

Gasketed plate heat exchangers

All products



Lit. Code

200006684-2-EN-GB

Maintenance Manual

BRITISH ENGLISH

Published by

Alfa Laval Technologies AB Box 74 SE–226 55 226 55 Lund, Sweden Telephone switchboard: +46 46 36 65 00 info@alfalaval.com

The original instructions are in English

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1 Introduction

This manual provides information needed for maintenance of your gasketed plate heat exchanger.

1.1 Intended use

The intended use of this equipment is to transfer heat in accordance with a decided configuration.

All other use is prohibited. Alfa Laval will not be held responsible for injury or damage if the equipment is used for any other purpose than the intended use described above.

1.2 Reasonably foreseeable misuses

- Do not lift or transport the crate nor the equipment in any other way than stated in this instruction manual.
- Connect a pipe in the way it is meant to be connected to the plate heat exchanger. Gasket and lining can be damaged if a pipe is connected in the wrong way.
- On semi-welded units it is a safety issue if the wrong pipe is connected to the wrong port, double check that the correct media is connected to the correct port according to the plate heat exchanger drawings.
- It is a risk to damage the hangers if you hang in or move many plates at a time. It is recommended to handle one, or maximum two, plates at the time.
- When setting the A measure (the distance between the inside of the frame plate and the inside of the pressure plate), always tighten the bolts crosswise, evenly, and a little at a time to avoid diagonal shifting and snaking. The A measure can be found on the plate heat exchanger drawing as well as the number of plates.
- Increase and decrease flow gently to avoid plate deformations and gasket blow-outs by for example water hammer.
- At a start, raise the temperature gently to avoid cracks in the gaskets or create a blow-out. See Section Start-up in the Installation Manual.
- If the plate heat exchanger will not be taken in operation within 6 months follow the instructions in Section *Storage*.

1.3 Prior knowledge

The plate heat exchanger shall be operated by persons who have studied the instructions in this manual and have knowledge of the process. This includes knowledge of precautions regarding media type, pressures, temperatures in the plate heat exchanger as well as specific precautions required by the process.

Maintenance and installation of the plate heat exchanger shall be done by persons who have knowledge and authorization according to local regulations. This may include actions such as piping, welding and other kind of maintenance.

For maintenance actions not described in this manual, contact your Alfa Laval representative for advice.

1.4 Delivered technical information

For the manual to be considered complete, the following delivered documentation must be accessible:

- Declaration of Conformity If applicable.
- **Parts list** A bill of material as the equipment is built.
- **Plate hanging list** A description of the plate package installation.
- **Technical specification** Connection information, measurements, and section information.
- Plate heat exchanger drawing
 - A drawing of the delivered plate heat exchanger.

The weight of the delivered plate heat exchanger as well as all dimensions can be found on the delivered plate heat exchanger drawing.

The listed documents are unique for the delivered product (equipment serial number). Instructions shall be accompanied, where appropriate, by the technical documents, drawings and diagrams necessary for a full understanding of these instructions.

The plate heat exchanger drawing mentioned in this manual are the drawings included in the delivery.

1.5 Warranty conditions

The warranty conditions are usually included in the signed sales contract prior to the order of the delivered plate heat exchanger. Alternatively, the warranty conditions are included in the sales offer documentation or with a reference to the document specifying the valid conditions. If faults occur during the specified warranty period, always consult your local Alfa Laval representative for advice.

1.6 Advice

Always consult your local Alfa Laval representative for advice on:

- New plate pack dimensions if you intend to change the number of plates
- Selection of gasket material if operating temperatures and pressures are permanently changed, or if another medium is to be processed in the plate heat exchanger

1.7 Environmental compliance

An enhanced energy efficiency when operating Alfa Laval's compact heat exchangers in an optimal way following our maintenance recommendations, will lead to energy savings and reduction of operational expenses (OPEX)."

Waste management

Separate, recycle, or dispose of all material and components in a safe, and environmentally responsible way, or according to national legislation or local regulations. If there is any uncertainty regarding what material a component is made of, contact the local Alfa Laval sales company. Use a certified (ISO 14001 or similar) scrapping or waste handling company.

Unpacking

Packing material consists of wood, plastics, cardboard boxes and, in some cases, metal straps.

- Wood and cardboard boxes can be reused, recycled or used for energy recovery.
- · Plastics should be recycled or burnt at a licensed waste incineration plant.
- · Metal straps should be sent for material recycling.

Maintenance

- All metal parts should be sent for material recycling.
- Oil, all non-metal wear parts, cleaning compound, cloths and other cleaning material must be taken care of in accordance with local regulations.

Scrapping

At end of use, the equipment shall be recycled according to relevant, local regulations. Besides the equipment itself, any hazardous residues from the process liquid must be considered and dealt with in a proper manner. When in doubt, or in the absence of local regulations, please contact the local Alfa Laval sales company.

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2.1 Safety considerations

The plate heat exchanger shall be used and maintained in accordance with Alfa Laval's instructions in this manual. Incorrect handling of the plate heat exchanger may result in serious consequences with injuries to persons and/or property damage. Alfa Laval will not accept responsibility for any damage or injury resulting from not following the instructions in this manual.

The plate heat exchanger should be used in accordance with the specified configuration of material, media types, temperatures and pressure for your specific plate heat exchanger.

2.2 Definitions of expressions

WARNING Type of hazard

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION Type of hazard

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

INOTE

NOTE indicates a potentially hazardous situation which, if not avoided, may result in property damage.

EN

2.3 Personal protective equipment

Protective shoes

A shoe with a reinforced toe cap to minimize foot injuries caused by dropped articles.



Protective helmet

Any helmet designed to protect the head from accidental injury.



Protective goggles

A pair of tight-fitting eyeglasses worn to protect the eyes from hazards.



Protective gloves

Gloves that protects the hand from hazards.





Safety

2.4 Working at height

WARNING Risk of falling.

For any kind of work at height, always ensure that safe means of access is available and used. Follow local work at height regulations and guidelines. Use scaffolds or a mobile work platform and a safety harness. Create a safety perimeter around the working area and secure tools or other objects from falling.

If the installation requires working at a height of two meters or higher, safety arrangements must be taken in consideration.



Safety



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Safety

3 Description

3.1 Components

This chapter describes the main components and accessories of an Alfa Laval plate heat exchanger.

3.1.1 Industrial plate heat exchangers

Main components

The illustration shows an exploded Alfa Laval T15 with alternative components.





1. Frame plate

Fixed plate with a various number of portholes for the connection of the piping system.

2. Pressure plate

Moveable plate that compress the plate package against the frame plate. The pressure plate can contain a various number of portholes for the connection of the piping system.

3. Carrying bar

Carries the plate package and the pressure plate.

4. Guiding bar

Keeps all the plates aligned at their lower end.

- a. Standard
- b. Compact design

5. Plate package

The denomination for all the plates that are installed between the frame plate and the pressure plate. A plate package can consist of:

- Channel plate

The plates placed between the end plate I and the end plate II or the transition plate.

End plate I

The plate placed next to the pressure plate.

- End plate II

The plate placed next to the frame plate.

- Transition plate

The plate placed next to the pressure plate.

- Twin plate cassette

Two plates welded together. For the semi-welded products.

- Gaskets

Assembled between the plates to prevent leakage.

6. Support column

Supports the carrying bar and the guiding bar. For some smaller plate heat exchanger models no support column is used.

7. Tightening bolt

Compress the plate package between the frame plate and the pressure plate.

8. Locking bolt

Shorter than a tightening bolt and are used to lock the plate package even more.

9. Porthole

Portholes through the frame plate allow the media to enter into or exit from the plate heat exchanger.

10. Stud bolt

Threaded stud bolts around the portholes to assemble a flange connections to the plate heat exchanger.

11. Foot

Gives stability to the plate heat exchanger and can, depending on the design, be used to secure the plate heat exchanger with bolts to the foundation.

Multi-section and multi-pass

Partition plates

Solid stainless steel plates used in multi-pass configurations. Supports the unholed ports of a turning plate.

Section

When using connection plates, the plate heat exchanger will contain several sections (plate packages).

Connections

Pipe connection

The plate heat exchanger can be equipped with of fixed pipe connection for different types of attachments such as pipes for welding, threaded pipes or grooved pipes.



Rectangular loose flange

The rectangular loose flange is a special flange supplied by Alfa Laval to be used with the customers piping and is attached with four stud bolts.



Optional equipment

Inspection cover

Used to allow inspection through the porthole. Can be equipped with a drainage pipe.

Protection sheets

Cover the plate package and protect against leakage of hot or aggressive fluids and the hot plate package.

Bolt protection

Plastic tubes that protect the threads of the tightening bolts.

Bolt protection

Plastic or stainless steel tubes that protect the threads of the tightening bolts.

Insulation

For applications where the plate heat exchanger surface will be hot or cold, insulation can be used.

Lifting device

Separate device that are attached on the plate heat exchanger used for lifting the plate heat exchanger.

• Earthing lug

An earthing connection is used to eliminate the risk of static electricity building up in the equipment.

Nozzle cover

Protection to avoid particles to enter into the plate heat exchanger during transportation.

Port filter

Protection to prevent particles to enter into the plate heat exchanger during operation. Backflushing not allowed

• Drip tray

Depending on the type of fluid in the plate heat exchanger and the type of installation, a drip tray (drainage box) may be necessary to avoid injury to personnel and damage to equipment.

3.1.2 Sanitary plate heat exchangers

Main components

The illustration shows an exploded Alfa Laval H8 with alternative components.



1. Frame plate

Fixed plate with a various number of portholes for the connection of the piping system.

2. Pressure plate

Moveable plate that compress the plate package against the frame plate. The pressure plate can contain a various number of portholes for the connection of the piping system.

3. Carrying bar

Carries the plate package and the pressure plate.

4. Guiding bar

Keeps all the plates aligned at their lower end.

5. Plate package

The denomination for all the plates that are installed between the frame plate and the pressure plate. A plate package can consist of:

- Channel plate

The plates placed between the end plate I and the end plate II or the transition plate.

- End plate I

The plate placed next to the pressure plate.

- End plate II

The plate placed next to the frame plate.

- Transition plate

The placed next to the pressure plate.

- Gaskets

Assembled between the plates to prevent leakage.

6. Support column

Supports the carrying bar and the guiding bar.

7. Tightening bolt

Compress the plate package between the frame plate and the pressure plate.

8. Locking bolt

Shorter than a tightening bolt and are used to lock the plate package even more.

9. Connection

Different types of connections can be used to connect the piping system to the plate heat exchanger.

10. Corner

Component on a connection plate that can have different functions depending on the design. Allow the media to enter into or exit from a plate heat exchanger section.

11. Connection plate

A connection plate divides the plate package into sections allowing two or more heat transfer processes in one plate heat exchanger.

12. Section

A section is a part of the complete plate package.

13. Foot

Gives stability to the plate heat exchanger and can, depending on the design, be used to secure the plate heat exchanger with bolts to the foundation.

Multi-section and multi-pass

Connection plate

Plate used to separate two or more services in one plate heat exchanger. The plate pack performing such a service is called a section.

Partition plates

Solid stainless steel plates used in multi-pass configurations. Supports the unholed ports of a turning plate.

Section

When using connection plates, the plate heat exchanger will contain several sections (plate packages).

Connections

Pipes with sanitary fittings or flanges allow the media to enter into or exit from the plate heat exchanger.

Optional components

Protection sheets

Cover the plate package and protect against leakage of hot or aggressive fluids and the hot plate package.

· Bolt protection

Plastic or stainless steel tubes that protect the threads of the tightening bolts.

3.2 Name plate

The type of unit, manufacturing number and manufacturing year can be found on the name plate. Pressure vessel details in accordance with the applicable pressure vessel code are also given. The name plate is fixed to the frame plate, most commonly, or the pressure plate. The name plate can be a steel plate or a sticker label.

WARNING Risk of damage to equipment.

The design pressures and temperatures for each unit are marked on the name plate. These must not be exceeded.

CAUTION Risk of damage to equipment.

Avoid aggressive chemicals for cleaning the plate heat exchanger when a sticker label is used.

The design pressure (11) and the design temperature (10), as given on the name plate, are the values against which the plate heat exchanger is approved according to the pressure vessel code in question. The design temperature (10) may exceed the maximum operating temperature (8) for which the gaskets have been selected for. If the operating temperatures as specified on the plate heat exchanger drawing are to be changed the supplier should be consulted.

- 1. Space for logotype
- 2. Open space
- 3. Website for service
- Drawing of possible locations of connections/Location of 3A tag for 3A units
- 5. Space for mark of approval
- 6. Warning, read manual
- 7. Date of pressure test
- 8. Maximum operating temperature
- 9. Manufacturer test pressure (PT)
- 10. Allowable temperatures Min/Max (TS)
- 11. Allowable pressures Min/Max (PS)
- 12. Decisive volume or volume for each fluid (V)
- 13. Locations of the connections for each fluid
- 14. Decisive fluid group
- **15.** Year of manufacture
- 16. Serial number
- 17. Type
- 18. Manufacturer's name



Figure 1: Example of name plates.

3.3 Plate package pattern

Honeycomb pattern

When the plates are hanged according to the plate hanging list the edges will create a honeycomb pattern when viewed from any of the sides. If you have hanged the plate package plates back in the plate heat exchanger you can observe the plate package from any side and easily see if a plate is assembled incorrectly.

The edge of the plates should form a honeycomb pattern as shown to the left in the illustration. Incorrectly assembled plates form an uneven pattern as shown to the right in the illustration.





3.4 A measure

The A measure is the distance from the inside of the frame plate (1) to the inside of the pressure plate (2).



3.5 Identification of plate side

The A side of the plate is identified by a stamp with the letter A and the model name at the top of the plate (see image below).



The A side of the plates (symmetric pattern) are identified by a stamp with the letter A and the model name at the top of the plate (see the image 1 below).

Plates with asymmetric pattern has two possible sides for placement of the gaskets. The pattern is marked A W for the wide-side image 2 and B N for narrow-side image 3.

Plates with WideGap pattern has two possible sides for placement of the gaskets. The pattern is marked A R for the wide-side (Ridge) image 2 and B V for narrow-side (Valley) image 3.



3.6 Bolt configuration

The bolt configuration of the plate heat exchanger varies between different models. The major force of the plate pack is held by the tightening bolts (TB). To distribute the force evenly over the frame plate and pressure plate, locking bolts (LB) are used as well. The locking bolts can be shorter and can have smaller dimensions. In the opening and closing procedure, it is important to identify the tightening bolts (TB) and the locking bolts (LB). See the illustration below.



ΤВ

LB

ΤВ



3.7 Function

The plate heat exchanger consists of a pack of corrugated metal plates with portholes for the input and output of the two separate fluids. The heat transfer between the two fluids takes place through the plates.

The plates are arranged as cassettes (twin plates) in such a way that every second channel is welded, and every other channel is gasketed. The heat transfer between the two fluids will take place through the plates. The cassette concept gives rise to two different type of channels - welded channels used for the aggresive primary media and gasketed channels used for the non-aggresive secondary media.

The plate pack is assembled between a frame plate and a pressure plate and compressed by tightening bolts. The plates are fitted with a gasket which seals the channel and directs the fluids into alternate channels. The plate corrugation promotes fluid turbulence and supports the plates against differential pressure.

NOTE Refrigeration

For refrigeration duties the end cassette channels can be blinded to isolate the plate pack from the frame and pressure plate.



Figure 2: Example of a single-pass set up.



Figure 3: Principle of plate pack arrangement, gaskets facing the frame plate.



Figure 4: Principle of plate pack arrangement, gaskets facing the pressure plate.



Figure 5: Example of a single-pass set up.

- 1. End cassette I. End single plate if M10-BWREF.
- 2. Channel cassettes
- **3.** End cassette II. End single plate if M10-BWREF
- 4. Gasketed channel created between two cassettes (blue)
- 5. Two plates which form the welded channel inside the cassette (red)

3.8 Multi-section

A multi-section plate heat exchanger can be set up by using connection plates. An example of multi-section configuration is when a media needs to be heated in one stage and then cooled down in the next stage.

Each of the connection plates can be configured by selecting different corner connections such as single, double, pass-through or blind.



Figure 6: Example of a multi-section set up.

- 1. End plate I
- 2. End plate II
- 3. Channel plates
- 4. Transition plate



Figure 7: Example of a multi-section set up.

- 1. End plate I
- 2. End plate II
- 3. Channel plates

3.9 Multi-pass

Multi-pass sections can be created by using turning plates with 1, 2 or 3 unholed ports. The main purpose is to change the flow direction of one or both fluids.

For some units, a partition plate is required to support the unholed ports in the turning plates. A transition plate also needs to be added to the pack to prevent media from coming into contact with the partition plate or pressure plate.

For some units, a partition plate is required to support the unholed ports in the turning plates.

An example of where multi-pass can be used is in processes that require longer heating periods if the media requires slower heating.



Figure 8: Example of a multi-pass set up.

- 1. End plate I
- 2. End plate II
- 3. Channel plates
- 4. Turning plate



Figure 9: Example of a multi-pass set up.

- 1. End plate I
- 2. End plate II
- 3. Channel plates
- 4. Transition plate
- 5. Turning plate



Figure 10: Example of a multi-pass set up.

- 1. End plate I
- End plate I
 End plate II
 Channel plates
 Transition plate
- 5. Turning plate
- 6. Partition plate



Figure 11: Example of a multi-pass set up.

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4 Maintenance

This chapter describes all maintenance procedures necessary.

4.1 Plate heat exchanger

This section consists of all maintenance performed on a complete unit.

4.1.1 Plate heat exchanger — Drain

NOTE Risk of personal injury.

The plate heat exchanger must not be pressurised, that is the plate heat exchanger should not be in operation.

WARNING Risk of personal injury.

Use proper protective equipment. See Section Personal protective equipment in Chapter Safety.

INOTE The plate heat exchanger contains media (liquid).

If the plate heat exchanger is not drained, media will come out of it when it is opened.

It is recommended to connect the plate heat exchanger to a draining system.

1) Make sure all valves and pumps are closed.

2) Drain the plate heat exchanger through a draining system so that the media can be taken care of according to local regulations.

3

Only valid if there is no draining system installed.

A plate heat exchanger can contain from xx litre up to yy litre of media (liquid). Depending on how large the plate heat exchanger is.

Make sure you can take care of all media (liquid) that is inside the plate heat exchanger

Remove the low port hole connection and let the media discharge from the plate heat exchanger.

4.1.2 Plate heat exchanger — Open

It is necessary to open the plate heat exchanger to manually clean the plates, to change a plate, or to change a gasket.



bar. Wipe the sliding surfaces clean and put grease on them.



5 Draw a diagonal line on the outside of the plate package.



6 Check and note the A measure.



7 If the plate heat exchanger has locking device, loosen and remove them. Save the locking device for reassembling.

- 8) The plate heat exchanger can have different kind of feet. Follow the sub-instruction corresponding to your installation.
 - a) Remove the foundation screws from the feet at the pressure plate. Remove the feet.
 - Remove the nuts and screws that connect the feet against the pressure plate. Remove the feet.
 - c) Remove the outer feet. The pressure plate has a slot which makes it possible to pass the protruding foundation screw.
 - d) Loosen and remove the feet at pressure plate. Loosen the nuts of the foundation bolts located at the outside. Remove the nuts and bolts that connect the feet against the pressure plate. Swing out the outer feet.









- 9 Loosen and remove the locking bolts.
- (10) Brush the threads of the tightening bolts with a steel wire brush.
- 11) Put grease on the threads of the tightening bolts.
- (12) Use the tightening bolts to open the plate package. During the opening procedure, keep the frame plate and pressure plate parallel. Skewing of the pressure plate during opening must not exceed 10 mm (2 turns per bolt) across the width and 25 mm (5 turns per bolt) vertically.
- **13** Remove the tightening bolts when possible.
- (14) Gently push the pressure plate away from the frame plate.

15 Now it is possible to open the plate package.

4.1.3 Tightening torque

When a pneumatic tightening device is used, see the table corresponding to your plate heat exchanger for maximum torque. Check the A measure during tightening.

IDENTE The A measure is the important value.

Torques stated in this table are only referring to the maximum value to which a bolt can be torqued. You must always check the A measure when tightening the bolts and never tighten more when the A measure is reached.

Bolt size	Bolt with bearing box		Bolt with washer	
	Nm	kpm	Nm	kpm
M10	—	—	32	3.2
M16	—	—	135	13.5
M20	—	—	265	26.5
M24	—	—	450	45
M30	585	58	900	90
M39	1300	130	2000	200
M48	2100	210	3300	330
M52	2100	210	3300	330

4.1.4 Plate heat exchanger — Close

IDENTE This section is not valid for hard gasket materials.

For hard gasket materials, for example EPDMAL, follow the instructions in Section Hard gasket materials.

INOTE Risk of damage to equipment.

If you are using a pneumatic tightening device please torque according to Section *Tightening torque*.

IDENTE The A measure is the important value.

Torques stated in this table are only referring to the maximum value to which a bolt can be torqued. You must always check the A measure when tightening the bolts and never tighten more when the A measure is reached.

Follow the instructions to ensure that the plate heat exchanger will be properly closed.

For bolt identification, see Section *Bolt configuration*.



3

4)

Check that all the sealing surfaces are clean.

2) Brush the threads of the bolts clean, using a steel wire brush or the Alfa Laval thread cleaner. Lubricate the threads with a thin layer of grease.



If a gasket is wrongly positioned, it will rise out of the gasket groove or be positioned outside the groove.

Check that all gaskets are properly attached. Check that all gaskets are correctly positioned in the grooves.

Press the plate package together.

5

Risk of damage to equipment.

To prevent misalignment that can occur during tightening the plate heat exchanger should be heated with 60 °C to 70 °C (140 °F to 160 °F) water. Proceed to complete the tightening of the somewhat softened gaskets as outlined.

Tighten the tightening bolts crosswise until the plate pack measure is 1.2×A making sure the frame plate and pressure plate are parallel when closing.. The tightening torque has to be estimated.

- 6) Let the plate package rest for eight hours so that all plates and gaskets can settle.
- 7) Tighten all the bolts crosswise until A measure has been reached.
- 8) If the A measure cannot be reached:
 - a) Check the number of plates.
 - b) Check that all the nuts and bearing boxes (if applicable) are running freely. If not, clean and lubricate, or replace.

() NOTE

9)

Only valid for TL6

When using an ASME standard frame.

For other product lines follow the instruction in the corresponding item instead.

Plate heat exchangers with pressure vessel code ASME are equipped with top and bottom bolts. Tighten those bolts after the procedure above has been finished or slightly before the A measure is reached.

- (10) If applicable, install the protection sheets.
- (11) Connect the pipes.
- (12) If the plate heat exchanger does not seal when the A measure has been reached, it can be tightened further to the given A measure value minus 1.0%.
- (13) Assemble the feet to the pressure plate.

14 If applicable, assemble the locking device.

15 Perform a hydrostatic test.

4.1.4.1 Hard gasket materials

I NOTE This section is only valid for hard gasket materials.

For other gasket materials follow the instructions in Section *Plate heat exchanger - Close*.

EPDMAL gaskets are harder than most standard gaskets. Because this gasket material is hard the gasket compression must be handled carefully. Improper gasket compression can cause gasket crushing or plate deformation.

The tightening procedure is critical to the life of the plate and gasket. If the procedure is done too quickly the result could be either deformed plates that will not seal or fractured gaskets that will lead to premature gasket failure.

This procedure should be carried out at temperatures of 18 °C (65 °F) or greater.

Measure the A measure on both sides of the exchanger at bolt position. The measurement should be from the inside of the frame plate (or stationary cover) to the inside of the pressure plate (or movable cover).

Check the A measure frequently during the tightening procedure. Skewing of the pressure plate must not exceed 10 mm (2 turns per bolt) across the width and 25 mm (5 turns per bolt) vertically.

The difference between the plate pack lengths measured at adjacent bolts should not exceed:

I NOTE This section is not valid for hard gasket materials.

For hard gasket materials, for example EPDMAL, follow the instructions in Section Hard gasket materials.

INOTE Risk of damage to equipment.

If you are using a pneumatic tightening device please torque according to Section *Tightening torque*.

IDENTIFY and SET UP: IDENTIFY and SET UP:

Torques stated in this table are only referring to the maximum value to which a bolt can be torqued. You must always check the A measure when tightening the bolts and never tighten more when the A measure is reached.

Follow the instructions to ensure that the plate heat exchanger will be properly closed.

For bolt identification, see Section *Bolt configuration*.

- 2 mm when the A measure is < 1000 mm
- 4 mm when the A measure is > 1000 mm
- $(\mathbf{1})$ Check that all the sealing surfaces are clean.
- Brush the threads of the bolts clean, using a steel wire brush or the Alfa Laval thread cleaner. Lubricate the threads with a thin layer of grease.

3)

If a gasket is wrongly positioned, it will rise out of the gasket groove or be positioned outside the groove.

Check that all gaskets are properly attached. Check that all gaskets are correctly positioned in the grooves.

(4)

5

Press the plate package together.

Risk of damage to equipment.

To prevent misalignment that can occur during tightening the plate heat exchanger should be heated with 60 °C to 70 °C (140 °F to 160 °F) water. Proceed to complete the tightening of the somewhat softened gaskets as outlined.

Tighten the tightening bolts crosswise until the plate package measure is 1.2×A making sure the frame plate and pressure plate are parallel when closing.. The tightening torque has to be estimated.

- 6 After eight hours, tighten all the bolts crosswise until the plate package measure is 1.05xA making sure the frame plate and pressure plate are parallel when closing. The tightening torque has to be estimated.
- 7 After an additional ten hours, tighten all the bolts crosswise to A measure.
- 8) If the A measure cannot be reached:
 - a) Check the number of plates.
 - b) Check that all the nuts and bearing boxes (if applicable) are running freely. If not, clean and lubricate, or replace.
- 9) If applicable, install the protection sheets.

10 Connect the pipes.

(1) If the plate heat exchanger does not seal when the A measure has been reached, it can be tightened further to the given A measure value minus 1.0%. Assemble the feet to the pressure plate.
If applicable, assemble the locking device.
Perform a hydrostatic test.

4.1.5 Pressure test

Neither of these processes are allowed unless performed by a person authorized according to local laws and regulations and following applicable standards. If no such person is internally available, a third party authorized entrepreneur working per local legislation using proper equipment shall be engaged.

Before the start-up of production, whenever plates or gaskets have been removed, inserted or exchanged, it is strongly recommended to perform a hydrostatic leakage test to confirm the internal and external sealing function of the plate heat exchanger. In this test, one media side at a time must be tested with the osther side open to the ambient pressure. In a multi-pass set up, all sections of the same side must be tested simultaneously. The recommended test time is 10 minutes for each media side.

CAUTION Risk of damage to equipment.

The recommended pressure for the leakage test is a pressure equal to the operating pressure + 10% of the actual unit but never above the allowable pressure (PS) as stated on the name plate.

CAUTION Refrigiration

Please note that semi welded plate heat exchangers for refrigeration applications and units with media not mixable with water must be dried after hydrostatic leakage testing. If refrigerants are in the welded channels, they must be tested with inert gas (like N_2). Dry inert gas should be used as test media to avoid water/ humid air to enter the refrigeration side.

WARNING Risk of personal injury.

Testing by putting gas (compressible media) under pressure can be very dangerous. Local laws and regulations regarding to the hazard involved in testing with a compressible medium must be respected. Hazardous examples are explosion risk due to uncontrolled medium expansion and/or suffocation risk due to oxygen depletion.

Risk of damage to equipment.

Any rebuilding or modification of the plate heat exchanger is the responsibility of the end user. Regarding recertification and pressure test (PT) of the plate heat exchanger the local laws and regulations for in service inspection must be respected. Example of a rebuilding is that more number of plates are added to the plate pack.

If there is any uncertainty about the testing procedure of the plate heat exchanger, consult an Alfa Laval representative.

4.1.6 Cleaning

In this section we describe the different cleaning methods used in different applications and situations.

To clean in an economical and efficient way it is recommended to use cleaning in place (CIP) and keeping the heat exchanger closed at all time. Every time the plate heat exchanger plate package is closed reduces the lifetime of the gasket. This since there is a risk of damaging the plates and to crush the gaskets if the plate heat exchanger plate package is not closed thoroughly.

The majority of plate heat exchangers, used to heat and cool different systems both land and sea based, the circulating medias over longer or shorter time settle something on the surface of the plates. This debris-, fouling layer is preventing the heat to transfer through the plate. The process will not get the heating or the cooling required. In section *General plate heat exchanger cleaning* this cleaning method is described.

In hygienic processes it is important to secure that the products going through the plate heat exchangers are not contaminated with bacteria or other particles that are harmful to the consumers of the product. This is done using special built in cleaning cycles. These are described in section *Hygienic processes*. Some plate heat exchangers in hygienic processes supporting utility duties shall be cleaned and maintained as described in section *General plate heat exchanger cleaning*.

If the plate heat exchanger becomes so dirty that cleaning liquid can not circulate through every channel properly, a reconditioning by an Alfa Laval authorized service center, or manual cleaning, must be done. For this the heat exchanger must be opened up. The manual cleaning is described in section *Manual cleaning*.

4.1.6.1 General plate heat exchanger cleaning

The cleaning-in-place (CIP) equipment permits cleaning of the plate heat exchanger without opening it. The purpose of cleaning with CIP is as follows:

- · Cleaning of fouling and descaling of lime deposits
- · Passivation of cleaned surfaces to reduce susceptibility to corrosion
- · Neutralization of cleaning liquids before draining

Follow the instructions of the CIP equipment.

WARNING Risk of personal injury.

Use proper personal protective equipment when using the cleaning agents. See Section *Personal protective equipment* in Chapter *Safety*.

WARNING Risk of personal injury.

Corrosive cleaning liquids. Can cause serious injuries to skin and eyes.

Use proper personal protective equipment. See Section *Personal protective equipment* in Chapter *Safety*.

CIP equipment

Contact an Alfa Laval sales representative for the size of CIP equipment.



WARNING Risk of personal injury.

The residuals after a cleaning procedure shall be handled according to local environmental regulations. After neutralization most cleaning solutions may be drained into the waste water system under the condition that the fouling deposits do not contain heavy metals or other toxic or environmentally dangerous compounds. Prior to disposal, it is recommended to analyze the neutralized chemicals for any hazardous compounds that were removed from the system.

Cleaning liquids

Liquid	Description
AlfaCaus	A strong alkaline liquid, for removing paint, fat, oil and biological deposits.
AlfaPhos	An acid cleaning liquid for removing metallic oxides, rust, lime and other inorganic scale. Contains repassivation inhibitor

Liquid	Description
AlfaCaus	A strong alkaline liquid, for removing paint, fat, oil and biological deposits.
AlfaPhos	An acid cleaning liquid for removing metallic oxides, rust, lime and other inorganic scale. Contains repassivation inhibitor
AlfaNeutra	A strong alkaline liquid for neutralization of AlfaPhos before drainage.

Liquid	Description
Alfa P-Neutra	For neutralization of Alfa P-Scale.
Alfa P-Scale	An acidic powder cleaner for the removal of primary carbonate scale but also other inorganic scale.
AlfaDescalent	A non-hazardous acidic cleaning agent for the removal of inorganic scale.
AlfaDegreaser	A non-hazardous cleaning agent for the removal of oil, grease or wax deposits. Also prevents foaming when using Alpacon Descaler.
AlfaAdd	AlfaAdd is a neutral cleaning strengthener designed to be used with AlfaPhos, Alfa- Caus and Alfa P-Scale. 0.5–1 vol% is added to the total diluted cleaning solution to provide better cleaning results on oily and fatty surfaces and where biological growth occurs. AlfaAdd also reduces any foaming.

If CIP cannot be done, cleaning must be done manually. See Section *Manual cleaning*.

Chlorine as a growth inhibitor

Chlorine, commonly used as a growth inhibitor in cooling water systems, reduces the corrosion resistance of stainless steels (including high alloys like Alloy 254).

Chlorine weakens the protection layer of these steels making them more susceptible to corrosion attacks then they otherwise would be. It is a matter of time of exposure and concentration.

In all cases where the chlorination of non-titanium equipment cannot be avoided, your local representative must be consulted.

Water of more than 330 ppm Cl ions may not be used in the preparation of cleaning solutions.

CAUTION Risk of personal injury.

Ensure that the handling of residuals after using chlorines follow local envionmental regulations.

Titanium is not affected by chlorine.

4.1.6.2 Hygienic processes

Immediately after a production cycle, the product side is normally cleaned through the circulation of acid and/or lye as a built-in sequence in the production cycle.

After the first test run of the product, the plate heat exchanger should be cleaned following a cleaning program applicable to the product in question. The plate heat exchanger should then be opened, see Section *Plate heat exchanger — Open*, and the plate surfaces carefully inspected. The cleaning results should be checked at regular intervals.

WARNING Risk of personal injury.

Use proper protective equipment when using the cleaning agents. See Section *Personal protective equipment* in Chapter *Safety*.

Corrosive cleaning liquids. Can cause serious injuries to skin and eyes.

Use proper protective equipment. See Section *Personal protective equipment* in Chapter *Safety*

Sterilisation is performed immediately before starting the next production cycle. See Section *Product side*.

Flow rates

The flow rate during the cleaning of the product side should always be at least the same as the production's flow rate. An increased flow rate may be required in some cases, for example in milk sterilisation and the processing of viscous liquids or liquids containing particles.

Recommended limits for cleaning solutions:

- 5% by volume AlfaCaus at max. 70°C
- 0.5% by weight acid solution at max. 70°C

For detailed information regarding cleaning and sterilisation contact an Alfa Laval representative.

Sterilisation

The methods of sterilisation below are recommendations. Instructions for sterilisation can also be included in the documentation of the complete system delivered with the plate heat exchanger as one part.

EN 4 Maintenance

Method	Instructions	
By heat	Circulate water of 90°C until all parts of the system have been kept at the required temperature for at least ten minutes.	
	Before introducing the hypochlorite solution, make sure that the equipment is clean, has cooled down and is free from deposits and that no acid residues are left.	
Chemically by hypochlorite	Gradually add 100 cm ³ of hypochlorite solution, containing max. 150 g/l of active chlorine to 100 l of circulating water at a max. temperature of 20°C.	
	Treat for five minutes, up to maximum of 15 mi- nutes. Rinse well after sterilisation.	

Typical cleaning programs

Consult your local Alfa Laval representative for advice on suitable cleaning programmes.

Table 1: Coolers

Products rich in protein	
Daily	Weekly
Rinsing 5 min	Rinsing 5 min
Lye 20 min	Acid 15 min
Rinsing 10 min	Rinsing 5 min
Stop	Lye 20 min
Sterilisation 10 min	Rinsing 10 min
	Stop
	Sterilisation

Table 2: Pasteurisers and other heaters

Products rich in protein		
Daily		
Rinsing 5 min		
Acid 15 min		
Rinsing 5 min		
Lye 20 min		
Rinsing 5 min ¹		
Acid 15 min ²		
Rinsing 10 min		

Stop

¹ The need for an additional acid cycle in order to remove calcium carbonate scaling depends on the product. In many cases, it is possible to carry out cleaning at considerably longer intervals. Sometimes, it is possible to eliminate acid cleaning altogether.

 2 The need for an additional acid cycle in order to remove calcium carbonate scaling depends on the product. In many cases, it is possible to carry out cleaning at considerably longer intervals. Sometimes, it is possible to eliminate acid cleaning altogether.

Table 3: High content of insoluble components, for example nectar and tomato juice

Products poor in protein	
Daily	Weekly
Rinsing 10 min	Rinsing 10 min
Lye 30 min	Lye 30 min
Rinsing 10 min	Rinsing 5 min
Stop	Acid 15 min
Sterilisation 10 min	Rinsing 10 min
	Stop
	Sterilisation 10 min

Table 4: Low content of insoluble components, for example beer and wine

Products poor in protein	
Daily ¹	Weekly
Rinsing 5 min	Rinsing 5 min
Lye 15 min	Lye 15 min
Rinsing 10 min	Rinsing 5 min
Stop	Acid 15 min
Sterilisation 10 min	Rinsing 10 min
	Stop
	Sterilisation 10 min

 1 In some cases, where the risk of growth of microorganisms is low, it is possible to eliminate daily cleaning and replace it with the following procedure: Rinsing 20 min – Stop – Sterilisation 20 min.

Applicable for 3A standards

When used in a processing system to be sterilised, the system shall be provided with an automatic shutdown if the product pressure becomes less than that of the atmosphere and not be restarted without resterilisation (see paragraph D10.3). The information plate will then state that the plate heat exchanger "is" designed for steam sterilisation.

4.1.6.3 Manual cleaning

CAUTION Risk of damage to equipment.

Never use hydrochloric acid with stainless steel plates. Water of more than 330 ppm CI may not be used in the preparation of cleaning solutions.

It is very important that aluminium carrying bars and support columns are protected against chemicals.

CAUTION Risk of damage to equipment.

Be careful not to damage the gasket during manual cleaning.

WARNING Risk of personal injury.

Use proper personal protective equipment when using the cleaning agents. See Section *Personal protective equipment* in Chapter *Safety*.

WARNING Risk of personal injury.

Corrosive cleaning liquids. Can cause serious injuries to skin and eyes.

Use proper personal protective equipment when using the cleaning agents. See Section *Personal protective equipment* in Chapter *Safety*.

Risk of damage to equipment.

If any cleaning of the welded channel of the cassettes please contact your Alfa Laval representative.

WARNING Risk of personal injury.

For manual cleaning of heat exchangers in refrigerant services please contact your Alfa Laval representative.

4.1.6.3.1 Cleaning deposits removable with water and brush

Plates do not need to be removed from the plate heat exchanger during cleaning.

WARNING Risk of personal injury. Consider risks such as loose particles and the kind of media that has been used in the plate heat exchanger. Use proper personal protective equipment. See Section Personal protective equipment in Chapter Safety. 1 Start cleaning when the heating surface is still wet and the plates are hanging in the frame. 2 Remove deposits using a soft brush and running water. 3 Rinse with water using a high pressure hose.

4.1.6.3.2 Cleaning — Removal, lifting and insertion of plates in the field

WARNING Risk of personal injury.

If hard winds or risk of contamination of the plates the removal shall be made in restricted and safe environment.

To avoid sharp edges protective gloves should always be worn.

Lifting in edges around the portholes shall be avoided.

1) Open the plate pack by letting the pressure plate glide on the carrying bar.Each plate shall be removed one by one, preferably by one person on each side of the plate.For safe removal and lifting of large plates a lifting device can be used.



- 2 Lifting of a single plate shall be done in a controlled way.Insert the plates according to the plate hanging list.
- 3) The plates shall be pressed towards the frame plate, preferably by holding a tool on the upper part of the plate and gently push it.



4.1.6.3.3 Cleaning deposits not removable with water and brush

CAUTION Risk of damage to equipment.

Long exposure of the cleaning compound can damage the gasket glue.

Rinse the plate with water immediately after you have cleaned it using a brush and cleaning compound.

Plates must be removed from the plate heat exchanger during cleaning. For a choice of cleaning agents, see Section *Non-product side*.

1) Clean using a brush and cleaning compound.



2 Rinse immediately with water.



4.1.7 Lifting equipment

Information and instructions regarding lifting can be found in the installation manual. This section contains instructions regarding handling of specific lifting equipment.

4.1.7.1 Lifting device

The lifting devices are assembled on delivery. It is recommended to let them remain on the plate heat exchanger.

This section describes how to assemble a lifting device if it for some reason has been disassembled.

4.1.7.1.1 Lifting devices — Assemble

WARNING Risk of personal injury.

The equipment is heavy.

Wear personal protective equipment when handling the equipment. Handle the equipment with precaution. See Section *Personal protective equipment* in Chapter *Safety*.

WARNING Risk of personal injury.

The equipment is heavy.

It is recommended that two persons execute the assembly and to use a hoist slings and lifting equipment like a fork lift truck or a overhead gantry. A hoist sling is used in this instruction.

The lifting devices must be assembled so they are facing away from the plate package, that is on the outside of the frame plate and the pressure plate according to the illustration.



 If applicable, remove the locking nut (6) using a nutrunner with a torque reaction bar, the screw (1), the washer (2), the lifting device (4), and the washer (5) from the lifting device (3). Use a wrench or adjustable spanner to prevent the screw (1) from rotating.



2) Attach a hoist sling to the lifting device eye.



- 3 Gently lift the lifting device in position on the plate heat exchanger.
- 4 Fit the lifting device (4). Make sure it fits correctly in the lifting device (3).



Fit the washer (2) and the screw (1).
Constrained in the screw (1).
Constrained in the screw (1).
Fit the washer (5) and the locking nut (6).
Fit the washer (5) and the locking nut (6).
Tighten the locking nut (6) firmly using a nutrunner with a torque reaction bar. Use a wrench or adjustable spanner to prevent the screw from rotating.

g.

- **9** Repeat the procedure on all lifting devices.
- (10) The plate heat exchanger can now be lifted according to the instruction for lifting using lifting devices in the installation manual.

4.2 Frame

This section describes maintenance of the plate heat exchanger frame.

4.2.1 Assemble feet

Some models of plate heat exchangers are delivered without the feet assembled. Follow the instruction below.

	WARNING Risk of crushing.
Т	he equipment is heavy.
В	e careful when handling the equipment. Do not reach in under equipment that is not secured.
	WARNING Risk of crushing.
	lever work under hanging load.
A	lways make safety arrangement to avoid crushing.
1	On delivery, cover plates are attached on the frame plate and support column in the same positions where the feet shall be assembled.
2	Lift up the equipment according to Section Lifting the equipment in the Installation Manual.
3	Place wooden beams under the equipment to minimize the risk of personal injury if the equipment should accidentally fall.
4	Remove the screws, the washers, and the nuts and then remove the cover plates.

 Use the same screws, washers and nuts to assemble the feet on the plate heat exchanger according to the picture.



6 If the unit should have two stabilising bars, assemble them according to the picture.



4.3 Plate

This section describes maintenance of the plate heat exchanger plates.

4.3.1 Plate — Change

Remove the plates if cleaning will be done using only water — not using a cleaning agent.

CAUTION Risk of personal injury. Plates and protection sheets has sharp edges. Wear personal protective equipment when handling the plates and the protection sheets. See Section Personal protective equipment in Chapter Safety. 1) Open the plate package according to Section Plate heat exchanger - Open. 2 If the plates are to be numbered, do this before removing them. 3) Localise the plate to be changed. 4 Tilt and gently lift out the plate from the carrying bar. 5) Check the gasket for wear and damage. If the gasket is in a good condition it can be moved from the old plate to the new plate. 6) Put the new gasketed plate in place on the carrying bar. 7 Close the plate package according to Section Plate heat exchanger - Close.

4.3.2 Regasketing of a plate

Before opening the plate heat exchanger, check the warranty conditions. If in any doubt, contact the Alfa Laval sales representative. See Section *Warranty conditions* in Chapter *Introduction*.

Before removing the old gaskets, check how they are attached.

Follow the procedure corresponding to your type of gasket.

The procedures in this section concern field gaskets, ring gaskets, and end gaskets.

4.3.2.1 Plate — Change Clip-on and ClipGrip gasket

CAUTION Risk of personal injury. Plates and protection sheets has sharp edges. Wear personal protective equipment when handling the plates and the protection sheets. See Section Personal protective equipment in Chapter Safety. Before opening the plate heat exchanger, check the warranty conditions. If in any doubt, contact an Alfa Laval sales representative. See Section Warranty conditions in Chapter Introduction. (1) Open the plate package according to Section Plate heat exchanger - Open. (2) Remove the plates where the gasket must be changed. Follow Section Plate - Change. 3 Remove the old gasket. 4 Make sure that all sealing surfaces are dry and clean. 5 Check the gasket and remove any rubber residual. Be specially thorough with the end plate gasket.

6 Place the gasket on the plate.

Fit the gasket tabs under the edge of the plate. The lower image is valid for semi-welded.

Make sure that the two gasket prongs are in the correct position.





- 8 Repeat the procedure on all the plates that needs to be regasketed.
- 9 Assemble the plate back to the carrying bar according to Section *Plate Change*.
- (10) Close the plate heat exchanger according to Section *Plate heat exchanger Close*.

4.3.2.2 Plate — Change Clip-ad gasket

CAUTION Risk of personal injury.

Plates and protection sheets has sharp edges.

Wear personal protective equipment when handling the plates and the protection sheets. See Section *Personal protective equipment* in Chapter *Safety*.

Before opening the plate heat exchanger, check the warranty conditions. If in any doubt, contact an Alfa Laval sales representative. See Section *Warranty conditions* in Chapter *Introduction*.

The Clip-ad gasket represents a system with the conventional Clip-on fastening around the ports and fastening by means of adhesive tape along the sides of the plates.

The use of the adhesive tape (GC1) is a simple way to obtain secure gasket positioning. It is adhered to the gasket groove by means of a special tape gun, making it easy to apply the tape exactly where wanted.

- 1 Open the plate package according to Section *Plate heat exchanger - Open*.
- 2 Remove the plates where the gasket must be changed. Follow Section *Plate Change*.
- **3** Remove the old gasket.
- 4 It is not necessary to remove old tape as the film is very thin. Make sure, however, that the gasket groove is clean and dry.
- 5 Apply tape, using a tape gun.



- 6) Attach the gasket to the plate. Slip the gasket prongs under the edge of the plate.
- 7 Repeat the procedure on all the plates that needs to be regasketed.
- 8 Assemble the plate back to the carrying bar according to Section *Plate Change*.

(9)

Close the plate heat exchanger according to Section *Plate heat exchanger* - *Close*.

4.3.2.3 Plate — Change Base-ad gasket

CAUTION Risk of personal injury.

Plates and protection sheets has sharp edges.

Wear personal protective equipment when handling the plates and the protection sheets. See Section *Personal protective equipment* in Chapter *Safety*.

Before opening the plate heat exchanger, check the warranty conditions. If in any doubt, contact an Alfa Laval sales representative. See Section *Warranty conditions* in Chapter *Introduction*.

- 1) Open the plate package according to Section *Plate heat exchanger - Open*.
- 2 Remove the plates where the gasket must be changed. Follow Section *Plate Change*.
- 3 Remove the old gasket.
- 4) It is not necessary to remove old tape as the film is very thin. Make sure, however, that the gasket groove is clean and dry.
- 5) Apply tape, using a tape gun. The lower image shows a semi-welded plate.



- 6 Attach the gasket to the plate.
- 7) Repeat the procedure on all the plates that needs to be regasketed.
- 8) Assemble the plate back to the carrying bar according to Section *Plate Change*.

(9)

Close the plate heat exchanger according to Section *Plate heat exchanger* - *Close*.
4.3.2.4 Plate — Change Glued gasket

Use glue recommended by Alfa Laval. Separate gluing instructions will be delivered together with the glue.

CAUTION Risk of personal injury.

Plates and protection sheets has sharp edges.

Wear personal protective equipment when handling the plates and the protection sheets. See Section *Personal protective equipment* in Chapter *Safety*.

Other glues than those recommended can contain chlorides that can damage the plates.

Do not use sharp tools when removing the glued gasket to avoid damage to the plates.

INOTE Refrigeration

On a semi-welded plate heat exchanger, glued gaskets are not allowed in the refrigerant side.

- 1 Open the plate package according to Section *Plate heat exchanger - Open.*
- 2 Remove the plates where the gasket must be changed. Follow Section *Plate Change*.
- **3** Remove the old gasket.
- 4 Make sure that the gasket groove is clean and dry.
- **5** Apply glue.
- **6** Attach the gasket to the plate.
- 7 Repeat the procedure on all the plates that needs to be regasketed.
- 8 Assemble the plate back to the carrying bar according to Section *Plate Change*.
- 9 Close the plate heat exchanger according to Section *Plate heat exchanger Close*.

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5 Storage

If storing for longer periods of time, such as one month or longer, certain precautions should be made to avoid unnecessary damage to the plate heat exchanger. See Section *Taken out of service*.

() NOTE

Alfa Laval and its representatives reserve the right to inspect the storage space and/or equipment whenever necessary until the expiration of the warranty period stipulated in the contract. Notification must be given 10 days prior to the date of inspection.

If there is any uncertainty about the storage of the plate heat exchanger, consult an Alfa Laval representative.

5.1 Taken out of service

If, for any reason, the plate heat exchanger is shut down and taken out of service for a long period of time, follow the precautions in this section. However, before storage the following actions must be done.

It is recommended to store the plate heat exchanger indoors.

- Check the A measure of the plate pack (the distance between the inside of the frame plate and the inside of the pressure plate).
- Drain both media sides of the plate heat exchanger.
- Depending on media, the plate heat exchanger should be rinsed and then dried.
- The connection should be covered if the piping system is not connected. Use a plastic or plywood cover for the connection.
- Cover the plate pack with non-transparent plastic film.

Indoor storage

- Store inside a room with the temperature between 15 and 20 °C (60 and 70 °F) and humidity up to 70%. For outdoor storage read Section Outdoor storage.
- To prevent damage to the gaskets, there should not be any ozoneproducing equipment in the room such as electric motors or welding equipment.
- To prevent damage to the gaskets, do not store organic solvents or acids in the room and avoid direct sunlight, intensive heat radiation or ultraviolet radiation.
- The tightening bolts (and the locking bolts if such are assembled to your plate heat exchanger) should be well covered with a thin layer of grease. See Maintenance Manual Section Closing.

Outdoor storage

If you need to store your plate heat exchanger outdoors, follow all the precautions in Section Indoor storage as well as the precautions listed below.

The stored plate heat exchanger shall be visually checked every third month. The check includes:

- · Greasing of the tightening bolts
- · Metal port covers
- · Protection of the plate pack and gaskets
- The unit should be protected from the weather conditions for example under a roof or tarpaulin.
- Make sure that the unit is ventilated.
- · Note that extreme temperatures might effect the performance of the unit.

Start-up after long-term out of service

If the plate heat exchanger has been taken out of service for an extensive period of time, longer than one year, the risk of leakage when starting up increases. To avoid this problem it is recommended to let the gasket rubber rest to regain most of its elasticity.

- **1.** If the plate heat exchanger is not in position, follow the instructions in chapter Installation in the Installation Manual.
- **2.** Note the A measure (the distance between the inside of the frame plate and the inside of the pressure plate).
- 3. If applicable, remove the feet attached to the pressure plate.
- 4. Loosen the tightening bolts (and the locking bolts if such are assembled to your plate heat exchanger). Follow the instructions in the Maintenance Manual. Open the plate heat exchanger until the plate pack measure is 1.25×A.
- **5.** Leave the plate heat exchanger for 24–48 hours, the longer the better, for gaskets to relax.
- 6. Re-tighten according to the instructions in this manual.
- 7. Alfa Laval recommends a hydraulic test should be carried out. The media, usually water, should be entered at intervals to avoid sudden shocks to the plate heat exchanger. Its is recommended to test up to the design pressure. See the plate heat exchanger drawing.

INOTE Valid for semi-welded products.

If refrigerants are in the welded channels, they must be tested with inert gas (like N_2).