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### Original instructions

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Contact details for all countries are continually updated on our website. Please visit [www.alfalaval.com](http://www.alfalaval.com) and contact your local Alfa Laval Representative.



## Preface

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

### Safety considerations


The Semi Welded Plate Heat Exchanger shall be used and maintained in accordance with Alfa Laval's instructions in this manual. Faulty handling of the 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 that has resulted from not following the instructions in this manual.


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


The following models are covered in this manual:

- M6-MW
- M10-BW
- MK15-BW
- TK20-BW
- T20-BW
- T20-MW
- MA30-W

### Definitions of expressions

	<p><b>Warning!</b> Type of hazard WARNING indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.</p>
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	<p><b>Caution!</b> Type of hazard CAUTION indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury.</p>
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	<p><b>Note!</b> NOTE indicates a potentially hazardous situation that, if not avoided, may result in property damage.</p>
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### SWHE drawings

The SWHE drawings mentioned in the manual are the drawings included in the delivery of the heat exchanger.

### Warranty conditions

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

Report the date when the heat exchanger was put into 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 the number of Cassettes (Twin plates).
- Selection of gasket material if operating temperatures and pressures are permanently changed, or if another medium is to be processed in the SWHE.
- Loosen the tightening bolts. Follow the instructions "[Opening](#)" on page 16.
- Re-tighten according to the instructions "[Closing](#)" on page 22 or .



## 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.

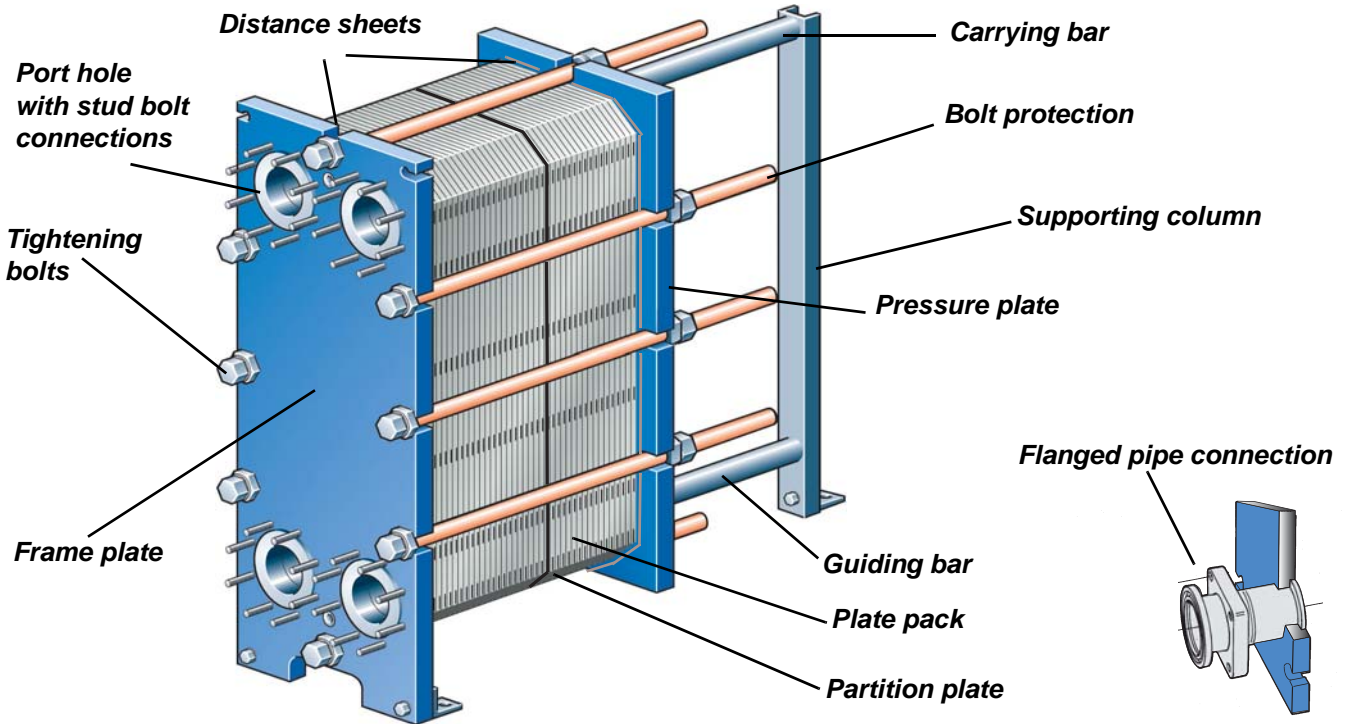
### Scrapping

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

### Main components

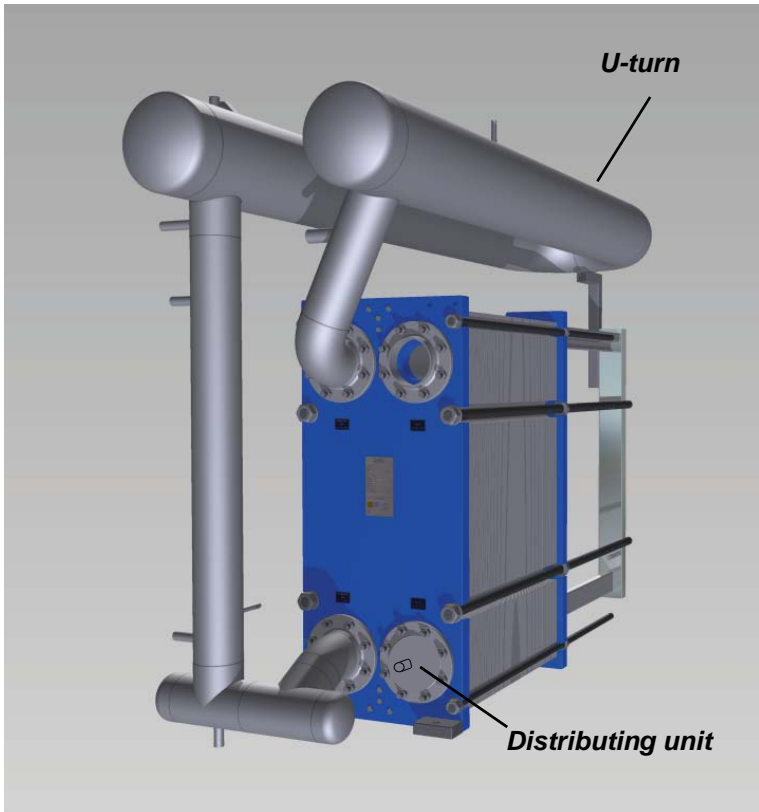
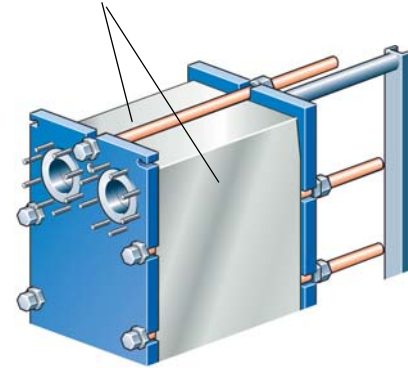


<b>Bolt protection</b>	Plastic tubes that protect the threads of the tightening bolts.
<b>Carrying bar</b>	Carries the plate pack and the pressure plate.
<b>Frame plate</b>	Fixed steel plate with a number of port holes for the connection of the piping system. The carrying and guiding bars are supported by the frame plate.
<b>Guiding bar</b>	Keeps the channel plates and the pressure plate in line at their lower end.
<b>Plate pack</b>	Heat is transferred from one medium to the other through the plates. The plate pack consists of semi welded plates in pairs which form a cassette (twin plate), gaskets and distance sheets. The measure of the plate pack is the A dimension, i.e. the measurement between frame and pressure plate. Refer to SWHE drawing.
<b>Port holes with stud bolt connections</b>	Port holes through the frame plate allow the media to enter into or exit from the heat exchanger. Different types of connections can be used to connect the piping system to the apparatus. Threaded stud bolts around the port holes secure the connections to the apparatus. The port holes may be protected against corrosion by metal linings. The SWHE can be equipped with different connection types. For details refer to SWHE drawings.
<b>Flanged pipe conn.</b>	Illustration of connection type used for M10-BWREF.
<b>Pressure plate</b>	Moveable steel plate that can contain a number of port holes for the connection of the piping system.
<b>Covers</b>	Used as blind flange or inspection cover at the SWHE port holes.
<b>Supporting column</b>	Supports carrying and guiding bars.
<b>Tightening bolts</b>	Compress the plate pack between the frame and pressure plate.
<b>Partition plate</b>	Support the nearest unholed plate port when a multi-pass plate pack is used. Valid for MA30-W, T20-BW, T20-MW, TK20-BW and if flow rate > 75kg/s MK15-BW. All units with >2 fluids always require partition plate

**Distance sheets**

Support the cassette closest to the frame and pressure plate.


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**Optional components****Protective sheets**

<b>U-turn</b>	Used for refrigeration duties. As the U-turn can not hold any liquid volume it is very important and critical to understand the use of it and be able to take advantage of its benefits. Total volume needed for the evaporator system as well as the matching liquid column level in the drop leg for the specific duty can be given from Alfa Laval. Overfill will cause a risk of liquid being sucked back in the suction pipe and harm the compressor. The system layout can be made in different ways but if you have any doubts, please contact Alfa Laval for more duty specific instructions.
<b>Distributing unit</b>	Used for some refrigeration duties applied at the SWHE port holes
<b>Protective sheets</b>	Cover the plate pack. Mandatory in the USA. Optional in other countries.

## Name plate

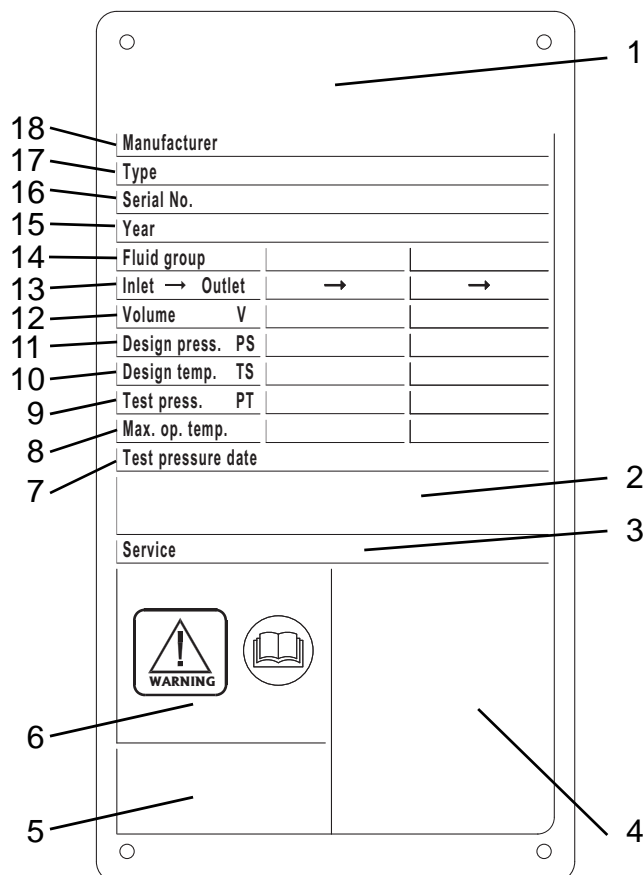
On the name plate the type of unit, manufacturing number and manufacturing year can be found. Pressure vessel details in accordance with the applicable pressure vessel code are also given. The name plate is fixed to the frame plate, most common, or the pressure plate.



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

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 maximum operating temperature established for the gasket material 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.



## Function

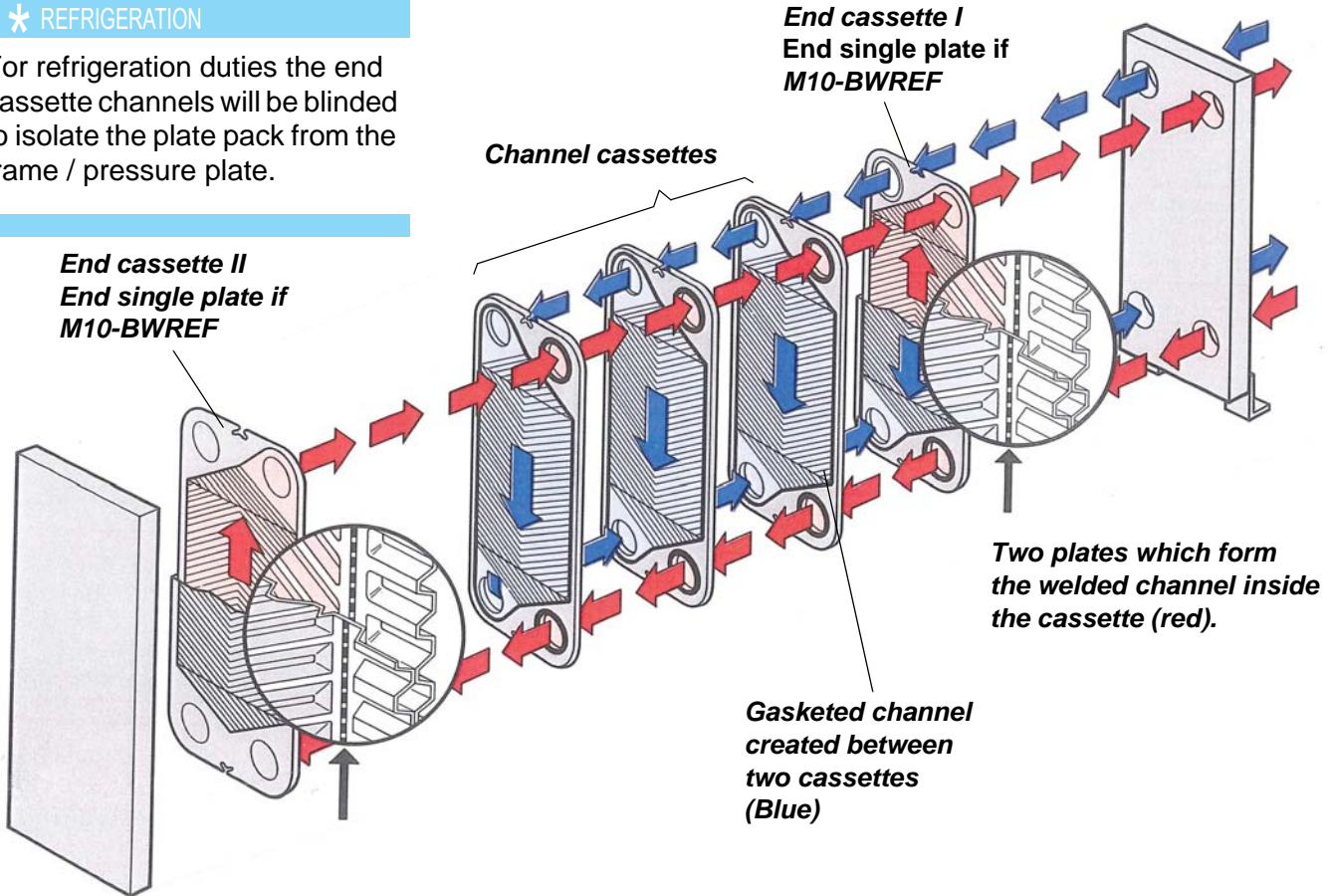
The Semi welded Plate Heat Exchanger (SWHE) consists of a set of corrugated metal plates with port holes for inflow and outflow of two separate fluids. The plates are arranged as cassettes (twin plates) in such a way that every second channel is welded, and every other channel is gasketed. The heat transfer 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

aggressive primary media and gasketed channels used for the non-aggressive 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 that seals the channel and directs the fluids into alternate channels. The plate corrugation promotes fluid turbulence and supports the plates against differential pressure.

### \* REFRIGERATION

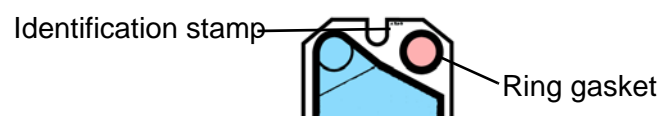
For refrigeration duties the end cassette channels will be blinded to isolate the plate pack from the frame / pressure plate.



*Principle of the cassette arrangement forming the plate pack.*

## Identification of plate side

The A orientation of the cassette is identified by the stamp with the **letter A** or **the model name**, in some cases both, at the top of the plate (see figure above). The separate ring gaskets always pointing to the right when the cassette is oriented as A.





# Installation

## Before installation

### To consider before installation

**Note!**

Before start-up, check that all tightening bolts are firmly tightened and that the correct measurements of the plate pack are used. See SWHE drawing .See "Closing" on page 22

- To avoid water hammer, do not use fast-closing valves.
- Safety valves should be installed according to current pressure vessel regulations.

- If the SWHE surface temperature is expected to be hot or cold, the heat exchanger should be insulated.
- It is recommended that protective sheets are used to cover the plate pack.
- For each model, design pressures and temperatures are marked on the identification plate. These must not be exceeded.

**\* REFRIGERATION**

- Full vacuum conditions shall apply at start up for refrigeration duties to avoid moisture and air in the heat exchanger.

## Requirements

### Space

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

### Foundation

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

### Elbow

To allow easier disconnection of the SWHE, an elbow should have a flange for connection in the pressure plate, directed upwards or sideways, and with another flange located just outside the contour of the heat exchanger.

### Shut-off valve

To be able to open the SWHE, shut-off valves should be installed at all connections.

### Drip tray (optional)

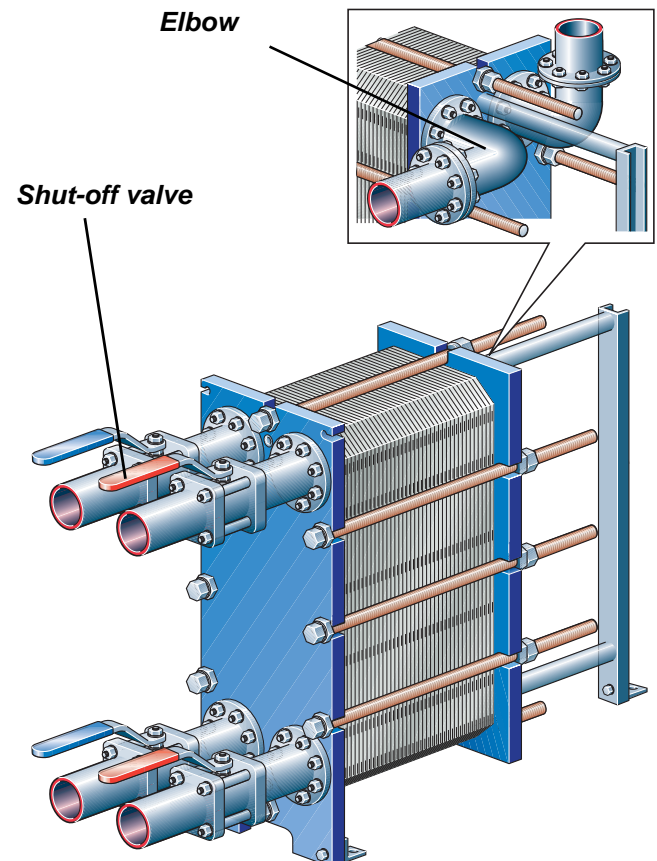
Depending on the type of fluid in the SWHE and the type of installation, a drip tray (drainage box) may be necessary to avoid injury to personnel and damage to equipment.

**Note!**

Put the drip tray in place before positioning the SWHE.

### Connections in the pressure plate

Ensure the plate pack is tightened to the correct dimension A (check SWHE drawing) before the pipe system is connected.

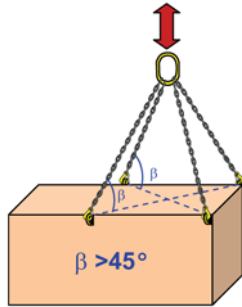


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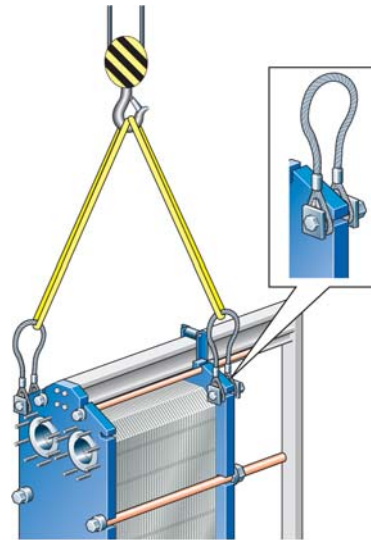
## Lifting

Straps should be used when lifting the SWHE. Position straps as illustrated.

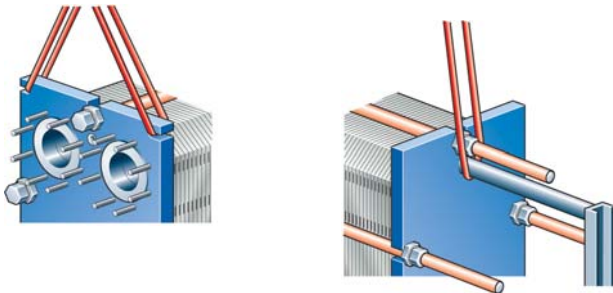
The straps shall be attached as illustrated and with a minimum angle of 45°. See illustration below.



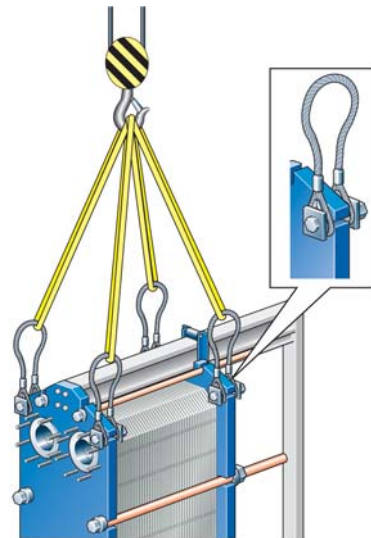
**Warning!**  
Never lift by the connectors or studs.



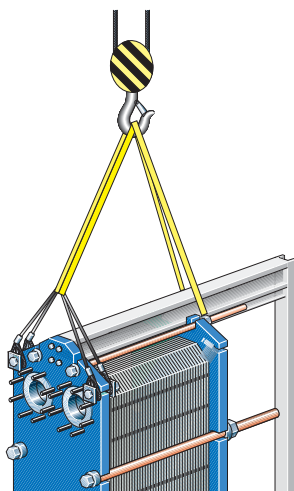
Lifting device for TK20-BW, T20-BW and T20-MW.



Lifting device for M6-MW and M10-BW.




Lifting device for MA30-W.



Lifting device for MK15-BW.

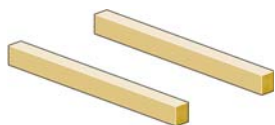
## Raising

This instruction is valid when raising the SWHE after delivery from Alfa Laval. Strap approved for the weight of the heat exchanger to be used.

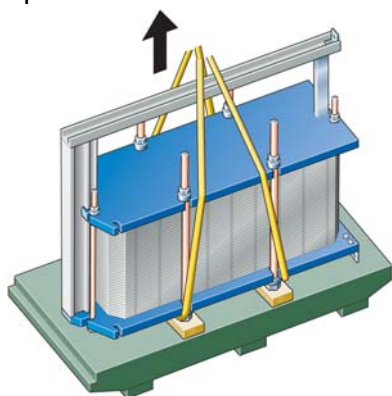


**Caution!**  
The straps shall be long enough to rotate the PHE without obstructions. Pay particular attention to the space required for the support column.

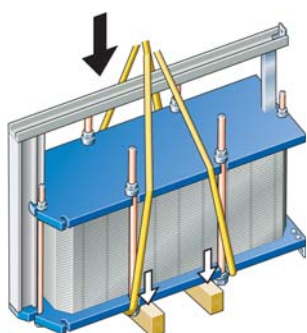
**1** Place two timber posts on the floor.



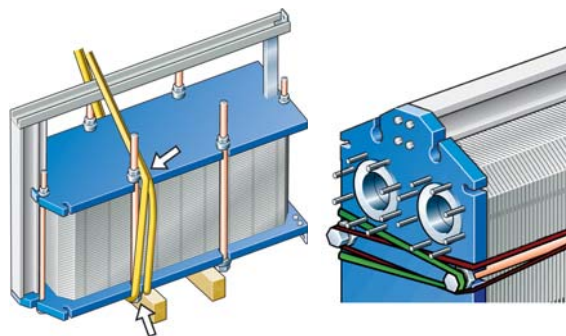
**2** Lift the SWHE off the pallet using e.g. straps.



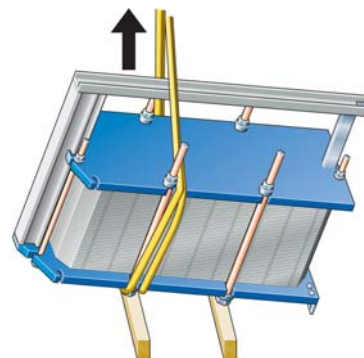
**3** Position the SWHE on the timber posts.



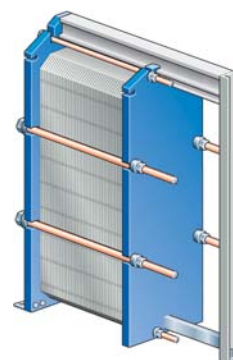
**4** Place straps around one bolt on each side.



**5** Lift the SWHE off the timber posts.



**6** Lower the SWHE onto the floor in a horizontal position.



## Connecting to system

- Remove sealing blind covers from the port holes before connecting the piping system.
- When connecting the piping system, make sure the pipes do not subject the SWHE to stress or strain.
- Before connecting any piping, make sure that no foreign objects have been left in the system that

should be connected to the SWHE. It is recommended to install a strainer or filter with 0.5-1.0 mm mesh size to prevent problems with foreign objects in the piping system.

## Operation

### Start-up

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

**Note!**

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

**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.

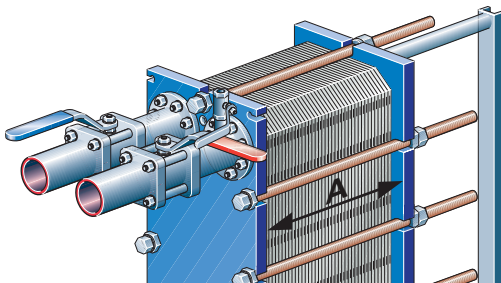
**Note!**

#### \* REFRIGERATION

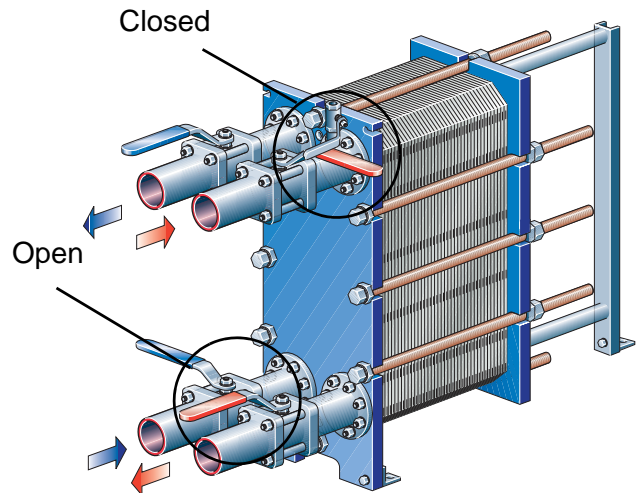
Charging liquid ammonia into a refrigeration circuit under vacuum will result in low temperatures. Such temperature levels might be lower than any elastomeric materials can seal against.

In applications where the field side is used for a two-phase refrigerant e.g. cascade CO<sub>2</sub>/NH<sub>3</sub> applications, it is very important to fill the two-phase refrigerant in gas phase. This to avoid temperature chocks for the gaskets and to avoid temporary leakages due to the natural fact that the metal is shrinking very fast.

- 1 Before start-up check that all tightening bolts are firmly tightened and that the dimension A is correct. See SWHE drawing.

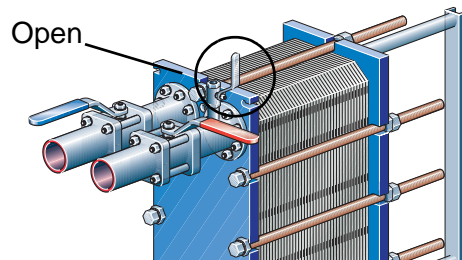


- 2 Check that the valve is closed between the pump and the unit controlling the system flow rate.

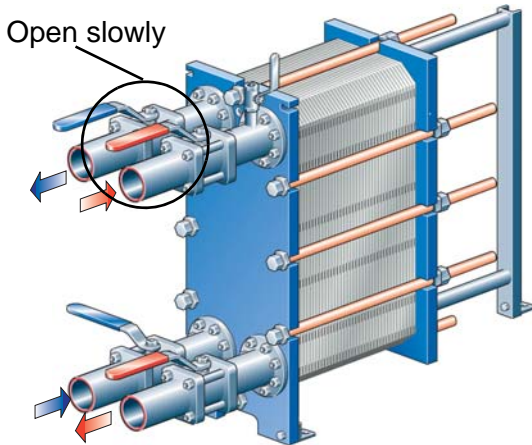


- 3 If there is a valve at the exit, make sure it is fully open.

- 4 Open the air vent and start the pump.



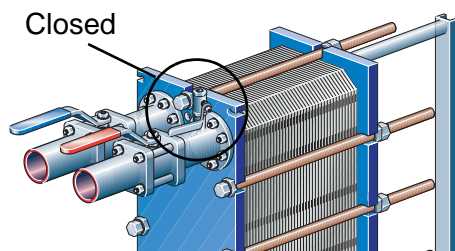
- 5** Open the valve slowly.



**Note!**

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

- 6** When all air is expelled, close the air vent.



- 7** Repeat steps 1– 6 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.

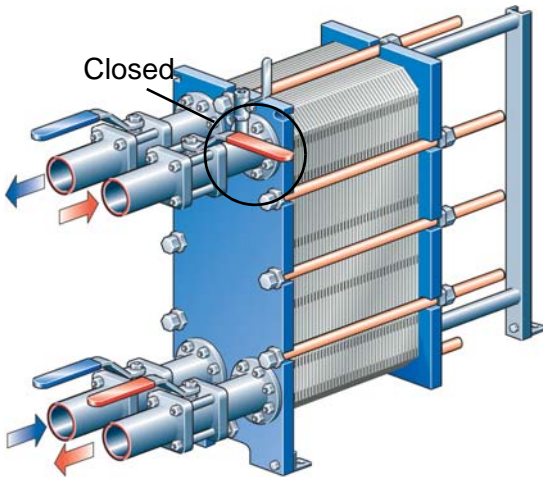
During operation, check that media temperatures and pressures are within the limits stated on the SWHE-drawing and identification plate.

## Shut-down

### Note!

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

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

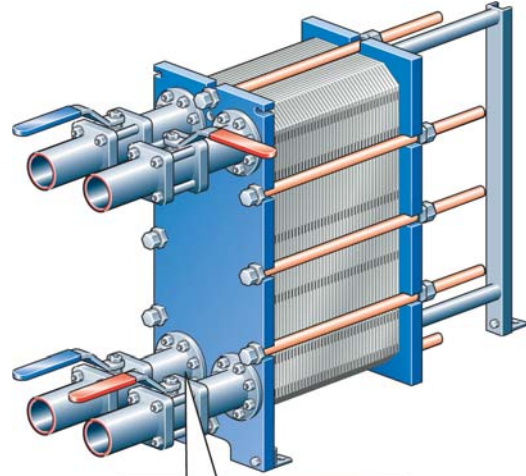


- 2 When the valve is closed, stop the pump.

- 3 Repeat steps 1–2 for the other side for the second media.

## 4

If the SWHE 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 the freezing temperature of the media. Depending on the media processed, it is also recommended to rinse and dry the heat exchanger cassettes and connections.



## Maintenance

To keep the Semi Welded Plate Heat Exchanger in good condition regular maintenance is required.

The plates (cassettes) need to be cleaned on a regular basis. The frequency depends on several factors such as type of media and temperatures. Three methods can be used for cleaning. See “[Cleaning-In-Place \(CIP\)](#)” on page 15, “[Manual cleaning](#)” on page 16 or a reconditioning at an Alfa Laval service centre.

**Note!**  
When cleaning within the process it is strongly recommended to use modulating or soft pumps to avoid high flow rates and pressure shocks.

### Cleaning-In-Place (CIP)

The Cleaning-In-Place (CIP) equipment permits cleaning of the PHE without opening it. Benefits CIP:

- Removal of fouling and lime scale deposits
  - Passivation of cleaned surfaces to reduce susceptibility to corrosion
  - Neutralisation of cleaning liquids before draining.
- See CIP equipment instructions.

**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!

Alfa Laval guarantees that plates (cassettes), gaskets and adhesive will not be damaged if the procedures and cleaning agents specified are used.

If CIP is inappropriate, cleaning must be done manually. See section “[Manual cleaning](#)” on page 16.

### \* REFRIGERATION

Always evacuate or drain the refrigerant before starting up maintenance or Cleaning-In-Place.

After a extended use, the SWHE gaskets may need replacing. See “[Regasketing](#)” on page 20.

Other maintenance that should be performed regularly:

- Carrying bar, guiding bar and tightening bolts should be cleaned and lubricated.

### Cleaning liquids

Liquids	Description
AlfaCaus	A strong alkaline liquid, for removing paint, grease, 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 the neutralisation of AlfaPhos before drainage.
Alfa P-Neutra	For the neutralisation of Alfa P-Scale.
Alfa P-Scale	An acidic powder cleaner for the removal of primary carbonate and 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 and wax deposits. Additionally prevents foaming when using Alpacon Descaler.

## Manual cleaning

To perform manual cleaning it is required to open the SWHE and lift out the cassettes to clean them. Only every second channel (gasketed) is feasible to clean.

### \* REFRIGERATION

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

## Opening

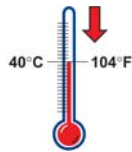
### Note!

Before opening the PHE check the warranty conditions. If in any doubt, contact an Alfa Laval sales representative. Refer to "Warranty conditions" on page 2.



### Warning!

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

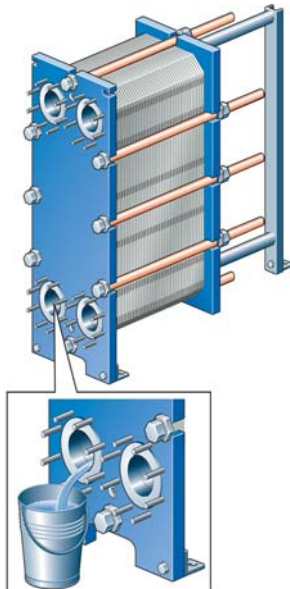


### Warning!

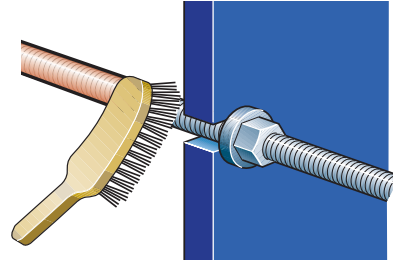
If necessary, use proper protective equipment, such as safety boots, safety gloves and eye protection, depending on type of media in the PHE.



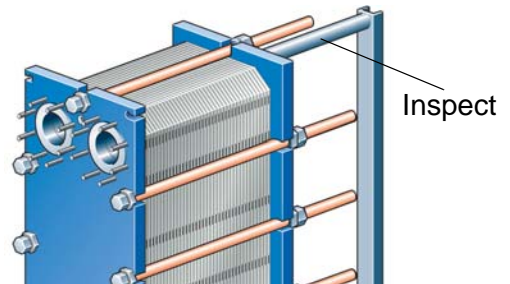
- 1** Drain the Semi Welded Plate Heat Exchanger.



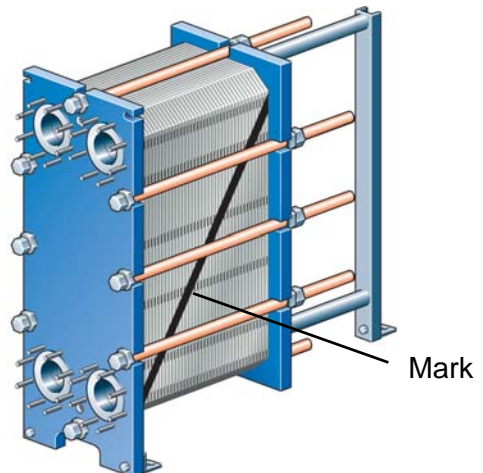
- 2** Brush the threads of the bolts clean, using a steel wire brush or the Alfa Laval thread cleaner. Lubricate the threads with a thin layer of grease, e.g. Gleitmo 800 Lubriplate or equivalent.



- 3** Inspect the sliding surfaces of the carrying bar and clean and grease it.

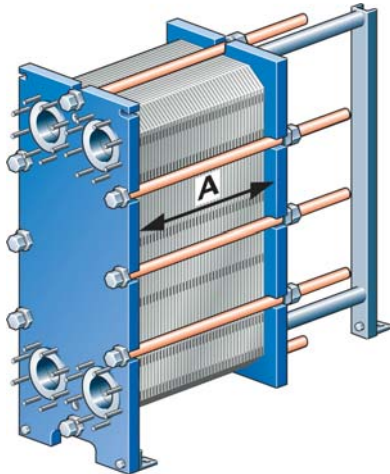


- 4** Mark the cassette assembly on the outside with a diagonal line.





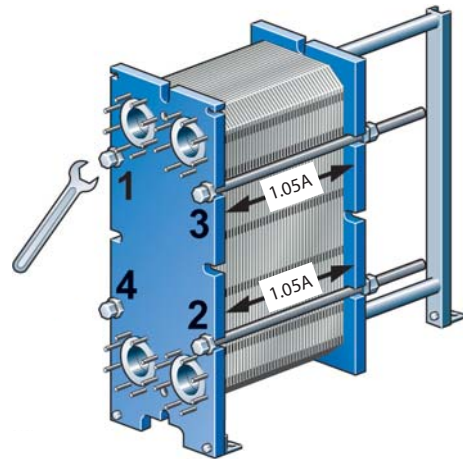
**5** Measure and note the dimension A.



**bolt)** across the width and 25 mm (**5 turns per bolt**) vertically.

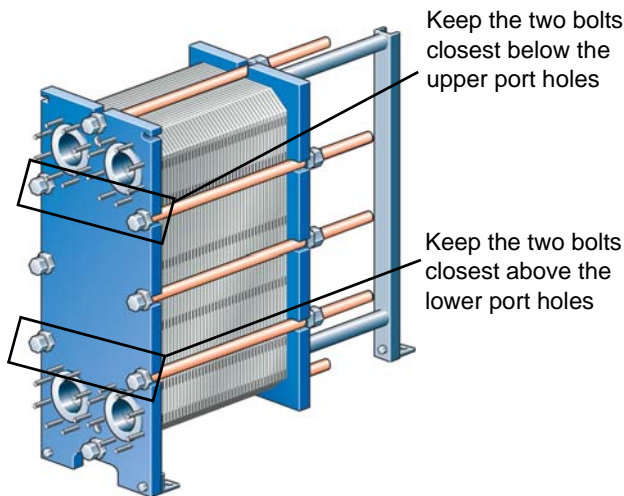
Step	Bolt No.	To dimension
1	1-2-3-4	1.05A
2	1-2 or 3-4	Opening

Step 1: Loosen the four bolts alternately and diagonally until the plate package measures 1.05A.

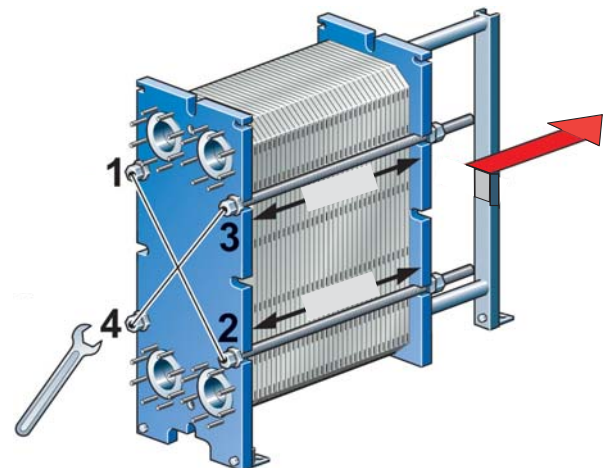


**Note!**  
Brush the threads of the tightening bolts with a steel wire brush and then grease before loosening them.

**6** Keep the four bolts in position, according to the figure below. Loosen the other bolts and remove them.



Step 2: Loosen the two diagonal pairs of bolts alternately, as shown in the figure below.



**7** The remaining four bolts are opened alternately and diagonally in two steps, see figures below.

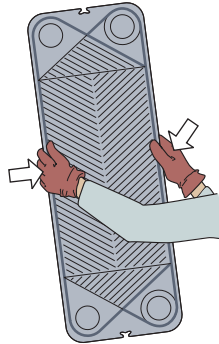
Be careful to ensure that the frame plate and pressure plate are always in parallel. Skewing of the pressure plate during opening must not exceed 10 mm (**2 turns per**

8

Open the plate pack by letting the pressure plate glide on the carrying bar.

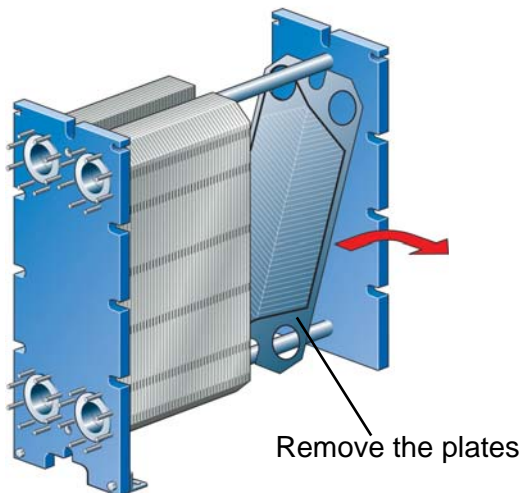
**Caution!**

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

**Note!**

Cassettes should be numbered, do this before removing the cassettes.

Cassettes do not need 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.

### 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.

### Deposits removable with water and brush

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

**\* REFRIGERATION**

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



**Warning!**

If necessary, use proper protective equipment. Consider risks like loose particles and what kind of media has been used in the PHE.

**1** Start cleaning when the heating surface is still wet and the cassettes are hanging in the frame.

**2** Remove deposits using a soft brush and running water.



**3** Rinse with water using a high pressure hose.



**Deposits not removable with water and brush** cassettes must be removed from the PHE during cleaning. For a choice of cleaning agents, refer to "Cleaning liquids" on page 15.



**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!



**1** Brush with cleaning agent.



**2** Rinse immediately with water.



**Note!**

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

## Regasketing

The procedures below apply to Field gaskets and Ring gaskets affixed to the cassettes using glue free Clip-on tabs.

### Note!

Before removing the old gaskets check how they are placed and attached. Especially the end cassette gasket configuration needs attention.

### Clip-on & Clip-Grip

1

Open the SWHE, [refer to “Opening” on page 16] and remove the cassette that is to have a new gasket.

### Note!

Before opening the SWHE check the warranty conditions. If in any doubt, contact an Alfa Laval sales representative. Refer to “Warranty conditions” on page 2.

2

Remove the old gasket.

3

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

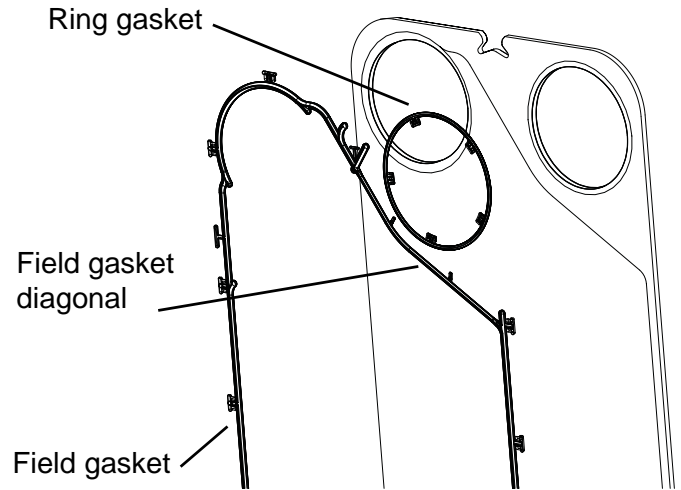
4

Check the gasket and remove rubber residual before attaching it.

5

Attach the Clip gasket to the cassette. Slip the gasket prongs under the edge of the plate. Fix the field gasket diagonal using tape on the the small tabs. (The gasket placement of the respective cassette type

can be advised by your Alfa Laval representative)



### Note!

Make sure the two gasket prongs of the Clip-on tabs are in the correct position.

6

Repeat the procedure until all cassettes that are needed to be regasketed are done. Close the SWHE according to “Closing” on page 22.

### Adhesive tape

The procedures below apply to end cassette gasket supports and distance rings fastening by means of adhesive tape around the ports and along the sides.

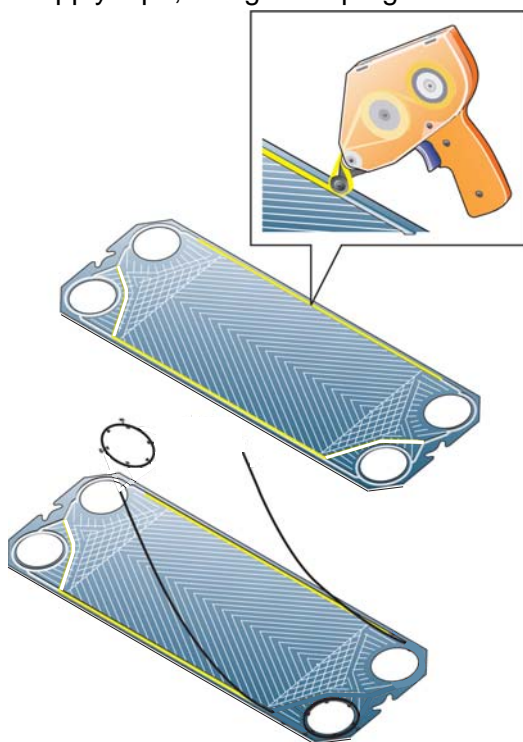
Adhesive tape (GC1) is a simple and secure way to position gasket. The gasket affixed to the groove using a special tape gun that enable you to apply the tape exactly where required.

- 1 Open the SWHE [see “Opening” on page 16] and remove the cassette to be regasketed.

**Note!**

Before opening the SWHE check warranty terms and conditions. If in doubt, contact your Alfa Laval sales representative. See “Warranty conditions” on page 2.

- 2 Remove the old gasket.
- 3 You do not remove any old tape as the film is very thin. Ensure that the gasket groove is clean and dry however.
- 4 Apply tape, using the tape gun.



- 5 Attach the gasket to the cassette. (The gasket placement of the respective cassette type can be advised by your Alfa Laval representative.

- 6 Close the heat exchanger, see “Closing” on page 22.

### Glued gaskets

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

**\* REFRIGERATION**

Glued gaskets are not allowed in refrigerant side of the heat exchanger.



**Caution!**

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



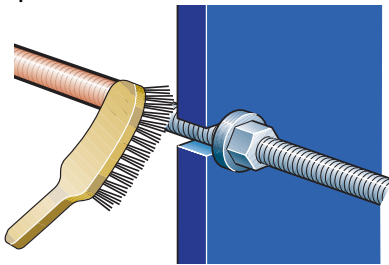
**Caution!**

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

## Closing

Follow the instructions below to ensure that the Semi Welded Plate Heat Exchanger will be properly closed.

- 1 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, e.g. Gleitmo 800 Lubriplate or equivalent.

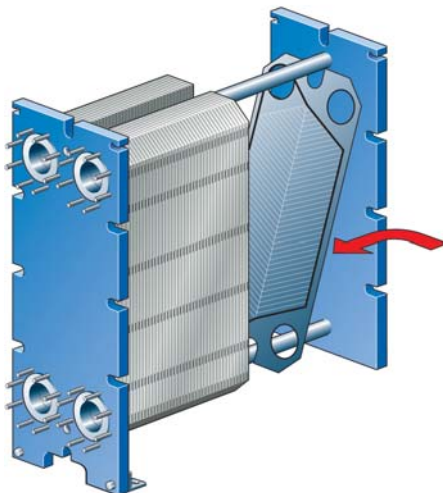


- 3 Attach gaskets to the cassettes or check that all the gaskets are properly attached.

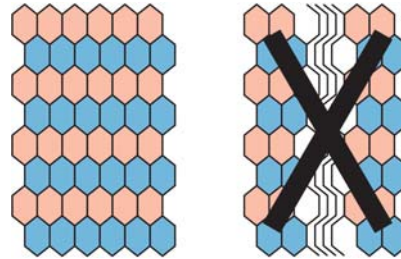
### Note!

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.

- 4 Insert the cassettes 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 SWHE was opened. Refer to step 3 in "Opening" on page 16.



- 5 If the cassettes are correctly assembled, the edges form a "honeycomb" pattern, see picture below.

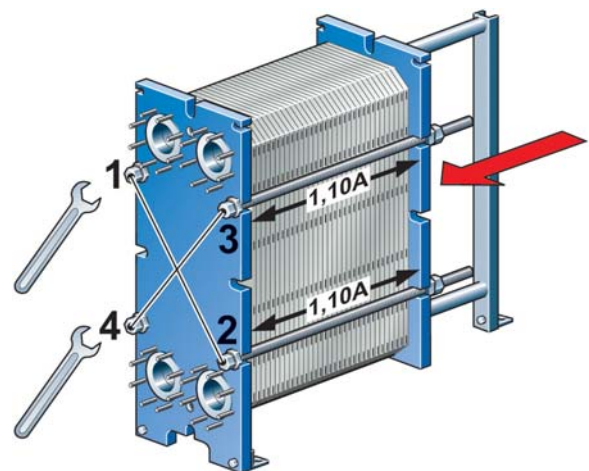


- 6 Press the plate assembly together. Tightening is done in two steps, see figures below. Be careful to ensure that the frame plate and the pressure plate are always in parallel.

Step	Bolt No.	To dimension
1	1-2 or 3-4	1.10A
2	1-2-3-4	A

Step 1: Tighten the two diagonal pairs of bolts alternately until the plate package measures 1.10A.

Be careful to ensure that the frame plate and pressure plate are 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.

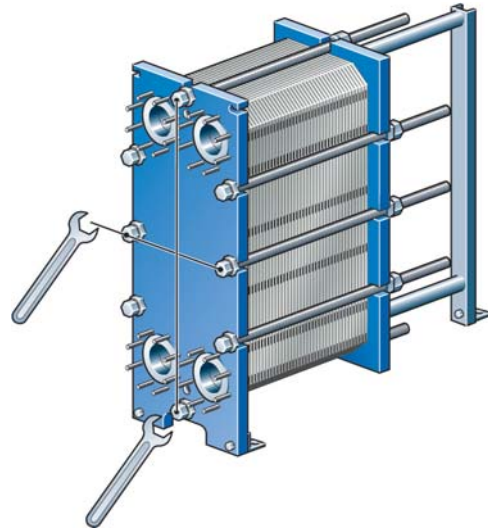
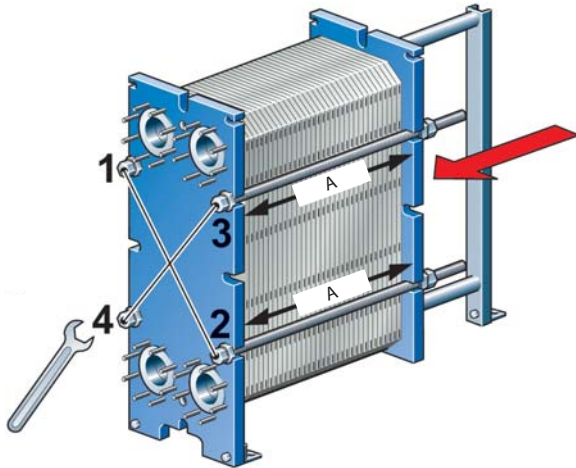


Step 2: After that, bolts are tightened alternately and diagonally, as shown in the figure below. Check the dimension A during tightening at the positions of the bolts that are being used.

# 7

Place the other bolts in position.

- Inspect the washers.
- When fully tightened, the bolts should all be equally tensioned.



**Note!**

The final tightening to reach dimension A is recommended to be divided into steps.

### Max tightening torque

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

Bolt size	Bolt with bearing box		Bolt with washers	
	N-m	kpm	N-m	kpm
M24			450	45
M30	585	58	900	90
M39	1300	130	2000	200
M48	2100	210	3300	330

For manual tightening, the tightening torque has to be estimated.

### If dimension A cannot be reached

- Check the number of cassettes and the dimension A.
- Check that all the nuts and bearing boxes are running freely. If not, clean and lubricate, or replace.
- Leave the SWHE between 24-48 hours, the longer the better, for gaskets to relax.



## Pressure test after maintenance

Before start-up of production, whenever cassettes 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 SWHE. During 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. Always check that the local regulations of this procedure are fulfilled.

### \* REFRIGERATION

Please note that SWHE units for refrigeration applications and units with media not mixable with water must be dried after hydrostatic pressure testing. If refrigerants are in the welded channels, they must be tested with inert gas (like N<sub>2</sub>).

Please consult the local office/representative of the supplier for advice on the pressure testing procedure.



## Storage of the SWHE

Alfa Laval delivers the SWHE ready to be put into service upon arrival if nothing else has been agreed. However, keep the heat exchanger in the packing box until installation.

Regarding storage for longer periods of time, one month or more, certain precautions should be made to avoid unnecessary damage to the SWHE.

### Note!

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

If there is any uncertainty about the storage of the PHE, consult your Alfa Laval Representative.

### Storage in packing box

If the nature of storage after the delivery of the SWHE is known in advance, inform Alfa Laval when ordering the heat exchanger 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 SWHE 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 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

#### Long time storage

If the SWHE has to be stored for a long period of time, follow the same advice as in the previous sections. At long term storage, the SWHE has to be filled with inert gas (like N<sub>2</sub>) in order to keep the gaskets in good condition by preventing moisture and oxygen to reach the gaskets.

#### Taken out of service

If, for any reason, the SWHE 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 SWHE.
- Depending on the media, the SWHE 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 SWHE 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 SWHE is not in position, follow the instructions "[Installation](#)" on page 9.
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 16. Open the SWHE until the measure is 1.25A.
5. Leave the SWHE between 24-48 hours, the longer the better, for gaskets to relax.
6. Re-tighten according to the instructions “Closing” on page 22 or .
7. Alfa Laval recommends a leakage test to be carried out. The media, usually water (hydraulic test), should be added at intervals to avoid sudden shocks to the heat exchanger. It is recommended to test up to the Design Pressure, Refer to SWHE drawing.

#### \* REFRIGERATION

8. If refrigerants are in the welded channels, they must be tested with inert gas (like N<sub>2</sub>)