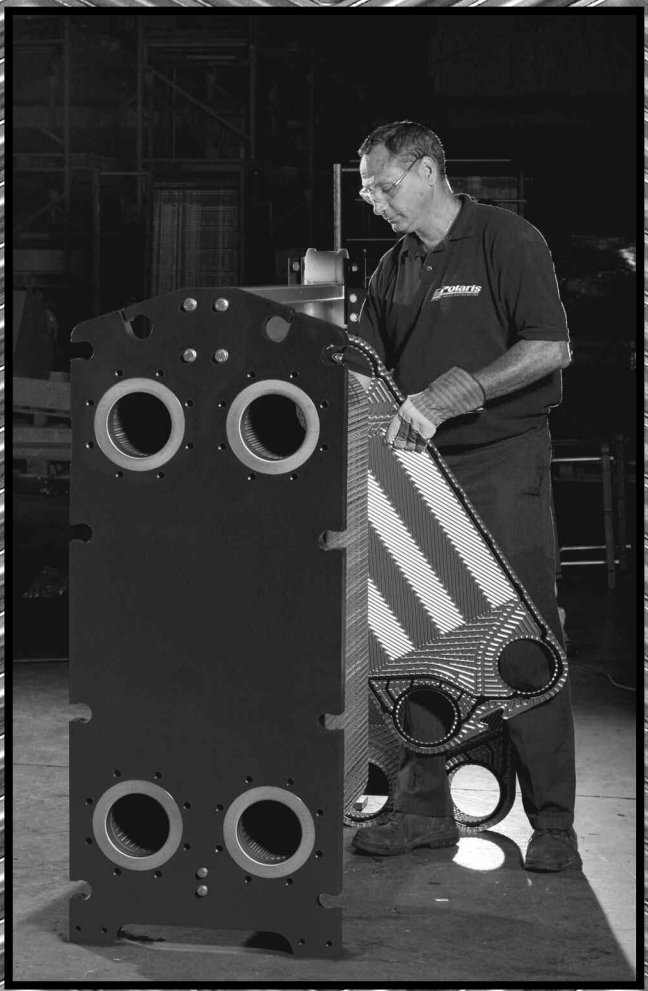
Polaris

PLATE HEAT EXCHANGERS



OPERATION AND MAINTENANCE MANUAL

CONTENTS

DISCLAIMER

This manual is a guide for installing, operating, and maintaining Polaris plate heat exchangers. Read it carefully before beginning any work.

The contents of this publication are based on the latest information available and materials used at the time of printing. Because of rapid developments in this field we cannot be held liable for changes in specifications or other information.

1. INTRODUCTION

This manual applies to all heat exchangers produced and supplied by Polaris.

Polaris cannot be held responsible or liable for damage resulting from incorrect installation, use, or maintenance of our plate heat exchangers, or from failure to comply with the instructions in this manual.

Please note that our plate heat exchangers are designed and built for the operating conditions (pressures, temperatures, capacities and fluids) identified by the customer. Sudden pressure peaks beyond normal operating pressure (or pressure surges) during system start-up or shutdown can severely damage the heat exchanger and must be avoided. Polaris is not responsible for damage as a result of any operation deviating from the original design conditions.

If you wish to alter the design specs of your unit, please contact us (see back page of manual). You may operate the heat exchanger under the modified conditions only after inspection and written approval by Polaris. The nameplate on the heat exchanger will be adapted accordingly.

2. SAFETY ALERTS

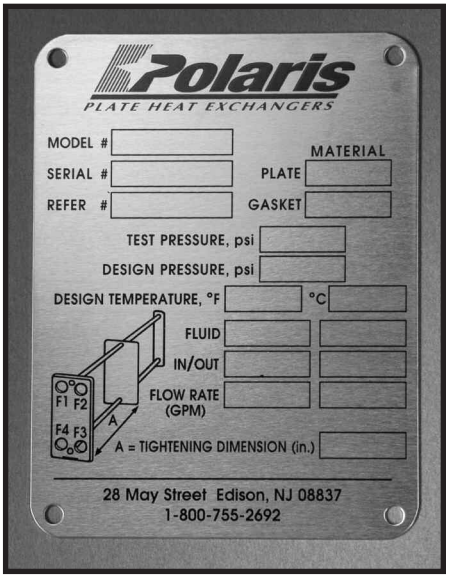
SAFETY ALERT notices warn of possible personal injury or equipment damage. They are identified by the following symbol.

3. GENERAL

3.1 Identification of the heat exchanger

All Polaris plate heat exchangers include a nameplate specifying the following details:

- Model number
- Serial number
- Reference number
- Plate material
- Gasket material
- Design pressure (psi)
- Test pressure (psi)
- Design temperature (°F, °C)
- Temperatures in and out (°F, °C)
- Flow rate (GPM)
- Tightening dimension



3.2 Correct operation

This manual provides information and instructions for safe, effective operation of the unit. Incorrect use causes many accidents! Study the instructions carefully, and make this information constantly available to those who install, maintain, and operate the equipment. The manual is of no value if not available when your staff needs it.

Should you have a problem beyond the scope of the manual with your Polaris Heat Exchanger, please contact us.

To avoid injuries and damage, carefully follow the instructions and applicable local safety regulations. Also, take necessary protective measures as demanded by your process and circumstances related to it.

3.3 Precautions

Injuries can be caused by

- burning as a result of touching the heat exchanger or other parts of the installation
- the uncontrolled release of pressurized media
- contact with chemicals
- touching sharp edges of the unit

Equipment can be damaged by

- external forces
- corrosion
- chemical action
- erosion
- wear
- water hammer
- thermal and/or mechanical shock
- freezing
- incorrect transport/lifting

Remember, parts of the unit may remain hot even after the unit has been turned off!

The heat exchanger must only be used with the fluids specified on the datasheet.

To prevent damage to the exchanger, the hot medium must not flow through the unit unless the cold medium is also flowing. If the cold medium is present but not flowing while the hot medium is flowing, the cold medium will boil and the exchanger will be damaged.

Sudden pressure and temperature changes must be avoided.

When a heat exchanger not in operation but filled with water or water mixture is exposed to temperatures below freezing, plates can become deformed. The heat exchanger should be drained completely if there's a risk of freezing.

Gasketed plate heat exchangers may leak. Install a drip tray under the heat exchanger to catch possible leaks and protect nearby electrical equipment.

If welding near the heat exchanger, don't use the heat exchanger to ground the construction work. Electrical currents can severely damage both plate and gasket. If you must weld, dismantle connecting flanges and isolate the heat exchanger from the system.

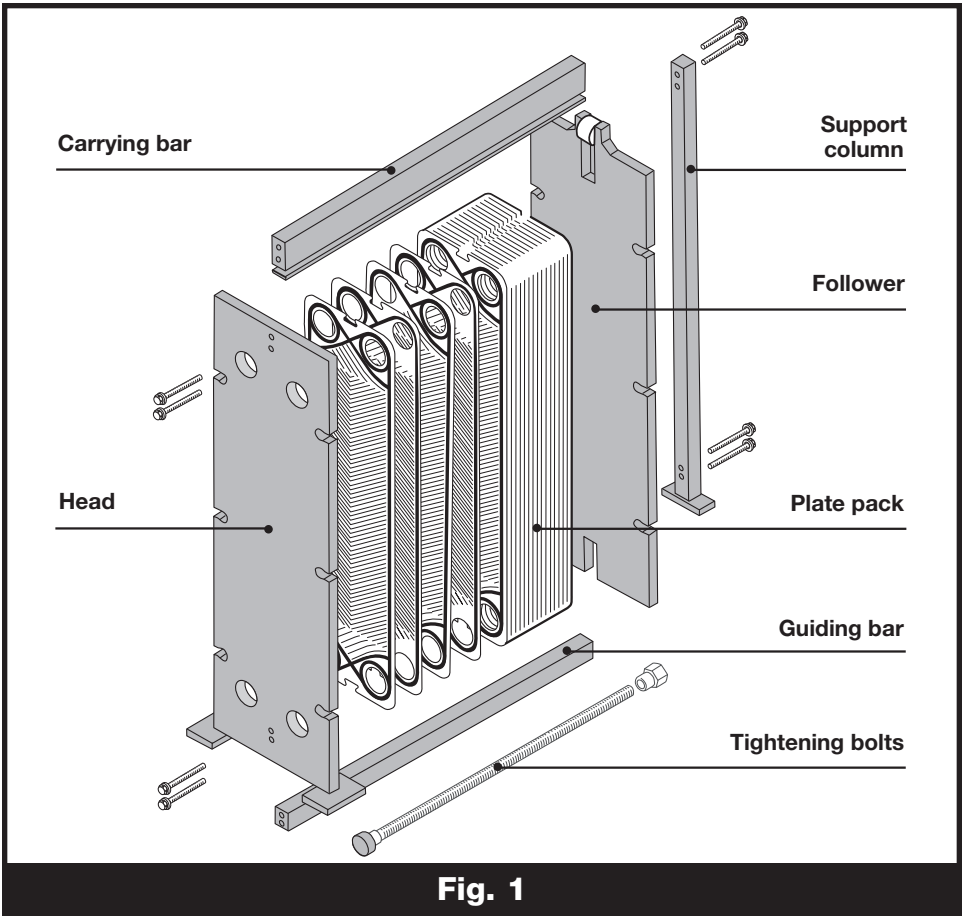


Fig. 1

4. CONSTRUCTION

4.1 Plate heat exchanger description

The Polaris Plate Heat Exchanger consists of a FRAME and a PLATE PACK. The frame consists of the following (See Fig. 1.):

- Fixed head
- Moveable follower
- Carrying bar
- Guiding bar
- Support column
- Tightening bolts

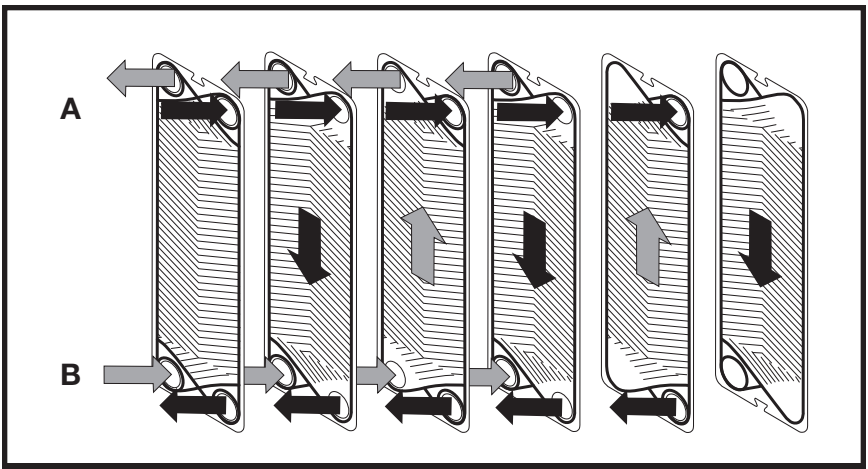


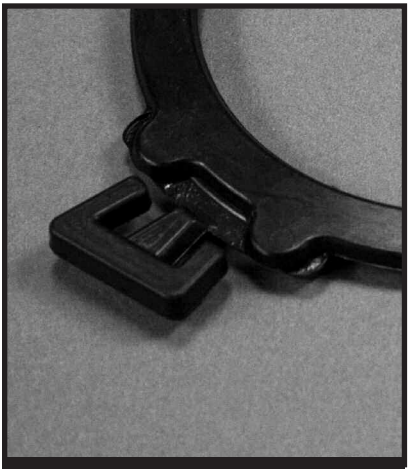
Fig. 2

The plate pack is where the heat transfer takes place. It is constructed from a series of embossed, gasketed metal plates. The plates are gasketed so that the hot and cold media flow in a parallel fashion across alternating channels. (See Fig. 2.)

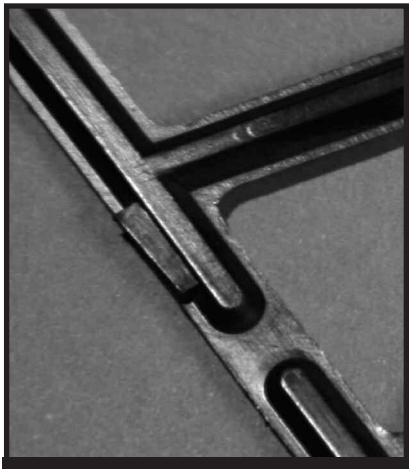
The pack is custom-designed to the exact requirements of the heat-transfer application. It consists of plates with a groove along the rim and around the ports. The number of plates, as well as their sizes and dimension, depends on the thermal output required.

Both Press-Tite and Clip-Tite gasketing from Polaris offer a combination of positive fluid separation, economy and ease of installation. Integrated gasket clips fasten securely to the plate stampings. And because Clip-Tite gaskets can be fastened without tools, they're easy to replace.

In addition, glued gaskets may be used with some plate styles.



Clip-Tite gasket



Press-Tite gasket

4.2 Construction and function

The compact design of the Polaris plate heat exchanger requires only a fraction of the space of a shell-and-tube heat exchanger. Both reduced heat transfer surface and lower hold-up volume mean less operating weight. Plates are manufactured in standard sizes in virtually any material that can be cold-worked, such as stainless steel (304 and 316), titanium, Hastelloy®, and SMO-254. The gaskets serve to seal the fluids in the plate pack and also to direct the hot and cold media into the proper flow channels. The space between the port gasket and the perimeter gasket is vented to atmosphere. This ensures that the fluids will never intermix, and that any leaks will be to the outside of the heat exchanger. (See Fig. 3.)

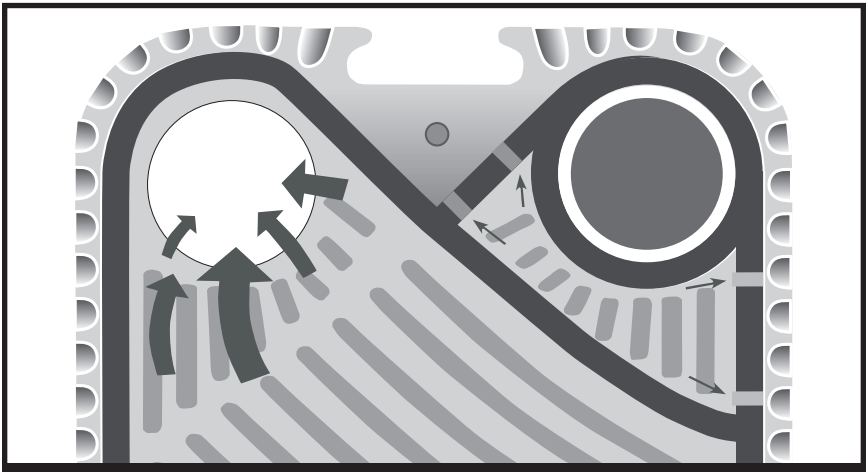


Fig. 3

The fluids enter the exchanger through connections on the frame. A single-pass arrangement has all four connections on the fixed head. This design is preferred, where possible, because the unit may be opened for maintenance or expansion without breaking the pipe connections. For "close-approach" applications, a multi-pass unit may be required. This arrangement puts connections on both the fixed head and the moveable follower. (See Fig. 4.)

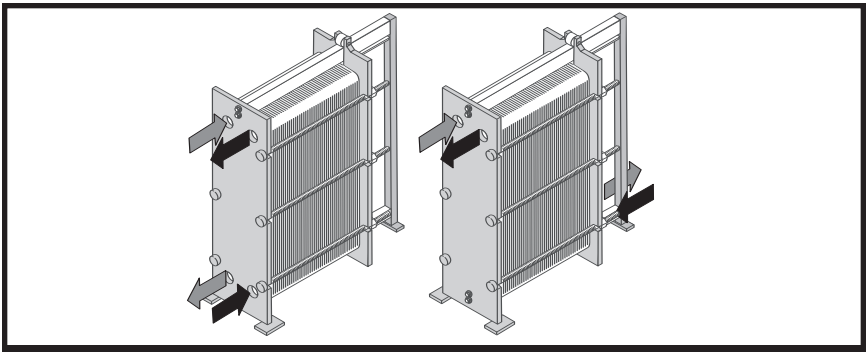


Fig. 4

The most common flow pattern is called countercurrent, where the fluid inlets are on opposite ends of the fixed head. The co-current flow pattern is rarely used, but may be a good solution in some cases.

4.3 Plate characteristics

The Polaris plate is designed to obtain the maximum possible heat transfer efficiency. Each plate is embossed (pressed) with a V-shaped herringbone pattern. The "Vs" always point in opposite directions on adjacent plates. This creates a large number of contact points between the plates – which in turn enables the plate pack to withstand high pressures with relatively thin (0.4-0.9 mm) plate materials.

In order to more closely match the exact requirements of the application, Polaris plates are manufactured in both short and long thermal lengths. This is accomplished by varying the angle of the "Vs" in the herringbone pattern. The long plate features a relatively flat V pattern, which produces extremely high turbulence and high heat transfer at the expense of higher pressure drop. The short plate features a more steeply angled V with correspondingly lower heat transfer and pressure drop. The two plate types may also be mixed to produce an optimized result. (See Fig. 5.)

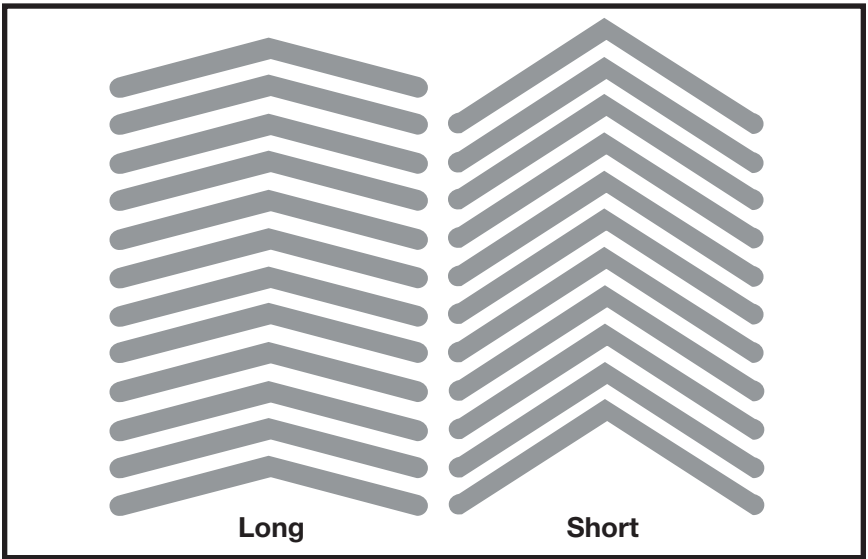


Fig. 5

Polaris heat exchangers use the parallel flow pattern. Fluid in a circuit enters and exits on the same side of the heat exchanger. This means that the plates may be used as either left or right plates simply by turning them 180 degrees. As shown in Fig. 6, fluid runs from port 1 to port 4 and from port 3 to port 2.

Corner hole openings are described in a "plate code index." For instance, "1234" means that all corner holes are open. Every plate can be identified by the packing configuration, the plate code index, and thermal short or thermal long configuration.

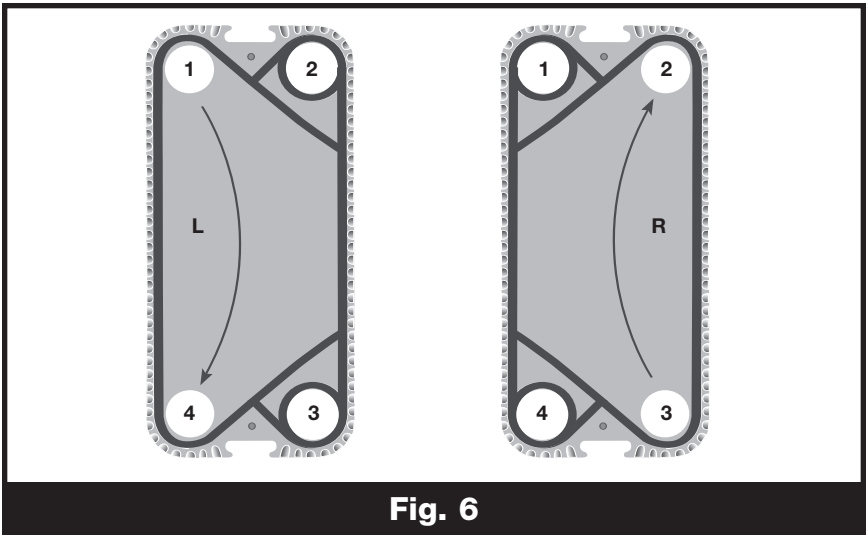


Fig. 6

4.4 Gasket design

Polaris gaskets are a single-piece molded design. The gasket materials are normally NBR, EPDM, or Viton®. The gasket material is selected for compatibility with the fluids being processed and the operating temperatures. Glued-type gaskets are normally bonded in the gasket groove by means of a thin layer of adhesive. This adhesive is meant only to keep the gasket in place during opening and closing of the unit. It does not provide any sealing advantage. A "start" gasket (used as the first plate in the pack) and a normal channel plate gasket are illustrated. (See Fig. 7.)

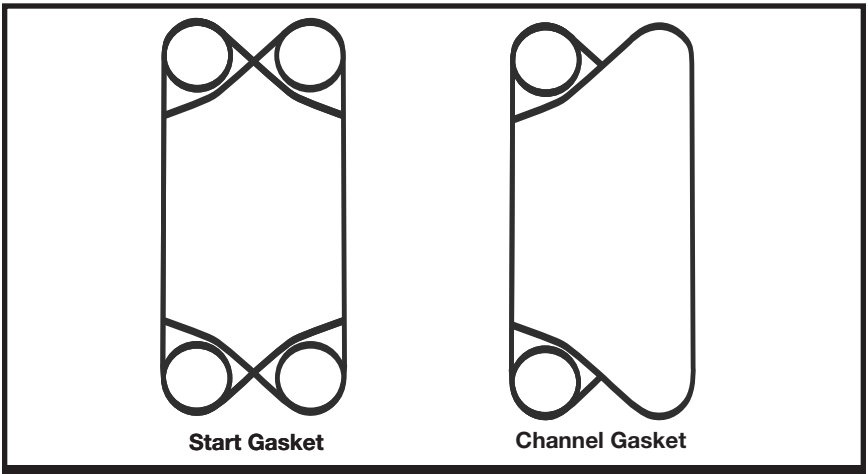
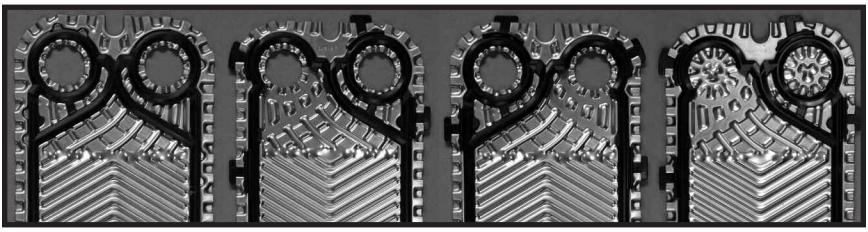


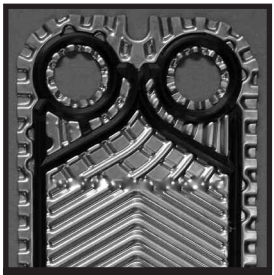
Fig. 7

Press-Tite gaskets fasten to the plate by means of molded tabs on the gasket. The tabs are pushed into holes drilled into the outside of the gasket groove.

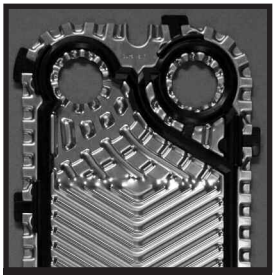
Clip-Tite gaskets are attached to the plate by a series of integrated clips that fasten around the edge of the heat transfer plate.

4.5 Plate types

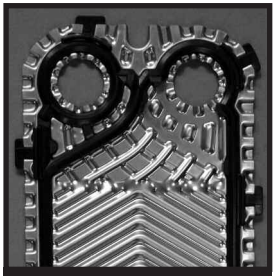




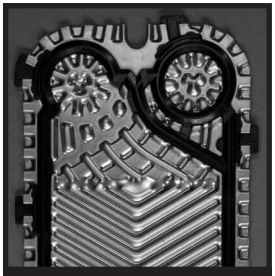
Start plate with gasket



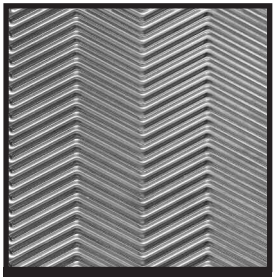
Left hand flow plate with gasket



Right hand flow plate with gasket



End plate with gasket



Thermal long plate

Thermal short plate

5. INSTALLATION

5.1 Installation space requirements

It's very important to keep enough space around the plate heat exchanger free for servicing the unit (renewal of plates, tightening the pack, etc.). See Fig. 8.

Free space around the unit should be one-and-a-half to two times the unit width.

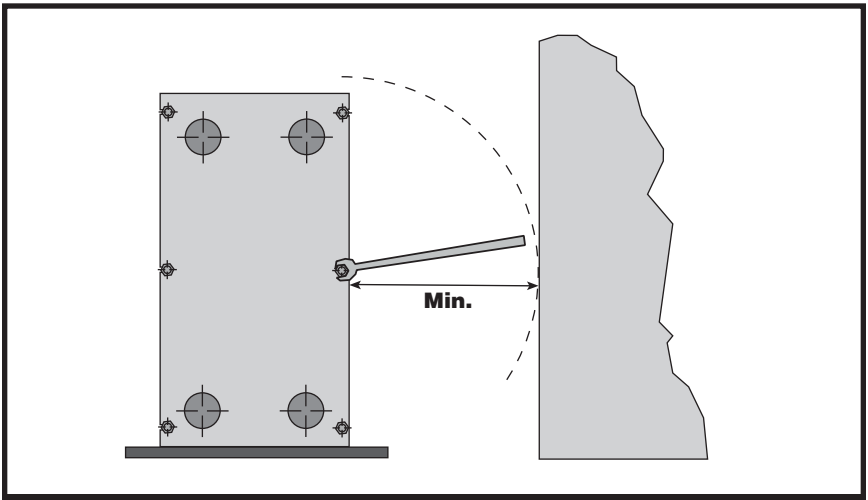


Fig. 8

5.2 Transport, lifting, and storage

Transport:

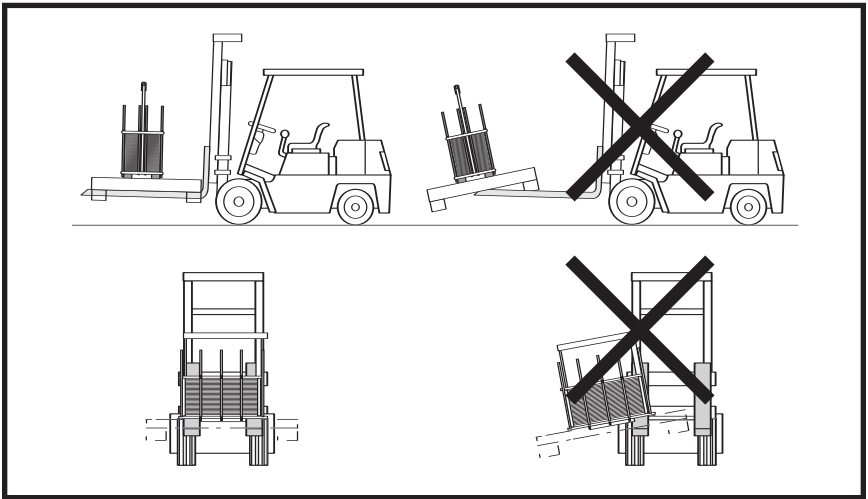


Fig. 9

WARNING: **To prevent personal injury, always use appropriate hoisting equipment. Use straps when lifting the heat exchanger itself. Place them as shown in the picture.**

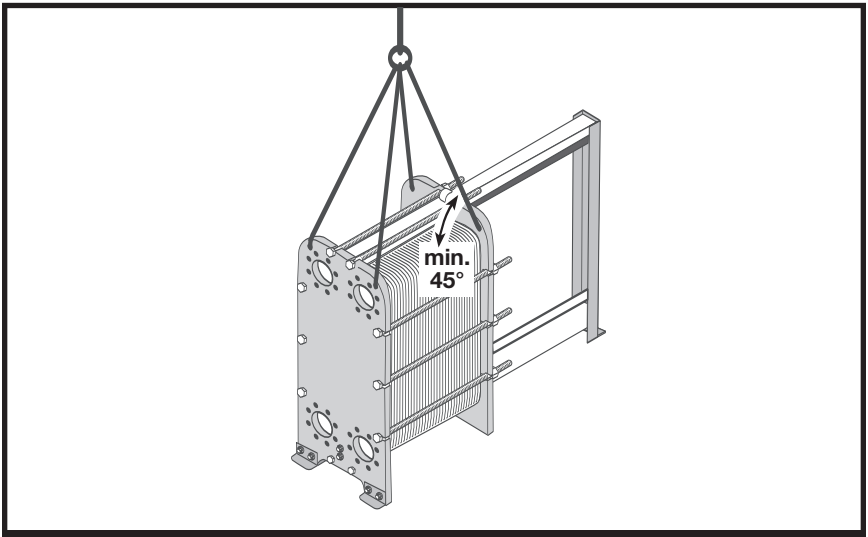


Fig. 10

Lifting:

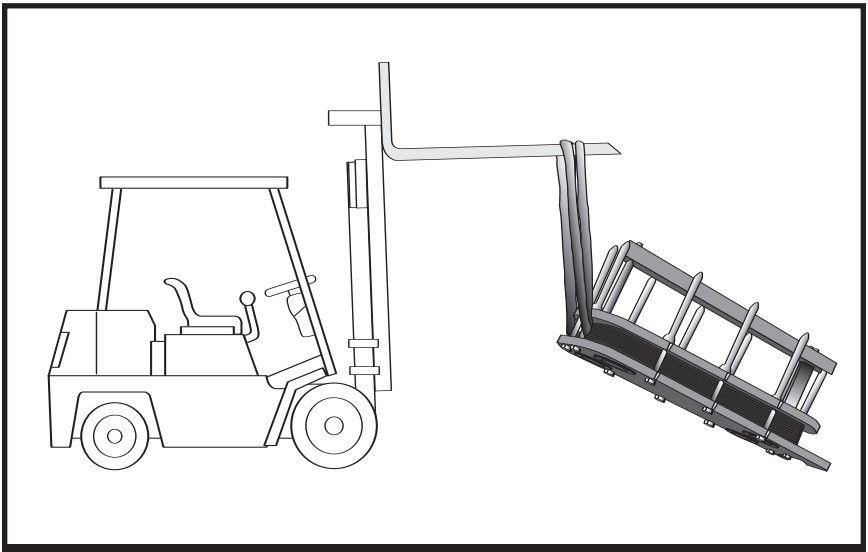
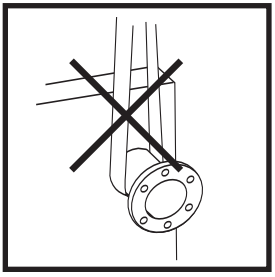


Fig. 11

The heat exchanger will usually be delivered on a pallet. The back side of the head will be tightened to the pallet. This allows you to use a forklift to transport the unit. See Figs. 9, 10, and 11 for illustrations of proper (and improper) lifting methods.

Raising the unit

- Remove all tightening elements from the pallet.
- Place straps around one bolt on each side as shown on the picture. Never use steel cables or chains!
- Lift the heat exchanger from the pallet.
- Lower the heat exchanger slowly to horizontal. Set it on its feet and place it in its final position on the floor.
- Remove the straps and fasten the heat exchanger to the floor.



***Never* lift the heat exchanger by using the connections or studs around them!**

ALWAYS Use lifting eyes (if fitted).
Lift the top side of the head.
Attach straps to the bolts close to the head.

NEVER Lift using the pipe connections.
Lift the follower.
Lift using an intermediate plate.
Lift with a strap attached close to the follower.

Storage

If you must store the heat exchanger for a month or more, take precautions to prevent damage to the equipment.

Store the heat exchanger in a room with a temperature of 60-70ºF and a maximum humidity of 70 percent. If this is not possible, place the heat exchanger in a wooden case lined on the inside against penetration of moisture.

Never store a heat exchanger in a room containing any ozone-producing equipment such as electric motors or arc-welding equipment. Ozone destroys many rubber materials. Also, don't store organic solvents or acids in the room. Avoid heat or ultraviolet radiation.

5.3 Installing the pipe connections

Depending on the type, a Polaris plate heat exchanger will be provided with flanges, couplings, threaded pipes, etc.

When connecting the piping to the heat exchanger, be sure the pipe system imposes no stress or strain onto the exchanger!

- Heavy pipe work must be supported so that undue stress won't be exerted on the heat exchanger.
- Always install flexible connections or strain-relief piping onto the follower to isolate the heat exchanger from vibration. Flexible connections also keep the pipe work from expanding against the heat exchanger because of temperature changes.
- These flexible connections must be fitted in a longitudinal direction to the plate package.
- Piping must be thoroughly cleaned and flushed before it's connected to the heat exchanger.
- Always install vents on both sides of the heat exchanger.
- Piping should be connected according to the design calculation and drawing.
- Locate pipe supports close to the exchanger so that piping and related valves and fittings do not put tension on the connections.
- If the pump's maximum pressure (zero-flow condition) is greater than the heat exchanger's working pressure, a safety relief valve should be installed at the inlet port, never the outlet.

Note: For proper venting, the vents should be fitted on the highest point in the direction of the flow of the medium (preferably on an air vessel). To enable the heat exchanger to be opened when necessary (and without draining the system), shut-off valves should be provided in all connections.

Make sure that the pipe work connected to the heat exchanger is secured against pressure peaks/surges and temperature shocks.

Threaded pipe connections

If a plate heat exchanger has threaded pipe connections, be sure these connections do not rotate when you attach unions or flanges.

Rotation of the pipes can damage the gasket which seals to the back of the pipe connection.

Flange connections

If the connection is rubber-lined, the liner will act as the flange gasket. Bolt the connecting flange directly to the endplate using the drilled and tapped holes provided. Tighten the bolts evenly – do not over-tighten. This can strip the threads cut into the frame plate.

If loose backing flanges are fitted to the heat exchanger, a suitable gasket is required to seal the flange.

Unless otherwise stated, liquid circuits should be connected to flow in reverse directions through the exchanger (counter-current). Refer to the contract drawing or quotation details if the connections are not marked.

6. START-UP

6.1 Preparation/pre-checks

Start-up must be done only by staff who have been trained specially for the job.

Control, maintenance, and repair of the installation must be done only by authorized, trained, and properly instructed staff.

Maintenance and cleaning must be done only when the heat exchanger is shut down.

Check to be sure all connections are fitted correctly (see also 5.3).

Filtration

Media flowing through the heat exchanger should not contain particles larger than 1.0 mm in diameter. If necessary, filters should be fitted.

Check the pressures and temperatures of the media. Make sure they do not exceed the values specified on the identification plate.

It's critical that the heat exchanger not be subjected to thermal or mechanical shock. This could cause premature gasket failure.

6.2 Start-up and operation

Start the cold circuit first, then the hot circuit.

- Check that the plate pack dimension is within the limits specified on the drawing.
- Make sure the piping system is cleaned to prevent entrance of gravel, sand, welding flux, etc. into the heat exchanger.
- Fully vent the system.
- Open the heat exchanger outlet valves.
- Close isolation valves between the pump and the exchanger.
- Fully open the valve fitted into the return line from the exchanger.
- Start the circulation pump.
- Gradually open the closed valve fitted to the inlet line of the exchanger.
- Vent the system again if necessary. Trapped air will reduce heat transfer and increase pressure drop.
- Examine the unit for leaks. Minor leakage may stop when the unit reaches operating temperature and pressure.
- Do not exceed the maximum working pressure.

Repeat the above for the secondary circuit.

When steam is one of the media:

Use slow-acting control valves and mechanisms only.

Before start-up:

- Be sure that the steam control valve is fully closed.
- Be sure that the heat exchanger is fully drained of condensate.
- Start the cold circuit first, then the steam side.
- Open the steam control valve slowly – this prevents water hammer from any condensate in the steam line and reduces pressure/thermal shock to the exchanger.
- Be sure that the steam trap is correctly sized to allow full condensate discharge – this prevents water clogging inside the exchanger.
- A float and thermostatic steam trap are recommended to ensure full drainage of the condensate.

Check for proper operation:

- Check for pressure pulses caused by the pumps or control valves. If necessary, stop the operation and rectify. Continuous pressure pulses will cause fatigue failure of the plates.
- Visually check the unit for leaks.
- Check that all vents are closed to prevent air being drawn into the system.

When the heat exchanger is in operation, conditions should not be changed. Maximum conditions specified on the identification nameplate should not be exceeded.

6.3 Shutdown for a short period

If the heat exchanger must be shut down for a short period, follow this procedure.

- Slowly close the control valve in the hot circuit while maintaining full flow in the cold circuit.
- Switch off the hot-circuit pump.
- Cool the heat exchanger to the level of the cold medium.
- Slowly close the control valve in the cold circuit.
- Switch off the cold circuit pump.
- Close all remaining isolating valves.

6.4 Shutdown for a long period

If the unit is to be taken off line for an extended period of time, follow this procedure.

- Allow the unit to cool down.
- Drain all circuits.
- Lubricate tie bolts.
- Loosen tie bolts until the plate pack is “relaxed” (maximum "a" size + 10 percent).
- Tie bolts should not be removed or loosened enough to allow dirt to enter between the plates. Attach a warning notice to the exchanger to remind personnel that the tie bolts need adjustment before the unit can be put back in service.
- Cover the plate pack with black plastic to exclude sunlight.

See also 5.2 – Storage.

7. MAINTENANCE

7.1 General maintenance

- Upper carrying bar and lower guiding bar should be coated with lubricant to enable the plates to slide smoothly.
- Lubricate tightening nuts and tightening bolts periodically so they can be loosened easily at disassembly.
- Check for loose tightening nuts. Temperature and pressure changes in the system may cause the plate pack length to shrink. Retighten to specified dimensions.

7.2 Dismantling and reassembly

- Before opening the heat exchanger, be sure that both sides are gradually lowered to atmospheric pressure.
- The temperature should be allowed to fall to ambient to avoid loosening the gaskets.
- Loosen the tightening bolts. The moving frame can now be pulled back toward the column, thus exposing the plate pack.
- The plates should be removed one by one if required.
- Dismantle the plate pack with great care. Number the plates before taking them out (if this has not already been done). To remove a plate from the frame, lift it and tilt it on an angle until it can be removed. If desired, the plates can be cleaned or inspected one by one while separated in the frame, and need not be removed.
- Before reassembly, wipe all plates and gaskets free of dirt. Solid particles adhering to the gaskets can cause damage and may also result in leakage when the unit is put back in operation.
- After each plate is inspected and cleaned, close and tighten the unit.

CAUTION! Plates may have sharp edges.
Wear gloves during disassembly and assembly.

Tightening Procedure

- Push moveable follower to contact rear of plate pack.
- Install tightening bolts and nuts.
- Starting with the center bolts, tighten using hand tools. It's important to keep the follower parallel to the fixed head during the entire tightening operation.
- Larger units will require power tools (such as pneumatic wrenches) to tighten further.
- When the required tightening measurement has been reached at the center of the pack, continue tightening the bolts out from the center. Continue until the frame is parallel and tightened to no more than the recommended tightening measurement.

Warning! The recommended tightening measurement is a minimum value which should not be exceeded. Permanent plate deformation may occur if the pack is overtightened. A unit may be shipped from the factory with a plate-pack measurement greater than the value shown on the drawing. This is due to manufacturing tolerances and is normal.

7.3 Clean-in-place (CIP)

CIP cleaning – recommended when corrosive or hazardous liquids are being processed – can be used if the scaling on the plates is soluble. All materials in the whole circulation system must be resistant to the mild cleaning detergent or weak acid used.

Drain both sides of the heat exchanger.

Back flush both sides with warm water until the water flows clear.

Ask the supplier of the cleaning detergent to confirm that it will not damage materials in the heat exchanger.

If the solution requires recirculation, set the flow as high as possible - never less than the service or product flows.

Follow the detergent supplier/cleaning specialist's instructions. For recirculated cleaning detergents, pump the fluid through the exchanger for at least 30 minutes.

If steam is used for cleaning, be sure that its temperature does not exceed the limitations of the gasket material (NBR/230°F, EPDM/320°F).

Rinsing

After using any cleaning agent, rinse thoroughly with fresh water. If cleaning in place, circulate fresh water for at least ten minutes.

7.4 Recommended cleaning agents

Remove oil and grease with a water-emulsifying oil solvent (i.e., BP system).

Remove organic and grease cover with sodium hydroxide (NaOH) – maximum concentration 1.5 percent, maximum temperature 85ºC. Mixture for 1.5 percent concentration = 5 liters 30 percent NaOH per 100 liters of water.

Remove stone and limestone with nitric acid (HNO_3) – maximum concentration 1.5 percent, maximum temperature 65ºC. Mixture for 1.5 percent concentration = 2.4 liters HNO_3 62 percent per 100 liters of water.

CAUTION: Nitric acid and sodium hydroxide may harm exposed skin, eyes, and mucous membranes. Use protective eyewear and gloves.

7.5 Opening the heat exchanger

When opening and assembling the heat exchanger:

- Measure and note the actual "a" size.
- Use correct tools and lubricant.
- Shut down the heat exchanger as described under 6.3.
- Make sure the heat exchanger cools down (<100ºF); with EPDM, < 70ºF.
- Be sure there's no pressure on any part of the unit.
- Clean and grease the clamping bolts.
- Loosen the clamping bolts equally in the correct order (Fig. 12.) so that the follower has a parallel opening motion.
- Pull the follower back towards the column.
- Remove the plates, taking care not to damage the gaskets.

CAUTION: To prevent injury, be sure unit is depressurized and drained of hot and/or aggressive product before opening.

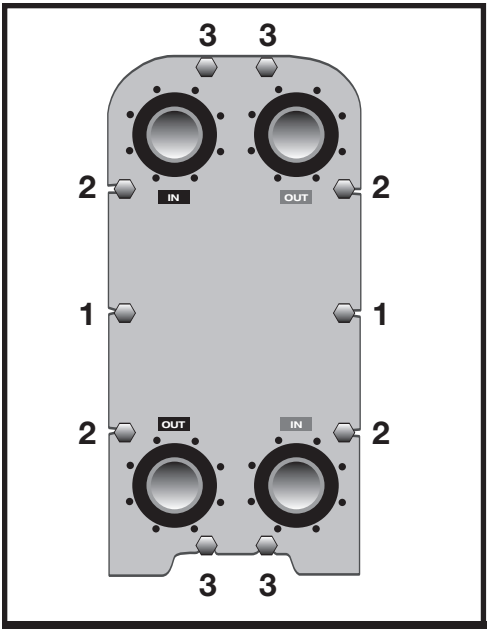


Fig. 12

CAUTION: Sharp edges. When handling plates, wear gloves.

Recommendation:

Mark the plate package before opening. Use a diagonal line on the outside, or number the plates in sequence. (See Fig. 13.)

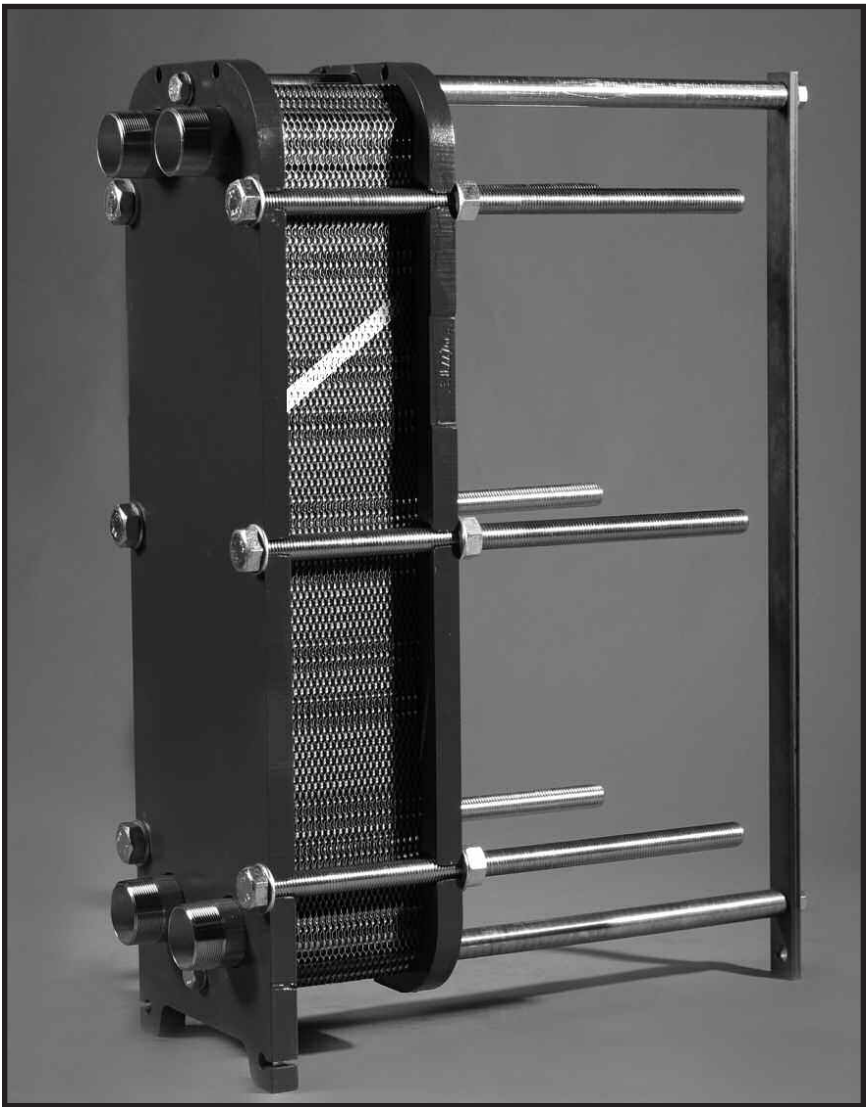


Fig. 13

7.6 Cleaning the plates

CAUTION: Always wear gloves and eye goggles when using cleaning detergents.

Use nylon or other soft scrubbing brushes with detergent.

Never use a metal brush, steel wool, or sand/glass paper. This will damage the passivation film of the plates.

To remove old gasket glue, use acetone or other chlorine-free solvents. Alternatively, use an LP gas flame, heating the plate's reverse side. Don't use any other type of gas, which may produce a "harder" flame. Boiling water can be used with some success.

Consult a cleaning specialist for a suitable choice of detergent. Be sure all detergents are compatible with plate and gasket material.

If plates are removed for manual cleaning, refit them in the same order.

Always remove plates one by one and number them!

Use a high-pressure cleaner only with absolute care. Never add abrasives.

If the cover is thick with scale or organic material, the plates can be put in a barrel with a qualified cleaning material.

Before fitting chemically cleaned plates, rinse them thoroughly with fresh water!

Important:

Cleaning has an important influence on the effectiveness of heat exchangers. Insufficient cleaning can have the following results:

- Poor circulation.
- Insufficient thermal output.
- Shortened service life.

If a plate in the middle of the pack must be replaced because of serious damage, replace either of the plates next to it as well (two plates total).

7.7 Plate replacement

Plates must be clean, dry, and free of oil or grease. Oil deposits on the gaskets or the gasket seating area make it likely that the plates will slip out of place when the unit is being tightened. Gasket contamination with dirt or grit can cause leakage.

- Be sure all seating areas are flat, clean, and undamaged.
- Always use new gaskets.

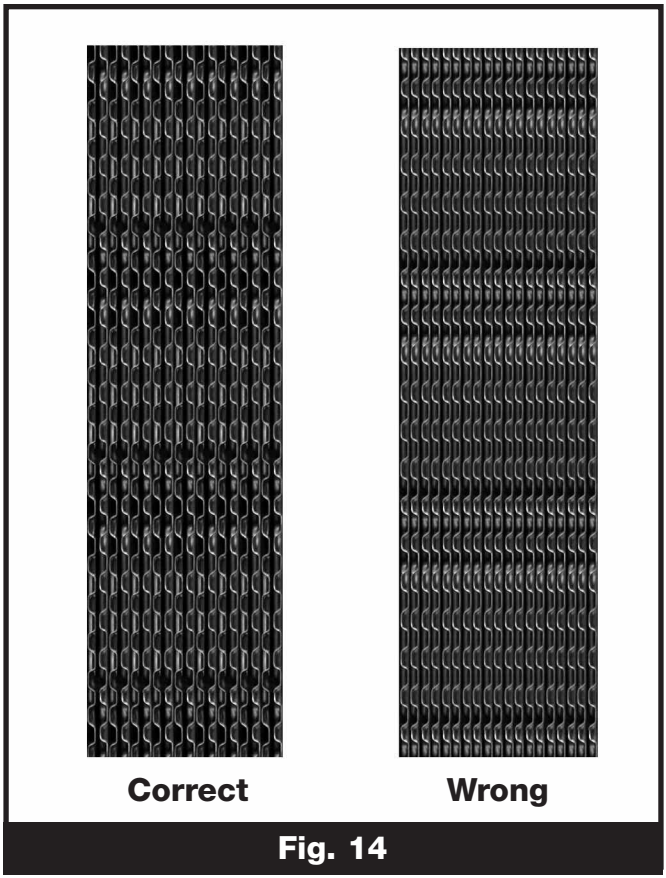


Fig. 14

Fit the plates according to the Plate Sequence Sheet. All gaskets must face the fixed/head frame plate.

Alternate between left- and right-handed plates – if the plate edges form a regular honeycomb pattern, the left hand/right hand sequence is correct. (See Fig. 14.)

7.8 Gasket replacement

Press-Tite gaskets

These gaskets require no adhesive. Push the tabs on the underside of the gasket into the corresponding holes in the plate.

Clip-Tite gaskets

These gaskets require no adhesive. Pull the clips on the side of the gasket around the edge of the plate so that the clips rest in the provided space. Make sure groove and gasket are clear.

Glue-type gaskets

Surfaces must be clean and free of oil.

Only use chloride-free glues like Pliobond 20 or 30, Bostic 1782, 3M Scotchgrip 1099 and Bond Spray 77. Use only a very small amount of glue in the gasket groove so that the glue does not press out of the groove when the gasket is installed.

Follow the manufacturer's instructions; these will be printed on the package.

CAUTION: When using commercial solvents and adhesives, follow manufacturers' recommendations carefully. Many of these materials are hazardous.

O-rings

Be sure the flat side of the O-ring fits into the special packing groove of the plate. If the O-ring is not provided with a flat side, the thinnest side of the ring needs to be fitted into the groove.

It may be necessary to use a little glue to position the O-ring during assembly.

Rubber liners

On some models, the rubber frame plate nozzle liners have an O-ring molded into the liner itself. This molded O-ring fits into the gasket groove in the first plate. If new gaskets have been fitted, the O-ring portion of the gasket around the nozzle hole will have to be cut off prior to assembly back into the frame.

7.9 Tightening of the plate pack and pressure testing

The minimum tightening dimension ("A" dimension) is shown on the name plate.

- Lightly oil the tightening bolt threads. Do not allow oil or grease onto the gaskets or the gasket seating faces on the back of the plates. Wet or contaminated plates can become misaligned during tightening. If that should happen, dismantle, clean and dry all areas in contact with the gaskets.
- Evenly tighten all bolts in the correct order. (See Fig. 12.) Use ratchet wrenches or hydraulic tools.
- Use the centermost bolts to tighten the pack to within approximately 80 percent of the final dimension. Then proceed to tighten the outlying bolts.
- Be sure that clamping is as uniform as possible. Keep frames and plates parallel throughout the operation. Avoid skewing the frame plates more than 5 mm.
- Tightening is complete when the distance between the inside faces of both frame plates approaches the "A" distance as shown on the contract drawing. See Fig. 15.

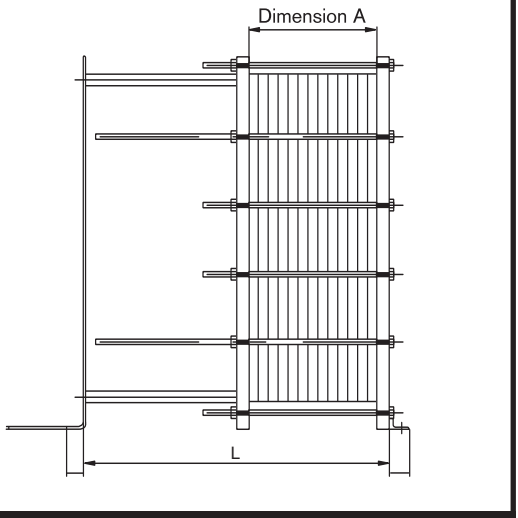


Fig. 15

Calculate the tightening distance as follows:

Tightening dimension = Number of plates x coefficient

Coefficients vary depending on the model type and plate thickness. If in doubt, check with Polaris or your local representative.

- Check that all bolts are properly in tension. Clean any oil off the frame plates.
- Pressure-test the unit. Test pressure is shown on the nameplate.

If dimension "A" isn't reached with application of maximum tightening effort:

- Check the number of plates and dimension "A" on the datasheet.
- Check that all nuts and bearing boxes are running freely. If not, clean and lubricate or replace.

If the unit does not fully seal, tighten it step-by-step to reach the minimum dimension "A."

Do not tighten the plate pack smaller than the "A" dimension.

Tighten the plate pack only when the unit is fully depressurized.

7.10 Additional maintenance tips

Time interval – minimum once a year

- Check temperatures and flows against commissioning data.
- Check general condition and look for any signs of leakage.
- Wipe clean all painted parts. Check surfaces for signs of damage – touch up if necessary.
- Check bolts and bars for rust; clean as needed. Lightly coat threaded parts with molybdenum grease or a corrosion inhibitor. (Be sure no grease or other contaminants reach the plate gaskets.)
- If rollers are fitted to the follower frame plate, lubricate the bearings with light machine oil.

8. TROUBLESHOOTING

Often, your own personnel can solve problems with your plate heat exchanger.

Continuous proper functioning of your plate heat exchanger depends on strict compliance with the permissible pressure and temperature values shown on the nameplate. Exceeding these values, even in short-term pressure peaks, will cause problems and damage the unit.

To avoid costly repairs, have properly trained personnel carry out your installation and maintenance. Need help? Contact Polaris or your local Polaris representative.

Problem	Possible cause	Possible solution
Leakage	At the connections	• Check the rubber liners (if fitted). • Check the flange packing (if fitted). • Check the O-ring on the first plate. • Fit the pipes tension-free.
	Mixing of primary and secondary circuit	• Check the plates for holes or cracks.
	In plate package	• Check the assembly distance. • Check condition of packings. • Check for proper position of the packings.
	The operating conditions deviate from the specification.	• Adjust the operating conditions.
Insufficient capacity	Air in the system	• De-aerate the pipe system. • Check the pipe work for possible air traps.
	The operating conditions deviate from the specification.	• Adjust the operating conditions.
	The heat exchanger is dirty.	• Clean the heat exchanger.
	The connections have been interchanged.	• Redo the fitting work.
Too high pressure drop	Flow larger than the design flow	• Adjust the flow.
	Channels in plate(s) blocked	• Flush/clean.
	Incorrect measurement	• Check the pressure indicator.
	Medium deviating from the design	• Addition of anti-freeze will increase the pressure drop.
	Air in the system	• De-aerate the pipe system. • Check the pipe work for possible air traps.

For nearly all leak problems, you'll need to dismantle the unit before attempting to fix the problem. Mark the area where the leak seems to be with a felt-tip pen before taking apart the exchanger.

"**Cold leakage**" is caused by a sudden change in temperature. The sealing properties of certain elastomers are temporarily reduced with sudden temperature changes. No action is required. The gaskets should re-seal after the temperature has stabilized.

Additional troubleshooting tips

- If performance decreases, the unit may be dismantled and cleaned, or cleaned in place as described above. Also, check that the unit is connected for counterflow operation.
- If leakage to the atmosphere is noted, and the plate pack measurement is greater than the minimum recommended measurement, you may further tighten the plate pack to stop the leak. Do not tighten beyond the minimum measurement.
- If leakage between the sides is noted, disassemble the exchanger and use a bright lamp to examine each plate for a hole.
- Remove the leaking plate, along with the adjacent plate. As stated above, plates must always be removed in pairs. The unit can then be retightened with minimal performance loss.
- Hard, shiny, or brittle gaskets may have been subject to temperatures beyond their design limitations. Check for excessive operating temperatures and consider replacing the old gaskets with high-temperature gaskets.
- Gasket swelling or disintegration may be a sign of fluid compatibility problems. Samples of gasket materials may be soaked before installation in the process fluid and checked for swelling.

Gasket failures are generally a result of:

- old age
- excessive ozone exposure
- high operating temperature, above the limit of the material
- exposure to pressure surges
- chemical attack
- physical damage resulting from poor assembly, or misaligned plate. (Check the hanging system at the top of the plate for distortion.)

Decreased performance is generally a result of:

- Plate surfaces that require cleaning or de-scaling
- Pumps or associated controls failure
- Plate channels blocked
- Liquid flows not as per design specification
- Associated chiller/cooling tower/boiler undersized
- Cooling water temperature to the exchanger is higher than designed
- Heating media temperature to the exchanger is lower than designed
- Steam flow not sufficient – control valve malfunction
- Steam trap broken or jammed – unit becomes filled with condensate
- Plate pack has been assembled incorrectly
- Unit is running in co-current flow, instead of counter-current – check contract drawing and alter pipe work if necessary. Check direction of pump flows.
- Air lock has developed in the plate package or pipe work

9. FOLLOW-UP SERVICE

9.1 Ordering parts

Spare parts may be ordered directly from Polaris or through your local authorized Polaris representative. Plates and gaskets may be ordered separately, or the plates may be ordered with gaskets already in place. When ordering, please have the following information available.

- Polaris model number
- Polaris serial number
- Plate material
- Gasket material

If you have any difficulty in identifying your heat exchanger, call Polaris or your local representative for assistance. We will have your unit on file, and will be able to help you in identifying the parts you need.

When ordering tie-bolts, measure the existing ones to be certain of getting new ones of the same size.

9.2 Modifications to the heat exchanger

The plate heat exchanger is built in modules and is therefore flexible for enlargement or reduction. It's easy to change the capacity by changing the number of plates. We'd be glad to advise you.

Ask about our certified products.

Polaris

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