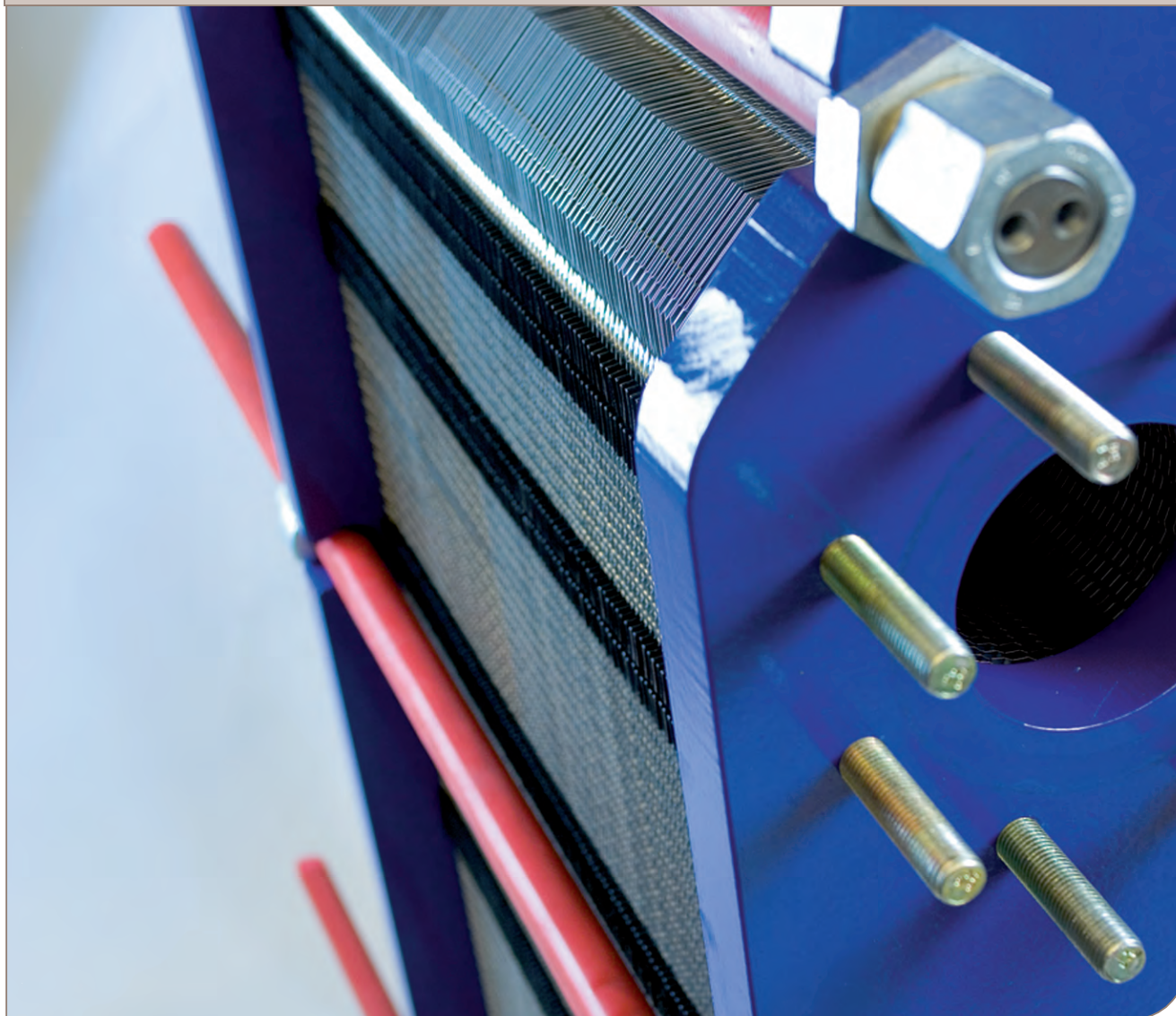




Instruction Manual - Plate Heat Exchangers

M3, M6, M10, TS6, T2, T5, T8, TL3, TL6



3490010216-EN 2014-11

Original manual

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How to contact Alfa Laval

Contact details for all countries are continually updated on our website.

Please visit www.alfalaval.com to access the information directly.

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Preface

This manual provides information needed to install, operate and carry out maintenance of the Plate Heat Exchanger (PHE).

Safety considerations

The Plate Heat Exchanger shall be used and maintained in accordance with Alfa Laval's instructions in this manual. Faulty handling of the Plate Heat Exchanger may result in serious consequences with injuries on persons and/or property damage. Alfa Laval will not accept responsibility for any damage or injury resulted from not following the instructions in this manual.

The Plate Heat Exchanger shall be used in accordance with the specified configuration of material, media types, temperatures and pressure for the specific Plate Heat Exchanger.

The following models are covered in this manual:

- M3
- M6
- M10
- TS6
- T2
- T5
- T8
- TL3
- TL6

Prior knowledge

The PHE shall be operated by persons that have studied the instructions in this manual and have knowledge of the process. It also considers knowledge of precautions regarding media type, pressures, temperatures in the PHE as well as specific precautions required of the process.

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

Maintenance actions not described in this manual please contact Alfa Laval representative for advice.

Definitions of expressions



Warning!

Type of hazard

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



Caution!

Type of hazard

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

Note!

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

PHE drawings

PHE drawings mentioned in the manual is the drawings included in the delivery of the Plate Heat Exchanger.

Warranty conditions

The warranty conditions are usually included in the signed sales contract prior to the order of the delivered PHE. Alternatively the warranty conditions is 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.

Report the date when the Plate Heat Exchanger has been taken in operation to the local Alfa Laval Representative.

Advice

Always consult your local Alfa Laval Representative for advice on

- New plate pack dimensions if you intend to change 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 PHE.

Storage of the PHE

Alfa Laval delivers the PHE ready to be put in service upon arrival, if nothing else has been agreed. Although keep the PHE in the packing box until the installation.

Storage for longer periods of time, one month or longer, certain precautions should be made to avoid unnecessary damages on the PHE.

Note!

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

If any uncertainty appear about storage of the PHE consult an Alfa Laval Representative.

Storage in packing box

If storage after delivery of the PHE is known in advance, inform Alfa Laval when ordering the PHE to ensure that it will be properly prepared for storage before packing.

Indoor storage

- Store inside a room with the temperature between 15 and 20°C (60 - 70°F) and humidity around 70%. For outdoor storage read "Outdoor storage" on this page.
- To prevent damage to the gaskets, there should not be any ozone-producing 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 should be well covered with light grease coating.

Outdoor storage

If the PHE has to be stored outdoors, all the precautions mentioned in the section "Indoor storage" on this page should be taken. Also, protection against climate is very important.

The stored PHE 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

Taken out of service

If, for any reason, the PHE is shut down and taken out of service for a long period of time, follow the same advice as in the previous section "Indoor storage" on this page. Although before storage following actions has to be done.

- Check the measurement of the plate pack (measure between frame and pressure plate, A dimension).
- Drain both media sides of the PHE
- Depending on the media, the PHE 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.

Installation after long-term storage

In cases when the PHE has been taken out of service for an extensive period of time, i.e. 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 and regain most of its elasticity.

1. If the PHE is not in position, follow the instructions "Installation" on page 11.
2. Note the measurement between frame and pressure plate (A dimension).
3. Remove feet attached to the pressure plate.
4. Loosen the tightening bolts. Follow the instructions "Opening" on page 20. Open the PHE until the measure is 1.25A.
5. Leave the PHE between 24-48 hours, the longer the better, for gaskets to relax.
6. Re-tighten according to the instructions "Closing" on page 26.
7. Alfa Laval recommends a hydraulic test to be carried out. The media, usually water, should be entered at intervals to avoid sudden shocks to the PHE. It is recommended to test up to the Design Pressure, refer to PHE drawing.

Environmental compliance

Alfa Laval endeavours to perform its own operations as cleanly and efficiently as possible, and to take environmental aspects into consideration when developing, designing, manufacturing, servicing and marketing its products.

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

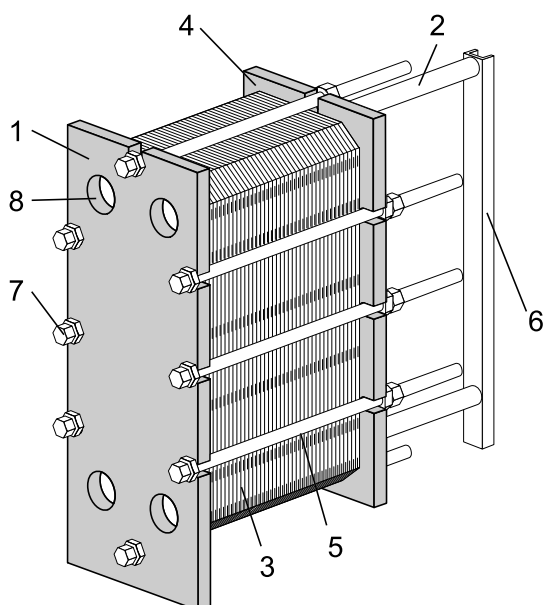
- All metal parts should be sent for material recycling.
- Oil and all non-metal wear parts must be taken care of in agreement with local regulations.

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 absence of local regulations, please contact the local Alfa Laval sales company.

Description

Components



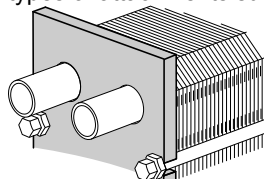
Main components

1	Frame plate	Fixed plate with various number of port holes for connection of the piping system. The carrying and guiding bar is attached to the frame plate.
2	Carrying bar	Carries the plate pack and the pressure plate.
3	Plate pack	Heat is transferred from one media to the other through the plates. The plate pack consists of channel plates, end plates, gaskets and in some cases transition plates. The measure of the plate pack is the A dimension, i.e the measurement between frame and pressure plate. Refer to PHE drawing.
4	Pressure plate	Moveable plate that can contain various number of port holes for connection of the piping system.
5	Guiding bar	Keeps the channel plates, connection plates and the pressure plate aligned at their lower end.
6	Supporting column	Supports carrying and guiding bars. For some smaller PHE models no supporting column is used.
7	Tightening bolts	Compress the plate pack between the frame and pressure plate. There are usually four tightening bolts used, in some cases six, these are used to open and close the PHE. Remaining bolts are used as locking bolts.
8	Port holes	Port holes through the frame plate allows the media to enter into or exit from the Plate Heat Exchanger. Different types of connections can be used to connect the piping system to the apparatus. The port holes may be protected against corrosion by metal or rubber linings.

Connections

Pipe connections

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.

**Stud bolts**

Threaded stud bolts around the port holes secure the flange connections to the apparatus.

Squared loose flange

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

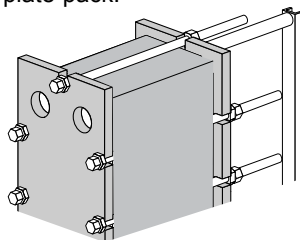
Optional components

Foot

Gives stability and is used to secure the PHE with bolts to the foundation. Feet is an optional feature.

Protection sheets

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

**Bolt protection**

Plastic tubes that protects the threads of the tightening bolts.

Insulation

For application where the PHE surface will be hot or cold insulation can be used.

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 PHE during transportation.

Drip tray

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

Description

Name Plate

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



Warning!

For each unit, the mechanical design pressures and temperatures are marked on the name plate. These must not be exceeded.



Caution!

Avoid aggressive chemicals for cleaning the PHE when sticker label is used.

The mechanical design pressure and the design temperature as given on the name plate are the values to which the plate heat exchanger is approved to the pressure vessel code in question. The mechanical design temperature may exceed the operating temperature for which the gaskets have been selected to reach a its lifetime. If the operating temperatures as specified on the assembly drawing are to be exceeded the supplier should be consulted.

1. Space for logotype.
2. Open space.
3. Web site for service.
4. Drawing of possible locations of connections. For 3A units location of 3A tag.
5. Space for mark of approval.
6. Warning, read manual.
7. Date of pressure test.
8. Maximum operating temperatures.
9. Test pressure.
10. Max permissible operating temperatures.
11. Max permissible operating pressures.
12. Decisive volume or volume for each fluid.
13. Locations of connections for each fluid.
14. Decisive fluid group.
15. Year of manufacture.
16. Serial number.
17. Type.
18. Manufacturer's name.

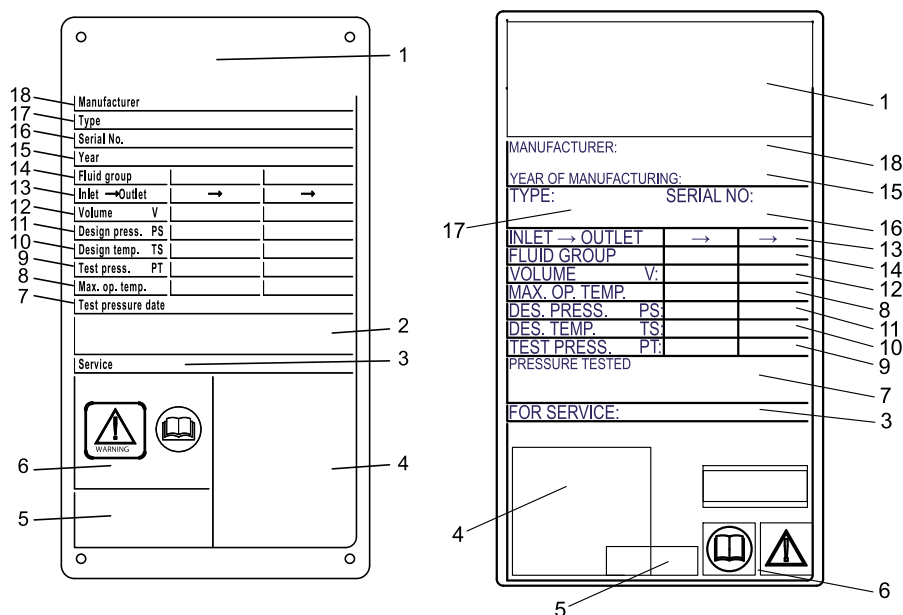


Figure 1. Metallic name plate on the left and label name plate on the right.

Function

The Plate Heat Exchanger (PHE) consists of a pack of corrugated metal plates with port holes for input and output for the two separate fluids. The heat transfer between the two fluids will take place through the plates.

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.

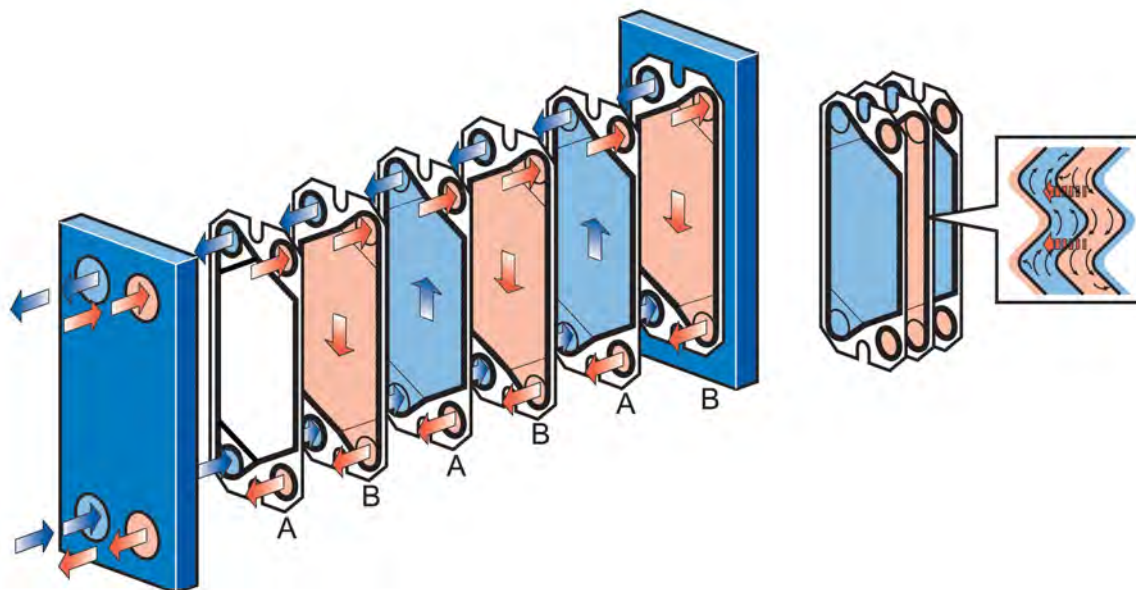


Figure 2. Principle of Plate pack arrangement.

Description

Multi-pass

Multi-pass 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 partition plate is required to support the unholed ports in the turning plates. Also transition plate need to be added in the package to prevent media to get in contact with the partition or pressure plate.

Example of use for multi-pass can be in processes that requires longer heating periods if the media requires a slower heating.

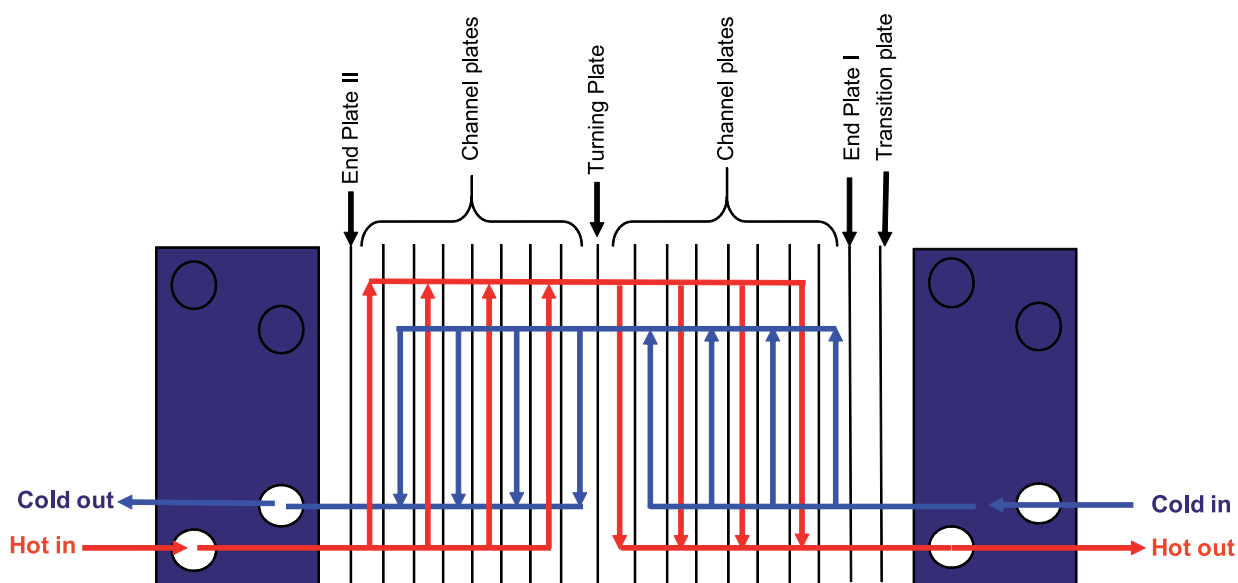
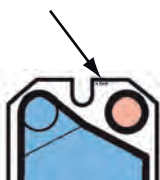


Figure 3. Example of multi-pass set up.

Identification of plate side

The A side of the plate is identified by the stamp with the letter A or the model name, in some cases both, at the top of the plate (refer to figure).



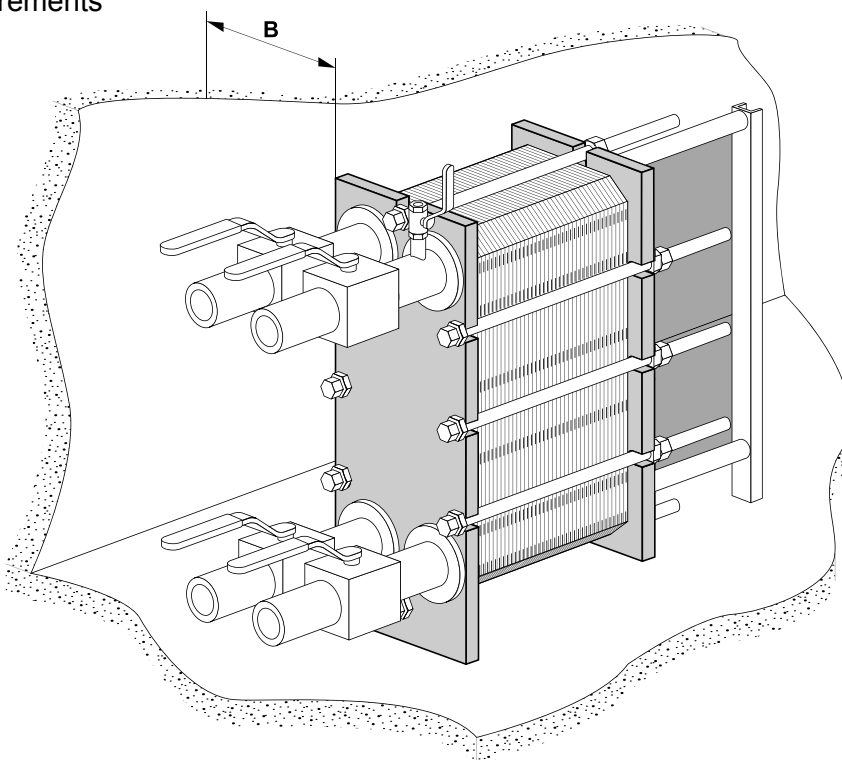
Installation

Before installation

To consider before installation

- Before connecting any piping, make sure all foreign objects have been flushed out of the piping system that should be connected to the PHE.
- Before start-up check that all tightening bolts are firmly tightened and that the correct measurements of the plate pack, refer to PHE drawing.
- When connecting the piping system make sure the pipes do not subject the PHE to stress or strain.
- To avoid water hammer, do not use fast-closing valves.
- Make sure that no air remains within the PHE.
- Safety valves shall be installed according to current pressure vessel regulations.
- It is recommended that protective sheets are used to cover the plate pack. Protect against leakage of hot or aggressive fluids and the hot plate pack
- If the PHE surface temperature is expected to be hot or cold take protective actions, such as insulate the PHE, to avoid risk for personnel injuries. Ensure that required action are according to local regulation.
- For each model, design pressures and temperatures are marked on the name plate. These shall not be exceeded.

Requirements



Space

A minimum free space is needed for lifting plates in and out. Refer to the delivered PHE drawing.

Foundation

Install on a flat foundation giving enough support to the frame.

Elbow

To make it easier to disconnect the PHE, an elbow should be fitted to the connection in the pressure plate, directed upwards or sideways, and with another flange located just outside the contour of the Plate Heat Exchanger.

Shut-off valve

To be able to open the PHE, shut-off valves should be provided in all connections.

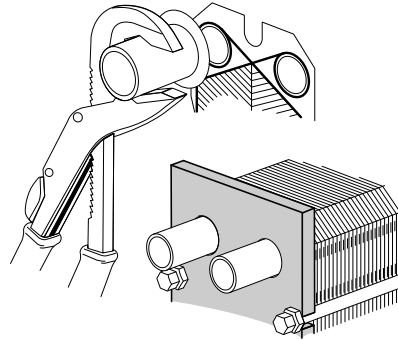
Installation

Connection

Different types of connections can be used to connect the piping system to the apparatus.

Flanged connections can be attached with either pin bolts or headed bolts.

Make sure the pipe connections are securely held when working on the pipings.



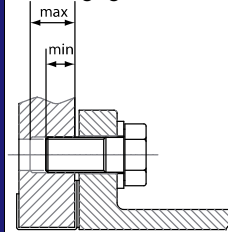
Caution!

Turning of the connections will damage the gaskets on the end plate and cause leakage.

Note!

Using headed bolts require careful measuring to ensure that the bolts get the correct engaged threaded length into the Frame plate and the minimum engagement length (min) are stated in the PHE drawing. The maximum engagement threaded length (max) in the Frame plate is limited, refer to the PHE drawing.

The engaged threaded length must be maintained within the limits for the tightened PHE.



Caution!

Failing to achieve correct engaged threaded length for headed bolt may result in leakage, damage to the frame plate and injury to personnel

Connections in the pressure plate

It is important that the plate pack has been tightened to the correct dimension A (check against PHE drawing) before the piping system is connected.

Drip tray (Optional)

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

Note!

Put the drip tray in place before positioning the PHE.

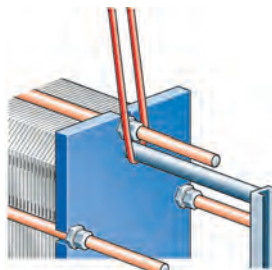
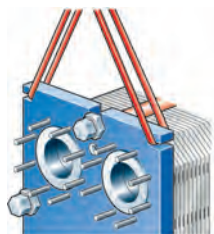
Lifting

Straps should be used when lifting the PHE. Place straps according to the picture.

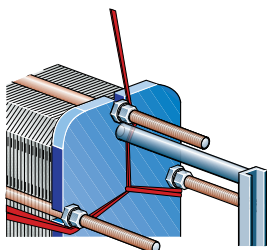


Warning!

Never lift by the connections or the studs around them.



Lifting TS-6



Raising

This instruction is valid when raising the PHE after delivery from Alfa Laval. Only use a strap approved for the weight of the PHE. Follow the principle of the instruction below.

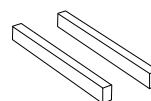


Caution!

The straps shall be long enough to be able to rotate the PHE without obstructions. Especially consider the space for the support column.

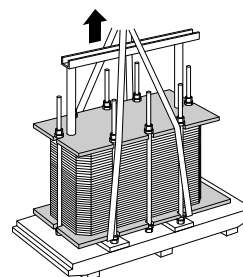
Step 1

Place two timber beams on the floor.



Step 2

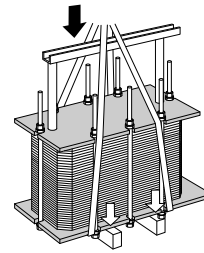
Lift the PHE off the pallet using e.g. straps



Installation

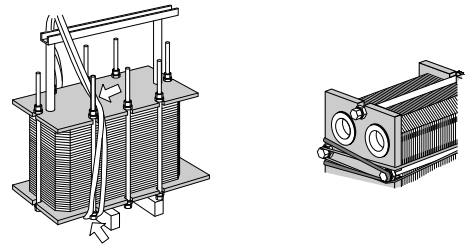
Step 3

Place the PHE on the timber beams.



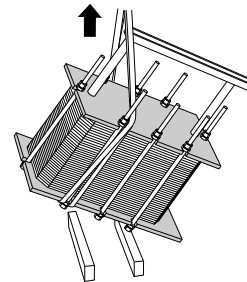
Step 4

Place straps around one bolt on each side.



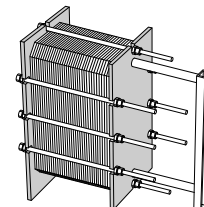
Step 5

Lift the PHE off the timber beams.



Step 6

Lower the PHE into a horizontal position and place it on the floor.



Operation

Start-up

During start-up check that no visible leakages appear from plate pack, valves or piping system.



Caution!

Before pressurizing the PHE it is important to ensure that the temperature of the PHE is within the temperature range stated in the PHE drawing.



Caution!

If the temperature of the PHE is below the minimum temperature for the gaskets prior to the service it is recommended to heat up the PHE above this limit to avoid cold leakage.

Note!

If several pumps are included in the system, make sure you know which one should be activated first.

Centrifugal pumps must be started against closed valves and valves must be operated as smoothly as possible.

Do not run pumps temporarily empty on the suction side.

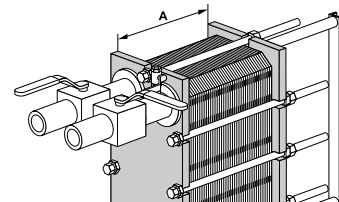
Note!

Adjustments of flow rates should be made slowly in order to avoid the risk of pressure surge (water hammer).

Water hammer is a short lasting pressure peak that can appear during start-up or shut-down of a system, causing liquids to travel along a pipe as a wave at the speed of sound. This can cause considerable damage to the equipment.

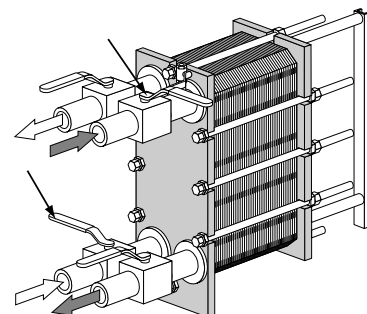
Step 1

Before start-up check that all tightening bolts are firmly tightened and that the dimension A is correct, refer to PHE drawing



Step 2

Check that the valve is closed between the pump and the unit controlling the system flow rate to avoid pressure surge.



Step 3

If there is a vent valve installed at the exit, make sure it is fully open.

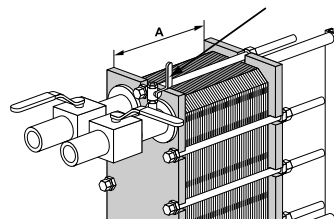
Operation

Step 4

Increase the flow rate slowly.

Step 5

Open the air vent and start the pump.

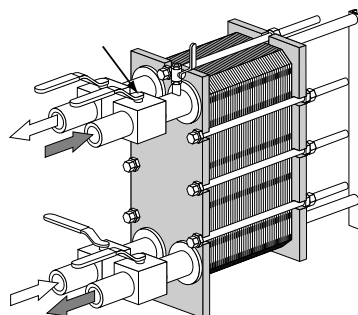


Step 6

Open the valve slowly.

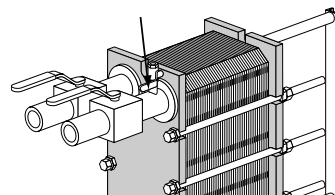
Note!

Avoid rapid temperature changes in the PHE. With media temperatures over 100 °C, slowly increase the temperature preferably at least for one hour.



Step 7

When all air is expelled, close the air vent.



Step 8

Repeat Step 1 – Step 7 for the second media.

Unit in operation

Adjustments of flow rates should be made slowly in order to protect the system against sudden and extreme variations of temperature and pressure.

During operation, check that media temperatures and pressures are within the limits stated on the name plate and PHE-drawing.



Warning!

In case of failures that endanger safety operation turn off the flow to the PHE in order to decrease the pressure and stop heat transfer.

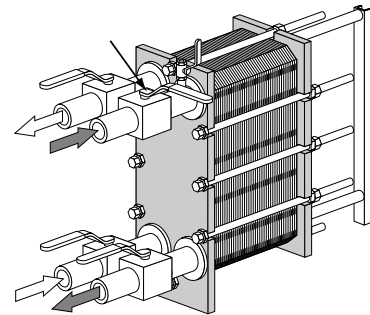
Shut-down

Note!

If several pumps are included in the system, make sure you know which one should be stopped first.

Step 1

Slowly close the valve controlling the flow rate of the pump you are about to stop.



Step 2

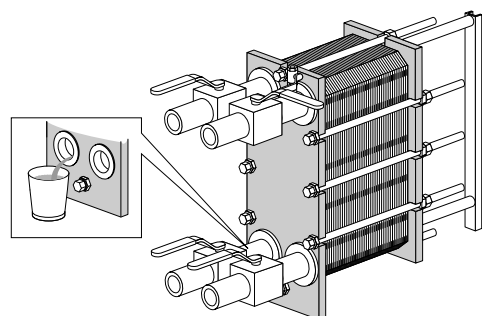
When the valve is closed, stop the pump.

Step 3

Repeat Step 1–Step 2 for the other side for the second media.

Step 4

If the PHE is shut down for several days or longer, it should be drained. Draining should also be done if the process is shut down and the ambient temperature is below freezing temperature of the media. Depending on the media processed, it is also recommended to rinse and dry the PHE plates and connections.



Maintenance

To keep the PHE in good condition regular maintenance of the component is required. It is recommended to record maintenance of the PHE.

The plates need to be cleaned on a regular basis. The frequency depends on several of factors such as type of media and temperatures.

Different methods can be used to perform cleaning. Refer to “Cleaning – Non-product side” on page 18 or a reconditioning at an Alfa Laval service center.

After a longer time of use it can be required to regasketing the PHE by exchanging the gaskets. Refer to “Regasketing” on page 29.

Other maintenance that should be performed regularly:


- Keep carrying bar and guiding bar clean and grease.
- Keep the tightening bolts cleaned and greased.

Cleaning – Non-product side

The Cleaning-In-Place (CIP) equipment permits cleaning of the PHE without opening it. The purpose of cleaning with CIP are 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!


Use proper protective equipment, such as safety boots, safety gloves and eye protection, when using the cleaning agents.





Warning!


Corrosive cleaning liquids. Can cause serious injuries to skin and eye!



CIP equipment

Contact Alfa Laval sales representative for size of CIP equipment.





Caution!

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

Cleaning liquids

Liquids	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.
Alfa P-Neutra	For neutralization of AlfaP-Scale.
Alfa P-Scale	An acidic powder cleaner for removal of primary carbonate scale but also other inorganic scale.
AlfaDescalent	A non-hazardous acidic cleaning agent for removal of inorganic scale.
AlfaDegreaser	A non-hazardous cleaning agent for removal of oil, grease or wax deposits. Additionally prevent foaming when using Alpacon Descaler.
AlfaAdd	AlfaAdd is a neutral cleaning strengthener designed to be used with AlfaPhos, AlfaCaus 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. Refer to Manual cleaning of opened units on page 24.

Chlorine as a growth inhibitor

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

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

In every case where chlorination of non-titanium equipment cannot be avoided, your local representative must be consulted.

Water of more than 300 ppm Cl ions may not be used for preparation of cleaning solutions.

**Caution!**

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

Maintenance

Opening

To perform manual cleaning it is required to open the PHE to clean the plates.

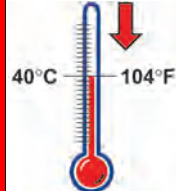
Note!

Before opening the PHE check the warranty conditions. If in any doubt, contact an Alfa Laval sales representative. Refer to "Warranty conditions" on page 4 .



Warning!

If the Plate Heat Exchanger is hot, wait until it has cooled down to about 40°C (104°F).



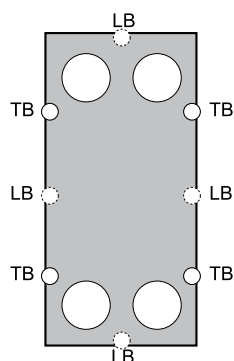
Warning!

If necessary, use proper protective equipment, such as safety boots, safety gloves and eye protection, depending on type of media in the PHE.



Bolt configuration

The bolt configuration of the PHE varies between different models. The major force of the plate package is hold by the tightening bolts (TB). To distribute the force evenly over the Frame and Pressure plate locking bolts (LB) are used as well. The locking bolts can be shorter and have smaller dimensions. In the opening and closing procedure it is important to identify the tightening bolts (TB) and the locking bolts (LB). Refer to picture below.



Step 1

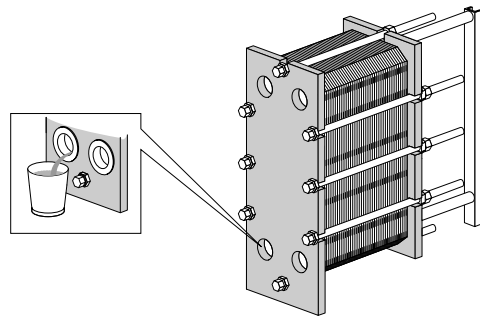
Shut down the PHE.

Step 2

Close the valves and isolate the PHE from the rest of the system.

Step 3

Drain the PHE.



Step 4

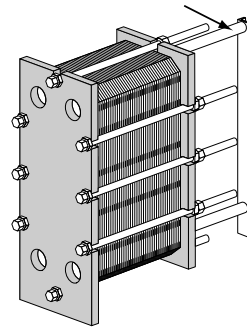
Remove the protective sheets, if any.

Step 5

Dismantle pipes from the pressure plate so that the pressure plate are free to move along the carrying bar.

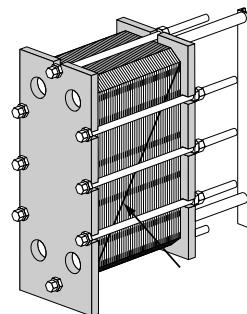
Step 6

Inspect the sliding surfaces of the carrying bar and wipe clean and grease.



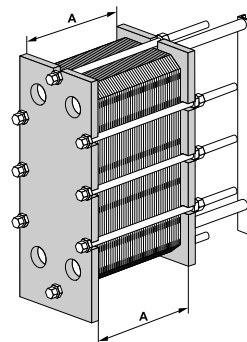
Step 7

Mark the plate assembly on the outside with a diagonal line.



Step 8

Measure and note the dimension A.



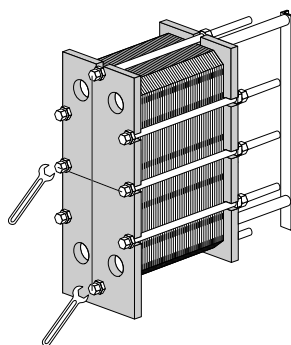
Maintenance

Step 9

Loosen and remove the locking bolts, identify according to on page the bolt configuration prior to this step instruction.

Note!

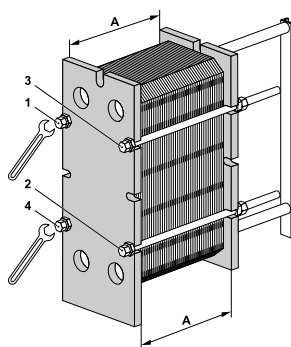
Brush the threads of the tightening bolts with a steel wire brush and then grease before loosening them.



Step 10

Use the tightening bolts to open the PHE. During the opening procedure keep the frame plate and pressure plate always in 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

Loosen the tightening bolts evenly in the numbered order, 1-2-3-4. Continue alternately until all reaction forces of the plate package has disappeared. Then remove the bolts.

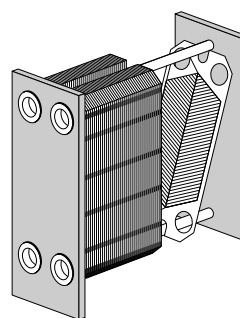
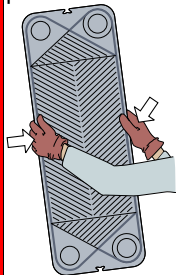


Step 11

Open the plate pack by letting the pressure plate glide on the carrying bar. Usually it is not necessary to remove the plates to clean them.

**Caution!**

To avoid hand injuries from sharp edges, protective gloves should always be worn when handling plates and protective sheets.

**Caution!**

When opening the plate pack of the models M3, T2 and TL3, be careful when moving the pressure plate. Make sure the pressure plate is positioned safely from the end of the carrying bar.

A starlock ring (spare part no. 33500045-45) can be attached to the end of the carrying bar to make sure the pressure plate will not pass the end of the carrying bar.

If plates are to be numbered, do this before removing the plates. Plates need not to be removed if cleaning is done using only water, i.e. without cleaning agent.

**Warning!**

The plate pack may still contain a small residual amount of liquid after draining. Depending on the type of product and type of installation, special arrangements, e.g. drainage box, may be necessary to avoid injury to personnel and damage to equipment.

Maintenance

Manual cleaning of opened units

**Caution!**

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

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

Note!

Be careful not to damage the gasket during manual cleaning.

**Warning!**

Use proper protective equipment, such as safety boots, safety gloves and eye protection, when using the cleaning agents.

**Warning!**

Corrosive cleaning liquids can cause serious injuries to skin and eyes!



Deposits removable with water and brush

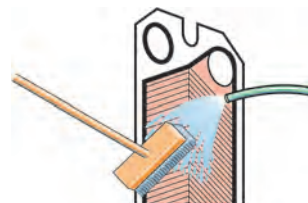
Plates do not need to be removed from the PHE during cleaning.

Step 1

Start cleaning when the heating surface is still wet and the plates are hanging in the frame.

Step 2

Remove deposits using a soft brush and running water.



Step 3

Rinse with water using a high pressure hose.

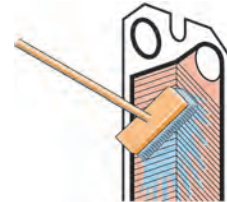


Deposits not removable with water and brush

Plates must be removed from the PHE during cleaning. For a choice of cleaning agents, refer to “Cleaning liquids” on page 19.

Step 1

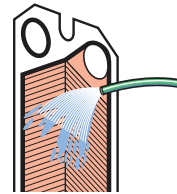
Brush with cleaning agent.

**Step 2**

Rinse immediately with water.

Note!

Long exposure to the cleaning agents can damage the gasket glue.



Maintenance

Closing

Follow the instructions below to ensure that the PHE will be properly closed.

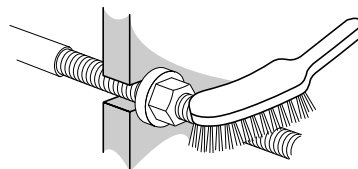
For identifying bolt refer to Bolt configuration on page 20

Step 1

Check that all the sealing surfaces are clean.

Step 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, e.g. Gleitmo 800 or equivalent.



Step 3

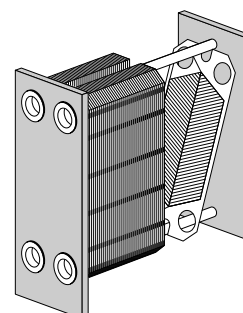
Attach gasket to the plates or check that all the gaskets are properly attached.

Note!

If the gasket is wrongly positioned, it will show by the fact that it rises out of the gasket groove or that it is positioned outside the groove.

Step 4

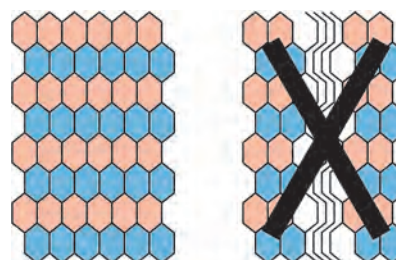
If the plates have been removed insert them in alternate directions and with the gaskets turned towards the frame plate or pressure plate as specified on the plate hanging list. Use the marked line that was done when the PHE was opened, refer to Step 7 in "Opening" on page 20.



Step 5

If the plate pack has been marked on the outside, check this Step 7 in "Opening" on page 20.

If the plates are correctly assembled (A/B/A/B etc.), the edges form a "honeycomb" pattern, see picture.

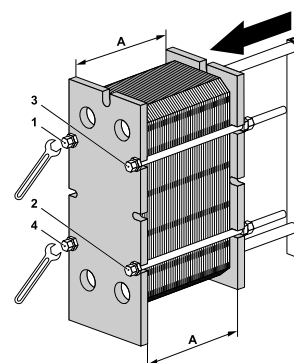


Step 6

Press the plate package together. Position the tightening bolts according to the figure.

Note!

For TL6-B: Position tightening bolts 1 and 2 (alternatively 3 and 4). Tighten the tightening bolts until the reaction force of the plate package can be noticed. Make sure that the frame and pressure plate are in parallel during the closing procedure (within maximum 10 mm). Position remaining bolts and tighten them to the same dimension.



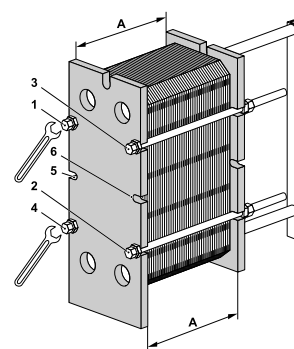
Tighten the tightening bolts (1-2-3-4) until the reaction force of the plate package can be noticed. Make sure that the frame and pressure plate are in parallel during the closing procedure.

Step 7

Tightening the tightening bolts evenly in the numbered order, 1-2-3-4. Continue alternately until dimension A has been reached.

Note!

For TL6-B: Continue to tighten 10 mm or less with bolt 5 and 6. Then tightening remaining bolts with same length. Repeat those step until the dimension A is achieved.



When a pneumatic tightening device is used, see table below for maximum torque. Measure dimension A during tightening.

Bolt size	Bolt with washer	
	Nm	kpm
M10	32	3.2
M16	135	13.5
M20	265	26.5
M24	450	45
M30	900	90

For manual tightening, the tightening torque has to be estimated. If dimension A cannot be reached

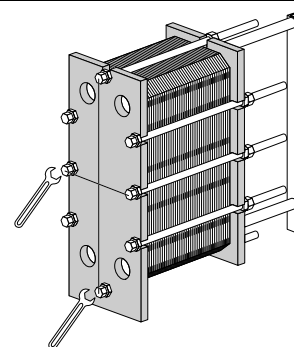
- Check the number of plates and the dimension A.
- Check that all the nuts and bearing boxes are running freely. If not, clean and lubricate, or replace.

Step 8

Position the locking bolts. Tightening the bolts and check measurement A on both sides, at top and bottom

Note!

Not valid for TL6-B.



Maintenance

Step 9

Mount protection sheets (if provided).

Step 10

Connect pipes.

Step 11

If the PHE does not seal when the measure A has been reached, it can be tightened further to A minus 0.5 %.

Note!

For TL6-B: When using frame ASME standard! PHE units 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 dimension A is reached.

Pressure test after maintenance

Before start-up of production, whenever plates or gaskets have been removed, inserted or exchanged, it is strongly recommended to perform a pressure test to confirm the internal and external sealing function of the PHE. At this test, one media side at a time must be tested with the other side open to the ambient pressure.



Caution!

The pressure testing shall be performed at a pressure equal to the operating pressure of the actual unit but never above the design pressure as stated on the nameplate.

The recommended test time is 10 minutes for each media.

Please consult the local Alfa Laval representative of the supplier for advice on the pressure testing procedure.

Regasketing

The procedures below regards Field gaskets, Ring gaskets and End gaskets

Note!

Before removing the old gaskets check how it is attached.

Clip-on/ClipGrip

Step 1

Open the PHE, refer to on page and remove the plate that is to have a new gasket.

Note!

Before opening the PHE check the warranty conditions. If in any doubt, contact an Alfa Laval sales representative. Refer to "Warranty conditions" on page 4 .

Step 2

Remove the old gasket.

Step 3

Assure that all sealing surfaces are dry, clean and free of foreign matter such as fat, grease or similar.

Step 4

Check the gasket and remove rubber residual before attaching it.

Note!

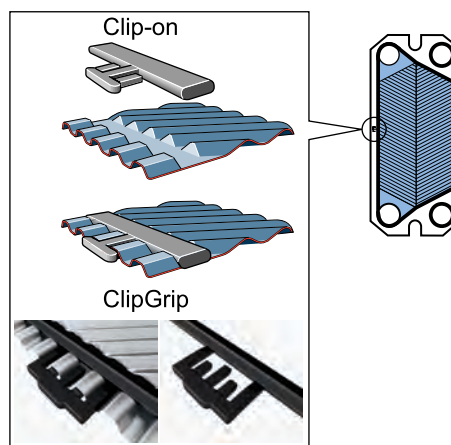
Especially the end plate gasket!!

Step 5

Attach the Clip-on/ClipGrip gasket to the plate. Slip the gasket tabs under the edge of the plate.

Note!

Make sure the two gasket prongs are in correct position.



Step 6

Repeat the procedure until all plates that is needed to be regasketed is done. Close the PHE according to Closing on page 26.

Maintenance

Glued gaskets

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

**Caution!**

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

**Warning!**

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