AlfaSolar S/SR™ Air Cooled Liquid Coolers

Instruction manual

ORIGINAL INSTRUCTIONS
No. 9460157273-04

Contents

1 How to contact Alfa LU-VE

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Visit alfa.luvegroup.com to get detailed contact information.

Newest manual use link or QR-code: http://alair.techmanuals.info/en/lc/solar/index.html.

2 General information

This instruction manual introduces you to the different situations you may encounter when using this equipment.

Read through this manual carefully, and ensure that it is available for the personnel installing, operating and maintaining the equipment.

If you encounter a problem not reviewed in this manual, contact the closest Alfa LU-VE representative.

Air cooled liquid coolers may be used to cool various process liquids. For this application, the liquid flows through the tubes. This liquid is cooled by the ambient air that is forced through the coil. Depending on the application, air cooled liquid coolers are often referred to as 'radiators' or 'dry coolers'.

2.1 System warranty and disclaimer

This equipment is designed to operate properly and produce rated capacity when installed in accordance with accepted industry standards. Failure to meet the following conditions may result in voiding of the system warranty:

- System piping must be installed following industry standards for good piping practices.
- Inert gas must be charged into piping during welding.
- System must be thoroughly leak-checked and evacuated before initial charging.
- As standard, the electrical connections must comply with the following conditions:
  - Voltages must not exceed ±5 % of nameplate ratings. The frequency is 50-60 Hz.
- Factory installed wiring must not be changed without written approval from Alfa LU-VE

⚠ **Caution:** Follow these instructions to guarantee safe and correct installation, service and use of AlfaSolar S/SR™ series. Do not change or repair the unit without the manufacturer´s permission and instructions. The neglect to follow the instructions may result in warranty expiration.

Disclaimer

This Instruction Manual applies to all AlfaSolar S/SR™ air cooled liquid coolers and is supplied in combination with the Air Cooled Liquid Coolers Product Manual AHE00050. Both manuals must be carefully examined and instructions should be followed up at all times. Alfa LU-VE does not accept liability for any damage resulting from non-compliance to the instructions as given in the manuals and order-related documents.

3 Safety

3.1 Terms used in this manual

Note: Always read this manual before using the equipment.

Note types	
	WARNING: Describes a potentially dangerous situation that may result in personal damage or fatal injury.
⚠	**Caution:** Describes a situation that may result in damage to unit, environment, assembly or service.
	Note: Gives the user a piece of information of particular importance.

3.2 Warning symbols

The following warning symbols are used in this instruction manual.

	**General warning.** Risk of malfunctioning and/or damage.
	**Overhead load.** Never stand or walk below the load.
	**Forklift trucks or other logistic vehicles.** Stay clear of working space.
	**Moving parts.** Danger of injuries. Do not operate without protection guard mounted.
	**Hot surfaces.** Danger of burns. Wear adequate protection.

	**Automatic start-up.**
	**Electric parts.** Switch off power before any handling or maintenance activities.
	**Sharp surface.** Danger of cutting injuries. Wear adequate protection.
	**Crushing of hands.** Hands and fingers can be crushed, pulled in or otherwise injured.

3.3 Prohibition symbols

	**No stepping on surface**
	**Do not extinguish with water** Do not attempt to extinguish with water. Disconnect all voltages sources in the control panel.
	**No open flame. Fire, open ignition source and smoking prohibited** Keep ignition sources away. Do not allow ignition sources to develop.
	**Do not lift with hook / No lift point** Moving parts can crush and cut you. Do not operate with the guard removed.
	**Forklifting not allowed**

3.4 Mandatory action symbols

	**Wear eye protection** Use eye protection: Protective cover, protective glasses or face protection.
	**Connect earth terminal to the ground**
	**Risk of injuries.** Wear protective gloves.
	**Wear protective clothing** Personal protective clothing must be suitable for the working fluid used. It must have good insulation properties.
	**Disconnect before carrying out maintenance or repair** Inactivate the electrical system and secure it against switching on accidentally before starting installation, maintenance or repairs.
	**Check guard** Before starting the machine, check that the guards of the fans are correctly fixed.
	**Risk of injuries.** Wear safety footwear.
	**Risk of injuries.** Wear head protection.
	**Wear ear protection**

3.5 Operator qualification symbols

	**Unskilled worker,** an operator without specific skills that is capable of performing simple tasks on qualified technicians' instructions.
	**Lifting and moving equipment operator,** a qualified operator capable of using the lifting and moving equipment for the materials and machine (while scrupulously following the manufacturer's instructions) in compliance with the laws in force in the nation of use.
	**Electrician,** an authorized electrician capable of making electric connections.
	**Manufacturer's technician,** a qualified technician provided by the manufacturer to conduct operations of complex nature in particular situations or whenever agreed with the user. This person may master mechanical and/or electrician and/or hardware and/or software skills as required.

3.6 Residual risks

	**WARNING:** Lift and transport the units packed in an upright position very carefully. Handle high units very carefully. Never place them on an inclined or uneven plane. Danger of falling. See section Transport and storage on page 25. 
 	**WARNING:** To avoid the falling of a wooden box (optional for Solar SR™): • Stack max 3 units on top of the other. • Place the packages in line. Always store the packages on a level surface. See Figure 10: Wooden box available only for AlfaSolar SR™ on page 32. 



WARNING:

Before lifting the unit, check its weight from the transport documents or from the product nameplate and make sure that the lifting device, crane or truck is appropriate.

1. Only use lifting equipment that is equipped with appropriate labels.
2. Ensure that the belts or slings with hooks used for lifting keep the equipment balanced.
3. Do not lift the unit with a crane before removing the pallet from under the unit.

Do not stand under the unit when it is hanging.

WARNING:

Always install the units in a place with no entrance for outsiders.

WARNING:

Do not walk or step over unprotected heat transfer section, since besides being damaged it can generate an accident or a risky situation.

WARNING:

If you must step on the unit for maintenance purposes, always wear safety shoes.

Use proper safety devices that prevent falling.

Do not step over SM/SRM™ units.

WARNING:

Before switching on the unit, always ensure that everyone is at a safe distance from the unit.

WARNING:

Risk of slipping or falling down.

WARNING:

Each fan is equipped with a fan guard and a lockable service switch. The wire spacing in the fan guard and the safety distance of the blade correspond to the European safety standard. The safety guards are protections from contact only.

Do not remove the safety guard before the fan is shut down. The rotating impeller may catch in your clothes, cut you or pull you in.

WARNING:

Breaks in pressure pipes or components may cause injuries. Do not exceed the unit design pressure. Only perform maintenance work on pressurized parts when the unit is empty.

WARNING:

In operation, the heat transfer section and pipe temperatures exceed 45 °C. Contact may cause burns. Use hand protection.

Hot air over the unit when the unit is operating. Never work a long time over the unit when it is operating.

WARNING:

Only an authorized electrician may perform the electric connections.

WARNING:

Before starting the service operation, ensure that the electrical supply is reliably isolated; use the lockout/tag-out system. Always check with a voltmeter that the unit is electrically isolated and shut off.

WARNING:

Ensure free space in front of the electrical cabinet according to local regulations.

WARNING:

EC-fans: Electrical load (>50 µC) between mains wire and protective earth connection after switching of the supply when switching multiple devices in parallel.

Electric shock, risk of injury. Ensure that you have sufficient protection against accidental contact.

Before working on the electrical connection, short the connections to the mains supply and PE.

EC-fans: Terminals and connections have voltage even in a unit that is shut off.

Electric shock. Wait for five minutes after disconnecting the voltage at all poles before opening the device.

WARNING:

Fans with Inverter: Terminals and connections have voltage even in a unit that is shut off.

Electric shock. Wait for 15 minutes after disconnecting the voltage at all poles before opening the device.

WARNING:

EC-fans: High temperature at the electronics enclosure. Danger of burn injuries. Ensure that you have sufficient protection against accidental contact.

WARNING:

Cutting and crushing hazard when removing the spare parts from the packaging. Wear safety shoes, safety helmet and cut-resistant safety gloves.

	WARNING: Follow the recommendation of the working fluid supplier (Material Safety Data Sheet) strictly. Prevent the accidental release of fluid and adopt the visual and acoustic alarms to minimize the consequences of insufficient amount of fluid. Plan the installation field for recovering or disposing of the fluid.
	WARNING: Before washing the heat transfer section, read the Material Safety Data Sheet of the detergent and follow the manufacturer´s instructions. When vacuum-cleaning and washing the heat transfer section, use protection glasses, safety gloves, safety shoes and other personal protection. 
	WARNING: Depending on the installation and operating conditions, a sound pressure level greater than 70 dB(A) may arise. Use appropriate ear protection. 
	WARNING: Sharp edges. Use protection glasses, safety gloves, shoes and clothes. 
	WARNING: Ensure that the unit is electrically isolated and dead before discarding and demolishing it. 
	WARNING: Do not lift the unit before it is fully empty.
	WARNING: Before moving to the solution, ensure that the unit is in safe condition. See Residual risks.

- The cables may carry voltage even when the unit is powered off.
- The action service switch on/off restarts the machinery/fan. Take appropriate precautions.
- All the main pressure bearing parts of the air heat exchanger (AHE) are designed according to PED 2014/68/EU and Harmonized standards only for internal pressure within the limits of maximum design pressure (PS) and maximum operation temperature (TS) pointed out in the nameplate (positive pressure).
- The end user is responsible for adopting the suitable safety devices against overpressure and overheating (i.e. safety valves).
- The stop/emergency stop device is not supplied by the manufacturer, because the total process risk may increase or a new risk would be introduced by the action of a localized stop/e-stop system.
- S-models without service switches (and without SW or cabinet options): The end user is responsible for securing the equipment, that is, for switching off the installation/machine where the fan is installed and for securing it from being switched on again.
- The end user is in charge of the periodic inspection of the safety devices installed on the air heat exchanger (AHE) according to the national regulations.

3.7 Additional remarks

Caution:

The venting/draining valve of the liquid coolers is not suitable for heat transfer fluids based on potassium formiate. There is a danger of leakage.

When using heat transfer fluids based on potassium formiate, the piping system and venting/draining valves of the heat transfer section must be adapted for the heat transfer fluid in question. Always check this from documentation.

Follow the instructions of the heat transfer fluid supplier at installation, pressure testing, startup, operation and maintenance.

Caution:

Only a skilled mechanic using proper tools and approach may discharge and assemble the motor. The mechanic must perform the repair work according to the standard IEC-60079-19. Under the period of guarantee, always return a faulty motor to the supplier. Do not demolish it.

Always use the spare part motor available from Fincoil LU-VE Oy to guarantee its applicability to the operating conditions.

4 Electrical safety checklist

All installation, controls, service, repair, and maintenance employees must have this list with them at every job and read it through before starting the job.

Note: These are the minimum requirements. If you do not meet these requirements, do not start the work.

4.1 Lockout and tagout

Proceed as follows:

1. Notify affected persons of the shutdown.
2. Shut down the equipment.
3. Disconnect, lock and tag all energy sources.
4. Release any stored energy (capacitors, transformers, etc.).
5. Ensure that all employees working on the equipment have their personal locks in place.
6. Prior to servicing the equipment, ensure with a ”proximate voltage sensor” that the frames or control enclosures of the equipment are not energized.

7. Check that the circuit-testing devices function.
8. Verify the absence of electrical current or voltage with a circuit-testing device.

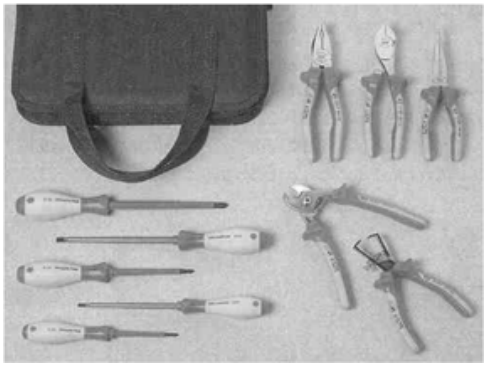
   Use insulated gloves and an insulated mat.

9. Notify affected persons of the reconnecting of electrical power.

4.2 Diagnosing a problem where power is required

Remove all conductive clothing or accessories.

Use insulated tools and safety glasses.



Do not work on electrical circuits greater than 600 volts, unless you have specific training.

Suspend work or have a shelter during adverse weather conditions.

Use a certified insulated mat to stand on while doing the testing.

Use certified electrical insulated gloves while doing the testing.

After completing the diagnostic and maintenance work, you must complete logout and tagout.

4.3 Tools and equipment (PPE)

Ensure that the electrical equipment you are working on is grounded.

Ensure that electrical power tools are double insulated or have a ground plug.

Use Ground Fault Circuit Interrupters (GFCI).

Inspect power tools, insulated hand tools and electrical cords for damage.

Do not use damaged tools and cords.

Do not use conductive equipment, for example, metal ladders.

5 General description

5.1 Equipment description

AlfaSolar S/SR™ series are designed for outdoor cooling with water, various oil solutions and other working fluids, which do not corrode copper, aluminum or brazing material (EN ISO 17672 Cup 279).

The SR™ models are specially designed for industrial cooling applications, because they allow higher customization based on customer needs.

To avoid outer corrosion of the heat transfer section, always ensure that the material of the fins and heat transfer tubes is suitable for ambient conditions. The air must be clean of any particles, which together with humidity or any other solvent might form corrosive combinations on fins or heat transfer tubes.

The manual also concerns non-standard SR™ models with different specialties and options like double circuiting, forced draught fans (FD), higher mounting legs, etc. If your model is non-standard, always check from the delivery documents how to take the difference into account in installation, use and service.

Code description

Code Description (SM and SD models)

S	D	4	B	09	TE	N5	Y	4	H	GS	P	*	-	AL	2.3	CU	132	1	x	DN65				*
1	2	3	4	5	6	7	8	9	10	11	12	13		14	15	16	17	18		19				23

Code Description (SRM and SRD models)

SR	D	4	B	09	T	N5	Y	42	H	GS	P	B	-	AL	2.3	CU	132	1	x	DN65	+	66	1	x	DN80	*
1	2	3	4	5	6	7	8	9	10	11	12	13		14	15	16	17	18		19		20	21		22	23

1 Solar stdandard or customized liquid cooler/radiator
2 Unit width (M=narrow, D=wide)
3 No. of modules
4 Module length (A=1400 mm, B=1800 mm, C=2100 mm)
5 Fan diameter (09 =910 mm, 12 =1240 mm)
6 Fan speed EC (D/Y (rpm): TE=100/890, SE =781/695, LE=621/560, QE=511/440, RE=385/345)
SR:Fan speed IEC (T=950, S=720, L=560)
7 Power supply (N5=3/380-420V/50 Hz, N6 = 3/440-480V/60Hz, N7=3/230/60, N8=3/690/50, NE= Special)
8 Fan motor connection SR: IEC(D=delta, Y=star),
EC fan speed (D/Y (rpm): TE=1000/890, SE =781/695, LE=621/560, QE=511/440, RE=385/345)
9 Number of tube rows in air direction S: 1-digit SR 1-/2-digit (LT-circuit HT circuit)
10 Air flow (H= vertical, V= horizontal)
11 Casing matrial/coating (GS = uncoated, GPU, **only SR:GP1, GP2, GP3**)
12 Packaging (P = Pallet, PP = P + protection frame on top, PH = PP +
fin surface protection, PT = PH+ light tarpaulin cover, **only SR:CN =Container, WB = wooden box**)
13 Electrical asessories (S: service switch SW as option for fan, SR:service switch SW for fan as standard)
14 Fin material (AL =aluminium, EP = epoxy pre coated, **Only SR:IF= industrial aluminium, CU = copper, SWR = AlMg**)
15 Fin spacing (mm)
16 Tube material (CU = Copper, CT = Copper with internal turbulators)
17 No. of circuits or No. of LT circuits
18 No. of connections or No. of LT connections (1= one inlet/outlet, 2= two inlets/outlets)
19 Liquid inlet/outlet connection size or LT liquid inlet/outlet connection size (e.g DN 65 or AN2.5" for ANSI dimensions)
20 No. of HT circuits (if 2-circuit application), (1= one inlet/outlet, 2= two inlets/outlets)
21 No, of HT connections (1= one inlet/outlet, 2= two inlets/outlets)
22 HT liquid inlet/outlet connection size (e.g DN 80 or AN3" for ANSI dimensions)
23 Mechanical options

For details, see S/SR™ series product-specific documentation.

Note: With Solar S™ models, only limited options are available.

5.2 Technical data

Design basic:

Wind load	40 m/s (installed unit)
Earthquake	0.2 g
Altitude	<100 M.A.S.L.
Minimum ambient air temperature	-40 °C (standard unit)

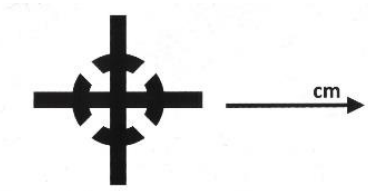
Note: See project-specific documentation for technical data, product designation, performance data, lifting/fixing points of fan motors, weights, internal volumes, and position of connections.

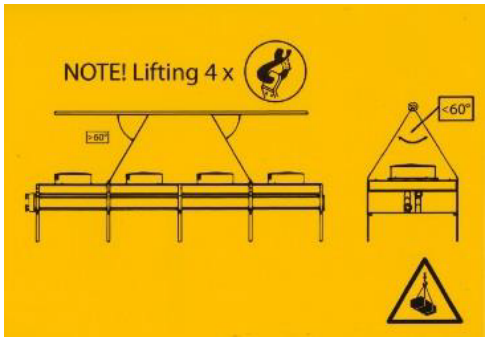
5.3 Identification of product

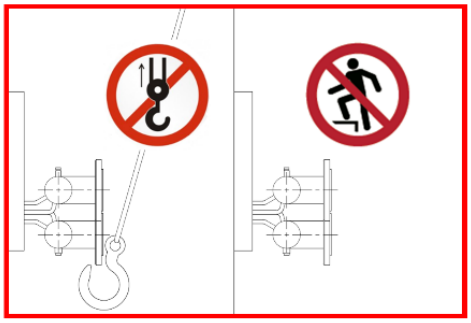
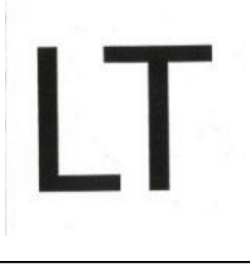
Check the identification data on the product nameplate. The nameplate is located at the same end of the unit as the inlet connections. The product nameplate includes contact information of the manufacturer, product designation, number of order acknowledgement, technical data of the fan motor, operating/test pressure, min/max operating temperature, internal volume, weight, month/year of manufacture and (if required) CE or EAC marking. CE marking is available for SR™ models on request.

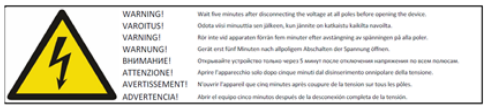
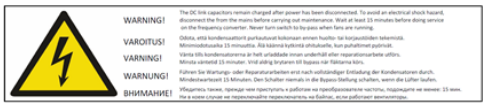
Product labels

Table 1: Product labels

<table>
<tr><td> 
</td><td colspan="2">Centre of gravity
When lifting the unit with a forklift, always place the forks under the centre of gravity.</td></tr>
<tr><td rowspan="11"> 
</td><td colspan="2">Product nameplate</td></tr>
<tr><td>Model</td><td>See Equipment description on page 18</td></tr>
<tr><td>O.A.</td><td>Order Acknowledgement number</td></tr>
<tr><td>Serial no: Ref</td><td>Communicate these when ordering spare parts as they identify the unit</td></tr>
<tr><td>Unit net weight</td><td>Check weight before any lifting operation to ensure that proper lifting tools are used</td></tr>
<tr><td colspan="2">Coil data</td></tr>
<tr><td>Material</td><td>Tube material</td></tr>
<tr><td>Volume</td><td>Internal volume</td></tr>
<tr><td>Fluid group</td><td>According to PED</td></tr>
<tr><td>max DN</td><td>Maximum diameter of the distributor tube</td></tr>
<tr><td>Coil TS</td><td>Range of operating temperatures for the coil</td></tr>
<tr><td>PS</td><td>Design pressure</td></tr>
<tr><td>PT</td><td>Test pressure</td></tr>
</table>

	Test date:	Date on which the factory has pressure tested the coil
	**Fan direction** Fan rotation direction (IEC-fan packages)	
	**Electrical warning** Electrically powered component. Switch off power supply before any maintenance or installation operation	
	**Hot surface warning**	
	**Lifting points** H-position lifting	
	**In/out** Fluid connections inlet and outlet	
	**Eurovent** Product is included in Eurovent Certify all program (only units where applicable)	
	**Pressure tested**	

	**Do not step over the header** Do not lift from the header
	**Only for transportation** Remove components with this sticker before installing the cooler
	**Operation notes**
	**Low Temperature circuit (only for two circuit models)** Identifies the Low Temperature circuit
	**High Temperature circuit (only for two circuit models)** Identifies the High Temperature circuit

	**Option: EC cabinet** Wait 5 min before opening
	**Option: Cabinet delivered with frequency converter** Wait 15 min before opening. Never turn the switch by-pass when the motors are running

Models according to air flow direction (induced fans)

SM/SRM™ narrow coil single fan row unit is on the left. SD/SRD™ wide coil units in dual fan row is in the middle and single fan row on the right.

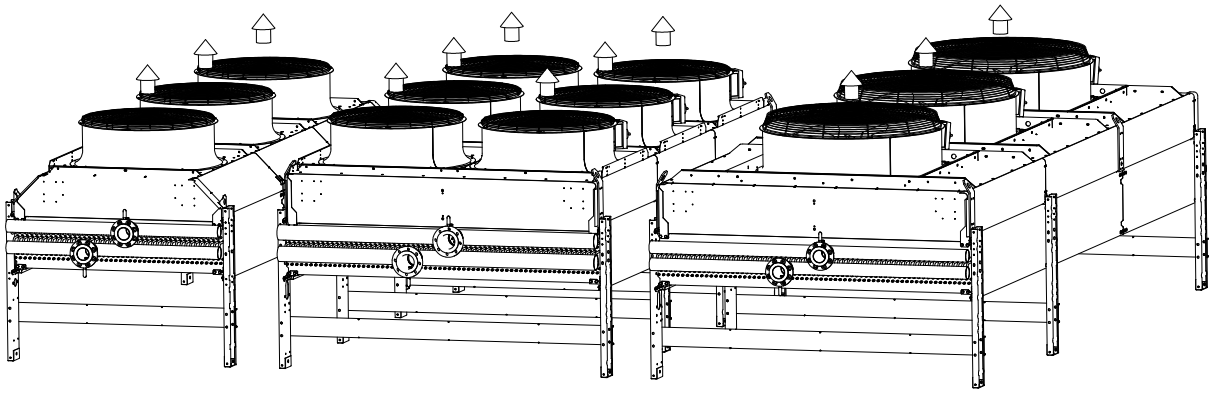


Figure 1: AlfaSolar S/SR™ series, vertical air flow

SM/SRM™ narrow coil single fan row unit is on the left. SD/SRD™ wide coil units in dual fan row is in the middle and single fan row on the right.

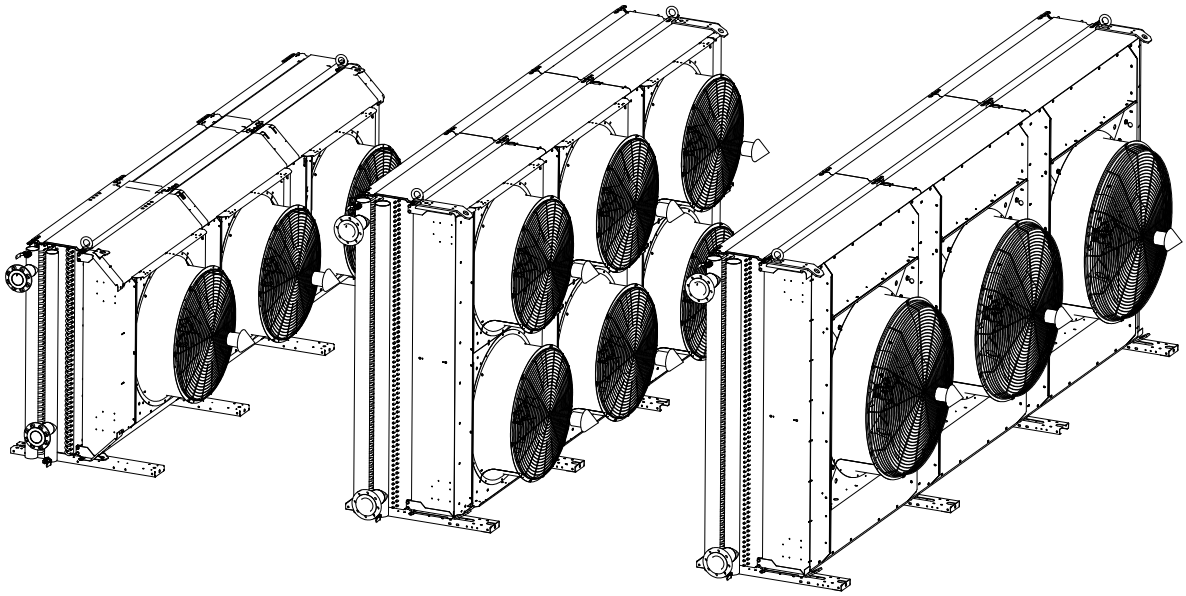


Figure 2: AlfaSolar S/SR™ series, horizontal air flow

Models with forced draught fans (option-FD) according to air flow direction

Note: These models are only available for the industrial AlfaSolar SR™ series.

SM/SRM™ narrow coil single fan row unit is on the left. SD/SRD™ wide coil units in dual fan row is on the right.

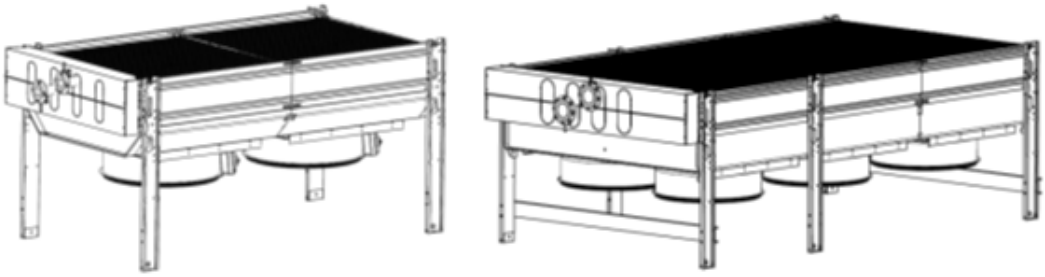


Figure 3: AlfaSolar SR™ series FD models, vertical air flow

SM/SRM™ narrow coil single fan row unit is on the left. SD/SRD™ wide coil units in dual fan row is on the right.

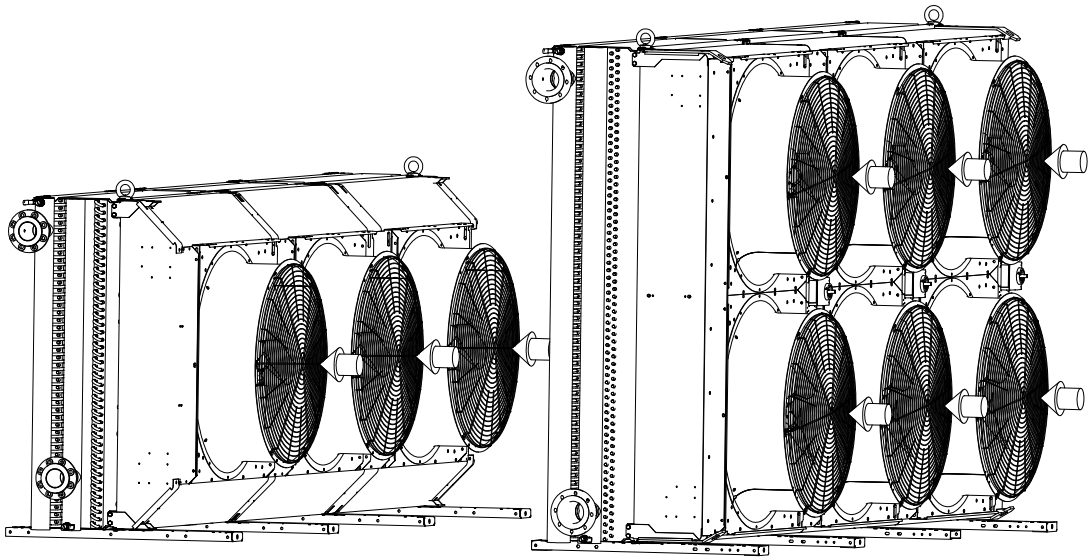


Figure 4: AlfaSolar SR™ series FD models, horizontal air flow

6 Transport and storage

6.1 Lifting package

WARNING:

Lift and transport the units packed in an upright position very carefully.

Handle high units very carefully. Never place them on an inclined or uneven plane.

Danger of falling.

Before lifting the unit, check the weight on the nameplate. Verify that the lifting supports at least the unit weight +10 %, when using a forklift. Only lift from the middle of the unit at the center of gravity supported by the pallet. For safe lifting, the forks must be longer than 2.5 m and fully inserted under the unit. Position the forks to the maximum width over the area supported by the pallet. Only lift an empty unit.

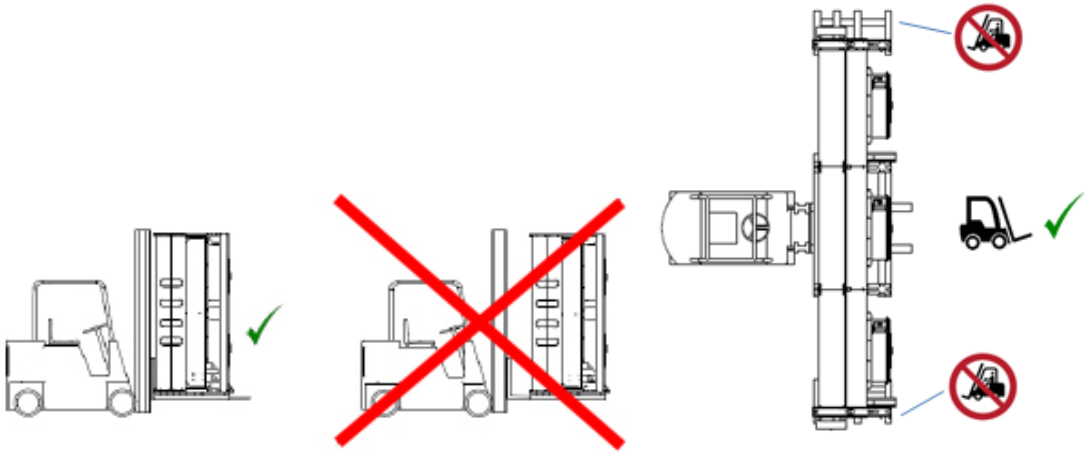


Figure 5: Correct lifting of AlfaSolar S/SR™ units with forklift

Before starting lifting, make sure that	✓
The manual is attached.	
You have noted all transport and lifting signs and instructions from the unit and packaging.	
You have made necessary advance control.	
You have checked the lifting device and it is functioning properly.	
The driver has the permission for lifting.	

Before starting lifting, make sure that	✓
The ground under the unit has enough bearing capacity.	
The device is correctly erected and horizontally installed.	
The support legs are in supporting position.	
The lifting capacity of the device is sufficient.	
The operators know how to use the lifting device according to the operation and safety instructions.	
No electric or other cables are near the lifting place.	
The working area of the lifting device is sufficient and safe.	
There are no obstacles or risks on the working area.	

In Figure 6: Units packed in different positions on page 26, on the left there is a unit packed in an upright position. In the middle, there is a unit packed in horizontal position. On the right, there is a unit with forced draught (FD) fans, delivered in the operation position.

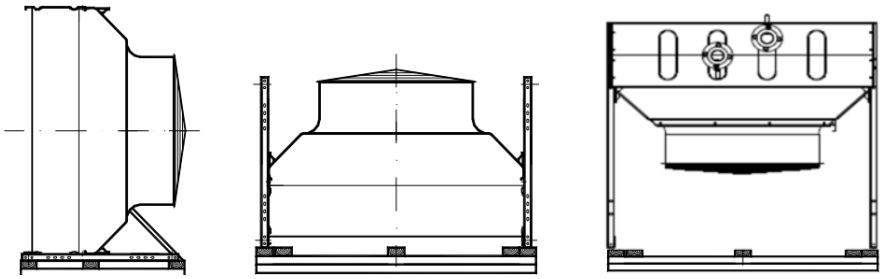


Figure 6: Units packed in different positions

Both in upright and horizontal transport position, the vertical air flow unit with has its legs fixed to the pallet. The legs are installed in the transport position. The lifting/turning lug, turning supports and horizontal leg support are delivered loose in the same package. The lifting/turning lugs and turning supports (not included in the FD units) are only delivered with the models packed in an upright position.

A horizontal air flow unit, packed in an upright position, is fixed to the pallet with a mounting rail. The lifting lug is delivered loose in the same package.

When you lift the package with a forklift truck, use the lifting point at the lengthwise center of gravity and ensure that it is in the middle, between the forklifts. When lifting a long unit, position the forks to the maximum width over the area supported by the pallet.

⚠ **Caution:** Check that the unit is tied tightly to prevent it from moving during transport. Ensure that the binding does not damage the unit.

6.2 Unloading unit from standard truck

Unload the unit from the side of the truck with a forklift. See Figure 5: Correct lifting of AlfaSolar S/SR™ units with forklift on page 25.

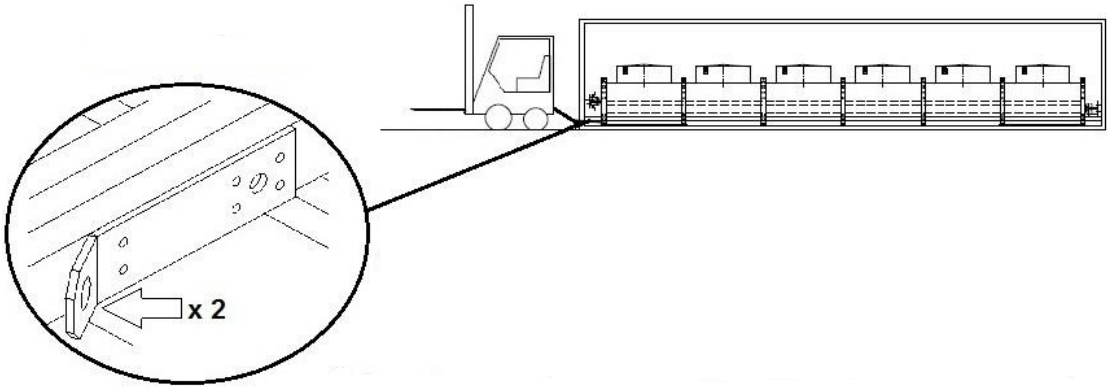
For general instructions to unload the unit from container, see Unloading horizontal unit from container (Container on ground level) on page 27, Unloading horizontal units from container (Container on wheels)

on page 27, Unloading vertical units from container (Container on ground level) on page 28 and Unloading vertical units from container (Container on wheels) on page 29.

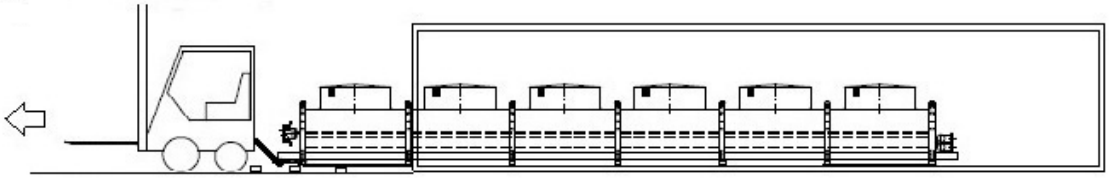
When lifting with crane, see Turning and lifting unit on page 33.

6.2.1 Unloading horizontal unit from container (Container on ground level)

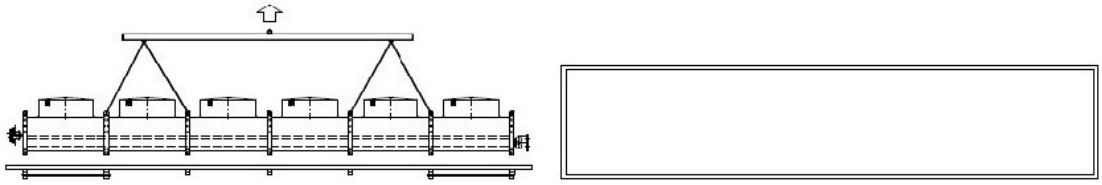
1. Use a chain with hooks to pull out the unit. Attach the hooks on both pull out plates mounted on the wooden pallet.



2. Use wooden balks under the unit to prevent fall impacts.

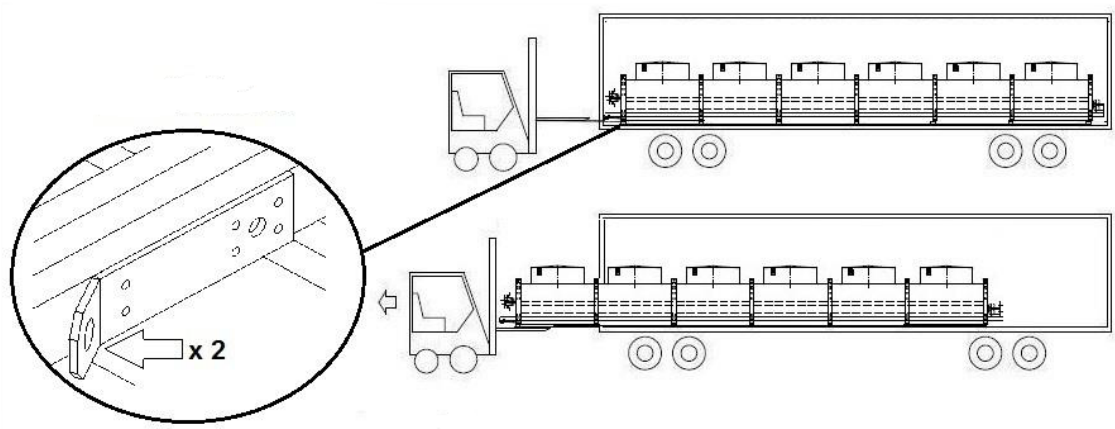


3. When the unit is pulled out, remove the pallet. Lift the unit by crane.



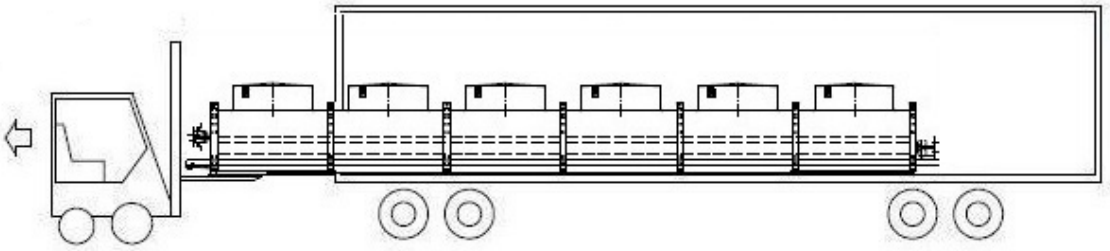
6.2.2 Unloading horizontal units from container (Container on wheels)

1. Use a chain with hooks to pull out the unit. Attach the hooks on both pull out plates mounted on the wooden pallet.

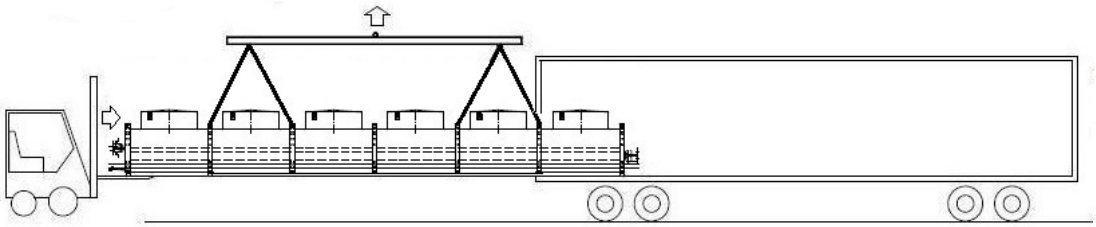


2. Hold up the end of the unit and continue pulling out.

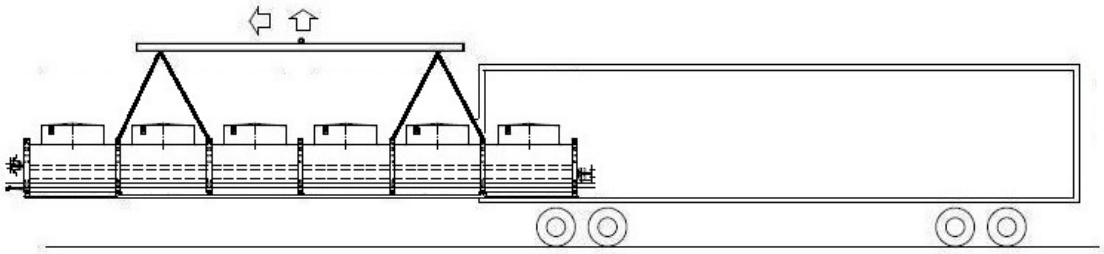
Note: Notice the weight of the unit to ensure safe lifting.



3. When the second pair of lifting eyes is outside the container, attach the lifting crane.

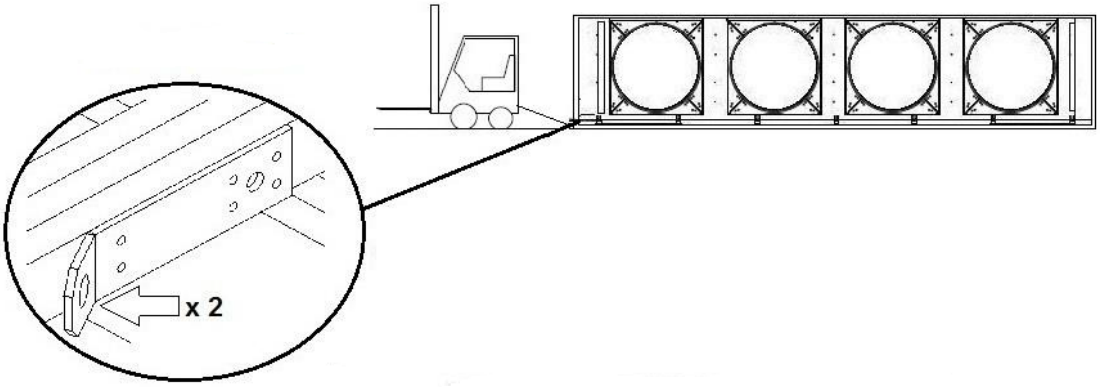


4. When the lifting crane holds up the unit, remove the fork-lift and lift the unit out of the container.

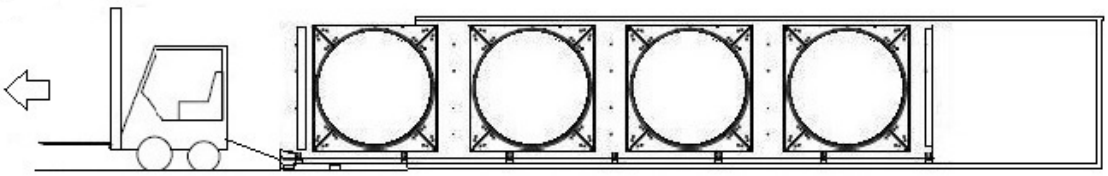


6.2.3 Unloading vertical units from container (Container on ground level)

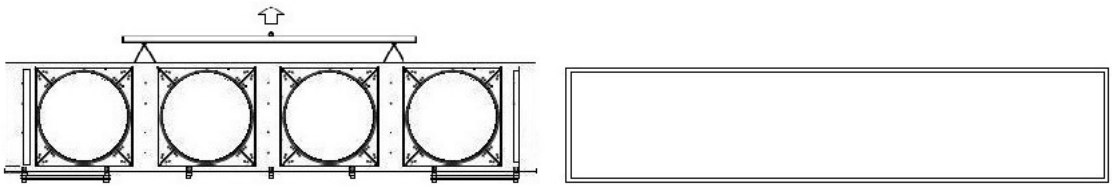
1. Use a chain with hooks to pull out the unit. Attach the hooks on both pull out plates mounted on the wooden pallet.



2. Use wooden balks under the unit to prevent fall impacts.

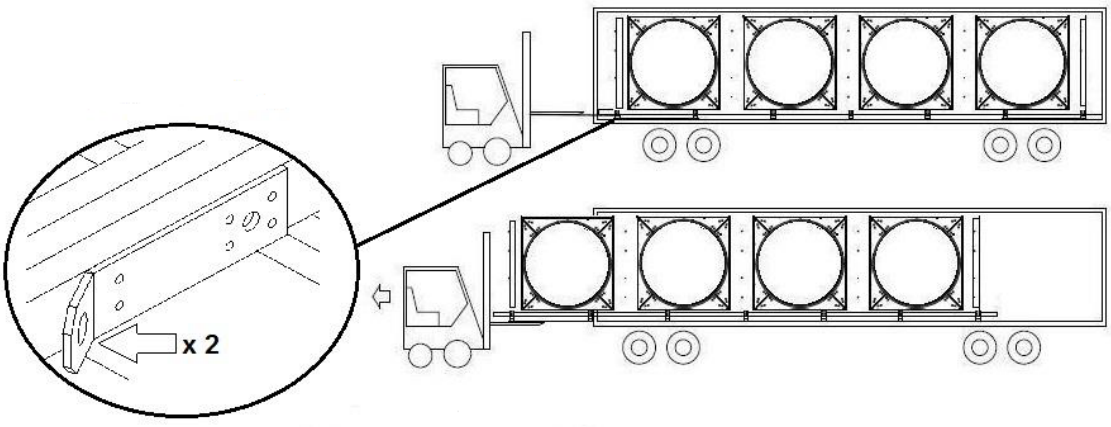


3. When the unit is pulled out, remove the pallet. Lift the unit by crane.



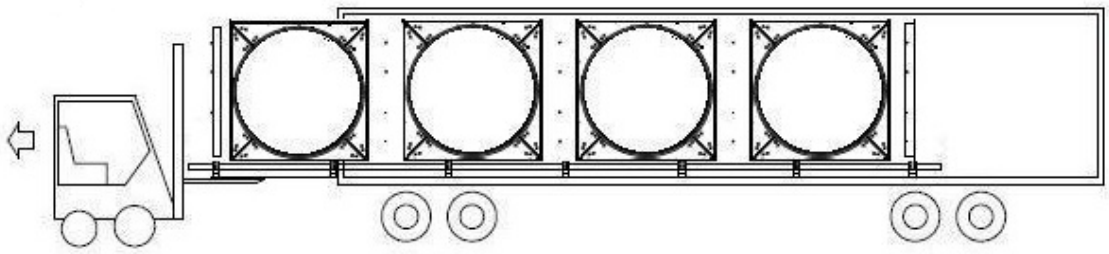
6.2.4 Unloading vertical units from container (Container on wheels)

1. Use a chain with hooks to pull out the unit. Attach the hooks on both pull out plates mounted on the wooden pallet.

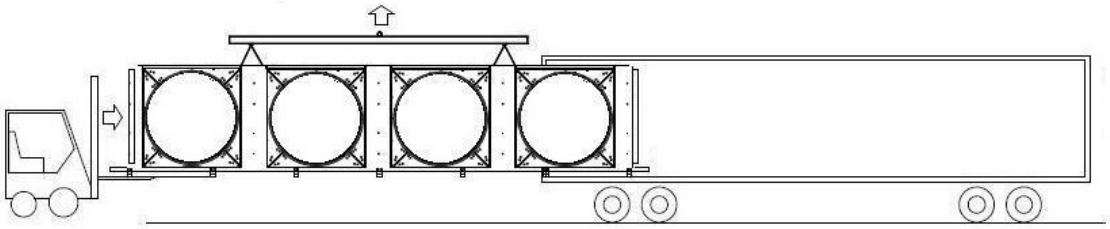


2. Hold up the end of the unit and continue pulling out.

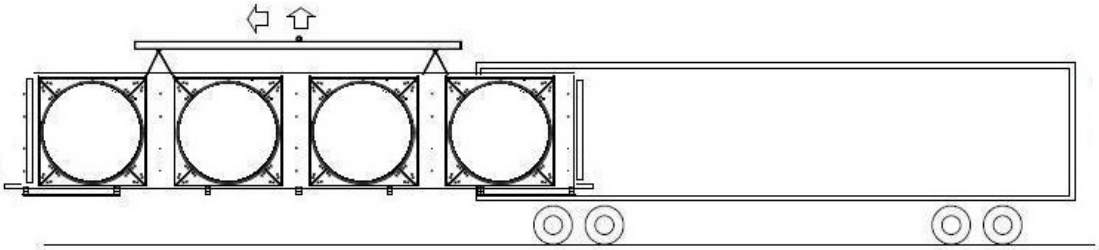
Note: Notice the weight of the unit to ensure safe lifting.



3. When the second pair of lifting eyes is outside the container, attach the lifting crane.



4. When the lifting crane holds up the unit, remove the fork-lift and lift the unit out of the container.



6.3 Packing

The following loose deliveries are always fastened to the pallet:

Option: Counter flanges and gaskets	Wooden box installed to the pallet
Option: Vibration dampers	Installed to the pallet
Option: Expansion joints and gaskets	Wooden box installed to the pallet

The standard truck pallet has two protection options: Hardboard coil protection and upper part fastening protection.

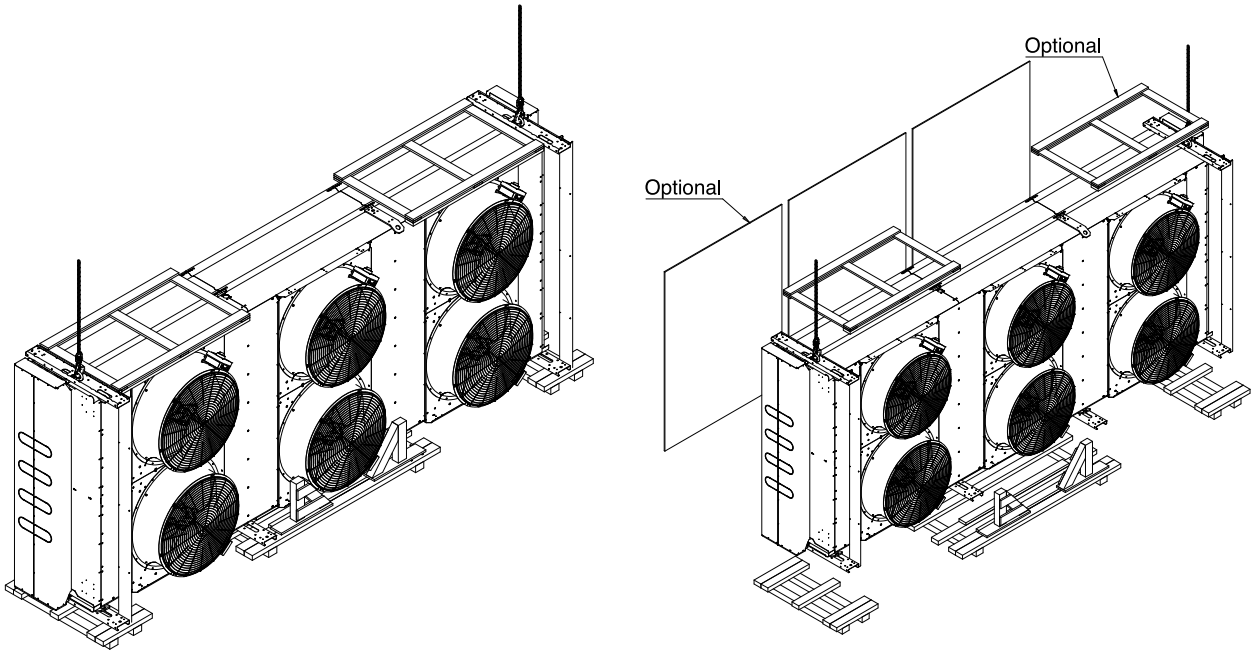


Figure 7: Upper part fastening protection (left) and hardboard coil protection (right)

When possible, high mounting legs are delivered on the pallet below the unit. Otherwise, the legs are delivered separately.

Note: Do not lift the unit with the pallet when high mounting legs are mounted on the pallet.

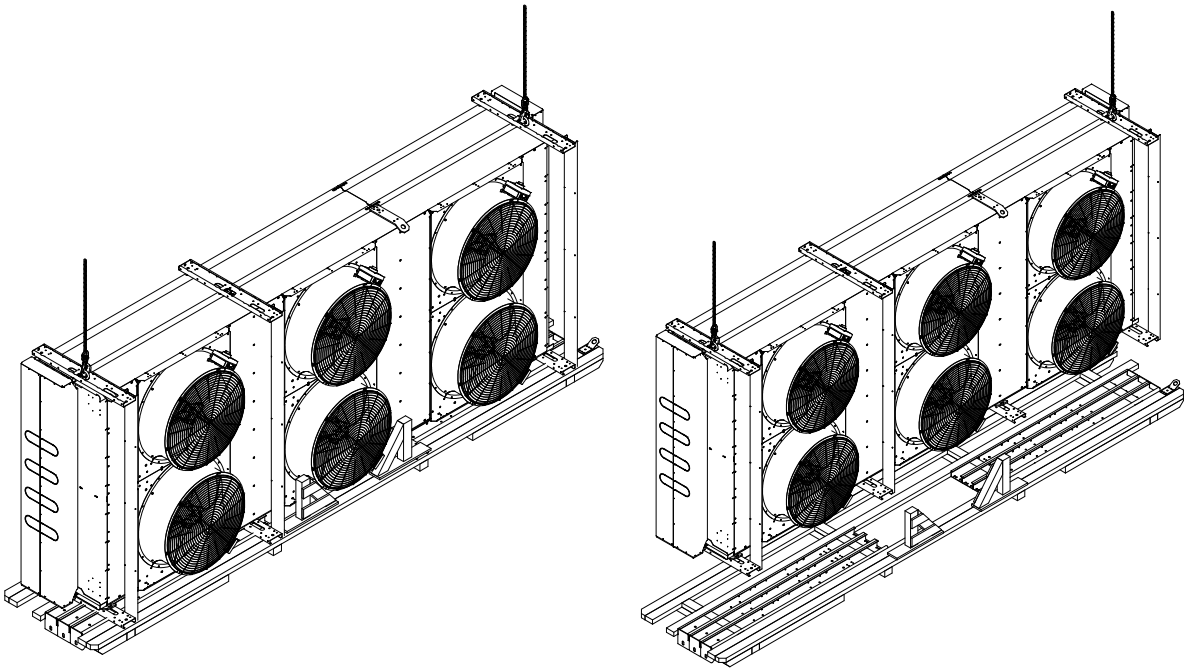


Figure 8: High mounting legs packing arrangement for truck and container transport

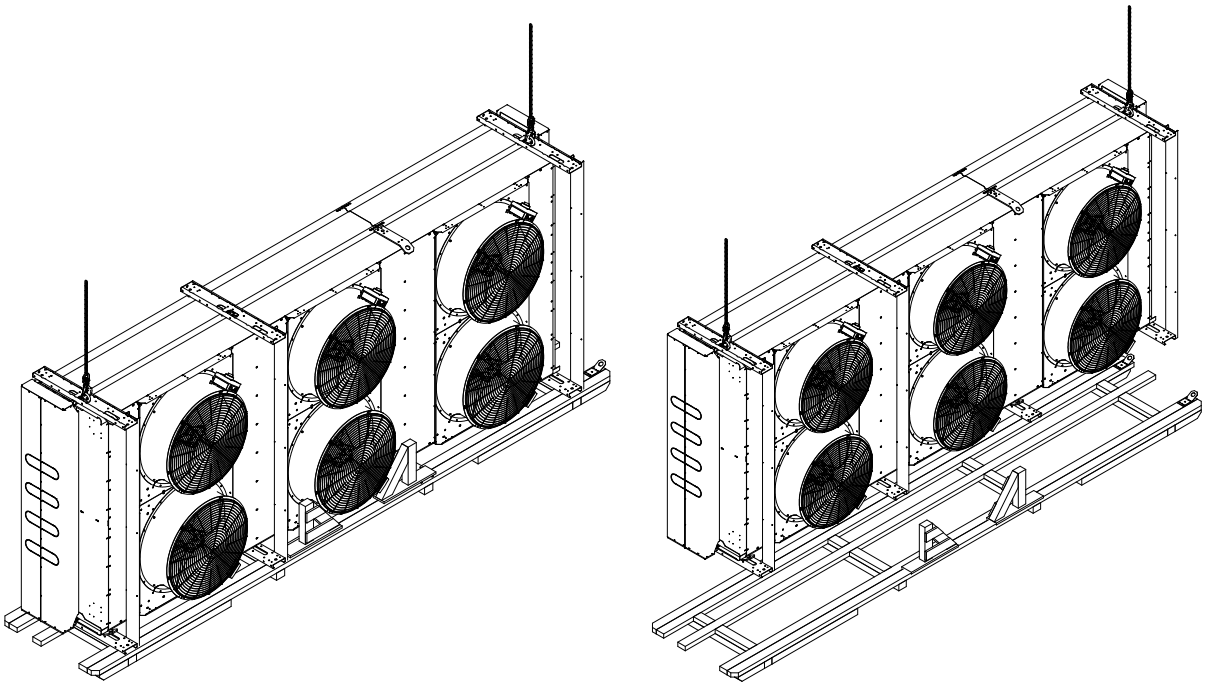


Figure 9: Container package only for Solar SR™

A wooden box protects the liquid cooler in the best way during long-term storage. If possible, store the packages in a dry room with even temperature. If you store the liquid cooler outdoors, make sure that there is no snow or other substance on the package to avoid impressions, water-logging or decay, and to prevent water running into the package. Also make sure that the vent holes on the package are clean to enable inside moisture evaporation. If there is moisture between the liquid cooler and the plastic cover, white rust forms on the hot dip galvanized surfaces. Often this is an esthetic deficit only.

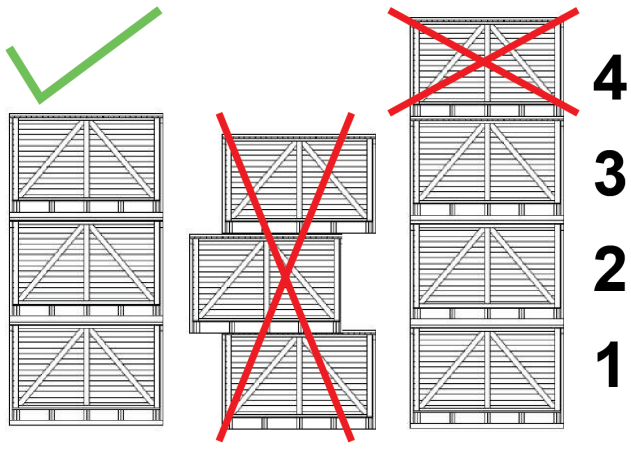


Figure 10: Wooden box available only for AlfaSolar SR™


WARNING:

To avoid the falling of a wooden box (optional for Solar SR™):

- Stack max 3 units on top of the other.
- Place the packages in line.

Always store the packages on a level surface.

See Figure 10: Wooden box available only for AlfaSolar SR™ on page 32.

6.4 Turning and lifting unit

Note: Contact the manufacturer for further information on turning and lifting the forced draught fans (FD).



WARNING:

Before lifting the unit, check its weight from the transport documents or from the product nameplate and make sure that the lifting device, crane or truck is appropriate.

1. Only use lifting equipment that is equipped with appropriate labels.
2. Ensure that the belts or slings with hooks used for lifting keep the equipment balanced.
3. Do not lift the unit with a crane before removing the pallet from under the unit.

Do not stand under the unit when it is hanging.

Caution: Air cooled heat exchangers are fragile products, which makes them extremely sensitive to incorrect handling during transport and positioning. Comply with the given instructions strictly to prevent the heat exchanger from being damaged during the lifting procedure.

Only qualified personnel using approved lifting equipment is allowed to carry out lifting operations.

When lifting the unit, use all lifting points in the direction of lifting. Do not mix the lifting points of vertical and horizontal position.

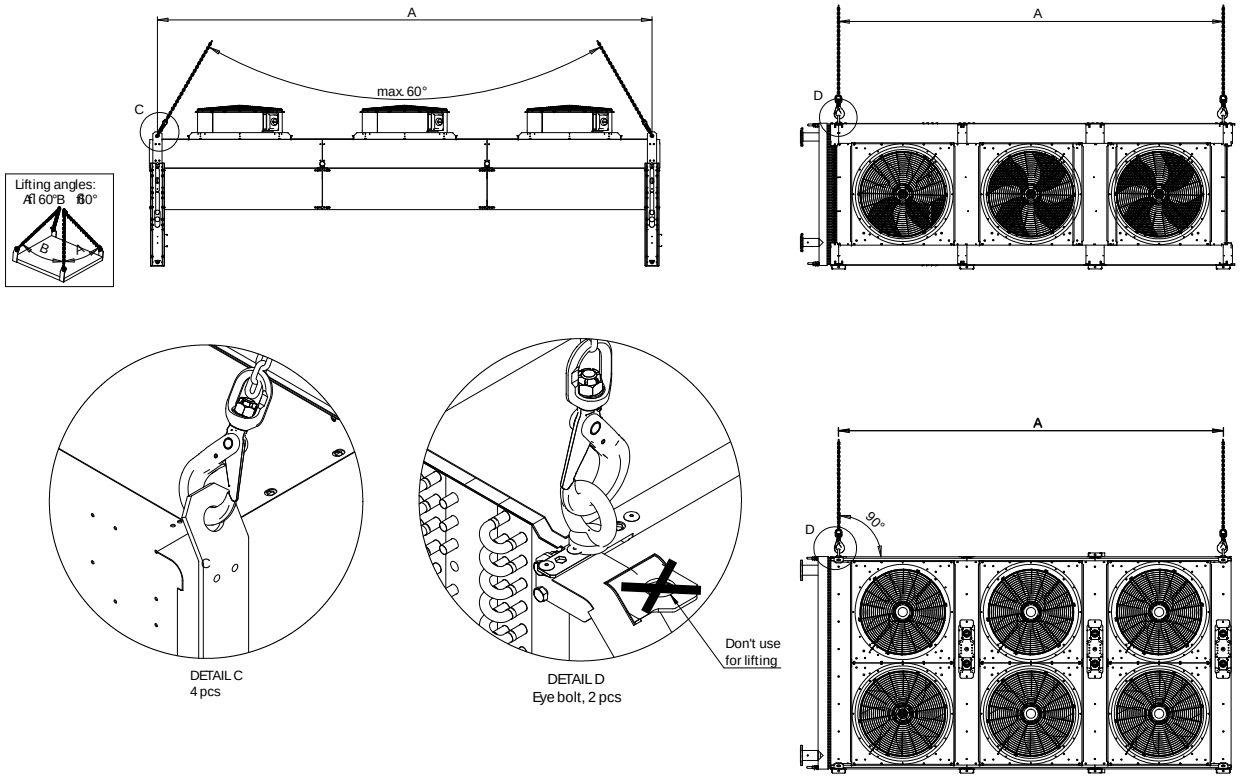


Figure 11: Unit lifting

The AlfaSolar S/SR™ units are transported in vertical position as standard. Turn the units for horizontal installation (vertical air flow) to the correct position at installation.

Two turning supports with locking bolts are included in the delivery of the AlfaSolar S/SR™ units.

Note: Remove the locking bolts before installing the turning supports to the unit.

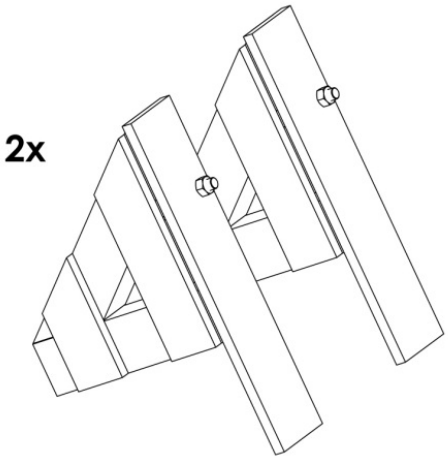
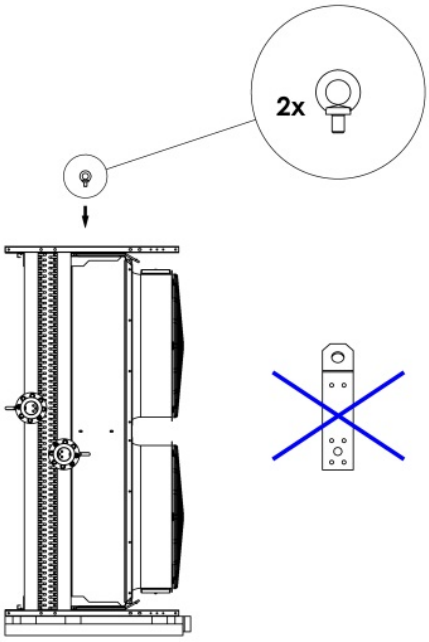


Figure 12: Turning supports

To turn a vertical air flow unit, which is packed in an upright position, into operating position:

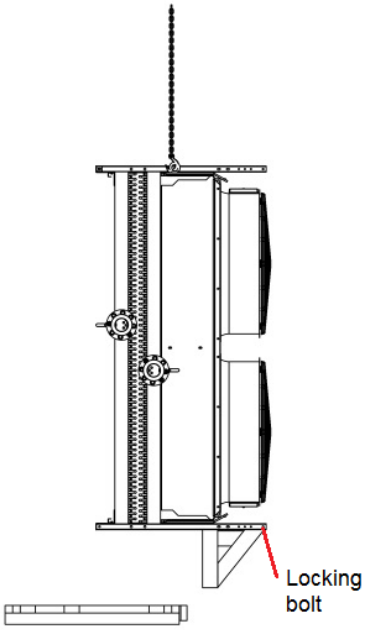
1. Fix the lifting/turning lugs into the fixing points on the sides of the unit.

⚠ **Caution:** Ensure that the lugs are tightly fixed.

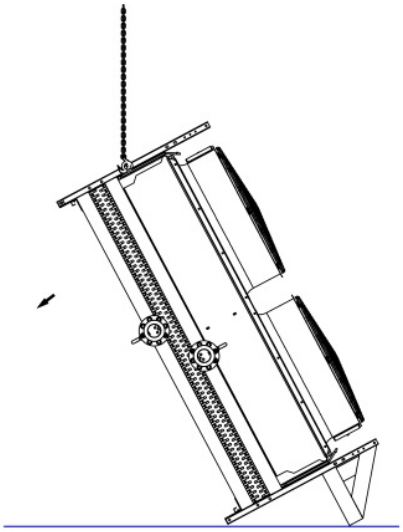


2. Hang the unit by crane from the lifting/turning lugs so that the lifting chain tightens but the unit remains on ground.
3. Remove the unit from the transport pallet.
4. Lift up the unit ca 0.5 m from the ground.
   a) Insert the turning supports into the leg profile until it reaches the fitting bolts.
   b) Place a turning support beneath each lifting eye.
   c) Lock the turning support into the leg with a locking bolt (remove the locking bolt before turning the support installation).

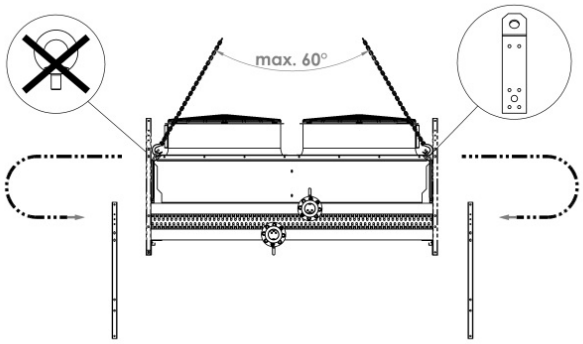
   While fixing the legs, support the unit so that it does not swing or fall down.



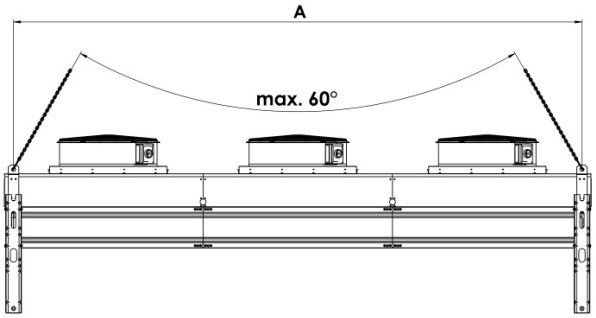
5. Put down the unit carefully so that it turns around the turning leg, to the direction of the centre of gravity. Drive the crane into the turning position and put the unit down slowly into horizontal position.



6. Remove the lifting/turning lugs from the unit.



7. Remove the turning supports.
8. Remove the transportation legs.
9. Hang the unit from the lifting points of the vertical air flow model. Adjust the legs of the vertical model to the correct installation height.



⚠ **Caution:** The minimum length of a lifting chain, when no lifting channel is used, is the distance of the lifting points. For SM™ and SD™ models, see the table *SM™ and SD™ models: Distance between lifting points*. We recommend using a lifting channel. Check the unit weight from the product nameplate.

Table 2: SM™ and SD™ models: Distance between lifting points

Unit SM™	Distance between lifting points A mm	Unit dry weight kg	Unit SD™	Distance between lifting points A mm	Unit dry weight	Unit SD™	Distance between lifting points A mm	Unit dry weight
1A-3	1400	259	2A-3	2800	689	5B-4	5400	1702
1A-4	1400	279	2A-4	2800	748	5B-3	5400	1898
1A-5	1400	300	2A-5	2800	809	5B-5	5400	2094
1A-6	1400	320	2A-6	2800	870	5B-6	5400	2290
1B-3	1800	282	2B-3	3600	775	5C-4	6300	1874
1B-4	1800	308	2B-4	3600	853	5C-3	6300	2102
1B-5	1800	334	2B-5	3600	932	5C-5	6300	2331

Unit SM™	Distance between lifting points A mm	Unit dry weight kg	Unit SD™	Distance between lifting points A mm	Unit dry weight	Unit SD™	Distance between lifting points A mm	Unit dry weight
1B-6	1800	360	2B-6	3600	1010	5C-6	6300	2560
2A-3	2800	408	2C-3	4200	845	6A-3	5600	1761
2A-4	2800	449	2C-4	4200	937	6A-4	5600	1944
2A-5	2800	489	2C-5	4200	1028	6A-5	5600	2127
2A-6	2800	530	2C-6	4200	1120	6A-6	5600	2310
2B-3	3600	463	3A-3	1400	945	6B-3	7200	2024
2B-4	3600	516	3A-4	1400	1037	6B-4	7200	2259
2B-5	3600	568	3A-5	1400	1128	6B-5	7200	2495
2B-6	3600	620	3A-6	1400	1220	6B-6	7200	2730
3A-3	1400	567	3B-3	1800	1077	6C-3	8400	2226
3A-4	1400	628	3B-4	1800	1195	6C-4	8400	2501
3A-5	1400	689	3B-5	1800	1312	6C-5	8400	2775
3A-6	1400	750	3B-6	1800	1430	6C-6	8400	3050
3B-3	1800	655	3C-3	2100	1178	7A-3	4200	2019
3B-4	1800	733	3C-4	2100	1315	7A-4	4200	2233
3B-5	1800	812	3C-5	2100	1453	7A-5	4200	2446
3B-6	1800	890	3C-6	2100	1590	7A-6	4200	2660
4A-3	2800	736	4A-3	2800	1224	7B-3	5400	2326
4A-4	2800	817	4A-4	2800	1346	7B-4	5400	2601
4A-5	2800	899	4A-5	2800	1468	7B-5	5400	2875
4A-6	2800	980	4A-6	2800	1590	7B-6	5400	3150
4B-3	3600	847	4B-3	3600	1399	-	-	-
4B-4	3600	951	4B-4	3600	1556	-	-	-
4B-5	3600	1056	4B-5	3600	1713	-	-	-
4B-6	3600	1160	4B-6	3600	1870	-	-	-
5A-4	4200	885	4C-3	4200	1399	-	-	-
5A-3	4200	987	4C-4	4200	1531	-	-	-
5A-5	4200	1088	4C-5	4200	1714	-	-	-
5A-6	4200	1190	4C-6	4200	1897	-	-	-
5B-3	5400	1038	5A-4	4200	1482	-	-	-
5B-4	5400	1169	5A-3	4200	1635	-	-	-

Unit SM™	Distance between lifting points A mm	Unit dry weight kg	Unit SD™	Distance between lifting points A mm	Unit dry weight	Unit SD™	Distance between lifting points A mm	Unit dry weight
5B-5	5400	1299	5A-5	4200	1787	-	-	-
5B-6	5400	1430	5A-6	4200	1940	-	-	-

⚠ **Caution:** The minimum length of a lifting chain, when no lifting channel is used, is the distance of the lifting points. See the table *SRM™ and SRD™ models: Distance between lifting points*. We recommend using a lifting channel. Models outside this list (E), non-standard models and copper coil (Cu…Cu): Check the unit weight from the product nameplate.

Table 3: SRM™ and SRD™ models: Distance between lifting points

Unit SRM™	Distance between lifting points A mm	Unit dry weight kg	Unit SRD™	Distance between lifting points A mm	Unit dry weight (ϕ914)/ (ϕ1200) kg	Unit SRD™	Distance between lifting points A mm	Unit dry weight (ϕ914)/ (ϕ1200) kg
1A-3	1400	360	2A-3	2800	820/-	5B-4	5400	2130/2600
1A-4	1400	440	2A-4	2800	950/-	5B-3	5400	2400/2870
1A-5	1400	470	2A-5	2800	1020/-	5B-5	5400	2620/3090
1A-6	1400	490	2A-6	2800	1080/-	5B-6	5400	2830/3300
1B-3	1800	390	2B-3	3600	960/1160	5C-4	6300	2310/2780
1B-4	1800	480	2B-4	3600	1110/1300	5C-3	6300	2620/3080
1B-5	1800	510	2B-5	3600	1200/1390	5C-5	6300	2870/3330
1B-6	1800	540	2B-6	3600	1280/1480	5C-6	6300	3120/3580
2A-3	2800	560	2C-3	4200	1040/1230	6A-3	5600	2110/-
2A-4	2800	660	2C-4	4200	1190/1390	6A-4	5600	2370/-
2A-5	2800	710	2C-5	4200	1300/1490	6A-5	5600	2580/-
2A-6	2800	750	2C-6	4200	1400/1590	6A-6	5600	2770/-
2B-3	3600	620	3A-3	1400	1130/-	6B-3	7200	2530/3090
2B-4	3600	740	3A-4	1400	1290/-	6B-4	7200	2840/3410
2B-5	3600	800	3A-5	1400	1390/-	6B-5	7200	3100/3670
2B-6	3600	850	3A-6	1400	1490/-	6B-6	7200	3360/3920
3A-3	1400	760	3B-3	1800	1340/1630	6C-3	8400	2750/3300
3A-4	1400	880	3B-4	1800	1530/1820	6C-4	8400	3100/3660
3A-5	1400	950	3B-5	1800	1660/1950	6C-5	8400	3410/3960
3A-6	1400	1010	3B-6	1800	1790/2070	6C-6	8400	3700/4260

Unit SRM™	Distance between lifting points A mm	Unit dry weight kg	Unit SRD™	Distance between lifting points A mm	Unit dry weight (ϕ914)/ (ϕ1200) kg	Unit SRD™	Distance between lifting points A mm	Unit dry weight (ϕ914)/ (ϕ1200) kg
3B-3	1800	850	3C-3	2100	1450/1740	7A-3	4200	2420/-
3B-4	1800	1000	3C-4	2100	1660/1940	7A-4	4200	2720/-
3B-5	1800	1080	3C-5	2100	1810/2100	7A-5	4200	2950/-
3B-6	1800	1170	3C-6	2100	1960/2240	7A-6	4200	3180/-
4A-3	2800	970	4A-3	2800	1460/-	7B-3	5400	2910/3570
4A-4	2800	1120	4A-4	2800	1650/-	7B-4	5400	3270/3930
4A-5	2800	1210	4A-5	2800	1790/-	7B-5	5400	3570/4230
4A-6	2800	1300	4A-6	2800	1920/-	7B-6	5400	3860/4520
4B-3	3600	1100	4B-3	3600	1740/2120	-	-	-
4B-4	3600	1270	4B-4	3600	1970/2350	-	-	-
4B-5	3600	1390	4B-5	3600	2140/2520	-	-	-
4B-6	3600	1500	4B-6	3600	2310/2690	-	-	-
5A-4	4200	1170	4C-3	4200	1890/2260	-	-	-
5A-3	4200	1340	4C-4	4200	2150/2520	-	-	-
5A-5	4200	1450	4C-5	4200	2350/2720	-	-	-
5A-6	4200	1560	4C-6	4200	2540/2920	-	-	-
5B-3	5400	1330	5A-4	4200	1780/-	-	-	-
5B-4	5400	1530	5A-3	4200	2010/-	-	-	-
5B-5	5400	1670	5A-5	4200	2180/-	-	-	-
5B-6	5400	1810	5A-6	4200	2340/-	-	-	-

6.5 Storage

Do not store the products in humid outdoor spaces, where water may condensate in their fan motors or in the tubing of the heat transfer section. Humidity may also damage the motor bearings. Long standing humidity in the tubing of the heat transfer section can cause formic acid corrosion. Store the units in a dry space with even temperature.

If you cannot guarantee appropriate storage conditions, lead a continuous low voltage into the motors to keep their surface temperature higher than the air dew point temperature.

In humid conditions, where the unit does not stay dry, some “white rust” may form on the zinc surface.

Store the units fixed on their packing flats.

Do not store the units on an inclined or uneven plane.

⚠ **Caution:** During long term storage, operate the fans for 3…4 hours at least once a month.

7 Installation instructions

Note: Before starting installation, see Residual risks on page 9.

During installation, wear appropriate personal protection equipment (PPE).

The customer is responsible for the use of the most suitable PPE.

Only qualified personnel may carry out the installation.

7.1 Installation checklist

Erection	✓
Before installation, check for possible transport damages, especially in the heat transfer section, fan collar and fan safety guard. The supplier is not responsible for costs caused by faulty handling.	
Remove the transportation legs.	
Ensure the tightness of bolts in the casing and fans.	
Ensure that all the connection terminals are fastened correctly.	
Check the bearing capacity of the fixing points and support structures before installation (see unit weights in product-specific documentation).	
To ensure optimum air venting and drainage of liquid coolers, place the tubes of the heat transfer section in horizontal position.	
If the fan guards are delivered separately, install them before taking the unit into use.	
Trouble-free operation of the liquid coolers provides good air venting of the units. Use the venting screws on the headers for air venting of the heat transfer section. Always follow the instructions of the working fluid supplier.	
Drain water circulated liquid coolers, when the ambient temperature is < 0 °C. Standard liquid coolers are not gravity drained. We recommend using frost-proof fluids in installations, where the ambient temperature can be lower than 0 °C.	
Always follow the instructions of the working fluid supplier in installation, performing the pressure test, taking into use, operation and service.	
All soldering of the heat transfer section is hard solder (EN ISO 17672 Cup 279).	
Ground the unit.	
Check the installation position and free space requirements (See Positioning on page 42 and Setup for installation on page 45)	
Ensure that the fans' rotation direction is correct.	

7.2 Tightening torques

See the recommended torque for tightening the bolts in Table 4: Tightening torques for bolts grade 8.8 (EN ISO 898-1) on page 42. All bolts used are grade 8.8 according to EN ISO 898-1. Do not use other type of bolts. For motors and related components, follow the torques given in the separate motor manual. Use max 50 Nm torque for the bolts fastening the impeller to the motor shaft.

Table 4: Tightening torques for bolts grade 8.8 (EN ISO 898-1)

Size	Torque (Nm)
M6	9.5
M8	20.0
M10	30.0
M12	50.0
M16	120.0

For the standard service switch (KEM 16-40A), the tightening torque for the cover screws (PZ2/1x5-7) is max 2.0 Nm. For electric connections, the max torque for the screws PZ2/1x5 is 1.8 Nm.

7.3 Positioning

7.3.1 Individual units

Position air cooled liquid coolers so that there is no obstruction to the air flow and that hot air recirculation does not occur.

Direct the units' air flow away from the wind blowing against them. This concerns especially the horizontal air flow models and models with low rpm fans.

When necessary, use fairings.

In dimensioning, take into account the actual site temperature in the sun. Also note the effect of snow for the installation level of the unit.

Note: Contact the manufacturer for further information on positioning the forced draught fans (FD).

Positioning of a horizontal air flow unit

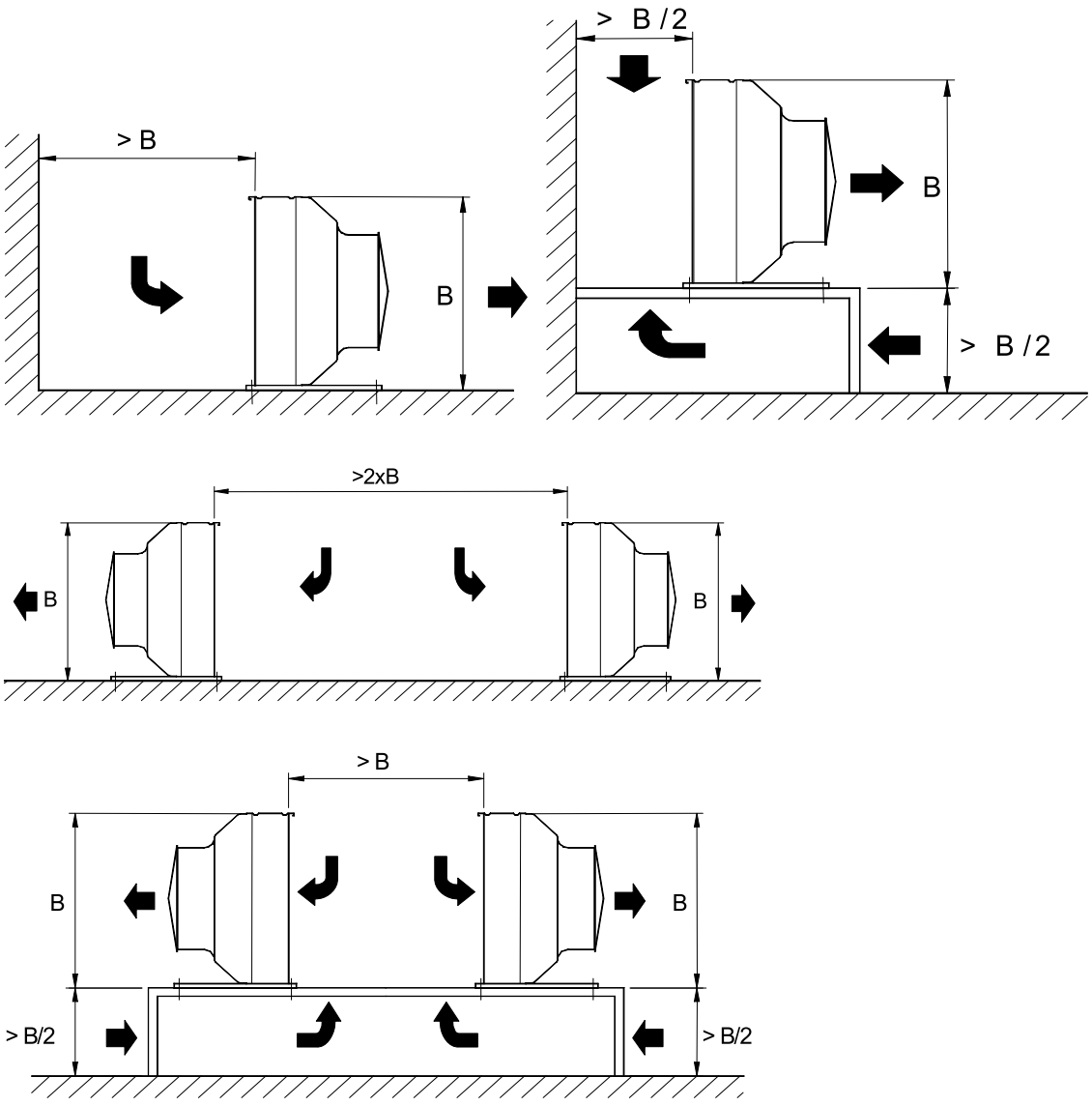
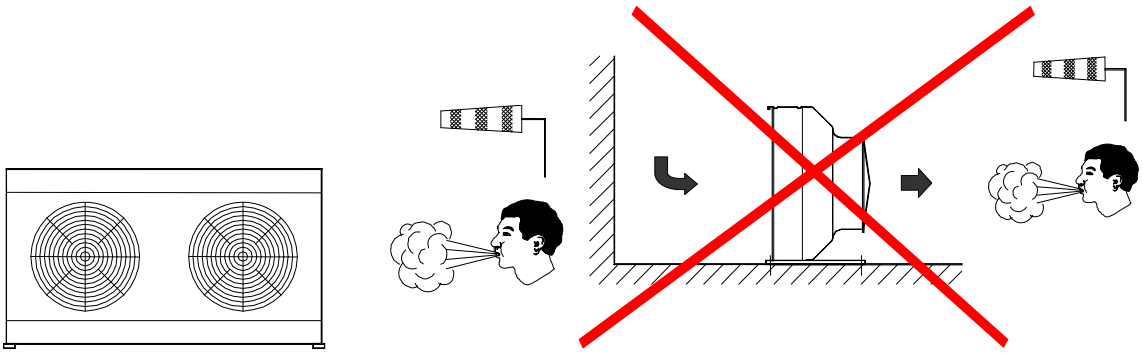


Figure 13: Positioning of horizontal air flow unit

Effect of wind direction



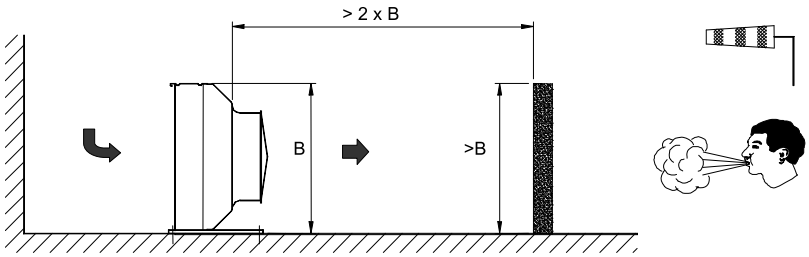


Figure 14: Effect of wind direction

Positioning of a vertical air flow unit

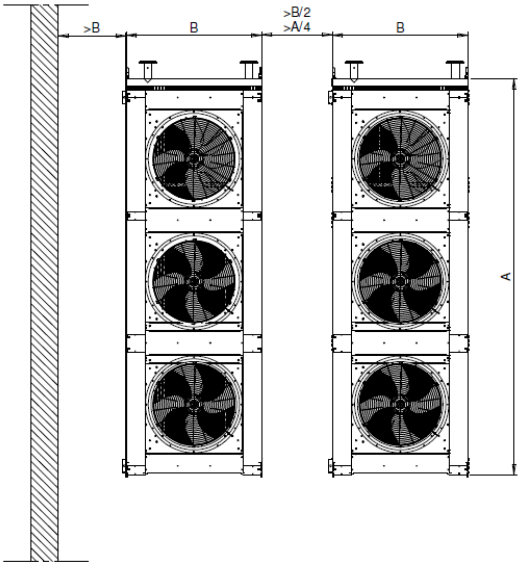


Figure 15: Fans in one row, wall higher than unit height

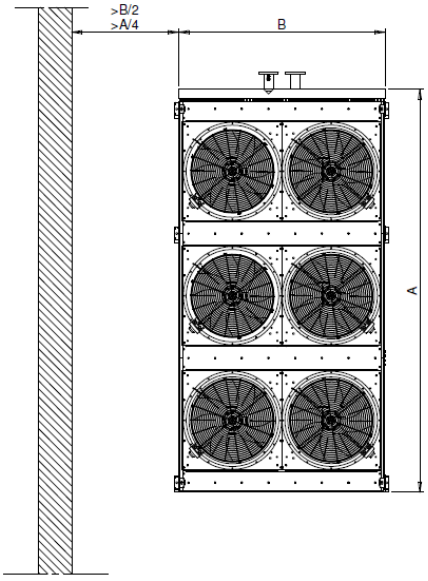


Figure 16: Fans in two rows, wall higher than unit height

You can install two units with fans in one row (B = 1630 mm) side by side (note the minimum distances shown in Figure 15: Fans in one row, wall higher than unit height on page 44). Check the leg height. When necessary, install the units on a platform.

If the wall is lower than the unit, the minimum distance between the unit and the wall is 0.5 x the minimum distance with a higher wall.

If the units are surrounded by 3 or 4 walls, the minimum distances are longer. Check them according to the amount of units and their air flow.

Note: In exceptional cases, contact the product supplier or manufacturer.

7.3.2 Multiple units

We recommend installing units with high mounting leg side by side in one common group.

Contact Alfa LU-VE sales representative for more information.

7.4 Setup for installation

Horizontal air flow models (induced fans)

You can install the horizontal air flow models directly. Remove the lifting lugs.

Vertical air flow models (induced fans)

When mounting a vertical air flow unit, install the legs in the correct height. If the unit is installed directly on an even surface, the height of the legs from the surface to the lower edge of the unit is ca 620 mm. Install also the horizontal supports for the legs. See Figure 17: Installation with legs on page 45.

When you install the unit on a basement, install the legs in a steady middle position (ca 420 mm), without the horizontal supports. See Figure 18: Installation on basement on page 46.

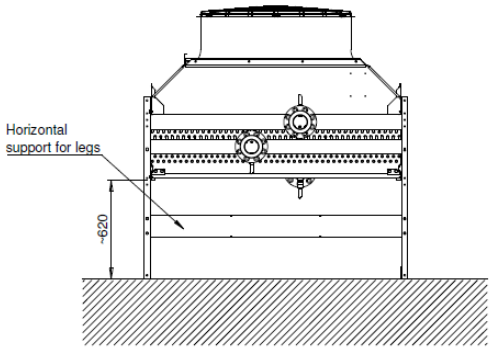


Figure 17: Installation with legs

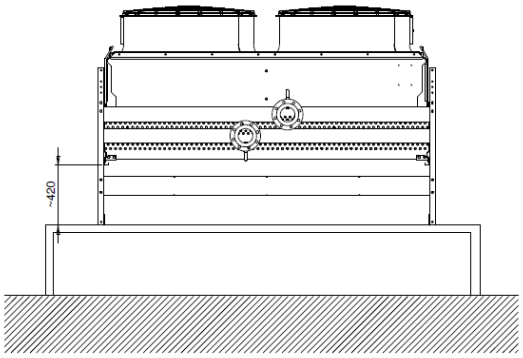


Figure 18: Installation on basement

SR™ horizontal air flow models with forced draught fans (FD)

You can install the horizontal air flow models directly. Remove the lifting lugs.

SR™ vertical air flow models with forced draught fans (FD)

When mounting a vertical air flow unit, install the legs in the correct height. If you install the unit directly on a plane surface, the height of the legs from the surface to the lower point of the fan collar is ca 550 mm. Install also the horizontal supports for the legs. See Figure 19: FD-model installation with legs on page 46.

When you install the unit on a basement, you can install the legs in a steady middle position (ca 350 mm), without the horizontal supports. When drawing air from only one side, the minimum height is 1100 mm. See Figure 20: FD-model installation on open basement on page 47.

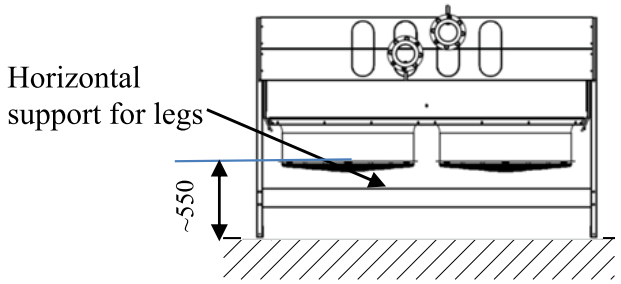


Figure 19: FD-model installation with legs

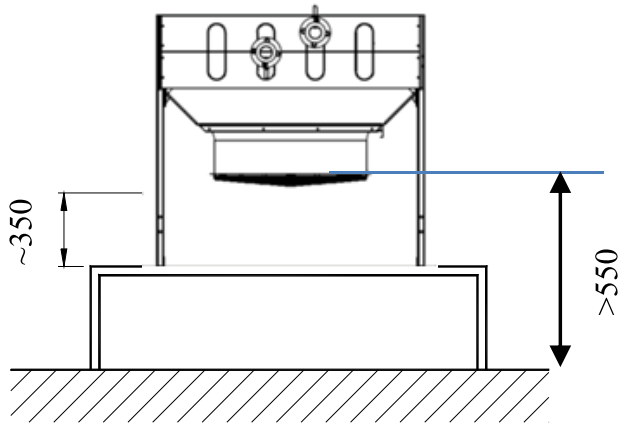


Figure 20: FD-model installation on open basement

7.5 Liquid cooler tube connections

WARNING:

In operation, the heat transfer section and pipe temperatures exceed 45 °C. Contact may cause burns. Use hand protection.

Hot air over the unit when the unit is operating. Never work a long time over the unit when it is operating.

Install the external tubes so that their weight, vibration or heat expansion does not strain the tubes of the heat transfer section. You can use flexible couplings to ensure this. Contact Alfa LU-VE for information on the flexible expansion joint solution.

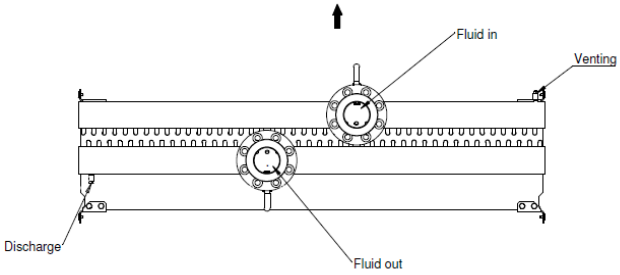


Figure 21: Vertical air flow model

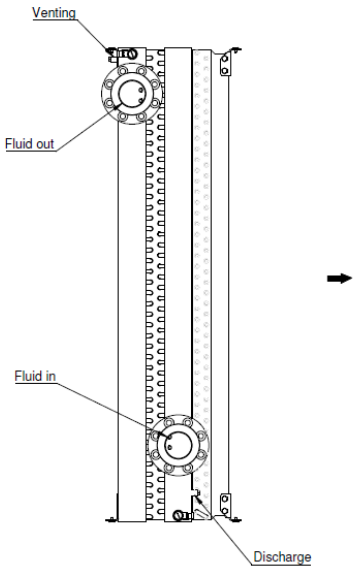


Figure 22: Horizontal air flow model

7.6 Grounding

The liquid cooler is grounded by the legs. Ensure unit grounding by a separate earth connection when vibration dampers are in use, the casing is painted or the basement is not conductive.

7.7 Fans and fan connections

WARNING:

Only an authorized electrician may perform the electric connections.

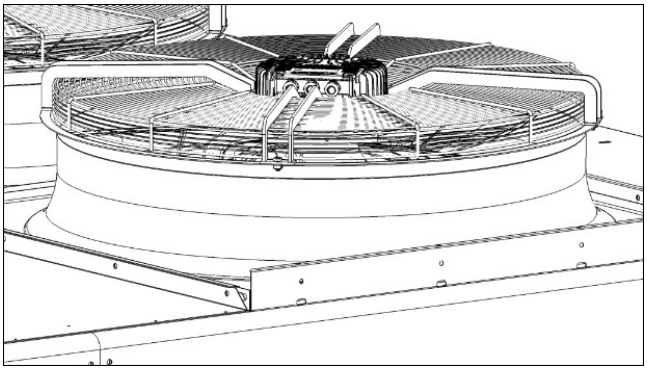


Figure 23: EC fan package for S/SR™ models

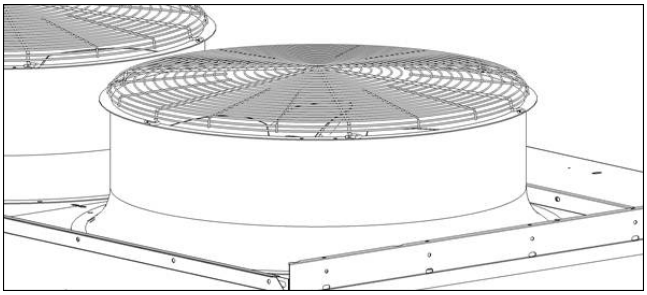


Figure 24: IEC fan package for SR™ models

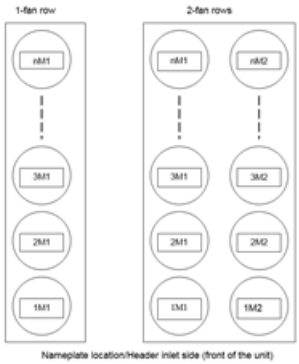


Figure 25: Fan/motor identification

Fan packages with EC motors

	**WARNING:** **EC-fans**: Electrical load (>50 µC) between mains wire and protective earth connection after switching of the supply when switching multiple devices in parallel. Electric shock, risk of injury. Ensure that you have sufficient protection against accidental contact. Before working on the electrical connection, short the connections to the mains supply and PE. **EC-fans**: Terminals and connections have voltage even in a unit that is shut off. Electric shock. Wait for five minutes after disconnecting the voltage at all poles before opening the device. 
	**WARNING:** **EC-fans**: High temperature at the electronics enclosure. Danger of burn injuries. Ensure that you have sufficient protection against accidental contact.

The fan package is suitable for 380...420 V 50/60 Hz electric network.

The protection glass is IP54, as the option fans are prewired to the safety switch (IP65).

Fan motors/electronics are over temperature protected.

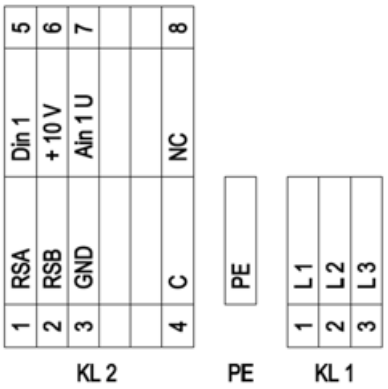
Fans installed in horizontal position

Route the cable in a loop (water trap).

Fans installed in upright position

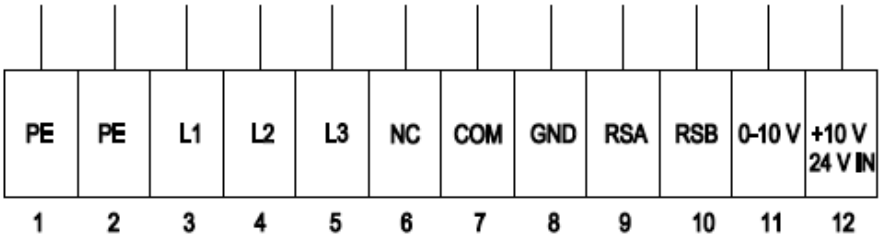
When routing the cable, ensure that you arrange the screwed cable glands at the bottom. Always route the cables downwards.

The fan units are preset at the factory to the required fan speed. Ask the condenser/liquid cooler manufacturer about the technical data of the fan motors.



No.	Conn.	Designation	Function / assignment
KL 1	1	L1	Mains supply connection, supply voltage 3~380-480 VAC; 50/60 Hz
KL 1	2	L2	Mains supply connection, supply voltage 3~380-480 VAC; 50/60 Hz
KL 1	3	L3	Mains supply connection, supply voltage 3~380-480 VAC; 50/60 Hz
PE		PE	Earth connection, PE connection
KL 2	1	RSA	Bus connection RS-485, RSA, MODBUS RTU; SELV
KL 2	2	RSB	Bus connection RS-485, RSB, MODBUS RTU; SELV
KL 2	3	GND	Signal ground for control interface; SELV
KL2	4	C	Status relay; floating status contact; changeover contact; common connection; contact rating 250 VAC / 2 A (AC1)
KL 2	5	Din1	Digital input 1 enabling of electronics, enabling: open pin or applied voltage 5-50 VDC disabling: bridge to GND or applied voltage <1 VDC reset function: triggers software reset after a level change to <1 V; SELV
KL 2	6	+ 10 V	Fixed voltage output 10 VDC, +10 V ±3%, max. 10 mA, short-circuit-proof, power supply for external devices (e.g. potentiometer), SELV
KL 2	7	Ain1 U	Analogue input 1 (set value) 0-10 V, Ri = 100 kΩ, parametrisable curve, only usable as alternative to input Ain1 I SELV
KL2	8	NC	Status relay, floating status contact; break for failure

Figure 26: Fans with EC motors (P_e = 2800 W) - Electrical connections: Motor junction box



No.	Conn.	Designation	Function / assignment
	1	PE	Protective earth
	2	PE	Protective earth
	3	L1	Power supply
	4	L2	Power supply
	5	L3	Power supply
	6	NC	Status relay, floating status contact, break for failure, contact rating 250 VAC / 2 A (AC1) / min. 10 mA; reinforced insulation on mains side and basic insulation on control interface side
	7	COM	Status relay, floating status contact, break for failure, contact rating 250 VAC / 2 A (AC1) / min. 10 mA; reinforced insulation on mains side and basic insulation on control interface side
	8	GND	Signal ground for control interface, SELV
	9	RSA	RS-485 interface for MODBUS, RSA; SELV
	10	RSB	RS-485 interface for MODBUS, RSB; SELV
	11	0-10 V	Analogue input (set value) SELV, 0-10 V, Ri=100kΩ, parametrisable curve
	12	+10 V	Fixed voltage output 10 VDC, SELV, +10 V +/-3%, max. 10 mA short-circuit-proof, power supply for ext. devices (e.g. potentiometer); Fixed voltage input 24 VDC for parameter setting via MODBUS without mains power supply

Figure 27: Fans with EC motors (P_e = 700 W) - Electrical connections: Motor junction box

Caution: Water penetration on the leads or wires. Water enters at the cable end on the customer's side and may damage the device.

Caution: The maximum air temperature for an EC fan package is 60 ... 65 °C.

Fan packages with IEC motors

Note: This option is only for SR™ models.

The fans are direct driven axial fans. The fan motors are 3-phase squirrel-cage motors built according to the IEC standards, designed for outdoor use and provided with condensing water outlets, shaft seals and self-lubricating bearings. The motors are suitable for 400 V/690 V 50/60 Hz electric network. Their protection class, except for condensing water outlet, is IP54 or IP55 (excluding waterholes) as a standard. The motors are prewired to the service switches (IP65).

Ask the liquid cooler manufacturer about the technical data of the fan motors.

If the unit stands inactive for a long period, we recommend you to anticondensate the heater installation to the fan motors.

When using inverter with the fan motors, ensure that you do not exceed the recommended cable lengths and that the fan motors are sufficiently protected from excessive du/dt and overvoltage spikes.

Note: Check the product nameplate about motor electrical connections.

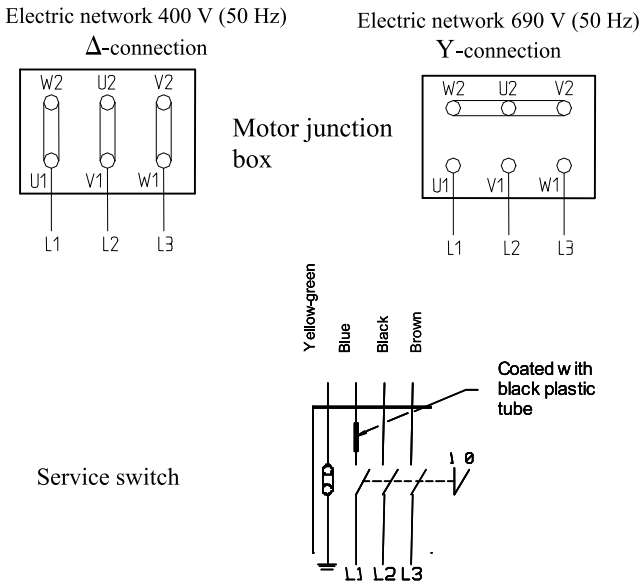


Figure 28: Electrical connections for SR™ models: Motor junction box and service switch

7.8 Fans' power values

The product nameplate indicates the power values at +20 °C and -30 °C.

For defining the set values of the overload protector, you may need the power value at other temperatures. You can calculate it nearly linearly by using the points mentioned above. For example, multiply the power value corresponding to +20°C (from the product nameplate) by the coefficient (k) given in the diagram at -10 °C, to calculate the power value corresponding to -10 °C.

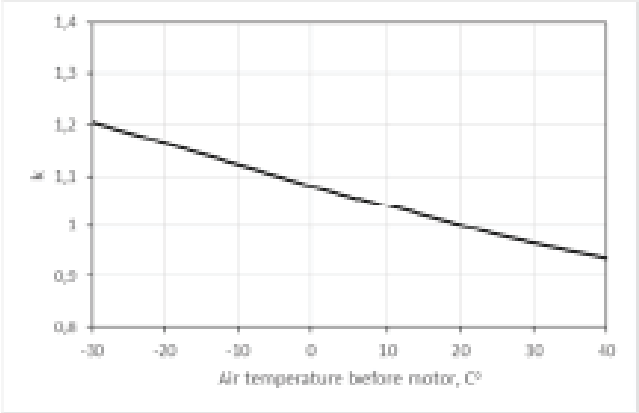


Figure 29: Motor power value depending on temperature

7.9 Options for AlfaSolar S/SR™ models

Note: These options are for both S™ and SR™ models.

7.9.1 Water spraying system

The water spraying system helps to even out the short loading peaks in the summer.

A unit with fans in one row has one water spray tubing. A unit with fans in two rows has two water spray tubings.

The delivery includes the loose tubing and assembly instructions.

Assemble the tubing in numerical order and at the place shown in Figure 31: Structure of water spraying system on page 54. Tighten the joints carefully and make sure that all nozzles are in the same direction. Turn the tubing so that the nozzle angle corresponds to the fan speed. Check the right nozzle angle from Table 5: Nozzle angle and fan speed on page 54.

Lock the tubing in place. The water flow is 0.5 l/min for one nozzle, pressure 3 bar.

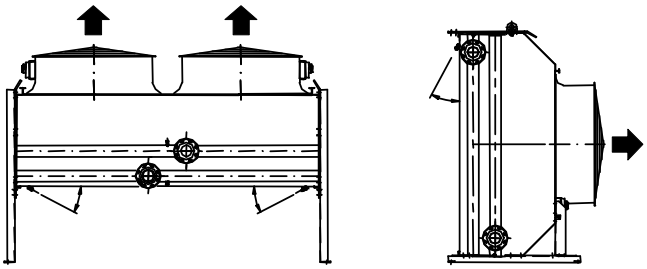


Figure 30: Water spraying system

Table 5: Nozzle angle and fan speed

Rpm	α#
950	45
720	40
560	35
470	30
350	25

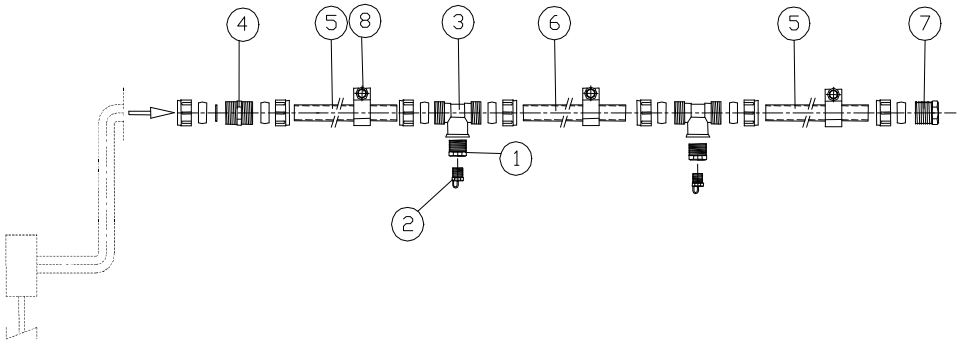


Figure 31: Structure of water spraying system

1. Reduction joint
2. Water nozzle
3. T-connector
4. Double nipple
5. End tube
6. Distance tube

7. Plug and connector
8. Clamp/drill screw

Caution: Limey water may block up the nozzles and it can also form an isolating layer on the surface of the heat transfer section.

A wrong pH value of water may damage the heat transfer section. The pH value varies between 7...8.

Caution: Freezing water may break the water tubing. Always drain the tubing after use by opening the end plug (no. 7).

7.9.2 Connection box options of EC-fans

WARNING:

EC-fans: Electrical load (>50 µC) between mains wire and protective earth connection after switching of the supply when switching multiple devices in parallel.

Electric shock, risk of injury. Ensure that you have sufficient protection against accidental contact.

Before working on the electrical connection, short the connections to the mains supply and PE.

EC-fans: Terminals and connections have voltage even in a unit that is shut off.

Electric shock. Wait for five minutes after disconnecting the voltage at all poles before opening the device.

WARNING:

Ensure free space in front of the electrical cabinet according to local regulations.

Electrical options for EC-fans		Code
Control box	Service Switch: • Optional in S™ models • Standard in SR™ models	SW
	Fan power supply and control signal cables are wired to the unit end.	CBP
	Fan power supply and control signal cables are wired to the unit end. The electrical panel is equipped with circuit breakers and unit power switch. Control signal 0 V … 10 VDC	ECCB
	Fan power supply and control signal cables are wired to the unit end. The electrical panel is equipped with circuit breakers and unit power switch. Control signal 4 mA … 20 mA	ECCBI
	Fan power supply and control signal cables are wired to the unit end. The electrical panel is equipped with circuit breakers and unit power switch. Control with temperature probe.	ECCBT

SW Service Switch

Each fan is wired to the safety switch located in the corner of fan. Control the alarm signal with a micro switch. The maximum voltage is 230 V.

CBP Terminal box at the unit end

Fan power supply and control signal cables are wired to the unit end. Wire the power supply for each fan separately from the Junction box.

ECCB/I/T Connection box at the unit end

Fan power supply and control signal cables are wired to the unit end. The connection box is equipped with circuit breakers and unit power switch. The unit power supply is wired with one cable to the electrical panel.

Note: ECCBT: Ensure that instrument cable to temperature probe is cabled downward to avoid water penetration to probe through cable inlet.

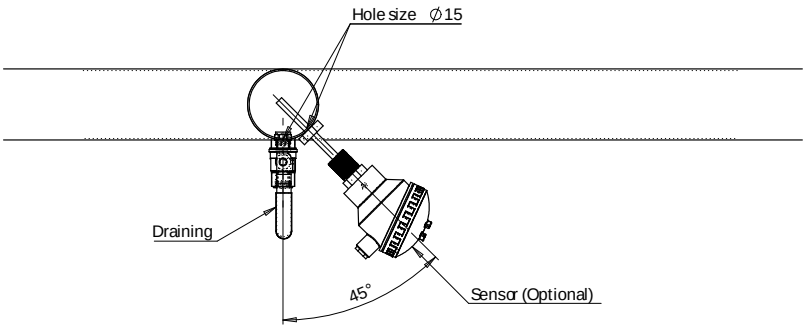


Figure 32: ECCBT: Temperature probe installation to outlet connection

The delivery includes the necessary documentation for the electrical connections (in the electrical panel).

In the models with two fan rows (SD™, SRD™), Modbus is wired as a loop. 0…10 V control signal is wired separately to the left and right fan row.

7.9.3 Painting

Painting options:

Option	Description	Availability
GS	Unpainted galvanized steel (standard)	S/SR
GPU	Visual painting, Galvanized steel (visible surfaces)	S/SR
GP1	Light painting; C3 (middle) (according to EN 12944-5:2018)	SR
GP2	Industrial painting; C4 (high) (according to EN 12944-5:2018)	SR
GP3	Heavy Industrial Painting; C5 (high) (according to EN 12944-5:2018)	SR

7.9.4 High mounting legs

Height [m]	Description	Availability
1	1 m leg extensions are fitted to the standard leg. The extensions are delivered loose.	S/SR
2	2 m legs are delivered loose.	SR
3	3 m legs are delivered loose.	SR

Height [m]	Description	Availability
4	4 m legs are delivered loose.	SR

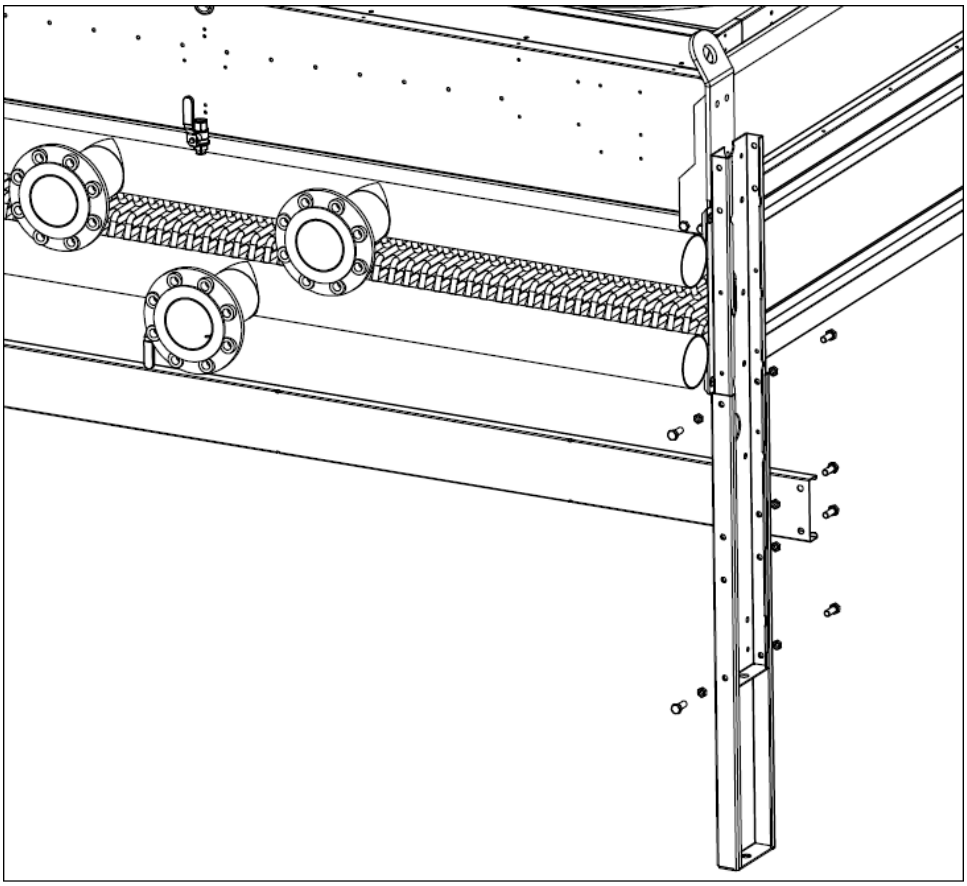


Figure 33: Installation of 1m leg extension to AlfaSolar S/SR™

1. Slide the extensions over the standard legs.
2. Install the vertical leg supports with M10 grade 8.8 bolts.

   The required M10 bolts, nuts and spring washers are included in the delivery.

Control cabinets with 2 m and 4 m legs are delivered loose. The legs are fitted at ground level.

See separate instructions for installing the AlfaSolar SR™ series high mounting legs (2 m, 3 m and 4 m legs).

Check the actual wind load and EQ classification from the datasheet.

The amount of legs and support beams depends on the local wind and snow loads and earthquake classification (special options). For greater environmental loads, the order specific stress calculations with additional support beams and legs are available.

High mounting legs are part of the machine and according to the EN1090-1 standard, they do not require CE-marking.

Standard surface treatment: Hot-Dip Galvanized.

All painting options are available according to the painting specification.

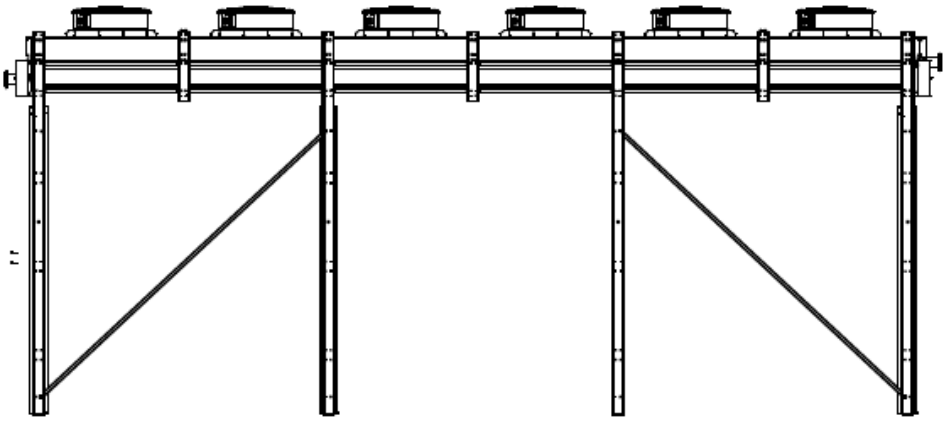


Figure 34: High mounting leg installation (AlfaSolar SR™ series)

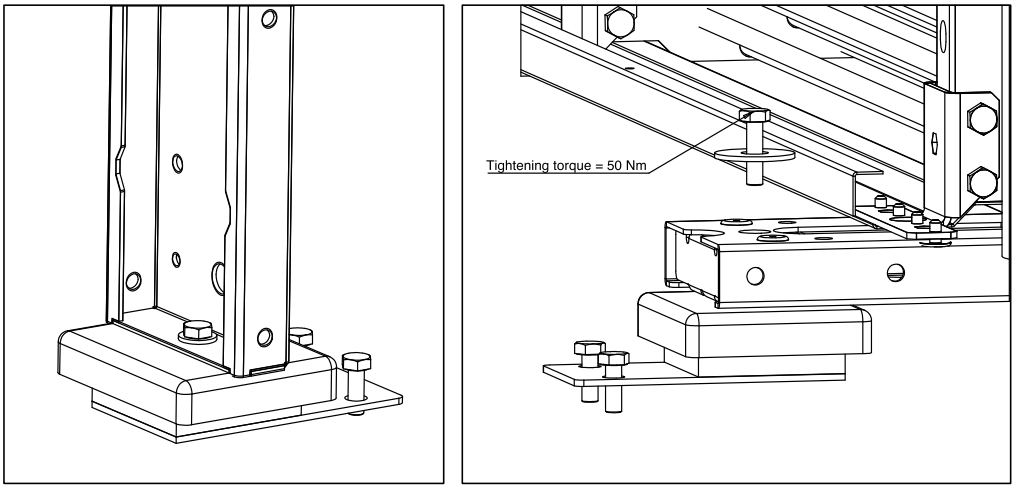
7.9.5 Vibration dampers

The suitability of the elastic vibration dampers supplied by Fincoil LU-VE Oy has been ensured.

Proceed as follows:

1. Check the load weight and ensure that the correct dampers for this load are available.

Note: Check the weight distribution on the damping rubber.



2. Check that the ground and the basement of the unit are horizontal.
   The vibration dampers are meant for vertical compression load.
3. When damping a group of units, place both the driving unit and the operated unit on a rigid basement.
4. Check the ambient conditions at site:
   - Temperature 35 °C … +65 °C
   - Organic solvents are injurious
   - Oils might damage the rubber parts of the damper
5. When connecting, for example, tubes to the unit, always use flexible connections.

This guarantees smooth vibration damping and prevents the transmission of vibration to the tubes and vibration stress on the tubing.

6. After installation, check the correct deflection of the dampers.

Table 6: Allowed deflection of the vibration damper

Vibration damper	Deflection [mm]	xx percentage from mm
34 LV 10/	7.5...8	75...80 % from 10 mm
34 LV 16/	12...12.8	75...80 % from 16 mm

7. Ensure that there is margin around the unit.
8. Ask the manufacturer for further instructions when necessary.

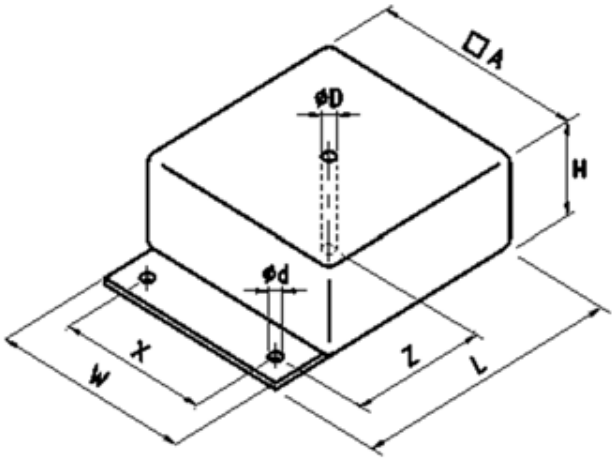


Figure 35: Vibration damper dimensions

	Damper type	ID number	Vibration damper dimension							
			A	L	W	H	D	Ød	Z	X
			mm	mm	mm	mm		mm	mm	mm
34LV10 1-layer damper	34LV10/120	9460137767	76	105	50	45	M10	12	54	0.5
	34LV10/200	9460007111	92	124	64	45	M10	12	66	40
	34LV10/300	9460137768	108	143	74	46	M12	14	75	45
	34LV10/600	9460006271	144	185	94	46	M12	14	98	64
34LV16 2-layer damper	34LV16/400	9460007071	170	215	160	72	M12	14	110	120
	34LV16/700	9460137769	170	215	160	72	M12	14	110	120
	34LV16/1000	9460137770	220	275	210	76	M16	18	140	160

7.9.6 Expansion joints

Benefits of using stainless steel expansion joints:

- Reducing harmful loads from piping to flange connection/manifolds of coolers
- Compensating heat expansion movements

- Reducing possible vibrations of piping
- Providing flexibility and more tolerance for installation
- Widening the temperature range up to +125 °C
- Providing excellent corrosion resistance in different climates

Expansion joints are delivered with gaskets.

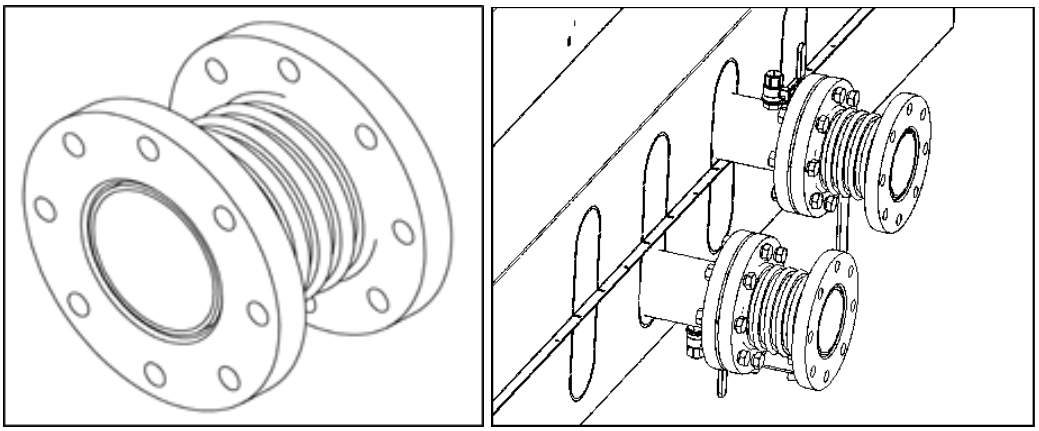


Figure 36: Expansion joints

Table 7: Available expansion joint sizes

Size	Item Id.	Size	Item Id.
DN65	9460080147	ANSI 2½”	9460080145
DN80	9460080148	ANSI 3”	9460080146
DN100	9460080149	ANSI 4”	9460065882
DN125	9460080143	ANSI 5”	9460065883

7.10 Options for AlfaSolar SR™ models

Note: These options are only for SR™ models.

7.10.1 Connection options for IEC-fans

Note: This option is only for Solar SR™ models.

WARNING:

Fans with Inverter: Terminals and connections have voltage even in a unit that is shut off.

Electric shock. Wait for 15 minutes after disconnecting the voltage at all poles before opening the device.

WARNING:

Ensure free space in front of the electrical cabinet according to local regulations.

Electrical options for IEC-fans		Code
Control panel	Motor Protective Switch Panel (always EMC)	B
	Starter Panel	SP
	Motor Protective Switch Panel and Frequency Converter (always EMC)	BFC
	Motor Protective Switch Panel, Frequency Converter and Temperature-probe (always EMC)	BFCT
Connection Box	Connection Box (Terminal Box)	CB
	Connection Box - EMC	CB…EMC

Table 8: Cable lengths for SR™ models

Fan size ø 900 mm				Fan size ø 1200 mm	
SRM™	Cable [m]	SRD™	Cable [m]	SRD™	Cable [m]
1A	4.1	2A	21.2	2A	11.2
1B	4.3	2B	22.8	2B	11.4
2A	9.6	2C	24.0	2C	12.0
2B	10.4	3A	36.0	3A	18.9
3A	16.5	3B	39.6	3B	19.8
3B	18.3	3C	42.3	3C	21.2
4A	25.0	4A	55.2	4A	28.8
4B	28.2	4B	61.6	4B	30.8
5A	34.8	4C	66.4	4C	33.2
5B	39.8	5A	76.0	5A	39.5
-	-	5B	86.0	5B	43.0
-	-	5C	93.5	5C	46.8
-	-	6A	99.6	6A	51.6
-	-	6B	114	6B	57.0
-	-	6C	125	6C	62.4
-	-	7A	126	7A	65.1
-	-	7B	130	7B	64.7

CB

Connection box: Fan power supply cables are wired to the unit end. EMC is optional.

SP

Starter panel: The panel includes one main contactor. When you close the customer's external potential free contact, all the fans go ON at the same time. When you open the contact, the fans go OFF. Fan power supply cables are wired to the unit end. The fan motors are supplied via tripping circuit breakers measuring both overcurrent and short circuit current. The electrical panel is equipped with a power main switch.

B

Motor protective switch panel: Fan power supply cables are wired to the unit end. The fan motors are supplied via tripping circuit breakers measuring both overcurrent and short circuit current. Customer only needs to bring main power to the electrical panel. The electrical panel is equipped with a power main switch. EMC is a standard option.

BFC

Motor protective switch panel and frequency converter: Inverter control provides continuous fan speed control for the liquid coolers. Fan power supply cables are wired to the unit end. The fan motors are supplied via tripping circuit breakers measuring both overcurrent and short circuit current. The electrical panel is equipped with a power main switch and a manual bypass switch. EMC is a standard option.

BFCT

Motor protective switch panel, frequency converter and temperature probe: Provides temperature control for the liquid coolers. Fan power supply cables are wired to the unit end. The fan motors are supplied via tripping circuit breakers measuring both overcurrent and short circuit current. The electrical panel is equipped with a power main switch and a manual bypass switch. EMC is a standard option.

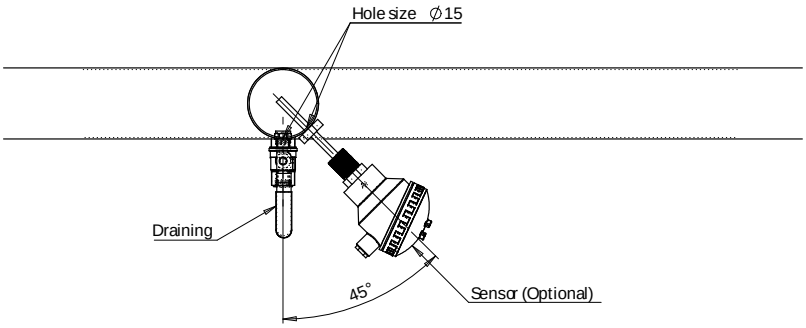


Figure 37: BFCT: Temperature probe installation to outlet connection

Caution: BFC and BFCT: Never turn the bypass switch when the fans are running.

Note: BFCT: Ensure that the instrument cable to the temperature probe is cabled downward to avoid water penetration through the cable inlet to the probe.

Note: BFC and BFCT: Not available for SR™ models with V-position.

Control panels have been pre-configured and test run at the factory, including a test run of the fans and inspection of the regulator. See the product-specific documentation of Alfa LU-VE Control Panels.

The delivery includes the necessary documentation for the control system and electrical panel. The documentation is in the electrical panel.

The cables corresponding to the EMC standard are connected to the unit end. See the normative cable lengths in Table 8: Cable lengths for SR™ models on page 61. The lengths may be different when you are using special equipment or special cables. If the model type is not listed below, contact Fincoil LU-VE Oy for information.

7.10.2 Counter flanges

Note: This option is only for Solar SR™ models.

Table 9: Available counter flange sizes

Size	Item id.	Size	Item id.
DN50	9460005856	ANSI 2"	9460065217
DN65	9460004834	ANSI 2½"	9460004831
DN80	9460004833	ANSI 3"	9460004832
DN100	9460004835	ANSI 4"	9460004839
DN125	9460004836	ANSI 5"	9460004830

Counter flanges are delivered with gaskets, bolts and nuts.

7.10.3 Vibration monitor device for fans

Note: This option is only for Solar SR™ models.

Suitable only for fans equipped with IEC-motors.

Easy means to control the vibration of motors and fans:

- Preinstalled at the factory
- Wired to a connection box beside the fans
- Optionally, the wiring can be completed to the panel at the end of the air heat exchanger
- Can be used for continual condition monitoring and/or protection of motors and fans in case of unexpected vibration
- Analogue output signal 4...20 mA (0...25 mm/s)

Suitable for a wide temperature range: -37 °C ... +80 °C

7.10.4 Air streamer

Note: This option is only for Solar SR™ models.

The air streamer is suitable only for fans equipped with IEC motors.

See separate installation and maintenance instructions included in the streamer delivery.

Streamers are delivered separately and installed at site.

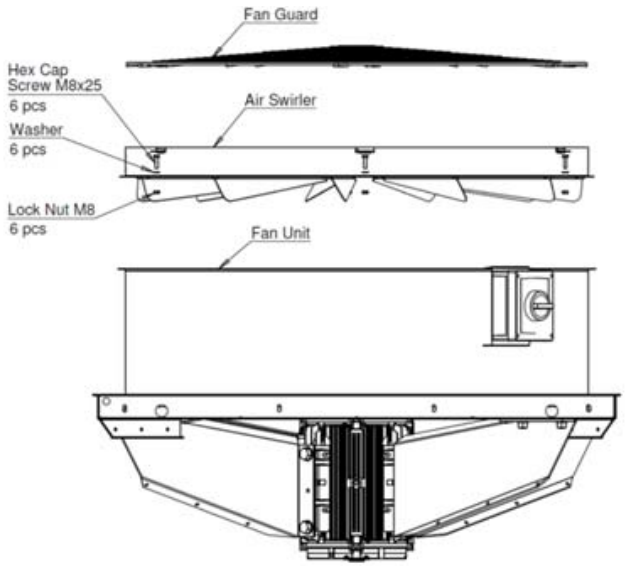


Figure 38: Installation of streamer

7.10.5 Handrails and ladders

Note: This option is only for Solar SR™ models.

See separate instructions for installing the AlfaSolar SR™ series handrails and ladders.

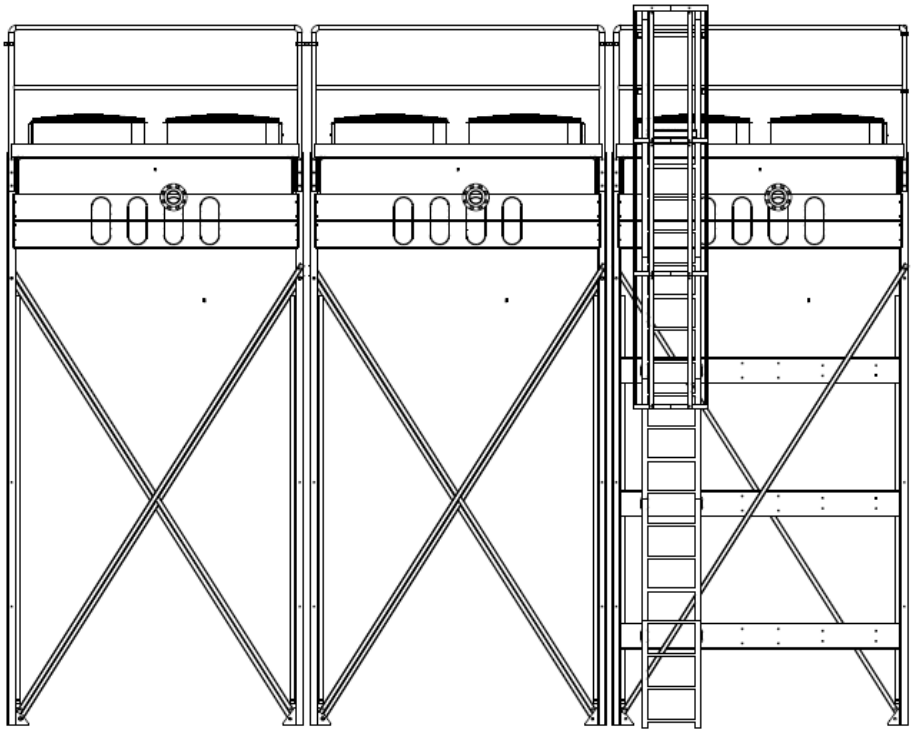


Figure 39: Handrail and ladder installation (SR™ series)

7.10.6 Expansion tank

Note: This option is only for Solar SR™ models.

The expansion tank is delivered separately and installed at site.

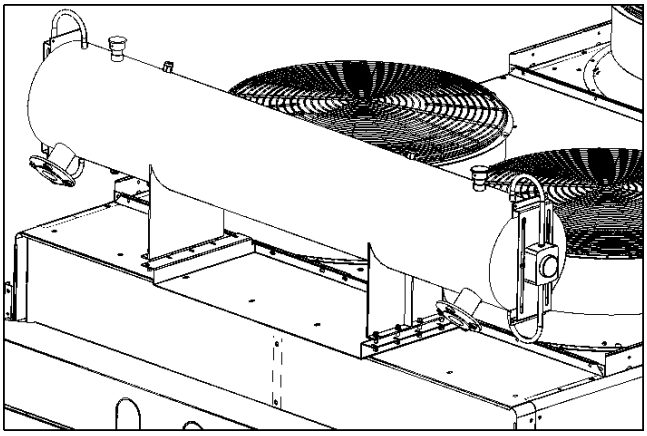


Figure 40: Expansion tank final assembly

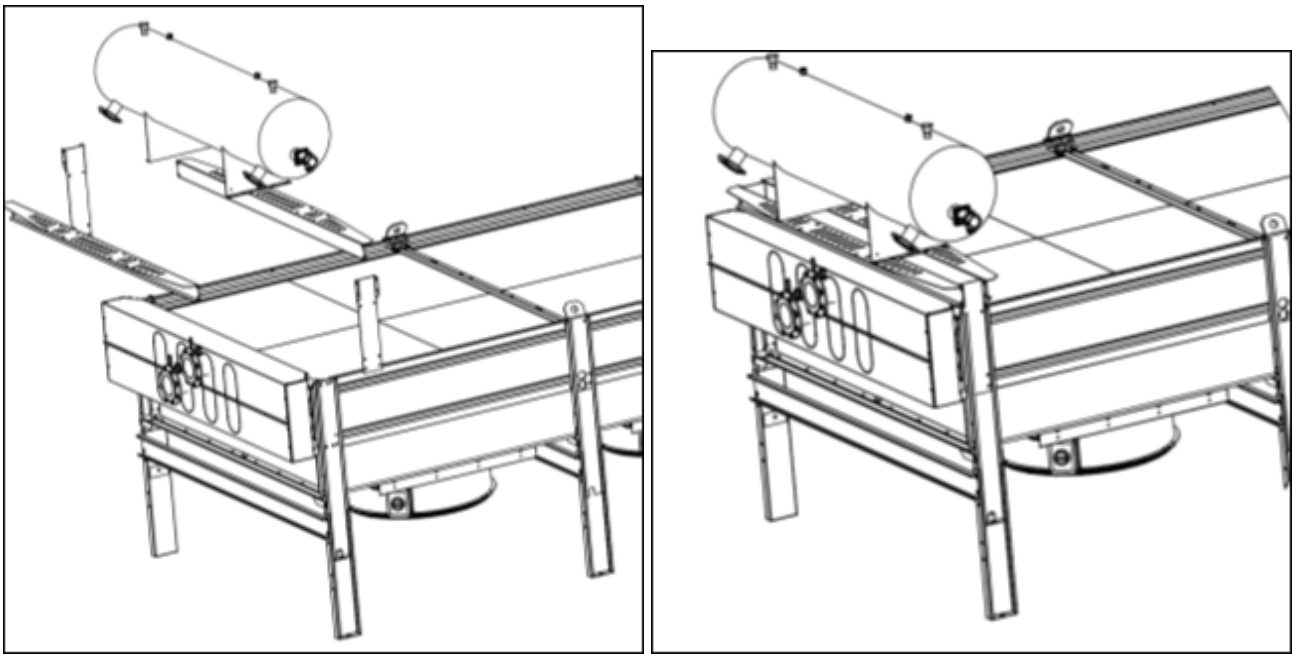


Figure 41: Expansion tank final assembly, FD models

The standard expansion tank is made from steel with a protective outer painting. Tanks from AISI material do not require any protective painting.

The expansion tank is not a pressure vessel.

The required level switch is included in the delivery.

For connection details, see the electrical and dimensional drawings.

Table 10: Available expansion tank sizes

Mechanical Option	Specification	Item Id	Specification	Item Id
2-Circuit	30 Liter + 180 Liter	9460068473	50 Liter + 150 Liter	9460038764
	35 Liter + 115 Liter	9460006265	70 Liter + 130 Liter	9460006266
	40 Liter + 50 Liter	9460006264	80 Liter + 20 Liter	9460038921
	50 Liter + 80 Liter	9460018283	100 Liter + 310 Liter	9460069583
1-Circuit	90 Liter	9460038874	260 Liter	9460012660
	150 Liter	9460006238	300 Liter, AISI 316L	9460038967

7.11 Checks before start-up

The heat transfer section is pressure-tested and the electric safety of the unit measured at the factory. The electric safety checking includes the steady-state and insulation resistance measurement of the protecting cable. The customer conducts all the measurements and tests (including the grounding resistance measurement), which are required in the operating country.

Before starting the unit	✓
Ensure that none of the components are damaged.	
Ensure that the unit is firmly in position.	
Check the fixing of the mechanical parts.	
Check the cleanness of the heat transfer section.	
Check the suitability of the electric network.	
Check the electrical connections.	
Ensure unit grounding.	
Fasten all the connection terminals correctly.	
Check the fan tip clearance between the fan and fan collar.	
IEC Fans: Ensure that the fan safe guards are installed.	
Ensure that the fan heaters operate correctly: they are ON when the fan is not operating and OFF when the motor is running (Option).	
After electric installations, check that the fans rotate properly and that the air flow direction is correct.	
When the fans are running, check that there is no unusual noise, imbalance, etc. in the unit.	
Ensure that there are no leaks.	

⚠ **Caution:** EC-fans: High-voltage test.

The integrated EMC filter contains Y capacitors. Therefore, the AC testing voltage exceeds the trigger current.

Test the device with DC voltage when you carry out the high-voltage test required by law. The needed DC voltage corresponds to the peak value of the AC voltage required by the standard.

8 Operation

Note: Before starting operation, see Residual risks on page 9 in this manual.

During operation, wear appropriate personal protection equipment (PPE).

The customer is responsible for the use of the most suitable PPE.

Only qualified personnel may operate the device.

8.1 Startup

To operate the unit, the system must be fully in operation, including the fluid circuit and electrical system. To start up the unit, open the respective valves on the inlet and outlet side of the fluid circuit and connect to the electrical system:

1. Switch on the electrical system (the fans start up automatically).
2. Open the working fluid-carrying lines.

Caution: In freezing conditions, open the inlet valve/by-pass valve slowly or control the pump startup speed to avoid tensions on the coil due to freeze structures. When the coil is free of ice, continue the normal startup procedure.

Start up procedure

3. Before starting, check that all the equipment fastening screws are properly tightened.
4. Close the system inlet valve and open the outlet valve fully.
5. Open the system and header vent valves.
6. Open the bypass valve slowly to start the liquid feeding pump.
   Fill the unit from bottom up to avoid trapped air bubbles in the coil.
7. When the air from the system has been discharged, close the vent valves.
8. Check that there are no leakages.
9. Check the electric connections.
10. Ensure that the fans are free from jams and obstacles.
11. Start the fans.

Caution: In freezing conditions, we recommend using the fans continuously at the minimum speed. With cold start, ensure that the fans rotate freely before the startup.

8.2 Shutdown

If the unit requires emptying because of maintenance, system shutdown or dismounting, proceed as follows:

1. Stop the system with normal shutdown procedure.
2. Stop or disconnect all the services.

   Note: Ensure that the water and electrical service switches are in the OFF position.

   Note: Ensure that no expected or human error causes further supply of water and electric power.

3. Follow the drainage instructions. See Draining liquid cooler on page 74.

9 Service instructions

Note: Before starting maintenance, see Residual risks on page 9.

During service work, wear appropriate personal protection equipment (PPE).

The customer is responsible for the use of the most suitable PPE.

Only qualified personnel may carry out maintenance procedures.

	**WARNING:** Only an authorized electrician may perform the electric connections. 
	**WARNING:** Before starting the service operation, ensure that the electrical supply is reliably isolated; use the lockout/tag-out system. Always check with a voltmeter that the unit is electrically isolated and shut off. 

9.1 Service inspection

	**WARNING:** Risk of slipping or falling down. 
	**WARNING:** Depending on the installation and operating conditions, a sound pressure level greater than 70 dB(A) may arise. Use appropriate ear protection. 

WARNING:

In operation, the heat transfer section and pipe temperatures exceed 45 °C. Contact may cause burns. Use hand protection.

Hot air over the unit when the unit is operating. Never work a long time over the unit when it is operating.

WARNING:

Breaks in pressure pipes or components may cause injuries. Do not exceed the unit design pressure. Only perform maintenance work on pressurized parts when the unit is empty.

The fluent operation of the AlfaSolar SR™ unit requires regular service. The necessary intervals between servicing depend upon the specific application. The operator stipulates the service interval according to the operating conditions.

Alfa LU-VE gives the following guidelines for regular service inspection intervals and tasks:

Task	Inspection Interval
Check the cleanness and visual condition of the heat transfer section; clean the unit, if needed.	1 week
Check the general liquid cooler conditions	1 month
Check the fans' visual condition and cleanness; clean the fans, if they are dirty.	1 month
Fix the units, fans, fan motors and fan guards.	1 month
When you change the number of fans to control the condenser/liquid cooler capacity stepwise, change the running order of fans periodically.	1 month
Operate the IEC-fans for 3…4 hours during stand-stills. During stand-stills, the power of the EC fan remains on (the fans are rotating with the minimum speed).	1 month
Check the vibration level and impeller tip clearance.	6 month
Complete cleaning (coil).	6 … 12 months
Check the device for leaks.	6 month
Check the insulation of the wires for damage.	6 month
EC Fan: Weld the seams for crack formation.	6 month

Task	Inspection Interval
IEC Fan bearing conditions: Check the replacement interval in the motor maintenance instructions. If the motor is equipped with re-greasing nipples, the normal lubrication period is 15,000–30,000 h. The grease amount and type are given in the motor nameplate or the motor manual.	1 year
Check the correct deflection of the vibration dampers (when needed, replace the vibration dampers with new ones that Fincoil LU-VE Oy supplies).	1 year
Fasten all the connection terminals correctly.	1 year

You can use the liquid cooler top cover plates as a service desk. Alfa LU-VE recommends installing handrails and using safety harness. Solutions for handrails and mounting legs are available from Alfa LU-VE.

9.2 Stepping on unit

WARNING:

If you must step on the unit for maintenance purposes, always wear safety shoes.

Use proper safety devices that prevent falling.

Do not step over SM/SRM™ units.

SM™/SRM™ and SD™ models

On the left, there is the SM/SRM™ model. Do not step over the units.

On the right, there is the SD™ model. Walkable areas are marked in Figure 42: Walkable areas of AlfaSolar SM/SRM™ and SD™ units on page 73.

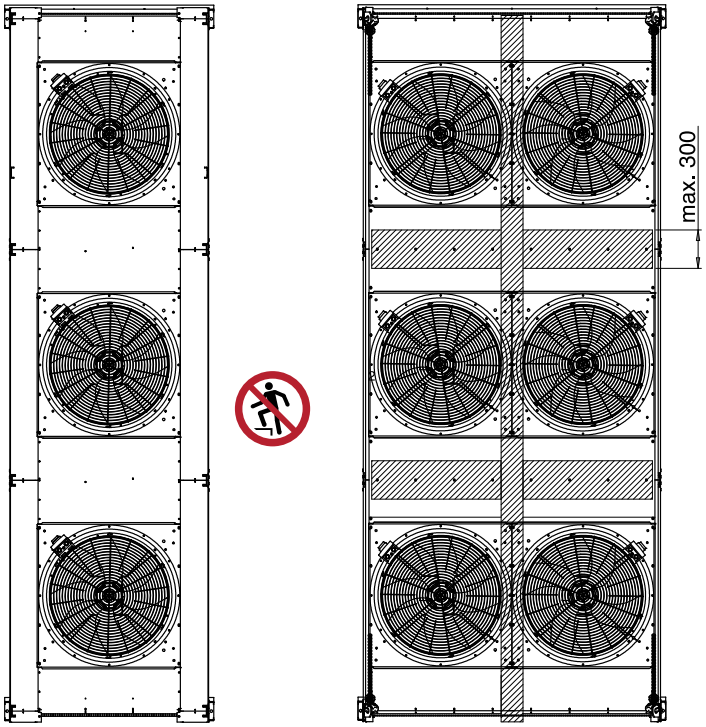


Figure 42: Walkable areas of AlfaSolar SM/SRM™ and SD™ units

= Walkable area

SRD™ models

Walkable areas of the SRD™ models are not limited on the deck plate. Note the slippery edges.

You can use the liquid cooler top cover plates as a service desk. Alfa LU-VE recommends installing handrails and using safety harness. Solutions for handrails and mounting legs are available from Alfa LU-VE.

9.3 Filling liquid cooler with fluid

WARNING:

Follow the recommendation of the working fluid supplier (Material Safety Data Sheet) strictly.

Prevent the accidental release of fluid and adopt the visual and acoustic alarms to minimize the consequences of insufficient amount of fluid. Plan the installation field for recovering or disposing of the fluid.

To fill the liquid cooler:

1. Mix the fluid well before use.

2. Open the venting valve.
3. Fill the system circuit from bottom to top to ensure coil circuit deaeration.

Note: The unit venting is not designed to cover the whole system deaeration. We recommend using system circuiting dearation to remove all absorbed air, including micro-bubbles.

9.4 Draining liquid cooler

WARNING:

Follow the recommendation of the working fluid supplier (Material Safety Data Sheet) strictly.

Prevent the accidental release of fluid and adopt the visual and acoustic alarms to minimize the consequences of insufficient amount of fluid. Plan the installation field for recovering or disposing of the fluid.

You can drain the circuit of the unit through the drainage valve. Open also the venting valve. Before starting the drainage, close the inlet and outlet valves of the unit.

Prevent fluid escaping from the unit to the environment.

Note: The unit does not drain fully with gravity. Use pressurized air to complete emptying.

9.5 Changing liquid to another liquid

Operating the unit with unsuitable working fluid may cause considerable danger.

Note: With water and improperly chosen liquid solution, there is a risk for unit freezing at ambient temperatures near 0 °C or below. Freezing water may break the water tubing in the coil.

9.6 Coil cleaning

WARNING:

Each fan is equipped with a fan guard and a lockable service switch. The wire spacing in the fan guard and the safety distance of the blade correspond to the European safety standard. The safety guards are protections from contact only.

Do not remove the safety guard before the fan is shut down. The rotating impeller may catch in your clothes, cut you or pull you in.

WARNING:

Before starting the service operation, ensure that the electrical supply is reliably isolated; use the lockout/tag-out system. Always check with a voltmeter that the unit is electrically isolated and shut off.

WARNING:

Before washing the heat transfer section, read the Material Safety Data Sheet of the detergent and follow the manufacturer´s instructions.

When vacuum-cleaning and washing the heat transfer section, use protection glasses, safety gloves, safety shoes and other personal protection.

WARNING:

Sharp edges. Use protection glasses, safety gloves, shoes and clothes.

The normal and continuous operation of the unit increases the risk that the coil becomes dirty. Depending on the environmental working conditions (atmospheric pollution, presence of pollen, dust, working residues, external temperature, distance from the sea, etc.), the build-up of dirt can become serious and lead to the drastic reduction in the performance of the unit.

Depending on the amount of dirt, the coil needs an appropriate cleaning plan.

Remove the dust gathered on the fins of the heat transfer section with a vacuum cleaner on the side of incoming air, or blow off with compressed air on the side of outgoing air.

If vacuuming or compressed air does not clean the heat transfer section, you can wash the fins with running fresh water without pressure on the side of outcoming air. Do not use too strong a water jet and direct it vertically against the fin sides so as not to bend them.

If none of these means suffice, spray cleaning detergent with a low-pressure sprayer and wash it away with running fresh water from the side of out coming air. Use a special solvent/degreaser, which cleans the coils more deeply.

Figure 43: Allowed angle of low pressure cleaning water jet against coil material

Note: Do not use any strong alkaline detergents/solvents and acids, or dangerous, inflammable or environmentally dangerous detergents. The pH value of the washing water must be between 7…8.

CIP - Cleaning in Place

Mix degreaser with hot water (~40 °C) and spray it on the coil (with a normal hand spray system), seeFigure 44: CIP equipment on page 76 , where there is a 25 liter plastic can of degreaser and 5 liter hand spray system. Clean the coil with water from the top of the coil. The quantity consumed may vary depending on the amount of dirt in the coil block. The estimated time is 1.5 hours per module. The recommended cleaning interval is 6 months to 1 year, depending on the site conditions.

The recommended cleaning interval is 6 months to 1 year, depending on the site conditions.

Figure 44: CIP equipment

9.7 Fans

WARNING:

Each fan is equipped with a fan guard and a lockable service switch. The wire spacing in the fan guard and the safety distance of the blade correspond to the European safety standard. The safety guards are protections from contact only.

Do not remove the safety guard before the fan is shut down. The rotating impeller may catch in your clothes, cut you or pull you in.

Note: Always check the motors when you are performing service operations.

If the fan makes unusual noise, stop it immediately and check the fixing of the fan and fan motor. When necessary, replace the motor by a new spare part motor available from Fincoil LU-VE Oy.

Caution: Operate the IEC-fans for 3…4 hours during stand-stills.

During stand-stills, the power of the EC fan remains on (the fans are rotating with the minimum speed).

9.8 Acceptable fan vibration level for single operating fan

The manufacturer has tested the vibration levels of the installed fans at the factory. The measurement point is near the bolt for motor support/collar end, shown in Figure 45: Location for vibration measurement on page 77. The limits for site vibrations are presented in Table 11: Vibration limits of fan on page 78. A sudden change in the vibration level may indicate the need for prompt inspection or maintenance. Do not use transitory changes in vibration level that result from relubrication or maintenance for evaluating the condition of the fan. The vibration sensor is optional for fans.

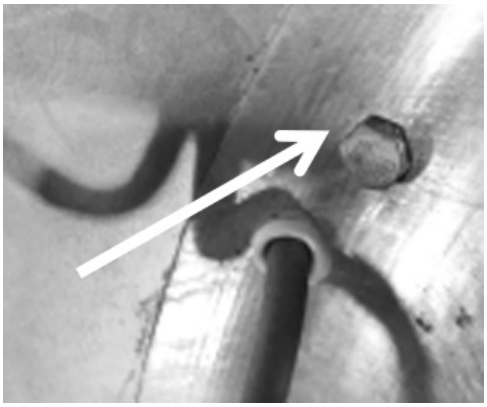


Figure 45: Location for vibration measurement

The vibration limits of the fan for a test conducted at site depend on the selected reference measuring point. At site, the reference point for outside measurement is in the leg near the fan. Always use the same measurement point or points.

Table 11: Vibration limits of fan

Condition	Vibration limit [mm/s]
Alarm	7.1...9
Shutdown	9...14

9.9 EC-fans: Replacing fan package

WARNING:

Before starting the service operation, ensure that the electrical supply is reliably isolated; use the lockout/tag-out system. Always check with a voltmeter that the unit is electrically isolated and shut off.

WARNING:

EC-fans: Electrical load (>50 µC) between mains wire and protective earth connection after switching of the supply when switching multiple devices in parallel.

Electric shock, risk of injury. Ensure that you have sufficient protection against accidental contact.

Before working on the electrical connection, short the connections to the mains supply and PE.

EC-fans: Terminals and connections have voltage even in a unit that is shut off.

Electric shock. Wait for five minutes after disconnecting the voltage at all poles before opening the device.

WARNING:

EC-fans: High temperature at the electronics enclosure. Danger of burn injuries. Ensure that you have sufficient protection against accidental contact.

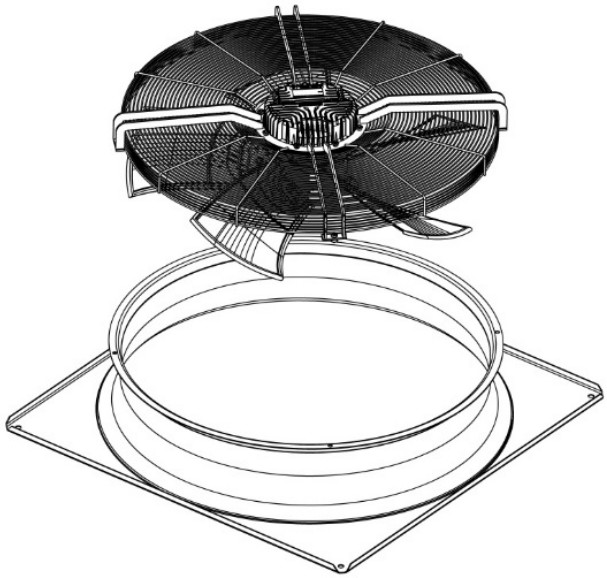
WARNING:

Cutting and crushing hazard when removing the spare parts from the packaging.
Wear safety shoes, safety helmet and cut-resistant safety gloves.

Do not perform any repairs on the fan package. If the fan or its package is broken, return the fan to Fincoil LU-VE Oy for repair or replacement.

To replace the fan package

1. Switch off the device through the control input.
2. Switch off the current from the unit.
   Use lockout and tagout.
3. Wait for five minutes before opening the device.
4. Disconnect all cables.
   Disconnect the earth wire connection last.
5. Open the motor bracket bolts and lift the fan unit up from the collar.



6. Mount the new unit and connect the cables.
   Use old cable glands.
7. When routing the cable, ensure that the screwed cable glands are arranged at the bottom.
   Always route the cables downwards.
8. Tighten the cable to the motor bracket with UV-protected cable ties.
9. Check the rotation and the general functioning of the fan on a test run.

9.10 IEC-fans: Replacing fan impeller

WARNING:

Each fan is equipped with a fan guard and a lockable service switch. The wire spacing in the fan guard and the safety distance of the blade correspond to the European safety standard. The safety guards are protections from contact only.

Do not remove the safety guard before the fan is shut down. The rotating impeller may catch in your clothes, cut you or pull you in.

WARNING:

Before starting the service operation, ensure that the electrical supply is reliably isolated; use the lockout/tag-out system. Always check with a voltmeter that the unit is electrically isolated and shut off.

WARNING:

Sharp edges. Use protection glasses, safety gloves, shoes and clothes.

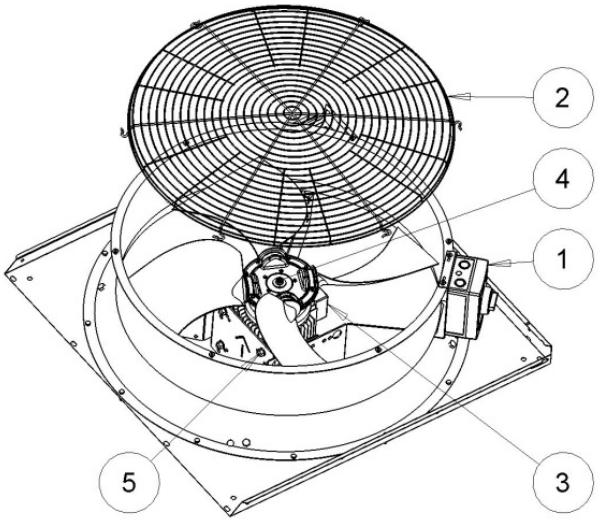


Figure 46: Fan unit structure

Fan unit:

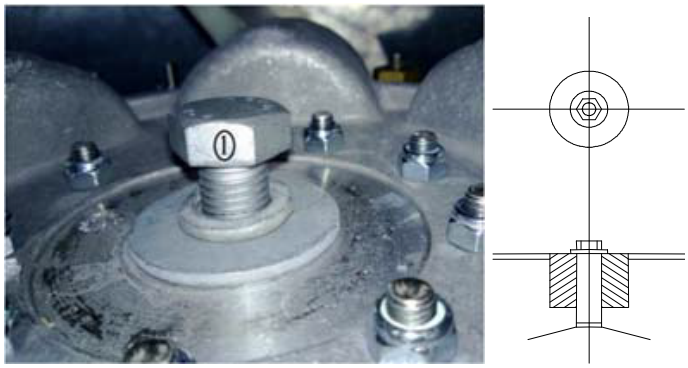
1. Service switch
2. Fan guard
3. Junction box
4. Fan's locking screw
5. Motor's fixing screw

To replace the fan impeller in IEC-fans:

1. To remove the fan guard, unscrew the fixing screws.
2. To remove the fan impeller, unscrew the locking screw.
3. Pull out the fan impeller with an extractor.
4. Clean and lubricate the shaft.
5. Place the new impeller into the shaft.

Note: Keep the wedge with the impeller.

Caution: Do not knock the impeller into the shaft. The motor bearings damage easily.



6. Spread silicone rubber sealing spray at the shaft end HI-TEMP 343 RTV.

   Silicone rubber sealing spray prevents the water running along the joint between the impeller hub and the motor shaft into the motor.
7. Place a washer at the shaft end on the silicone rubber sealing.
8. Lock the impeller hub into the motor axle with a fixing screw.

   Use a strong enough torque (see Table 4: Tightening torques for bolts grade 8.8 (EN ISO 898-1) on page 42). When tightening the fixing screw, some sealing compound presses out through the washer edge and hole. This shows that you have used enough silicone rubber sealing spray.

9. Place the fan guard.
10. Check the fan visually on a test run.

9.11 IEC-fans: Replacing fan motor

WARNING:

Each fan is equipped with a fan guard and a lockable service switch. The wire spacing in the fan guard and the safety distance of the blade correspond to the European safety standard. The safety guards are protections from contact only.

Do not remove the safety guard before the fan is shut down. The rotating impeller may catch in your clothes, cut you or pull you in.

WARNING:

Before starting the service operation, ensure that the electrical supply is reliably isolated; use the lockout/tag-out system. Always check with a voltmeter that the unit is electrically isolated and shut off.

WARNING:

Only an authorized electrician may perform the electric connections.

WARNING:

Sharp edges. Use protection glasses, safety gloves, shoes and clothes.

See Figure 46: Fan unit structure on page 80

To replace the fan motor in IEC fans:

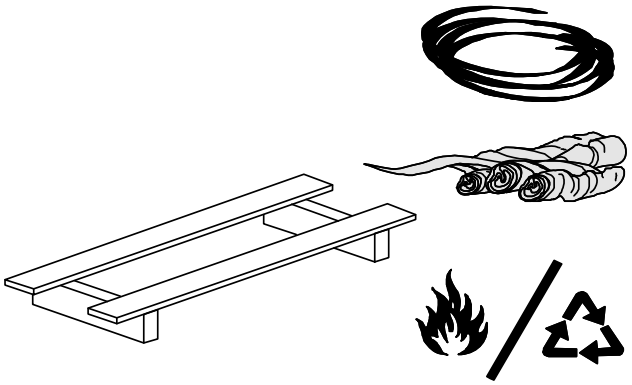
1. Use the service switch to switch off the current.
2. Close the switch.
   Use lockout and tagout.
3. Remove the fan guard.
4. Remove the fan impeller.
   See IEC-fans: Replacing fan impeller on page 80.
5. Open the junction box and ensure that the motor is dead.
6. Remove the electric cable.
7. Unscrew the four fixing screws of the fan motor.
8. Lift the fan motor up.

9. Install the new fan motor in reverse order.
   See Table 4: Tightening torques for bolts grade 8.8 (EN ISO 898-1) on page 42
10. Install the fan impeller.
    See IEC-fans: Replacing fan impeller on page 80.
11. Check the minimum blade point gap.
    The minimum blade point gap is
    - 3 mm for fan Ø914
    - 5 mm for fan Ø1240
12. Replace the fan guard.
13. Check the correct rotation direction and the fan's general functioning on a test run.

Always use spare part motors available from Alfa LU-VE to guarantee their applicability to the operating conditions.

10 Discharge and recycling

10.1 Discharge and recycling of packing materials



All packing materials are suitable for recycling or energy recovery. Wood material is according to the standard ISPM 15.

10.2 Recovery of fluid

For drainage, see Draining liquid cooler on page 74.

Caution: Follow the local, national and international regulations in demolishing the unit and in recovery, recycling and discarding of refrigerants, components and materials.

10.3 Demolishing unit

	**WARNING:** Ensure that the unit is electrically isolated and dead before discarding and demolishing it. 
	**WARNING:** Do not lift the unit before it is fully empty.

To demolish the unit:

1. Remove the unit from the installation site and transfer it to the place of demolishing.

Note: Follow the instructions for lifting the unit.

2. Turn the horizontal air flow unit into a horizontal position.
3. Remove the fans, fan motors and cables.
4. Remove the fan plate, legs and side plates.
5. Cut off the connection tubes to remove the headers from the heat transfer section.

Note: The fans are integrated to the liquid cooler. Fans shall only be used for the purpose which it is designed.

10.4 Material recycling and discharging

Material	Recycling
Sheet metals, Fe + Zn –	To steel scrap
EC-fans, frequence converter, cabinets	To electronic scrap (authorized contractor)
Heat transfer section, Cu-tube/Al-fin–	To mixed copper scrap
Header, Cu –	To copper scrap
Fan collar/motor bracket, Fe + Zn –	To steel scrap
Fan guard, Fe + Zn	To steel scrap
Motors	Recycling/scrapping (authorized contractor)
Service switches, cables	Recycling/scrapping (authorized contractor)
Water jet tubing, Cu –	To copper scrap

11 Troubleshooting

Problem	Possible cause	Solution
Short of capacity	Liquid flow too low	Check the valves/filters.
	Leakage in system/coil block	Check the connections, brazings in the heat transfer section and the tubing. When there is a leakage in the heat transfer section, contact the manufacturer for further repair instructions.
	Wrong flow direction in the circuiting	See Liquid cooler tube connections on page 47.
	Air in system	Ventilate the system.
	Fan/fans not operating	Locate the problem and repair it or change the fan unit.
	Heat transfer section blocked up/ dirty	Vacuum clean/wash the heat transfer section.
	Incoming air flow too low	Check the minimum distance between the unit and the obstacles (see Positioning on page 42). Ensure that there are no obstacles for the air flow.
	Wrong fan rotation direction	Wrong phase sequence. Change the connection on motor coupling or from the switch board.
	Inlet air too warm	Check the location of the units (see Positioning on page 42). Shade the unit from the sun. The heat transfer capacity can be increased by a water jet system. There may be hot air recirculation in the unit. Use streamers and/or wind barriers to minimize recirculation.
Vibration in the unit	Broken fan	Repair or change the fan.
	Dirty fan	Clean the device; if it is unstable after cleaning, replace the fan.
	Damaged vibration dampers	Install new vibration dampers.
Fan does not start	Fan frozen in fan collar	Remove ice.
	Fuse blown out	Replace the fuse.
	Overload release	Check and reset the device from the overload release switch.

Problem	Possible cause	Solution
	Wrong supply voltage	Check that the supply voltage corresponds to the value marked on the motor sign. Restore power supply. **Note:** EC-fans: The error message resets automatically. The device restarts automatically without an advance warning.
	Wrong connection	Check the connections: see Fans and fan connections on page 48 and the product nameplate.
	Break in coil or control circuit	If the switch is in the OFF position, there is a bumbling noise. Check the slack line switches. Check that the line switches close.
	Mechanical failure	Check that the fan motor and fan blade rotate freely. Check the bearing and lubrication.
	Short circuit in coil	Can be indicated by a blown-out fuse. Replace the motor.
	One phase in motor may be broken	Check the connection.
Fan stops	Voltage break	Blown-out fuses
	Low voltage	Follow the voltage given in the product nameplate. Check the connections.
Fan starts, then stops	Failure in supply voltage	Check the loose connections, fuses and control circuit.
Fan does not reach maximum speed	Wrong fan motor type	Ask the supplier about a correct type of fan.
	Too low voltage at fan motor terminals because of voltage drop	Use higher voltage or a starter transformer. Check the connections and the correct cable size.
	Broken rotor	Check for breaks in the short-circuiting ring. Change the rotor or motor.
Motor takes high amp	Too low voltage	Check the size of cables.
	Too low supply voltage	Check the supply voltage.
Wrong rotation direction	Wrong sequence of phases	Change the connection on the motor coupling or from the switchboard.
Fan motor overheating	Motor body or cooling openings may be dirty or blocked up, hindering proper motor ventilation.	Clean the motor and and ensure free air circulation.
	One motor phase may be open.	Check the connection.
	Earth fault	Identify and repair.
	Asymmetric supply voltage to motor terminal	Check the cables and connections.

Problem	Possible cause	Solution
Vibrating fan	Loose motor fixing	Tighten the fixing screws and check the alignment.
	Unbalanced fan blade/Fan blades misaligned	IEC-fan: Balance the blade or change it. EC-fan: Change the fan unit.
	Faulty bearings	IEC-fan: Change the motor. EC-fan: Change the fan unit.
	3-phase motor running as single phase	Check the connections.
	Too big axial play	Check the bearings.
Abrasive noise in fan	Fan blade is chafing against fan collar.	Check the motor centering and fixing.
	Motor ventilator is chafing against the cover.	Repair the fan or cover.
	Ventilator hits on insulation.	Prevent the touch.
	Motor has loosened from its fixing.	Tighten the fixing bolts and rebalance the fan.
Exceptionally heavy noise of running	Air gap not centralized	Check the impeller placement and bearings.

WARNING:

Before moving to the solution, ensure that the unit is in safe condition. See Residual risks.

12 Spare parts

Item Description	Order
Safety guard for fan	Unit order number_Safety guard
Motor	Unit order number_Motor
Motor bearing	Unit order number_Motor gear
EC-fan	Unit order number_EC_fan
Impeller	Unit order number_Impeller
Service switch	Unit order number_Service switch
Streamer	Unit order number_Streamer

For the unit order number, see the order or the identification number of the unit.