, you can maintain the original pump efficiency.

6.9 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-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. Slightly spread the opening of the coupling guard half and place it over the pump end plate. The annular groove in the guard will be located around the end plate. Then, position the opening (flange) so that it does not interfere with the piping but still allows for access when you install the bolts.
4. Place one washer over the bolt and insert the bolt through the round hole at the front end of the guard half.
5. Install the bolt retainer over the exposed end of the bolt, and the U-Nut into the slot in the coupling guard if it was not done from the factory.
6. Thread bolt into the U-Nut and tighten firmly.
7. Slightly spread the opening of the remaining coupling guard half and place it over the installed coupling guard half so that the annular groove in the remaining coupling guard half faces the motor.
8. Place the end plate over the driver shaft and locate the end plate in the annular groove at the rear of the coupling guard half.
9. Repeat Steps 4 through 6 for the rear end of the coupling guard half. The hole is located on the driver-side of the coupling guard half.
10. Slide the driver-half of the coupling guard towards the motor so that the coupling guard completely covers the shafts and coupling.
11. Repeat Steps 4 through 6 for the center slots in the coupling guard.
12. Tighten all nuts on the guard assembly.

6.10 Rigid rubber liner assembly

Suction and gland side liners for pump sizes 12x10x25 SRL-C, 14x12x29 SRL-C, 16x14x34 SRL-C, and 20x18x40 SRL-C were redesigned in 1997 to be rigid. These rigid liners do not require bonding as outlined in previous manuals. The fasteners that hold the liners in have been eliminated. The exception is

the gland side liners on the 12x10x25 SRL-C and 14x12x29 SRL-C which now require only four studs instead of 10 (Figure 12: Gland side liner without rear side plate on page 44).

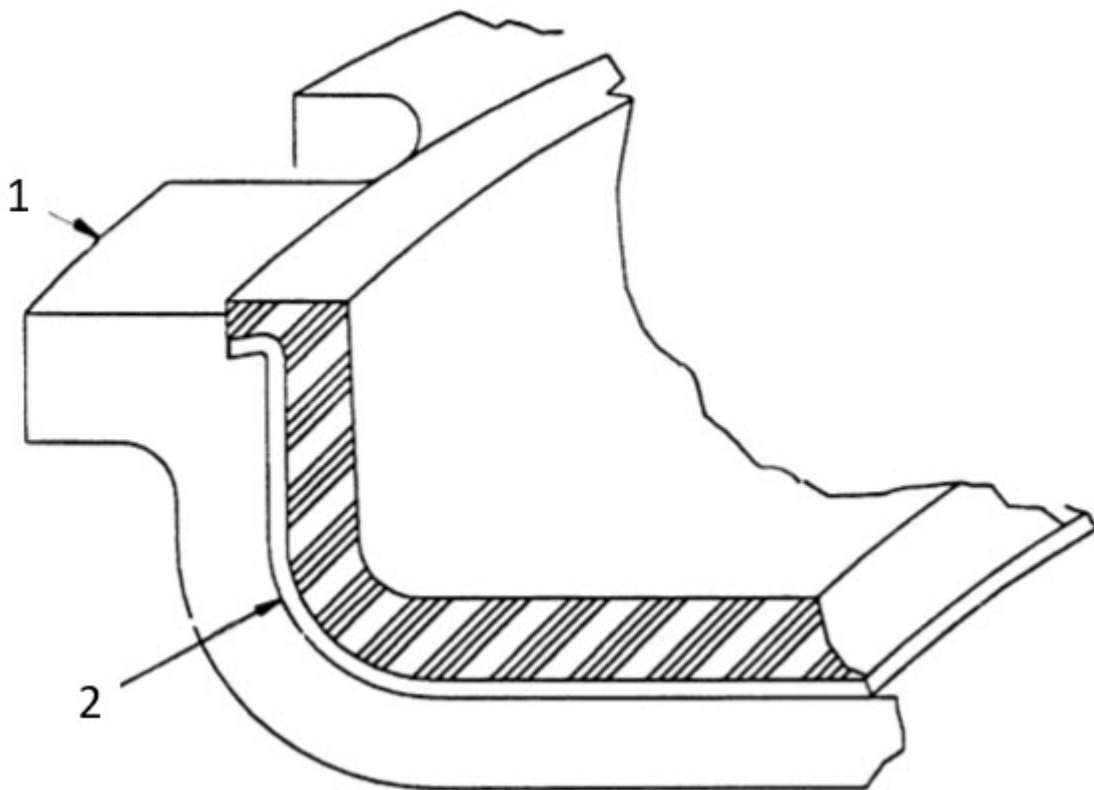
Apply an anti-seize compound to these four studs on the gland side liners and apply torque as specified in Figure 12: Gland side liner without rear side plate on page 44. Sideplate torque specifications and a comparison of fasteners required on rigid liners versus previous design shown in Figure 13: Gland side liner with rear sideplate on page 45 and Figure 14: Suction side liner with suction sideplate on page 46.

Due to the rigid nature of the casing liners and assembly of these parts, it may be necessary to make some modifications to the liners to assure proper fitment.

Assembly of these large parts should be made on a flat, Horizontal surface to assure the liners fit evenly in the casing. Assemble the volute liner first into its casing half and leave the bolting hardware loose. Assemble the Gland wear plate or Suction wear plate and center it in the volute liner assembly to assure even compression.

Tighten the wear plate casing hardware bolting first, then tighten the volute liner hardware. This will assure even compression and maintain concentricity between the parts.

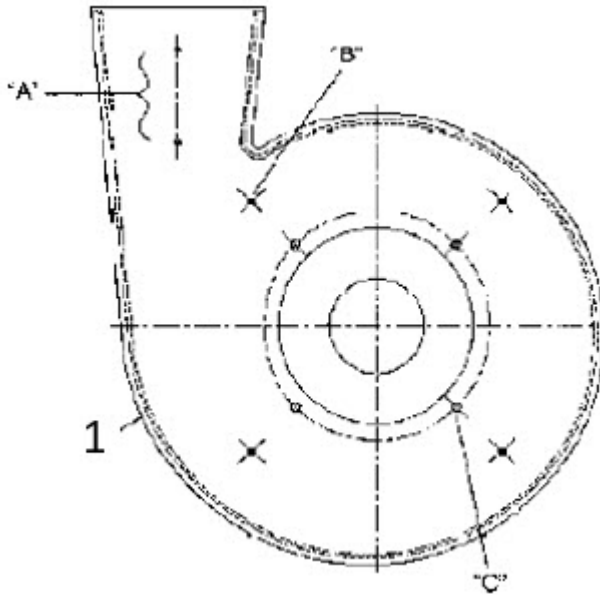
Test fit the sleeve into the gland assembly. If the sleeve fit through the liner is too tight, trim the rubber liner through the bore using a low speed rotary tool or rotary rasp tool.



1. Casing
2. Rigid liner

Figure 11: Liner assembly

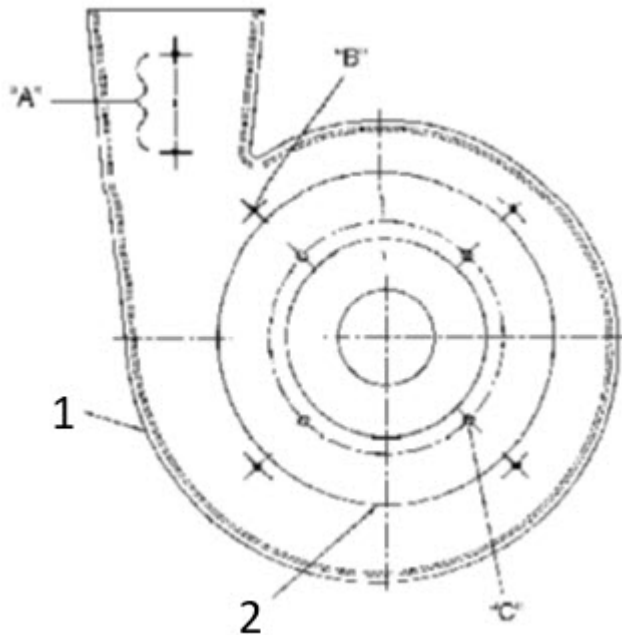
Gland side liner without rear sideplate



1. Gland side liner (no rear side plate required)

Figure 12: Gland side liner without rear side plate

Pump size	"A"	"B"	"C"	Torque limit in ft-lbs (Nm)
12x10x25 SRL-C	—	—	Four (4) 0.750-10 UNC	30 (41)
14x12x29 SRL-C	—	—	Four (4) 0.875-9 UNC	35 (47)

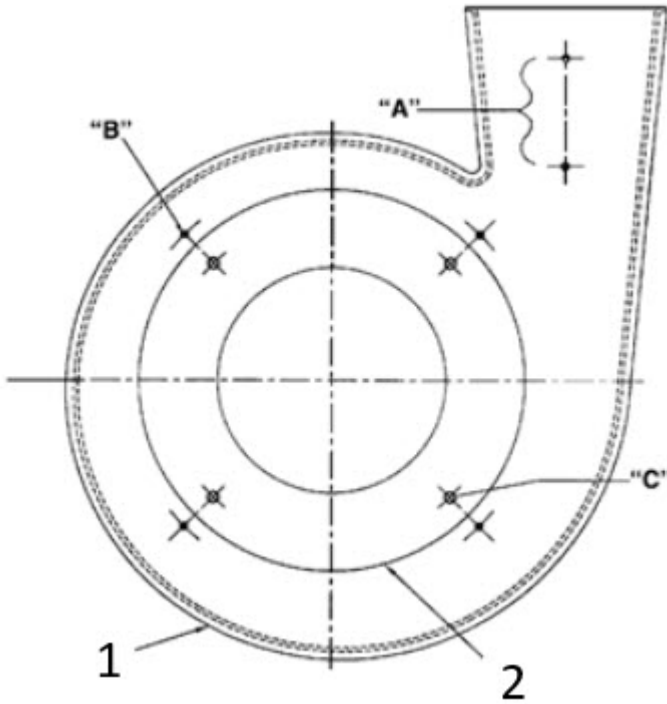
Gland side liner with rear sideplate

1. Gland side liner
2. Rear sideplate

Figure 13: Gland side liner with rear sideplate

Pump size	"A"	"B"	"C" (rear sideplate)	Torque limit in ft-lbs (Nm)
16x14x34 SRL-C	Two (2) 0.500-13 UNC	Four (4) 0.500-13 UNC	Four (4) 1.000-8 UNC	<ul style="list-style-type: none"> • 30 (41) for A and B • 175 (237) for C
20x18x40 SRL-C	Two (2) 0.750-10 UNC	Eight (8) 0.750-10 UNC	Four (4) 1.000-8 UNC	<ul style="list-style-type: none"> • 30 (41) for A and B • 175 (237) for C

Suction side liner with suction sideplate



1. Suction side liner
2. Suction sideplate

Figure 14: Suction side liner with suction sideplate

Pump size	"A"	"B"	"C" (suction sideplate)	Torque limit in ft-lbs (Nm)
12x10x25 SRL-C	—	—	Four (4) 0.750-10 UNC	100 (136)
14x12x29 SRL-C	—	—	Four (4) 0.875-9 UNC	120 (163)
16x14x34 SRL-C	Two (2) 0.500-13 UNC	Four (4) 0.500-13 UNC	Four (4) 1.000-8 UNC	<ul style="list-style-type: none"> • 30 (41) for A and B • 175 (237) for C
20x18x40 SRL-C	Two (2) 0.750-10 UNC	Eight (8) 0.750-10 UNC	Four (4) 1.000-8 UNC	<ul style="list-style-type: none"> • 30 (41) for A and B • 175 (237) for C

6.11 Spare parts

Light duty

For mildly abrasive particles, one seal/gasket set is recommended.

Medium duty

For light slurries of up to 1.2 SG with moderately abrasive materials, these are the recommended spare parts:

- One impeller
- One gland liner
- One suction liner
- One seal/gasket set

- One set of bearings

Heavy duty

For slurries over 1.2 SG with highly abrasive materials, these are the recommended spare parts:

- One impeller
- One gland liner
- One suction liner
- Three seal/gasket sets
- One shaft/bearing assembly

Severe duty

For key process equipment and/or heavy slurries over 1.2 SG with high heads and highly abrasive particles, these are the recommended spare parts:

- Two impellers
- Two gland liners
- Two suction liners
- Three seal/gasket sets
- One spare pump

7 Troubleshooting

7.1 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.

7.2 Assembly troubleshooting

7.3 Operation troubleshooting

Symptom	Cause	Remedy
There is either not enough or no liquid being delivered to the pump.	There is not enough prime.	Completely fill the pump and suction with slurry and then check for vapor bind.
	The speed is too low.	Verify that the motor is wired correctly and that it is receiving full voltage across each phase. If the frequency is too low, the motor might have an open phase. Also check the V-belt tension and sheave diameters.
	The discharge head is too high.	Check the pipe for friction losses. A larger pipe might correct this condition. Check to see if the valves are wide open.
	The suction lift is too high.	Check the pipe for friction losses because the static lift might be too great. Measure this with a mercury column or vacuum gauge while the pump operates. If the static lift is too high, you must either raise the liquid to be pumped or lower the pump.
	The impeller is either completely or partially plugged.	Dismantle the pump and clean the impeller.
	There is an obstruction at the inlet.	Check for and then remove any obstructions.
	The packing is defective.	Replace the packing and sleeve if they are badly worn.
There is not enough pressure.	The speed is too low.	Verify that the motor is wired correctly and that it is receiving full voltage across each phase. If the frequency is too low, the motor might have an open phase. Also check the V-belt tension and sheave diameters.
	There is an obstruction in the liquid passages.	Dismantle the pump and inspect the passages of the impeller and casing. Remove any obstructions.
The pump is not operating consistently.	There is not enough prime.	Free the pump, pipes, and valves of all air. If high points in the suction line prevent this, they need to be corrected.
	The suction lift is too high.	Check the pipe for friction losses because the static lift might be too great. Measure this with a mercury column or vacuum gauge while the pump operates. If the static

Symptom	Cause	Remedy
		lift is too high, you must either raise the liquid to be pumped or lower the pump.
	The casing is distorted by excessive strains from the suction or discharge piping.	Examine the pump for rubbing between the impeller and casing. Replace any damaged parts.
	The stuffing box is too tight.	Release the gland pressure. If sealing water does not flow while the pump operates, replace the packing. Check the shaft or shaft sleeve for scoring, and replace the packing if necessary. Always have slight leaks from the packed stuffing box.
	The shaft is bent due to thermal distortion, damage during overhauling, or improper assembly of rotating element.	Check the runout by turning between the lathe centers. Total runout should not exceed 0.002 in. (0.005 cm) on all pumps.
	There is a mechanical failure of critical pump parts.	Check the bearings and the impeller for damage. Any irregularity in these parts causes a drag on the shaft.
Motor overloads	The liquid is heavier, in specific gravity, than what is allowed.	Use a larger driver. Consult ITT for the recommended size. Test the liquid for specific gravity.
	The speed may be too high (brake HP of the pump varies as the cube of the speed). Therefore, any increase in speed means a considerable increase in power demand.	Check the voltage on the motor.

8 Parts List and Cross-Sectionals

8.1 Parts list

Item number	Description
100A	Casing, suction half
100D	Casing, gland half
101	Impeller, open
105	Half seal cage
106	Packing
107	Gland
112C	Roller bearing, outboard
112D	Thrust bearing
113A	Oil fill plug
119B	Bearing cover, inboard
119C	Bearing cover, outboard
122	Shaft
123	Deflector/water slinger
125Z	Water seal bushing
126	Shaft sleeve, stuffing box
130	Shaft sleeve nut
134	Bearing housing
134A	Oil filler cap with vent
134C	Bearing cylinder
136	Bearing locknut
149	Release collar
157	Shaft sleeve, spacer
168C	Roller bearing, inboard
182	Suction cover
184	Stuffing box
199	Waterseal bushing
228	Pedestal / cylinder strip
248	Oil slinger
251	Oil level sight glass
332	Bearing seal, outboard
333	Bearing seal
351	Stuffing box O-ring
360F	Bearing cover gasket, inboard
360I	O-ring bearing cover
382	Bearing lockwasher
412A	O-ring
412Y	Bearing cover gasket, outboard
443V	Spring retainer/spacer
496	O-ring bearing cover, outboard
600R	Suction side liner

Item number	Description
600S	Casing/suction sideplate
600T	Gland side liner
600U	Rear sideplate
not shown	Grease fitting - one on each end, threaded into 134 and 119B

8.2 Sectional assemblies

Sectional assembly 1.5x1.5-8

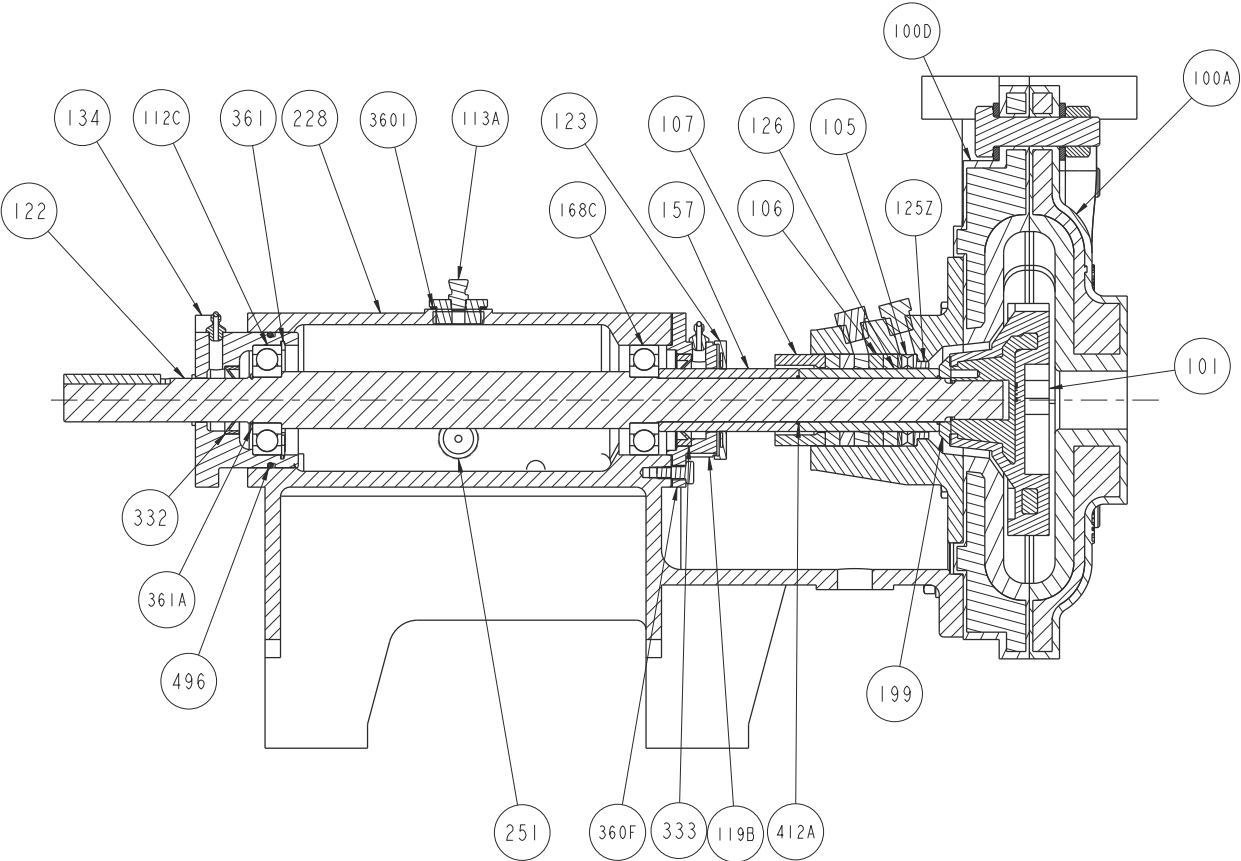


Figure 15: Sectional assembly 1.5x1.5-8

Sectional assembly 2x2-10

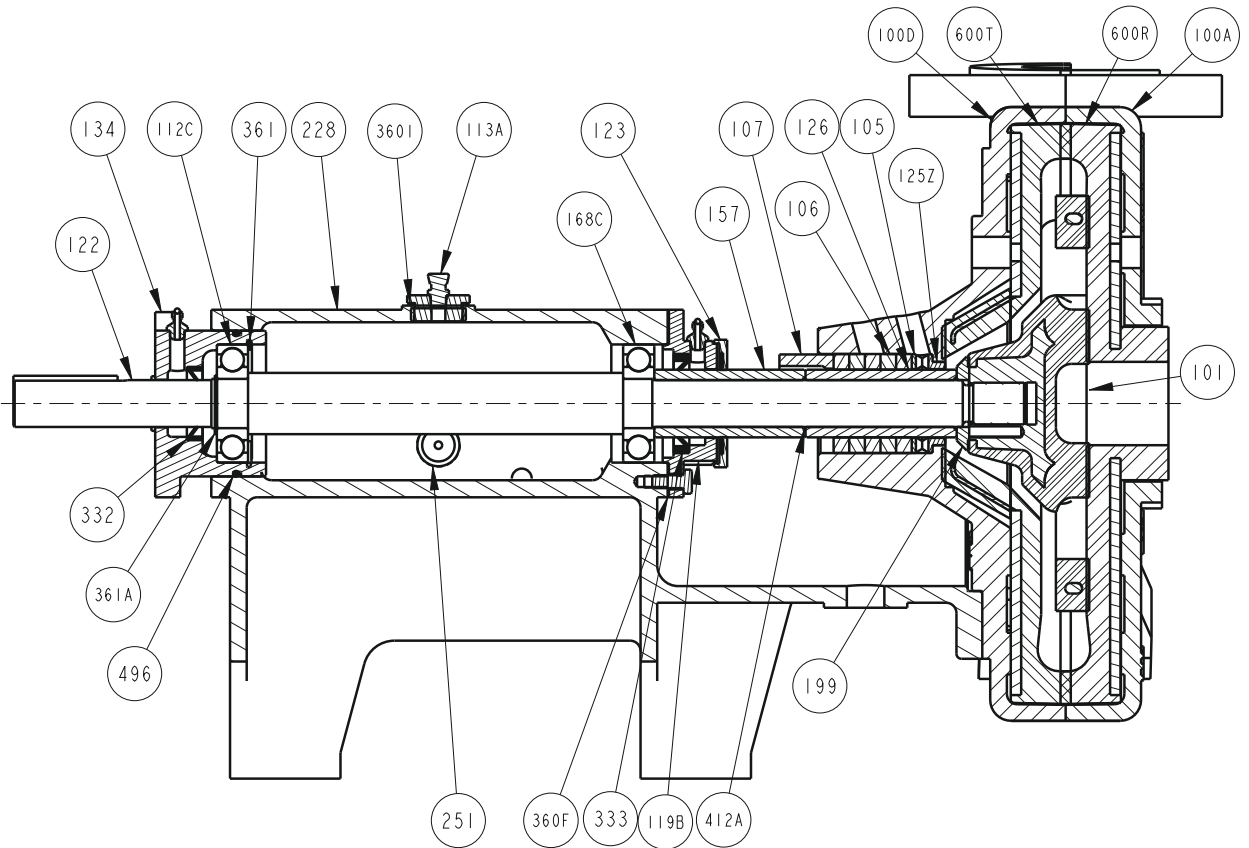


Figure 16: Sectional assembly 2x2-10

Sectional assembly 3x3-10

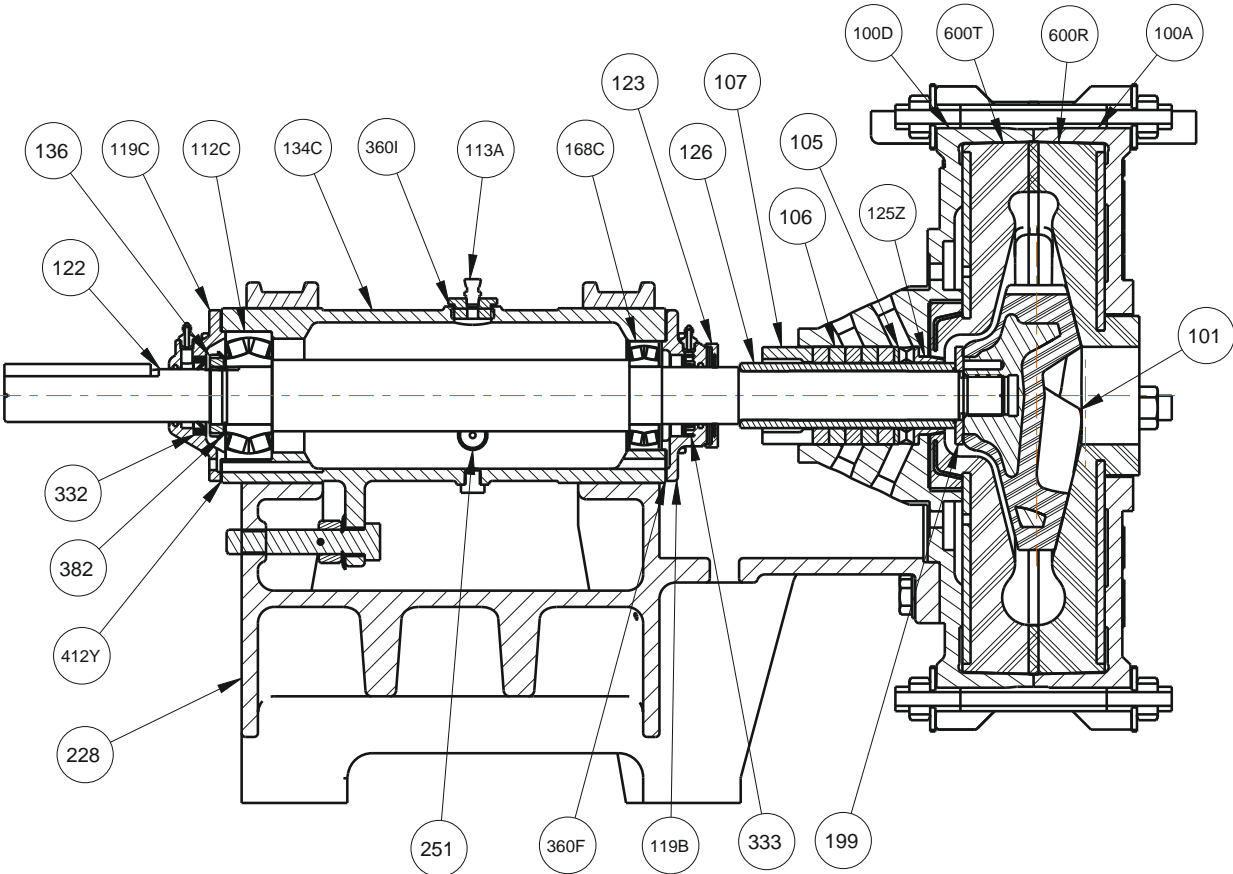


Figure 17: Sectional assembly 3x3-10

Sectional assembly 5x5-14

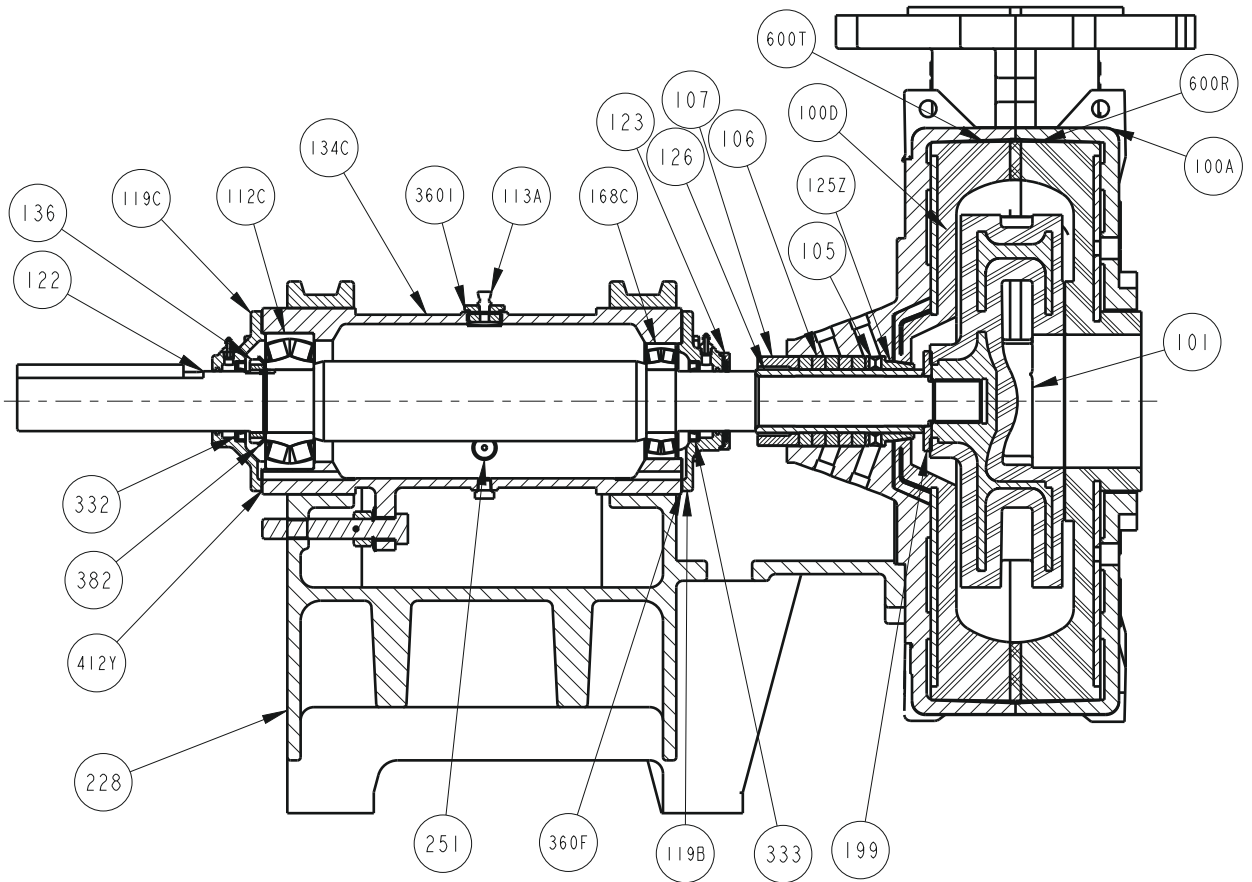


Figure 18: Sectional assembly 5x5-14

Sectional assembly 6x6-15

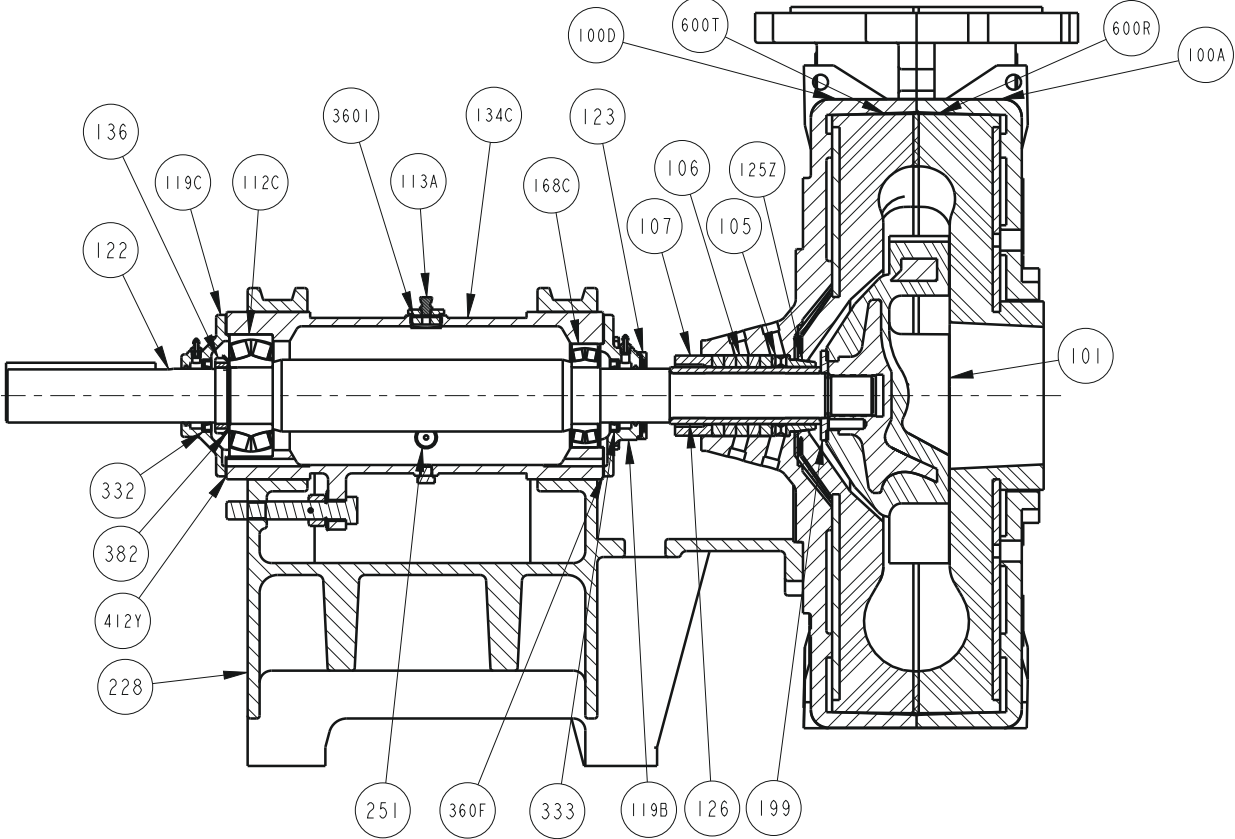


Figure 19: Sectional assembly 6x6-15

Sectional assembly 3x3-10 C

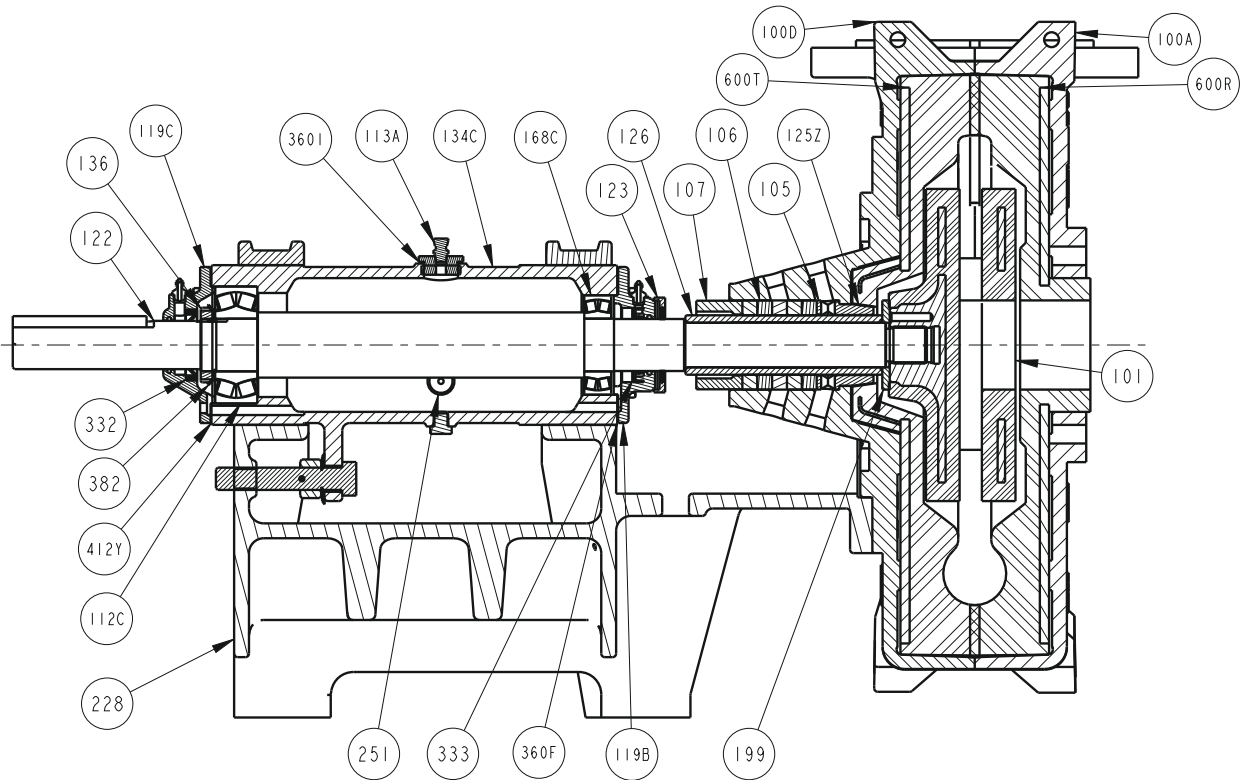


Figure 20: Sectional assembly 3x3-10 C

Sectional assembly 5x5-14 C

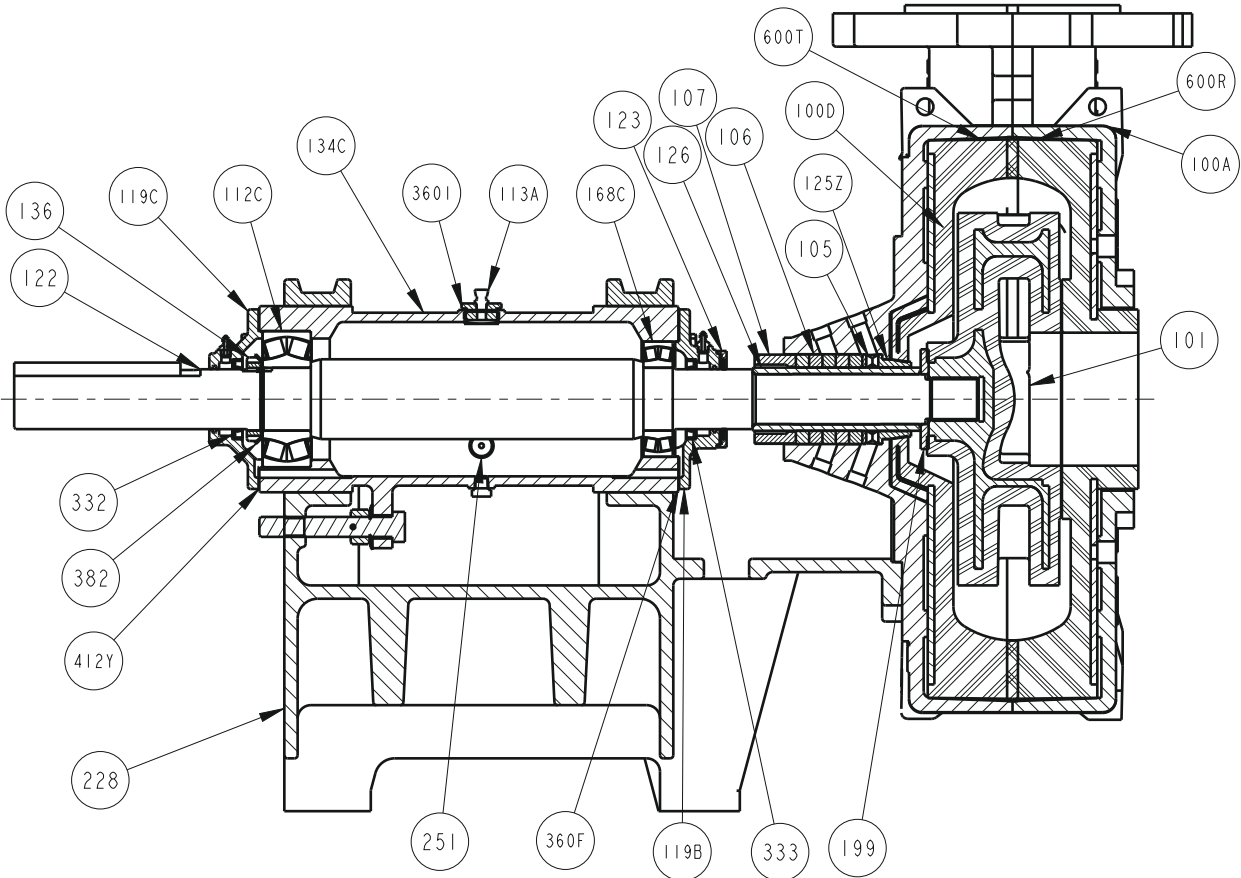


Figure 21: Sectional assembly 5x5-14 C

Sectional assembly 8x6-18 C

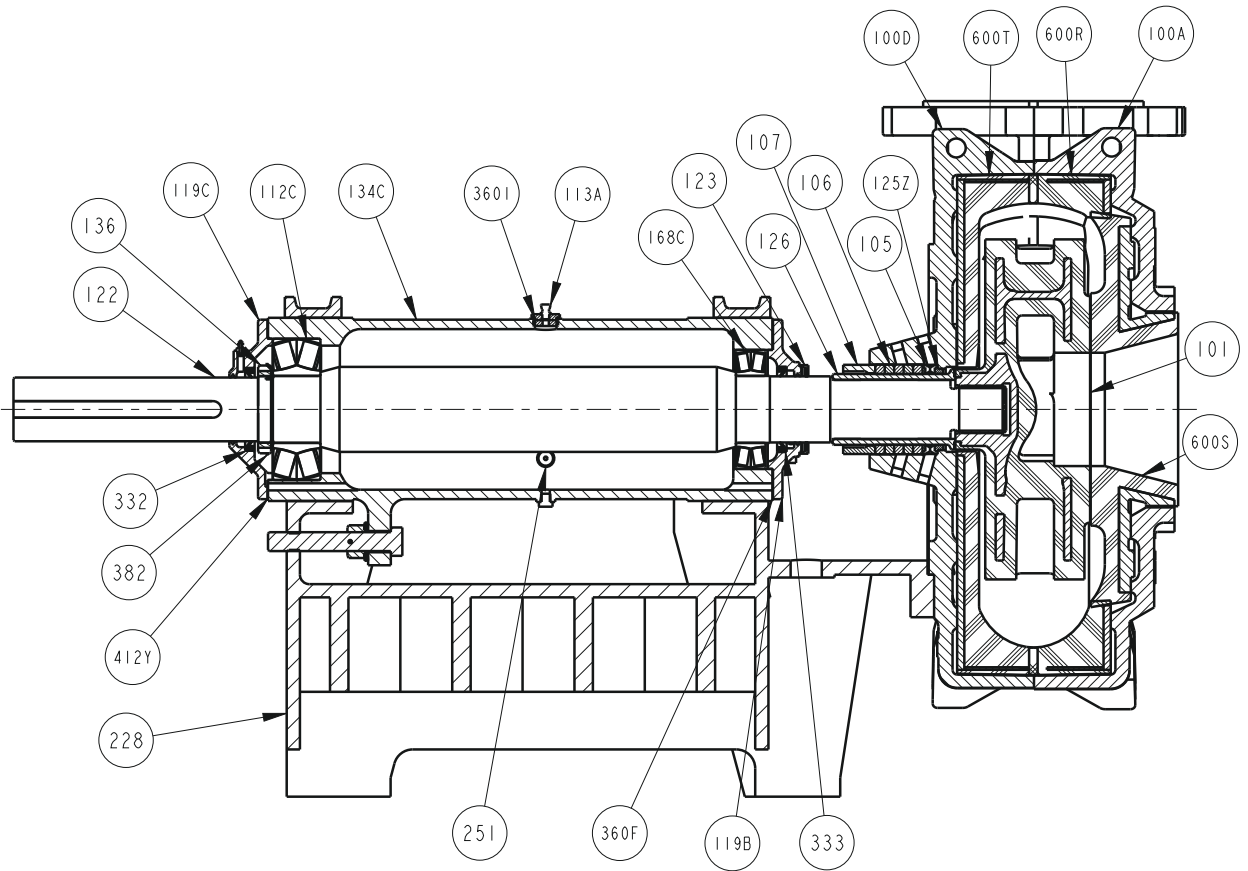


Figure 22: Sectional assembly 8x6-18 C

Sectional assembly 10x8-21

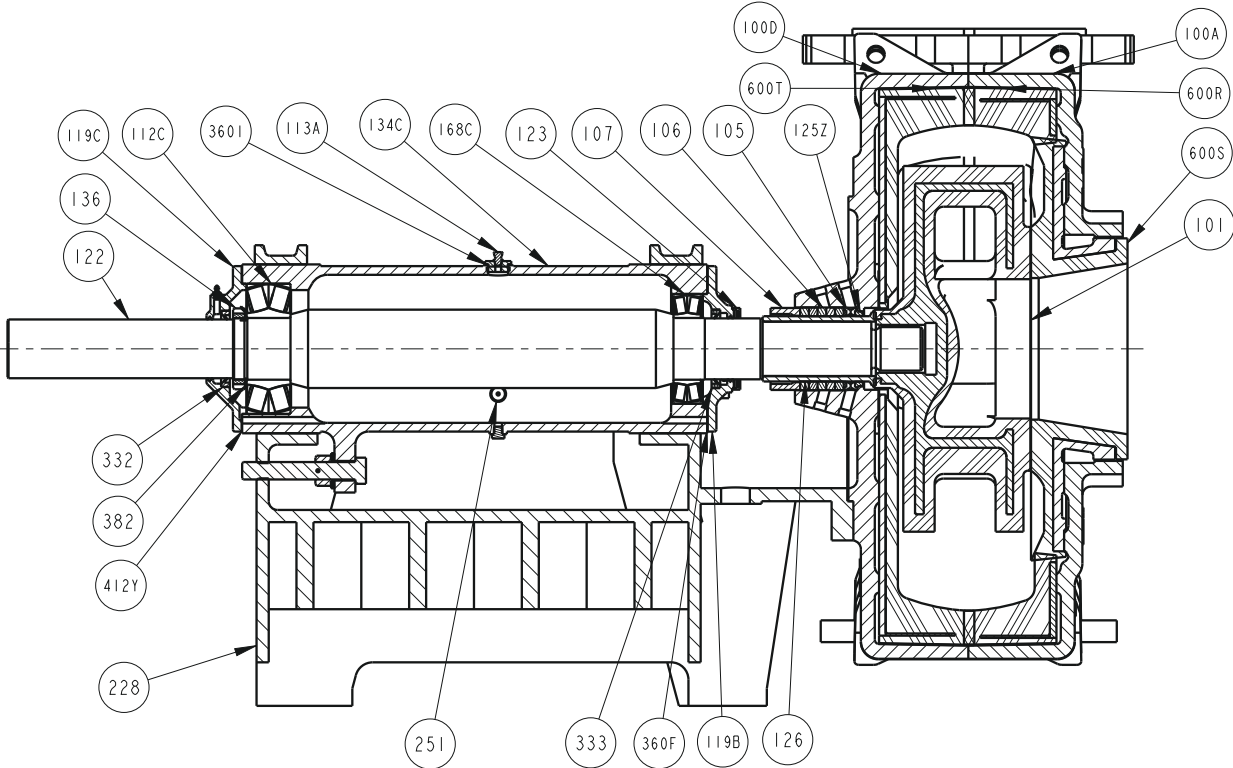


Figure 23: Sectional assembly 10x8-21

Sectional assembly 12x10-25C

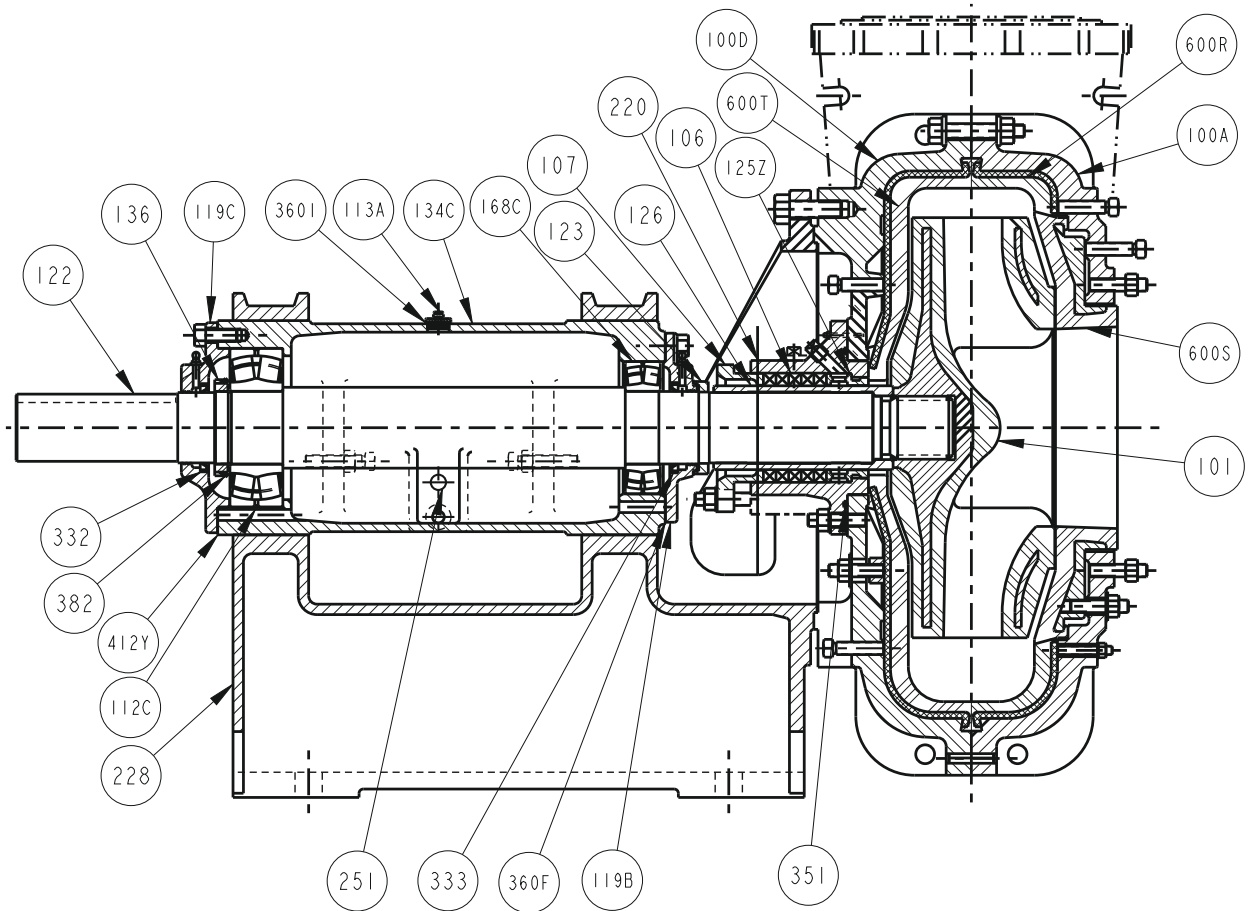


Figure 24: Sectional assembly 12x10-25C

Sectional assembly 14x12-29 C

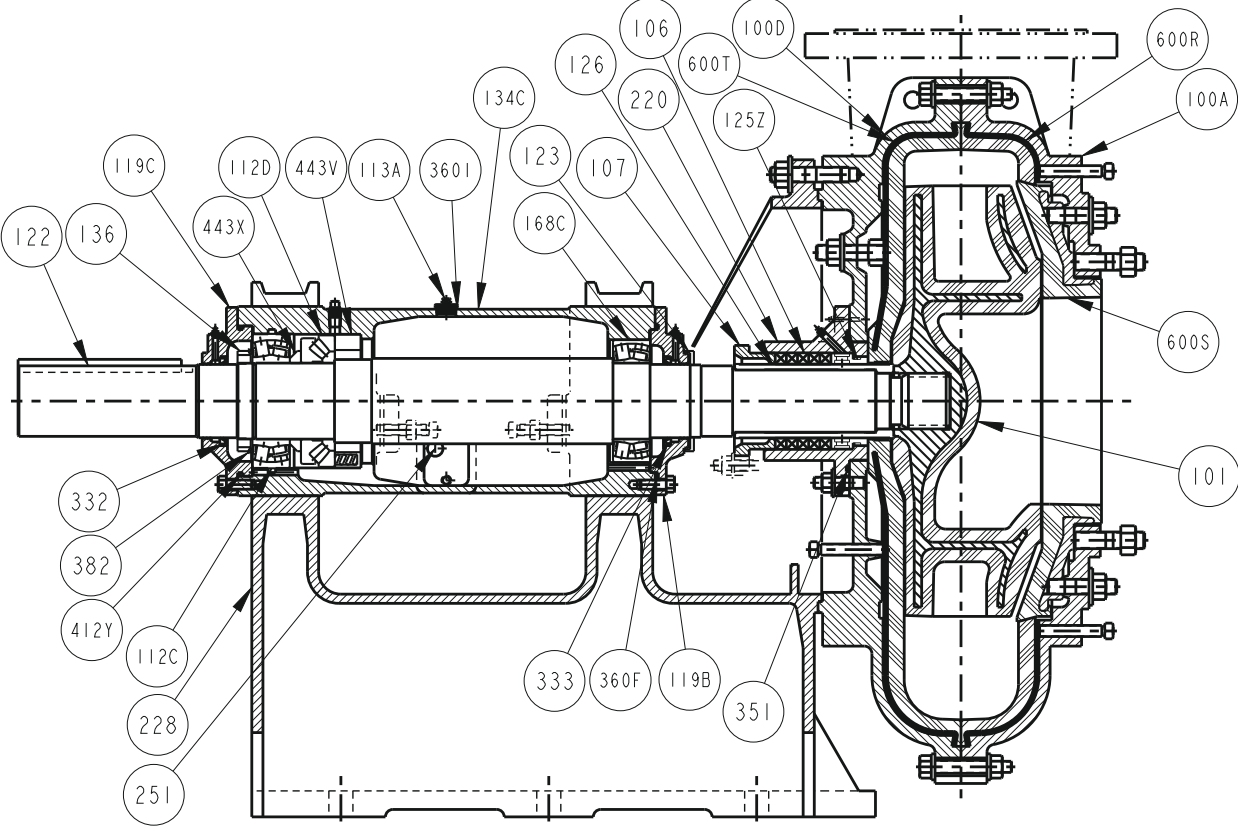


Figure 25: Sectional assembly 14x12-29 C

Sectional assembly 16x14-34 C

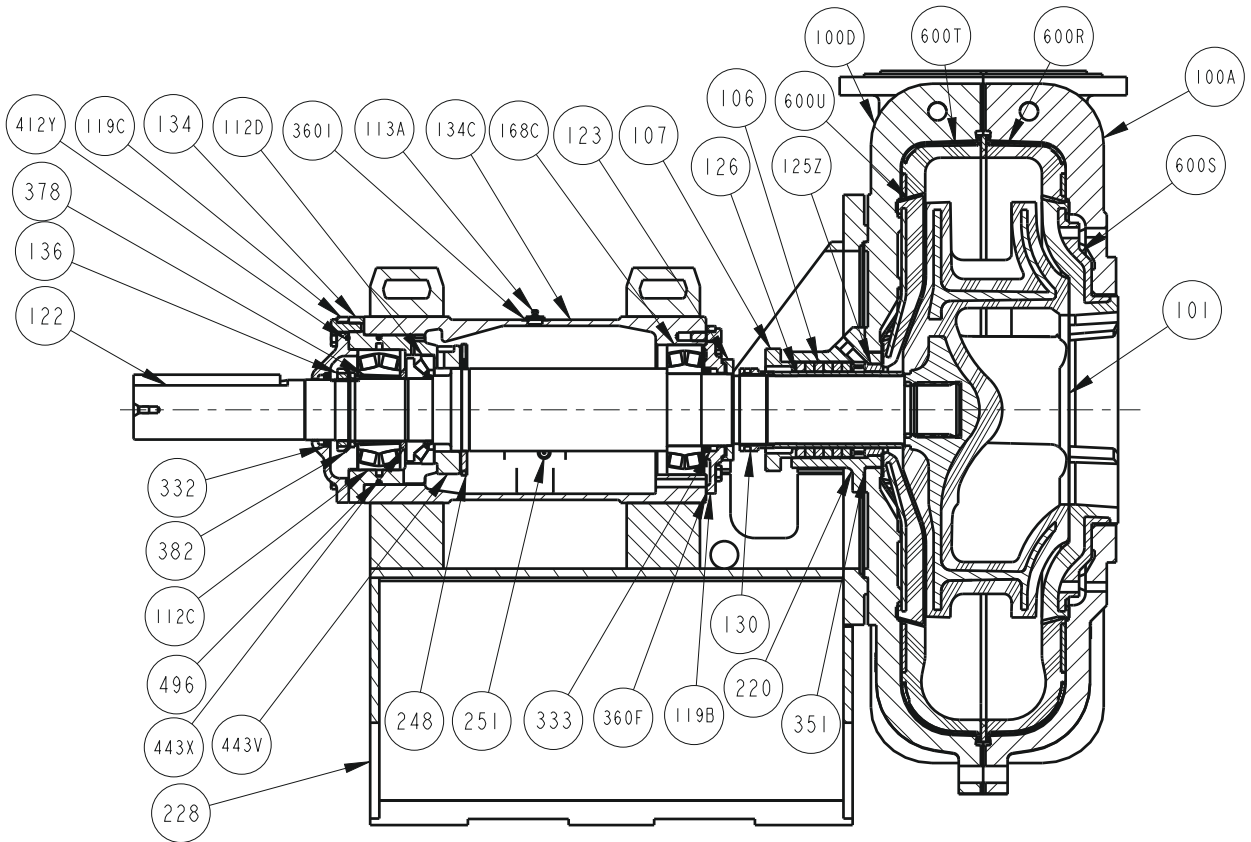


Figure 26: Sectional assembly 16x14-34 C

Sectional assembly 20x18-40 C

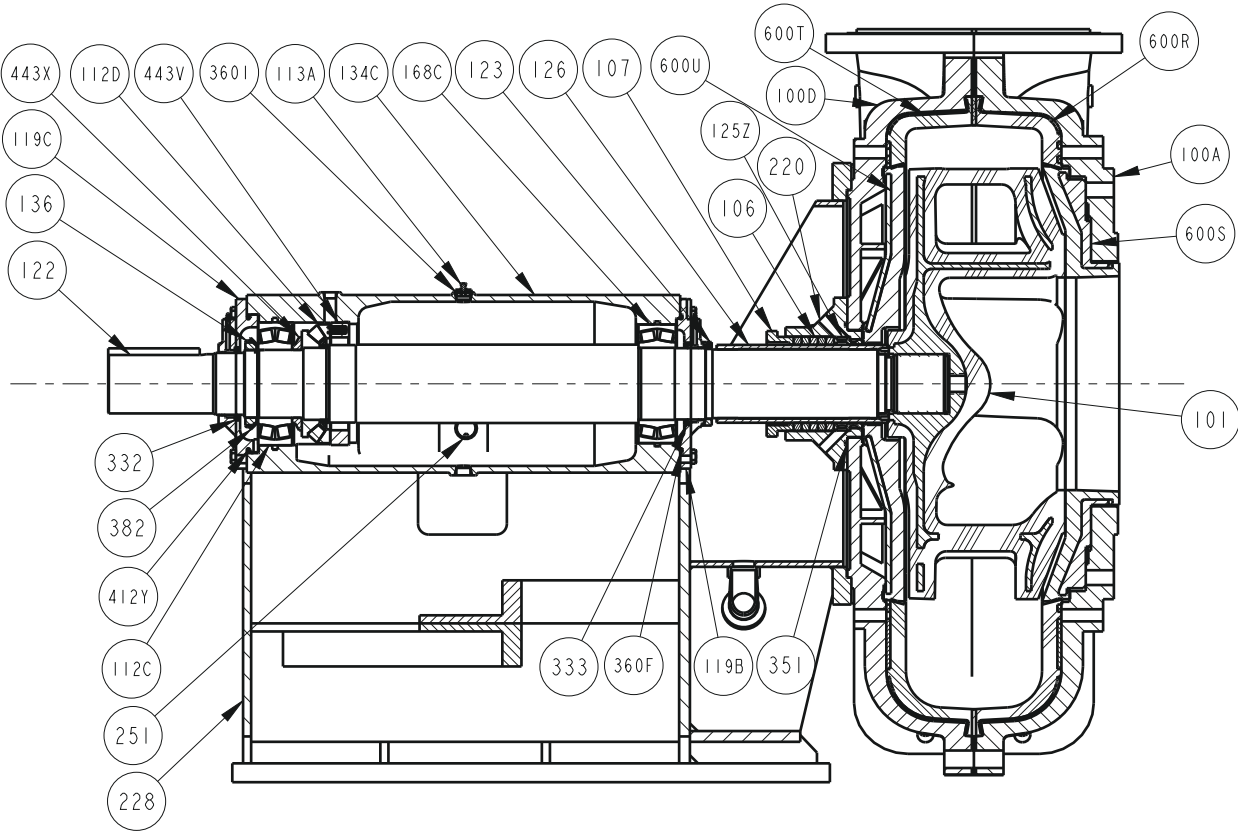


Figure 27: Sectional assembly 20x18-40 C

Sectional assembly 6x6-21 XT

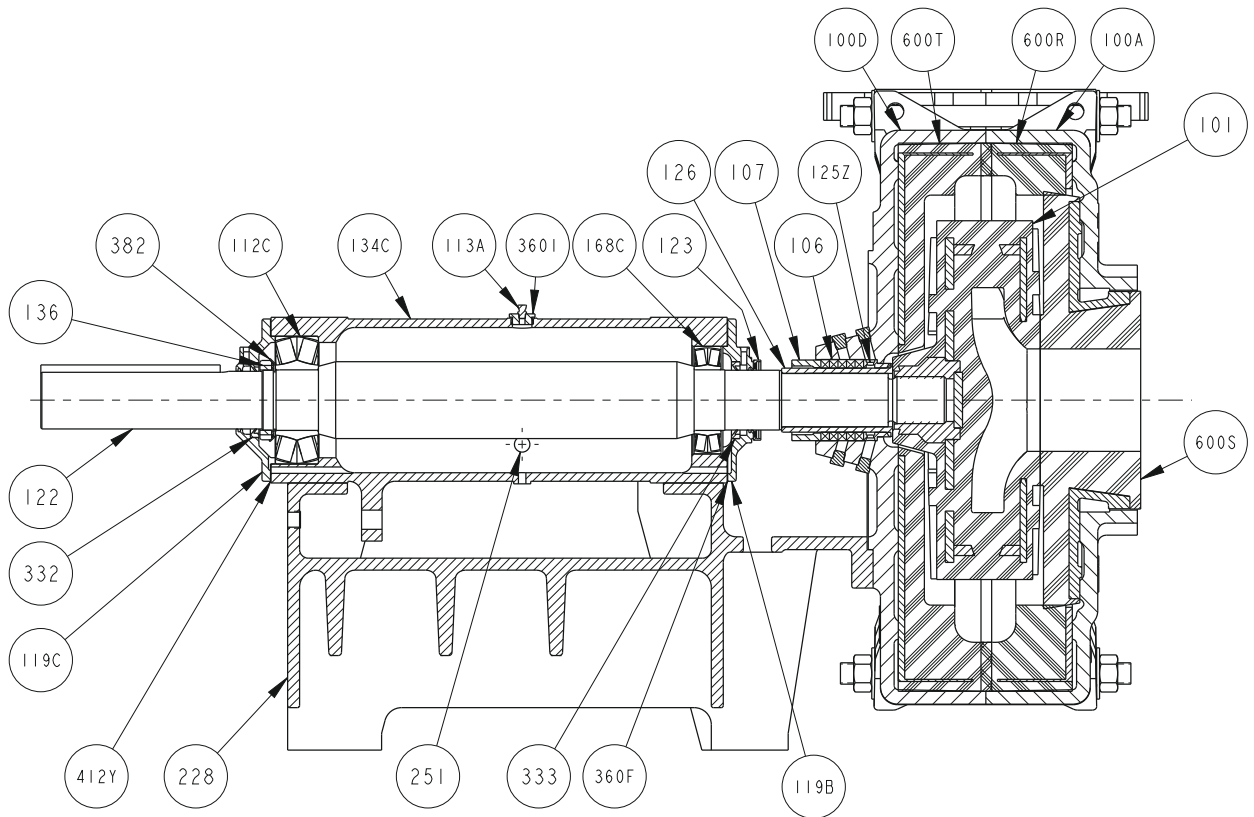


Figure 28: Sectional assembly 6x6-21 XT

Sectional assembly 10x10-28 XT

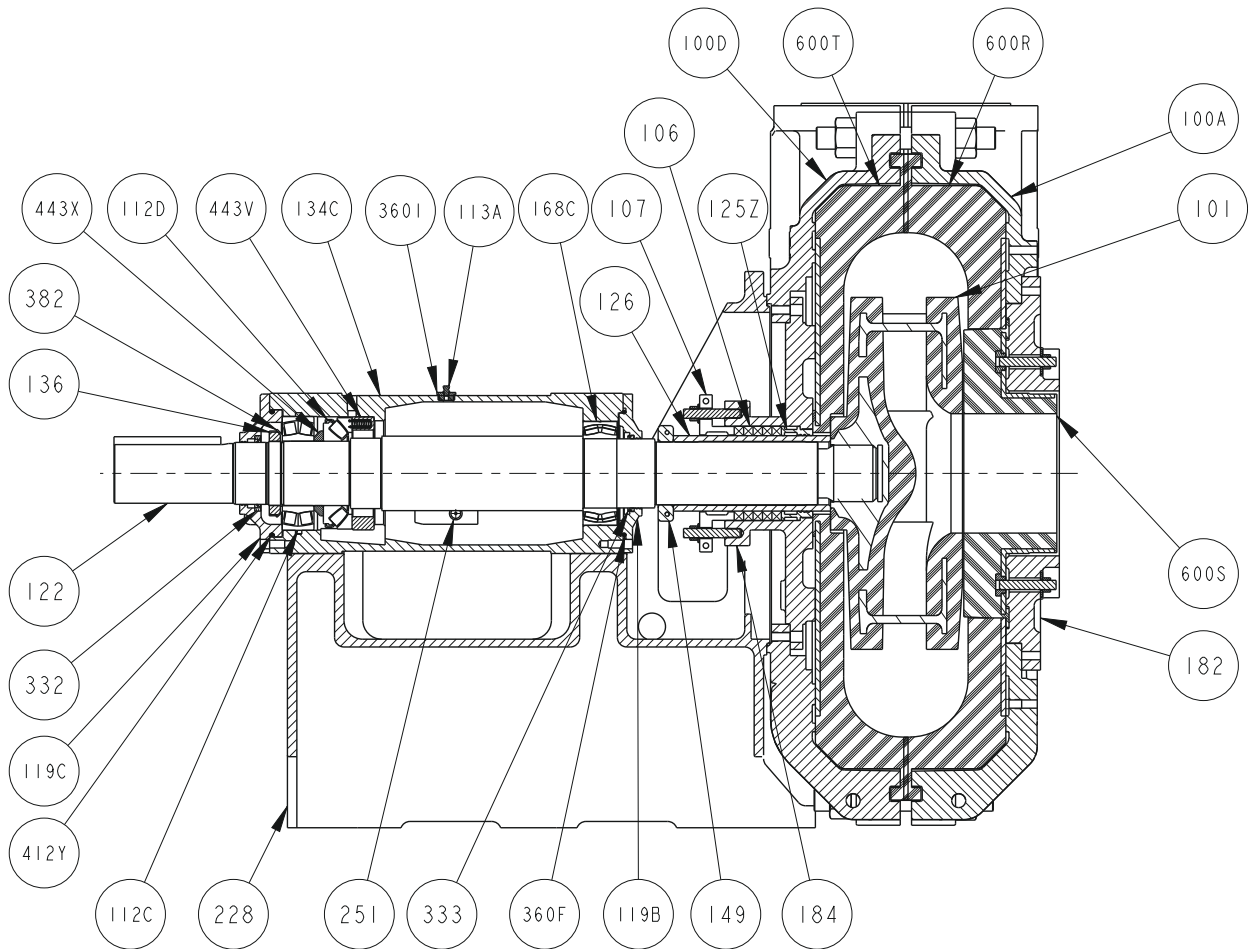


Figure 30: Sectional assembly 10x10-28 XT

Sectional assembly 14x12-36 XT

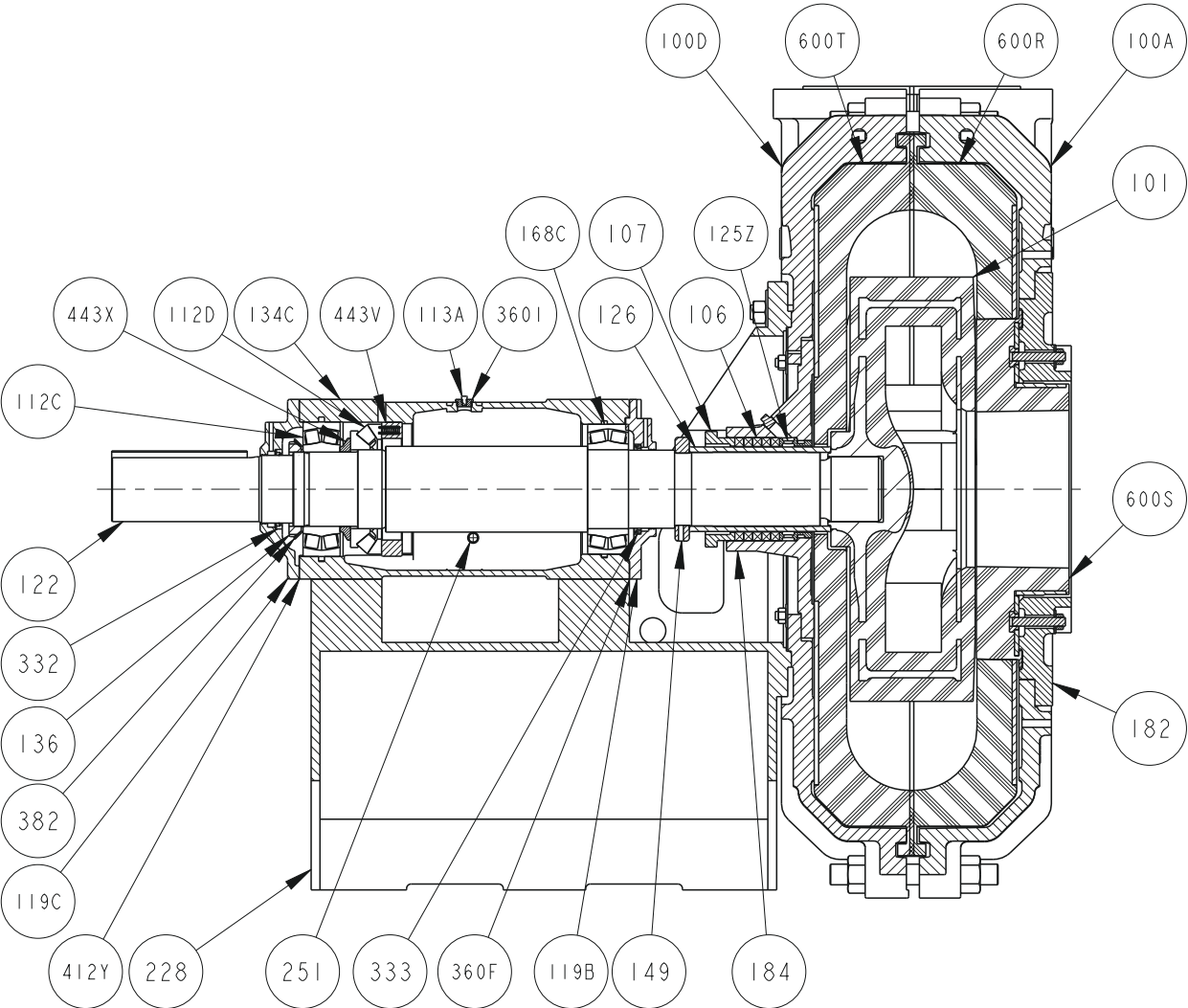


Figure 31: Sectional assembly 14x12-36 XT

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