



Contherm[®] **Max**

Scraped Surface Heat Exchanger (SSHE) User's Manual



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Alfa Laval 111 Parker Street
Newburyport, MA 01950 USA

Tel: +1 978 465-5777

Fax: +1 978 465-6006

E-mail: uscontherm.support@alfalaval.com

Website: www.alfalaval.com

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Chapter 1: Safety Summary

1.1 Introduction

Do not install, operate, or service the CONTHERM MAX until you have read this manual and understand how to use the necessary equipment. To help ensure your safety and avoid damage to the CONTHERM MAX, we have provided safety precautions in this manual to identify potentially dangerous or hazardous situations. While we cannot foresee every potential safety hazard that may occur with the equipment at your facility, you can eliminate and prevent many of them if you follow all of the instructions provided in this manual.

Unsafe and hazardous conditions may occur if the equipment is used by untrained personnel or without regard or knowledge of applicable safety precautions. These unsafe and hazardous conditions may cause serious personal injury and/or damage to the equipment.

1.2 Safety Precautions

The following symbols in this manual point out safety precautions. It means your attention is needed and your safety is involved.

Four types of safety precautions are used in this manual, with each type determined by the level of hazard seriousness the user is exposed to.



Danger:

Immediate hazards which WILL result in severe personal injury or death.



Warning:

Hazards or unsafe practices which COULD result in severe personal injury or death.

Caution:



Hazards or unsafe practices which COULD result in minor personal injury or product/property damage.



Note:

This symbol is used to indicate the requirement of an extra attention.

If you have any safety concerns that are not addressed within this manual, please notify your supervisor and/or your local Alfa Laval Inc. representative.

Failure to follow the instructions may lead to unsafe operation, malfunction, increased operational costs, inadequate service and reduced lifetime.



WARNING:

The instructions particularly do not cover measures to avoid:

- hazards from processing corrosive and or erosive materials
- hazards specific to processing radioactive products
- hazards specific to microbiological processing - including viral and parasitic hazards
- hazards from processes involving flammable or explosive substances
- hazards caused by leakage of hazardous substances
- inherent chemical hazards of process materials and/or service media and their biological effects on exposed persons

Chapter 2: Warranty

2.1 Warranty Information

This section describes the warranty on the materials, workmanship and equipment of the CONTHERM MAX Scraped Surface Heat Exchanger offered by Alfa Laval Inc. to the original purchaser of the CONTHERM MAX. In addition to stating the specific conditions of this warranty, this section identifies warranty exclusions, additional warranties, and the warranties applicable to equipment manufactured by others.



Warning:

Contherm MAX should only be used for the purpose for which it was provided. The use of the CONTHERM MAX and its equipment for processes other than those it was designed for is discouraged and may result in the voiding of warranties.

2.1.1 CONTHERM MAX Scraped Surface Heat Exchanger Warranty

1. Alfa Laval Inc. warrants to the original purchaser that all equipment manufactured by Alfa Laval Inc. is free from defects in material and workmanship.
2. A defect in a part should not condemn the entire machine.
3. Alfa Laval Inc. guarantees to repair or replace FOB (Freight On Board) point of shipment any such equipment found to be defective, provided that written notice of the alleged defect is received by Alfa Laval Inc. within 90 days from the date of shipment.
4. Alfa Laval Inc. makes no additional warranties, expressed or implied, whether of merchantability or otherwise, other than that stated in Section 2.1.1, CONTHERM MAX SSHE Warranty. The manufacturer shall not be responsible for any indirect, special or consequential damages, nor any other claims arising out of the sale or use of its equipment beyond the remedy stated in Section 2.1.1, CONTHERM MAX SSHE Warranty.

2.1.2 Warranty Exclusions

The warranties set forth above are inapplicable to and exclude (i) any product, components or parts not manufactured by Alfa Laval Inc. or covered by the warranty of another manufacturer, (ii) damage caused by accident or the negligence of you or any third party, normal wear and tear, erosion, corrosion or by disasters such as fire, flood, wind and lighting, (iii) damage caused by your

failure to follow all installation and operation instructions or manuals or to provide normal maintenance, (iv) damage caused by unauthorized or improper installation of attachments, repairs or modifications, (v) damage caused by a product or component part which we did not design, manufacture, supply or repair, or (vi) any other abuse or misuse by you or any third party.

2.2 Product Support Services

Alfa Laval Inc. offers ongoing product and technical support through a worldwide network of trained, technical support personnel. These technical service representatives are available to assist and support you upon request, and are often utilized in the following situations:

- During equipment installation and start-up
- For resolving problems that occur after start-up
- Training of customer staff
- Within your equipment's warranty period, all charges for service and parts attributed to defective material or workmanship will be paid for by Alfa Laval Inc.

2.2.1 Returned Materials

Do not return any material or equipment until you have obtained a "Return Material Authorization" number from Alfa Laval Inc. All materials and/or equipment returned for credit are subject to service and transportation charges. Securely package all materials and/or equipment authorized for return to ensure their undamaged return.

2.2.2 Damaged Shipments

Alfa Laval Inc. carefully packages its equipment to protect it from normal hazards that may occur during shipment. If our equipment is damaged when it arrives, the consignee must immediately file damage report with the carrier and forward a copy of this claim to the Alfa Laval Inc., Newburyport, Massachusetts, USA facility.

2.2.3 Office and Service Locations

Alfa Laval Inc. offers its customers a worldwide network of technical sales and service representatives. For your convenience, we encourage you to work with our local representatives in your area. If you cannot locate an Alfa Laval Inc. representative in your area, please contact us directly at the following location:

Alfa Laval Inc.

111 Parker Street

Newburyport, MA 01950 USA

Tel: (978) 465-5777

Fax: (978) 465-6006

E-mail: contherm@alfalaval.com

Chapter 3: General Description

3.1 Introduction

This chapter provides a general description of the CONTHERM MAX SSHE manufactured by Alfa Laval Inc. Many of the parts and functions of the CONTHERM MAX SSHE will be described in detail throughout the sections of this chapter.

3.2 How It Works

Product enters the cylinder through the lower product head and flows upwards through the inner and outer heat transfer cylinders. At the same time, the heating/cooling media travels in a counter-current flow through the narrow annular channels of both inner and outer cylinders.

Rotating scraping blades continuously remove product from the inner and outer cylinder walls in order to ensure proper transfer of heat from the media to the product.

Product exits the cylinder through the port on the lid of the CONTHERM MAX. Product flow and rotation speed can be varied to suit the properties of any particular product flowing through the CONTHERM MAX.

Trained and knowledgeable Alfa Laval staff is able to customize each CONTHERM MAX unit by selecting the appropriate materials, features and options to meet each customer's exact requirements.



WARNING:



The contherm MAX is designed to support the use of product and media in a range of 10°F to 302°F (-12°C to 150°C). Because the workers (operators) of Contherm Max could be exposed to potentially harmful cold or hot surfaces the signs (labels) are used to prevent that from happening. Each sign is compliant to OSHA/ANSI formatting regulations and for EU (ISO 7010:2003 --> safety signs in workplaces) and utilizes symbols to draw attention to its important safety message. Burns from hot surfaces continue to be a leading cause of injury in the workplace. Hot Warning Labels warn people of the need to avoid contact with hot surfaces.

3.3 Configuration

The CONTHERM MAX is designed to be vertically mounted. It offers the customer minimum floor space requirements and reduced product loss at the time of shutdown.

The CONTHERM MAX is designed, constructed and stamped for A.S.M.E. code section VIII, Div. 1. The CONTHERM MAX meets all the requirements for the CE Certificate of Incorporation for the machine directive and the Pressure Equipment Directive (P.E.D.).

The following figures identify and show the location of the major components of a standard CONTHERM MAX. A cross-sectional view of the CONTHERM MAX is also shown.

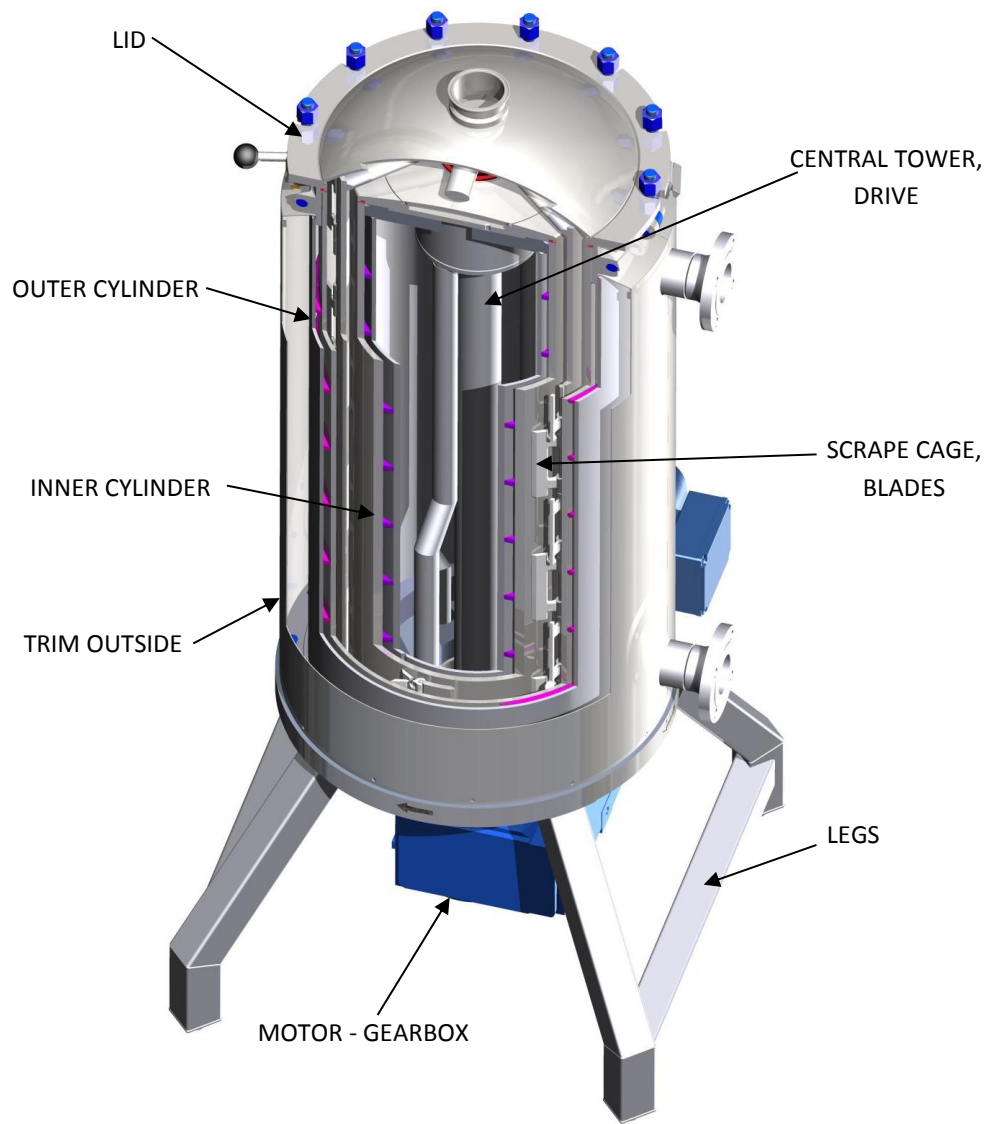


Figure 3-1. Standard CONTHERM MAX scraped surface heat exchanger (SSHE)

The CONTHERM MAX consists of two heat transfer cylinders (inner and an outer) mounted on a stainless steel base plate. The upper part of the inner cylinder contains the central tower drive shaft. A four or six arms cage with attached scraping blades receives power from the shaft. The outer wall of the outer cylinder can be surrounded by insulation, which is surrounded by the trim.

The coiled annulus (outer and inner cylinder) is used for circulating media such as water, glycol, freon, oil or steam. As a result, the media entering the top of the CONTHERM MAX is forced to follow a swirling path down through the annular spaces in a flow that is counter-current to the product. This small channel distributes the media throughout the annulus and aides in increasing the velocity to a turbulent level which enhances heat transfer to the product.

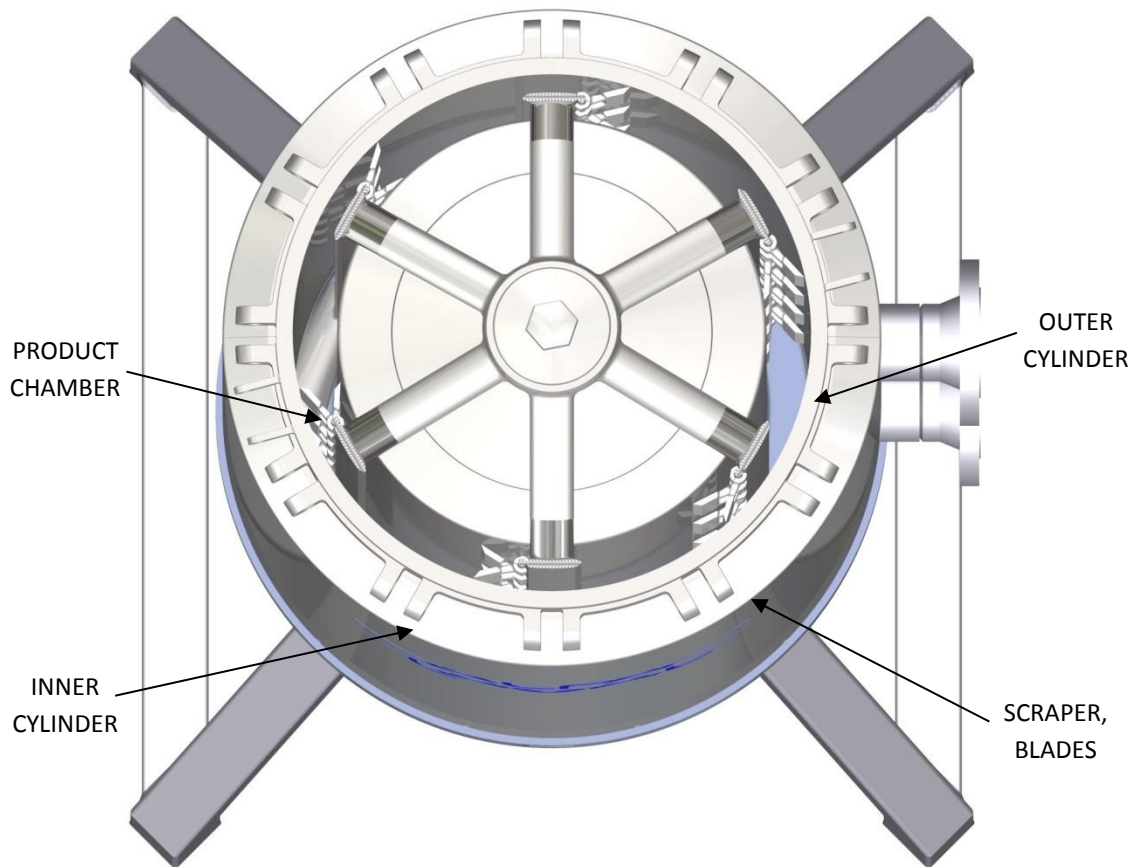


Figure 3-2. Standard CONTHERM MAX scraped surface heat exchanger (SSHE) – top-front view

3.4 Materials designated for Contherm MAX Heat Exchanger

This following section identifies the materials most commonly used for standard CONTHERM MAX heat exchanger cylinders, blades, gaskets and seals. All the materials used for fabrication of the components in contact with food are in compliance with the following regulation:

- FDA - Food and Drugs Authority of the United States of America
- EU - Food contact materials (FCMs)

Table 3-1 identifies the basic cylinder types and the corresponding applications in which they are used.

Table 3-1. CONTHERM MAX Heat Exchange Cylinder Types and Applications

Cylinder Type	Application
Stainless Steel (316L)	Highly Acidic Products
Duplex Stainless Steel (318L, 2205)	Salt and Chlorides in Process

Other materials used for fabrication of other parts are:

Blades--> Elastic synthetic polymers, Fortron® PPS, Metal detectable.

Gaskets--> Silicone Rubber, EPDM Rubber, Nitrile (Buna – N) Rubber and Neoprene Rubber

NOTE:

- ! Refer to Appendix for information regarding other product contact materials.

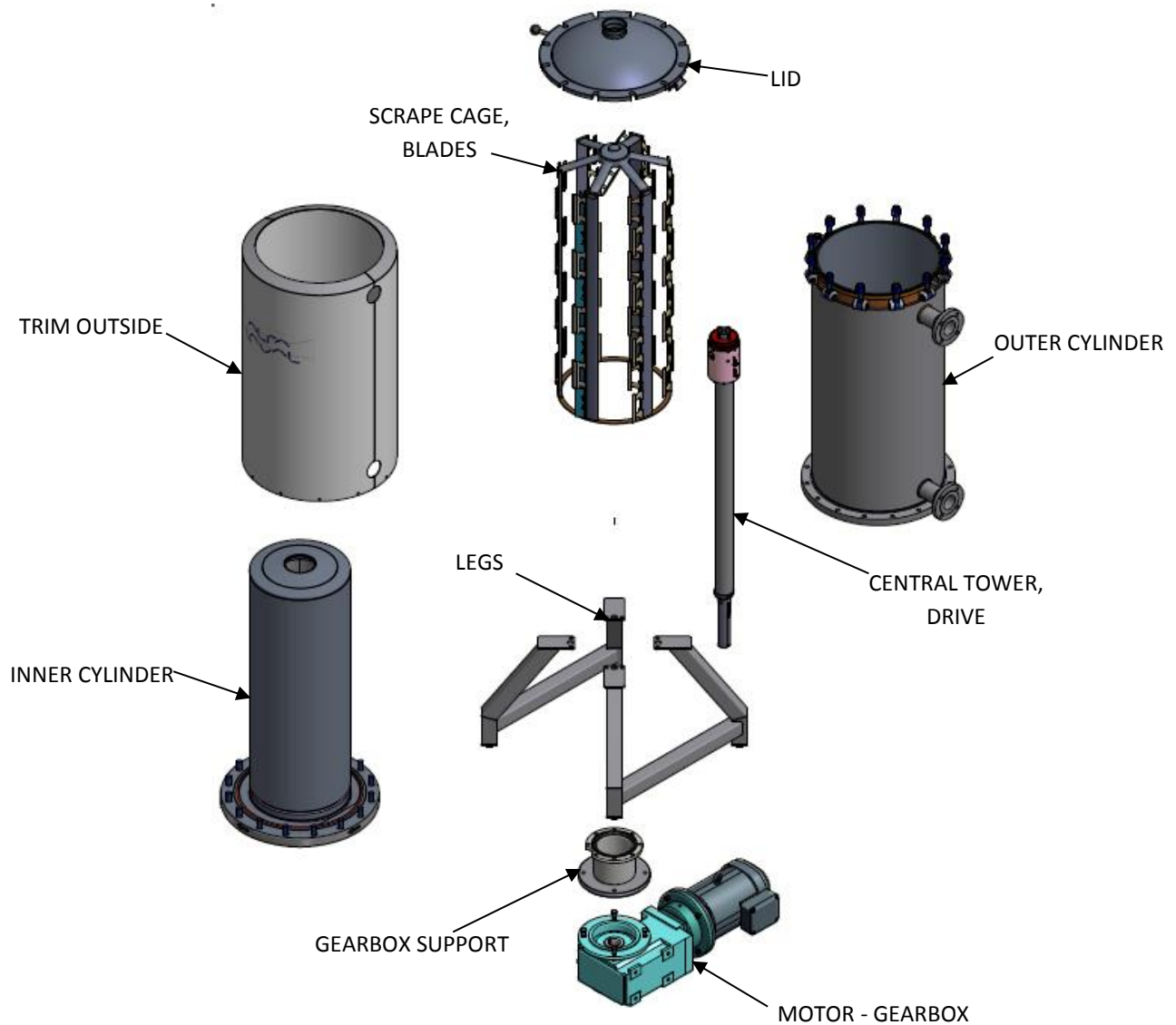


Figure 3-3. Standard CONTHERM MAX scraped surface heat exchanger (SSHE) – Components

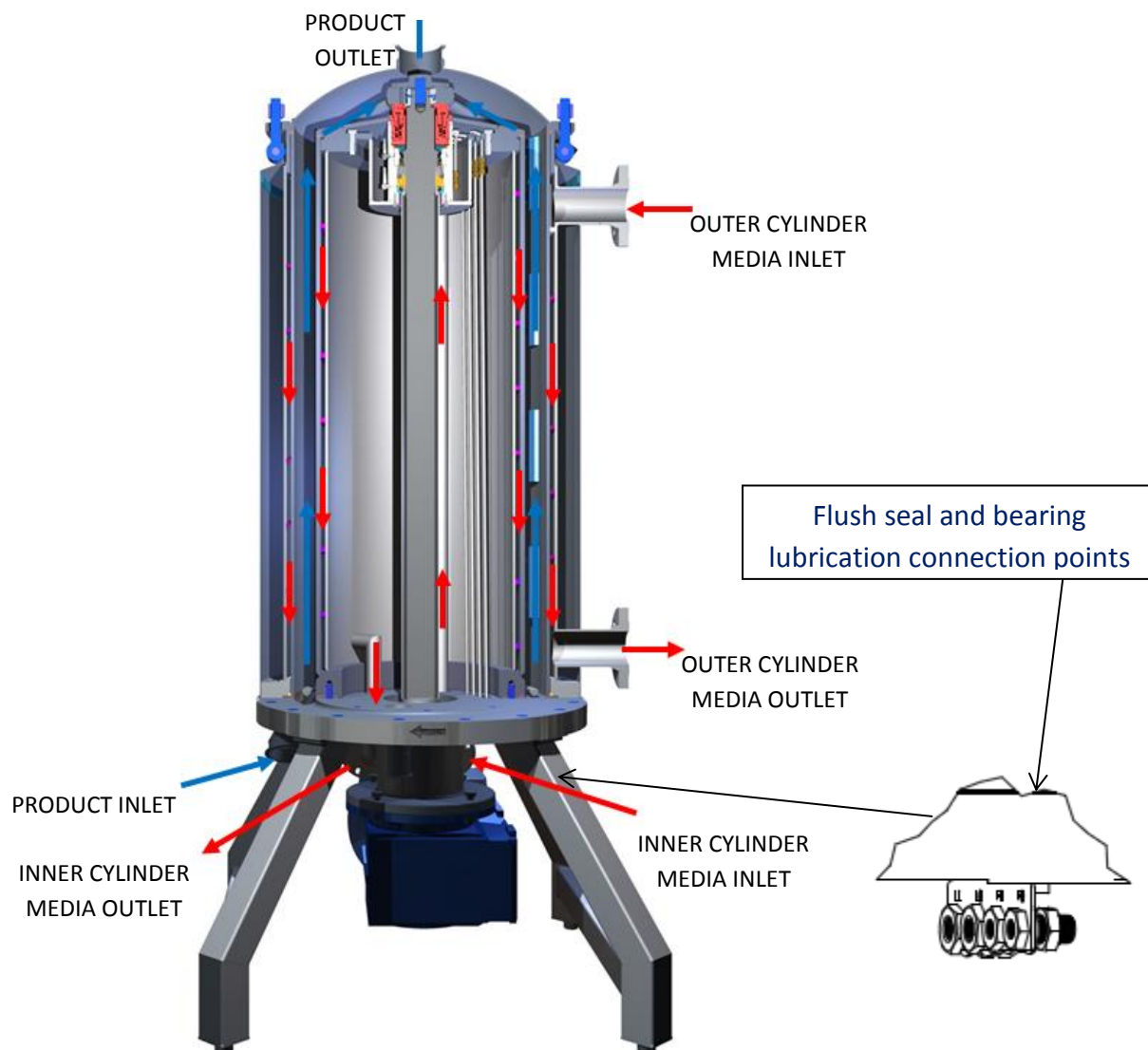


Figure 3-4. Standard CONTHERM MAX scraped surface heat exchanger (SSHE)

3.5 Parameters

The CONTHERM MAX is designed to support the use of product and media in a range of 10°F to 302°F (-12°C to 150°C)

The maximum working pressure of the product and media sides of the CONTHERM MAX's heat exchange cylinders are indicated on the inspection plate mounted on the exterior of the CONTHERM MAX. The standard CONTHERM MAX is rated to support the use of the product and media within the following pressure range:

Product 220 psi at 302°F (15 Bar at 150°C)

Media 116 psi at 320°F (8 Bar at 160°C)

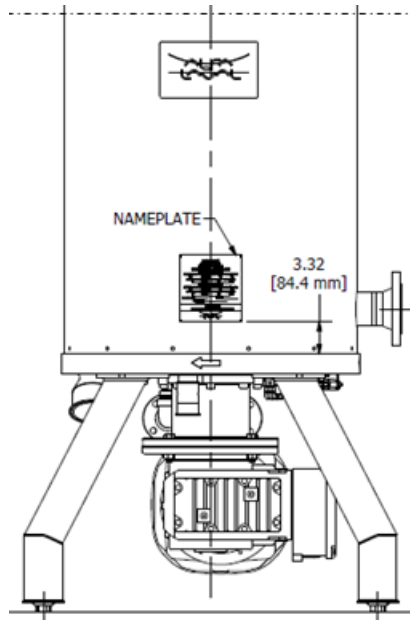


Figure 3-5. Nameplate location



Danger:

Never exceed nameplate temperature or pressure

Chapter 4: Serial Number Information

4.1 Introduction

Alfa Laval Inc. assigns a unique serial number to each CONTHERM MAX manufactured at its factory. The serial number is inscribed on the inspection plate mounted on the exterior of the CONTHERM MAX and on each of the inner and outer cylinder assemblies.



WARNING:

Never remove serial number plate from Cylinders of Contherm MAX

4.2 Serial Number Information

An example of a serial number for a standard CONTHERM MAX is shown in Figure 4-1. In this example, the serial number inscribed on the inspection plate is “160100-1.” The information provided by your CONTHERM MAX’s serial number should be referenced whenever you correspond with Alfa Laval Inc. to order spare parts or receive technical assistance.

160100-1

Figure 4-1. Components of the CONTHERM MAX’s Serial Number

Chapter 5: Installation

5.1 Safety Introduction

Before performing any installation procedure, please review the safety precautions provided in Chapter One, Safety Summary.

WARNING



Do not install the CONTHERM MAX or its equipment and parts until you have read this manual and are knowledgeable of the equipment and all applicable safety precautions.

5.2 Receiving the Contherm Max

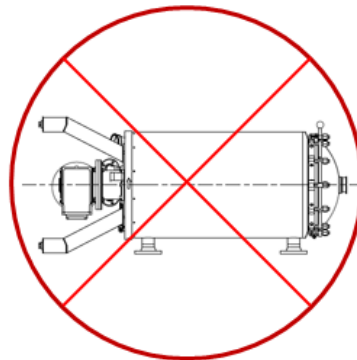
The CONTHERM MAX may only be transported in the vertical orientation, it must be within its packaging and it must be bolted to the bottom of the transportation crate. Transport the CONTHERM MAX to its installation location and take great care not to damage the crate or packaging as damage could result to the equipment. Carefully open all crates. Try not to scratch or mark the items when unpacking them. Use the packing list, this instruction and parts manual to verify that all equipment has been received. If any part of the shipment is missing, notify your local Alfa Laval Inc. representative as soon as possible. Leave all components in their crates and containers until they are ready to be installed.

5.3 Transporting the Contherm Max



WARNING:

Never ship the CONTHERM MAX in the horizontal orientation. The CONTHERM MAX weighs 3500 lbs. (1588 kg) alone and 3615 lbs. (1640 kg) shipped. Keep this in mind when transporting the CONTHERM MAX. **Do not attempt to move, remove or raise the CONTHERM MAX without the use of the appropriate lifting equipment.** If this equipment is not used, personal injury and damage to the equipment may occur.

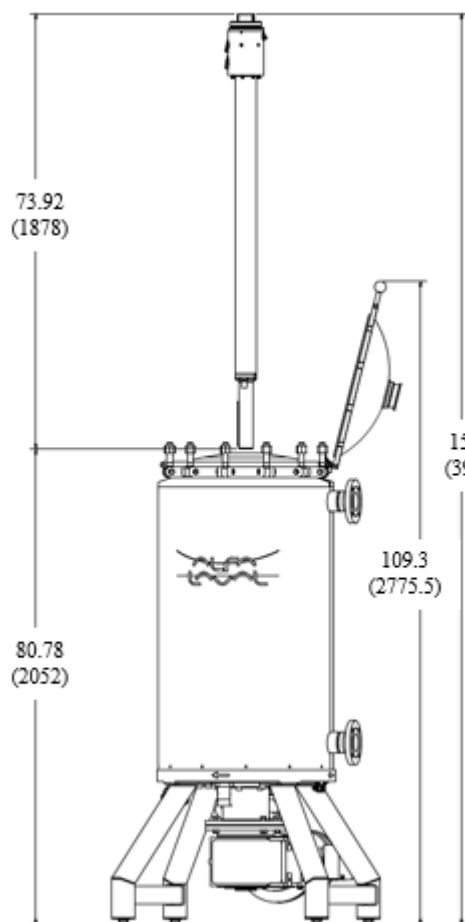


An overhead hoist or chain-fall for removal / installation of the drive line and cage during maintenance is necessary. The recommended capacity is minimum 500 kg (1100 lbs.).

Caution:



Severe damage in the machine will result in turning it horizontally.



The maximum Height of the shaft from the ground is about 12.89' (3930 mm)

WARNING:



The center of gravity for the CONTHERM MAX lies at 40 inches above the ground, making the CONTHERM MAX both top heavy and a potential risk for toppling over. Keep this in mind when moving the machine.

WARNING:

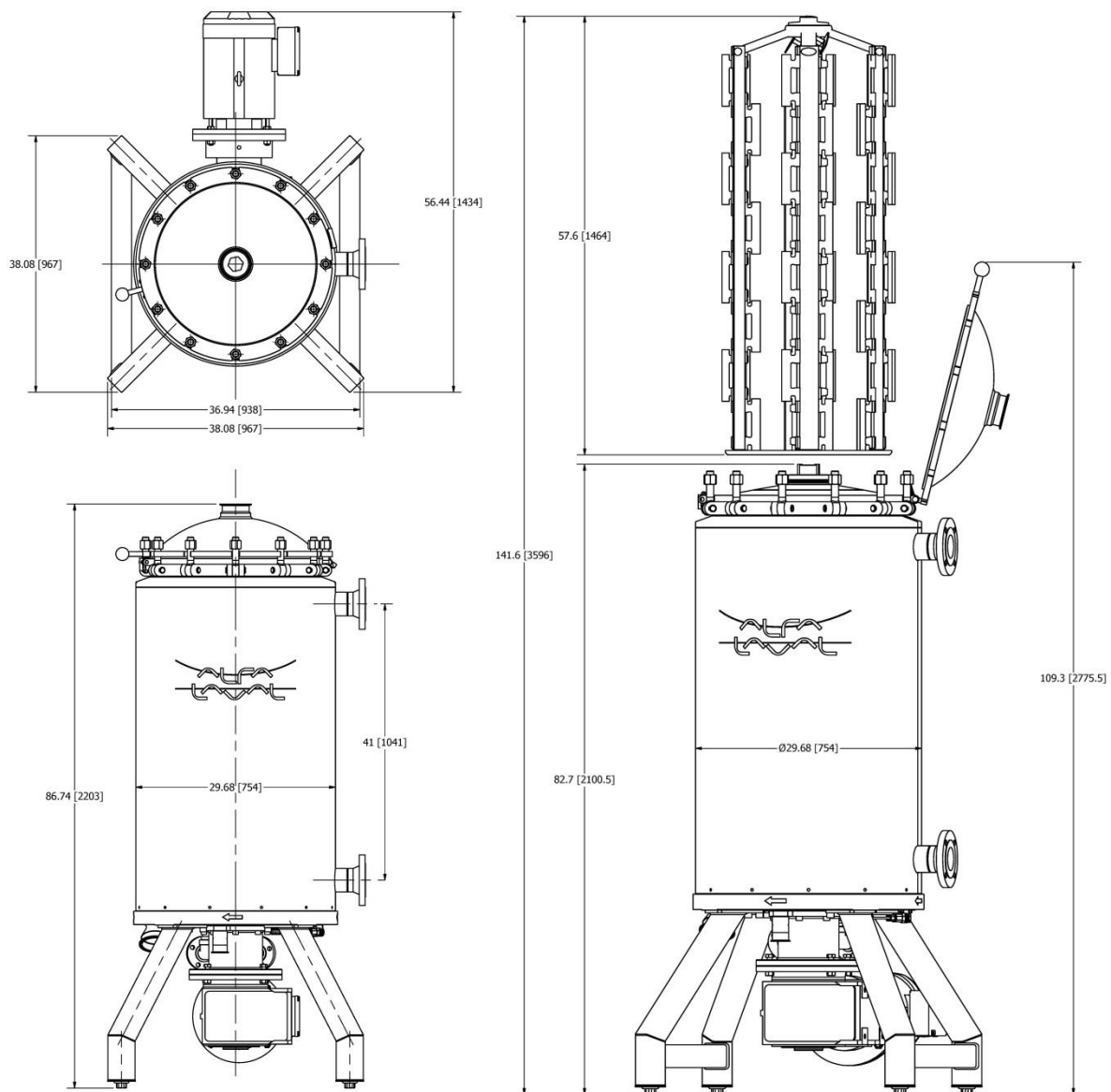


Do not tip the unit due to high center of gravity. Place always the CONTHERM MAX in a horizontal surface.

Caution:



Check the floor plans for the building to make sure that the area it is being placed can support its weight of 3500 lbs. (1588 kg). A total clearance height necessary for installation and service will be at least 16 feet (4.875m) from the floor to the ceiling. There should also be a clearance of 6 inches (150mm) from the motor to the ground and a foot away from the non-driven end of the motor for ventilation.



A sling (see next page) attached to the eyebolts / eyenuts used to transport the CONTHERM MAX using a hoist should be at least 56.5 inches long to allow for optimal transportation.

When transporting the CONTHERM MAX, a forklift is ideal, providing it is still within its packaging and affixed to the bottom of the crate. To remove the CONTHERM MAX from its packaging, a hoist must be used to pull it out of the crate. The hoist must be fixed to the eyebolts / eyenuts attached to the M24 bolts on top of the CONTHERM MAX. The hoist must be able to support the weight of the CONTHERM MAX. Please consult Table 5-1 to see the weight and dimensions of the product. Make sure that the area where the CONTHERM MAX is being installed will have adequate enough space. Make sure when it's placed down that it's lowered slowly and evenly to prevent toppling in the case of it being tilted. See Figure 5-1 for the correct way to attach the sling to the eyebolts.

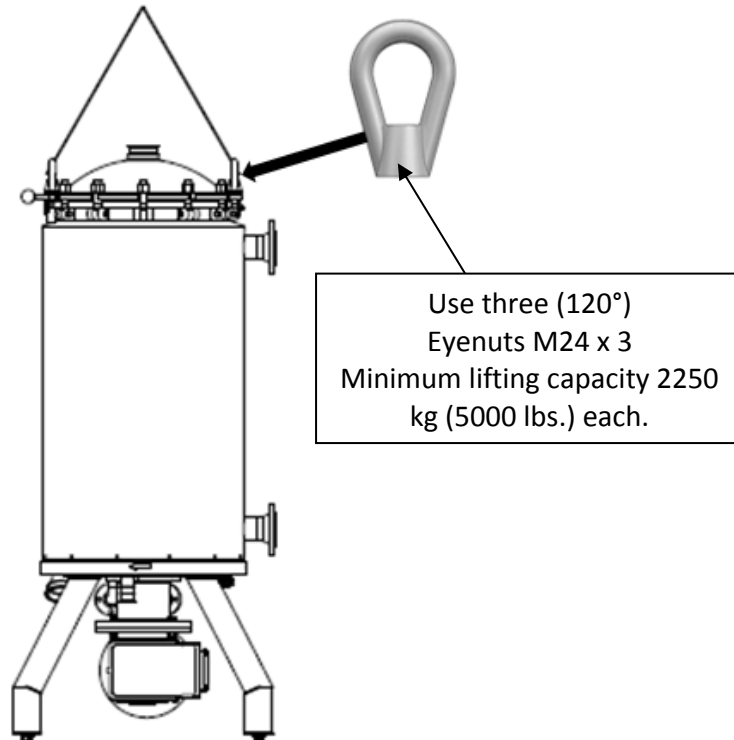


Figure 5-1: CONTHERM MAX with eyebolts and sling for transportation

Table 5-1: Overall length and height of CONTHERM MAX

Model	Weight		Dimensions (L x W x H)	
	Lbs.	Kg.	Inches	cm
Max 4.5	3500	1588	57x39x87	144x97x221

5.4 Setting up the Contherm Max

Once fully removed from the packaging, inspect again and make sure there is no damage to the exterior or interior of the CONTHERM MAX.



DANGER:

Check the breaker or power source and make sure the power is always off before starting any electrical and mechanical work. Lock the breaker, and leave an easily noticeable note “DANGER, ELECTRICAL HAZARD”.

The motor will require a three-phase current. An emergency stop button along with an on/off switch for the motor should also be installed for safety. For the correct operation and control of Contherm MAX it is necessary to use the VFD (variable frequency drive) supplied by others; the rest of its specifications will be selected based on the process’s requirements. Refer to gearmotor instruction for proper wiring and operation.

After having wired the motor, check the correct rotation of the motor. Looking through the 4" product outlet opening on the top of the contherm MAX lid, the cap (cage) should rotate clockwise.

The product inlet and outlet requires 4 inch piping.

Make sure you have access to a water source for the flush seal. Water can be supplied through plastic water tubing from the water supply system and can be connected to a push to connect tube fitting (pressure fitting) for water as shown in fig. 5-2. The water return is configured in the same way with a plastic tubing and push to connect fittings. The flow rate very much depends on the speed, pressure and temperature of both the product and the incoming water. We recommend that you set a desired temperature increase of the water passing through the seal and adjust the flow accordingly. Without additional information we recommend less than 1 bar pressure.

If the steam is to be used as a buffer seal fluid (aseptic products) the inlet / outlet and supply / return tubing will be different; specific instructions on steam pressure / temperature will be provided.

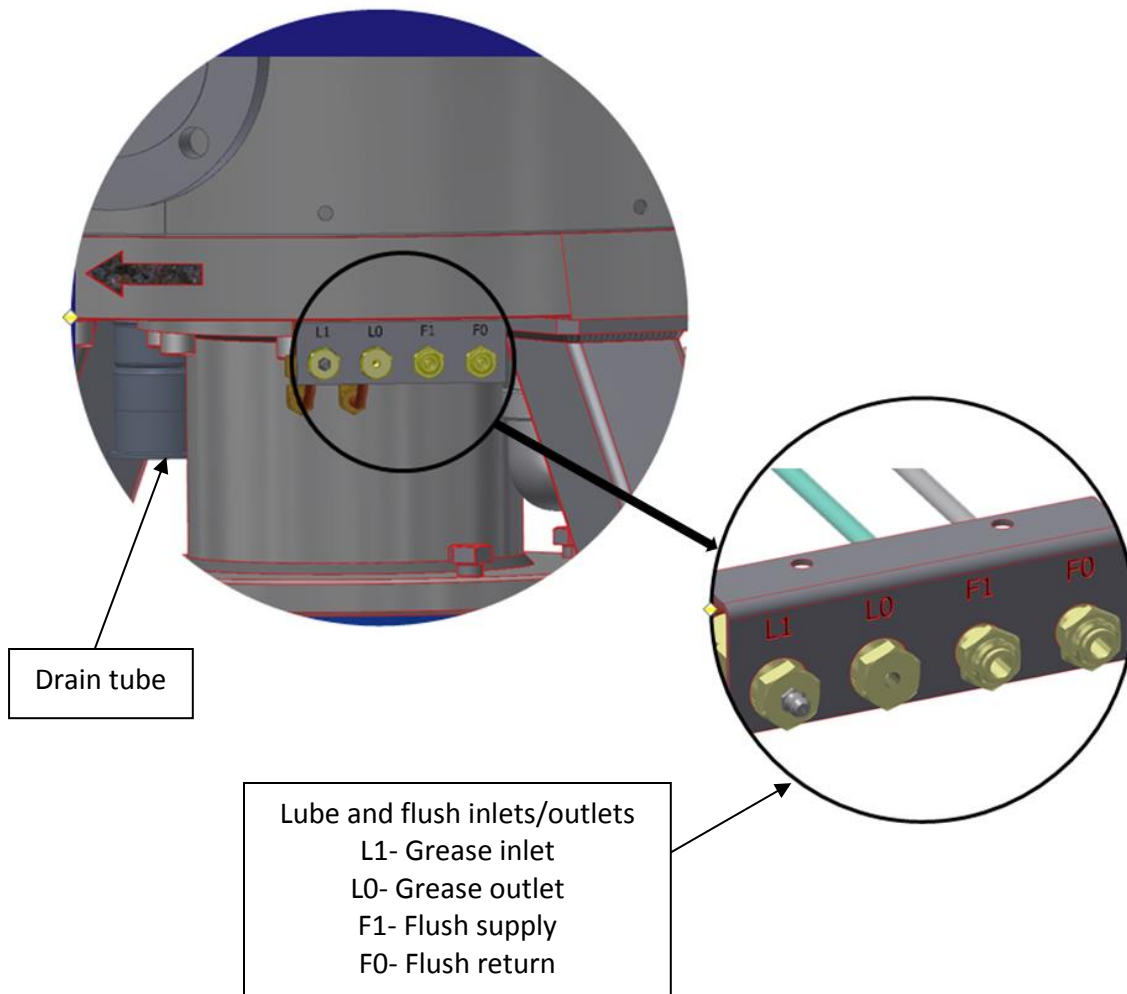


Figure 5-2: CONTHERM MAX seal flush ports

Since most of the CONTHERM MAX comes pre-installed, there isn't much assembly required. Something unique for the CONTHERM MAX is the limit switch feature. The limit switch will shut off power to the motor while the lid is opened. When the lid comes into contact with limit switch, it sends a signal to open or close a circuit. Since the limit switch will be pre-wired, connect it to the electrical system and panel control as indicated to the limit switch booklet (Switch Starting Position: 1 Off (Normally Open) or 1 On (Normally Closed)); flip the external switch once the CONTHERM MAX is installed. This is all that is required to set it up.

CAUTION:



All connecting pipes must be adequately supported and not allowed to vibrate. Do not place other machinery that can vibrate in the same area to exclude that vibrations or dynamic forces can be transmitted to the Contherm MAX.

5.5 Precautionary Measures

CAUTION:



To ensure smooth operation and to reduce the risk of damaging your equipment, the CONTHERM MAX system should have a variety of features to protect it from potential overpressure and temperature fluctuations.

5.5.1 Overpressure Prevention

Since the CONTHERM MAX is a pressurized vessel used in conjunction with pumps, there is potential for overpressure. To prevent this from happening, safety valves with a pressure safeguard must be installed around pumps. An expansion pipe for the product outlet must also be installed in case of pressure surges. **DO NOT EXCEED** the maximum pressure displayed to nameplate.

5.5.2 Temperature Fluctuation Control

Temperature fluctuation is an issue that may occur in your cooling/heating system. This won't require any parts to be replaced, but certain precautions should be taken. One instance where temperature fluctuation can occur is when steam is used as your media for heating. If an extra use of steam is found in the system, the regulator will open up (adjust) to compensate for a pressure or temperature drop. This will cause an increase in temperature and all that can be done is wait for the temperature to settle.

5.6 Connecting Media Steam, Cooling / Heating

WARNING:



The following pictures show how to correctly connect the media supply / return for cooling/heating with Contherm MAX. Because is the most efficient, the counter current flow design is used (see also Figure 3-4). **Do not connect the media pipes in different configuration (view from the motor side).**

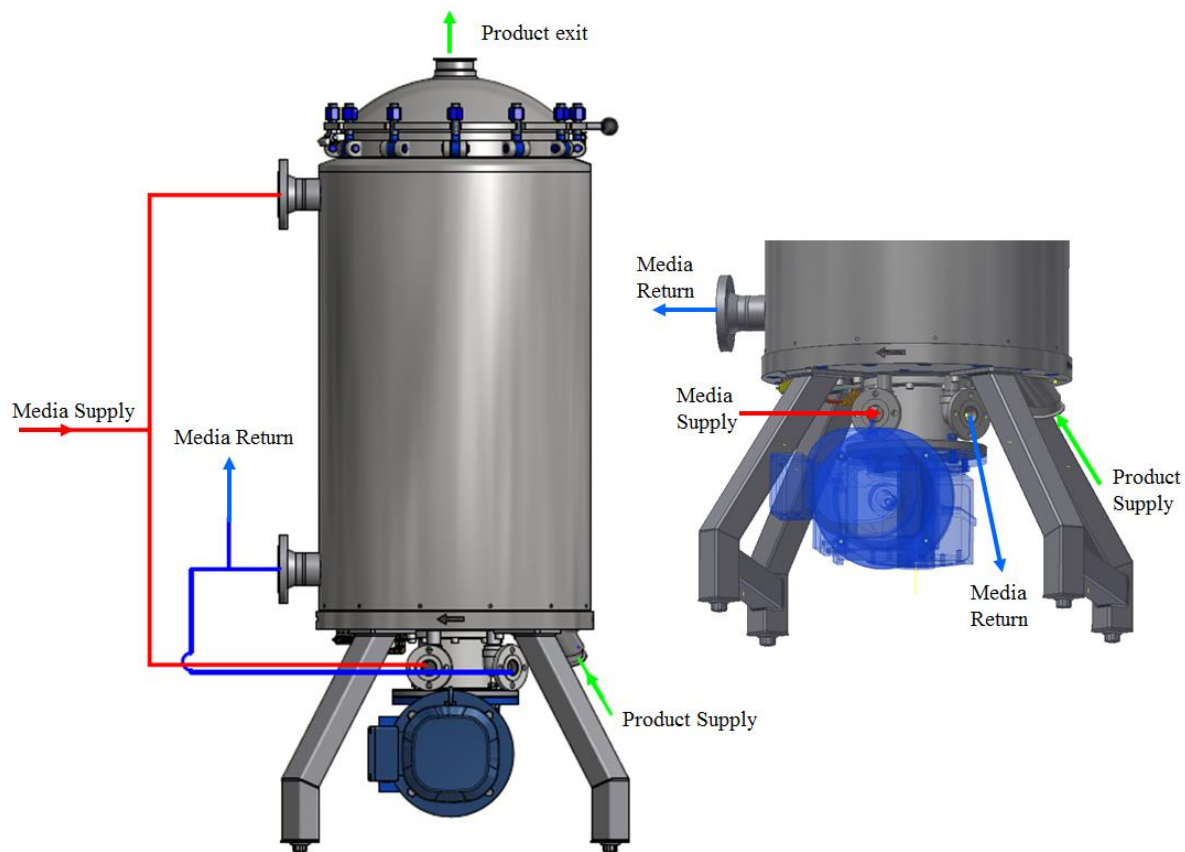


Figure 5-3: Media pipes connection (supply/return)

5.7 Installing a Steam Heating System

Figure 5-3 shows a typical steam heating system configuration for a CONTHERM MAX. Depending on your specific media, power, product, and plant layout, your installation configuration may vary from what is shown in this diagram. The pressure and temperature gauges are important tools that should be incorporated within your CONTHERM MAX's steam heating system to monitor system performance and help aid in the performance of troubleshooting activities. Only use sensors that are calibrated to an approved standard.

NOTE:



The Steam Trap should be located as far below the lower media connection (1.50 inches (38 mm)) on the CONTHERM MAX as possible. A piping bypass should also be constructed around the Steam Trap.

5.7.1 Component Description

The following components are used in a standard CONTHERM MAX steam heating package:

- 1 - Remote or self-actuating control valve
- 2 - Solenoid valve

- 3 - Pressure gauge
- 4 - Bypass and shut off valves
- 5 - Return Steam trap piping and bypass valves
- 6 - Purge valve
- 7 - Flanged connections to the CONTHERM MAX
- 8 - Pressure relieve valve set for maximum allowable nameplate pressure



NOTE:

Safety / purge valve is the responsibility of the user.

5.7.2 Remote or Self-Actuating Control Valve

Three methods are available for controlling the steam pressure within the CONTHERM MAX:

1. Manual - Physically setting the regulator to the desired pressure
2. Current Controller - Used with thermocouple sensors
3. Pressure Controller - Used with pressure sensor

The steam valve is pneumatically or electronically controlled by the controller. To maintain a constant pressure level, the steam valve will open an amount that is proportional to the difference between the set point temperature and the actual temperature sensed at the product outlet port.

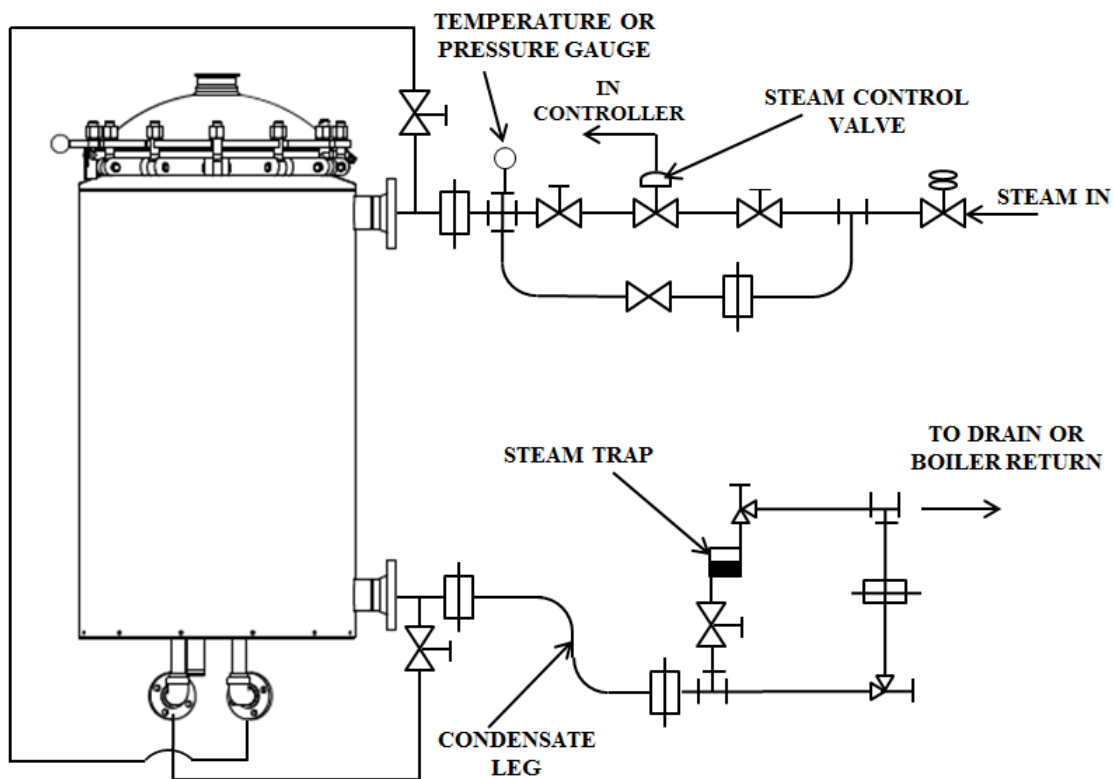


Figure 5-4: Steam heating system layout

5.8 Installing a Hot Water Heating System

5.8.1 Installing a Hot Water Heating System

Figure 5-5 shows two typical hot water heating system configurations for a CONTHERM MAX. The first configuration utilizes a dedicated hot water system; the contherm MAX is provided with its own water/steam heat exchanger. The second configuration utilizes a central hot water supply.

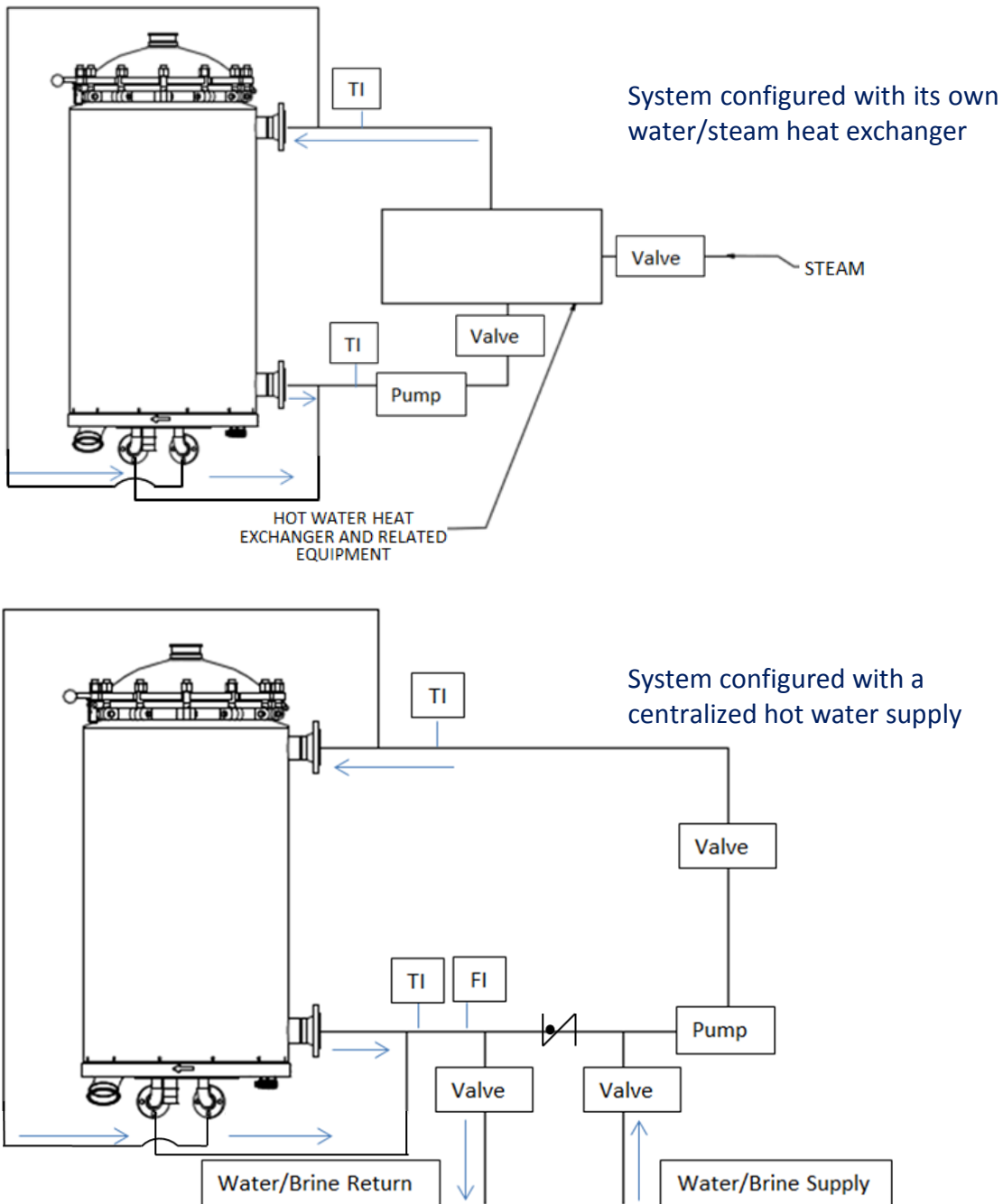


Figure 5-5: Typical Hot Water System Layout

5.9 Installing a Liquid Heating or Cooling Media System

Alfa Laval Inc.'s Scraped Surface Heat Exchangers are designed for counter-current flow between the product and the media. Product enters the cylinder at the bottom or non-driven end while the inlet for the liquid media is at the top or driven end. It is extremely important that pumps, pipe lines and valves be sized and installed properly to ensure that the flow rate of the media reaches a turbulent level. Water media must achieve a minimum of 125 gpm (475 liter/min) and non-water media (i.e. propylene glycol) 165 gpm (625 liter/min). Total media flow should be split between both inner and outer heat exchange cylinders.

Two typical CONTHERM MAX cooling system configurations are shown in Figure 5-5. One configuration shows an open loop set-up where product temperature control is required. In this configuration, the cooling water/brine is piped in a series arrangement through each CONTHERM MAX. This arrangement minimizes water consumption while maintaining high velocities through the media annulus thereby ensuring efficient heat transfer.

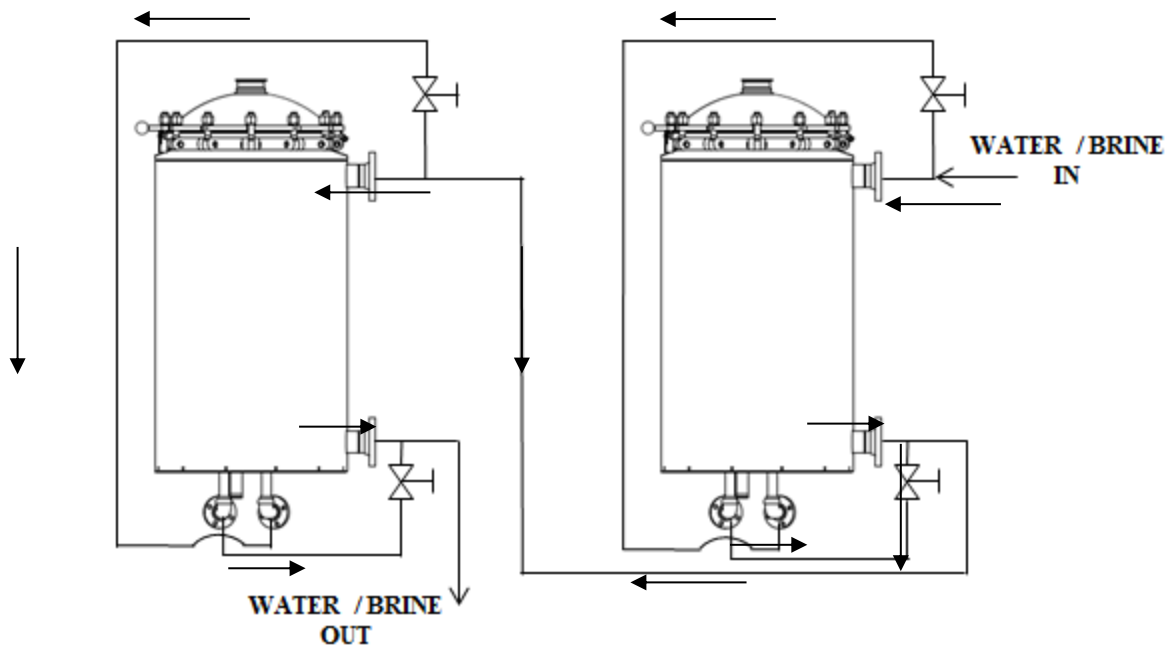
The other configuration shows a temperature control loop using a centrifugal pump. In this configuration, the pump circulates the cooling fluid through the CONTHERM MAX's media jacket. In configurations with more than one CONTHERM MAX, this set-up is usually utilized for the final CONTHERM MAX when the product outlet temperature must be controlled.

Depending on your specific media, power, product, and plant layout, your installation may vary from what is shown in Figure 5-6. If more than one CONTHERM MAX is utilized, liquid media can be piped in parallel where each CONTHERM MAX is receiving its own media stream or in series flow as shown. The thermometers are important tools that should be incorporated within your CONTHERM MAX's cooling system to monitor system performance and aid in the performance of troubleshooting activities.

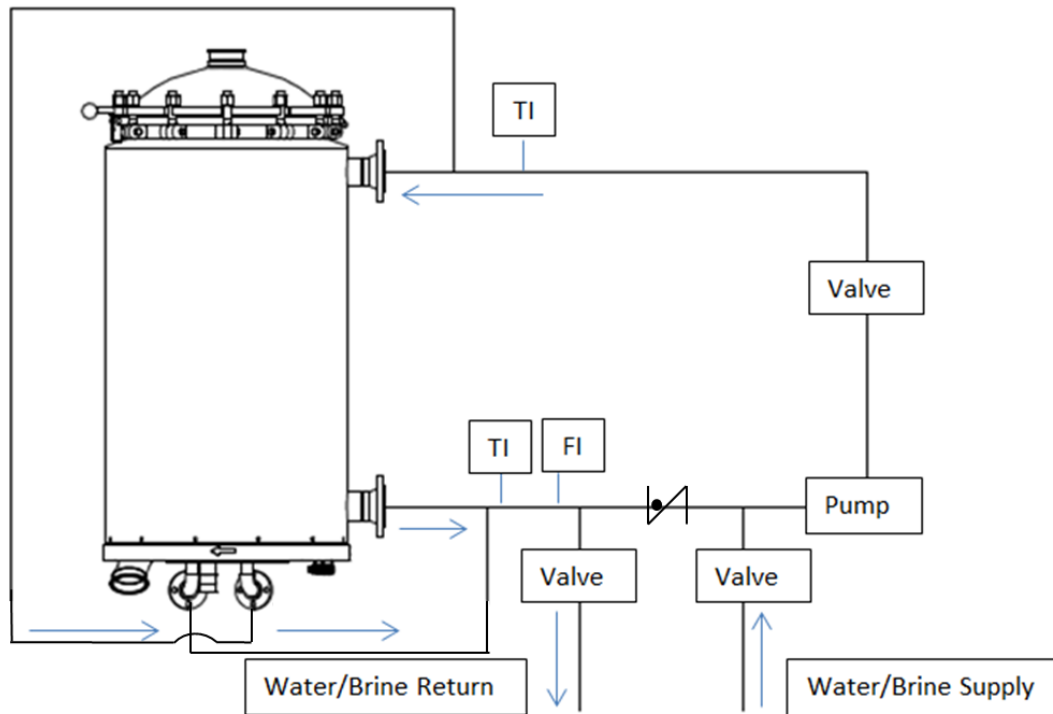
5.9.1 Component Description

The following components are typical of those used in standard CONTHERM MAX Water/Brine media recirculation packages:

1. Supply line solenoid valve and thermometer
2. Centrifugal pump
3. Check valve
4. Flow metering valve
5. Return line remote actuated control valve
6. Pressure relieve valve set for maximum allowable nameplate pressure



Open – loop cooling configuration



Temperature control – loop cooling configuration

Figure 5-6: Two typical cooling system configurations

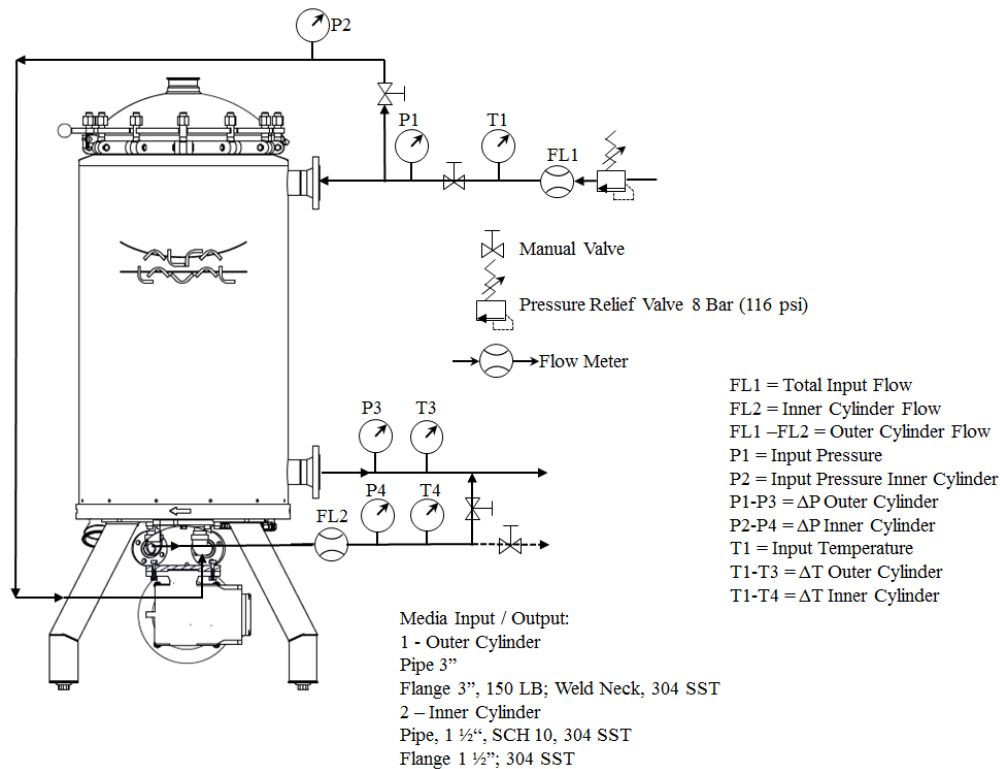


Figure 5-7: Typical full cooling system configurations –instruments for process control

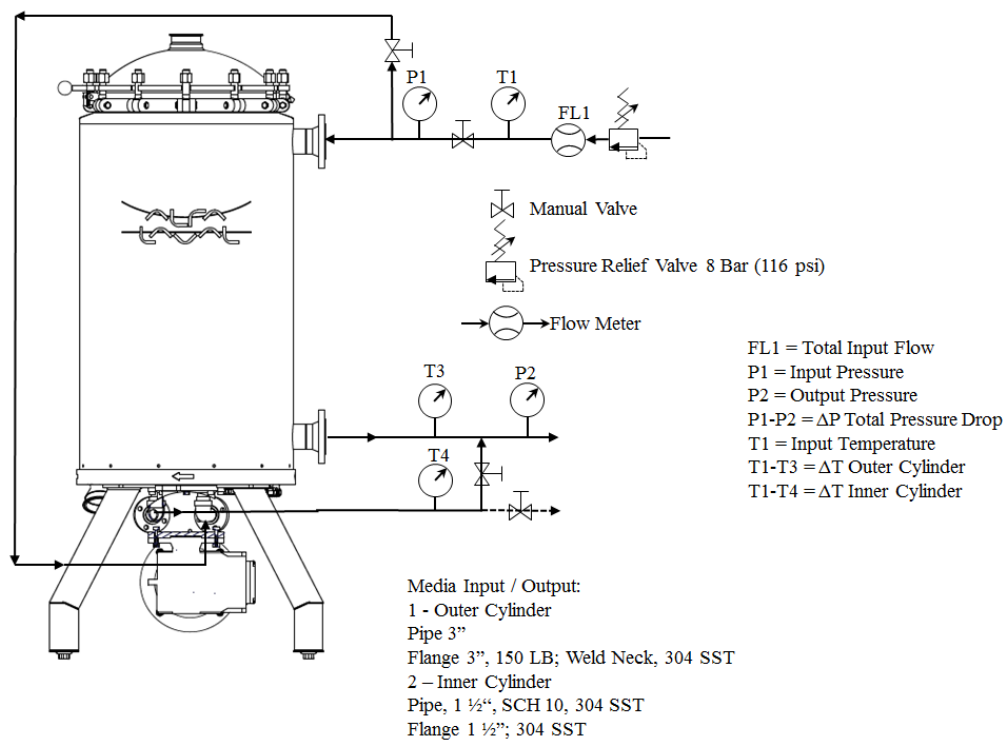


Figure 5-8: Typical partial cooling system configurations –instruments for process control

Chapter 6: Operation

6.1 Introduction

This chapter describes how to safely operate the CONTHERM MAX Scraped Surface Heat Exchanger (SSHE) and its related equipment. It is assumed that you have read the Safety Summary in Chapter One and have installed the CONTHERM MAX and all related equipment in accordance with the procedures provided in Chapter Five, Installation.

6.2 Initial Power Up

Make sure that the components and piping are correctly connected as stated in Chapter Five. Lower the lid using the hoist installed for removing the cage and make sure the lid is centered. Raise the bolts up and tighten them so that the CONTHERM MAX will remain sealed during operation.

CAUTION:



The media piping should be self-supporting (by others). Do not stress the Contherm MAX media connections.

Turn on the flush water source to make sure that the flush seal is properly lubricated before operating the machine. Water will be seen exiting the drainage port when it is ready for use. The flush water regulator should be set to a maximum of 15 psi for optimal use.

Do not proceed with the start-up and initial testing of the CONTHERM MAX unless you have read this manual. Flush the product chamber and thoroughly clean it of all foreign materials before turning on the motor (turn the cage). Failing to do so can result in damaging the heat transfer surfaces and scraping blades. Jog the motors and pumps to ensure their proper operation (See section 5.4 about wiring the motor). Verify the settings of all the air supply and all pressure level controls. Test all solenoids for proper operating voltage. Ensure that the scraping blades are installed properly. Ensure that leaks are not present at any of the product or media connections.



NOTE:

- Some early seepage around the product seals is normal. This would be visible via the drain tube located at the bottom of the CONTHERM MAX (see Fig. 5-2 –Page 19). Any leak should disappear as the seals seat themselves.
- Place thermometers and pressure gauges in both the product and the media lines as these gauges will be useful when troubleshooting system problems.

6.3 Operating the Contherm Max

This section describes the start-up and initial testing procedures for the CONTHERM MAX configured for use in the following systems:

1. Steam Heated
2. Liquid Heating or Cooling

All contherm MAX are flushed seals, turn on the seal flush water or steam prior to turning on the drive motor to the rotating cage assembly. **Do not exceed 15 psi (1 Bar) of water or steam pressure on the seal flush media.** Using water as the test “product” for the initial start-up, begin flowing the water through the CONTHERM MAX via the product inlet. The volume of product chamber is about 130 liter (36.35 US gallons). When water begins exiting the product outlet, start the motor to begin scraping. Slowly open the media valve a small amount and then check the media piping for leaks. Verify that the control valves and/or steam traps are working properly. For steam heating, a small amount of condensate and vapor should be discharged at regular intervals. For the best results, adjust the product side flow rate and temperature profile of the water to that of the actual product. When you are satisfied that the CONTHERM MAX is operating properly with water, your CONTHERM MAX is now ready to be used for production. Complete the CIP / SIP (sterilization); use the same standard procedure as is used to the production lines. Switch from water to the product and adjust the system parameters as needed.

NOTE:



The product/water should be flowing through the system before the media is turned on. The motor must be turned on before the media is introduced. To avoid scorching the product onto the heat exchanger's cylinder wall, do not allow steam to enter the CONTHERM MAX before the product has completely filled the heat exchange cylinder.

CAUTION:



Always close the steam shut-off valve when the rotation of the scraping cage is stopped. Otherwise blades that are in contact with the hot cylinder may become damaged.

6.4 Shutting Down the Contherm Max

When the production run is complete, divert from product back to water to chase the product from the cylinder. Time and experience will determine the amount of product that can be saved before water and product mixture exits the CONTHERM MAX. When the product has been rinsed /cleared from all lines, shut off the heating or cooling media source.

At this point, the CONTHERM MAX may be cleaned in accordance with the information provided in the following section, *Section 6.6 Cleaning the CONTHERM MAX*. After you have completed in the cleaning process in accordance with the information provided in Section 6.6, you can shut off the CONTHERM MAX's drive motors.

6.5 Noise Emission and Sound

The noise is declared as the total sound power emitted from the Contherm MAX when the machine is operated with closed outlet and water as a process medium. Upon request detailed noise emission information can be obtained from Alfa Laval.

The sound pressure level at an operating Contherm MAX in normal operation are well within the maximum permitted set for VDI guideline 2159 for gear unit and IEC/EN 60034 for motors; never will exceed the limits for long time exposure 80 dB(A) and short time exposure 85 dB(A).

6.6 Cleaning the Contherm Max

The CONTHERM MAX is designed to be cleaned in place (CIP), using conventional CIP equipment and cleaning solutions. The selection of the appropriate cleaning solutions and the proper time/temperature relationships is critical to the integrity of the equipment. Specific product soils can cause variations in the cleaner and procedure selections.

For additional recommendations on cleaning and sanitizing your CONTHERM MAX, contact your local chemical supplier representative.

6.6.1 Recommended Cleaning Guidelines

The following list provides recommended guidelines to follow when cleaning your CONTHERM MAX equipment.

1. A high velocity water rinse is the most important step. The remaining steps are far more efficient after a thorough rinse has been completed.
2. Do not use acid solutions lower than 3.5 pH.
3. You can improve the cleaning for stringy or particulate products by periodically pulsing the rotating assembly, reversing the rotation of the cage during the cleaning cycle and reversing the CIP flow direction for very difficult to clean products.
4. Do not heat cleaning solutions in the CONTHERM MAX. Precautions should be taken to insure that the steam cannot be turned onto the heat exchangers during CIP.
5. CIP flow rate recommendations are found below in Table 6-1. To increase mixing and turbulence, Alfa Laval Inc. strongly recommends that cage rotation be operated intermittently during the cleaning cycle at the highest possible speeds.
6. Do not air blow cleaning solutions from the CONTHERM MAX. Cleaners should be rinsed from the equipment.
7. Do not leave the product or the CIP solution in the CONTHERM MAX for extended periods of time after completion of a production run. If left in the CONTHERM MAX, accelerated corrosion of the parts in contact with the product or the CIP solution will occur.

Table 6-1: CIP Flow Rates

CONTHERM MAX Model	Flow Rate*	
	GPM	m ³ /hr.
4.5 m ²	180	40
* Optimal CIP flow rate will vary depending upon the product solids and degree of fouling. The above flow rate is a recommendation that should be suitable for most products. The flow rate should be increased or decreased through trial and error to optimize cleaning flow rate, cleaning time and chemical concentration.		

To protect your equipment and your warranty, clean the CONTHERM MAX in accordance with the following guidelines and the recommended cleaning program provided in Table 6-2. If you use chemical concentrations and temperatures that are not recommended and approved by Alfa Laval Inc. or if cleaning agents are used improperly, you may void your warranty for the heat exchange cylinder and blades.

Table 6-2: Recommended Cleaning Program

Order	Cleaning Agents	Temp.	Time	Chemical Concentration (Conc.)	Solution pH	Purpose
1	High velocity water rinse	60-120°F (16-49°C)	5- 10 minutes; until discharge is clear	Not Applicable	Not Applicable	To remove loosen soil
2	Caustic alkaline cleaner (Chlorine) additive	160-190°F (71-88°C) Match Product Temperature Chlorine Max. 160°F	30 – 60 minutes	0.5 to 2% NAOH 200 ppm Chlorine	12 - 13	To remove fat deposits & remaining soil
3	Water rinse	60-120°F 16-49°C	Until discharge indicates pH of 7.0	Not Applicable	Available Water Supply	Remove and neutralize alkaline cleaner
4	Acid Cleaner (Phosphoric)	135-145°F; max. 165°F 57-63°C; max. 74°C	10 – 20 minutes	Up to 1%	3.5 - 4	Remove protein deposits & any remaining alkaline & minerals
5	Water rinse	68°F max. 20°C	Until discharge indicates pH of 7.0	Not Applicable	Available Water Supply	Neutralize acid cleaner
6	Sanitize	68°F 20°C	0.5 – 2 minutes	Depends on sanitizers used	Depends on sanitizer used	Sanitize surface

Chapter 7: Maintenance

7.1 Introduction

You must perform periodic maintenance on the equipment and components of your CONTHERM MAX to ensure its safe and efficient operation. This chapter provides a recommended schedule for performing these maintenance actions. In addition to the maintenance schedule, detailed procedures for performing all maintenance actions required to support the equipment and components of your CONTHERM MAX are provided.

The maintenance information in this chapter is organized as shown in Table 7-1.

Table 7-1: Maintenance Sections

Section	Description
7.2	Scheduled Maintenance
7.3	Open-Close Lid
7.4	Scraping Blades
7.5	Seals
7.6	Bearings
7.7	Heat Exchange Cylinders

WARNING:



Do not perform maintenance on the CONTHERM MAX or its equipment and parts until you have read this manual and are knowledgeable of the equipment and all applicable safety precautions.

7.2 Scheduled Maintenance

The rate of wear of CONTHERM MAX components is linked to many things such as the frequency of use, the physical nature of the product being processed (i.e. abrasiveness or chemical makeup), the condition of product contact surfaces and the degree of the fouling rate associated with extreme temperature differences between product and media. As a result, it is impossible to accurately predict wear rates making it critical that each customer monitor their equipment closely in the first months of use to develop the necessary experience to predict maintenance intervals.

Table 7-2 provides a schedule for performing periodic maintenance on the equipment and components of your CONTHERM MAX. This table has been provided by Alfa Laval Inc. as a suggested maintenance guideline.

Table 7-2: Scheduled Maintenance For The CONTHERM MAX

Component	Maintenance Action	Time Period
Mechanical Seal Components (rotary and stationary seal faces, O-rings, etc.)	Inspection maintenance	Post CIP for the first month of operation. Reduce frequency based on observed wear rate.
Scraping Blades	Inspection	Post CIP for the first month of operation. Reduce frequency based on observed wear rate.
Bearings	Inspection and lubrication	Grease weekly

Product Contact Surfaces of Cylinders	Inspection maintenance	Whenever equipment is opened. When surface is no longer smooth and concentric contact Alfa Laval Inc. for further instructions.
Gaskets	Inspection and lubrication Maintain/replace	Each time the CONTHERM MAX is opened – weekly. Reduce frequency based on observed wear rate.

7.3 Opening/Closing the Lid (Upper Cover)

WARNING:



Do not open the lid of the CONTHERM MAX until you have read these instructions. Not following these instructions can result in serious personal injury.

- Always turn off the power of the CONTHERM MAX prior to performing service. Lockout-Tag out operations must be done on the CONTHERM MAX before Authorized Personnel can perform repairs or service.
- Before you open the lid (cover) make sure that the pressure inside the CONTHERM MAX (product area) is at atmospheric pressure. Never release the pressure inside the CONTHERM MAX by unscrewing the nuts of the swing bolts.
- For safety, it is recommended to use an overhead lifting device or to have two persons to open the lid. Refer to Table 5-1 for the necessary weight to be lifted. Use the following warning label “HAND CRUSH / PINCH POINT” in a visual place of the lid.



7.3.1 Opening the Lid

Step 1:

1A: Loosen the M24 hex nuts using a 41 mm wrench, swing the eyebolts back way from the lid.

Step 2:

2A: Open the lid using a hoist on the ball handle. The hinge for the lid will hit a stop at the approximate angle shown. This will stop it from opening any further (Fig 7.3-2).

2B: In order to keep it from accidentally closing while working in the cylinder, **the safety pin will need to be inserted**. Secure the pin in the hole of the lid hinge as shown (Fig 7.3-2).

7.3.2 Closing the Lid

When closing the top lid, follow the instructions below:

- Before closing the lid, make sure that there is not any undesirable object in the CONTHERM MAX's product area and the seal assembly and blades are properly installed.
- Clean any debris from the gasket and lubricate the gasket.



WARNING:

Watch fingers, hands and head

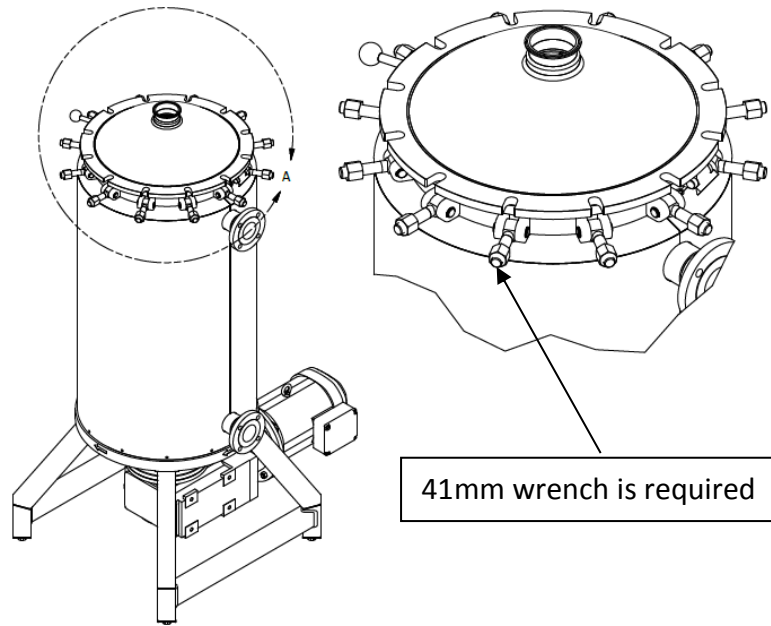


Figure 7.3-1: Disengage the bolts

Step 1:

1A: Remove the safety pin from the lid hinge as depicted below. Set aside.

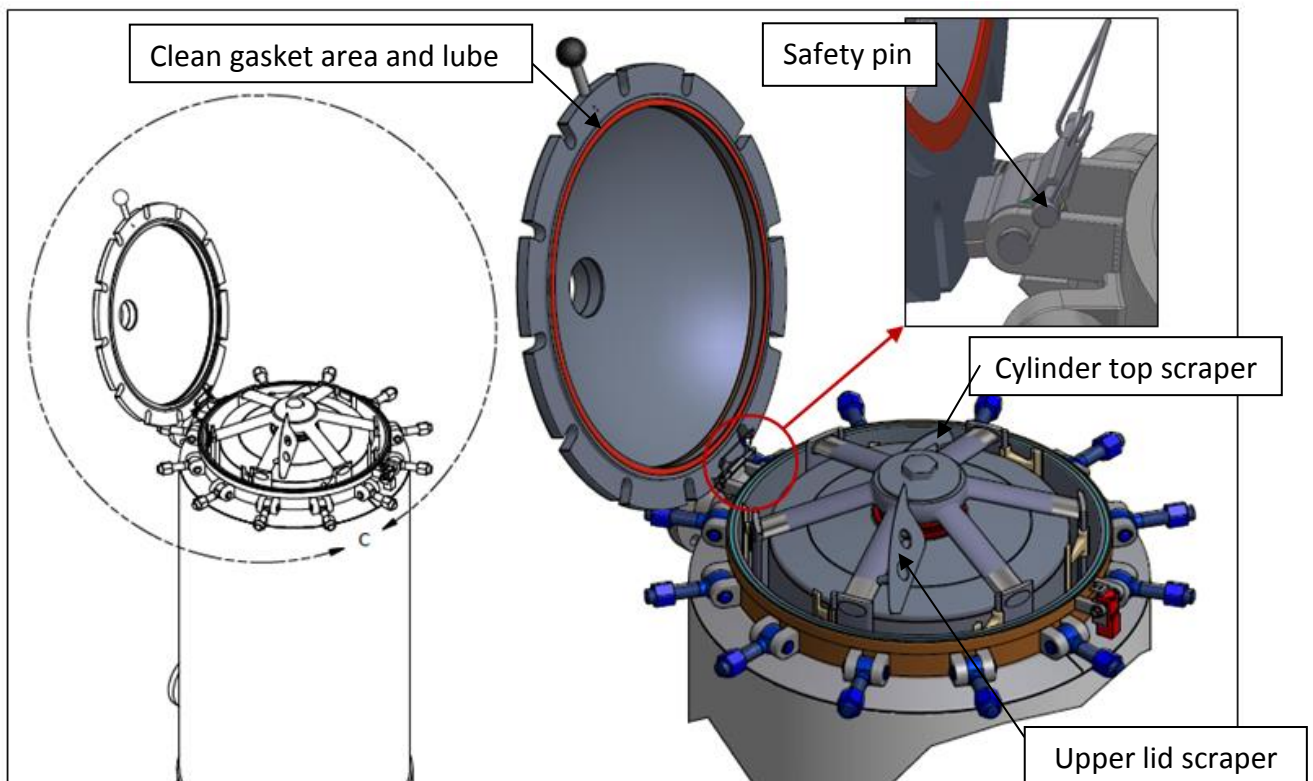


Figure 7.3-2: Remove Safety Pin, Wipe gasket and lube

Step 2:

2A: Use a hoist with the ball handle to carefully lower the lid to its closed position. **See Figure 7.3-2.** Make sure to have two persons available to safely lower the lid.

Step 3:

3A: Rotate the bolts upwards into their respective slots in the lid, and then tighten the nuts on each bolt to secure the lid. **See Figure 7.3-1.** **The recommended torque to tighten the swing bolts is 75 ft.*lb. to 80 ft.*lb [101.68 N*m to 108.5 N*m];** cross pattern to follow during this process.

7.4 Scraping Blades

The following sections describe how to remove-install, inspect, and maintain the blades used with your CONTHERM MAX.

Inspect your CONTHERM MAX's scraping blades every week to ensure the blades are working properly. If your CONTHERM MAX's scraping blades begin to wear unevenly or show significant signs of wear, all the scraping blades must be replaced and serviced.

We confirm that CONTHERM MAX scraping blades are constructed of FDA compliant materials intended for food contact and are in compliance with Regulation (EC) No. 1935/2004 including underlying directives for specific materials and Regulation (EU) No. 10/2011 where applicable.

With the request of the customer the Contherm MAX can be provided with metal detection blades or other blades with different configuration.

The scraper blades need regular servicing to maintain an effective scraping edge. The recommended maximum distance to be removed would be .375" shorter starting from the initial dimension. When servicing, make sure to only remove a little bit off the angled surface of the blade until the contact edge is at a point. New blades should be purchased once it is no longer possible to service the existing blades without going over the .375" constraint.

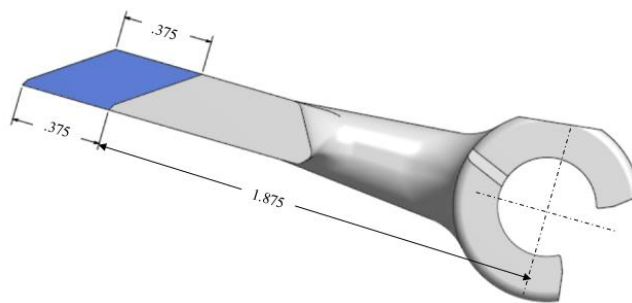


Figure 7.4-1: Max area of blade that can be removed for servicing

7.4.1 Removing Blades

Each column of blades (each arm) at the top contains a blade stop; the side in contact with the blade contains a notch that fits the notch of the blade. The blade stop limits the vertical movement of the blades (disengagement) during work due to product flow and thermal expansion or retraction. The blade stops are configured for the blades in contact with inner cylinder or outer cylinder.

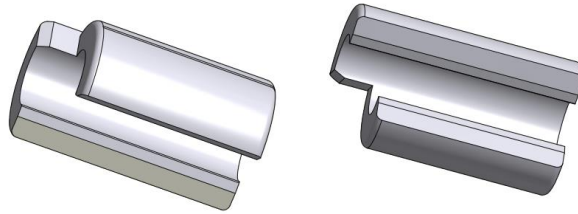


Figure 7.4-2: Blade Stop Inner and Outer



NOTE:

During the blades replacement, be careful no blade stop fall to the product area.

Step 1:

1A: Using the blade retriever tool, remove the blade from the cage arm as shown. Place the removal tool on the bottom blade's arm and lift all the blades removing one-by-one.

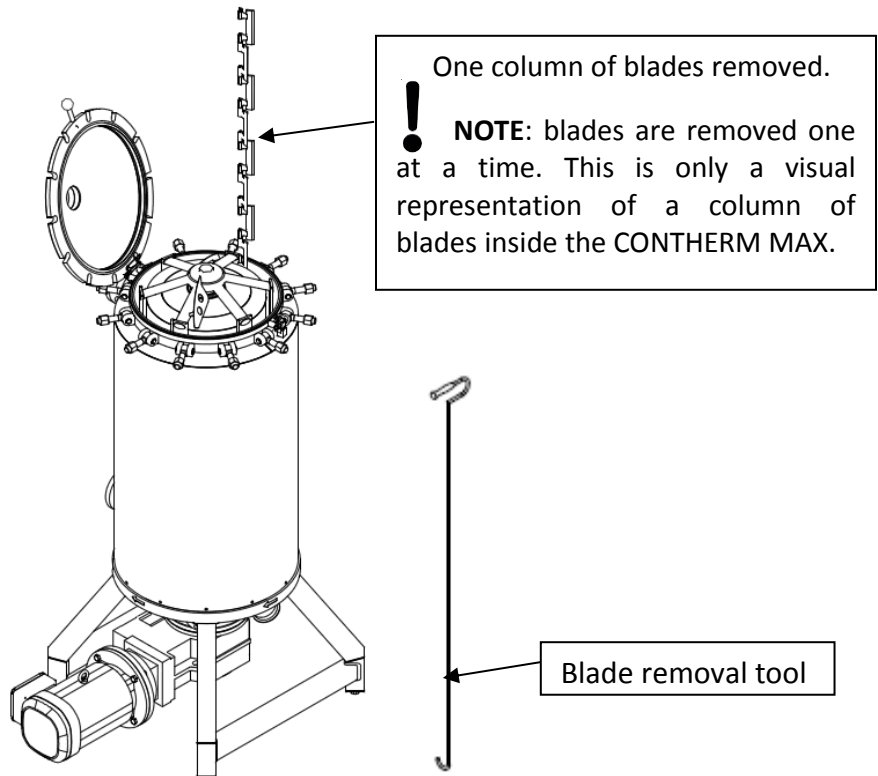


Figure 7.4-3: Removing blades

Step 2:

2A: Using the blade removal tool, continue to remove the blades one at a time. Be careful that no blades fall within the CONTHERM MAX's product area. There are 8 blades per arm; inspect each one for damage, and replace/clean/service if needed. If the blade is worn, note its position and look for any wear in the corresponding cylinder surface.

7.4.2 Inserting Blades

Step 1:

1A: Slide blades onto the cage arms. Do not apply excessive force on the blade when you are inserting it on the cage arms; the scraper blade has to move easily in its location. The same scraper blade is used for scraping the inner and outer cylinders and should be configured per the below table. See Figure 7.3-2 for a clearer view of the upper lid and cylinder top scrapers.

NOTE:



All blades are identical and are placed in the CONTHERM MAX in such a way that one is touching the outer wall and the next one is touching the inner wall.

Hanger	Blade Position							
	1	2	3	4	5	6	7	8
1	I	O	I	O	I	O	I	O
2	O	I	O	I	O	I	O	I
3	I	O	I	O	I	O	I	O
4	O	I	O	I	O	I	O	I
5	I	O	I	O	I	O	I	O
6	O	I	O	I	O	I	O	I

I = inner scraping blade

O = outer scraping blade

Blade Position: (Clockwise from 1 – 6)

1 = Arm with upper lid scraper

4 = Arm with cylinder top scraper

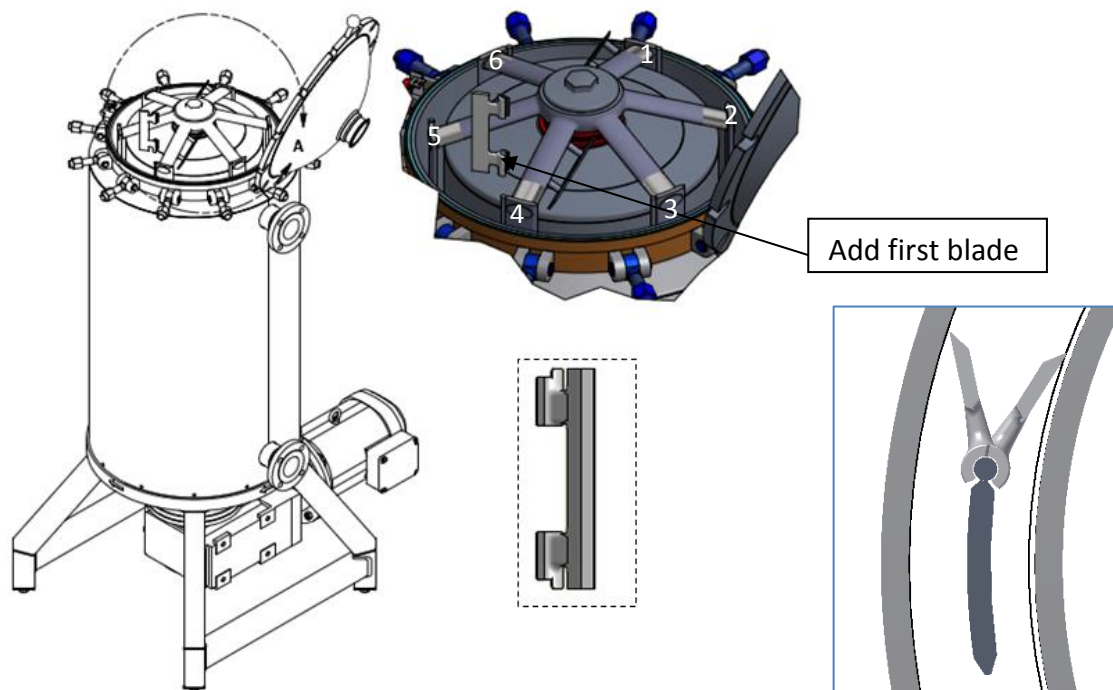


Figure 7.4-4: Add the blades in an alternating pattern

NOTE:



Numbers appearing on the cage arms aren't actually included on the CONTHERM MAX. They are for reference when inserting the blades onto the cage.

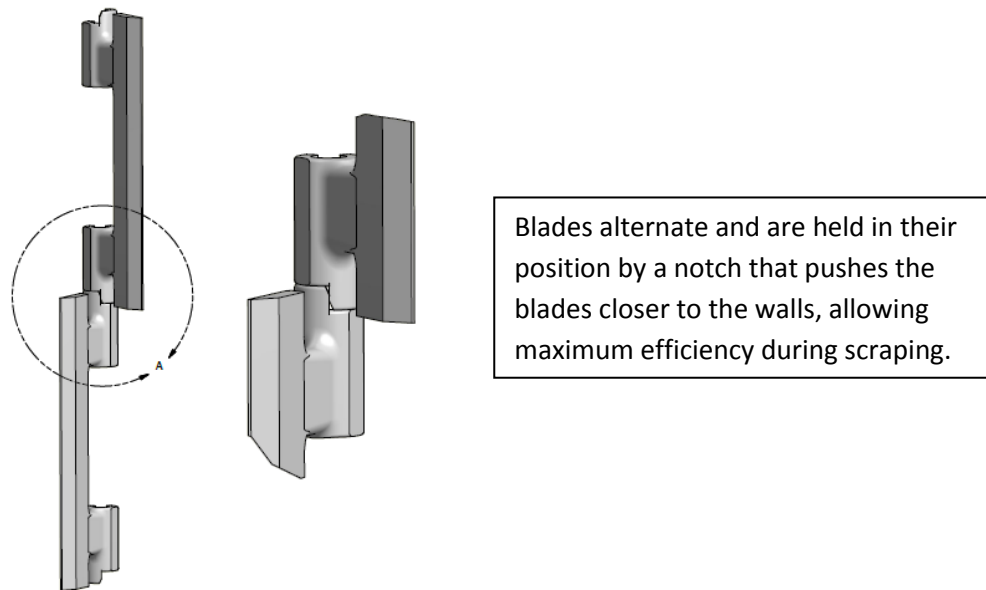


Figure 7.4-5: Scraper Blade Notch Joint

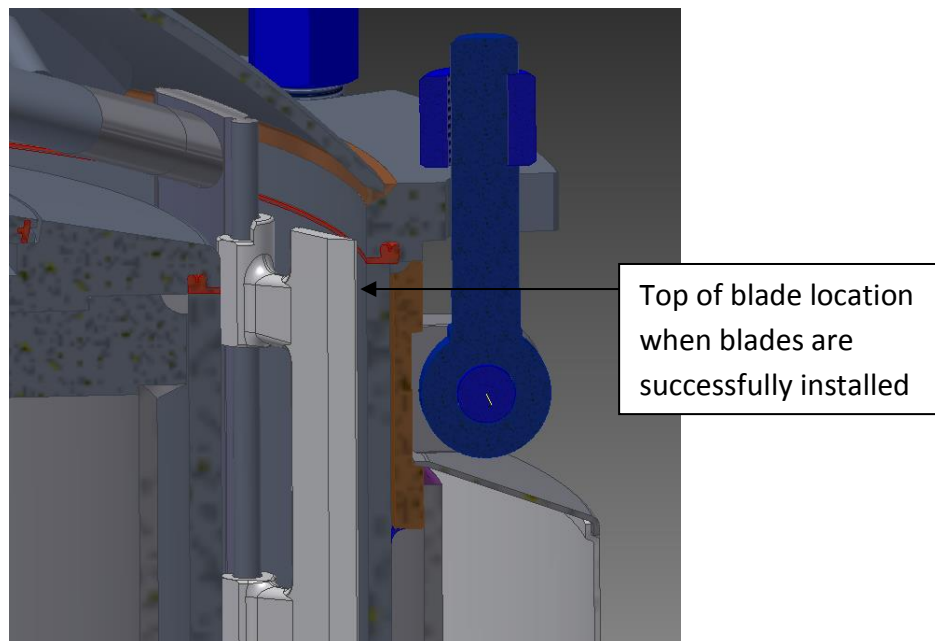


Figure 7.4-6: Where the top blade should line up in the CONTHERM MAX

7.5 Seals

This section describes how to inspect, replace, and test the CONTHERM MAX's shaft mechanical seal.

These seals prevent product from escaping from within the product chamber and outside contamination from entering the cylinder. The seal is created between two very flat surfaces, one

on the rotating assembly (the seal face) and the other installed into the inner cylinder assembly (seal bushing). It is the integrity of the contact between these surfaces that ensures a proper seal.



WARNING:

Avoid any dry running.

Always ensure the barrier fluid chamber is filled and properly bled. Maintain an appropriate buffer fluid flowrate so that the buffer fluid outlet temperature remains at least 20°C below its boiling point. Do not exceed the maximum design pressure and speed of the equipment.

If product leakage is discovered in the bucket discharge pipe, the seal unit must be inspected and have parts replaced as necessary.



Figure 7.5-1: Various parts of the seal used in the CONTHERM MAX

7.5.1 Removing the seal unit

Step 1:

NOTE:



To get to this stage, you must first open the lid. Refer to the "Open the Lid" and "Removing Blades" instructions before proceeding.

1A: Use a 2" socket wrench to unscrew the cage cap. Set aside. There should be a gasket attached to it; inspect it for need of repair/greasing. Remove the threaded stud from the top of the drive tower as well.

Step 2:

2A: Attach the cage extraction tool (CET) to the top of the cage using three screws (3/8" Allen wrench supplied by Alfa Laval). Attach the hoist to the hoist ring, and carefully begin lifting the cage out of the Contherm Max. Blades should always be removed when removing the cage to prevent damage. Set the cage aside in a safe place until it is ready to be reassembled.

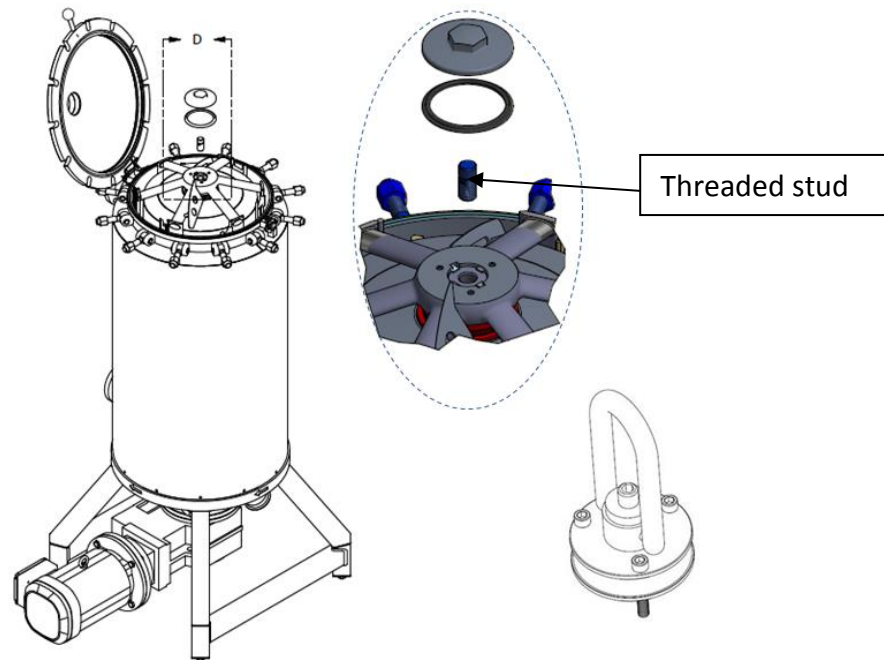


Figure 7.5-2: Cage cap & gasket & Cage Extraction Tool (CET)

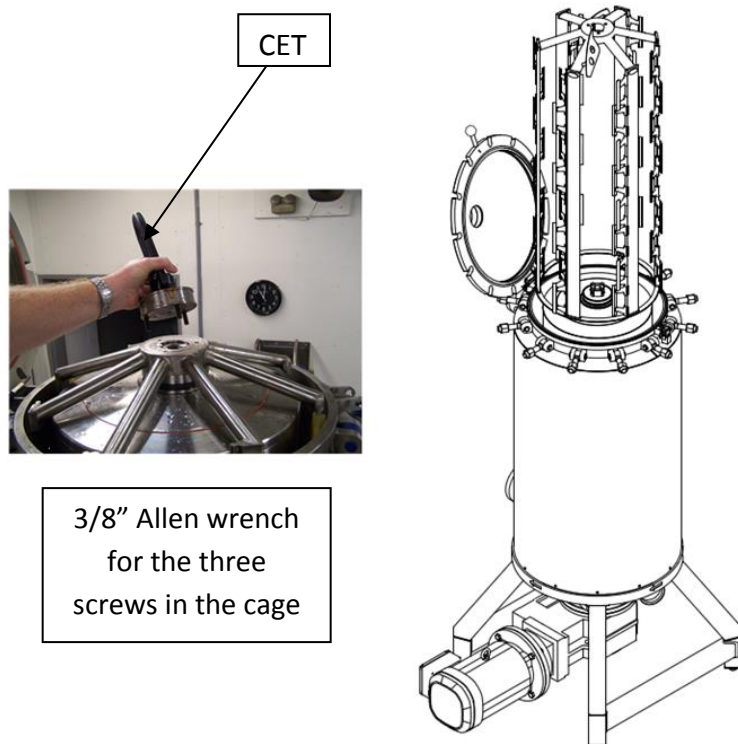


Figure 7.5-3: Cage removal

Step 3:

3A: Remove the key on the shaft that keep the seal in place. Remove mechanical seal.

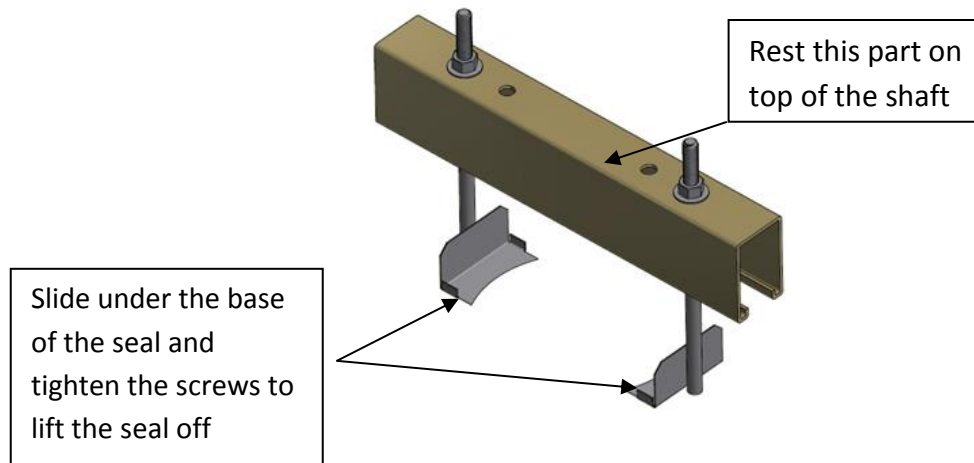


Figure 7.5-4: Seal Removal Tool

A screwdriver can be used also to remove the seal. Gently insert the screwdriver under the seal base (be careful not to damage the O-Ring of seal hole) and separate the seal from seal sleeve. The upper part of the seal (rotating face) can be removed separately before the seal body.

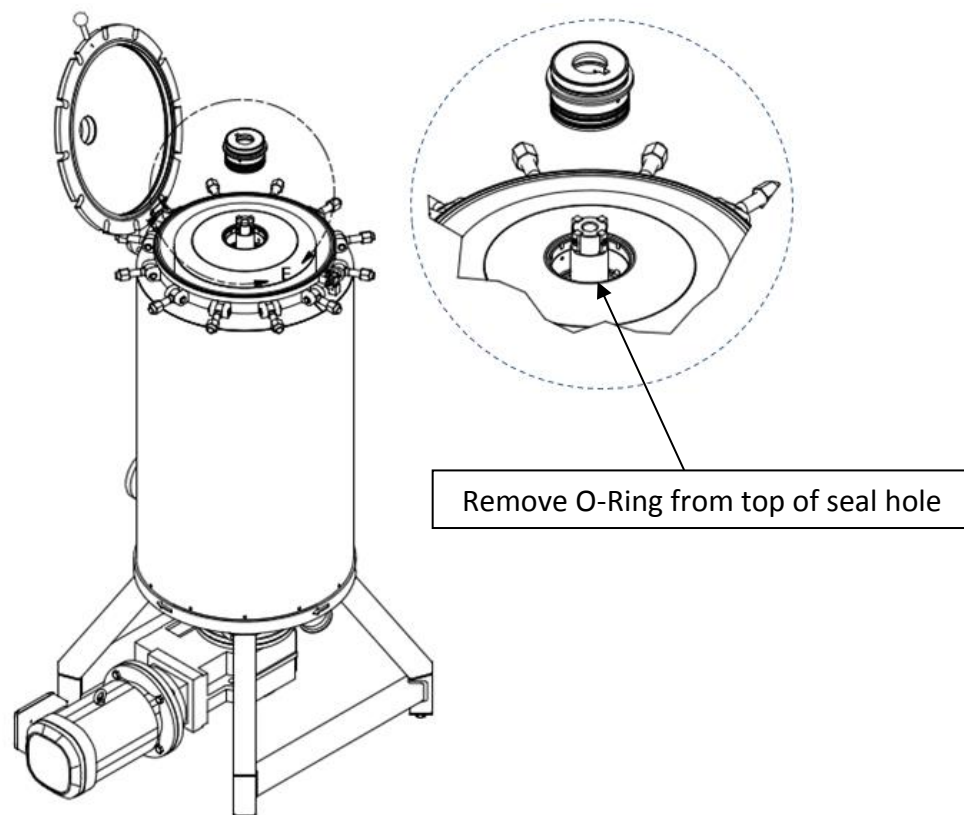


Figure 7.5-5: Remove mechanical seal

7.5.2 Disassembling/Assembling the seal unit

Both disassembly and assembly will require the use of a kit that will consist of the parts listed in Table 7.5-1 shown below. Item numbers referenced will refer to Table 7.5-1.

Table 7.5-1: Parts included in maintenance kit with EPDM O-rings

Item Number	Quantity	Description	Article Nr.	Part Number	Material
1	1	Inboard Static Face	302738	11-0701-6350-01	SiC
2	1	Outboard Static Face	302739	11-0701-6350-02	Carbon
3	1	Rotary Face	302740	11-0701-6350-03	SiC
4	1	O-ring	302749	11-0701-6350-04	EPDM FDA
5	1		302753	11-0701-6350-05	
6	2		302755	11-0701-6350-06	
7	3		302762	11-0701-6350-07	
8	1		302757	11-0701-6350-08	

Table 7.5-2: Parts included in maintenance kit with NBR O-rings

Item Number	Quantity	Description	Article Nr.	Part Number	Material
1	1	Inboard Static Face	302738	11-0701-6350-01	SiC
2	1	Outboard Static Face	302739	11-0701-6350-02	Carbon
3	1	Rotary Face	302740	11-0701-6350-03	SiC
4	1	O-ring	302748	11-0701-6360-04	NBR FDA
5	1		302752	11-0701-6360-05	
6	2		302754	11-0701-6360-06	
7	3		302761	11-0701-6360-07	
8	1		302756	11-0701-6360-08	

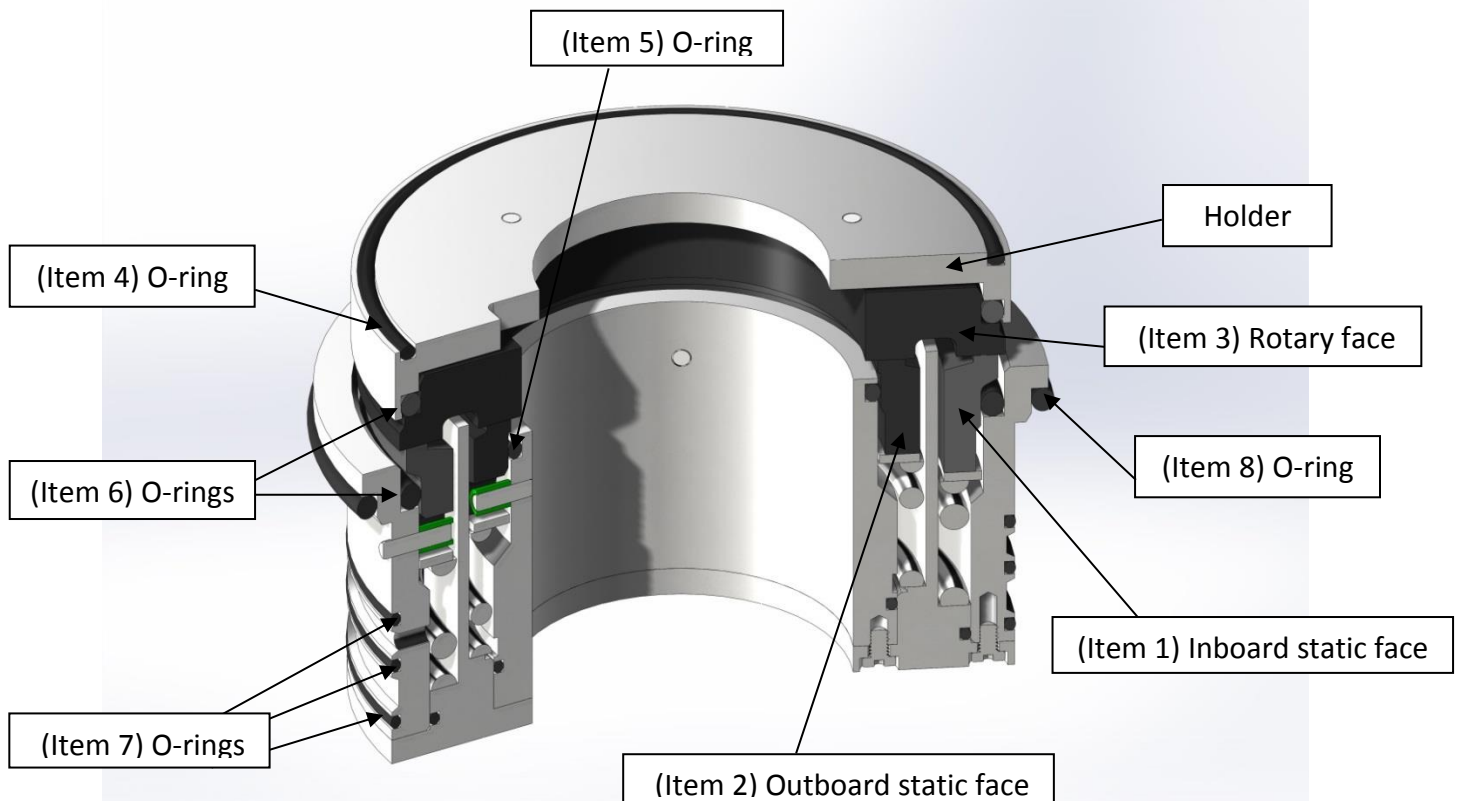




Figure 7.5-6: Seal Assembly and Spare Parts

Step 1: Rotary Assembly

1A: Pry rotary face (Item 3) out of its holder

1B: Remove and replace both O-rings (Item 6) on the holder

1C: Gently press new face back into holder by hand, making sure to align the pins on the holder with the slots on the rear of the face

Step 2: Static Assembly

2A: Remove and replace the housing buffer cavity O-rings (Item 7)

2B: Pry both inboard (Item 1) and outboard (Item 2) static faces out of the seal housing

2C: Remove and replace the inboard and outboard face O-rings (Item 5)

2D: Gently press the new inboard (Item 1) and outboard (Item 2) faces in by hand, making sure to align the pins in the housing with their corresponding slots in the faces

7.5.3 Installing the seal unit

Step 1:

1A: Make sure that the seal O-ring surfaces are free of burrs, sharp edges, or other damage that may cut the O-rings or otherwise prevent them from seating.

Step 2:

2A: Install mechanical seal.

- Clean seal area with an alcohol based solvent, lubricate the 3 O-rings and do not clog flush holes.
- Ensure seal faces are separated since they may be stuck together. If this is the case, run them under warm water. Seal faces should snap into place in the mechanical seal.

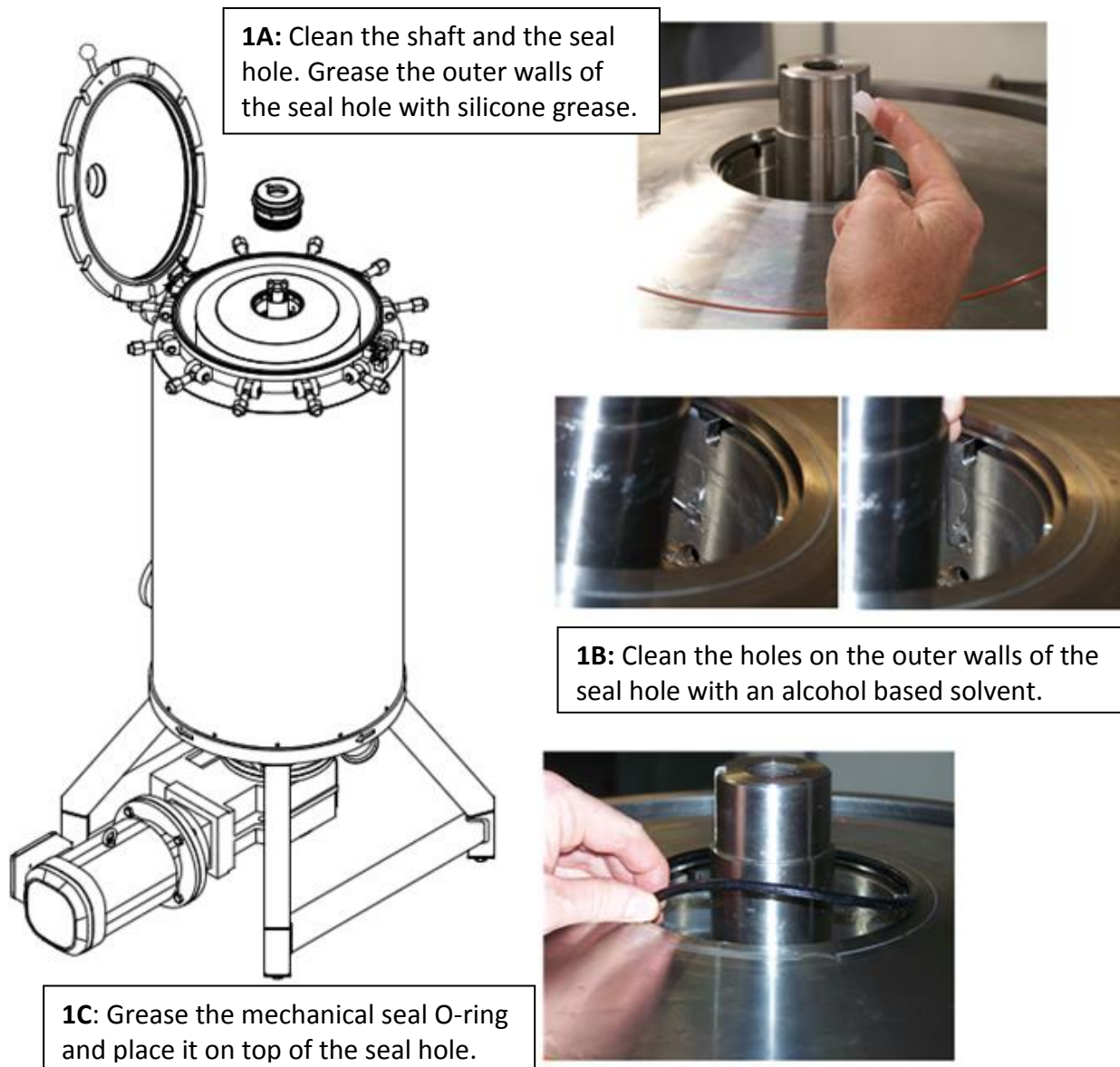


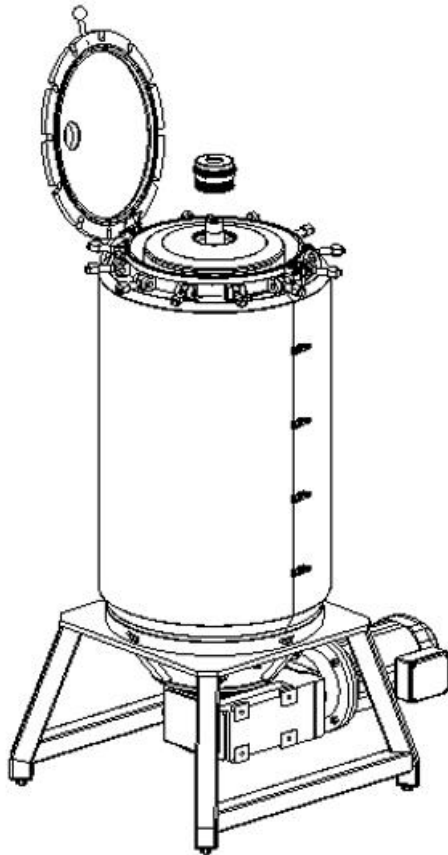
Figure 7.5-7: Service mechanical seal

Step 3: See Figures 7.5-8 & 7.5-9

3A: Install mechanical seal. Use the seal press fixture with the cage cap to push the mechanical seal into the hole around the drive tower.

3B: Unscrew the cage cap and remove the seal press fixture. Make sure the mechanical seal is secure.

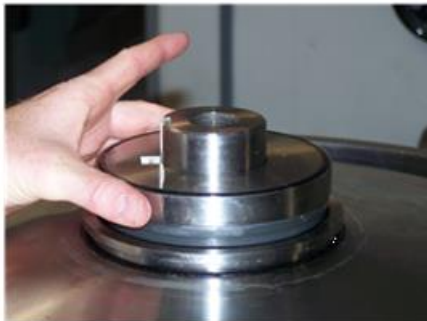
3C: Clean & lubricate O-ring & groove on rotary part of mechanical seal (Figure 7.5-9)



2A: Lightly insert the bottom half of the mechanical seal into the seal hole.



2B: Spray both faces of the mechanical seal with an alcohol based solvent.



2C: Place the upper half of the mechanical seal onto the bottom half so that the sprayed faces are in contact.

Figure 7.5-8: Mechanical seal installation

NOTE:

- ! When installing the seal, sometimes, after removing the seal press fixture (Fig 7.5-10) the seal returns back (seal springs). When the seal is compressed, locate the second shaft (cage) key. Use the second shaft key to prevent the seal from returning back.

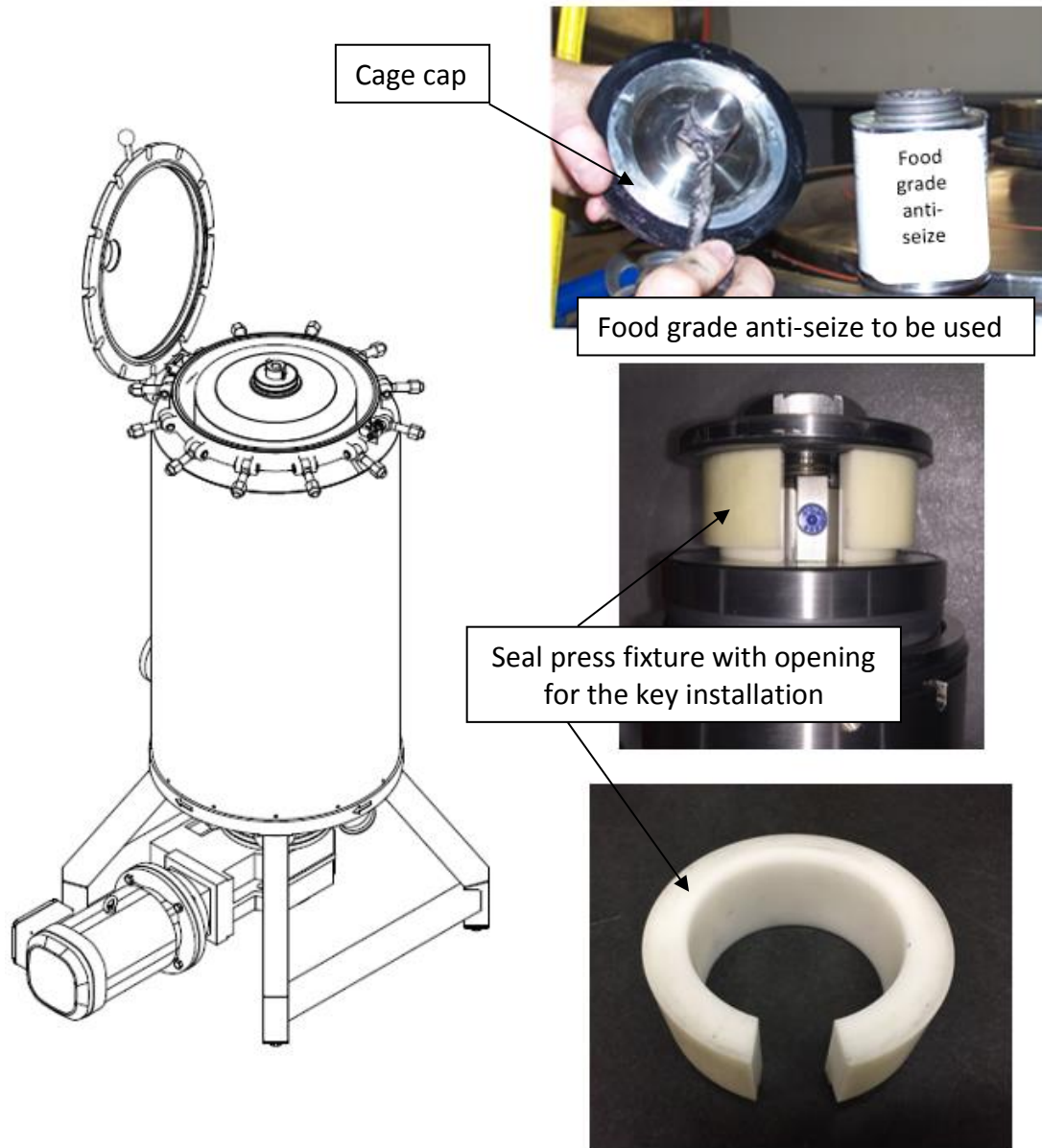


Figure 7.5-9: Mechanical seal installation

The seal press fixture can allow installing of the shaft key when the seal is in the proper low location.

Step 4:

4A: Cage Installation is carried out in the reverse order to cage removal

- Attach the CET to the top of the cage if it is not already secured. Attach the hoist to the CET and lift the cage. Hover it over the CONTHERM MAX as shown.
- Slowly lower the cage into the cylinder; being careful not to damage the blades. It is advisable to remove the blades when removing the cage (see 7.5.1 removing the seal unit).

- Be sure to line up the key holes in the top of the cage with the keys (rectangular piece) on the drive tower.
- Once the cage is in place, detach the hoist and remove the CET from the cage.

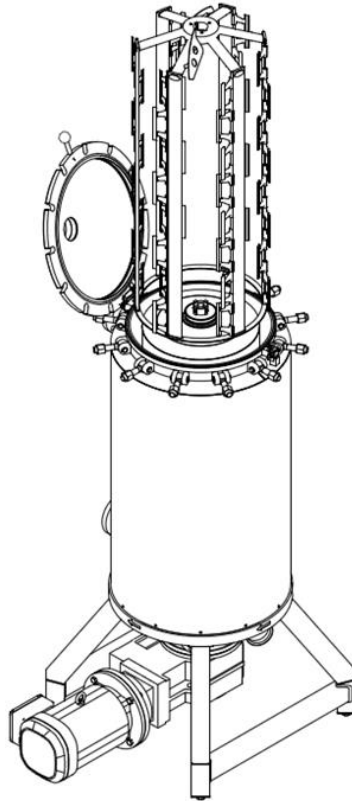


Figure 7.5-10: Cage installation

Step 5:

5A: Screw the stud into the hole at the top of the drive tower. Insert the gasket into the cage cap. Screw the cage cap onto the stud; tighten with a 2" socket wrench. See Figure 7.5-2.

The lid can now be closed. Refer to Section 7.3.2 Closing the Lid.

7.6 Bearings

The following sections describe how to remove/install, inspect, and maintain the bearings used with your CONTHERM MAX.

It is important to inspect the bearings of the drive tower – cage whenever the equipment has been opened for scheduled or preventative maintenance. Proper lubrication is critical to avoiding contamination and achieving the maximum life of the bearings.

Indicators of failing bearings can be a grinding noise when rotating the drive shaft, or when "ticks" or "clicks" are felt from normal operation or external inspection. Note that bearings in need of replacing will tend to be loose and allow the shaft/cage to slide side-to-side.

If a seal leak occurs, when inspecting and/or replacing the seal body, check the bearing seals and housing and remove any remaining product. If the product is penetrating inside the grease seals, remove the drive unit and replace with new one (send the damaged unit for repair).

Bearing lubrication (Weekly)

Lubricants have four major purposes:

Reduce friction and wear, dissipate heat, protect surfaces from contamination and corrosion and help seals protect the bearings. Failing to properly lubricate the bearings can lead to catastrophic failure of the equipment.

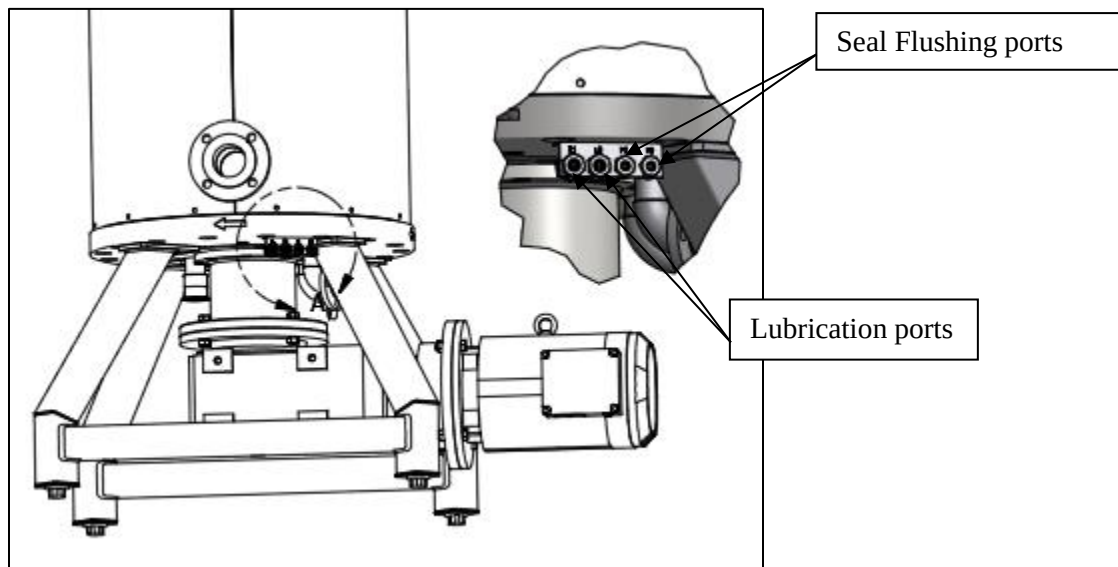


Figure 7.6-1: Lubrication ports

Fittings for lubrication (inlet and outlet) of the bearings are located at the lower part of base plate and are properly labeled.

NOTE:



This is the same location of the seal flushing connections. Be certain to utilize the correct fittings for lubricating both the bearings and seal assembly. Utilize a greasing pump and supply the grease to the bearings.

WARNING:



It is very important to use food grade grease to lubricate the bearings in Contherm MAX as a machine used in food production facilities to avoid potential product pollution and unnecessary costs related to it. The clean, non-toxic bearing grease has to have also the high resistance to water, excellent grease life and excellent corrosion resistance (SKF – LGFP -2/0.4 and similar greases).

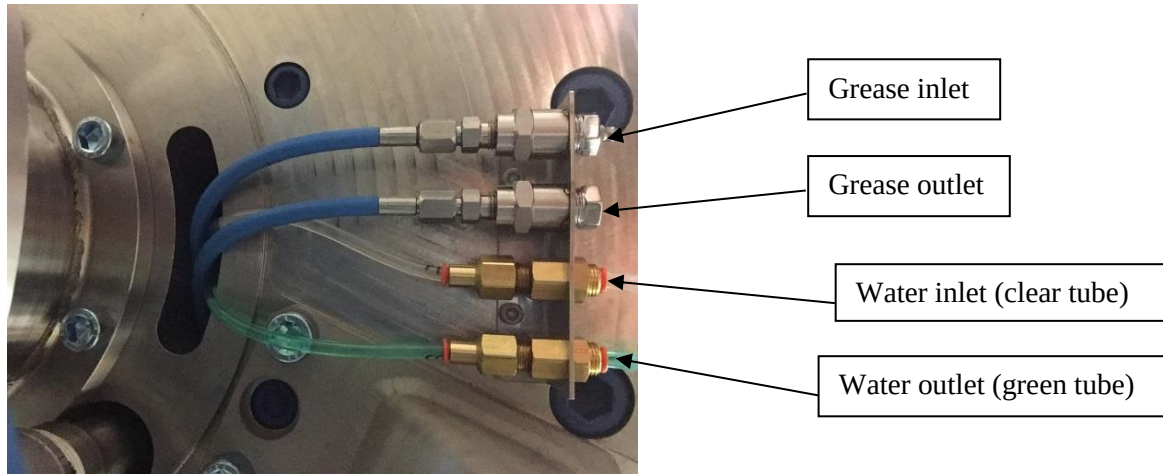


Figure 7.6-2: Lubrication & Flushing ports

7.6.1 Removing the bucket and drive tower (bearings included)

CAUTION:



Make sure to be careful when taking apart the bucket and drive tower of the CONTHERM MAX. Be sure not to force anything apart or to apply too much pressure when assembling or disassembling anything. Keep fingers clear of small and enclosed spaces to avoid harming yourself.

Step 1:

NOTE:



To get to this stage, you must first remove the mechanical seal. Refer to the "Mechanical Seal Removal" instructions before proceeding.

1A: Use the cap removal tool to lift the top cap & its gasket. Set aside.

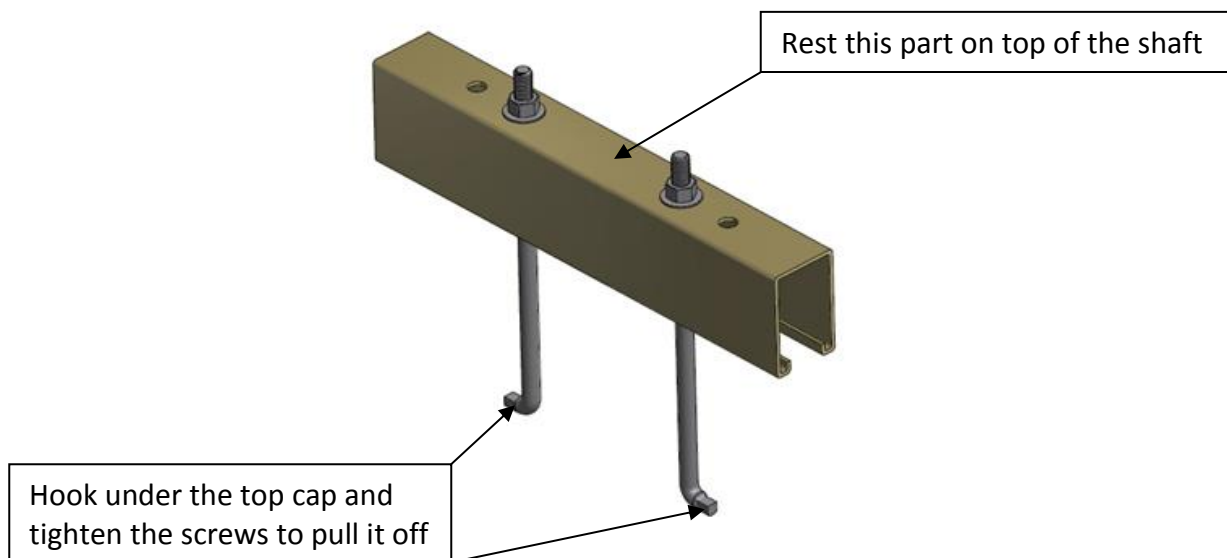


Figure 7.6-3: Cap Removal Tool

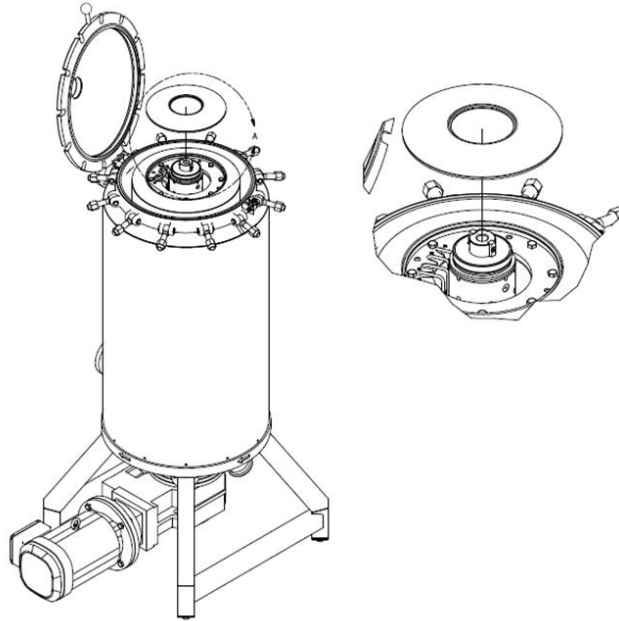


Figure 7.6-4: Top Cap Removal

Step 2:

2A: Use a socket wrench (19 mm) to remove the 8 bolts from the top of the bucket. Set 4 aside, you will need 4 for the next step.

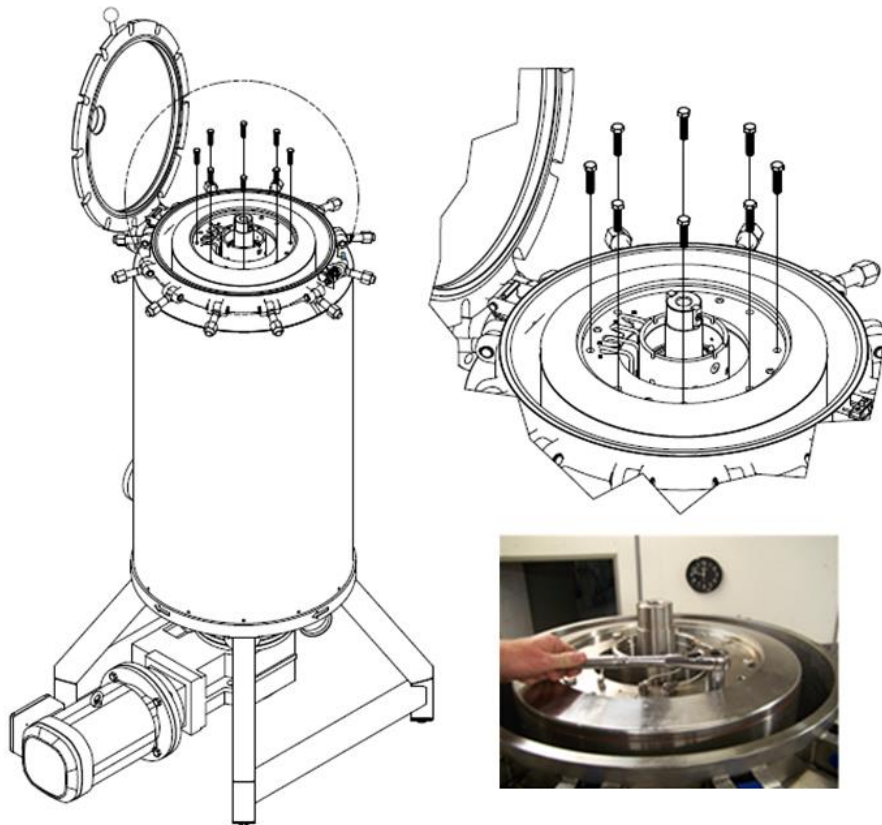


Figure 7.6-5: Removal of bucket screws

Step 3:

3A: At each set of 3 holes on top of the bucket assembly, place a screw in the central hole. Screw them in with a socket wrench. The goal here is to separate the bucket from the inner cylinder. The screws will push off the inner cylinder, lifting the bucket & relieving any suction force that may be holding it down. After this is accomplished, remove the screws & set aside.

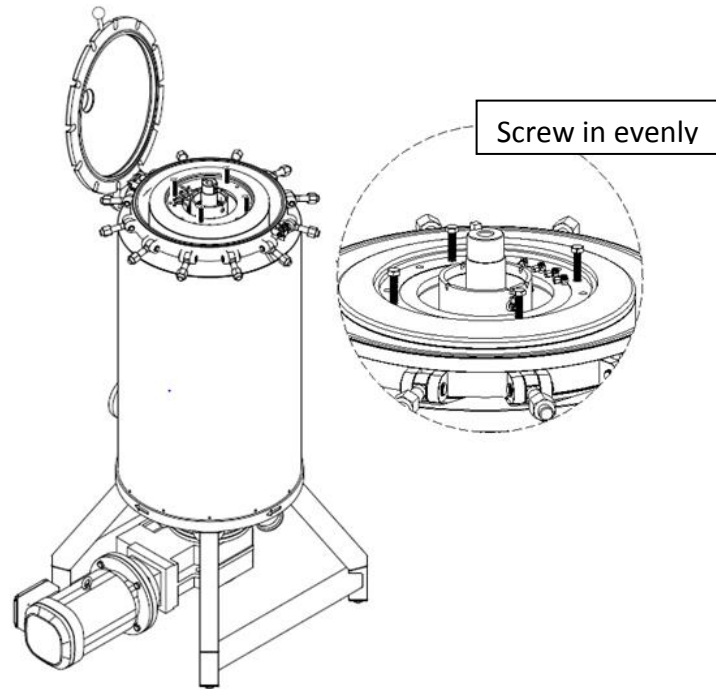


Figure 7.6-6: Prop up bucket to counter suction

Step 4:

4A: Attach two M12 hoist rings to the bucket assembly using M16 nuts as spacers. Ensure the hoist rings are across from one another on the bucket. Once in place, use a hoist to slowly lift the bucket fractions of inch, because there are fittings underneath that will need to be disconnected.

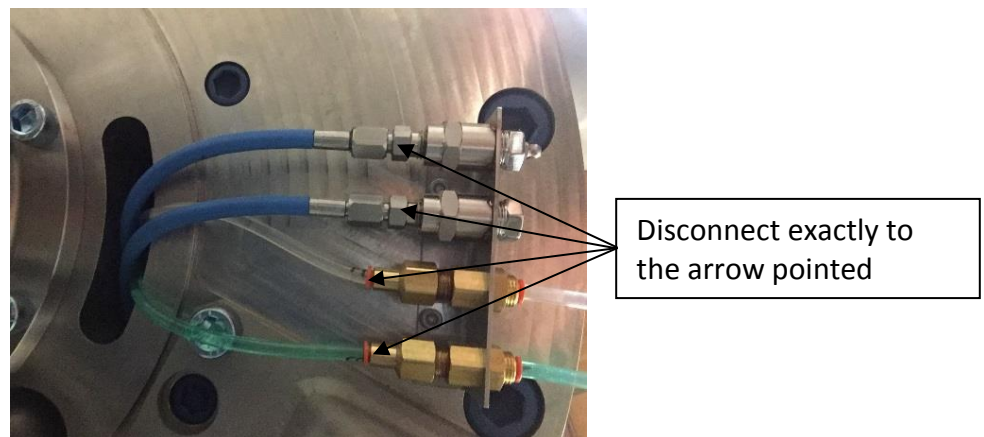


Figure 7.6-7: Disconnect fittings (flush and lube)

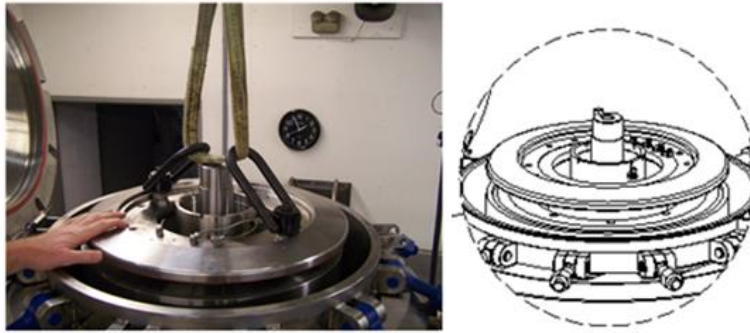


Figure 7.6-8: Hoist (first increment)

Step 5:

5A: Once the underside fittings have been disconnected, make sure to label the lube lines to ensure that they are not mixed. Use the hoist to further raise the bucket assembly & drive tower completely out of the CONTHERM MAX. Remove the bolts (8x Item 7). Attach the hoist rings (2x Item 22) with the nuts (2x item 21). Using a hoist, lift the bucket assembly (Item 10) off of the inner cylinder (Item 5). Carefully lay the drive tower horizontally on a flat surface, such as a table, depending on what is available.

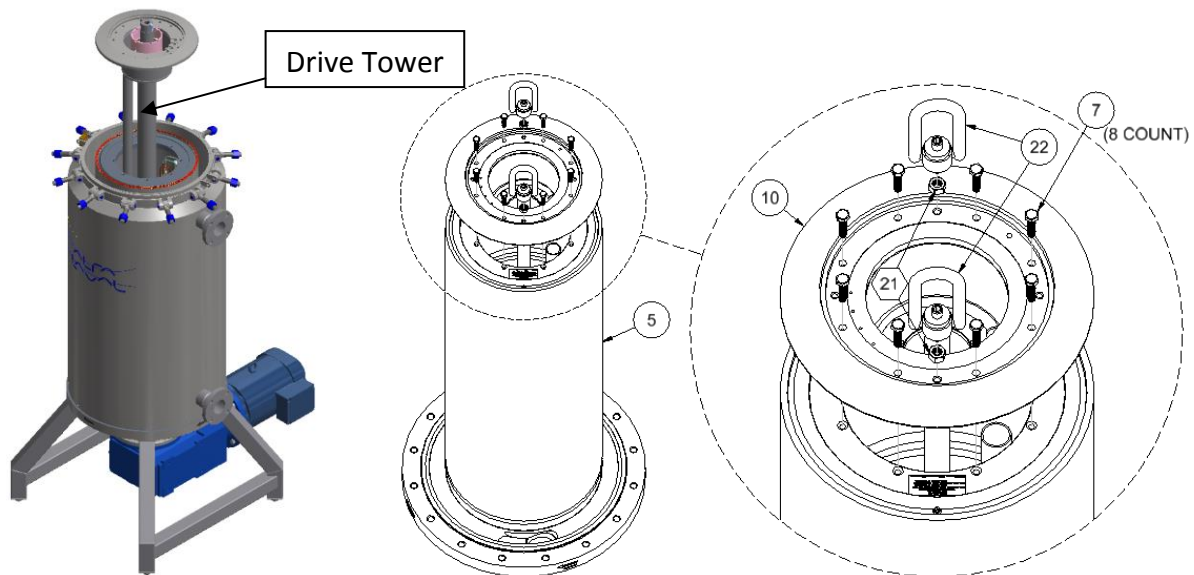


Figure 7.6-9: Hoist (second increment)



Figure 7.6-10: Remove drive line, bucket, lube & flush lines

Step 6:

6A: Once the tower is resting on a flat surface, remove the eight screws from the bottom of the bucket assembly, as shown.

6B: Before proceeding to the next step (removing the bucket), be sure to disconnect the fittings on the top side of the bucket. Slide bucket unit some inches to do it.

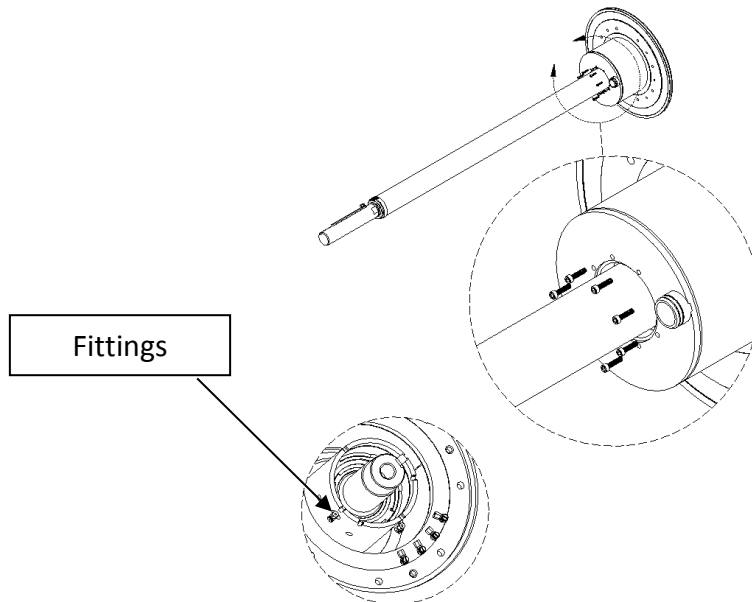


Figure 7.6-11: Isolated drive tower

Step 7:

7A: Remove the bucket down the long end of the drive tower. Set aside.

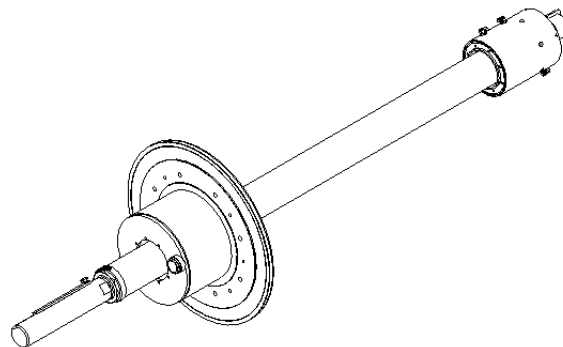


Figure 7.6-12: Bucket removal & drive tower separated

NOTE:

Due to the design of the drive tower, there are many unique and expensive tools required for disassembly. It is required that you send it back to Alfa Laval Inc. for any repairs or service. Not doing so may void your warranty.

7.6.4 Installing the bucket and drive tower (bearings included)

NOTE:



The installation process is the reverse of the removal process. Therefore, the figures referenced will be the ones used before. In some cases, when more explanations are required, more images will be provided.

Step 1:

1A: Ensure that the drive tower is completely assembled according to the Drive Tower Assembly instructions.

1B: Slide the bucket assembly up the drive tower as far as possible; it should be in contact with the bearing housing. See Figure 7.6-12.

Step 2:

2A: Attach the bucket assembly to the bearing housing using the eight screws as shown. Also, make sure the gasket is in place on the underside of the outermost ring of the bucket.

2B: Make sure the fittings on top of the drive line assembly are all connected. See Figures 7.6.10 & 7.6-13.



Figure 7.6-13: Attach the bucket assembly to the bearing housing

Step 3:

3A: Attach the hoist rings to the bucket assembly if they are not already attached. Use the hoist to lower the drive tower / bucket assembly into the CONTHERM MAX as shown. The drive tower should line up with the center hole at the bottom of the inner cylinder to be connected to the motor.

3B: When the bucket assembly is almost in place, be sure to align the motor key from below. Line up the bucket outlet with the drain pipe with the hole in the base plate. Proceed to lower the bucket onto the inner cylinder. See Figure 7.6-8.



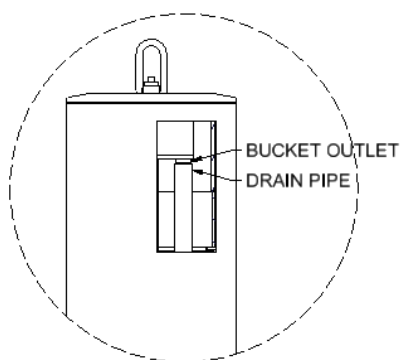
CAUTION:

- An additional person is required to align the key, drain tubing and lube & flush lines underneath
- DO NOT rotate the bucket while it is resting on the inner cylinder as this will disrupt the fragile gasket.
- Make sure the bolts properly align during installation to avoid an uneven installation
- There is no harm in applying anti-seize to the bottom of drive tower
- Align the outlet hole on the bottom of the bucket with the drain pipe before bolting

NOTE:



The "window" in the cylinder is simply for visibility of the inside. It does not actually exist on the cylinder.



Keep the driveline suspended and align the bolts with the holes and begin to thread the bolts. Once the bolts have a few threads in the holes, the driveshaft can be lowered.



Figure 7.6-14: Attach the bucket assembly to the Contherm MAX

Step 4:

4A: Insert the eight screws using a torque wrench (15 in-lbs.) in order to attach the bucket to the inner cylinder. See Figures 7.6-4 & 7.6-15.

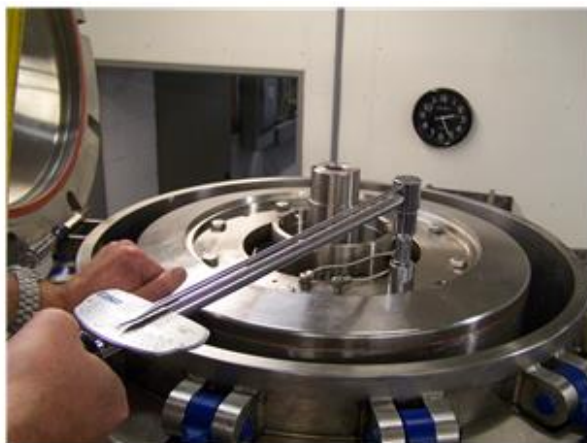


Figure 7.6-15: Attach the bucket assembly to the Contherm MAX

Step 5:

5A: First, clean & grease the area on the bucket where the top cap will be resting. Make sure the top cap's gasket is in place and then place the top cap on the bucket as evenly as possible. See Figures 7.6-3 & 7.6-16.



Figure 7.6-16: Top Cap Assembly



CAUTION:

- Rinse the gasket and wipe with paper towels and alcohol wipes.
- Inspect gasket for wear & tear.
- DO NOT STRETCH – fragile gasket.
- Wipe top cap w/ rag.
- When reinstalling the gasket, line it up evenly. It does not need to be perfectly snug.
- Wait 2 min. for the gasket to set.

5B: Use the top cap fixture (with O-ring to prevent scratching) with the cage cap and 2" socket to press down on the top cap, sealing it in place.

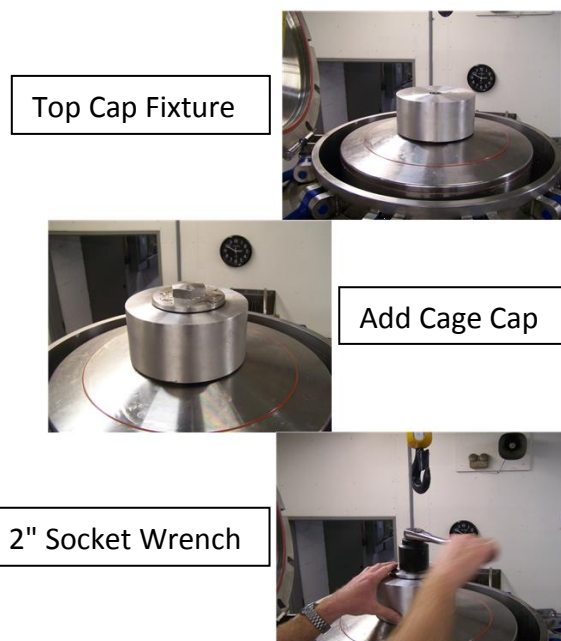


Figure 7.6-17: Top Cap Assembly

5C: Remove the cage cap & fixture. Rotate manually to make sure that the bearing is installed correctly. If the top cap is secure, proceed to the Mechanical Seal Insertion instructions to complete the assembly process.

7.7 Heat Exchange Cylinders

The following sections describe how to remove-install, inspect the heating/cooling cylinders and to maintain the gaskets of the cylinders used with your CONTHERM MAX.

Inspect your CONTHERM MAX's cylinders periodically every week to ensure no wear of the walls and that the walls' surfaces are smooth.

7.7.1 Removing the outer cylinder

This section describes how to disassemble the outer cylinder from the main base plate of CONTHERM MAX. The main reason for that is to replace the lower gasket located to the bottom of the outer cylinder and the base plate of the CONTHERM MAX. The outer cylinder will move with the outer trim as one piece (the trim is welded to the outer cylinder).



NOTE:

- Do not dismantle the outer cylinder from the machine unless the gasket is damaged and product leakage is taking place.
- We recommend to remove the outer cylinder even when you have to remove the inner cylinder to replace the damaged inner cylinder – base plate product gasket.



NOTE:

- To get to this stage, you must first open and remove the lid and the cage. Refer to Section 7.3.1 "Opening the Lid" & Section 7.5.1 "removing the seal unit" instructions before proceeding.

Step 1:

1A: Attach two eye nuts M24x3 for lifting to the top of the outer cylinder using two screws M24 from the lid closing screws and attach the hoisting fixture to the slings passing through the eye nuts or use two or three screw-pin shackles—for lifting located to the swing bolt pin holes and slings.

Unscrew the bolts that connect the main base plate with outer cylinder of the CONTHERM MAX and place aside in a safe place.

Step 2:

2A: Carefully begin lifting the outer cylinder out of the CONTHERM MAX. Set the outer cylinder aside in a safe place until it is ready to be put back in. Remove the product gaskets.



CAUTION:

- Rinse the gasket and wipe with paper towels and alcohol wipes.
- Inspect gasket for wear & tear.
- DO NOT STRETCH – fragile gasket.

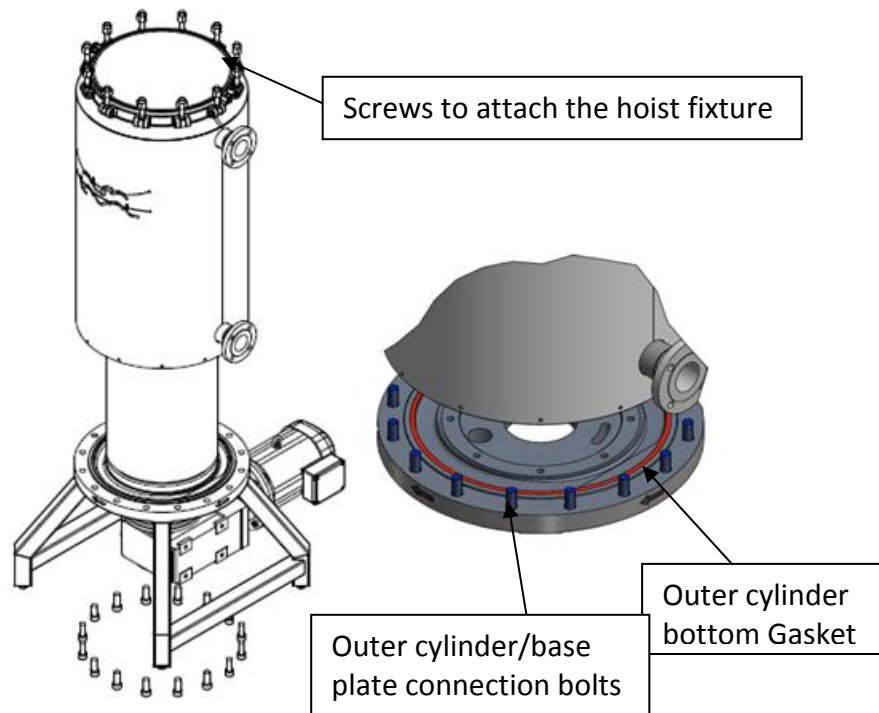


Figure 7.7-1: Dismantle the outer cylinder

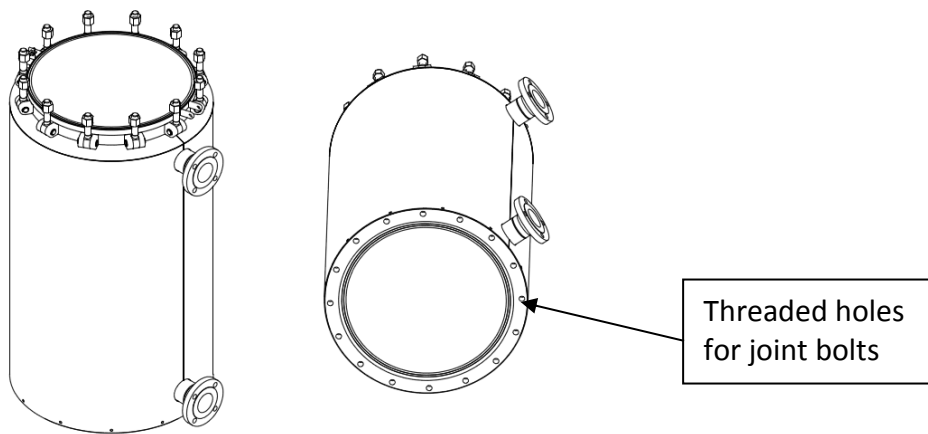


Figure 7.7-2: Dismantle the outer cylinder

7.7.2 Installing the outer cylinder

Step 1:

1A: First, clean & grease the area on the base plate where the bottom part of outer cylinder will be resting. Grease the gasket and insert it into the crevice on the bottom of the outer cylinder. Lift carefully and place the outer cylinder on the upper part of the base plate as evenly as possible.

Step 2:

2A: Lower the inner cylinder onto the base plate using the hoist. Then, bolt the cylinder onto the base plate from underneath the base.

7.7.3 Removing the inner cylinder

This section describes how to disassemble the inner cylinder from the main base plate of CONTHERM MAX.

NOTE:

- Do not dismantle the inner cylinder from the machine unless the gasket is damaged and product leakage is taking place.
- You could remove the inner cylinder even when the outer cylinder is located in machine. We recommend before removing inner cylinder to remove the outer cylinder.

NOTE:

To get to this stage, you must first open the lid and remove the cage. How to remove the cap and bucket unit was presented in an earlier section. Refer to section 7.6.1 Removing the bucket & drive tower (bearings included). See Figures 7.6-1 to 7.6-10.

Step 1:

1A: Remove the top cap and its gasket (Figure 7.6.4). Set aside. Remove the bucket and drive tower (bearings included). Check the components under the bucket to discern if they need to be replaced or not. These components are: the bucket gasket (Item 17), the underside fittings (4x Item 1), the bucket O-ring (Item 14). The drain pipe will come out together with the bucket unit.

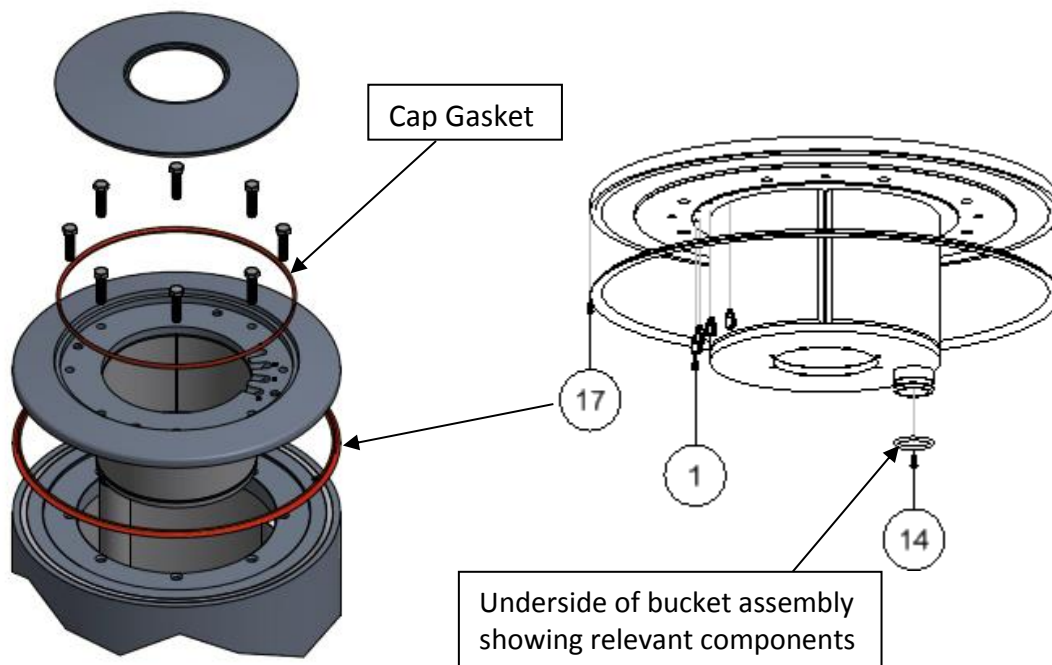


Figure 7.7-3: Remove top cap and bucket

Step 2:

2A: Remove the inlet-outlet media flanges with the elbows from the bottom of base plate. To do this it is necessary to remove the gear-motor unit and the support part.

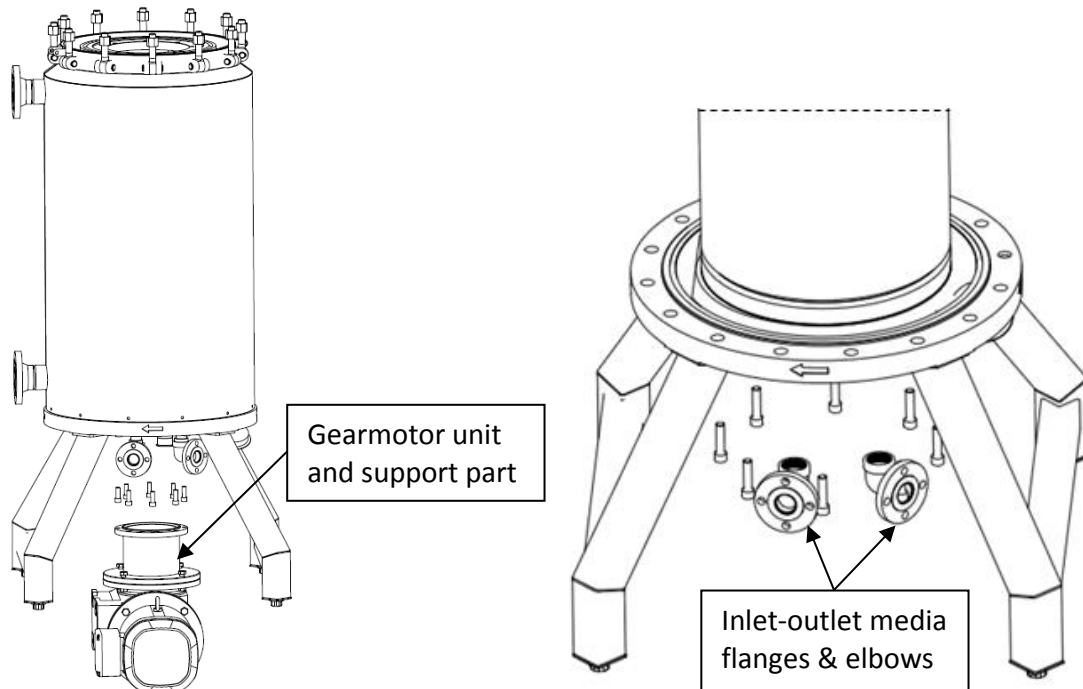


Figure 7.7-4: Inlet-outlet media flanges & Overflow bottom pipe

Step 3:

3A: Screw in the hoist rings to the threaded holes on the top of inner cylinder; unscrew the bolts that connect the main base plate with inner cylinder and place in a safe place. The inner cylinder can then be lifted by a hoist and set aside. The cylinder's gasket can be removed if needed.

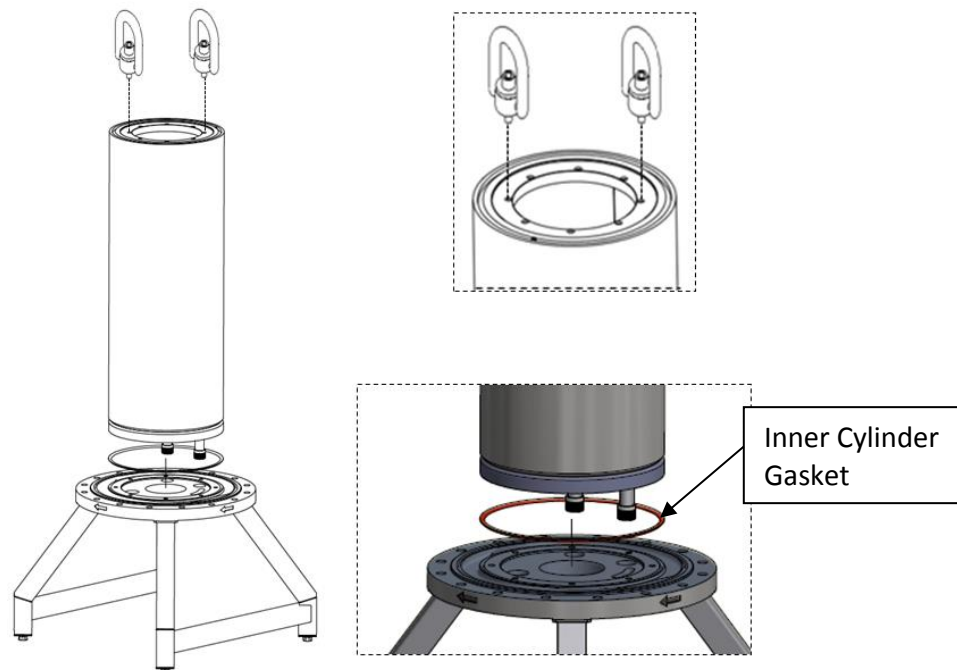


Figure 7.7-5: Dismantling the heat exchange inner cylinder

Step 4:

4A: The only remaining parts of the assembly are the inner cylinder & outer cylinder gaskets; the base plate, gearmotor group, connection support and the legs.

**NOTE:**

The base plate may differ in appearance, but the functionality is the same.

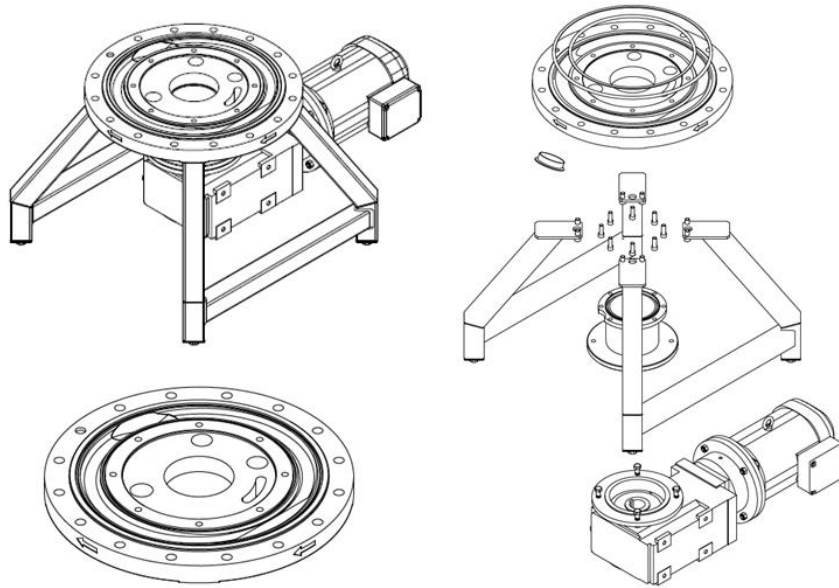


Figure 7.7-6: Moving the base plate

7.7.4 Installing the inner cylinder**Step 1:**

1A: If the base plate is not already resting on the legs do the following: Place the base plate in a flat surface upside down. Attach the legs to the base plate through threaded holes. Use the slings to lift the assembly and place in the correct position.

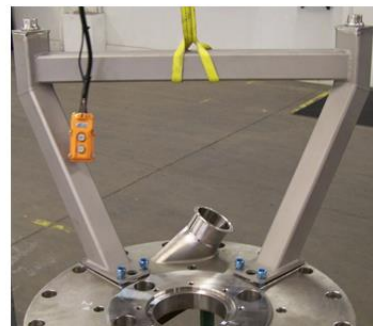
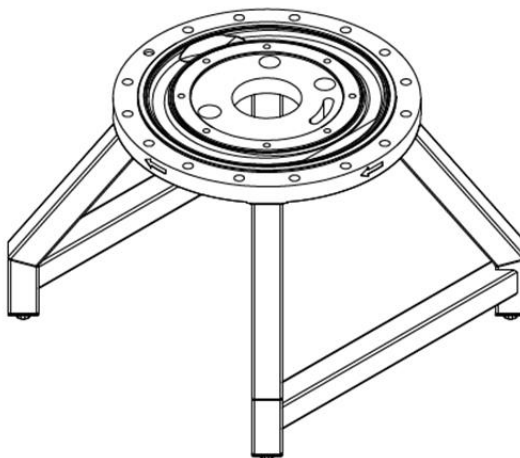


Figure 7.7-7: Assembling the base plate and the legs

Step 2: Refer Figure 7.7-5

2A: Insert the Hoist Rings into the top of the inner cylinder assembly and the sling too.

2B: Grease the gasket and insert it into the crevice on the top of the base plate.

2C: Lower the inner cylinder onto the base plate using the hoist. Then, bolt the cylinder onto the base plate from underneath the base **Refer Figure 7.7-4**.

Step 3:

3A: Place the inlet-outlet media flanges with the elbows from the bottom of base plate. Locate close to the final position. Install the gear-motor unit with the support part.

Step 4: See Figures 7.7-3

4A: Before adding the bucket assembly to the inner cylinder, make sure the bucket's gasket (upper inner cylinder gasket) is in place. Drain pipe is attached with bucket unit and will be inserted with it through the base plate. Additionally, use the recommended procedure for adding a gasket, described in Appendix A.

4B: Attach the M12 hoist rings to the bucket assembly (**Refer Figure 7.6-9**). Once attached, lower the bucket assembly onto the inner cylinder. Then, attach the 8 bolts.

Step 5:

5A: Once they are arranged and attached correctly, add the gasket to the top cap, and attach the top cap & its gasket to the top of the assembly as shown (**Refer Figure 7.6-17**).

Chapter 8: Troubleshooting

8.1 Introduction

If you experience a problem with the CONTHERM MAX, first determine if it is described in one of the following tables. If it is identified, perform the remedy described for resolving the problem. If it is not identified and you cannot decide how to remedy it, contact your local Alfa Laval Inc. representative.

CAUTION:

Before performing any troubleshooting task described in this chapter, please review the safety precautions provided in Chapter One, Safety Summary. Do not assemble, disassemble, clean, operate or maintain the CONTHERM MAX until you have read the manual and are thoroughly familiar and knowledgeable with all safety precautions and the equipment.

8.2 Seal Leaks

The two most common leaks that may occur in your CONTHERM MAX are the following:

1. Product Seal Leaks
2. Flush Seal Leaks

8.2.1 Product Seal Leaks

A product seal leak may be caused by any of the conditions identified in Table 8-1. To resolve the problem, perform the appropriate action as described in the table. When applicable, the table will direct you to the appropriate maintenance related procedure in Chapter Seven, Maintenance for correcting the problem.

Table 8-1. Product Seal Leaks

Problem	Possible Cause	How To Resolve
Product Seal Leaks	Damaged or worn seal face	Re-lap or replace seal face
	Damaged or worn seal bushing	Replace seal bushing
	Defective O-Rings	Replace O-Rings
	Foreign matter lodged in O-Ring groove of seal shell	Clean groove and replace O-Ring
	Product has prevented inner spring from exerting proper pressure onto seal shell	Thoroughly clean and replace the inner spring and the seal shell
	Seal face not installed into seal shell properly	Remove and replace seal face
	Improper O-Ring material	Consult your local Alfa Laval Inc. representative

8.2.2 Flush Seal Leaks

Flush seals are used for product applications that benefit from seal face lubrication or require the processing of sterile products. When a flush seal leak occurs, flushing media either enters the product or the atmosphere. A flush seal leak may be caused by any of the conditions identified in Table 8-2. To resolve the problem, perform the appropriate action as described in the table. If applicable, the table will direct you to the appropriate maintenance related procedure in Chapter Seven, Maintenance to resolve the problem.

Table 8-2. Aseptic Seal Leaks

Problem	Possible Cause	How To Resolve
Flush seal leaks into the product area	Seal flushing fluid pressure is too high (this condition would allow flush fluid to enter the product zone)	Reduce fluid pressure to 15 psi (1 Bar)
Flush seal leaks to atmosphere; External to the product area	Damaged carbon seal face of aseptic seal	Re-lap or replace seal face
	Improper O-Ring material	Consult your local Alfa Laval Inc. representative

8.3 Lower Bearing

If the bearing in your CONTHERM MAX is wearing out prematurely, perform the appropriate action as described in Table 8-3. When applicable, the table will direct you to the appropriate maintenance related procedure in Chapter Seven, Maintenance.

3. Lack of lubrication
4. Bearing contamination
5. Excessive torque situation during operation

Table 8-3. Lower Bearing

Problem	Possible Cause	How To Resolve
Lower Bearing Wearing Out Prematurely	Lack of grease lubrication	Follow greasing instructions in Chapter Seven, Maintenance
	Contamination of bearing	Identify the root cause; possible causes are product or flush seal leaks into the bearing.
	Excessive torque situation during operation	Identify root cause; possible causes are misalignment of equipment, damaged rotating assembly, cooling to excessive viscosity levels beyond the equipment's capabilities.

8.4 Product Heating

If your CONTHERM MAX is installed, operated and maintained as described in this manual, your product will be heated to the desired temperature by the CONTHERM MAX. However, if a product heating problem does occur, the following procedures will show you how to identify its cause and resolve the problem.

The two most common product heating problems that may occur in your CONTHERM MAX are:

6. Product is not being heated to the specific temperature
7. Product is burning onto the cylinder wall

8.4.1 Product Not Heated To Specific Temperature

Table 8-4 identifies specific factors that may result in the product not being heated to the proper temperature. To resolve the problem, perform the appropriate action as described in the table. When applicable, the table will direct you to the appropriate maintenance related procedure in Chapter Seven, Maintenance.

Table 8-4. Product Not Heated To Specific Temperature

Problem	Possible Cause	How To Resolve
Product Not Heated To Specific Temperature	Product flow rate too high	Decrease the product flow rate
	Product input temperature too low	Increase the temperature of the product entering the input port
	Steam control valve improperly sized	Re-size and replace the valve
	Steam control valve not installed within five feet (1.5 meters) of the CONTHERM MAX	Relocate the steam valve
	No condensate trap in the condensates return line	Install a properly sized steam trap
	Steam trap not functioning properly	Open the bypass line at the trap. If the product temperature rises to the desired reading, the trap is not working properly. Replace the trap.
	Rotating assembly and blades turning in reverse direction	Change the motor wiring
	Rotating assembly speed is too low	Increase speed and monitor performance until satisfactory

8.4.2 Product Burning Onto Cylinder Wall

Table 8-5 identifies specific factors that may result in the product burning onto the cylinder wall. To resolve the problem, perform the appropriate action as described in the table. When applicable, the table will direct you to the appropriate maintenance related procedure in Chapter Seven, Maintenance.

Table 8-5. Product Burning Onto Cylinder Wall

Problem	Possible Cause	How To Resolve
Product Burning Onto Cylinder Wall	Product not flowing through CONTHERM MAX before steam is turned on	Start product flow through the CONTHERM MAX before turning the steam on
	Rotating assembly not turned on before steam turned on	Turn on the rotating assembly as soon as the product enters the CONTHERM MAX
	Rotating assembly stopped when product flow is interrupted	Leave the rotating assembly on when the product flow has temporarily stopped (for short periods of time between 1 to 5

		minutes)
	Steam leaking past the control valve when system is shut down	Install a normally closed solenoid valve ahead of the steam control valve
	Rotating assembly speed is too slow	Consider the use of a variable frequency drive to increase the scraping speed

8.5 Product Cooling (Water/Glycol/Brine)

If your CONTHERM MAX is installed, operated and maintained as described in this manual, your product will be cooled to the desired temperature by the CONTHERM MAX's coolant media (water/glycol/brine). However, if a product cooling problem does occur, the following procedure shows you how to identify its cause and resolve the problem.

Table 8-6 identifies specific factors that may result in the product not being cooled to the proper temperature. To resolve the problem, perform the appropriate action as described in the table. When applicable, the table will direct you to the appropriate maintenance related procedure in Chapter Seven, Maintenance.

Table 8-6. Product Not Cooling To Specified Temperature (Water/Glycol/Brine)

Problem	Possible Cause	How To Resolve
Product Not Cooling To Specified Temperature	Product flow rate too high	Reduce the product's flow rate
	Product input temperature too high	Reduce the temperature of the entering product
	Media temperature too high	Reduce the temperature of the media
	Media flow rate too low	Increase the media flow rate
	Rotating assembly speed too slow or too fast	Change the motor pulley or use variable frequency drive to increase (decrease) the speed
	Rotating assembly turning in reverse direction	Change the motor wiring
	Blades not installed properly after maintenance	Open unit for inspection. Install any missing blades.
	Brine/Glycol concentration too high	Check the freezing point and lower the concentration (%)

Chapter 9: Documentation

Material Compliance Documents

Recommended Spare Parts

11-0701-7000 ASM					
ITEM	QTY.	DESCRIPTION	PART NR.	NOTE - LOCATION	PAGE
1	2	Gasket	11-0701-4410	Inner Cylinder - Top-Bottom	56;57
2	2	Gasket for outer cylinder	11-0701-2506	Outer Cylinder - Top (Lid)-Bottom	31,55
3	1	O ring 6.5mm x 3mm	11-0701-4469	Inner Cylinder	
4	1	Bolt	11-0701-4470	Inner Cylinder	
5	1	O ring	11-0701-3453	Bucket Outlet	56
6	1	10 Degree Gasket	11-0701-3429	Top Cap	53;56
7	1	Cage Cap Gasket	11-0701-3831	Cage unit	37
8	12	Swing Bolt	11-0701-1332	Outer Cylinder - Lid	31
9	12	Nut M24	11-0701-1331		
10	12	Swing Bolt Pin	11-0701-1334		
11	24	Snap Ring For 20mm Shaft	11-0701-1335		
12	1	Tower Shaft	11-0701-6100	Assembly	49;50
13	1	Mechanical seal	11-0701-6350	Assembly	36,39
14	1	Mechanical seal spare parts	11-0701-6350 - S	Spare Parts Kid	39,40
ITEM 14 INCLUDES THESE ITEMS	1	Stationary Inner	11-0701-6350 - 01	Silicon Carbide	39,40
	1	Stationary Outer	11-0701-6350 - 02	Carbon	39,40
	1	Rotary seal face	11-0701-6350 - 03	Silicon Carbide	39,40
	1	O-Ring Kit	11-0701-6350 - O	O - Rings Material: EPDM FDA O Ring Kit Include: 1 piece O-Ring 1; 1 piece O-Ring 2; 2 pieces O-Ring 3; 3 pieces O-Ring 4 and 1 piece O-ring 5	39;40
	1	O-Ring 1	11-0701-6350 - 04		
	1	O-Ring 2	11-0701-6350 - 05		
	2	O-Ring 3	11-0701-6350 - 06		
	3	O-Ring 4	11-0701-6350 - 07		
	1	O-Ring 5	11-0701-6350 - 08		
15	1	Gasket	11-0701-3831	Cage Bolt (Cap)	37
16	48	Blade Alfa Lon III, Standard	11-0701-6891	Blade Selection	32;34;35
17	6	Blade Stop Inner	11-0701-6894		33
18	6	Blade Stop Outer	11-0701-6895		33
19	48	Blade Nylon Metal Detectable	11-0701-6897		32;34;35

Motor specific documentation

Table 9-1. Motor Specifications

Motor Type	Power Pn		Nn Full Load	In Full-Load Current		Ia/In	Code Letter	Torque Tn	Ta/Tn	Tk/Tn	pf	Eff.	Jm inertia
	[hp]	[kW]	[rpm]	230V [A]	460V [A]	[%]		[lb-in]				[%]	[lb-ft²]
160LH/4	20	15	1765	49	24.5	850	K	712	2.8	3.5	0.85	91.0	1.35

Table 9-2. Gearbox Specifications

[illegible]