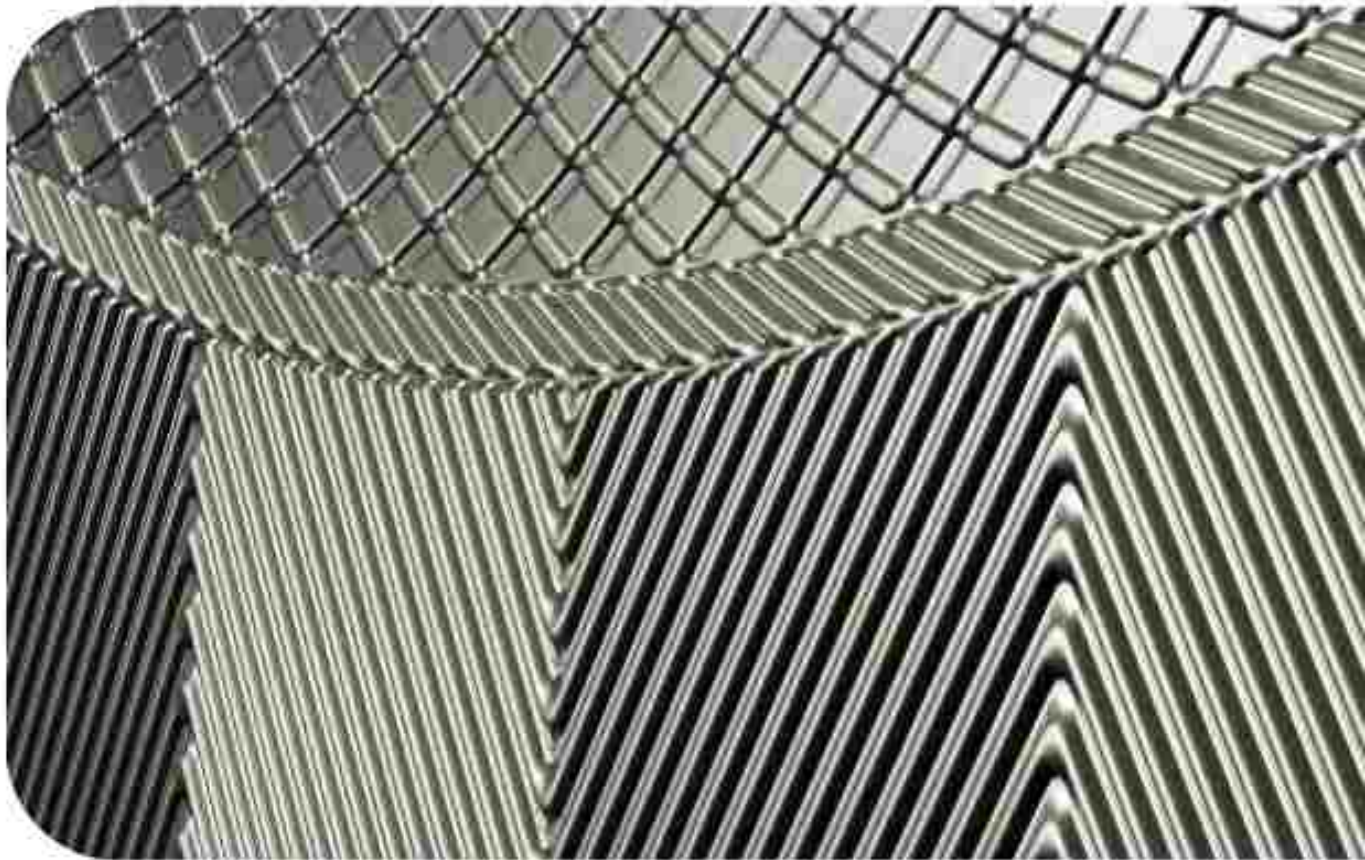


# Gasketed plate heat exchangers

All products

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Installation Manual

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**The original instructions are in English**

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# Contents

1	Introduction	7
1.1	Intended use	7
1.2	Reasonably foreseeable misuses	7
1.3	Prior knowledge	7
1.4	Delivered technical information	8
1.5	Warranty conditions	8
1.6	Advice	8
1.7	Environmental compliance	9
1.8	Name plate	10
2	Safety	13
2.1	Safety considerations	13
2.2	Definitions of expressions	13
2.3	Personal protective equipment	14
2.4	Working at height	15
3	Storage	17
3.1	Storage of equipment	17
4	Installation	19
4.1	Installation workflow	19
4.2	Components	20
4.3	Before installation, lifting and transport	23
4.4	Securing the heat exchanger before lifting	25
4.5	Crate handling	26
4.5.1	Crate — Inspection	26
4.5.2	Lifting and transportation	27
4.6	Unpacking the crate	30
4.6.1	Manufactured sides — Open	31
4.6.2	Flip box — Open	32
4.6.3	Crafted sides — Open	33
4.6.4	Inspection after uncrating	34
4.7	Lifting the equipment	35
4.7.1	Lifting using lifting device	38
4.7.2	Lifting using lifting wire	39
4.7.3	Lifting using lifting eye bolts	41
4.7.4	Lifting using swivel eye bolt	42
4.7.5	Lifting using hoist slings	44
4.8	Raising	47
4.8.1	Raising using lifting eye bolts	47
4.8.2	Raising using hoist slings on pressure plate	51

4.8.3	Raising using hoist slings around the plate heat exchanger	55
4.9	Assemble feet	59
4.10	Inspection before installation	61
4.11	Start-up	62

# 1 Introduction

This manual provides information needed to handle and install 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 PHE 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 a few plates at a 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 PHE 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](#).
- If the plate heat exchanger will not be taken in operation within 6 months follow the instructions in Section [Storage of equipment](#).

## 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 channel plate installation.
- **Technical specification**  
Connection information, measurements, and section information.
- **Plate heat exchanger (PHE) 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 PHE 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 PHE 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.

Report to the local Alfa Laval representative, the date when the plate heat exchanger was put into operation.

## 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

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:

### 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.

## 1.8 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 PHE drawing are to be changed the supplier should be consulted.

1. Space for logotype
2. Open space
3. Website for service
4. 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

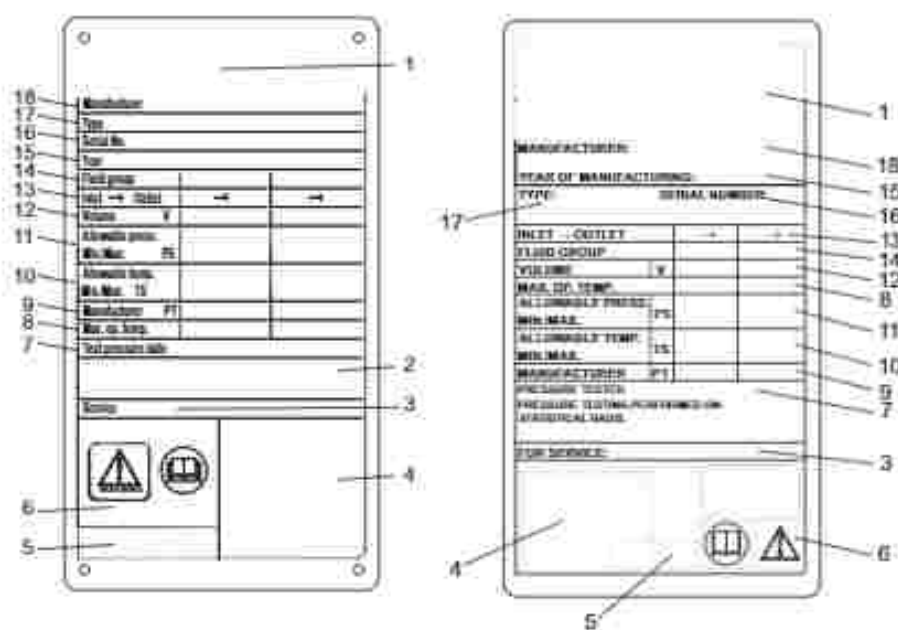


Figure 1: Example of name plates.



## 2 Safety

### 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.



#### **NOTE**

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



Safety

## 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 protect the hand from hazards.



Safety

## 2.4 Working at height

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

 **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.



Safety



Safety



## 3 Storage



### **WARNING** Risk of damage to equipment.

The crate is not designed to be stacked.  
Never put a load on top of the crate.

Alfa Laval delivers the plate heat exchanger ready to be put into service upon arrival, if nothing else has been agreed.

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 *Storage of equipment*.



### **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.

### 3.1 Storage of equipment

#### 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 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 and the bolt sleeves 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. When closing the packing it shall be restored to original condition. The check includes:

- Greasing of the tightening bolts
- Metal port covers
- Protection of the plate pack and gaskets
- The packing

- 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.

#### Long time storage before taken in operation

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 *Installation*.
2. Note the measurement between frame plate and pressure plate (the **A** measure).
3. If applicable, remove the feet attached to the pressure plate.
4. Loosen the tightening bolts. Follow the instructions in the Maintenance Manual. Open the plate heat exchanger until the plate pack measure is  $1.25 \cdot A$ .
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 the Maintenance 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 PHE drawing.

**NOTE** Valid for semi-welded products.

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

## 4 Installation







### 4.1 Installation workflow

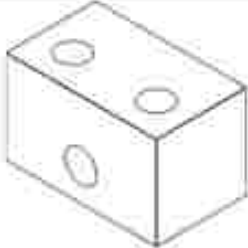

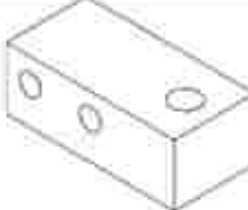

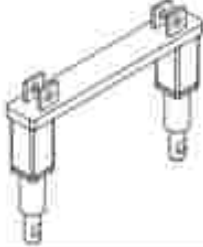


An installation of any Alfa Laval equipment follows the installation process described below. Depending on the installation agreement and operating industry, follow the relevant steps in the installation process in order.

Step	Process activity	End state	Note
1	Preparations	Site prepared Equipment at prepared site.	
2	Cleaning of pipes	Pipes free from dust, dirt and other foreign particles that can clog the plate heat exchanger.	It is recommended to install a inline strainer before the plate heat exchanger inlet.
3	Mechanical completion	Equipment mechanically installed.	Also includes connection to the process equipment piping.
4	Cleaning	Equipment cleaned and ready for production.	Only relevant for some industries. Check with installation responsible. Follow the clearing instructions in the Maintenance Manual.
5	Commissioning	Equipment commissioned and functionally validated.	Only valid if agreed upon.
6	Performance validation	Equipment performance validated.	
7	Hand over	Contract fulfilled.	

## 4.2 Components

The installation manual, this manual, is divided into sections corresponding to components used with any plate heat exchanger. Among the delivered document, see Section *Delivered technical information* there is a list of all components included in your specific plate heat exchanger. The table below show the name and design of each component included in a headline in this manual.

Denomination	Design
Lifting device	
Lifting wire	
Lifting eye bolt	
Swivel eye bolt	
Hoist sling	
L-foot	

Denomination	Design
Block foot	
Swing foot L-foot	
Swing foot block foot	
Fixed foot	
Low adjustable foot frame plate	
Low adjustable foot supporting column	
High adjustable foot frame plate	

## Denomination

## Design

High adjustable foot supporting column



Stabllising bar



### 4.3 Before installation, lifting and transport

**CAUTION** Risk of damage to equipment.

During installation or maintenance, precautions must be taken to avoid damaging the plate heat exchanger and its components. Damage to components can adversely affect the performance or serviceability of the plate heat exchanger.

**WARNING** Risk of personal injury.

The equipment is heavy.  
Never lift or move the equipment manually.

**WARNING**

Identification of connections to welded channel and gasketed channel are vital. Entering wrong media into the gasketed channel can cause serious personal injuries and severely damage the gaskets.

If any hesitation in this matter contact Alfa Laval representative.

#### To consider before installation

- Keep the plate heat exchanger packed until installation.
- Before connecting any piping, make sure all foreign objects have been flushed out of the piping system that should be connected to the plate heat exchanger.
- Before connecting any piping, make sure that all the bolts for the feet are tightened and that the plate heat exchanger is firmly fixed to the foundation.
- Before start-up, check that all the tightening bolts are firmly tightened and that the plate pack has the correct measurements (A measure). See the PHE drawing.
- When connecting the piping system, make sure the pipes do not subject the plate heat exchanger to stress or strain.
- Avoid vibration, install any anti-vibration equipment if necessary.
- The plate heat exchanger connections on the follower and connector grids have little strength against pipe work or nozzle loads. Such loads can arise for example from thermal expansion. Proper care must be taken to avoid transfer of such pipe forces and moments to the plate heat exchanger.
- Secure that the opening time of valves is sufficiently slow to avoid pressure surges.
- In automated installations, the stopping and starting of pumps and actuation of valves should be programmed so that the resulting amplitude and frequency of the pressure variation will be as low as possible.
- If pressure variance is expected, install efficient dampers.
- Make sure that no air remains inside the plate heat exchanger.
- Safety valves shall be installed according to current pressure vessel regulations.

- It is recommended that protection sheets are used to cover the plate pack. Protect against the leakage of hot or aggressive fluids and the hot plate pack.
- If the plate heat exchanger surface temperature is expected to be hot or cold, take protective actions, such as insulate the plate heat exchanger, to avoid risk for personnel injuries. Always ensure that required actions are according to local regulations.
- Design pressures and temperatures for each model are marked on the name plate. These shall not be exceeded.
- \*REFRIGERATION\* drain the compressor oil system. Use oil draining connection setup or an oil trap in front of the plate heat exchanger to prevent oil from entering the equipment.

**NOTE****\*REFRIGERATION\***

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

- Follow the hierarchy specified in this presentation.
- Check the condition of the flooring.
- Always complete a risk assessment.
- Always check the centre of gravity before unpacking or moving the equipment. Keep the centre of gravity as low as possible.
- Always move slow and steady.

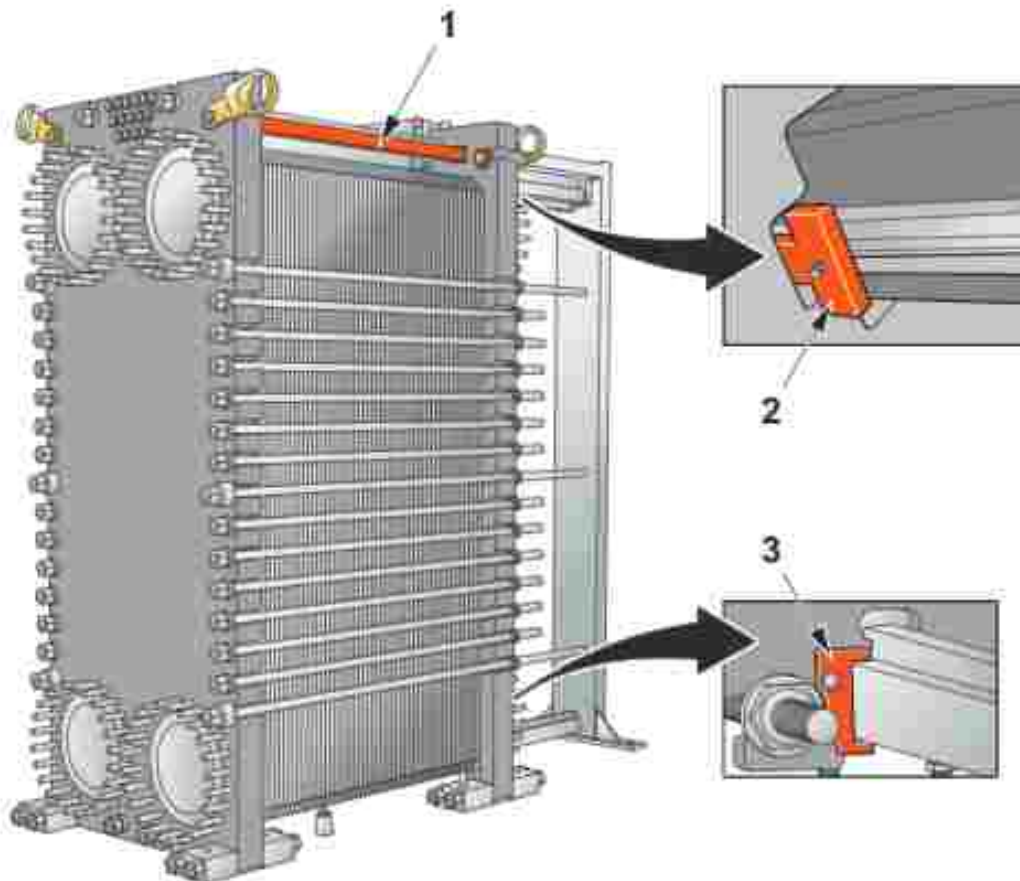
**Risk assessment**

Always perform a thorough risk assessment before lifting and transporting the crated or uncrated equipment on every handling occasion.



#### 4.4 Securing the heat exchanger before lifting

Some of the larger plate heat exchangers has lifting and transportation securing device (1), (2), and (3). The securing device must not be removed before the plate heat exchanger is installed. It is not allowed to use any of the securing devices for lifting.



1. Fasten the locking device securely between the frame plate and the pressure plate.
2. Fasten the locking bracket to secure the pressure plate to the carrying bar.
3. Fasten the locking bracket to secure the pressure plate to the guiding bar.

## 4.5 Crate handling

### **WARNING** Risk of personal injury.

Lifting and transport of the crated and uncrated equipment must be carried out by skilled persons. See *Prior knowledge* in Chapter *Introduction*.

The plate heat exchanger is delivered on a pallet and can be packed in a crate or wrapped in stretch film. There are three main versions of crates:

- Manufactured sides — sides and a top made in separate pieces
- Flip box — a box with hinges in the sides and a loose top
- Crafted sides — sides and top crafted board by board when packed for delivery

The centre of gravity is marked on the crate or the wrapping.

A crate is also marked with other symbols according to the table:

Symbol	Meaning
	Centre of gravity
	Do not stack on top
	Fragile
	This way up

### 4.5.1 Crate — Inspection

Examine the outside of the crates before starting to unload and report any transport damage. Contact the insurance company in case of any damages.

## 4.5.2 Lifting and transportation

### **WARNING** Risk of personal injury.

The equipment is heavy and sensitive and must be handled with precaution. Unauthorized personnel is not allowed to be in the defined risk area when the crated or uncrated equipment is handled.

### **WARNING** Risk of damage to equipment.

The crate is not designed to stand the force from hoist slings pressing on the top of the crate.

Always use a forklift to lift and transport the crated equipment.

### **WARNING** Risk of personal injury.

Never work under hanging load.

### **WARNING** Risk of personal injury.

Always use a forklift approved for the load and in accordance with local regulations.

Labels, symbols, and warning placards are located on the external surfaces of the crates and outline the handling principles which must be observed.

- Never leave a hanging load unattended.
- When the equipment, crated or uncrated, is assembled with the delivered pallet it must be lifted using a forklift.
- Plan the lifting and the transportation thoroughly.
- Define the risk area for lifting and transport of the crated or uncrated equipment.
- Always perform a risk assessment of the risk area and transport ways before lifting and transporting the crated or the uncrated equipment.
- The crates should not be subjected to sudden shocks or movement. The crates are not load bearing and must not be stacked or have other items placed on them.
- The crates should be kept in the indicated upright position.
- Lift the crates as instructed. Lift only enough to clear the floor.
- Lift and transport the load slowly and gently.
- Crated equipment must be lifted in the pallet using a forklift.
- The length of the forklift forks should be equal to, or longer than, the depth of the pallet.
- Make sure that the crate remains stable on the lifting equipment.
- Move the crate to its destination.
- Lower the crate gently to the floor, leaving enough room around it for easy access to all sides.

- Make sure that the crate is firmly supported. Place blocks or plates under it if required.
- When working under a hanging load, for example when assembling the stands, you must secure the load from falling on you using wooden beams or likewise.
- The centre of gravity must always be between the forklifts forks.

Labels that will indicate if the crates have been tipped over or exposed to extremes of humidity can be put on the crates or the equipment.

When the equipment is crated it must be lifted in the delivered pallet using a forklift.



Uncrate the equipment according to Section [Unpacking the crate](#).

It is recommended to let the equipment remain assembled with the pallet and handle it using a forklift until it is time to install it.

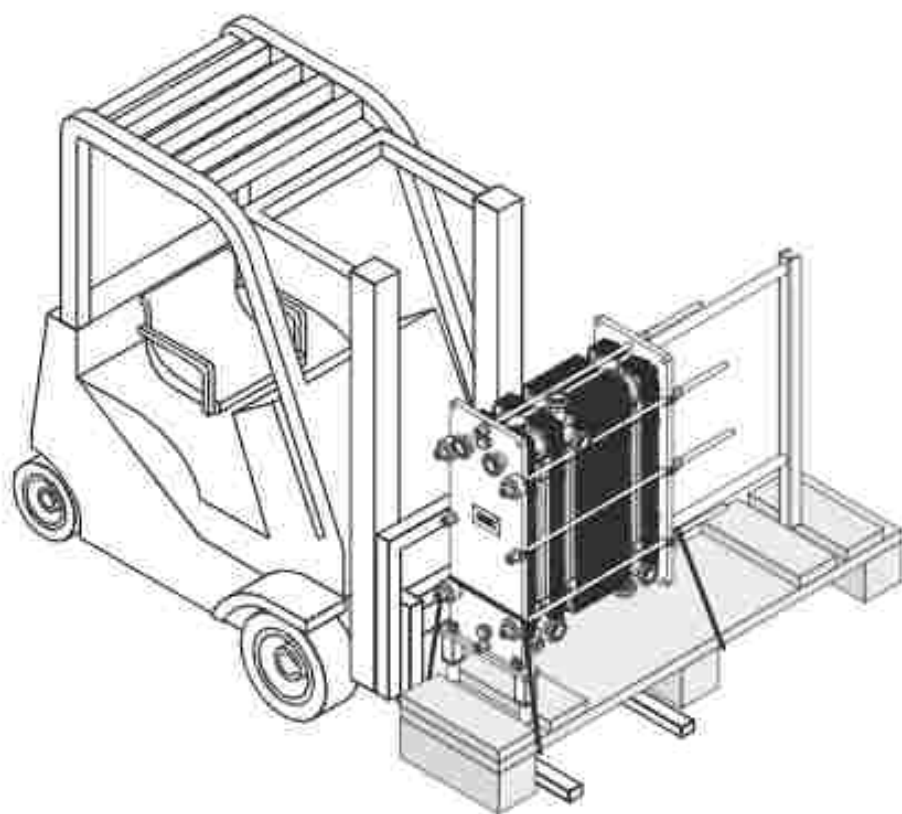
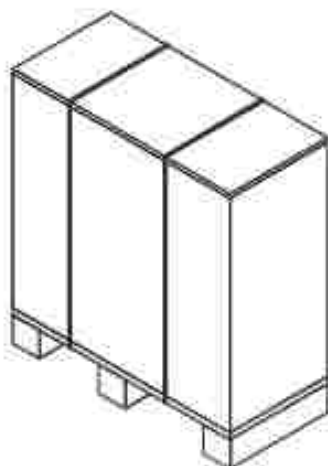


Figure 2: The illustration shows an example of equipment.

## 4.6 Unpacking the crate

Follow the procedure for the corresponding type of crate:

- Manufactured sides — See Procedure [Manufactured sides - Open](#)
- Flip box — See Procedure [Flip box - Open](#)
- Crafted sides — See Procedure [Crafted sides - Open](#)



### Unpacking area

The minimum unpacking area must be at least twice the size of the largest crate.

When the crate is removed but the equipment is still assembled with the pallet, remove any loose parts or smaller parts assembled with the pallet.

Equipment can be assembled with the pallet with plastic bands or with screws. Plastic bands are cut off. Screws are removed.

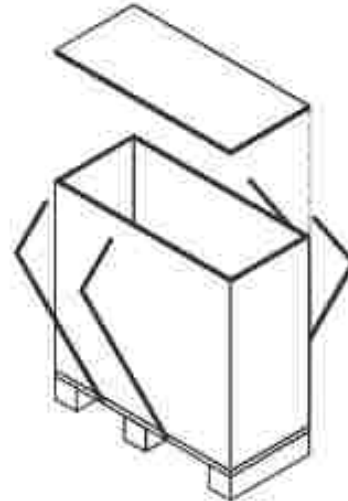
#### 4.6.1 Manufactured sides — Open

**⚠ WARNING** Risk of personal injury:

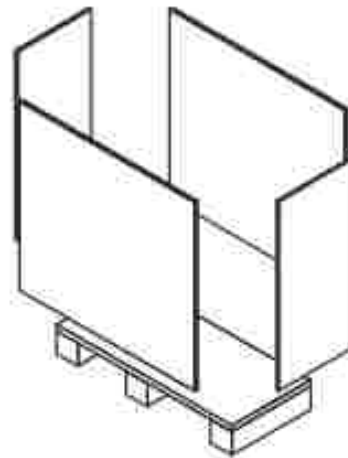
The equipment or loose objects can fall. Plastic straps may snap when cut off. There can be sharp edges, splinters, and nails on the crate and the equipment.

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

- 1 Cut the plastic bands off and remove the top of the crate.



- 2 Disassemble the sides by removing the screws or the nails.



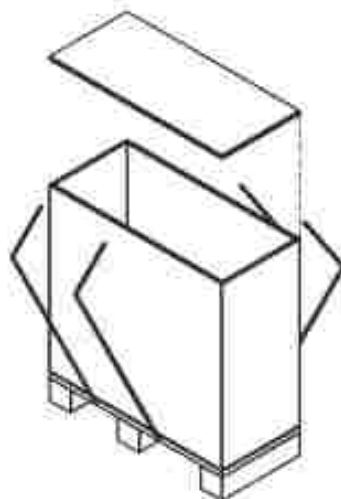
## 4.6.2 Flip box — Open

**⚠ WARNING** Risk of personal injury.

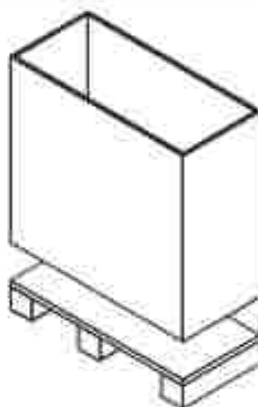
The equipment or loose objects can fall. Plastic straps may snap when cut off. There can be sharp edges, splinters, and nails on the crate and the equipment.

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

- 1 Cut the plastic bands off and remove the top of the crate.



- 2 Lift the flipbox up and remove it from the pallet.





### 4.6.3 Crafted sides — Open

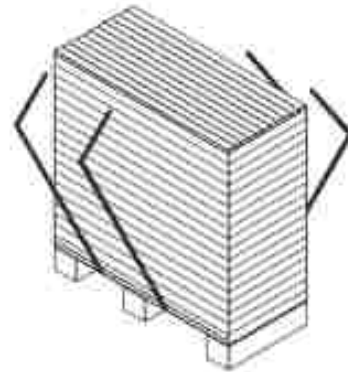
**⚠ WARNING** Risk of personal injury.

The equipment or loose objects can fall. Plastic straps may snap when cut off. There can be sharp edges, splinters, and nails on the crate and the equipment.

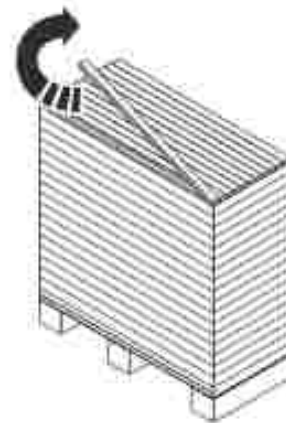
Wear personal protective equipment when handling the equipment during unpacking and installation. Handle the equipment with precaution. See Section *Personal protective equipment* in Chapter *Safety*.

A crate with crafted sides and top is assembled with boards.

- 1 Cut off the plastic bands and remove them.



- 2 Start with the top of the crate and remove one board at a time.



- 3 When the boards on the top are completely removed continue with the sides.

#### 4.6.4 Inspection after uncrating

When the equipment is placed in its intended location, always perform the inspections listed below:

- Check the **A** measure (the distance between the inside of the frame plate and the inside of the pressure plate). The **A** measure can be found on the PHE drawing as well as the number of plates.
- Make sure that all bolts are properly tightened.
- Make sure that the stands and feet are properly tightened.

**NOTE**

Some equipment is delivered with the stands disassembled.

- Check that connection piping can be removed to perform service.
- Make sure that there is enough space to remove plates on one side of the plate heat exchanger.

## 4.7 Lifting the equipment


It is recommended to engage the services of a rigging company to take care of all handling related matters until the equipment is in the position where it will be installed.

The safety information in this section is valid for all the lifting instructions described for different lifting equipment. Always read this section and take the safety messages in consideration before proceeding to the lifting instruction corresponding to your plate heat exchanger.

 **WARNING** Risk of personal injury.

Equipment is heavy with a centre of gravity placed high.

Lifting and transport of the crated and uncrated equipment must be carried out by skilled persons. See Section *Prior knowledge* in Chapter *Introduction*.

 **WARNING** Risk of personal injury.

The equipment or loose objects can fall. Plastic straps may snap when cut off. There can be sharp edges, splinters, and nails on the crate and the equipment.


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

 **WARNING** Risk of personal injury.


Never work under hanging load.

 **WARNING** Risk of personal injury.

Never work alone during lifting and handling of the crated or uncrated equipment.

 **WARNING** Risk of damage to equipment.

For hoist slings or for lifting devices always use the attachment points marked with red rings in the illustrations. Use of other attachment points or hoist slings load directions than those described are not allowed. If the plate heat exchanger is not supplied with lifting devices from Alfa Laval, the corresponding equipment must be selected and the same attachment points must be used. The authorized personnel have full responsibility for selecting components and procedures in a safe and correct way. Always be careful during the lifting procedure to avoid damage to the equipment.

 **WARNING** Risk of damage to equipment.

Never lift by the connections or the stud bolts around them.

The authorized personnel are always responsible for the safety, correct selection of lifting equipment and execution of the lifting and raising procedures. Use undamaged hoist slings approved for the weight of the plate heat exchanger. Use the lifting points as illustrated in each section. If the equipment has lifting equipment assembled, these must be used.

If otherwise not stated, use two hoist slings (1) and (2) and make sure that the lifting angle ( $\alpha$ ) is between 45° and 90°.

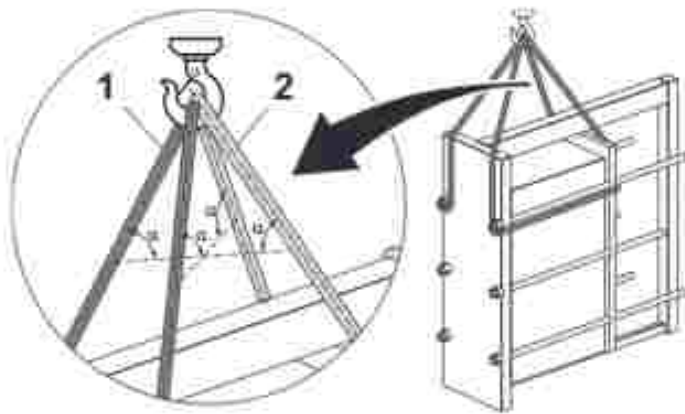


Figure 3: The illustration shows the threading of the hoist slings on an example of equipment.

Before loosening the equipment from the pallet, secure the equipment from falling using hoist slings.

**NOTE**

Do not lift up the equipment and the pallet. Only stretch the hoist slings so the equipment will not fall.

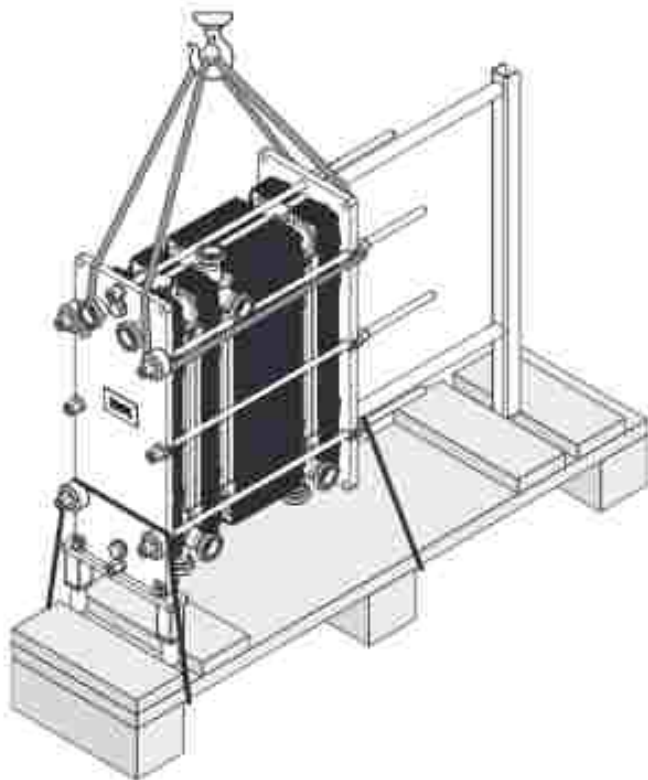


Figure 4: The illustration shows an example of equipment.

Remove any attachment that assembles the equipment with the pallet.

Gently lift up the equipment and make sure that it releases from the pallet.

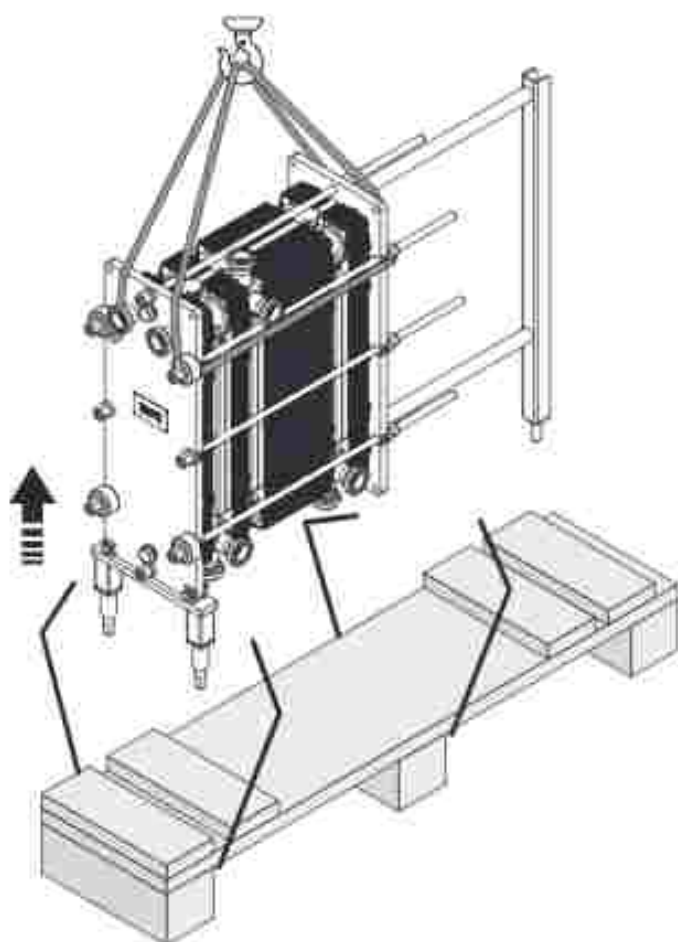


Figure 5: The illustration shows an example of equipment.

### 4.7.1 Lifting using lifting device

This section is only valid when lifting devices are used.



#### **⚠ WARNING** Risk of damage to equipment.

If there are transport securing equipment installed do not use these as lifting points. Always use the lifting devices as lifting points.

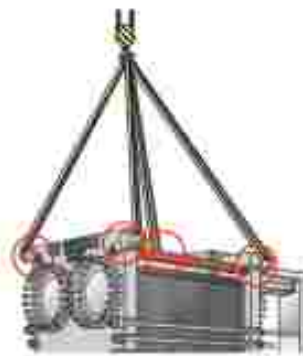
#### **! NOTE**

The equipment is delivered with the lifting devices assembled. You can let them remain on the equipment after installation.

If the equipment is assembled with the delivered pallet, it must be lifted using a forklift. Follow the instructions in Section [Lifting and transportation](#).

If the equipment is disassembled from the delivered pallet, it must be lifted using hoist slings. Follow the instructions in Section [Lifting the equipment](#).

- 1 Check that the lifting devices are properly assembled. Tighten the screws if necessary.
- 2 Assemble hoist slings to the lifting devices. Use two or four hoist slings depending on the weight of the plate heat exchanger.



- 3 Slowly lift the equipment just to clear the ground.
- 4 Make sure that the equipment is hanging levelled.

## 4.7.2 Lifting using lifting wire

This section is only valid when lifting wire is used.



### NOTE

The equipment is delivered with the lifting wires assembled. You can let them remain on the equipment after installation.

The bending diameter of the wire loop  $D$  must be greater than six times the wire diameter  $D > 6d$ .

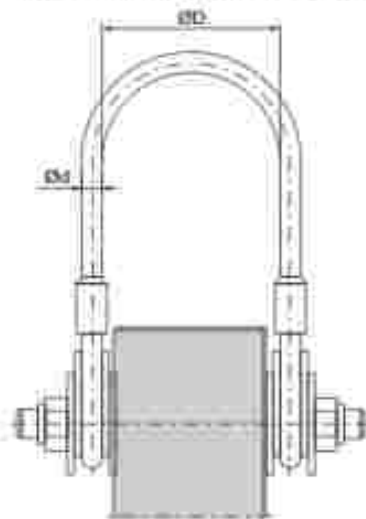


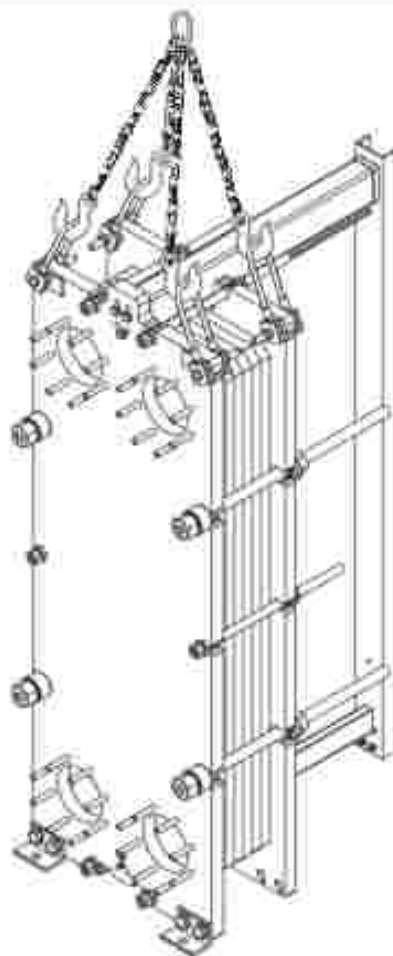
Figure 6: Lifting wire assembled with a frame plate.

If the equipment is assembled with the delivered pallet, it must be lifted using a forklift. Follow the instructions in Section [Lifting and transportation](#).

If the equipment is disassembled from the delivered pallet, it must be lifted using chain slings. Follow the instructions in Section [Lifting the equipment](#).

- 1 Check that the lifting wires are properly assembled. Tighten the screws if necessary.

- 2 Connect chain slings to the lifting wires.



- 3 Slowly lift the equipment just to clear the ground.
- 4 Make sure that the equipment is hanging levelled.



### 4.7.3 Lifting using lifting eye bolts

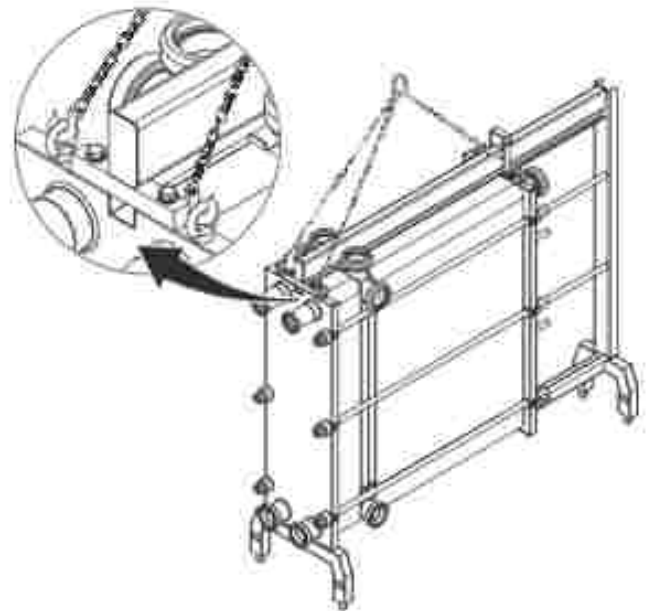
This section is only valid when lifting eye bolts are used.



If the equipment is assembled with the delivered pallet, it must be lifted using a forklift. Follow the instructions in Section *Lifting and transportation*.

If the equipment is disassembled from the delivered pallet, it must be lifted using hoist slings. Follow the instructions in Section *Lifting the equipment*.

- 1 Make sure that the lifting equipment lifting point is placed in the centre of gravity area of the plate heat exchanger.
- 2 Use a chain sling and fit the lifting hooks or the lifting shackles to each of the four lifting eye bolts assembled with the plate heat exchanger.



- 3 Slowly lift the equipment just to clear the ground.
- 4 Make sure that the equipment is hanging levelled.

#### 4.7.4 Lifting using swivel eye bolt

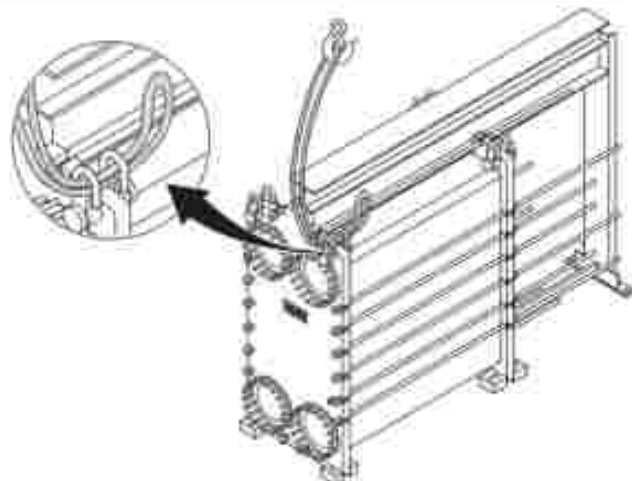
This section is only valid when swivel eye bolts are used.



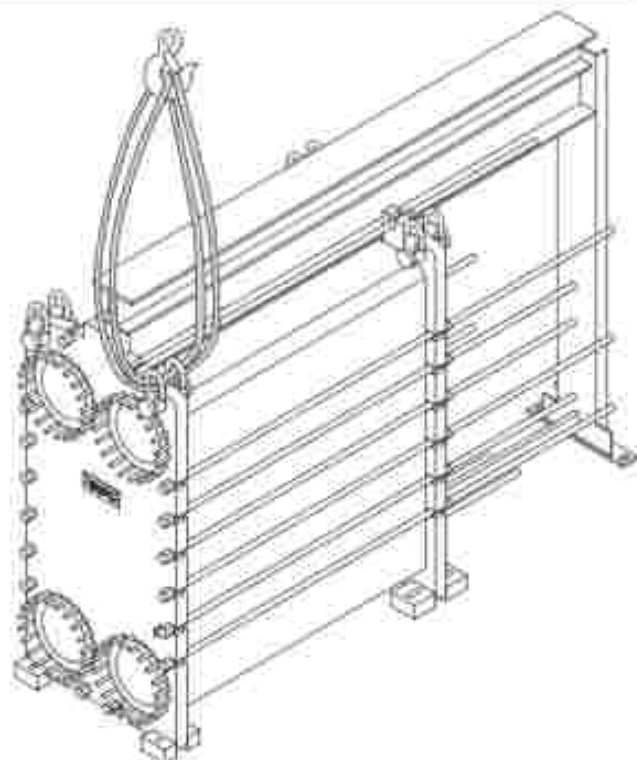
If the equipment is assembled with the delivered pallet, it must be lifted using a forklift. Follow the instructions in Section [Lifting and transportation](#).

If the equipment is disassembled from the delivered pallet, it must be lifted using hoist slings. Follow the instructions in Section [Lifting the equipment](#).

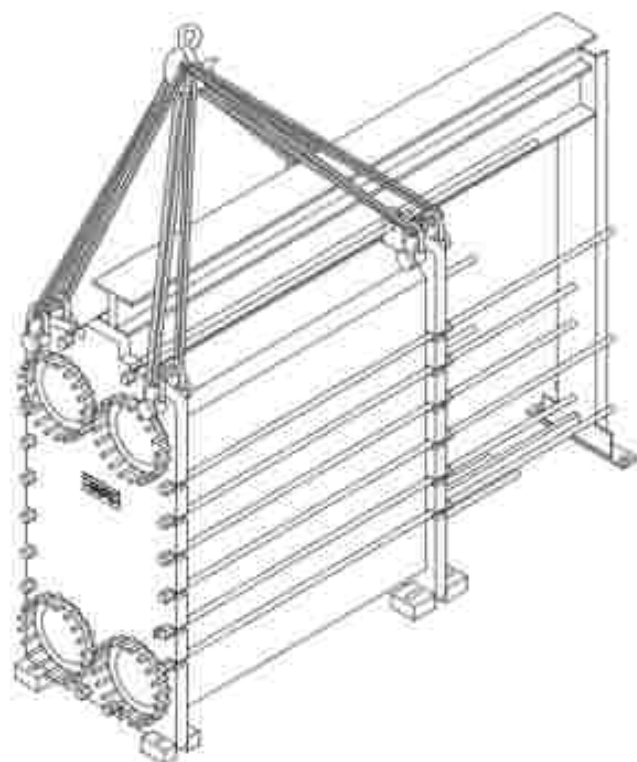
- 1 Make sure that the lifting equipment lifting point is placed in the centre of gravity area of the plate heat exchanger.
- 2 Thread one end of a hoist sling over the lifting equipment.
- 3 Thread the other end of the hoist sling through one of the swivel eye bolt pairs.



- 4 Thread also the second end of the hoist sling over the lifting equipment.



- 5 Repeat the procedure on the remaining swivel eye bolts.



- 6 Slowly lift the equipment just to clear the ground.
- 7 Make sure that the equipment is hanging levelled.

### 4.7.5 Lifting using hoist slings

This section is only valid when hoist slings are used. There are two different ways of threading hoist slings, the first one described is the recommended one. If this method can not be used, follow the instructions for the alternative method.



If the equipment is assembled with the delivered pallet, it must be lifted using a forklift. Follow the instructions in Section [Lifting and transportation](#).

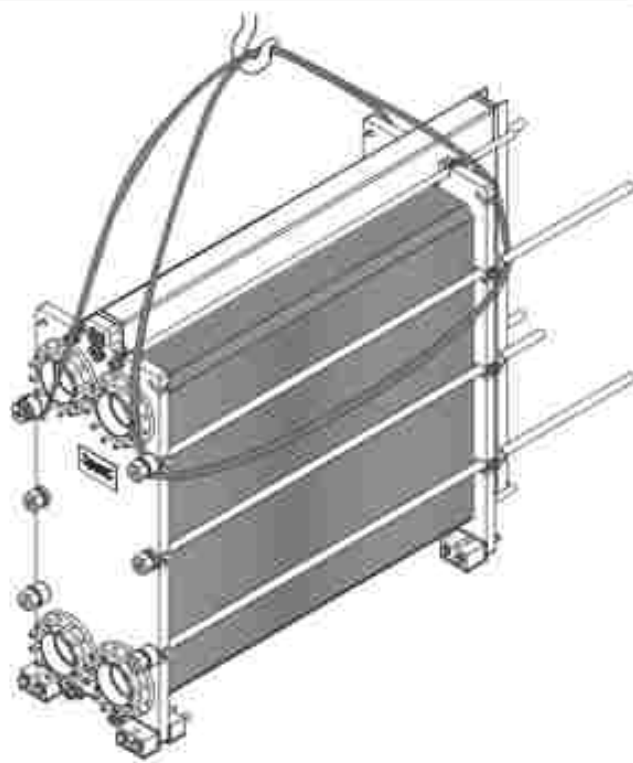
If the equipment is disassembled from the delivered pallet, it must be lifted using hoist slings. Follow the instructions in Section [Lifting the equipment](#).

**⚠ WARNING** Risk of personal injury

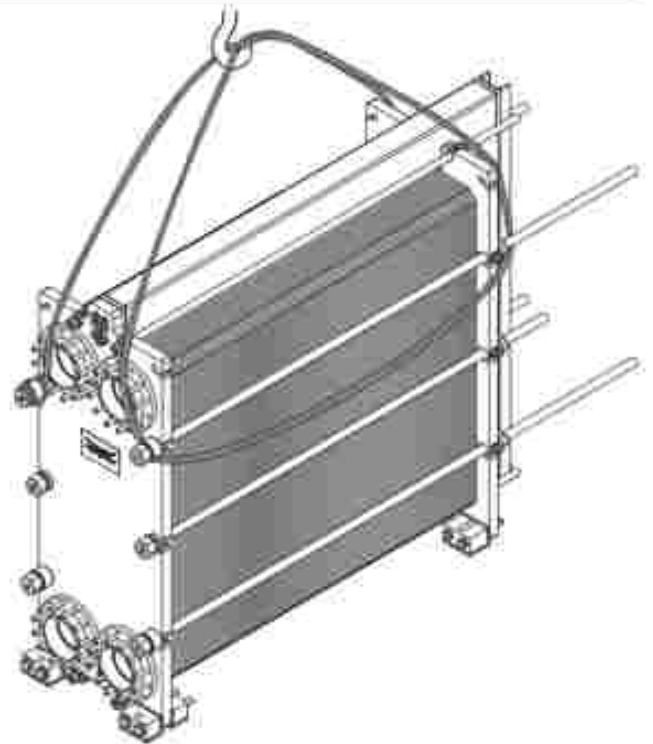
The equipment is heavy.

Use one or two hoist slings depending on the equipment weight.

- 1 If two hoist slings are used, thread them according to the illustration.



- 2 If one hoist sling is used, thread it according to the illustration.

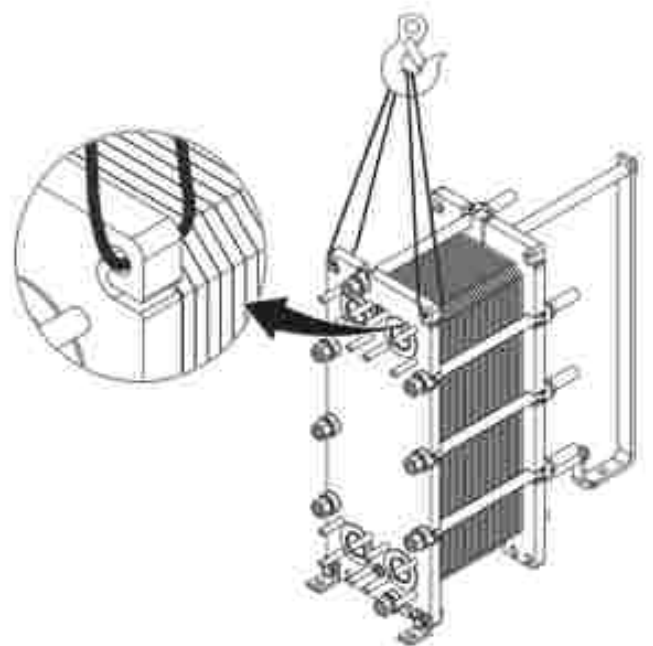


- 3 Slowly lift the equipment just to clear the ground.
- 4 Make sure that the equipment is hanging levelled.

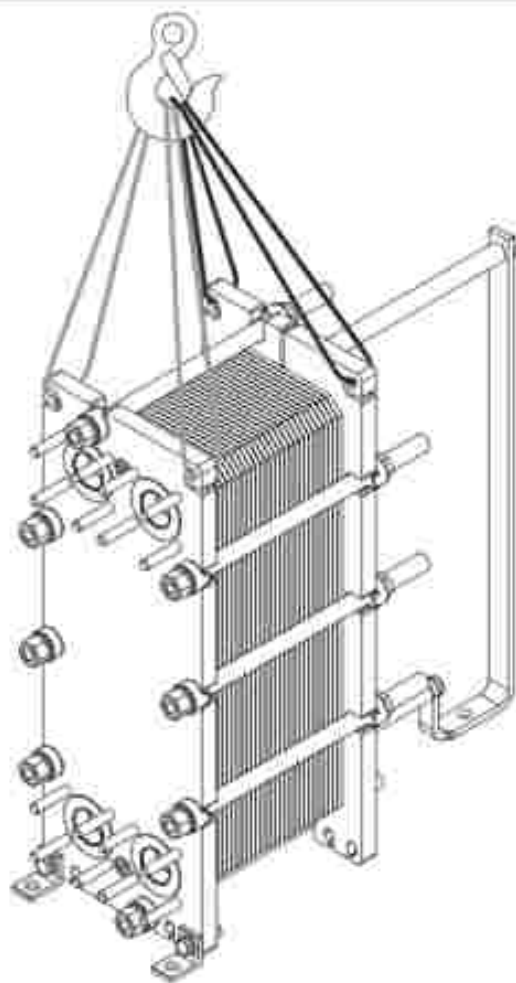
5 **NOTE**

The method described in this and the following steps is an alternative method.

Put one hoist sling between the frame plate slots. Connect the hoist sling to the lifting equipment.



- 6 Put one hoist sling between the pressure plate slots. Connect the hoist sling to the lifting equipment.



- 7 Slowly lift the equipment just to clear the ground.
- 8 Make sure that the equipment is hanging levelled.

## 4.8 Raising

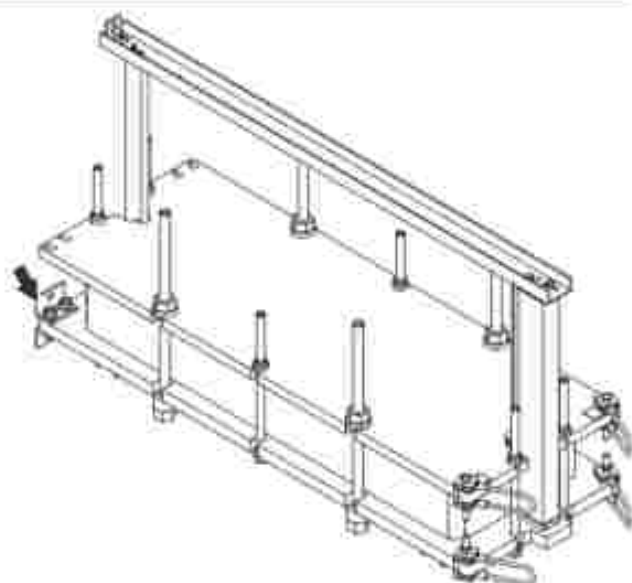
### 4.8.1 Raising using lifting eye bolts

This instruction is valid when raising the plate heat exchanger after delivery from Alfa Laval. Only use lifting equipment approved for the weight of the plate heat exchanger.

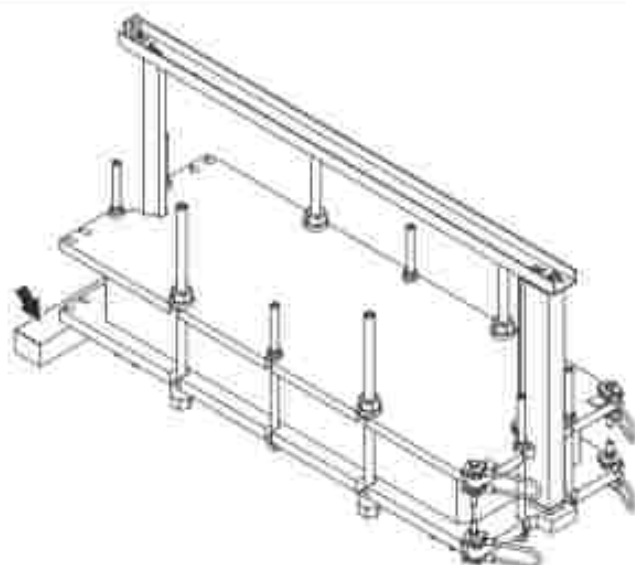
**CAUTION** Risk of damage to equipment.

The hoist slings shall be long enough to be able to rotate the plate heat exchanger without obstruction. Consider especially the space for the support column. Always be careful during the raising procedure to avoid damage to the plate heat exchanger components.

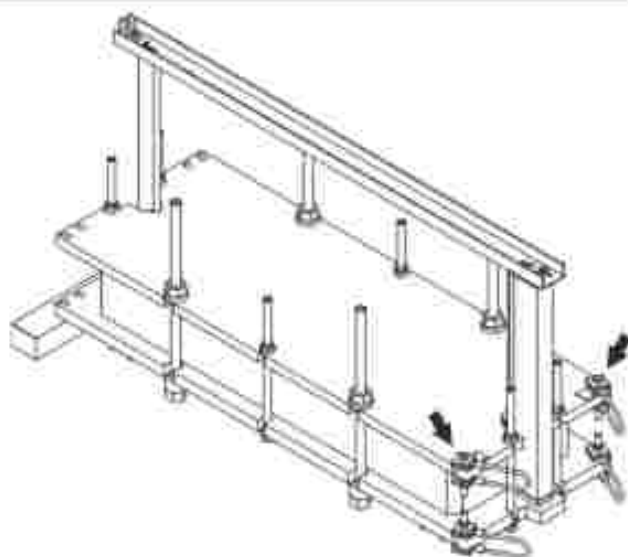
- 1 Remove all the feet from the frame plate



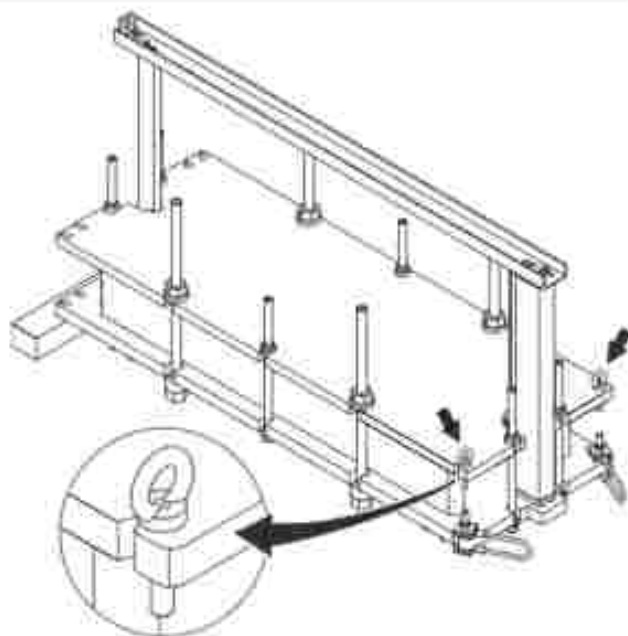
- 2 Place a wooden beam under the frame plate bottom edge.



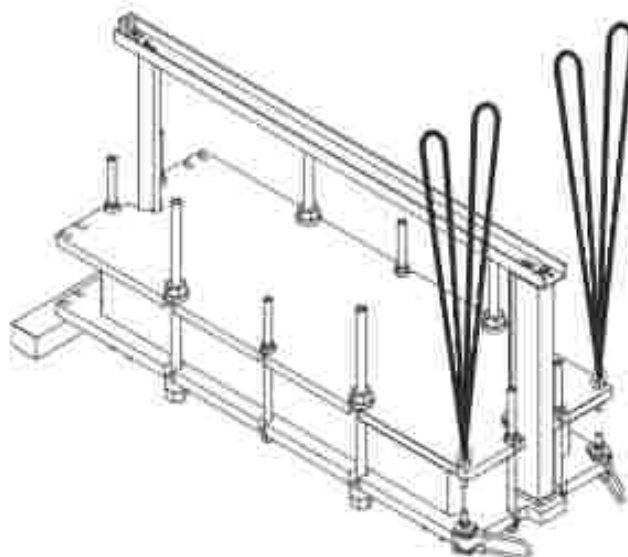
- 3 Remove the lifting wires from the pressure plate.



- 4 Assemble two lifting eye bolts to the pressure plate.

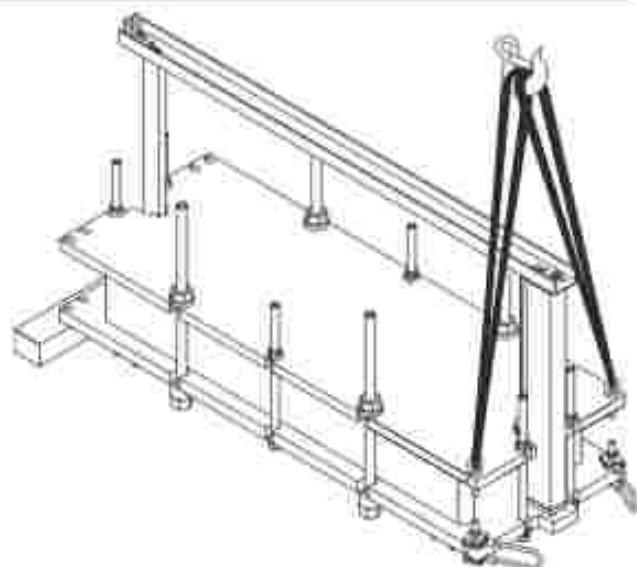


- 5 Fit one hoist sling in each lifting eye bolt.

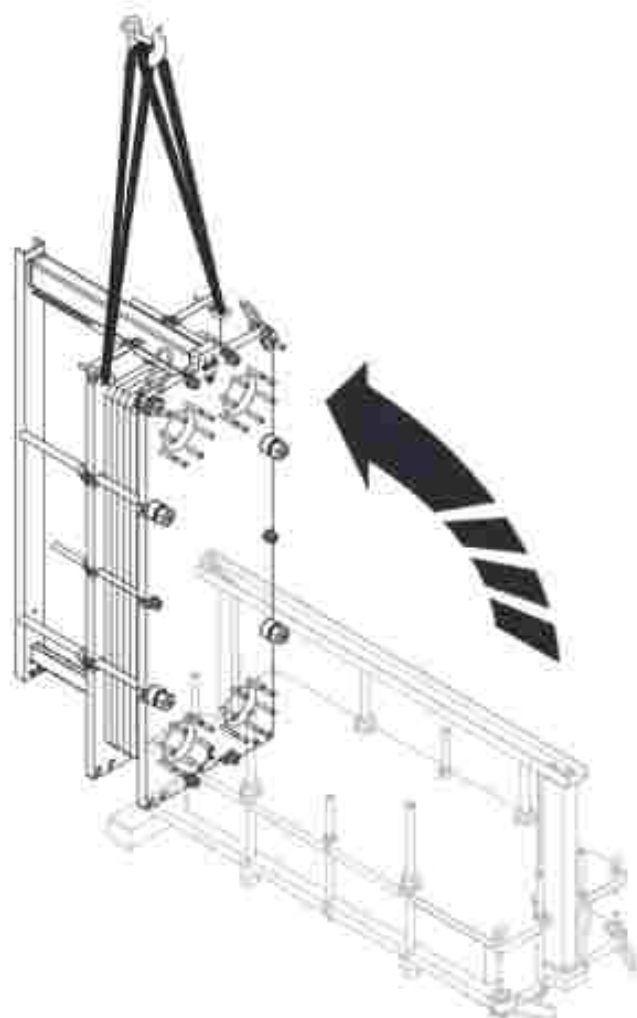




- 6 Attach the hoist slings to a lifting point.



- 7 Carefully raise the plate heat exchanger. Pay special attention when passing the centre of gravity.



- 8 Remove the hoist slings.

- 9 Remove the lifting eye bolts.

- 10 Assemble the lifting wires back to the pressure plate.
- 11 Gently lift the plate heat exchanger up a bit from the ground. Lift according to the Section *Lifting using lifting wire*.
- 12 Assemble the feet back to the frame plate.
- 13 Remove the wooden beam.
- 14 Lower the plate heat exchanger to the ground.
- 15 Remove the lifting equipment.

The plate heat exchanger can now be handled according to the lifting instructions in this manual.

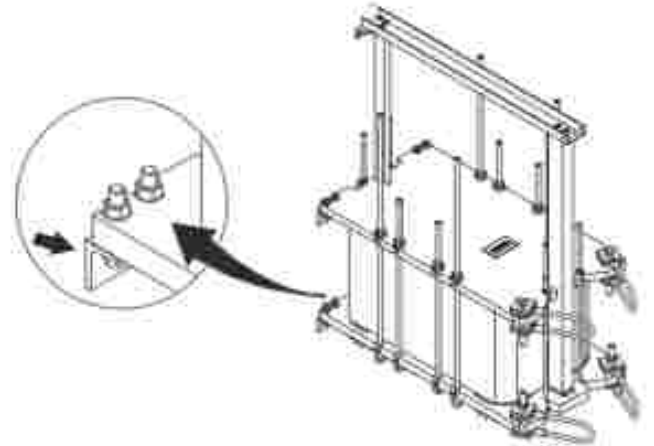
#### 4.8.2 Raising using hoist slings on pressure plate

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

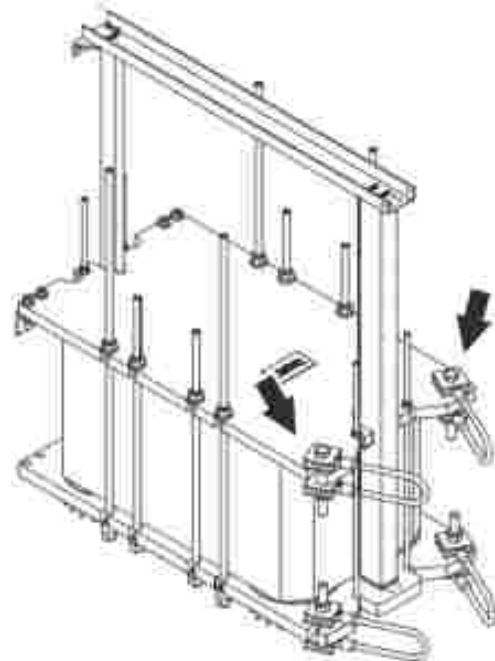
**CAUTION** Risk of damage to equipment.

The hoist slings shall be long enough to be able to rotate the plate heat exchanger without obstruction. Consider especially the space for the support column. Always be careful during the raising procedure to avoid damage to the plate heat exchanger components:

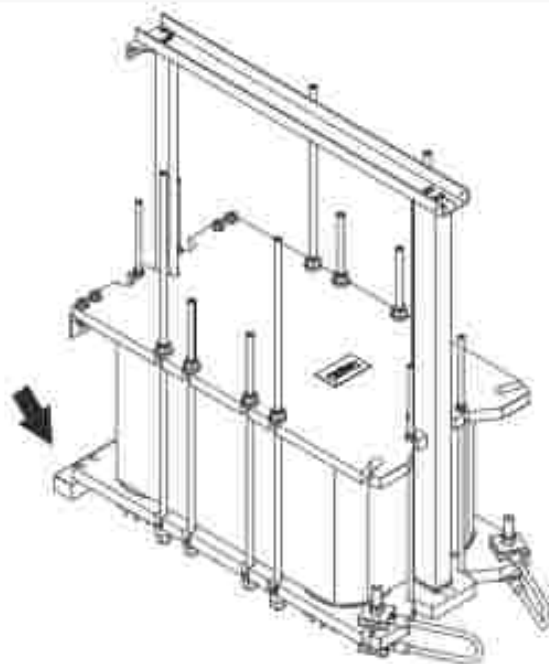
- 1 Remove all the feet from the frame plate



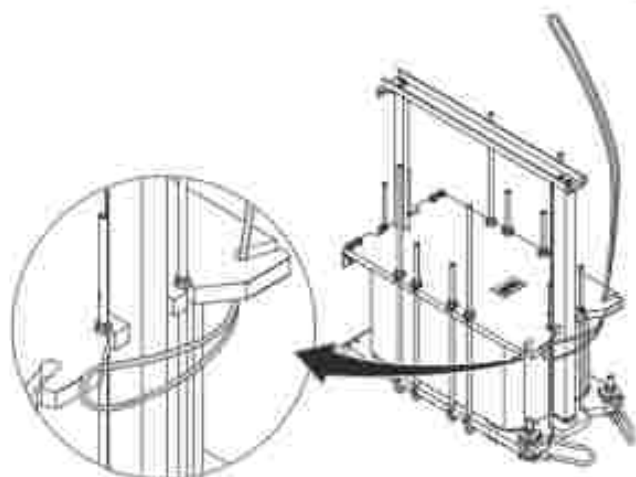
- 2 Remove the lifting wires from the pressure plate.



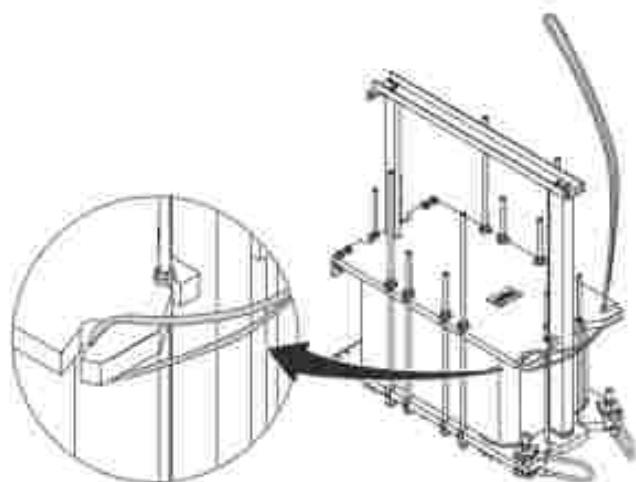
- 3 Place a wooden beam under the frame plate bottom edge.



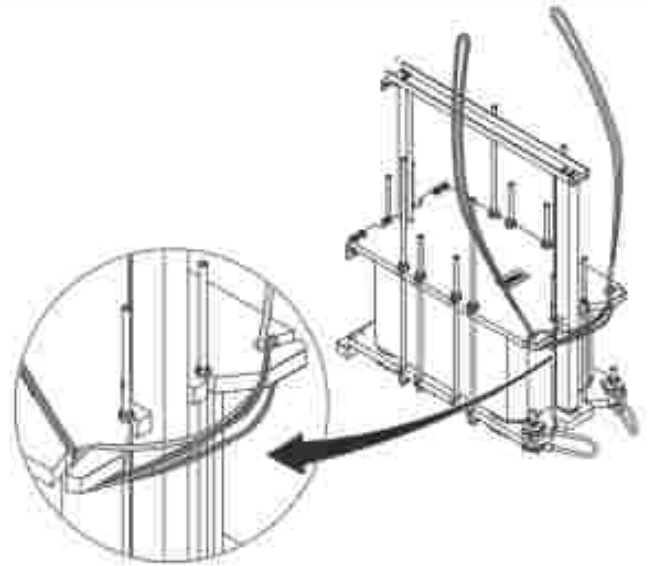
- 4 Thread a hoist sling through the pressure plate keyhole.



- 5 Pull the hoist sling further until you can put in the opposite side keyhole of the pressure plate.

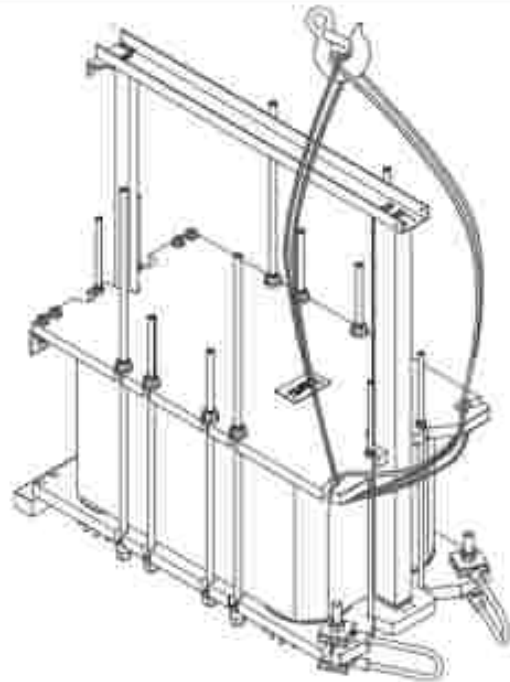


- 6 Thread a second hoist sling in the same way but starting from the opposite side.

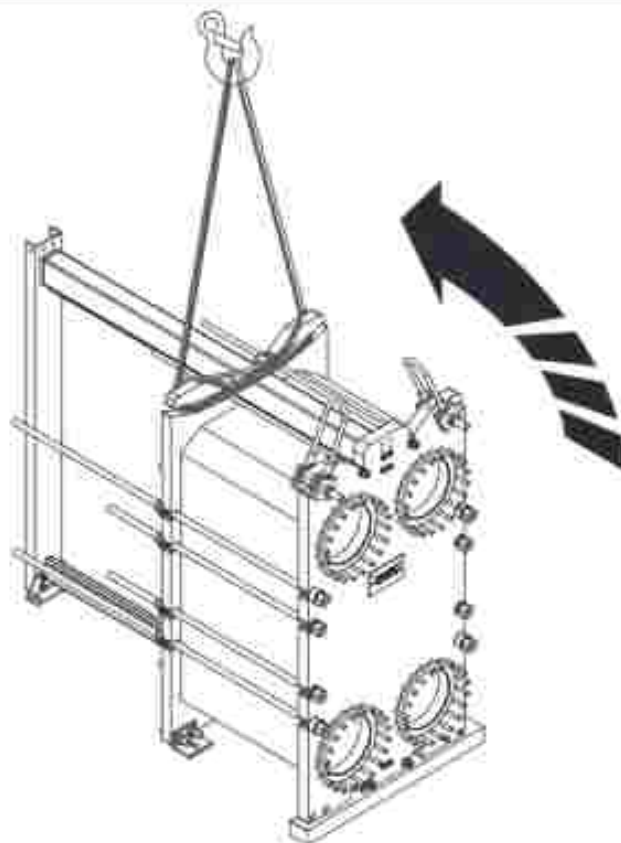


- 7 Stretch the hoist slings and make sure that both fits inside the keyholes.

- 8 Attach the hoist slings to a lifting point.



- 9 Carefully raise the plate heat exchanger. Pay special attention when passing the centre of gravity.



- 10 Remove the hoist slings.
- 11 Assemble the lifting wires back to the pressure plate.
- 12 Gently lift the plate heat exchanger up a bit from the ground. Lift according to the appropriate section in the Chapter *Lifting the equipment*.
- 13 Assemble the feet back to the frame plate.
- 14 Remove the wooden beam.
- 15 Lower the plate heat exchanger to the ground.
- 16 Remove the lifting equipment.

The plate heat exchanger can now be handled according to the lifting instructions in this manual.

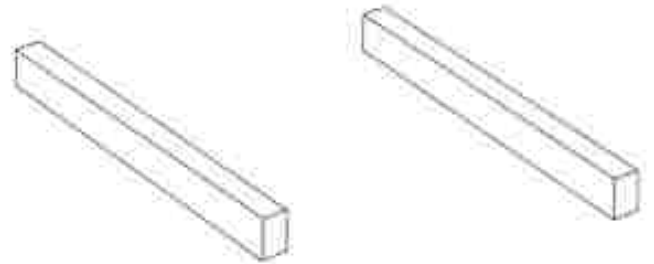
### 4.8.3 Raising using hoist slings around the plate heat exchanger

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

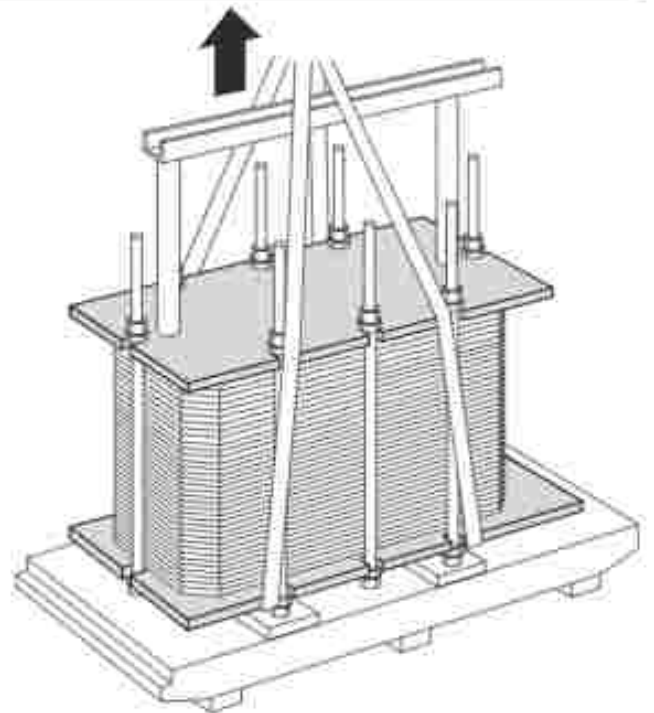
**CAUTION** Risk of damage to equipment.

The hoist slings shall be long enough to be able to rotate the plate heat exchanger without obstruction. Consider especially the space for the support column. Always be careful during the raising procedure to avoid damage to the plate heat exchanger components.

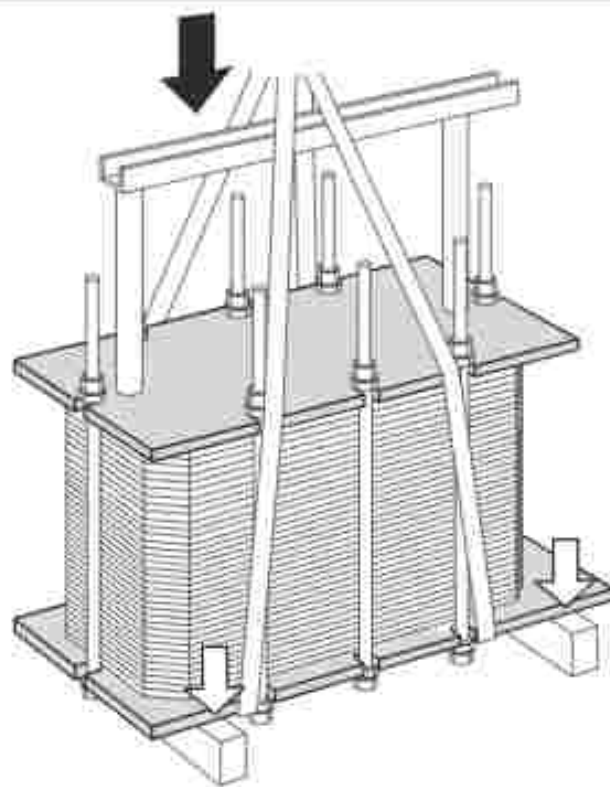
- 1 Place two timber beams on the floor.



- 2 Lift the plate heat exchanger off the pallet using hoist slings.

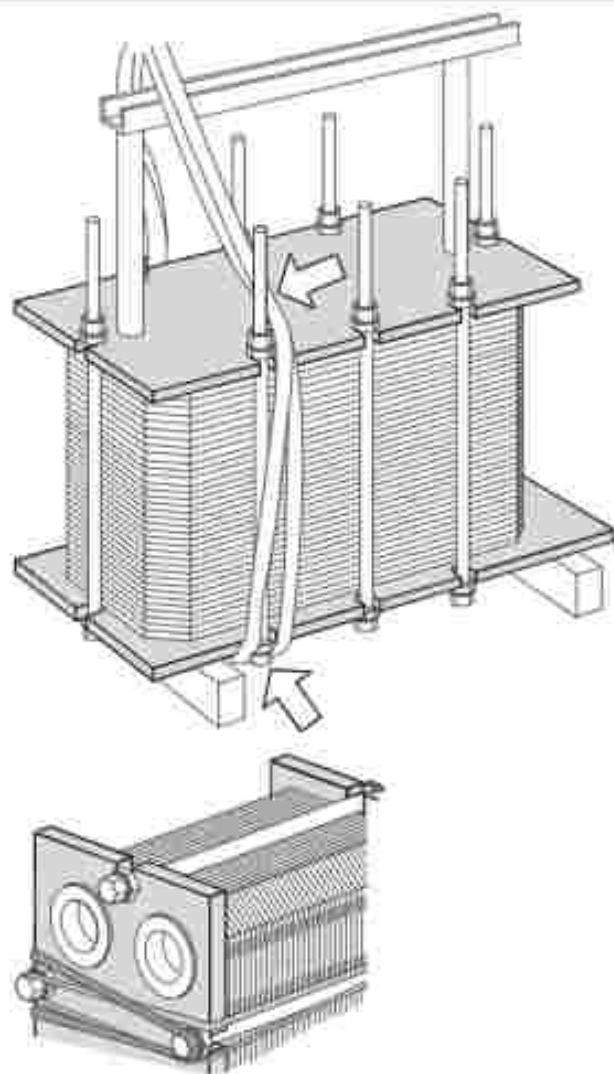


- 3 Place the plate heat exchanger on the timber beams.

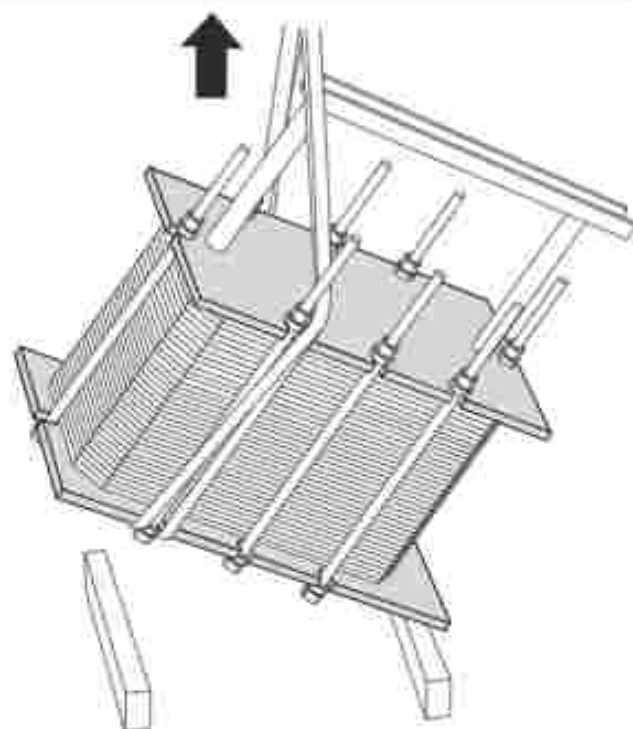




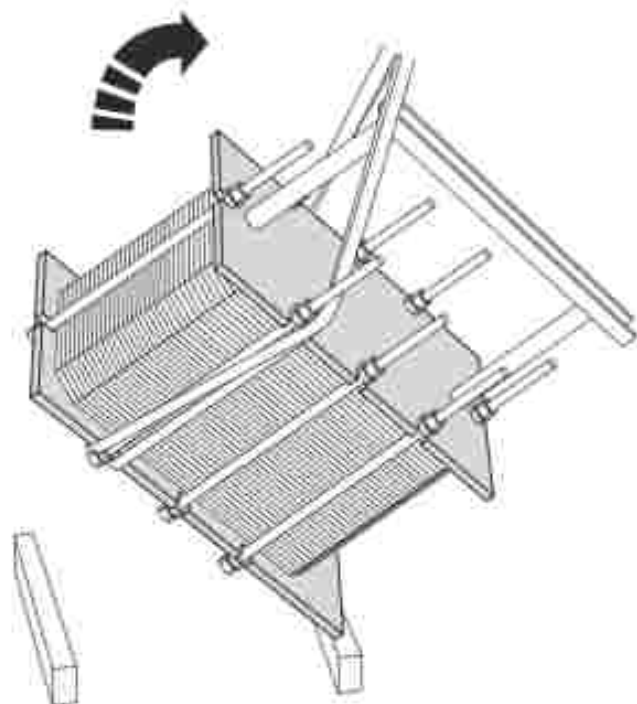
- 4 Place a hoist sling around one bolt on each side.



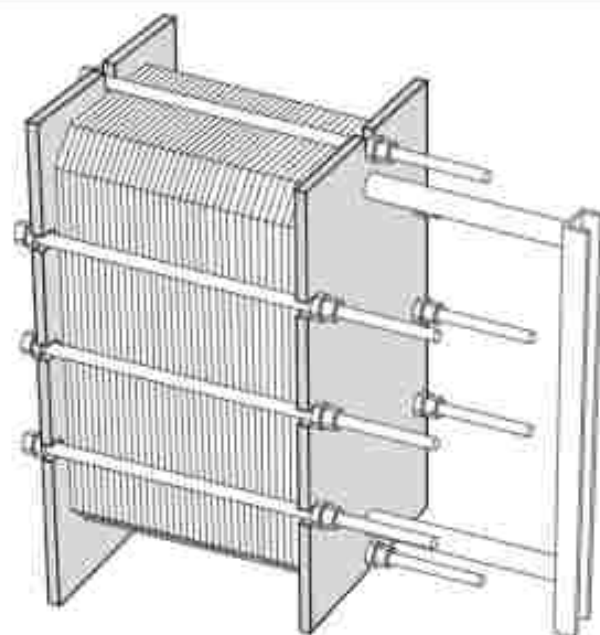
- 5 Lift the plate heat exchanger off the timber beam at one side.



- 6 Carefully move the lifting equipment forward until the plate heat exchanger turns over to raised position. Pay special attention when passing the centre of gravity.



- 7 Lower the plate heat exchanger into a horizontal position and place it on the floor.



## 4.9 Assemble feet

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



**WARNING** Risk of crushing.

The equipment is heavy.

Be careful when handling the equipment. Do not reach in under equipment that is not secured.



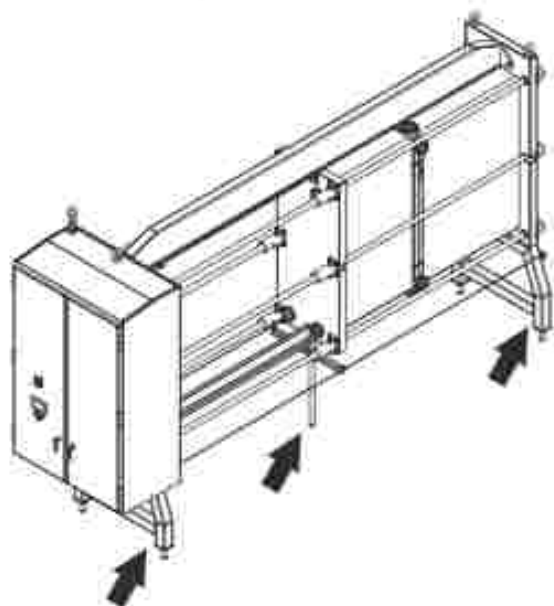
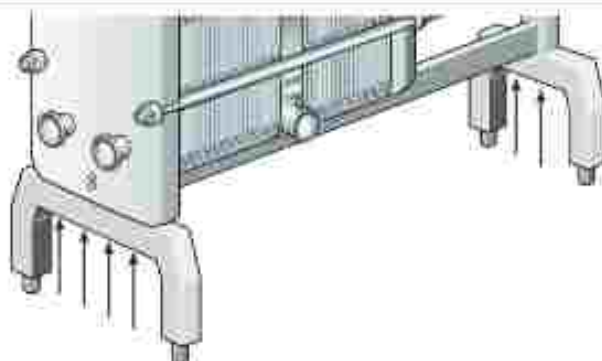
**WARNING** Risk of crushing.

Never work under hanging load.

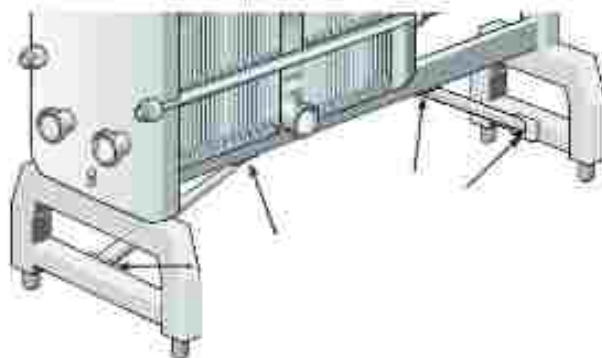
Always make safety arrangement to avoid crushing.

- 1 On delivery, cover plates are attached on the frame plate and support column in the same positions where the stands shall be assembled.
- 2 Lift up the equipment according to Section [Lifting the equipment](#).
- 3 Remove the screws, the washers, and the nuts and then remove the cover plates.

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



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



## 4.10 Inspection before installation

When the equipment is placed in its intended location, always perform the inspections listed below:

- Check the **A** measure (the distance between the inside of the frame plate and the inside of the pressure plate). The **A** measure can be found on the PHE drawing as well as the number of plates.
- Make sure that all bolts are properly tightened.
- Make sure that the stands and feet are properly tightened.
- Check that connection piping can be removed to perform service.
- Make sure that there is enough space to remove plates on one side of the plate heat exchanger.

## 4.11 Start-up

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

**⚠ CAUTION Risk of damage to equipment.**

Before pressurizing the plate heat exchanger, it is important to ensure that the temperature of the plate heat exchanger is within the temperature range as stated in the PHE drawing or on the name plate.

**⚠ CAUTION Risk of leakage.**

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

**⚠ CAUTION Risk of damage to equipment.**

If several pumps are included in the system, make sure you know which one should be activated first. Centrifugal pumps must be started with valves closed and the valves must be operated as smoothly as possible. Do not run pumps temporarily empty on the suction side.

**⚠ CAUTION Risk of damage to equipment.**

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 the 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.

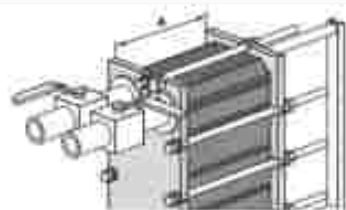
**⚠ CAUTION Risk of damage to equipment.**

Avoid rapid temperature changes in the plate heat exchanger. Slowly increase the media temperature, preferably in steps of 10 °C each sixth minutes. To reach a media temperature of 100 °C should take at least one hour.

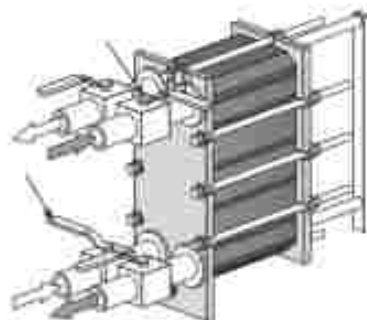
**⚠ CAUTION Risk of damage to equipment.**

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 like 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 shocks for the gaskets and to avoid temporary leakages due to the natural fact that the metal is shrinking very fast.

- 1 Check that all the tightening bolts are firmly tightened and that the A measure is correct. See the PHE drawing.



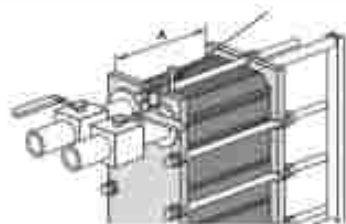
- 2 Check that the valve is closed between the pump and the unit controlling the system flow rate to avoid pressure surge.



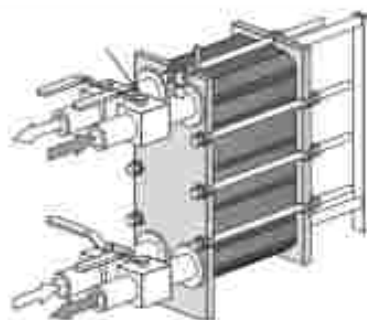
- 3 If there is a vent valve installed at the exit, make sure it is fully open.

- 4 Increase the flow rate slowly.

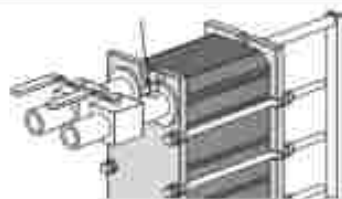
- 5 Open the air vent and start the pump.



- 6 Open the valve slowly.



- 7 When all the air is expelled, close the air vent.



- 8 Repeat the procedure for the second media