ThermoWay
Heat Exchanger Solutions

user's manual

dry coolers

INDUSTRIAL TYPE DRY COOLERS

TDI HV SERIES
TDI H
TDI V

TDI W SERIES
TDI W

Table of contents

1. Technical Information

1.1. Coils Information

- Standard designs of the product are designed as aluminum fins on copper pipes.
- As a standard lamella spacing, 2,1mm - 2,5mm is designed.
- In order to increase efficiency, a staggered pipe array has been made.
- The faucet is made of aluminum cover on galvanized sheet metal to prevent mirror cuts and to increase strength.

1.2. Tool Intented Use

- Chemical, plastic, Energy etc. It is used in facilities that need process water cooling.
- The basic working principle is to transfer the heat load of the hot return water to the air by means of fans and to reduce its temperature.
- Capacity standards for dry cooler are defined for 34% ethylene glycol ratio by volume according to TS EN 1048 standard. (Heat Exchangers-Air Cooled Liquid Coolers "Dry Coolers"-Test Methods For Establishing the Performance).

1.3. Working conditions

In order to choose a Dry Cooler, the following criteria must be answered first.

- Determination of water inlet and desired water outlet temperature,
- Determining the amount of water to be cooled,
- Determining the required cooling capacity,
- Determination of device dimensions,
- maximum allowed in the working environment. Determining the sound level.
- Determination of the desired energy class,
- Determination of fan operating temperature,

1.4. Fan Information

- High efficiency Rosenberg, EBM or equivalent fans should be used.
- Axial fans working in the suction direction are used for the Industrial Condensers specified in this manual.
- Voltage value for single-phase fans : 220V / 50Hz.
- Voltage value for three-phase fans : 400V / 50Hz.
- Three-phase fans with star-delta connection option to operate at two different speeds.
- All motors have internal protection thermistors. Motor protection class IP 54; insulation class is F.
- The allowable operating temperature range is from -40°C to +50°C / + 65°C.

(*1) Thermoway reserves the right to use equivalent fans of different companies.

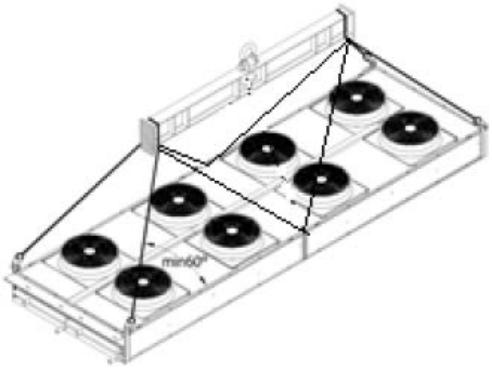
(*2) Fans should be operated for 2 to 4 hours per month during long-term storage and system downtime.

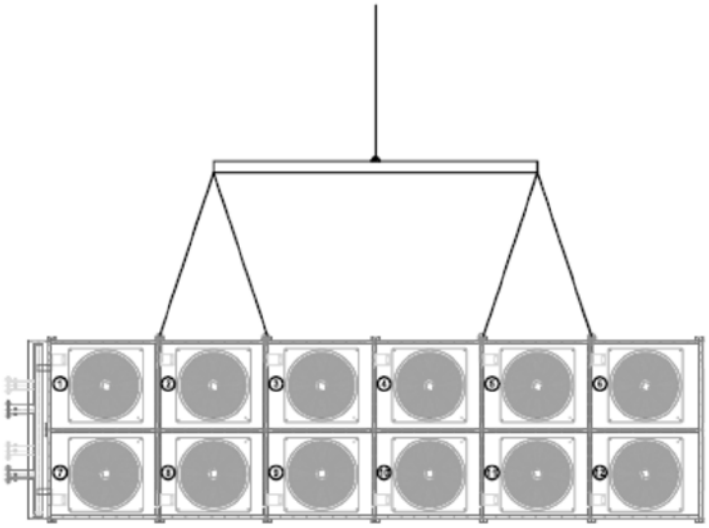
2. Transport and Storage

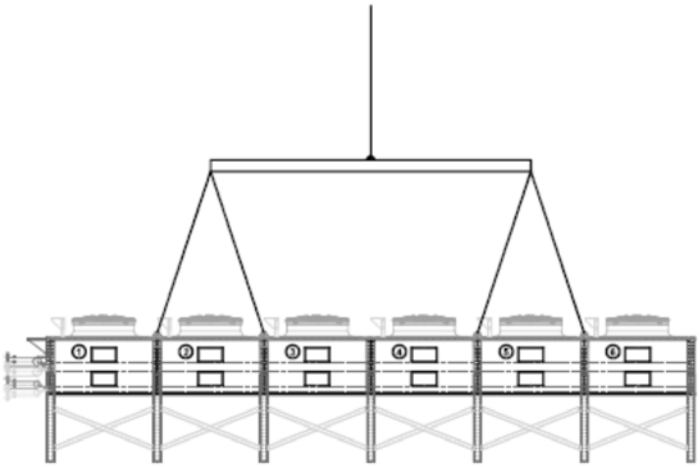
2.1. Transport

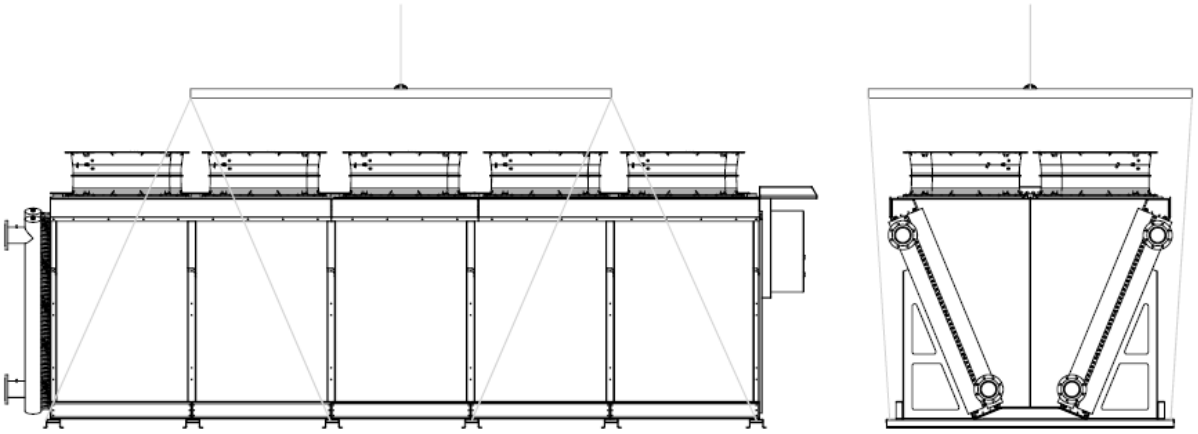
- Before receiving the product, it should be checked that there is no damage to the product or its packaging.
- Vibrations generated during transportation may cause damage to the device. After the product is unloaded, the delivery pressure control should be done.
- If any damage is detected, THERMOWAY A.Ş. company should be informed.
- The following instructions and safety rules must be followed while the product is being transported.
- Carrying out by a competent and certified personnel,
- Using equipment with sufficient carrying capacity,
- Making connections from the transport points specified on the device,
- Equal weight distribution should be provided at the transport points.

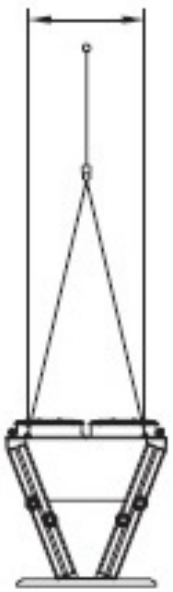
If the desired angle cannot be achieved with a single rope mechanism in the product, it is necessary to carry it with the equipment in the image.

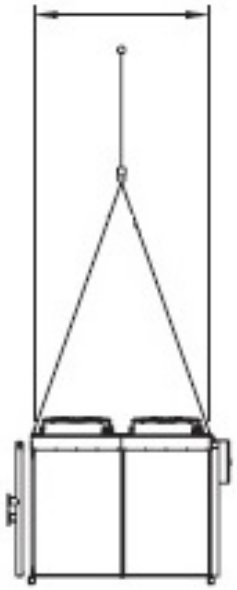


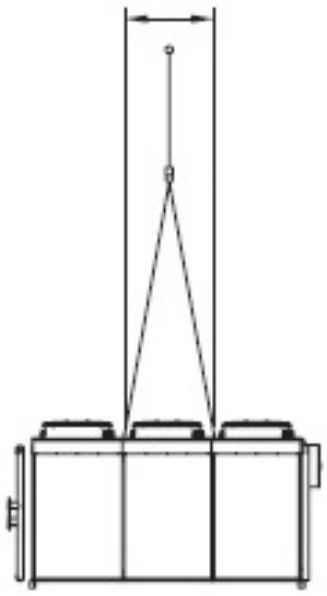


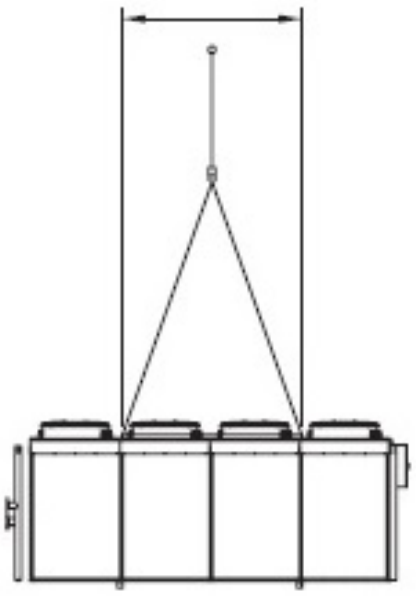




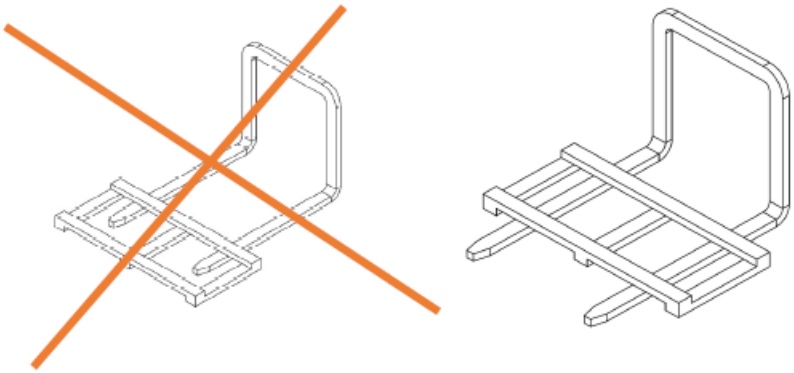








If the product is to be transported by forklift, check that the forklift blades are lifted in the correct direction and with the necessary clearance so that they do not damage the device.



2.2. Storage

- tore the product in its package to protect it from unsuitable weather conditions and environmental effects.
- If the product is to be stored for a long time in a humid environment, the condensed water vapor formed may cause mold on copper and lamella surfaces, so it should be removed from the environment. run the fans for at least 4 hours every month.
- When storing products, avoid stacking them according to the type of packaging.

3. Installation and Location

3.1. Installation

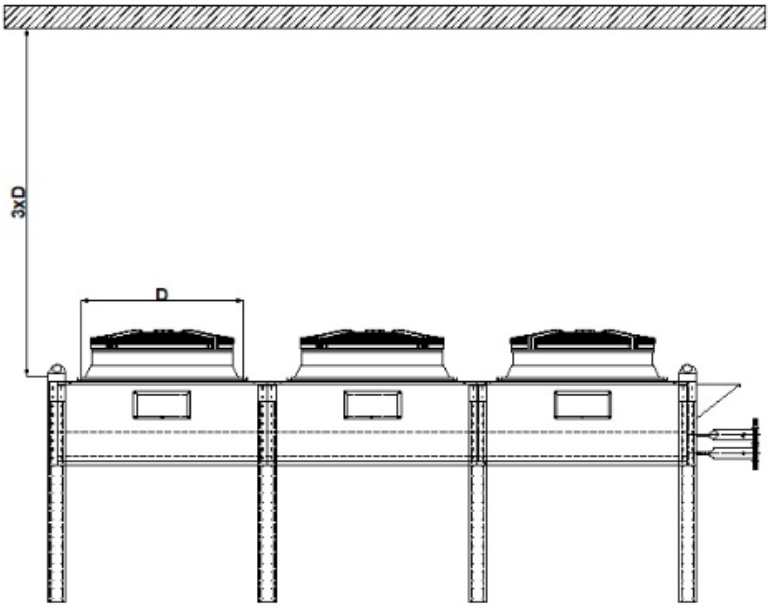
In order for the product to work efficiently, there should be no obstacles affecting the air suction and discharge.

Appropriate conditions for device placements are given in the following headings.

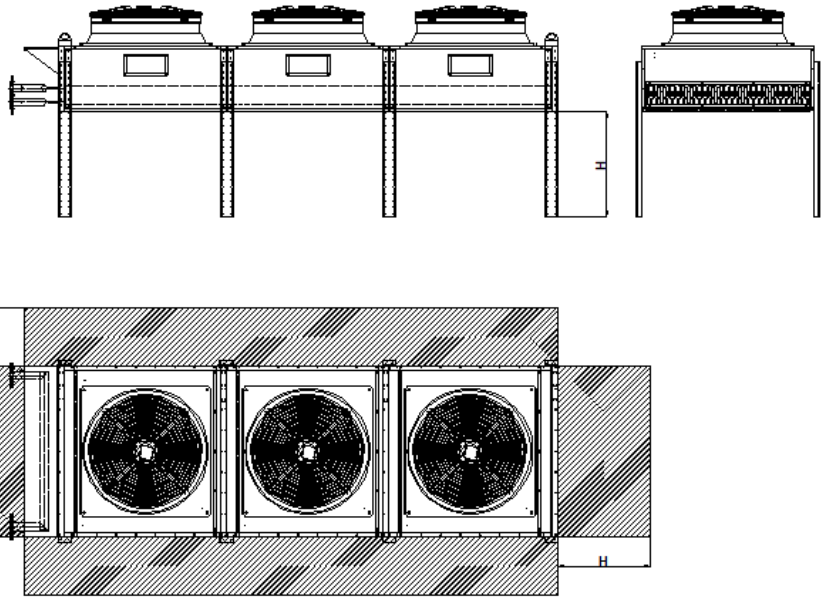
(*) It should be kept away from heat source or devices blowing high temperature air near the device.

3.1.1. Horizontal Use of Products

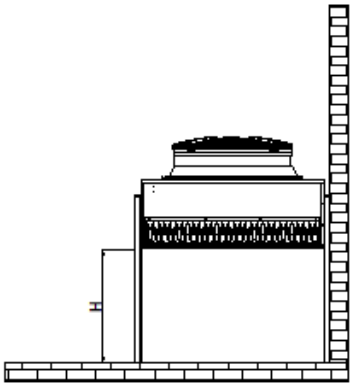
If the product is to be used horizontally, there must be no obstacle to prevent the flow in the direction of air blowing. If there is an obstacle, it should be at least distance 3 times the diameter of the fan in order not to create back pressure in the system, and if possible, an air blowing channel should be made by giving an appropriate angle.

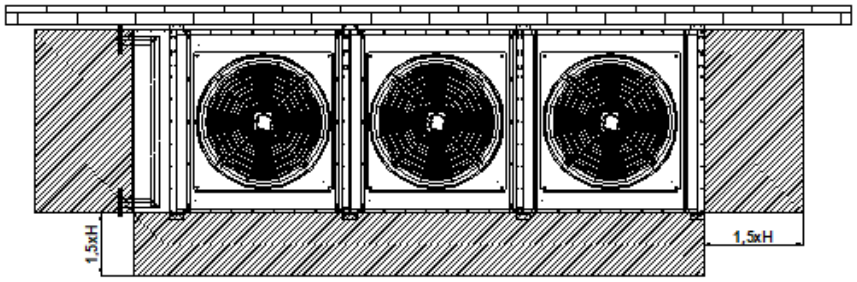


When placing the product, it is necessary to leave a distance of at least as much as the leg space from all four sides in order not to prevent the air flow around and to provide comfortable maintenance, cleaning and repair conditions.

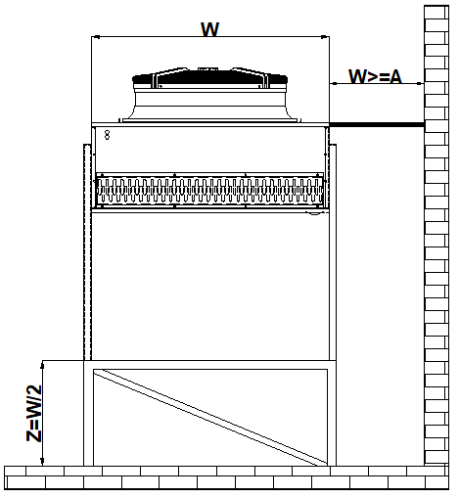


In some cases, there may be cases where one side of the device is adjacent to the wall. In such cases, it is beneficial to build a chassis with a height of at least half the width of the device under the device and leave a distance of at least 1.5 times the leg space from the 3 sides.



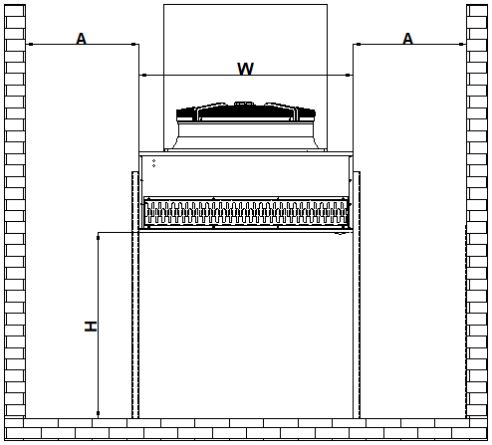


there is a certain opening between the wall and the device, it is useful to close it as in the figure below so that the air flow is not bypassed.



If the device is located in a hollow environment:

To prevent fan air bypass, the air diverter must be adjusted to the level of the pit. Or the device should be raised with an additional chassis.

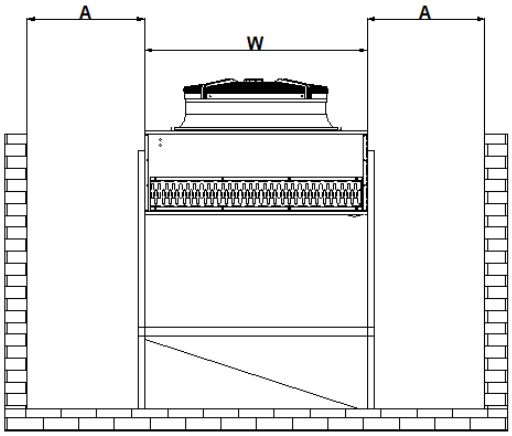


If an air diverter is to be used, its length should not exceed the diameter of the fan.

Distance A must be greater than W/2

H distance must be greater than A*0.7

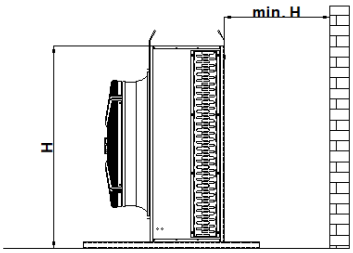
If an upgrade was made with a chassis;

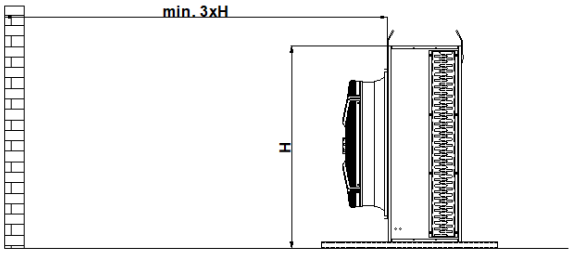


Dimension A must be greater than W/2

3.1.2. Vertical Use of Products

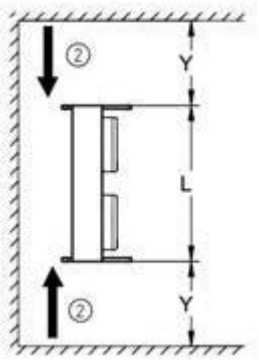
If the products are to be used vertically,





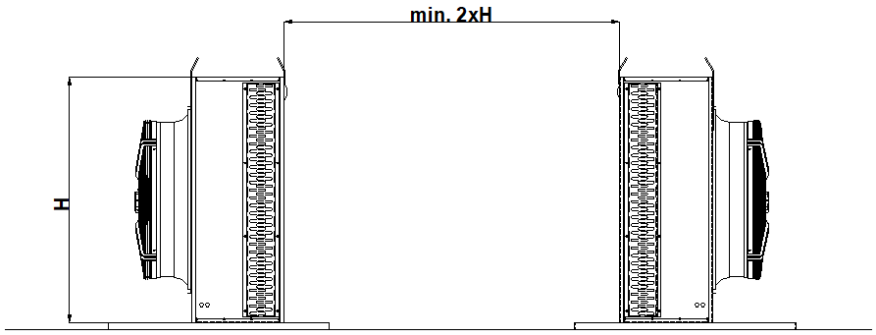
distances that should be between it and the surrounding wall are indicated in the pictures.

In addition, if the device is to be placed in an area surrounded by a wall;

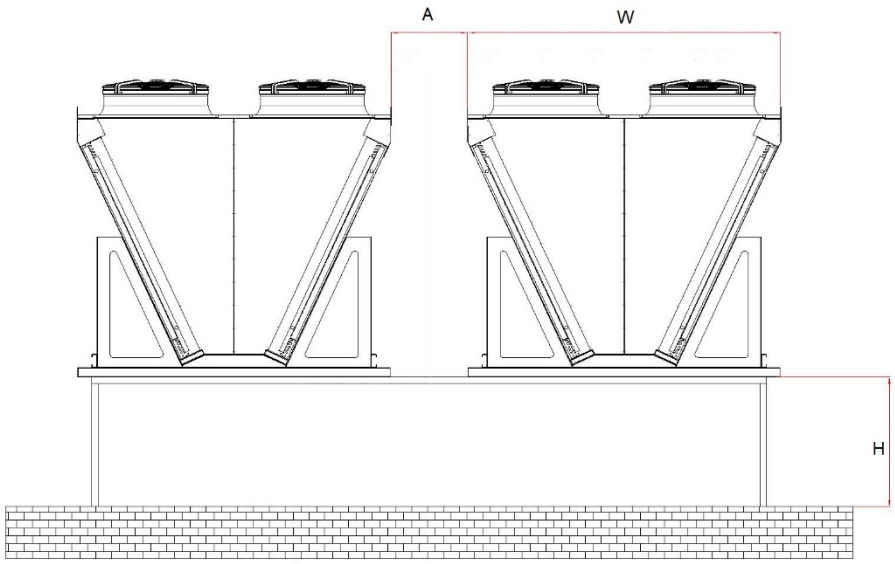


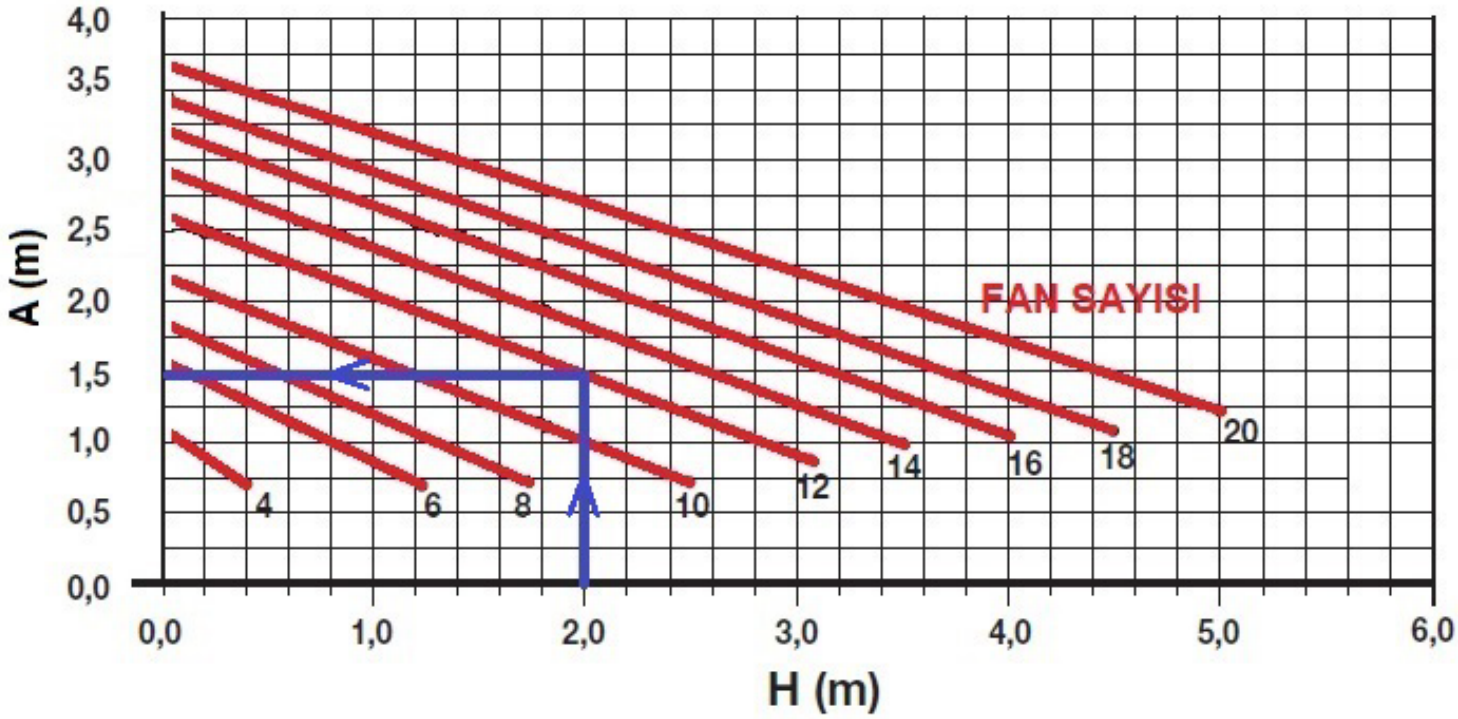
The Y distance must be at least L*0.5.

In cases where the received devices must face back to back;



3.1.3. V Type Use of Products





3.2. Installation and Assembly

3.2.1. Leg Installation

Care should be taken to use appropriate equipment while mounting the feet . Regardless, care must be taken not to use parts, if additions are to be made, to use parts with the same properties.

3.3. Test and Final Control

Failure to perform pre-start testing and final inspection could result in serious injury or death.

What to do is outlined below.

- Check the availability of the device location Make sure the rules in the Location header are applied.
- Identify and eliminate factors that would interfere with adequate airflow.
- Check that the electrical connections are complete and under protection.
- Check the suitability of the pipeline connected to the system, its support from the necessary points and its direction.
- Check the welding points of the pipe connections for the last time.
- If the product is under the sun or in a place where it will be exposed to constant rain, it is useful to take it under protection.
- Check whether there are any residual packaging parts that will prevent the air flow on the product air suction and discharge sides.

4. First Run

- Make sure the Test and Final check procedure is complete.
- When refrigerant gas is supplied to the system, perform leak control with a suitable leak control device.
- Remove any vibration detected in system operation.
- Check the running direction of the fans.
- Check the vibration of the fans.
- Make sure all fans are activated.
- Monitor system pressure.
- If possible, provide observation of the system for the first 48 hours.

5. Maintenance and Cleaning

For safety purposes before maintenance, the gas in the system should be collected in another place and the inlet and outlet valves, if any, should be closed to prevent possible serious injuries and deaths from being disconnected from the system.

Since regular maintenance and cleaning will extend the life of the product, it is necessary to establish and follow the maintenance and cleaning period.

5.1. Maintenance of Fans

Regular maintenance of fans will prevent possible hazards and prevent decreasing in device efficiency.

Sample periodic maintenance chart is attached below.

Vibrating Operation Control of Fans Sound control to detect possible malfunctions	3 Months
Corrosion control of the connecting bolts of the fans (*)	6 Months
Deformation of fan blades or protection wire (*)	6 Months
Detection of possible deformations in fan electrical cables (*)	6 Months

(*) Closing the electrical line to the fans during the controls will prevent possible serious injuries and deaths.

5.2. Checking the Unit Battery Section

Intermittent maintenance and inspection of the battery section will prevent possible hazards and device efficiency.

Sample periodic maintenance chart is attached below.

Cleaning of the lamella surface and control of dents	2 Months
Cleaning the lamella surface with pressurized water. (*)	6 Months
Control of the system with a leak detector to prevent leaks that may occur due to possible vibration.	6 Months
Control of corrosion or deformation in connecting pipes	6 Months

(*)Cleaning the lamella surface should be done against the direction of air suction. For this, the fans must be disconnected from the electrical connection and removed. Example of cleaning with water is given below.

Check the First Run procedure after all maintenance work is finished

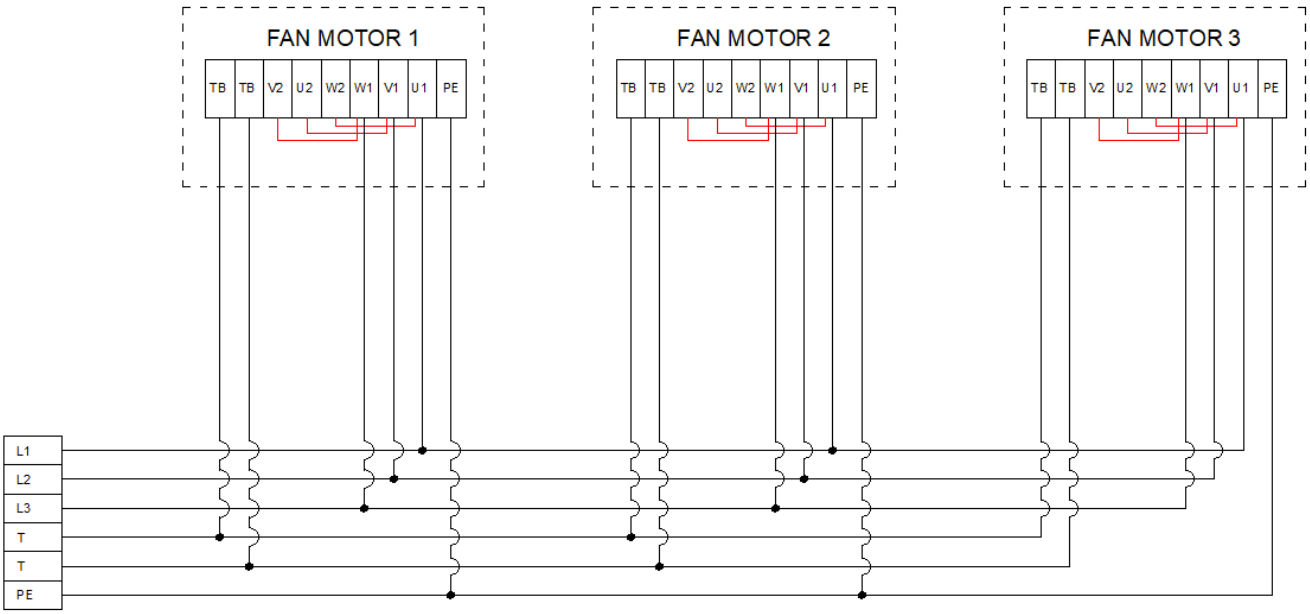
6. Troubleshooting

Possible Problems	Reasons	Solutions
Fans Not Working	There may be a problem with the electrical connection	Check Electrical Connection
	Fan blade jamming	Identify possible mechanical failures.
Loud Fan Sound	Fan Motor has failed	Fan Needs Renewal.
Vibration	Fan sourced	Investigating the cause of vibration of the fan, checking the connecting bolts, balancing or replacing the fan with a new one.
	Pipeline welded	Recalculating the diameters used on the line, checking the pipe support points
Insufficient Unit Capacity	fan sourced	Check that the fans are working properly
	Battery surface is dirty	Cleaning the battery surface and removing substances that will block the air flow
	Possible Pressure Equipment Failure	Defective equipment should be detected if any
	Possible Gas Leak	Leak detection should be done

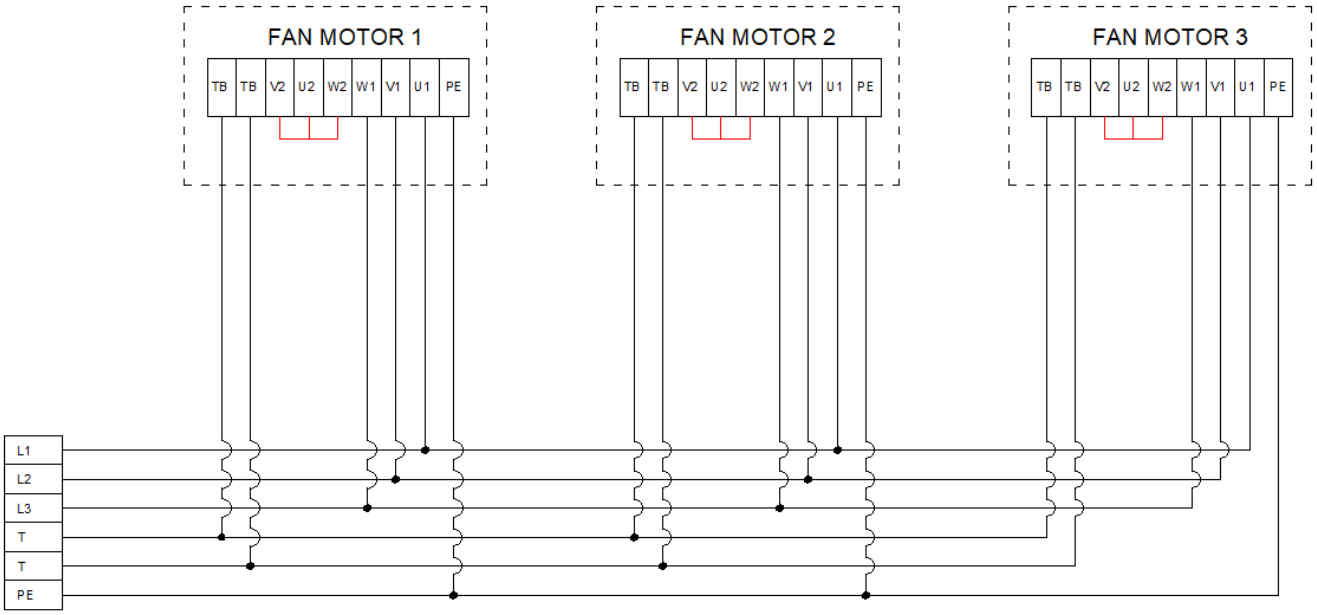
7. Electrical Wiring Diagrams

7.1. Fan Connection

HIGH SPEED CONNECTION



LOW SPEED CONNECTION



8. Adiabatic Cooling System

8.1. Intended Use

INFORMATION

WARNING

Adiabatic cooling system must be used only for purposes given below. In case of using out of warnings given below, it is taken as inconvenient usage and keeps supplier company exempted from all responsibilites

Adiabatic cooling system generally is preferred below welt bulb temperatures in applications of refrigeration and conditioning. It is designed to be used as accessories in Vertical dry coolers, W-type dry coolers and condensers. System decreases dry bulb temperature with the help of water, this leads an increase in capacity.

8.2. Transportation and Assembly

CAUTION

Adiabatic cooling system is transported as assembled or disassembled according to its dimensions and method of transportation.

After receiving products, their package must be checked. Manufacturing company and forwarder company must be informed in case of detecting damages.

Dispatching of products must be executed as shown in chapter of 5. Dispatching and storage.

Convenient protection methods must be applied to prevent injuries stems from sharp corners. Keep your eyes, skin, clothes away from adiabatic pad and dust or smoke of adiabatic pad.

Packed products have to be opened in nearest place of installing.

8.3. Adiabatic Cooling Equipment

- 304 quality stainless steel sheets,
- stainless steel connections elements,
- Evaporative pads,
- Valves,
- PPRC distributor pipes,
- Water tank suitable for recirculation
- Recirculation pump and buoy system,

8.4. Installation and Operation

WARNING

Assembling modules, operation and piping of adiabatic cooling system has to have been done by qualified and experienced worker.

Pin at components prescribed all points by using screws that giving with products.

Modules add extra static pressure to ventilation of the module are mounted. For proper air circulation, verify the device's works area to being adequative to air flow qualities and air transition. Pay attention not to blocks the fan motors and heat exchanger air intake or outtake.

(For products placement, you can examine 7. Installation, placement and assembling part.)

Otherwise, declared performances cannot be guaranteed and operating defects may occur.

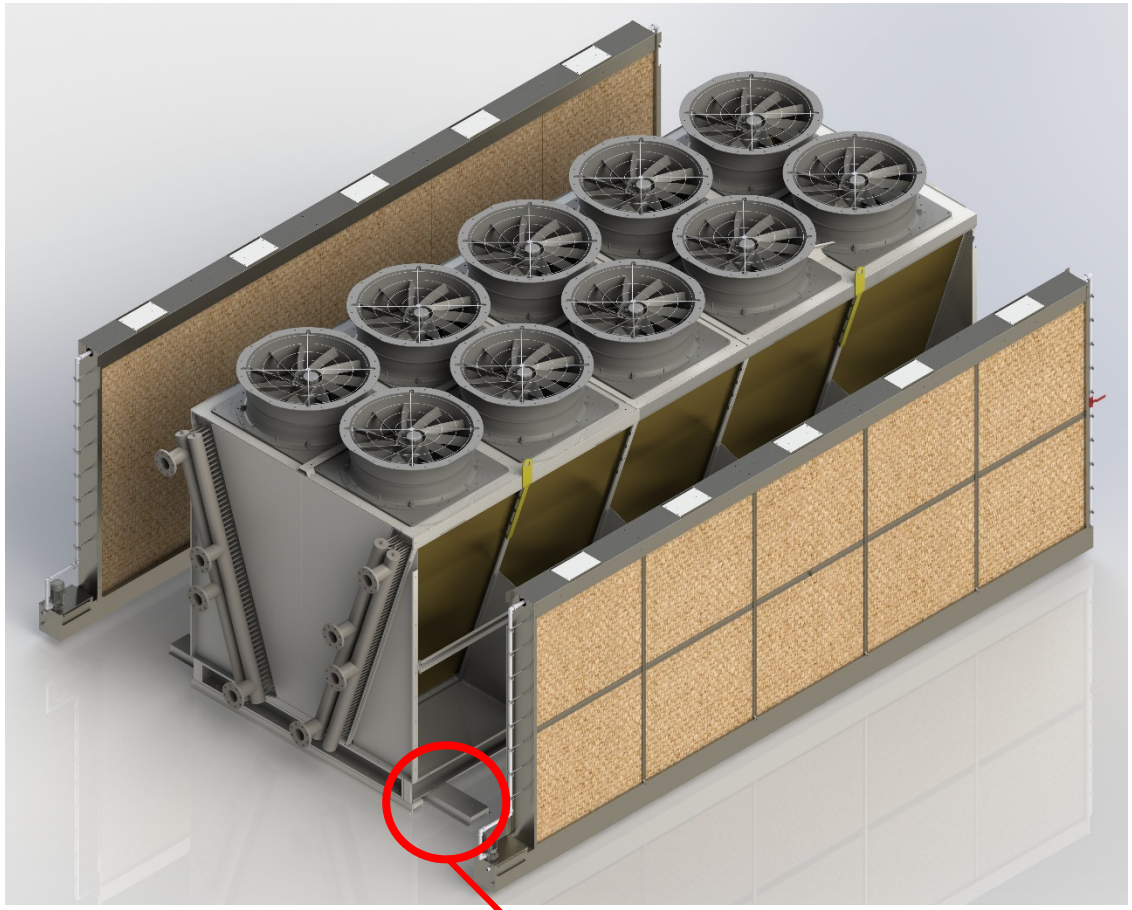
Modules are not designed to support additional loads. Water distribution tubes that leading to modules are protected with metal case. It is forbidden to walk on the upper metal casing or tube protection of the modules. Have to be careful during the maintenance process that workers' required walking on the model. (e.g changing the fan motors.)

Check to provide that water feeding sufficient water flow rate and required pressure.

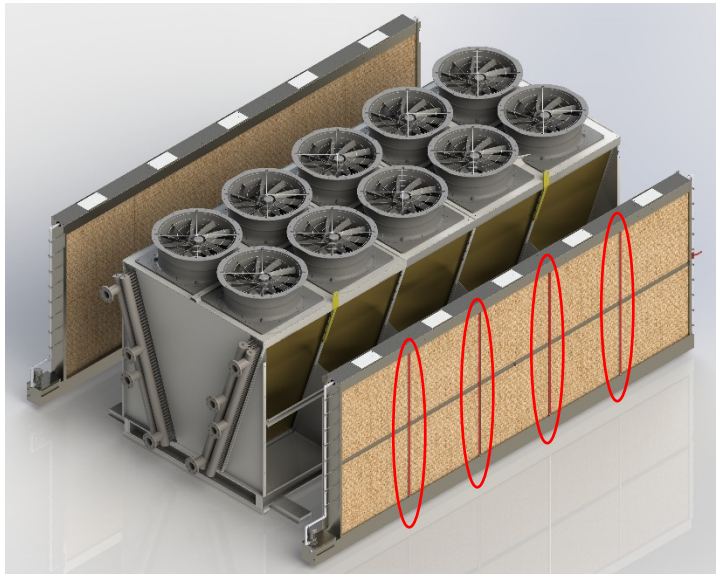
Have to be sure was cut electric and water connection on the device during making Assembly and disassembly.

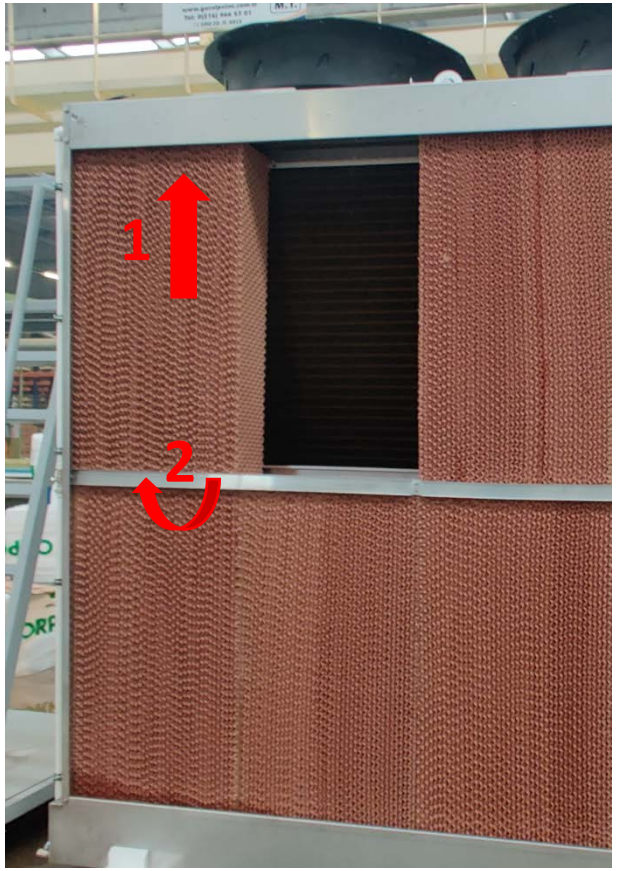
Any kind of intervention have to do by qualified and experienced worker.

1. Connection of product support leg

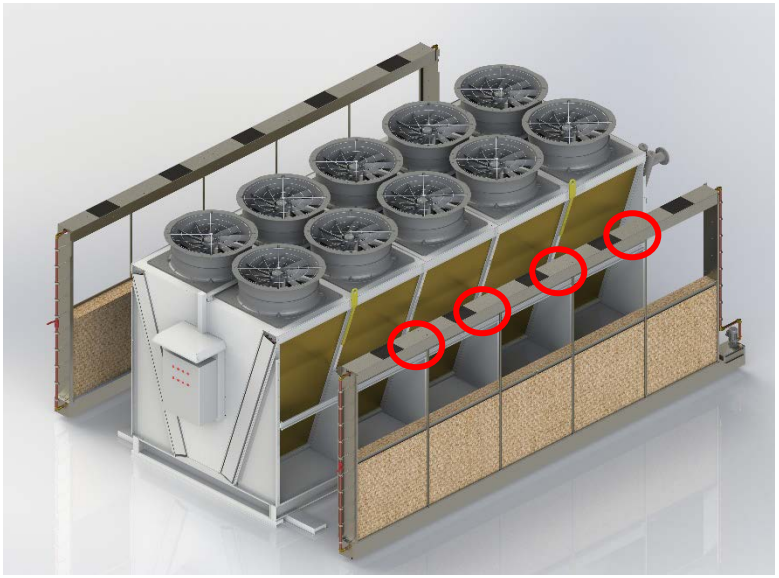


2. Top cooler pad in adiabatic cooling system remove from their place. For this, first vertical supports remove then you have to first pull upwards and pull yourself for removing of cooler pad.





3. In adiabatic cooling system support parts installed. This part generally sends installed from our factory. If It's not, the cooling system has to installed before replace. After, with the help of forklift and crane It passing from product carrying lifting eye is place on support legs and makes top connections of product.

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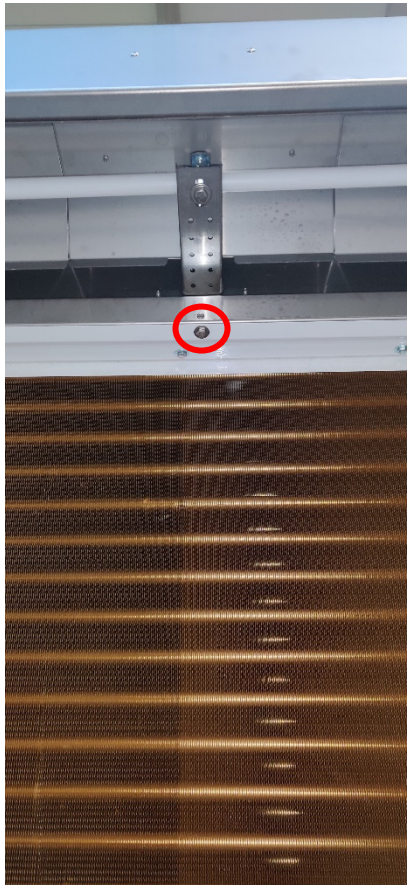
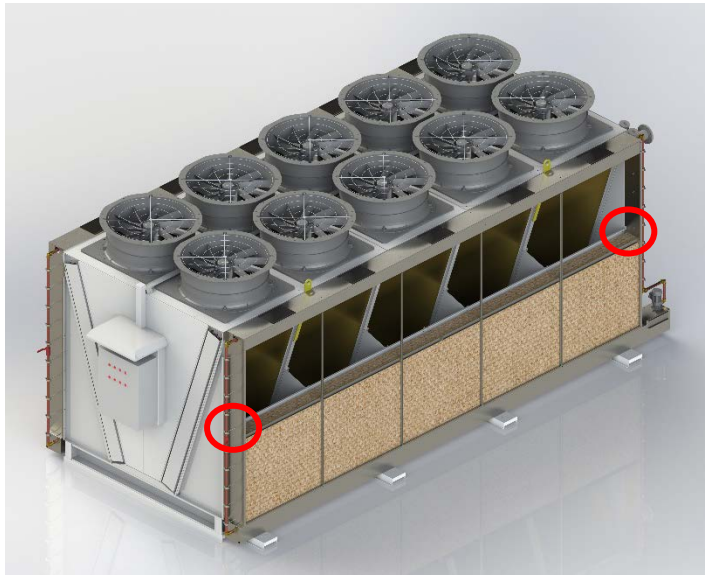
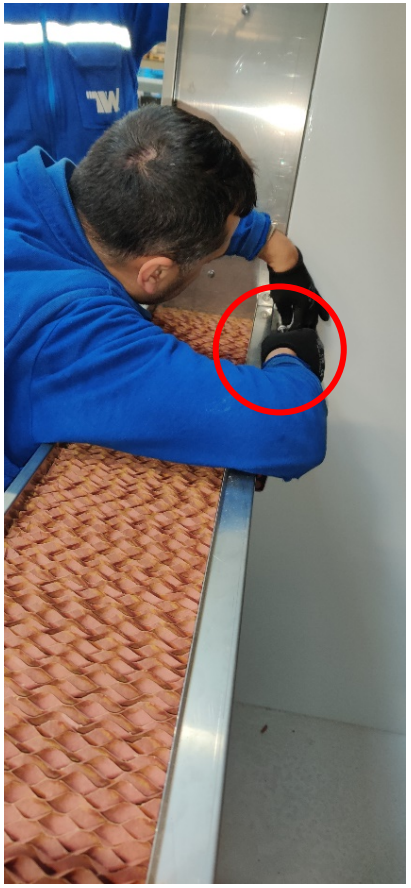
4. Product inner connections with adiabatic system.

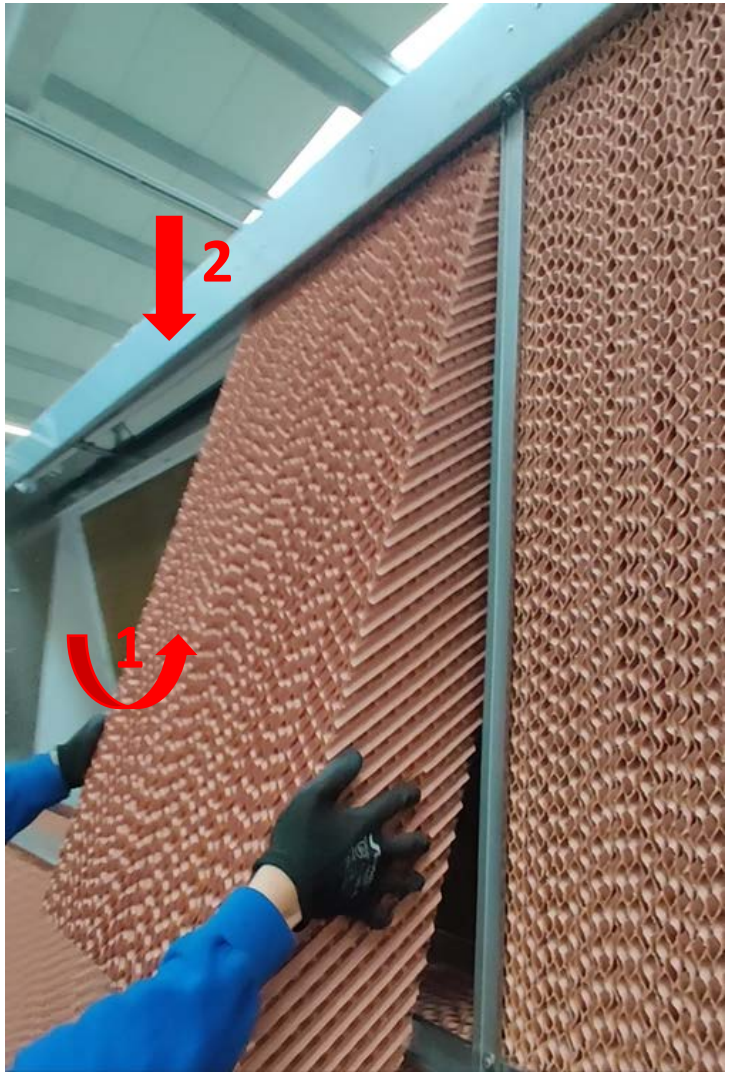


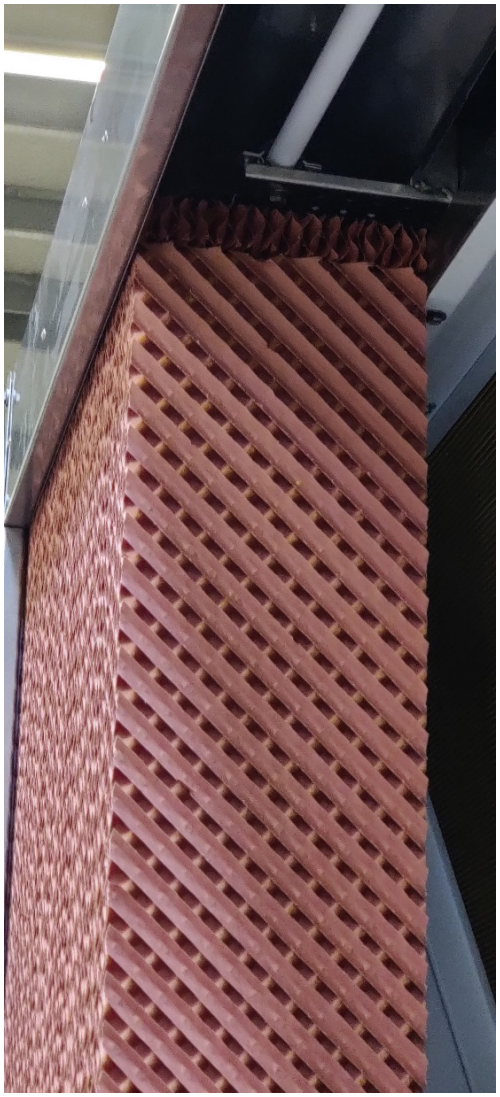


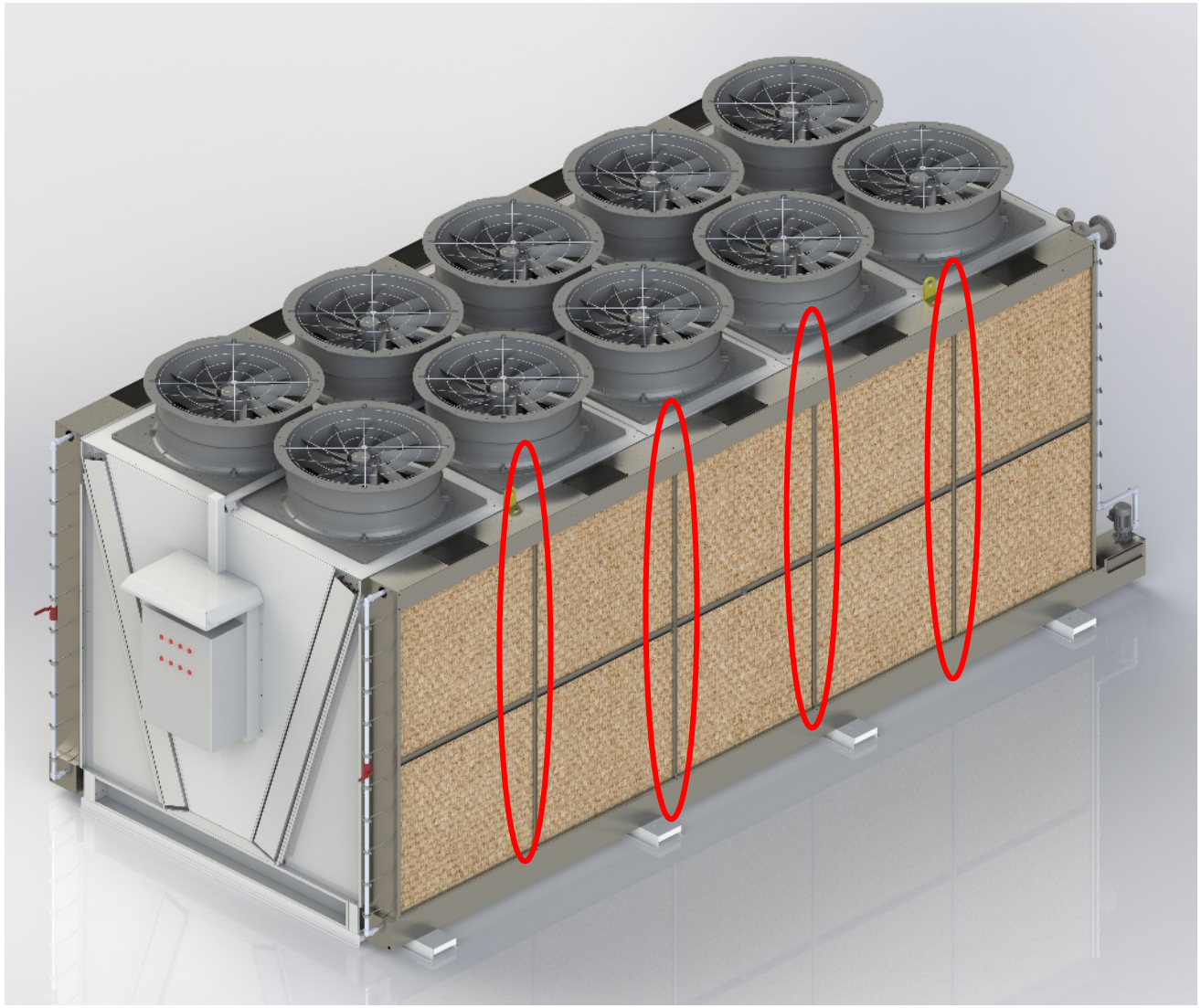


5. lower support sheets places of adiabatic cooling system for supporting

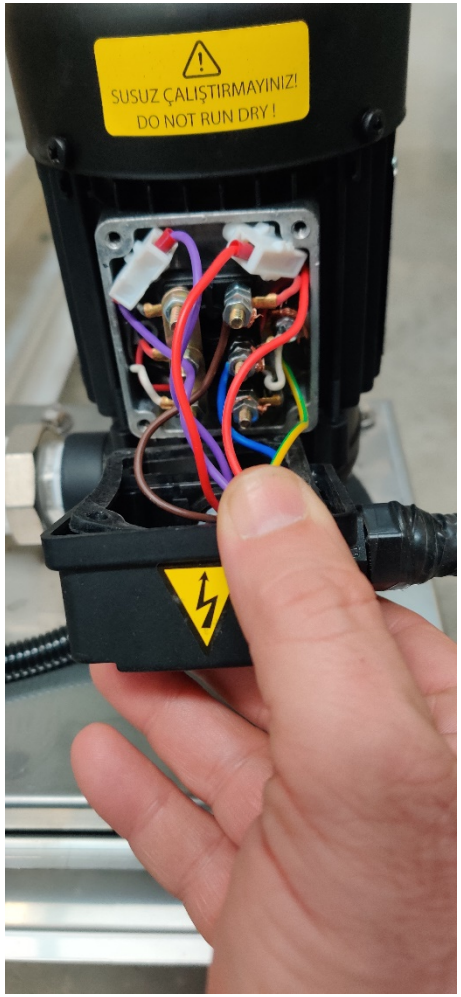
6. Adiabatic top floor cooler pad replaces. While placing the cooler pad adds one line cooler padon top of it. Then vertical support laths removed in the first stage are reinstall.







7. The system is ready to work by completing the pump electric connection and water connections.



8.5. General Maintenance and Control

INFORMATION

WARNING

Before any maintenance working be sure to cut power source of model. All maintenance working has to been done by qualify and experienced worker.

Adiabatic cooling system includes basically 304 quality stainless steel support frame, evaporative peds. Evaporative cooling peds must not be exposed sparks, open flame and weld spatter.

As periodically fixing parts, plumbing and electric connections have to check.

Adiabatic cooling system modules can be removed for avoid damage in winter. For increase to cooling pads working time, as suitable to climate conditions, modules should be thought storage for a long time during adiabatic systems are not using. During to storage keep the modules in protect that dry place from dust and direct sunlight.

Cooling pad material efficiency and using lifetime, determine by water mineral quality that using, air intake, amount of using and probable storage.

Air flow of cooling pad in all place has to be equal as much as possible to get optimum work. It has an affect both cooling pad efficiency and working of machine (Vertically mounted cooling pads are benefited this in best way. It has to making controls periodically for preventing in air passage or eliminate.

Evaporative cooling pad has to be cleaned periodically. correct air passing and wettability of cooling pads should be provided. In case of not applying cleaning process, operational efficiency of adiabatic system can be put into risk and it leads, during the product choosing can occur in decreases of expected performance. Change the cooling pads when obvious breakdown was happened or cleaning is no longer effective. Heat exchanger performance only guarantees with peds that provided by Thermoway.

Clean to evaporative cooling peds with a soft head brush then make periodic cleaning by using water. (check. 12.7 Water quality)

Provide to periodic inspection and cleaning of water distribution system. Do not use corrosive detergents, solvents, chlorine or including ammonia acidic, alkali solution or generally corrosive material. If sterilization material must be used, first check this accordance with material. Spraying pipe can take out and it can be washed with material suitable for removing accumulated limescale

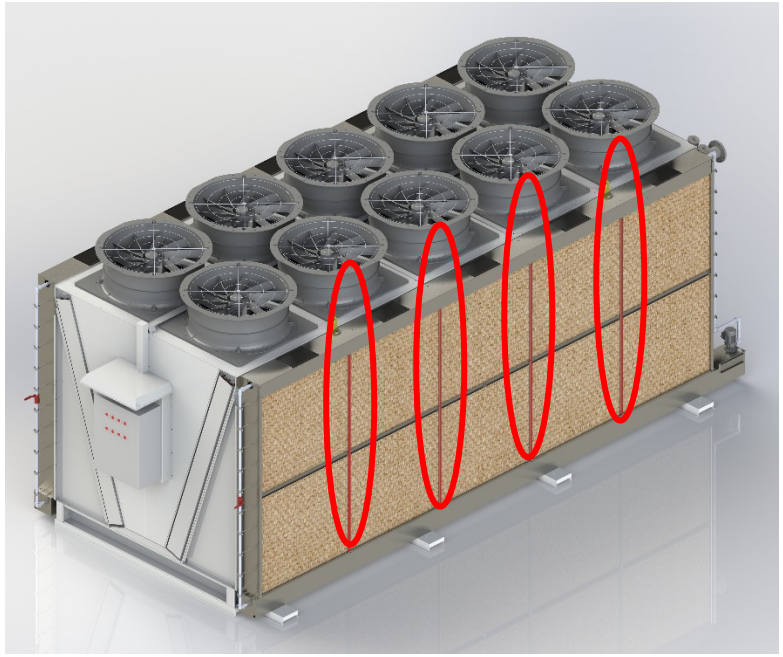
Frequency of audit and maintenance process can change according environmental quality, specific quality of feeding water.

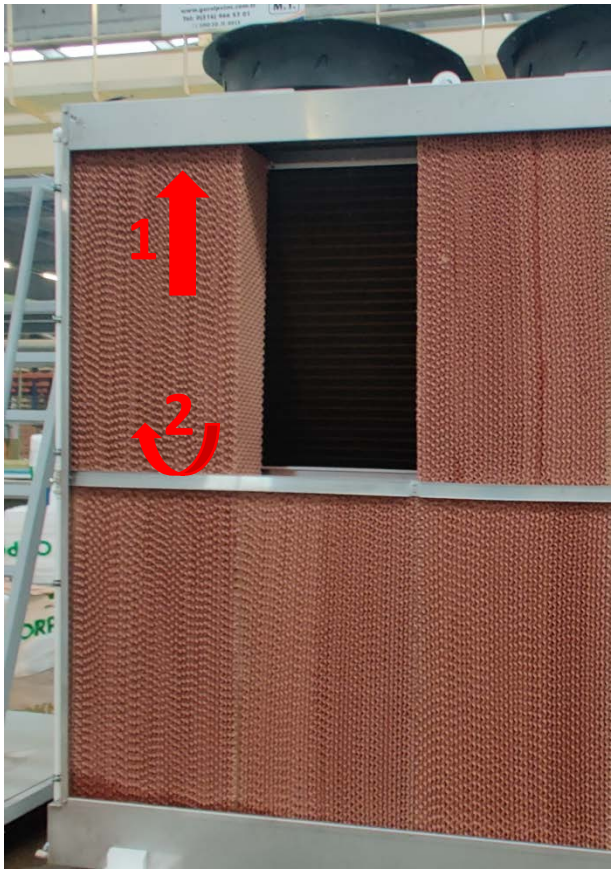
To guarantee maximum efficiency of adiabatic cooling system, it should be checked whether selected products' expected features of working parameters, relative humidity, ambient temperatures and air out temperature calculates are convenient.

Provide that chemical and microbiological parameters of the water used in the adiabatic cooling system are checked before each working period and program the frequency of audits according ambient conditions.

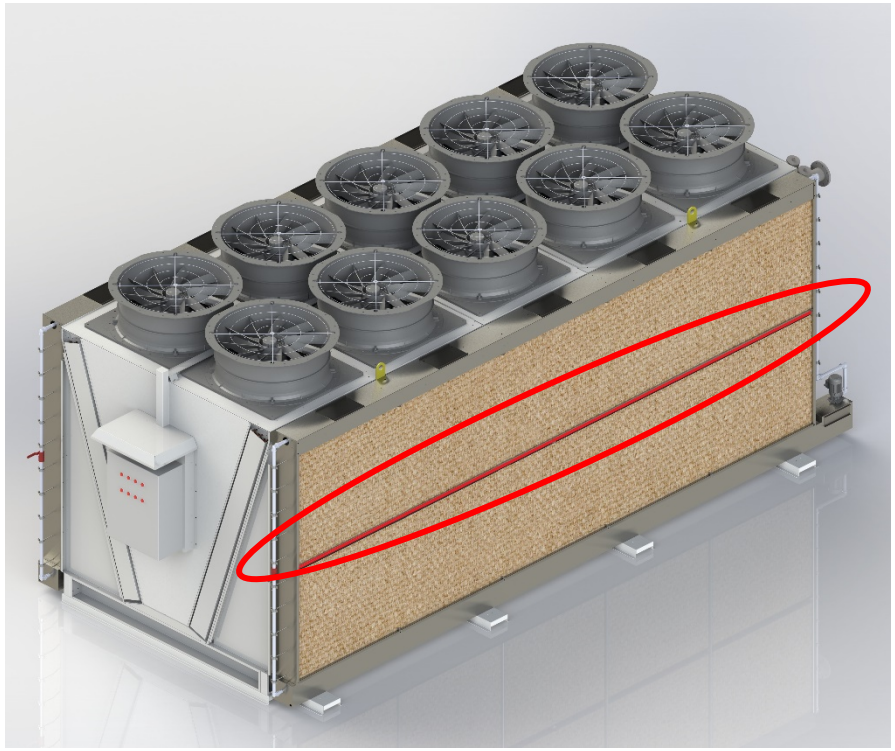
Contact with the manufacturer company for any process on the product in this Manuel that didn’t explain.

1. To remove the cooling pads, firstly support laths dismounted . You can remove the Top floor cooling pads first up then from under to yourself by pulling.





3. After removing the top cooling pads horizontal support lath by removing lower floor cooling pads remove too.



8.6. Water Quality

INFORMATION

COUTION

REFERENCE WATER PARAMETERS	
pH (@25°C)	6.5 ... 8.0
Total hardness	3.5 ... 4.0 °d (1°d = 17,85 ppm CaCO3, 1°f = 10mg/l = 10 ppm CaCO3)
Electrical conductivity (@25°C)	< 1500 mS/cm
Claride	< 50.0 mg/l
Sulfate	< 90.0 mg/l
Nitrate	< 50.0 mg/l
Silicon	< 20.0 mg/l
Iron solution	< 0.1 mg/l
To prevent sudden corrosion and/or crusting Langelier saturatement index (IL) and Ryznar stability index (IR) must be in below rate: IL -1 ... +1 / IR 5.5 ... 6.6	

Obtained water from mains water or other water sources, can be used for purification in accordance with material durability and purification cost expectations, however microbiologic parameters must be considered.

To avoid damage about chemical at pads of evaporative cooling system , supply water mustn't never decrease under minimum pH 5 level and mustn't exceed maximum pH 9 level. Water hardness mustn't never exceed 250 ppm CaCO3. In case that configuring to circulate the water of system, for the purpose of preventing exceed acceptable limits of salinity level , cleaning loops must effectuate.

Acceptable total hardness rate should be as below.

(< 14 °d (1°d = 17,85 ppm CaCO3, 1°f = 10mg/l = 10 ppm CaCO3)

To comply with the specified parameters , the person that installation must be sure chemical materials are compatible and wheter material of used in modul won't be cause any corrosion or damage. If necessary, the water used must be conditioned.

Because of chance of having problem on cellulose layer in evaporative cooling system, Do not add oxidizing substances inside feeding water routinely. If necessary, try to use only minimum amount: in ongoing maintenance situation maximum 1 ppm or once maintenance situation maximum 5 ppm.

Caution! Do not use hot water for feed or clean, insteade of this use ambiant temperature water (T max <20°C)

Water rate, during cutin the adiabatic system must be checked by qualified worker and after that It has to be confirmed according to applicable standarts, planned frequency for special technic and also calculated rates as convenient.

Results have to be documented and registered. During the observation, If the rates of water are determined not comply with requirements, directly spraying has to be stopped for all chemical and microbiologic parameters and made convenient reformative activities

the devices work safe and effective to garantee, we suggest take precautions in below:

a) prepare the risk analyze of all system

b) Documantation based on inspectation and maintenance planning (maintenance, cleaning etc.)

c) Draining the adiabatic system water feeding line using water fill valve at the installation site with closure and drain loop maximum once every 7 days.

8.7. Operational Instructions

INFORMATION

CAUTION

Adiabatic cooling system is not convenient for working ambient temperatures under 3°C.

Environmental qualities such as heat and relative humidity, determine the capacity of evaporative pads. These parameters detection adjust before for following such as envisioned by design.

Evaporative cooling system works and closes according to ambient temperature

When the outdoor temperature increases the referance rates, evaporative coolong system comes into circuit.

When the outdoor temperature decreases the referance rates, evaporative coolong system is out of circuit.

Fans will come into circuit and out of circuit with the help of step control according to outdoor temperature.

For adiabatic water system were defined in below parameters:

MİNİMUM = According to technical data theoric water consumption

MEDIUM = Practic working water flow (per cooling ped approximately 4 l/mins water)

MAXIMUM = cleaning water flow (optional, per cooling ped approximately 6 l/mins water)