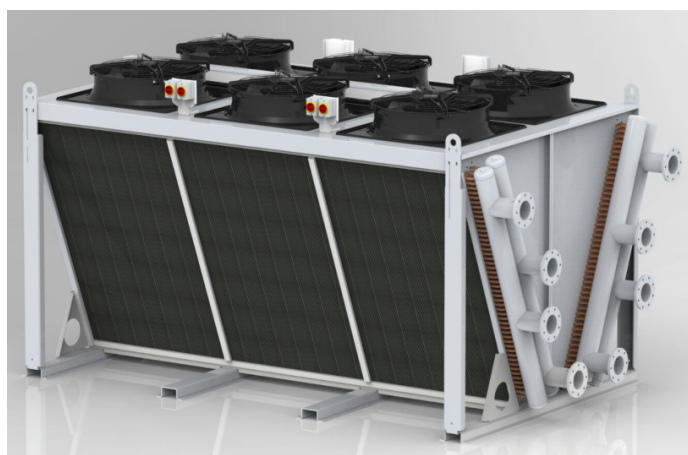


INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS



FDH, FDV, FDW

www.friterm.com



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1. ABOUT THIS MANUAL/GENERAL

This document specifies the instructions for installation, operating and maintenance of the Dry Coolers (FDH, FDV, FDW models) manufactured by FRITERM A.Ş., Turkey.

The instructions below must be followed strictly for the labor health and safety reasons during installation and maintenance of products.

Upon receipt, the product should be visually inspected, and in case of any damage or fault, the supplier must be notified within 7 days.

The manufacturer will not accept any responsibility in these situations;

- Damages caused by persons,
- Damages product due to the disregarding of the recommendations indicated in this handbook.

1.1 Examining the operating manual

To follow the instructions defined in this document is a prerequisite for safety of the staff and for the products to be operated in a fault-free and safe manner.

- The operating manual must always be available. In case of absence of this manual another copy could be obtained from the manufacturers' web page. It should be printed out and kept in an accessible place to everyone whoever should carry out any work regarding the product. (<http://www.friterm.com/en-US/catalogue/dry-wet---dry-coolers/horizontal-and-vertical-type-dry-coolers-with-axial-fans/4/10063>)
- All persons who are responsible for the transport, assembly, initial commissioning, operating, maintenance or repair of the component must be acquainted with the operating manual. The operator should accept in written form that they are acquainted with the operating manual.
- Whenever you have difficulty in understanding and/or comprehend and description or definition given/expressed in this manual, please immediately ask for help from an expert or from then manufacturer. It is of great importance to understand this manual completely and correctly for the sake of labor health and safety.

1.2 Responsibilities

1.2.1 Manufacturer's Responsibilities

- The manufacturer is strictly responsible for supplying a manual accompanying the product which comprises the necessary and enough detailed information regarding the installation/mounting and operation of the product. Besides, the product is expected to fulfill the requirements and satisfy with the anticipated functioning.

- The construction of the product should comply with the presumed operational conditions. The product is expected to be robust enough and resistive against all the mechanical, thermal and chemical challenges. The material used to produce should be compatible with the fluid and the mixture of fluids used as heat transfer media.
- All the materials and components used in constructing the product should be resistive against all the stress and pressure that the product will be subjected to.

1.2.2 Contractor's Responsibilities (Installation, Commissioning)

- Should follow all the instructions and provide all the conditions stated in this manual.
- All the documentation accompanying the product is complementary to this manual. The safety instructions and all other information stated in this manual should be considered.
- The national regulations regarding the protection of environment and labor safety should be strictly followed besides the instructions for safe and correct operation.
- In case of any problem encountered during the installation, FRITERM A.Ş. should be informed and asked for technical assistance if necessary.
- Emergency instructions and the required infrastructure should be prepared and ready for use in any case.
- The regular maintenance/servicing periods and instructions should be determined and defined.
- The additive in order to prevent the freezing of the operating fluid should be feed as requires and as much as required.
- If storage of the product for a long period is needed, a clean, non-hazardous and low humidity environment is recommended.
- The fans of the products that are stored horizontally are recommended to be run for 4-5 hours a week. In case of difficulty of running the fans, then they should be covered and protected from rain and excess humidity.
- In case of storing vertically, it is not recommended to store more than 1 month.

1.2.3 Operator's or Owner's Responsibilities (Operation and Maintenance)

- The director is the responsible person who employs the adequate staff for servicing operating and monitoring the system.
- All requirements and instructions in this operating manual must be complied with.
- The documentation of purchased products is a constituent part of this operating manual. All safety information in this operating manual and all other information must be observed.

- All relevant regulations concerning accident prevention and environmental protection must be complied as well as the confirmed technical regulations for safe and proper working.
- Personal ineligibility. All the work should be conducted by authorized and trained personnel.
- Any defect/damage/malfunction caused by disregarding the instructions given in this manual is the responsibility of the operator.
- Any defect/damage/malfunction caused by the misuse of the product is the responsibility of the operator.
- The product should not be put in operation without the completion of the installation and commissioning.
- The personnel who is responsible for the operation/servicing/maintenance of the product should be provided with all the necessary documentation including this manual.

1.3 Warranty

- The manufacturer warrants that the equipment delivered to the client shows no defects caused by failure of design, material, manufacturing and/or workmanship within the warranty period.
- The client must notify in written form within 10 days from the receipt of the goods, any perceptible defects including transport damages. For hidden defects, he must notify and explain in details the defect in written form within 10 days from observation time.
- Unless otherwise agreed, the warranty period shall be 24 months starting from the date of delivery.
- The warranty does not cover defects in the product's operation stemming from a fault in materials or parts provided by the client, nor shall it cover an installation that has not been assembled according to the manufacturer's instructions and according to professional practice. The products or parts that the costs are not paid to the producer are out of manufacturer's warranty.
- The products called "Dry Coolers" mainly used in order to cool the fluid (usually water but in case of atmospheric conditions below zero degree, antifreeze added solution) to a desired temperature. The fluid to be cooled down should be transferred to the Dry cooler via the piping properly installed according to the rules and related instructions. The usage of the Dry Cooler out of its anticipated functioning is out of the scope of warranty.
- In sub-zero temperatures sufficient antifreeze solution must be added and fluid should be checked by measuring the freezing temperature on a regular basis. In case of occurring any damage on the product due to freezing of the fluid, all the fitting actions and materials used in order to repair the product will be out of manufacturer's warranty.

- The warranty shall not cover equipment and/or its accessories if they have been modified by the client without manufacturer's written consent.
- The warranty clause can only be invoked by the client if the equipment is used normally and in conformity with its purpose and manufacturer's instructions.
- The manufacturer's liability hereunder shall be limited to repair, modify or replace the parts or equipment that shows defect within the limitation of the items under this article.
- The warranty period of the repaired or modified or replaced parts or equipment shall in no way extend the warranty period of the original ones.
- The works resulting from the warranty conditions shall be carried out in the manufacturer's workshop after the client has sent the defective equipment or parts for repair or replacement.
- The manufacturer's responsibility is strictly limited to the obligations as stipulated herein and it is expressly agreed that he shall not be found to make any other indemnity. In particular, he shall in no case be liable to compensate loss caused directly or indirectly by a defect in the equipment delivered.
- The product should be installed and commissioned in accordance with the national/international regulations and rules.
- For the fans having thermal protection, the related wiring should be definitely done and it is considered as contractor's and/or owners' responsibility. Any defect caused by misconnection of the thermal protection wiring in accordance to the circuit diagrams given in this manual would be out of manufacturer's warranty.
- The power supply which the product is supplies should not deviate 10% from the values given on the label.

**DANGER OF FREEZING**

In case of operational conditions with temperatures below zero the sufficient amount of antifreeze (e.g. Ethelene Glycol) should be added unless the water will stay in the system at still times. In order to be able to avoid the danger of freezing a sufficient amount of antifreeze solution should be added to reach a freezing temperature of 7-10 C below the operation temperature.

2. SAFETY REGULATIONS

2.1 Symbols and warning signs

The following terms and/or symbols are used in the operating manual for particularly important information.

Safety messages and symbols are quoted at the relevant positions in the operating manual if there is danger such as death, personal injury and environmental damage. These safety warnings must be strictly adhered to.



Indicates a hazardous situation which, if not avoided, may result in death or serious injury



Indicates a hazardous situation which, if not avoided, may result in serious injury.



Indicates a hazardous situation which, if not avoided, may result in moderate or minor injury.



Additional notes, information and tips.



IN CASE OF DANGER!

- Switch off the power
- Switch off the main
- Please ask assistance from an authorized technician or expert.
- Please do not try to resolve any problem by trial and error.

2.2 Personal protection

While working on and standing by the product, protective clothing must be worn.



[Metni yazın]

- Safety shoes
- Safety helmet
- Protective gloves for fitting and repair work
- Chemical-resistant clothing and protective gloves for cleaning work, especially when handling solvents
- Safety goggles for cleaning work, especially while handling solvents or using compressed air for cleaning
- Hearing protection

2.2.1 Personal protection signs



Head Protection



Eye Protection



Foot Protection



High Visibility Clothing



Protective Clothing



Hand Protection



Respiratory Protection

2.2.2 Warning signs



No Smoking



Flammable



High Voltage



Hot Surfaces



Hand Injuries



Poisoning Danger



Fire Risk



Frostbite Hazard

2.3 Warnings

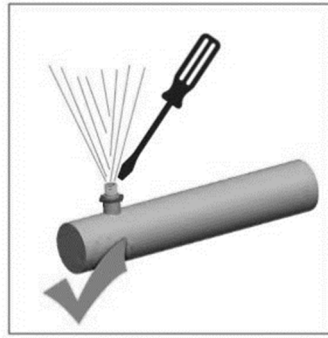
- In an unexpected situation use the emergency stop button which is set up on an easily accessible place.
- Do not exceed maximum operating pressure given on the unit's type plate.
- Unless the advised safety devices available or fully active the unit must not be operated.
- Set up the unit with extreme cleanliness.
- The unit must not be operated if it is damaged. FRİTERM A.Ş. must be informed about all damages.
- The unit must be installed, operated and maintained by authorized/qualified personnel **only**.
- **In case of using any other fluid and additives specified on the label (water, Ethylene Glycol, propylene Glycol, Brandname thermal fluids) may cause damage, leakage, danger and environmental pollution.**
- **No modification is allowed on the product without written permission from the manufacturer.**

[Metni yazın]

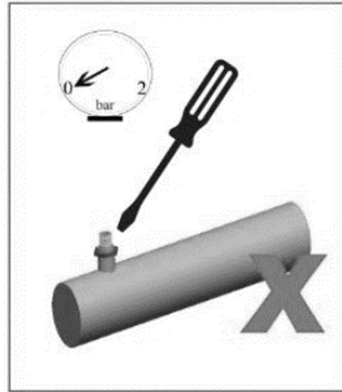
- Operational conditions are limited within the specified range by the manufacturer. In case of need to operate the product out of the range, a confirmation should be asked from FRITERM A.Ş.



Radiator cooler are filled with dry air and delivered under positive pressure in order to notice that transportation damage or the unloading damage causes the leakage in coil block



In case of no pressure in radiator cooler, radiator cooler must not be installed and Friterm must be notified immediately



.4 Improper Use

Danger of injuries in improper using;



2.4.1 Hazardous rotating machinery



Danger of cutting hands and fingers. Lids should be unscrewed by an authorized technician.



protection.



2.4.2 Hazardous voltage



Electrical voltage can cause serious injuries or death. Do not contact with voltage direct or indirect. Do not forget to power off the unit before you begin maintenance work.



2.4.3 Hazardous thermal



Some of the components of the unit such as fin and tube have high temperatures.



Danger of burns and frostbites.



The danger of frostbite can occur if there is insufficient frost protection. Also if the unit cannot be drained completely, frostbite hazard occurs after draining.



2.4.4 Hazardous Fluid: Glycol



Due to its flammable property always keep fire away from ethylene glycol.



No smoking.



Ensure suitable firefighting equipment is used in order to prevent ignition while working with fire or sparks.



Due to the hazardous effect on human skin and nerve system please avoid direct contact of skin. For protection use protective clothing.

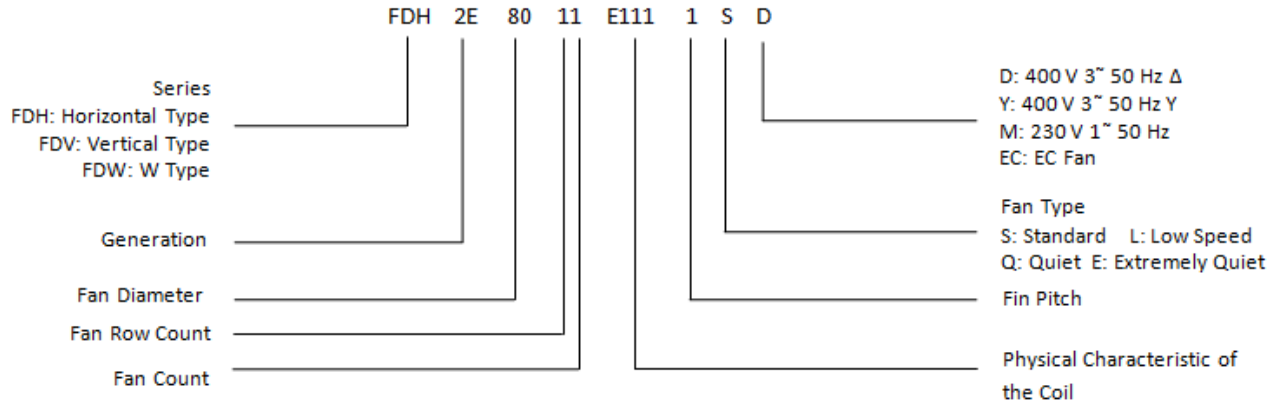
2.5 Environmental protection

While handling the product, it has to be ensured that materials which can endanger the environment are disposed of properly. Service materials must not be allowed to enter the sewerage system and the ground water system.

All relevant national regulations concerning environmental protection and the technical issues for safe and proper working must be complied.

3. LABELLING

3.1 Product code



3.2 Type plate

			
Type	FDH 2E 8012 E121 3 SD- 6p	Fan speed	(Δ / Y) 890 / 690 rpm
Serial Nr.		Total Power	(Δ / Y) 3.6 / 2.3 kW
TS min / max.	- 40 / +110 °C	Power Supply	400 V AC 3 Ph 50 Hz
Dry Weight	409 kg	Max. Opr. Pr.	16 Bar
Internal Vol.	41.4 L.	Test Pr. / Medium	20 Bar / Dry Air
Medium	Water- Glycol / Fluid G2	Prod. Year	
			
FRİTERM TERMİK CİHAZLAR SAN. ve TİC. A.Ş. İDOSB Dilek Sokak No: 10 X-12 Özel Parsel Tuzla 34957 İstanbul / Türkiye E-mail: info@friterm.com Web: http://www.friterm.com			

3.3 Friterm Logo



3.4 Warning Label



Products that do not have the "Ex" label on the label are not suitable for operation in explosive and flammable environments.

4. TECHNICAL DATA

4.1 Standards

- 2014/68/EU PED (Pressure Equipment Directive)
- EN 378 “Refrigeration systems and heat pumps, technical safety and environmental requirements”
- Capacity standard for dry coolers is defined according to the EN 1048 standard with the ratio of % 34 ethylene glycol. (Heat exchangers- Air-cooled liquid coolers dry coolers- Test methods for establishing the performance)
- The system installer is responsible for that the inherent installation and security information are harmonized with the valid standards and guidelines (DIN EN 292 / 294).

4.2 Product

The basic principle is to transfer the return water load in the system to air by the aid of a heat exchanger including fans. Its working principle is that the air sucked by fans cools the fluid within the tube while it passing through the fins. Thanks to closed fluid circuit, quantity of water does not diminish hence it is not needed to add extra water to the system.

The unit is delivered for operation with a specific operating point:

- Air inlet temperature and volumetric flow
- Fluid inlet temperature and volumetric flow

4.3 Fans

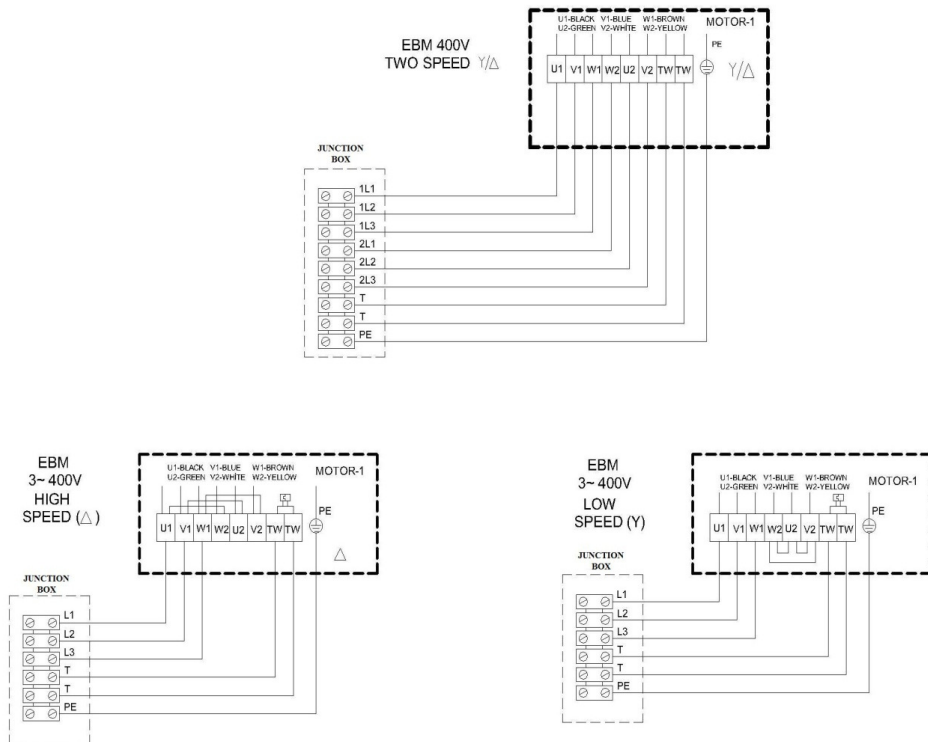
- Highly efficient axial Ziehl Abegg, EBM or equivalent fans are used.
- Fans diameters: Ø800/ Ø910 mm
- 400V 3~50Hz,
- Triphase fans can work at two different speeds. Furthermore, providing speed control is optional for EC fans.
- Variable fan speed regulation can be achieved using triphase fans with frequency inverter and sine filter.
- Variable voltage speed control system could be used as an alternative fan speed control system.
- All motors are suitable for speed control applications up to 100 %.
- All motors have feature internal thermal protection.
- Standard wiring of all motors are for one speed.
- Working temperature for exterior mounting is between -40 °C and +50 °C - +70 °C.

[Metni yazın]

- Fans are designed with assuming fans working Fans run in a housing designed to maximize air flow.
- Recommended starting for motors is 6 starts per hour, maximum starting for motors is 10 starts per hour.
- In case of prolonged stoppage of system, run the fan motors at least 4 hours per week.
- Motor protection IP54; insulation class F.
- Friterm reserves the right to use fans of different manufacturers. Depending on the type, the fan data may slightly vary.

4.3.1 Fan connection diagrams

EBM 400V Fan Connection Diagram

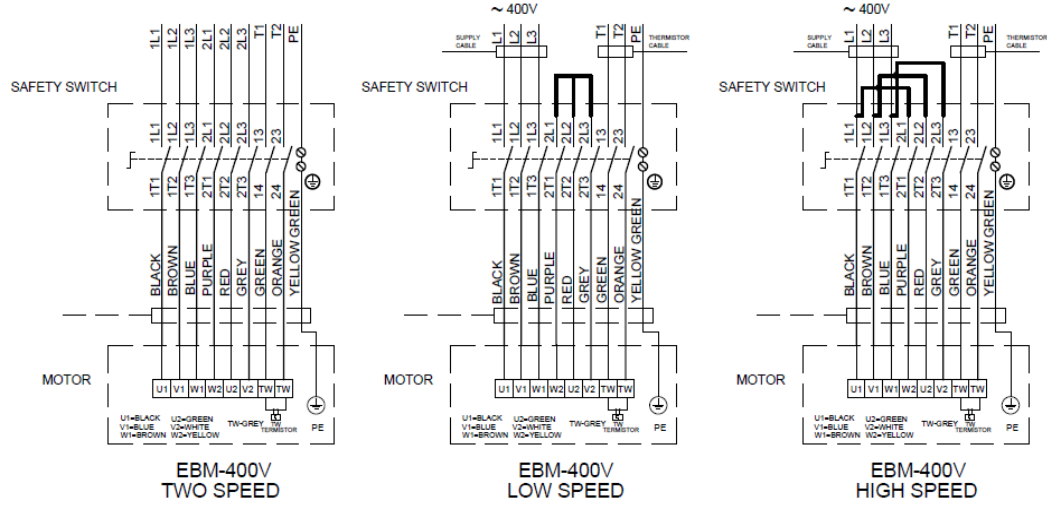


NOTICE

Only specified section in bold lines are scope of supply.

[Metni yazın]

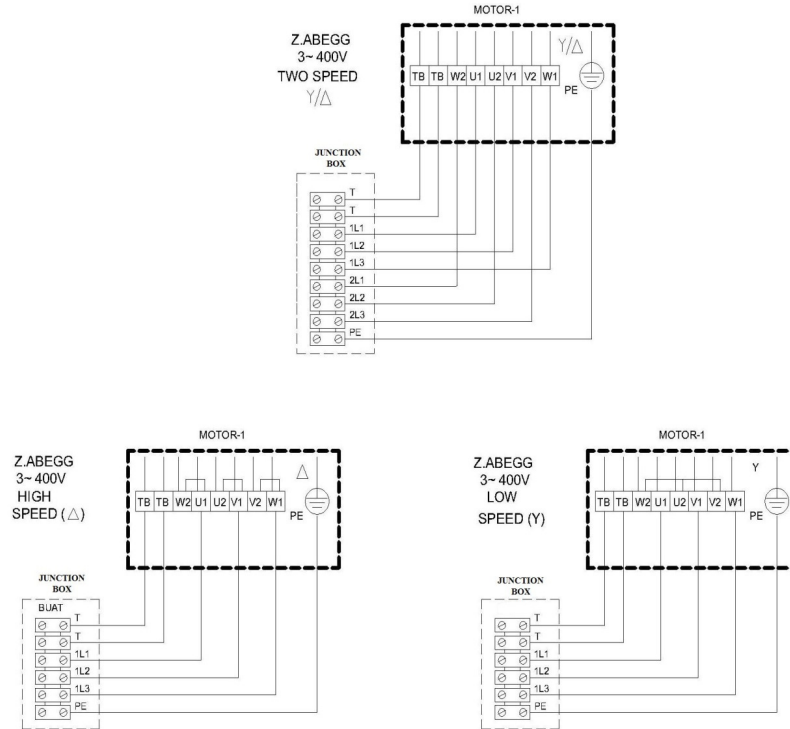
Wiring of Safety Switch and Motor



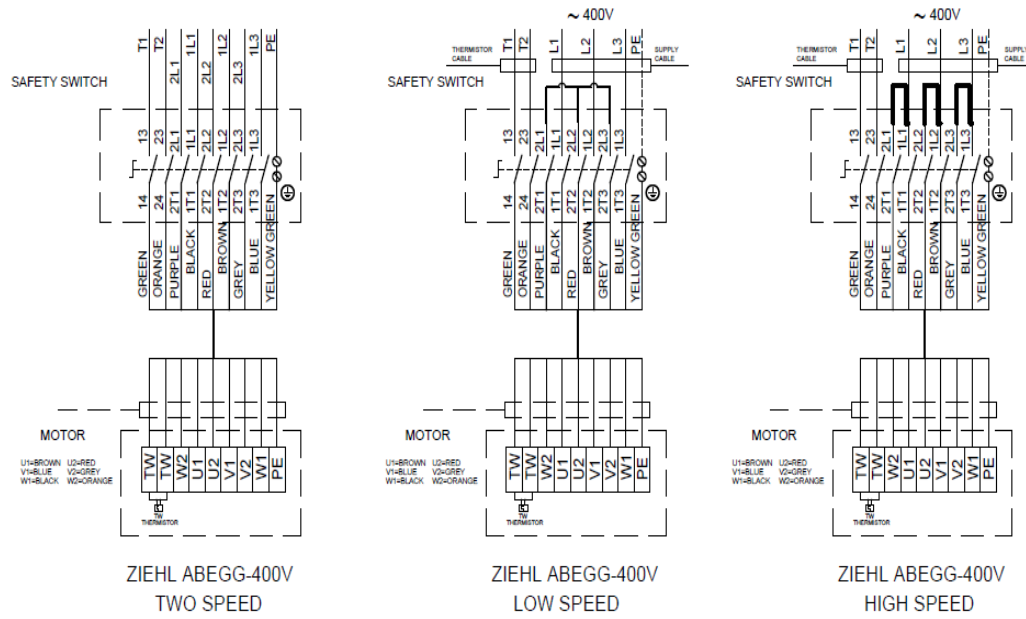
Z.ABEGG 400V Fan Connection Diagrams

NOTICE

Only specified section in bold lines are scope of supply.



Wiring of Safety Switch and Motor



4.4 Control Systems

4.4.1 Thermostat (Dixell XC650C) Keyboard



Dixell XC650C thermostat

SET: To see or modify the set point. In programming mode it selects a parameter or confirms an operation.

Alarm Menu: By holding it pressed for 3 s, the current alarm is erased.

▲ (UP) TO enter the Alarm menu:

In programming mode: it browses the parameter codes or increases the displayed value.

With Hot key inserted: it starts the Hot key programming procedure.

▼ (UP) TO enter the **Alarm menu**: it browses the parameter codes or decreases the displayed value.

Manual restart of loads: By holding it pressed for 3s, it switches on again loads previous locked by a safety digital input alarm.

 **CLOCK**: To display the loads running hours.

By holding it pressed for 3s the **Maintaining menu** is entered.

KEY COMBINATIONS

▲+ ▼ To lock and unlock the keyboard.
SET + ▼ To enter the programming mode.
SET + ▲ To exit the programming mode.

4.4.2 Icons

LED	FUNCTION	MEANING
°C	ON	Celsius degrees
°F	ON	Fahrenheit degrees
bar	ON	Bar displaying
PSI	ON	PSI displaying
1	ON	Load 1 on
1	Flashing	Load 1 is waiting to start (1HZ). Or digital input alarm for Load 1 (2Hz). o Load 1 in maintenance status (2Hz).
2	ON	Load 2 on
2	Flashing	Load 2 is waiting to start (1HZ). Or digital input alarm for Load 2 (2Hz). o Load 2 in maintenance status (2Hz).
3	ON	Load 3 on
3	Flashing	Load 3 is waiting to start (1HZ). Or digital input alarm for Load 3 (2Hz). o Load 3 in maintenance status (2Hz).
4	ON	Load 4 on
4	Flashing	Load 4 is waiting to start (1HZ). Or digital input alarm for Load 4 (2Hz).

		o Load 4 in maintenance status (2Hz).
	ON	Load 5 on
	Flashing	Load 5 is waiting to start (1HZ). Or digital input alarm for Load 5 (2Hz). o Load 5 in maintenance status (2Hz).
	ON	The Maintenance menu has been entered
	Flashing	One or more loads have been placed in maintenance status
	ON	Alarm is happening.
	ON	All the stored alarms have been seen.
	Flashing	A new alarm has happened.

4.4.3 Parameters

Name	°C	°F	Bar	PSI	Level	Description	Range
SEtc	-18	0	2,3	33	--	Set point of compressors	LSE÷HSE
SEtF	35	95	15,1	220	--	Set point for fans	LSF÷HSF
oA1*	CPr	CPr	CPr	CPr	Pr2	Outputs 1 configuration	FAN
oA2*	CPr	CPr	CPr	CPr	Pr2	Outputs 2 configuration	FAN
oA3*	CPr	CPr	CPr	CPr	Pr2	Outputs 3 configuration	FAN
oA4*	FAN	FAN	FAN	FAN	Pr2	Outputs 4 configuration	FAN
oA5*	FAN	FAN	FAN	FAN	Pr2	Outputs 5 configuration	FAN OR NU
ctYP	SPo	SPo	SPo	SPo	Pr2	Compressor type	SpO/dPo/Scr
StP	CL	CL	CL	CL	Pr2	Valve outputs polarity	oP/cL
Pc1	20	20	20	20	Pr2	Power of compressor 1	0÷255
Pc2	20	20	20	20	Pr2	Power of compressor 2	0÷255
Pc3	20	20	20	20	Pr2	Power of compressor 3	0÷255
Pc4	20	20	20	20	Pr2	Power of compressor 4	0÷255
Pc5	20	20	20	20	Pr2	Power of compressor 5	0÷255
FtYP	404	404	404	404	Pr2	Freon Type	r22/404/507/134/717
rtY	db	db	db	db	Pr2	Type of regulation	db/Pb
CH	cL	cL	cL	cL	Pr2	Type of action	cL/Ht

StY	yES	yES	yES	yES	Pr2	Compressor rotation	no/YES
rot*	yES	yES	yES	yES	Pr2	Fans rotation	NO
Pbc*	Cur	Cur	Cur	Cur	Pr2	Probe 1 setting	NTC
PA04	0,5	7	0,5	7	Pr2	Adjustment of read out for the Probe at 4mA	0.0 bar o 0 PSI÷PA20
PA20	12	174	12	174	Pr2	Adjustment of read out for the Probe at 20mA	PA04÷51.0bar o 750 PSI
cAL	0	0	0	0	Pr2	Probe 1 calibration	-12÷12.0°C o bar / - 20 ÷20°F o PSI
P2P*	yES	yES	yES	yES	Pr2	Second probe presence	YES
Pbc2*	Cur	Cur	Cur	Cur	Pr2	Probe 2 setting	NTC
FA04	1	14	1	14	Pr2	Adjustment of read out for the Probe at 4mA	0.0 bar o 0 PSI ÷ FA20
FA20	31	450	31	450	Pr2	Adjustment of read out for the Probe at 20mA	FA04 ÷ 51.0 bar o750 PSI
FcAL	0	0	0	0	Pr2	Probe 2 calibration	-12÷12.0°C o bar / - 20 ÷20°F o PSI
SEP	CL	CL	CL	CL	Pr2	Low pressure switch input polarity	oP/cL
HPP	CL	CL	CL	CL	Pr2	High pressure switch input polarity	oP/cL
i1c	cL	cL	cL	cL	Pr2	Configurable digital input polarity	oP/cL
i1F	ES	ES	ES	ES	Pr2	Configurable digital input polarity functions	ES / oFF / LL
did	0	0	0	0	Pr2	Configurable digital input delay	0 ÷ 255 min.
AliP	CL	CL	CL	CL	Pr2	Alarm input for compressors and fans polarity	oP/cL
ALMr	no	no	no	no	Pr2	Manual reset of alarms for compressors and fans	no/YES

dEu	°C	°F	bar	PSI	Pr2	Default measurement unit for displaying	bar/°C/PSI/°F
rES	dE	in	dE	in	Pr2	Resolution for °C and bar	in/dE
dSP2	P1	P1	P1	P1	Pr2	Default visualization of lower display	nu-P1-P2-SEt1-SEt2
dEU2	PrS	PrS	PrS	PrS	Pr2	Lower display probe format	PrS ÷ tPr
rELP	rEL	rEL	rEL	rEL	Pr2	Pressure displaying	rEL/AbS
Pbd	4	8	0.5	7	Pr2	Proportional band or neutral zone width	> +10.0 bar/30.0 °C/80 PSI/50 °F

Esc	0	0	0	0	Pr2	Energy saving value for compressors	- + 20.0bar/ - + 50 °C/- + 300 PSI/- + 90 °F
onon	5	5	5	5	Pr2	Minimum time between2 following switching ON of the same compressor	0 ÷ 255 min.
oFon	2	2	2	2	Pr2	Minimum time between the switching off of a compressor and the following switching on	0 ÷ 255 min.
don	0,3	0,3	0,3	0,3	Pr2	Time delay between the insertion of two different compressors	0 ÷ 99,5 min. (res. 10 sec.)
doF	0,1	0,1	0,1	0,1	Pr2	Time delay between switching off of two different compressors	0 ÷ 99,5 min. (res. 10 sec.)
donF	0,3	0,3	0,3	0,3	Pr2	Minimum time a stage stays switched ON	0 ÷ 99,5 min. (res. 10 sec.)
Maon	0	0	0	0	Pr2	Maximum time for compressor ON	0 ÷ 24 h
FdLY	no	no	no	no	Pr2	' don " delay enabled also for the first call	no/YES
FdLF	no	no	no	no	Pr2	"doF" delay enabled also for the first switching off	no/YES
odo	20	20	20	20	Pr2	Regulation delay on start-up	0 ÷ 255 sec.
LSE	-40	-40	0,3	0,3	Pr2	Minimum set point for compressors	PA04 ÷ HSE
HSE	10	50	7,2	100	Pr2	Maximum set point for compressors	LSE ÷ PA20
Pb	4	8	2.0	24	Pr2	Proportional band or neutral zone width for fans	0.1÷10.0 bar/30.0 °C/80 PSI/50 °F
ESF	0	0	0	0	Pr2	Energy saving value for fans	- + 20.0 bar/- + 50.0 °C / - + 300 PSI/- + 90 °F
Fon	15	15	15	15	Pr2	Time delay between the insertion of two different fans	0 ÷ 255 sec.
FoF	5	5	5	5	Pr2	Time delay between switching off of two different fans	0 ÷ 255 sec.
LSF	10	50	7,2	100	Pr2	Lower set for fans	PA04 ÷ HSE
HSF	60	140	27,8	404	Pr2	Higher set for fans	LSE ÷ PA20
Pao	30	30	30	30	Pr2	Alarm probe exclusion at power on	0 ÷ 255 min.
LAL	15.0	30	1,5	21	Pr1	Low pressure (temperature) alarm compressor section	> 0÷30.0 bar/100.0 °C/430 PSI/200 °F
HAL	20.0	40	2,5	46	Pr1	High pressure (temperature) alarm	> 0÷30.0 bar/100.0

						compressor section	°C/430 PSI/200 °F
tAo	15	15	15	15	Pr1	Low and High pressure (temperature) alarms delay-compressor section	0 ÷ 255 min.
SEr	999	999	999	999	Pr2	Service request	(0 = disable) 1 ÷ 999; res 10h
PEn	5	5	5	5	Pr2	Low pressure-switch intervention numbers	0 ÷ 15
PEi	15	15	15	15	Pr2	Pressure -switch interventions time	0 ÷ 255 min.
SPr	2	2	2	2	Pr2	Number of steps engaged with faulty probe	0 ÷ # compressors

NOTICE

The thermostat's set point is sent programming to 28 °C by the technicians of Friterm A.Ş.

NOTICE

The parameters specified with “ * ” are adjusted according to the products of Friterm A.Ş.

4.4.4 Tables of Alarms

Code	Description	Cause	Action	Reset
E0L	Low pressure switch alarm	Low pressure switch input enabled	All compressors are turned off. Fans unchanged.	Automatically (If the number of activation are less than PEn in the PEi time) when the input is disable. - The compressors restart working according to the working algorithm. Manually (If PEn activation happened in the PEi time) When the input is disable: a. hold pressed the Restart (DOWN) key for 3s or b. turn off and on the instrument.
E0H	High pressure switch alarm	High pressure switch input enabled	-All compressors are turned off. -All fans are turned on.	Automatically (If the number of activation are less than PEn in the PEi time) when the input is disable. - Compressors and fans restart working according to the working algorithm. Manually (If PEn activation happened in the PEi time) When the input is disable: a. hold pressed the Restart (DOWN) key for 3s or b. turn off and on the instrument. Compressors and fans restart working according to the working algorithm.
P1*	P1 probe failure alarm	Probe failure or out of range	- The compressors are activated according to the SPr or PoPr	Automatically as soon as the probe restarts working.

P2*	P2 probe failure alarm	Probe failure or out of range	- The fans are activated according to the FPr parameters.	Automatically as soon as the probe restarts working.
------------	-------------------------------	-------------------------------	---	---

Code	Description	Cause	Action	Reset
EA1 EA2 EA3 EA4 EA5	Load safeties alarm	Safeties compressor /fan input activation. NOTE: with step compressors 1 input for each compressor has to be used.	- the corresponding load is turned off.(with step compressors all relays referred to the input are disabled).	Recovery depends on ALMr parameter: With ALMr = no The instrument restarts the standard operating mode when the input is disabled. With ALMr = YES manual recover for the alarms of compressors and fans. Push the DOWN key for 3s.
LA	Minimum pressure (temperature) alarm compressors section	Suction pressure or temperature lower than SET_C-LAL value	- signaling only	Automatically; as soon as the pressure or temperature reaches the (Set_C-LAL+ differential) value. (differential =0.3 bar or 1 °C)
LA2	Minimum pressure (temperature) alarm fans section	Condensing pressure or temperature lower than SET_F-LAL value	- signaling only	Automatically; as soon as the pressure or temperature reaches the (Set_F-LAL + differential) value. (differential = 0.3 bar or 1 °C)
HA	Maximum pressure (temperature) alarm compressors section	Suction pressure or temperature higher than SET_F-HAL value	- signaling only	Automatically; as soon as the pressure or temperature reaches the (Set_C+HAL - differential) value. (differential = 0.3 bar or 1 °C)
HA2	Maximum pressure (temperature) alarm fans section	Condensing pressure or temperature higher than SET_F+HAL	- signaling only	Automatically; as soon as the pressure or temperature reaches the (Set_F+HAL - differential) value. (differential = 0.3 bar or 1 °C)
A5	Liquid level alarm	Input enabled	- signaling only	Automatically; as soon as the input is disabled
A14	Load	A load has	- signaling	Manually; reset the running hour of the

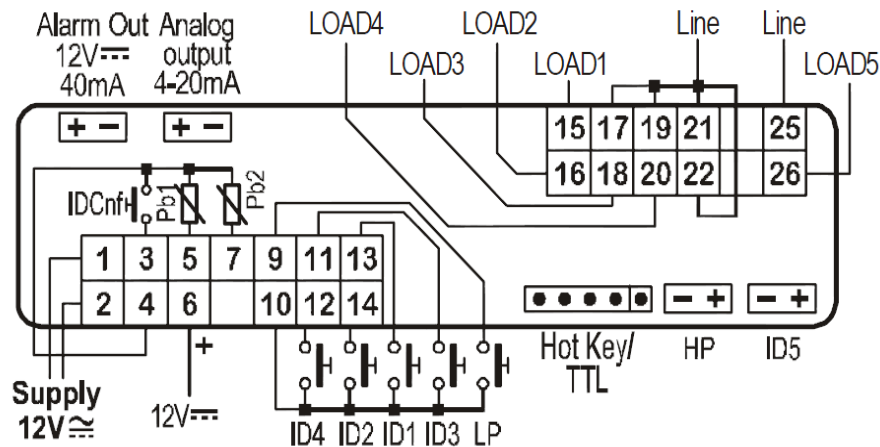
[Metni yazın]

	maintenance alarm	worked for the hour set in the SEr parameter	only	compressor (see par.8 Running hours of loads)
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NOTICE

Only two alarms specified with “ * ” is activated by Friterm A.Ş

4.4.5 Wiring Connection:



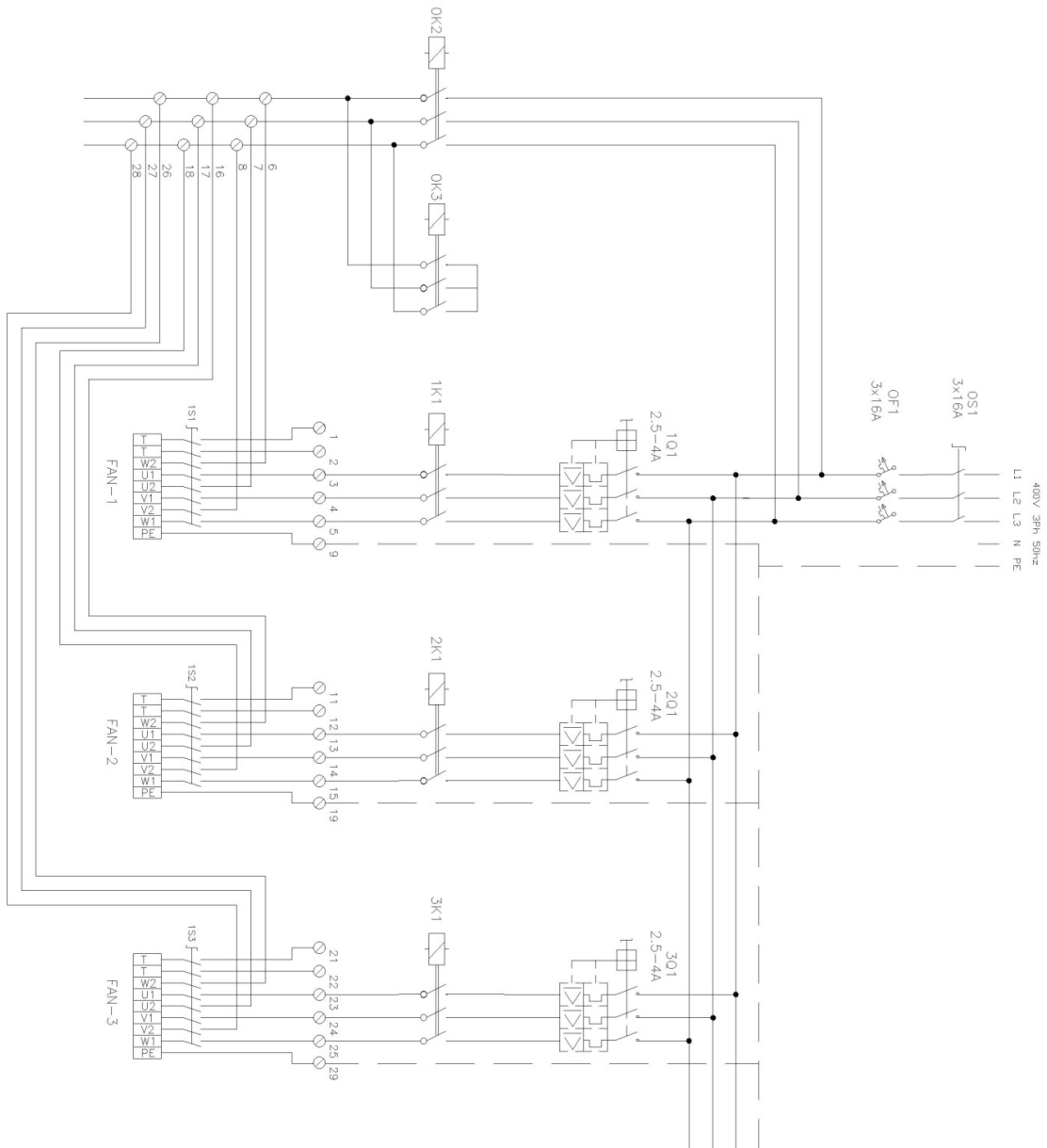
4.4.6 The Adjustment of Thermostat Control Part According to the Application of Different Fan Number

Fan Number	LOAD1	LOAD2	LOAD3	LOAD4	LOAD5
1 FAN	1 FAN-Y	1 FAN-Δ	ECOMESH OR LIQUID SPREY		
2 FAN	1 FAN-Y	2 FAN-Y	2 FAN-Δ	ECOMESH OR LIQUID SPREY	
3 FAN	1 FAN-Y	2 FAN-Y	3 FAN-Y	3 FAN-Δ	ECOMESH OR LIQUID SPREY
4 FAN	2 FAN-Y	1 FAN-Y	1 FAN-Y	4 FAN-Δ	ECOMESH OR LIQUID SPREY
5 FAN	2 FAN-Y	2 FAN-Y	1FAN-Y	5 FAN-Δ	ECOMESH OR LIQUID SPREY
6 FAN	2 FAN-Y	2 FAN-Y	2 FAN-Y	6 FAN-Δ	ECOMESH OR LIQUID SPREY
7 FAN	3 FAN-Y	2 FAN-Y	2 FAN-Y	7 FAN-Δ	ECOMESH OR LIQUID SPREY

[Metni yazın]

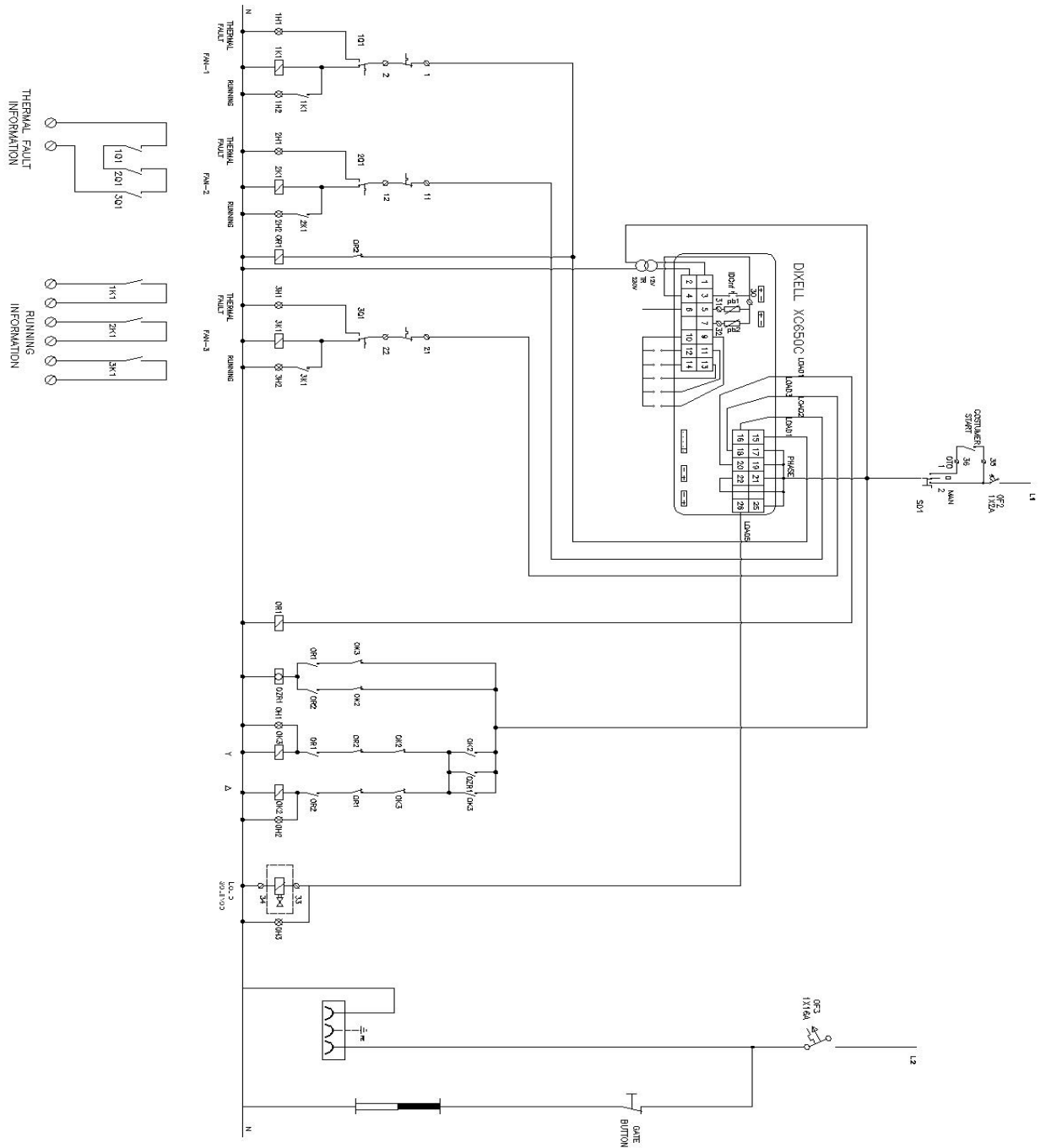
8 FAN	4 FAN-Y	2 FAN-Y	2 FAN-Y	8 FAN-Δ	ECOMESH OR LIQUID SPREY
10 FAN	4 FAN-Y	2 FAN-Y	4 FAN-Y	10 FAN-Δ	ECOMESH OR LIQUID SPREY
12 FAN	4 FAN-Y	4 FAN-Y	4 FAN-Y	12 FAN-Δ	ECOMESH OR LIQUID SPREY
14 FAN	4 FAN-Y	4 FAN-Y	6 FAN-Y	14 FAN-Δ	ECOMESH OR LIQUID SPREY
16 FAN	6 FAN-Y	6 FAN-Y	4 FAN-Y	16 FAN-Δ	ECOMESH OR LIQUID SPREY
18 FAN	6 FAN-Y	6 FAN-Y	6 FAN-Y	18 FAN-Δ	ECOMESH OR LIQUID SPREY
20 FAN	6 FAN-Y	6 FAN-Y	8 FAN-Y	20 FAN-Δ	ECOMESH OR LIQUID SPREY

4.4.7 Power Circuit Wiring



[Metni yazın]

4.4.8 Control Wiring



4.5 Sound pressure level

Noise pressure levels (LpA) are determined from the sound power levels (LwA) by using following formula according to EN 13487 Surrounding Surface Method.

$$LpA = LwA - 10 \log\left(\frac{Sp}{Sr}\right)$$

Sp = parallel piped surface at 10 m

Sr = surface reference(1m²)

Sound pressure levels given show the average values on a parallelepiped surface at 10 m distance from the unit in open air over a reflecting plain.

10 m'de Ses Seviyesi Sound Pressure Level at 10m dB(A)			Fan Sayısı Number of Fans															
Fan Tipi	Fan Type		1	2	3	4	5	6	7	8	9	10	12	14	16	18	20	
SD	800 mm / Δ	(890 rpm)	47	50	52	53	54	55	55	56	56	57	58	59	59	60	60	
SY	800 mm / Y	(690 rpm)	42	45	47	48	49	50	50	51	51	52	53	54	54	55	55	
LD	800 mm / Δ	(670 rpm)	41	44	46	47	48	49	49	50	50	51	52	53	53	54	54	
LY	800 mm / Y	(510 rpm)	33	36	38	39	40	41	41	42	42	43	44	45	45	46	46	
QD	800 mm / Δ	(440 rpm)	29	32	34	35	36	37	37	38	38	39	40	41	41	42	42	
QY	800 mm / Y	(350 rpm)	25	28	30	31	32	33	33	34	34	35	36	37	37	38	38	
SD	910 mm / Δ	(900 rpm)	62	65	67	68	69	70	70	71	71	72	73	74	74	75	75	
SY	910 mm / Y	(700 rpm)	56	59	61	62	63	64	64	65	65	66	67	68	68	69	69	
LD	910 mm / Δ	(885 rpm)	45	48	50	51	52	53	53	54	54	55	56	57	57	58	58	
LY	910 mm / Y	(685 rpm)	39	42	44	45	46	47	47	48	48	49	50	51	51	52	52	
QD	910 mm / Δ	(650 rpm)	38	41	43	44	45	46	46	47	47	48	49	50	50	51	51	
QY	910 mm / Y	(475 rpm)	31	34	36	37	38	39	39	40	40	41	42	43	43	44	44	
ED	910 mm / Δ	(420 rpm)	27	30	32	33	34	35	35	36	36	37	38	39	39	40	40	
EY	910 mm / Y	(305 rpm)	19	22	24	25	26	27	27	28	28	29	30	31	31	32	32	

Uzaklık Distance m	Ses Seviyesindeki Değişim Change in Sound Pressure Level dBA
1	20
5	6
10	0
50	-14
100	-20

4.6 Sound power level

Fan Çapı Fan Diameter	Fan Hızı (d/dk) Fan Speed (rpm)		Ses Gücü Seviyesi - Lwa - fan başına Sound Power Level -Lwa- per fan dB(A)																Toplam Total Lwa dB(A)	
			63 Hz		125 Hz		250 Hz		500 Hz		1000 Hz		2000 Hz		4000 Hz		8000 Hz			
	Δ	Y	Δ	Y	Δ	Y	Δ	Y	Δ	Y	Δ	Y	Δ	Y	Δ	Y	Δ	Y		
800	890	690	54	49	67	62	69	64	71	66	75	69	73	67	68	60	62	54	79	74
800	670	510	46	44	59	51	61	57	63	58	68	61	66	58	60	52	54	46	72	65
800	440	350	42	43	47	47	53	50	53	51	56	52	56	47	46	40	41	35	61	57
910	900	700	-	-	77	74	80	76	86	80	86	80	82	75	74	67	67	60	94	88
910	885	685	-	-	60	60	67	59	71	55	70	54	66	52	66	51	59	47	80	73
910	650	475	-	-	66	-	63	-	61	-	59	-	57	-	54	-	50	-	70	63
910	420	305	-	-	43	50	41	44	40	44	44	46	43	42	36	35	25	28	59	54

Fan Sayısı Değişiminin Ses Gücü Seviyesine Etkisi Deviation on Sound Power Level in case of Several Fans																
Fan sayısı Number of Fans	(ad.) (pcs.)	1	2	3	4	5	6	7	8	9	10	12	14	16	18	20
Ses Gücü Seviyesindeki Artış Change in Sound Power Level	(dBA)	0	3	5	6	7	8	8	9	9	10	11	12	12	13	13

5. TRANSPORT AND STORAGE

5.1 Check for completeness and transport damage

- Attention! May cause severe injuries or unrecoverable damages in case of uncontrolled fall down.
- Instructions on lift and transportation should be strictly followed.
- Check if there is any damage on product or package. Immediately after receipt, the delivery must be inspected for possible transport damage. Any damage must be reported immediately to the shipping company. If it is to be expected that the transport damage may affect proper operation, then the product must not be commissioned.
- Upon receipt, the product should be visually inspected, and in case of any damage or shortage, the supplier should be notified within 7 days.

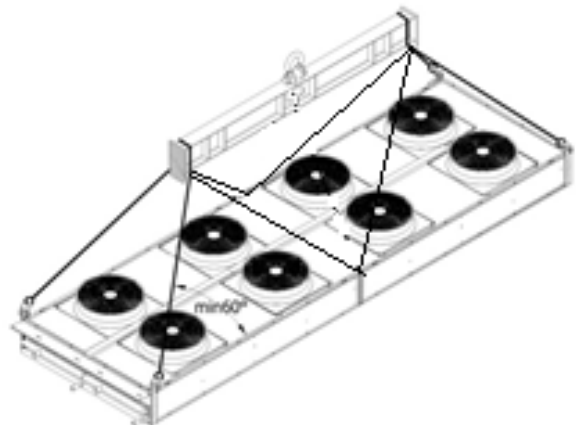
5.2 Transport

The product may only be lifted and moved by persons who:

1. Are authorised to operate crane systems,
2. Are authorised to drive motorised handling product
3. Also know the transport and lifting instructions according to the operating manual and the assembly drawing.

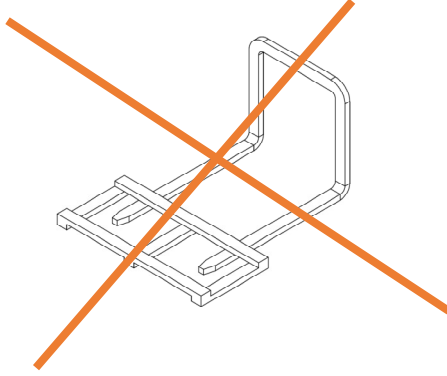


Suitable transport equipment must be used.

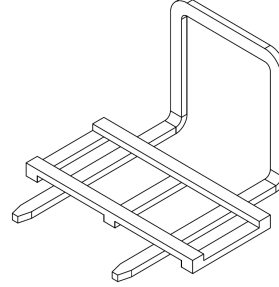




Only lift the packed unit with a forklift with full work length.



FALSE



TRUE



Risk of accident due to falling load

The size and weight of the product may cause accidents while transporting.

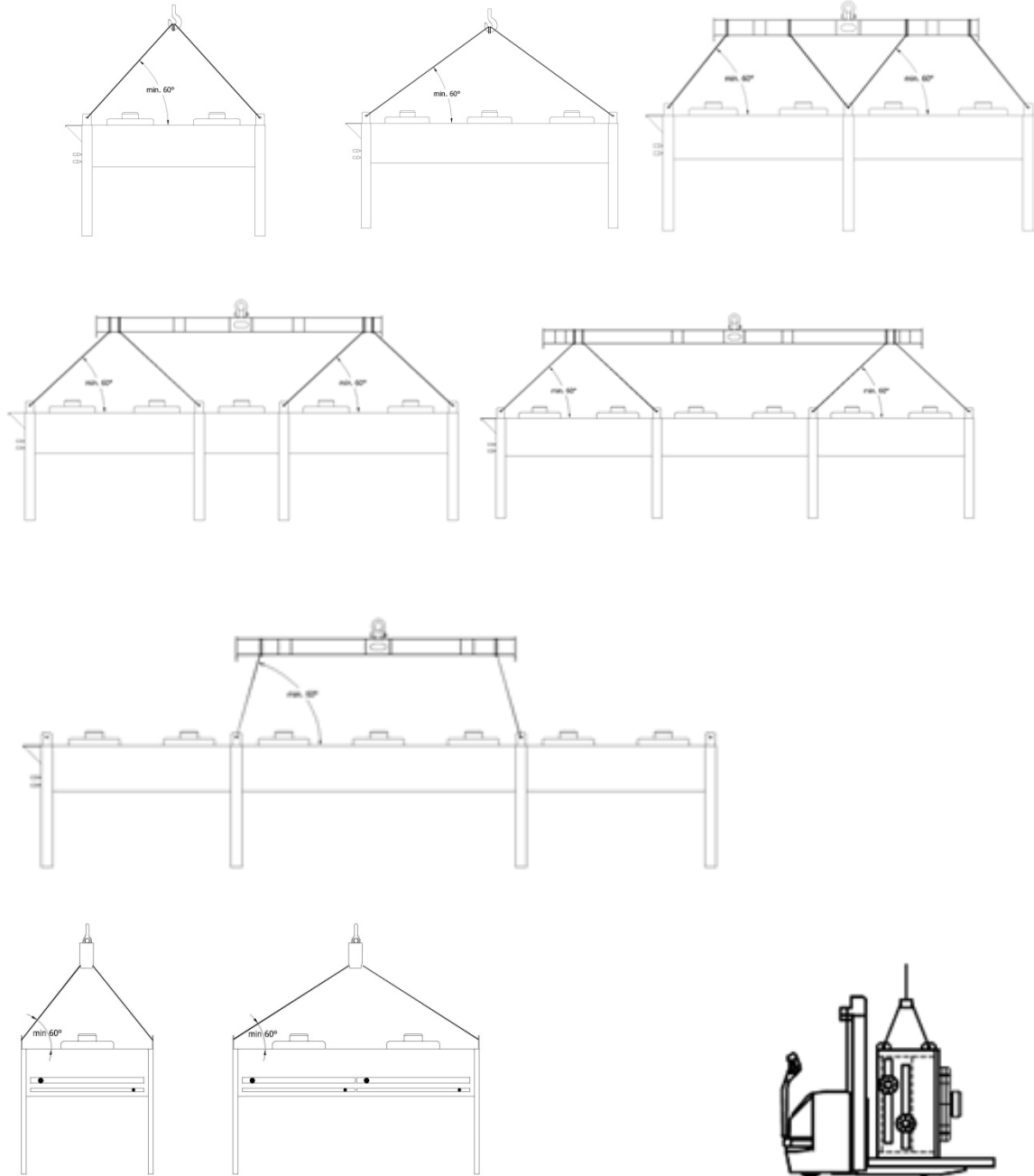
- Be extremely careful during transport to avoid damage or deformation on the product.
- Only use suitable transport equipment and lifting gear with sufficient load-bearing capacity.
- All precautions should be taken against any possible mechanical risk.
- Never stand or work under suspended loads.
- Wear appropriate protective clothing (helmet, safety gloves, safety shoes).



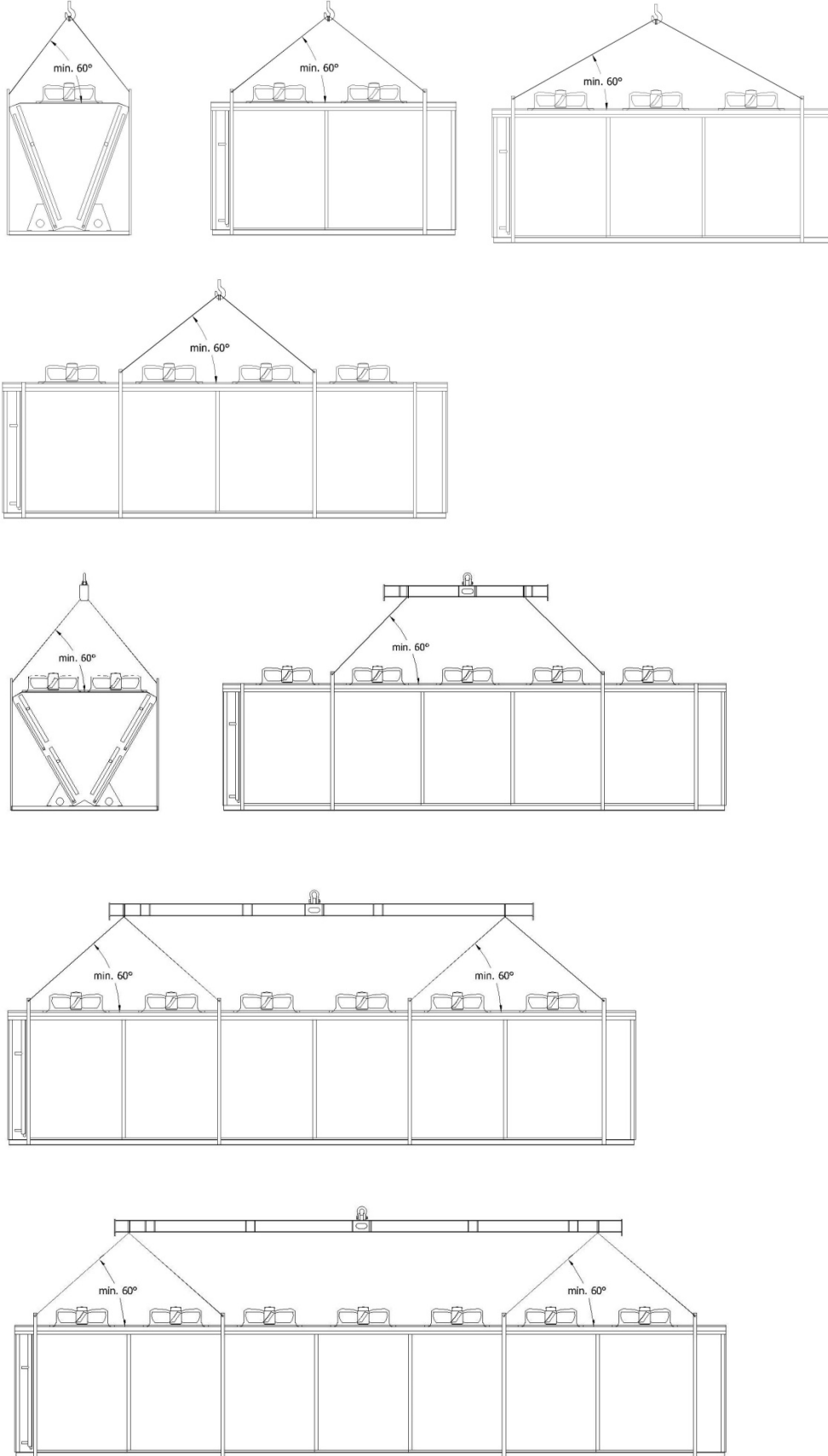
- During lifting, a suitable lifting tool like a forklift or a crane is to be operated as in the drawings below. When lifting the product with hauling hooks, it is necessary to use a lifting beam connected to the hooks.
- Product is mounted with wooden beams at the bottom. It can be placed on the ground on these wooden beams. These wooden beams provide enough height for forklifts. During landing the product onto the ground, be careful for the notches on the ground and prevent defects of the aluminium fins below the product.



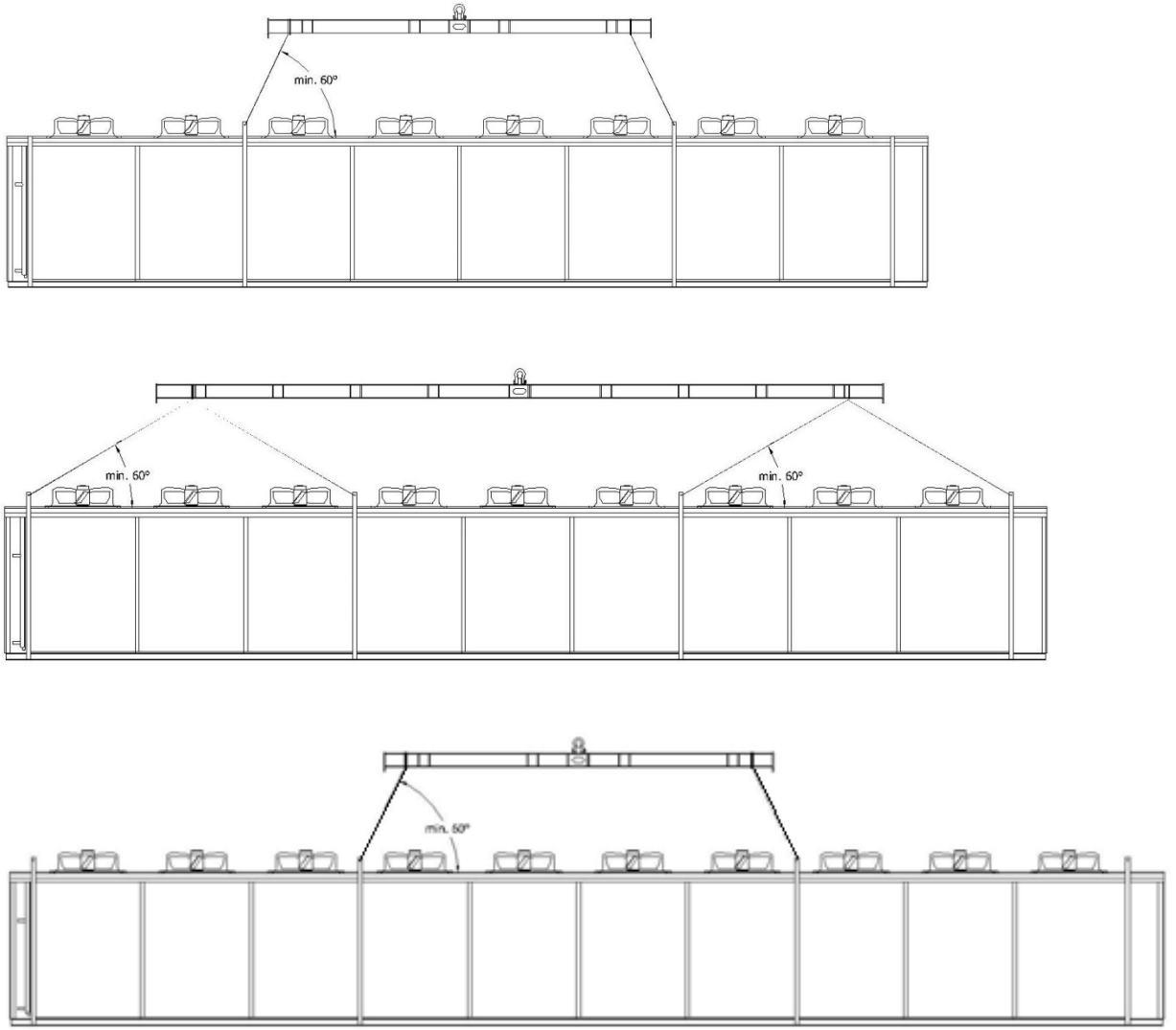
Carrying and handling operations should be in accordance with the suggested method otherwise unit might be damaged due to intolerable stresses. If the units are damaged due to mishandling the contractor and/or operator will be accepted as disregarding his/her responsibilities.



[Metni yazın]



[Metni yazın]



Handling scheme during carriage

If lightweight product is to be handled without a lifting vehicle, excessive care should be taken and suitable gloves should be used.

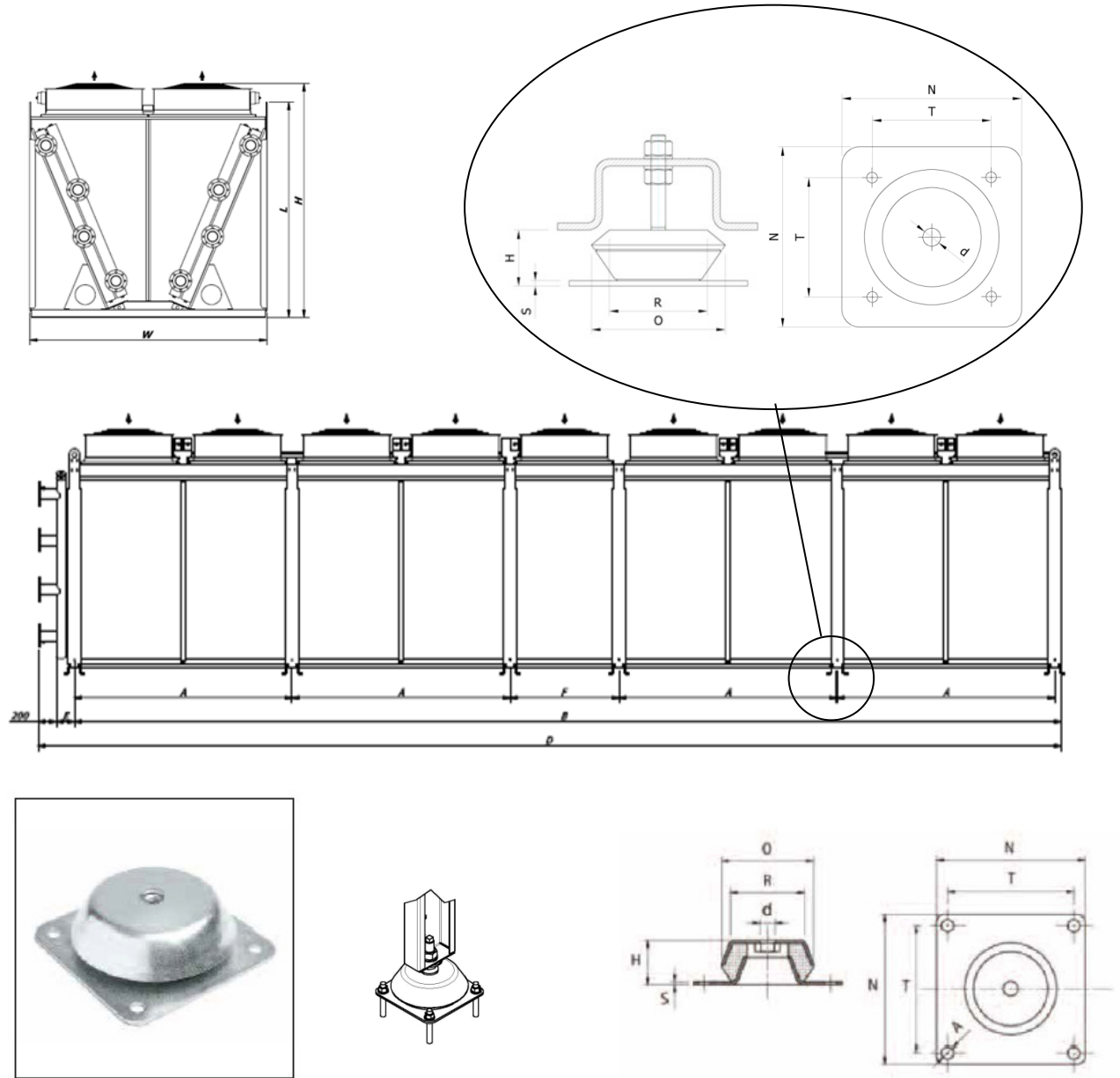
NOTICE

Be careful not to damage the product by the forks of the forklift. In order not to scratch the product, place a separator material. (cardboard, plywood, isolation material etc.)

NOTICE

Vibration absorber stand mounting detail is given as follows. The absorber should be fixed to the floor with suitable size bolts.

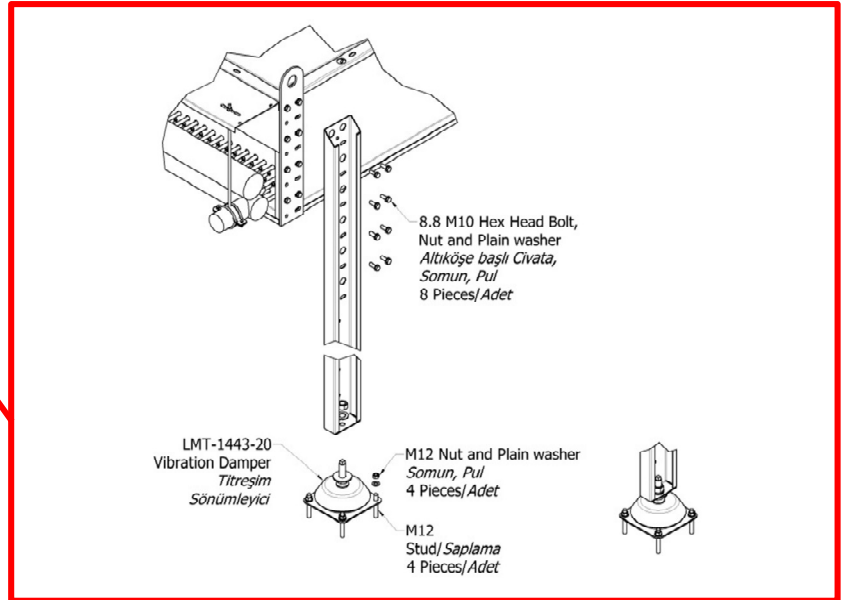
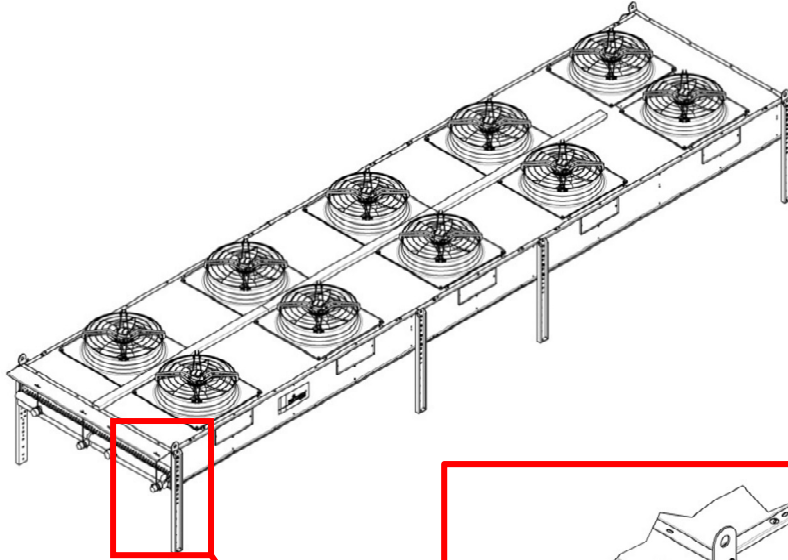
[Metni yazın]



Model	A	H	M	N	O	R	S	T	Hardness	Max. Load (kg)
M1	12.5	51.5	M16	168	150	110	4	132	55° ± 5°	500
M2	12.5	51.5	M16	168	150	110	4	132	70° ± 5°	600
M3	13	63	M20	200	177	125	6	150	55° ± 5°	850

NOTICE

The legs and vibration absorber mounting should be done by using appropriate size bolts and/or fixing elements.



5.3 Storage

- Store the product in the original packaging in order to protect from improper weather conditions, dirt, moisture and environmental effects and the equipment.
- Avoid excessive storage periods (one year of storage at maximum is recommended).
- If the product is stationary for long periods in a humid atmosphere, the fans should be switched ON for minimum four hours per a month to remove moisture that may have condensed within the motors
- Pay attention to the instructions on visual signs and labels for safety transport and handling of packaged product.
- Avoid exposure to extreme heat and cold.

CAUTION

Damage caused by improper storage

Incorrect or improper storage may cause damage to the radiator or radiator components.

6. INSTALLATION

The system installer is responsible for the proper installation according to standards and guidelines (DIN EN 292 / 294) which contains installation and security guidelines.

Before installing, it must be ensured that the technical specifications of the product are in accordance with the desired working conditions.

6.1 Location

The product is designed only for permanent installation. It should be fixed to a stable base.

The working fluid, the maximum working pressure and the voltage declared by the producer should be proper for the working environment.

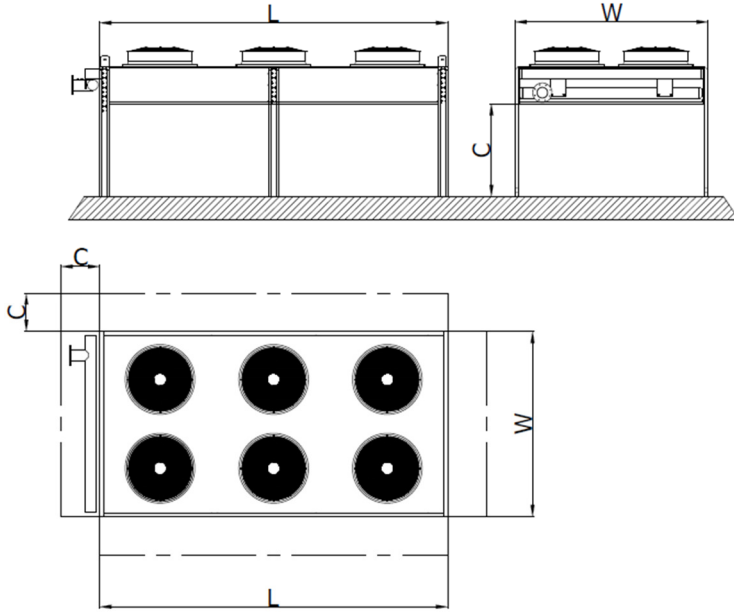
DANGER

The working area should be well ventilated and should not be contained any hazardous substances or explosives.

- Air motion should not be adversely affected by obstructions and inlet air should not be undesirably heated or cooled by some other product.
- All the blind bolts and/or flanges should be removed right before the installation.
- The site where the installation process is being carried out should be provided as clean as possible and low humidity.

6.2 Requirements at the set up point

6.2.1 Outdoor set up of FCH unit



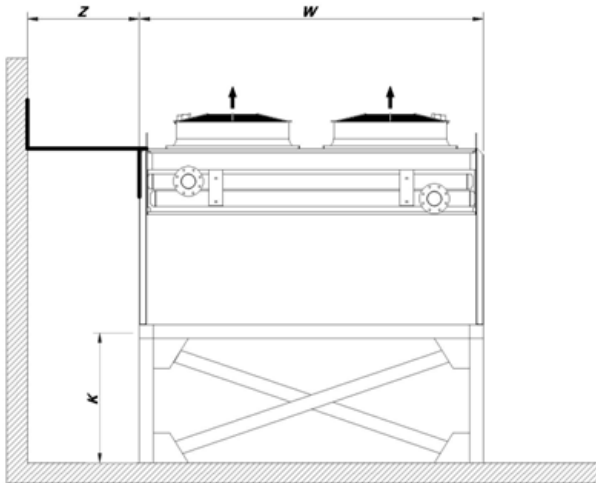
$$A_1 = L * W \text{ (m}^2\text{)}$$

$$A_2 = 2 * (L + W) * C$$

$$\text{Condition: } A_2 \leq A_1 * 0,65$$

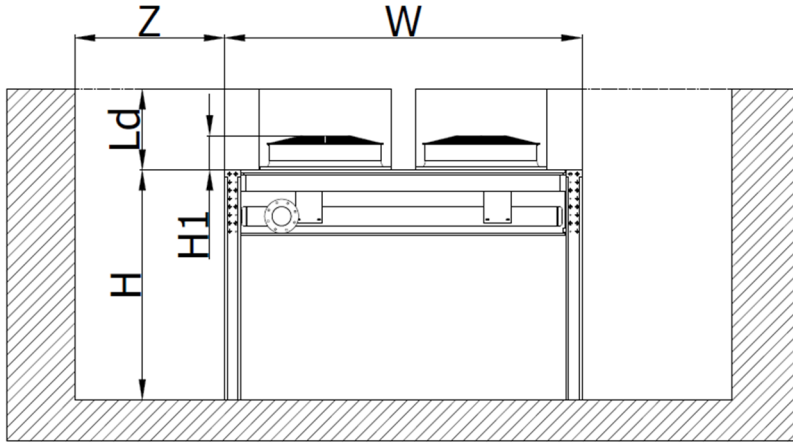
6.2.2 Set up next to wall

To avoid the by-pass of the blowing air because of the side wall, prevention accessories must be used and to facilitate suction from the bottom, raising chassis (with a high of half-width of the dry cooler) or higher extended legs must be used (700-1200 mm).



$$K \geq W/2$$

6.2.3 Set up in pit-hallow

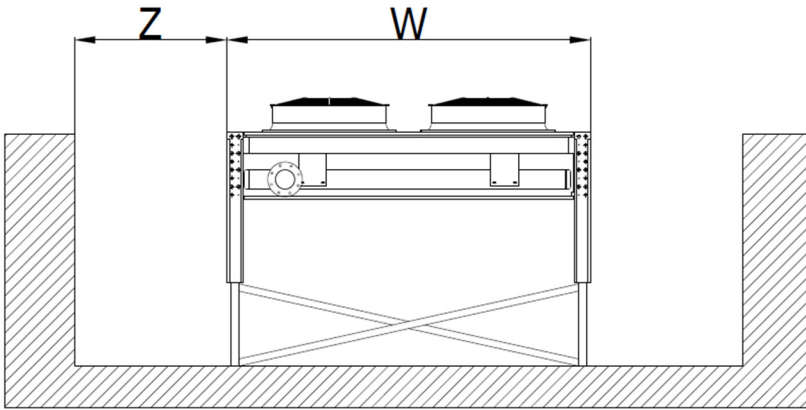


Condition;

Fans with ventilation channel:

$$Z \geq 0,5 * W$$

$$L_d = 450 - 600 \text{ mm}$$



Condition;

Fans with Friterm Streamer:

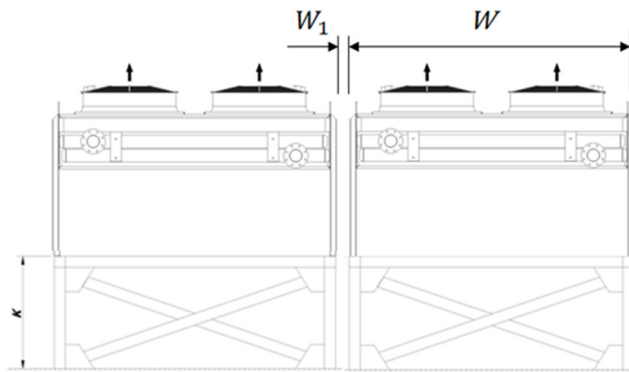
$$Z \geq 0,5 * W$$

Fans without Friterm Streamer:

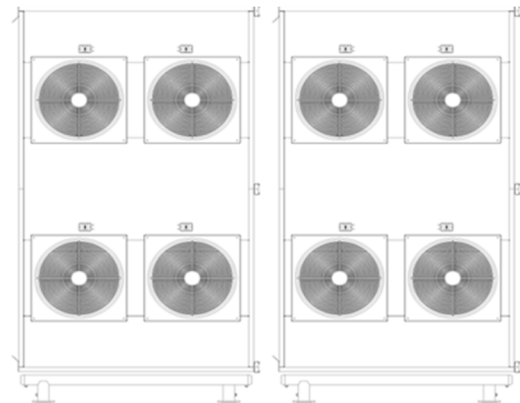
$$Z \geq 0,65 * W$$

6.2.4 Several FDH units

Condition: $W_1 \cong 100 \text{ mm}$

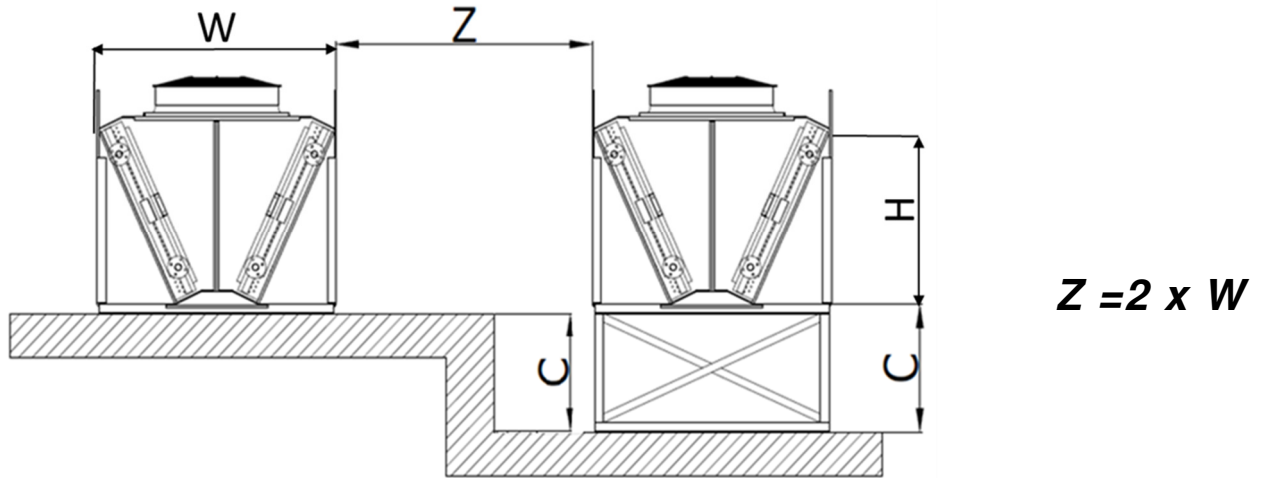


$$K \geq W/2$$



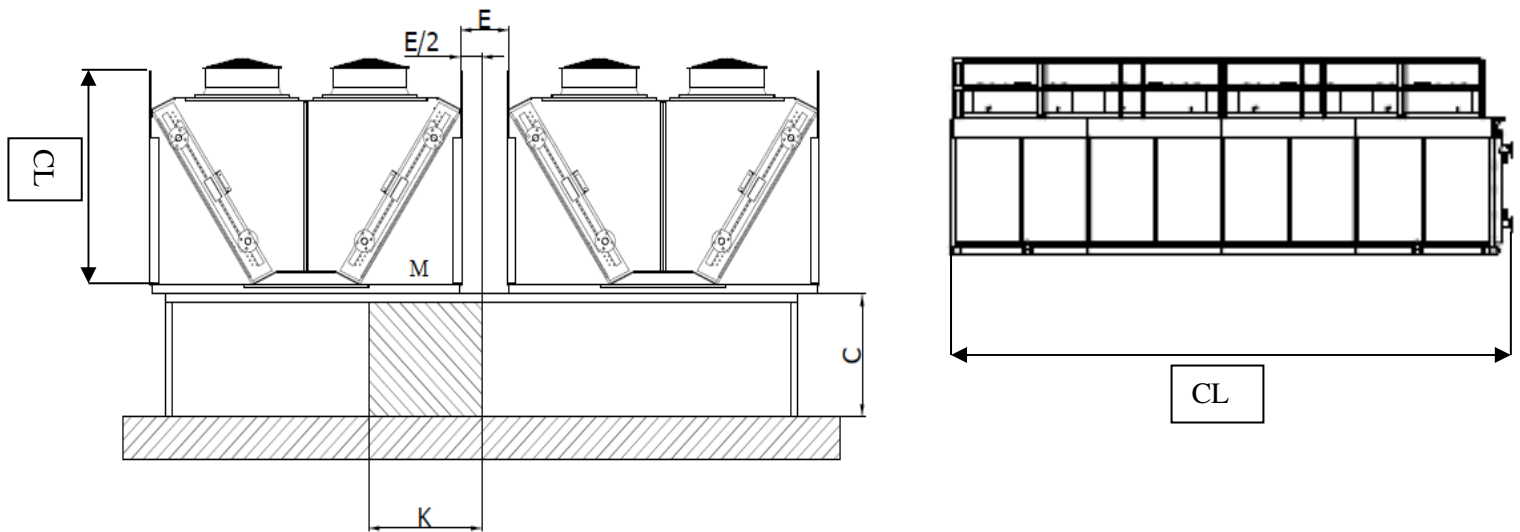
[Metni yazın]

6.2.5 Requirements at the set up point (FDW units)



C value must be set by taking into account the top level of units. Z must be equal to the double of width of the product.

6.2.6 Several FDW units



Flow Area = Finned Length x Finned Height

$$K = M + \frac{E}{2}$$

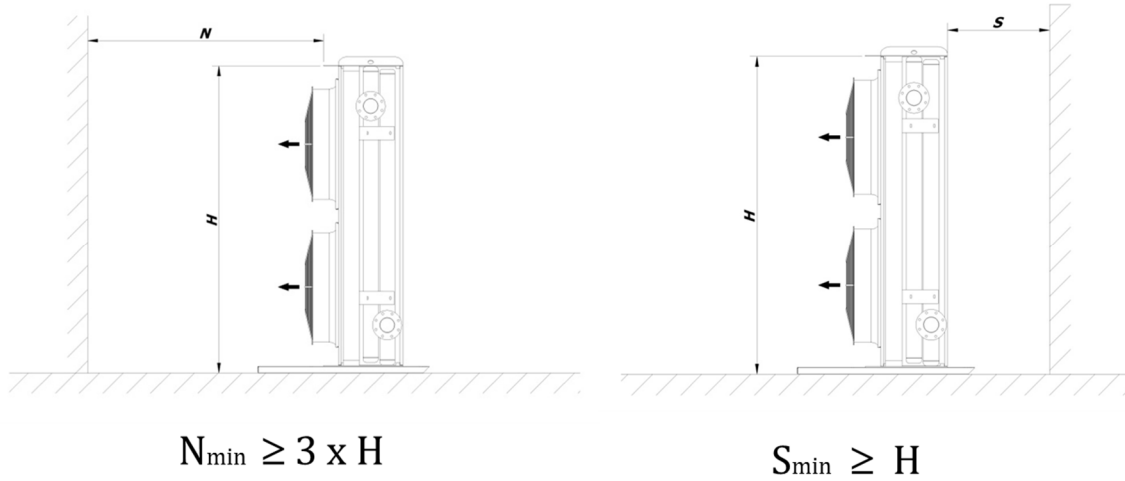
E = 100 mm
n = Number of
dry cooler

$$C = (n - 1) \frac{\text{Flow Area} \times 0,7}{K \times 2 + CL + E \times CH}$$

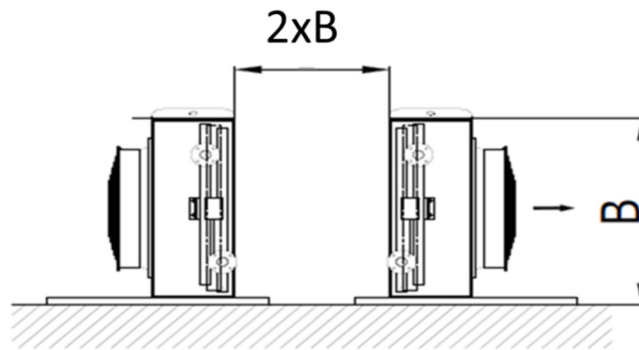
CH: Construction Height

CL: Construction Length

6.2.7 Requirements at the set up point (FDV units)



6.2.8 Side-by-side setup (FDV units)



6.3 Mounting

Stability of units must be provided by users in their plants during mounting against to any vibration.

Air flow should not be faced with any obstacle because of any restriction.

Additional pressure should not be created by fans or motors which are located next to the product.

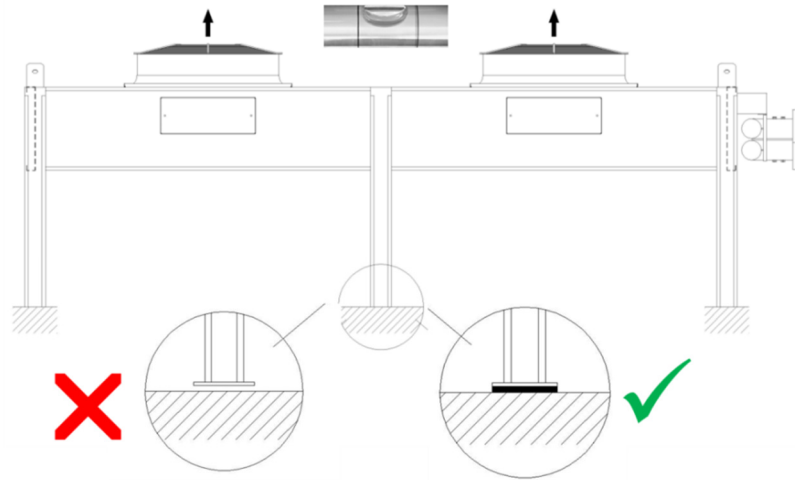
Installation and electrical connection must be performed by only qualified personnel.

Be careful while unpacking and installing products in order not to cause any damage to the tubes and piping connections.

NOTICE

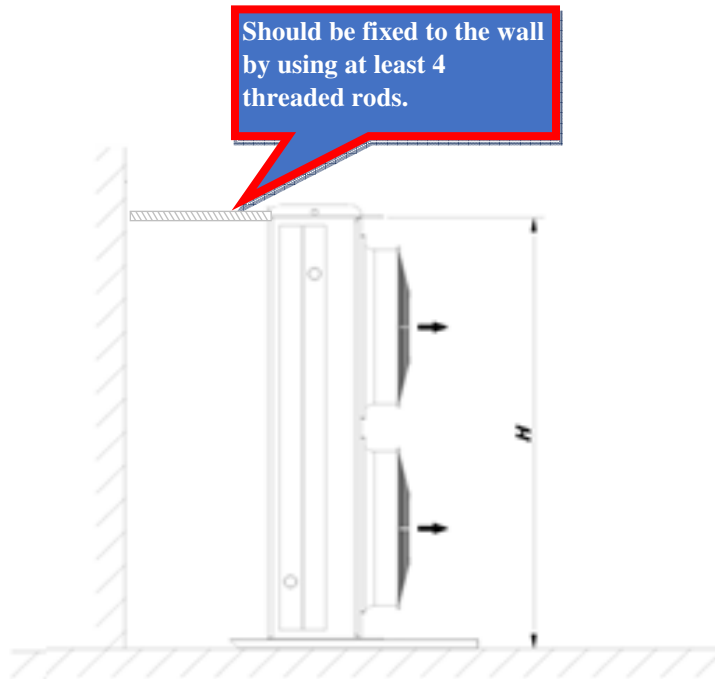
All the legs of the dry cooler must stand on floor and the unit should be levelled.

[Metni yazın]

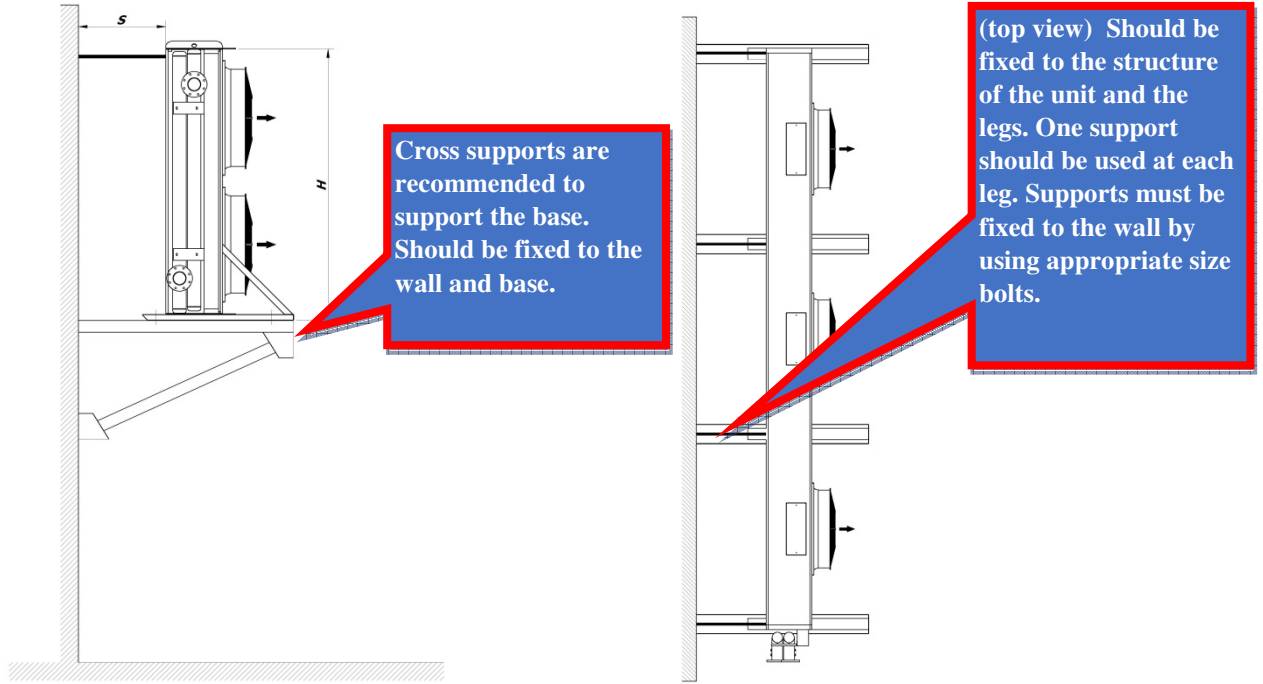


NOTICE

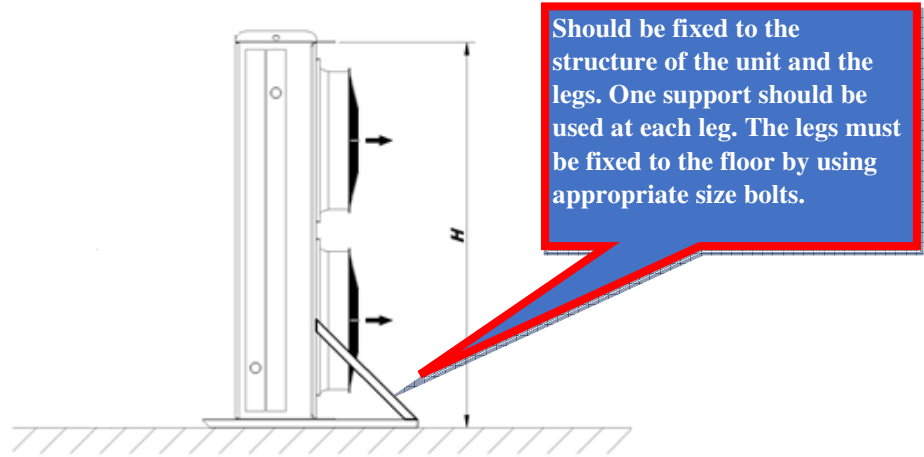
In case of operating in a windy site (Wind speed > 20 km/h), the vertically mounted dry coolers should be fixed to the wall behind by using threaded rods not smaller than M10 size. Besides the legs should be fixed on the floor by using appropriate bolts.



In case of operating in a windy site (Wind speed > 20 km/h) and mounting high from the floor, the vertically mounted dry coolers should be fixed to the wall behind by using threaded rods not smaller than M10 size. And also a cross support under the base is recommended in order to prevent the vertically standing unit vibrating with the effect of strong wind. Please note that, these supports does not come with the unit, but should be ordered as accessories.



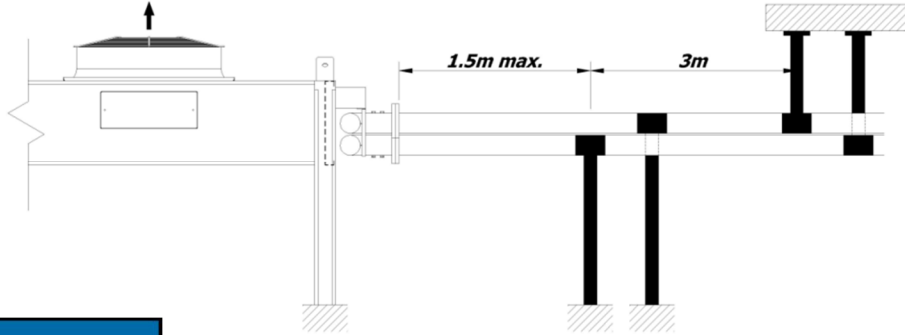
In case of mounting away from any vertical wall, a cross support is recommended in order to prevent the vertically standing unit vibrating with the effect of strong wind. Please note that, these supports does not come with the unit, but should be ordered as accessories.



NOTICE

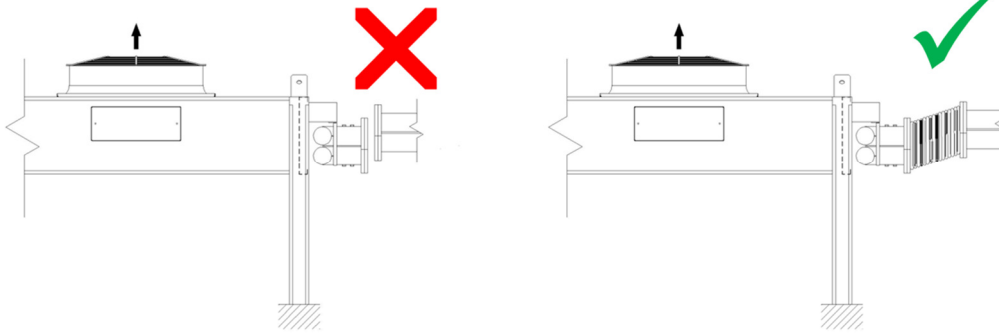
Piping should be fixed and supported at a distance of 1.5 m from the unit connection. After the first supporting point the entire piping should be fixed at each 3 m.

[Metni yazın]

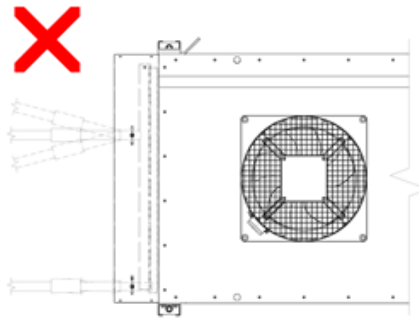


NOTICE

The flanged connection to the dry cooler should be made at perfect facing position. Unless, a flexible vibration absorber intermediate connector should be used.

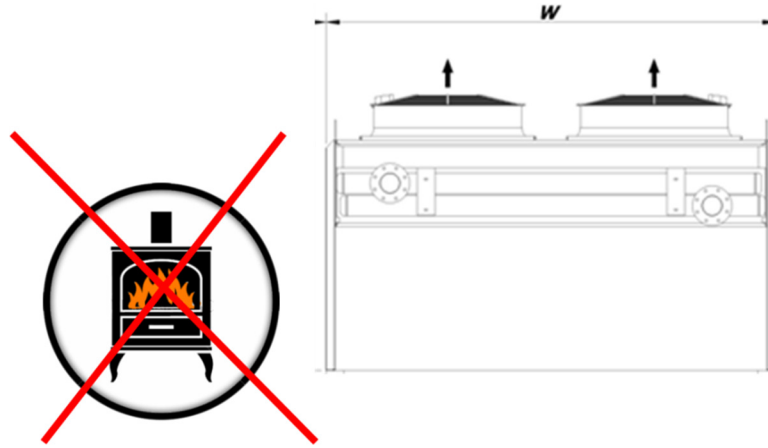


Do not bend the connection pipes while mounting. The pipe connection must be in line.



NOTICE

There should be NO Heat Source close to the dry cooler, especially hot air outlet ducts.



NOTICE

It must be ensured that no electrical supply connection exists during installation.

The mounting position of the product should be in accordance with its design.

The connections used for mounting should be adequate to support the total operational forces.

The product must be mounted in such a way that no vibration would be carried to the product (vibration dampers can be used if required).

Carrier legs and lifting lugs are delivered as mounted on product

! DANGER

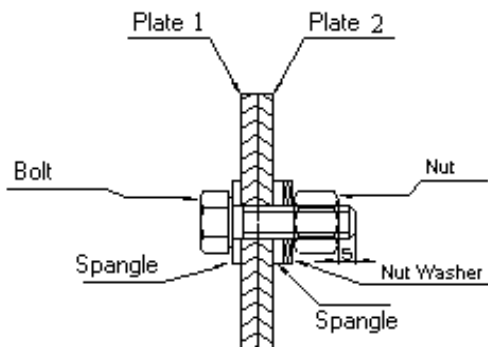
Electrical connections must not be done before mounting the product to the ground with the legs.

! CAUTION

Product must not be operated and electrically connected before the mounting legs fixed.

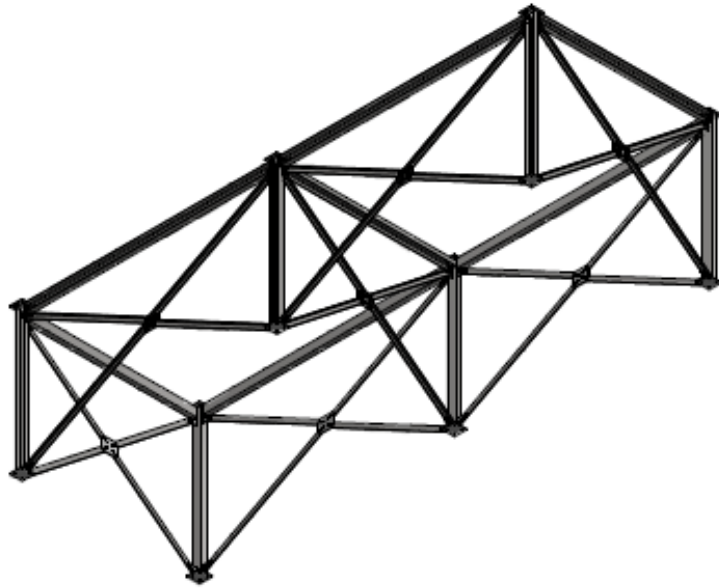
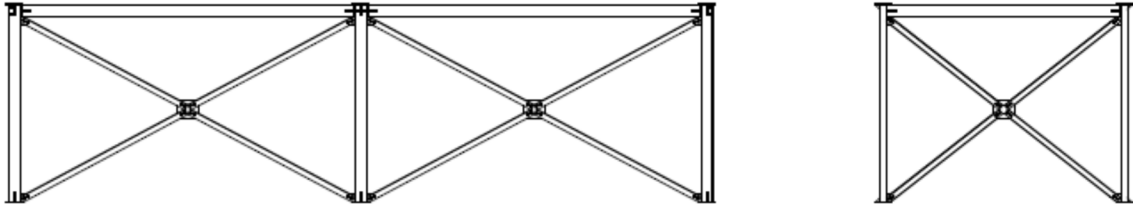
NOTICE

6.3.1 Ideal mounting scheme



NOTICE

The Units to be mounted on a metal carcass horizontal/Vertical, the structure of the carcass should be made of NPU120 and L60*60 profiles at least.



6.3.2 Leg mounting

Legs have been delivered demounted with the product.

For every leg; 6 piece M10x25 nut, M10 bolt and 12 piece spangles are given.

The product is delivered with lifting eyes. The product is delivered with lifting eyes mounted on it.

While mounting the product, number of legs that must be used depending on current fan counts is specified in the table given below.

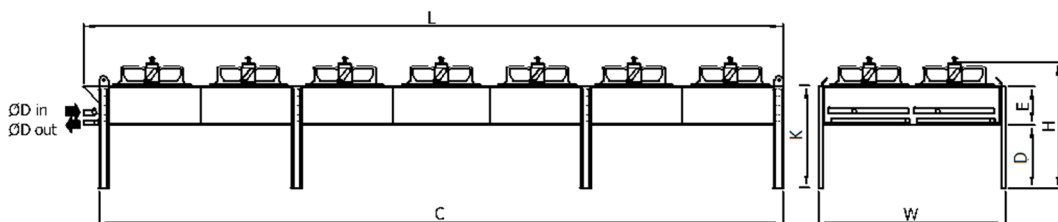
NOTICE

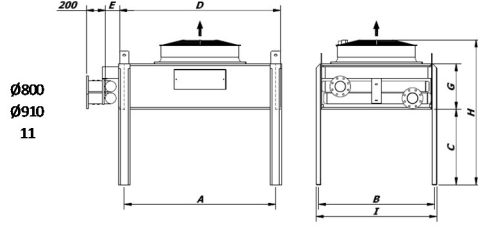
Same leg counts can be used for products with two row fans (FDH/ FDV 2E 21, 22,..., 28).

	Fan Count	Physical Characteristic of Coil	FDH Leg Count	FDV Leg Count
Ø800/ Ø910 FDH / FDV 2E	11	All Type	4	2
	12	D111, D211, D121, D221, D131, D231, D331	4	2
		D241, 341, 251, 351	6	3
	13	D111, D211, D121, D221, D131, D231, D331	6	3
		D241, 341, 251, 351	8	4
	14	D111, D211, D121, D221, D131, D231, D331	6	3
		D241, 341, 251, 351	10	5
	15	D111, D211, D121, D221, D131, D231, D331	8	4
		D241, 341, 251, 351	12	6
	16	D111, D211, D121, D221, D131, D231, D331	8	4
		D241, 341	14	7
	17	D111, 211	8	4
		D121, D221, D131, D231, D331	10	5
	18	All Type	10	5

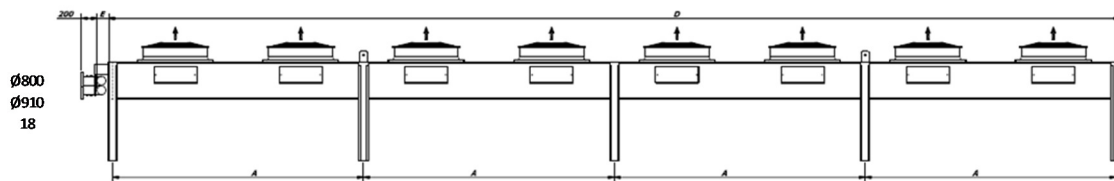
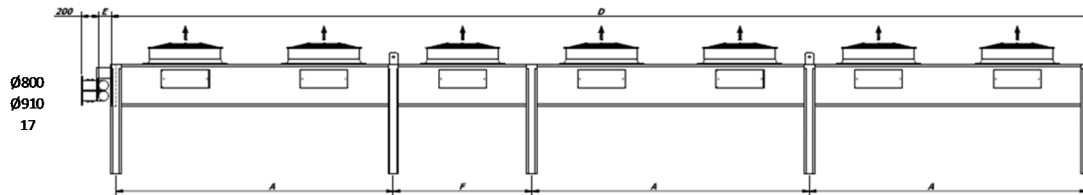
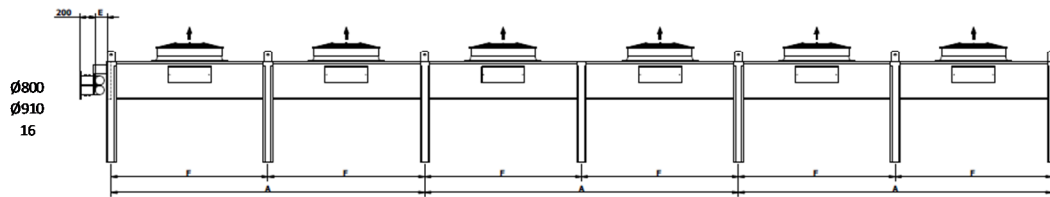
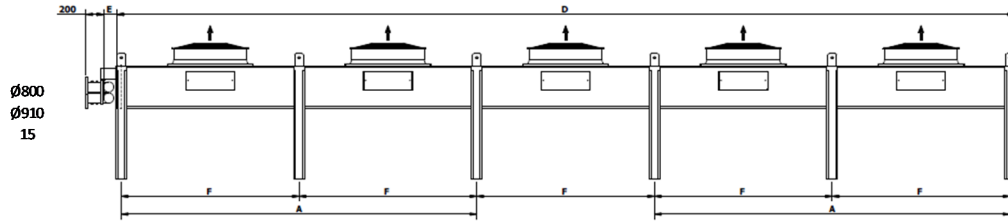
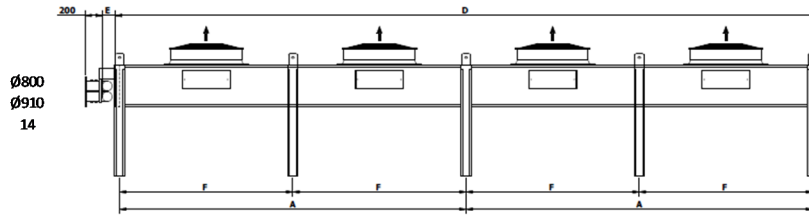
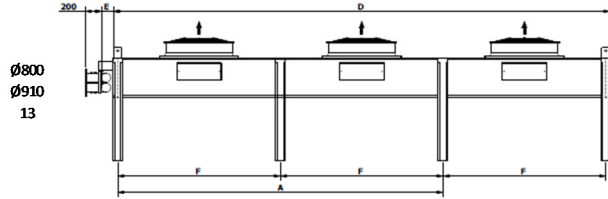
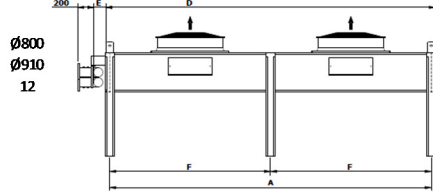
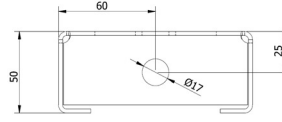
*For some dry coolers that have same fan count, the number of legs can be different. For current leg counts please see the catalogues.

For example, according to Table if the product has 7 fans with 2 rows, 8 legs must be used while mounting the product. It is depicted as in the figure given below.





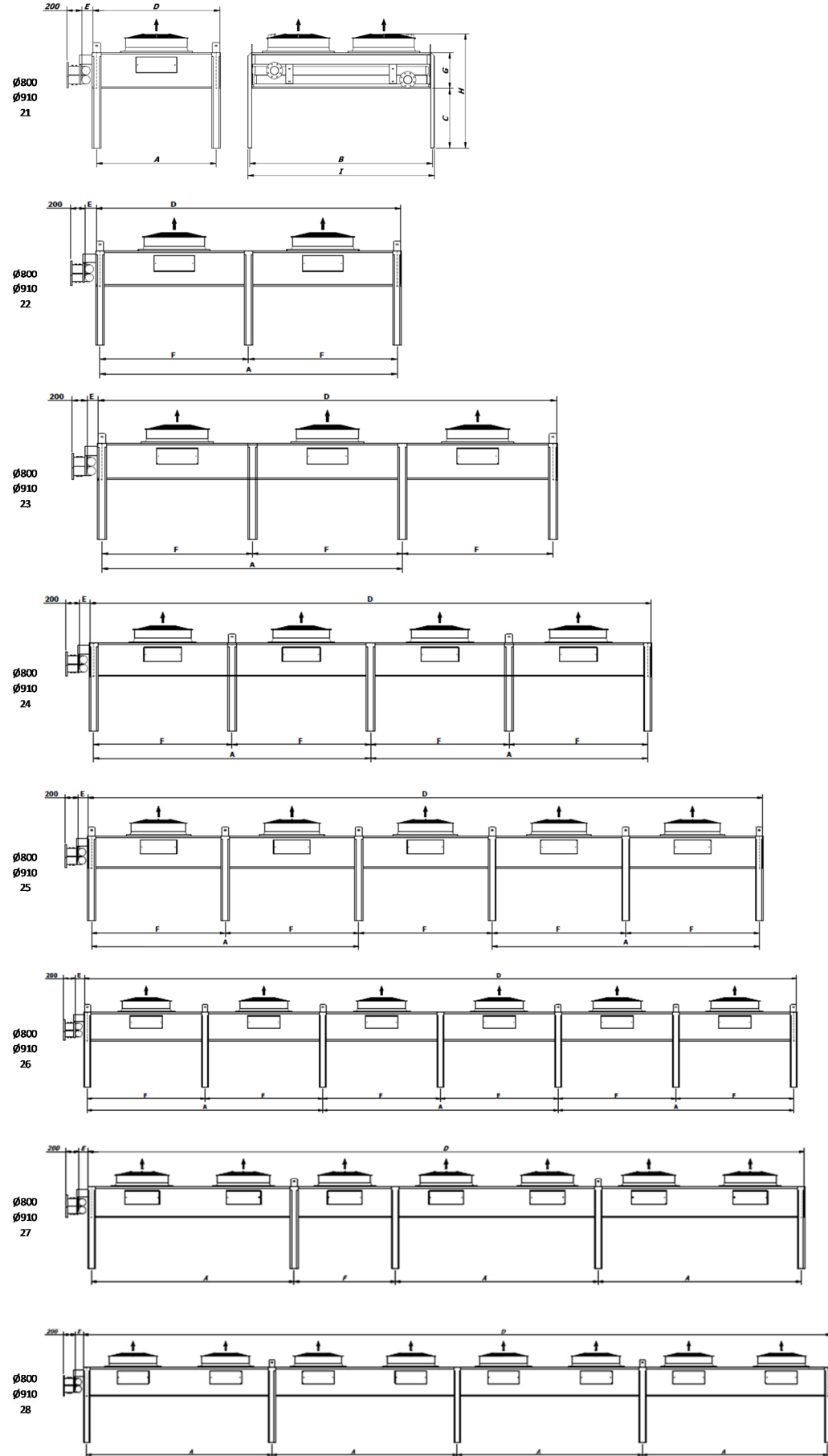
Montaj ayağı detayı/ Mounting leg detail



[Metni yazın]

FDH 2E 2 Sıra Fanlı/2 Row Fans

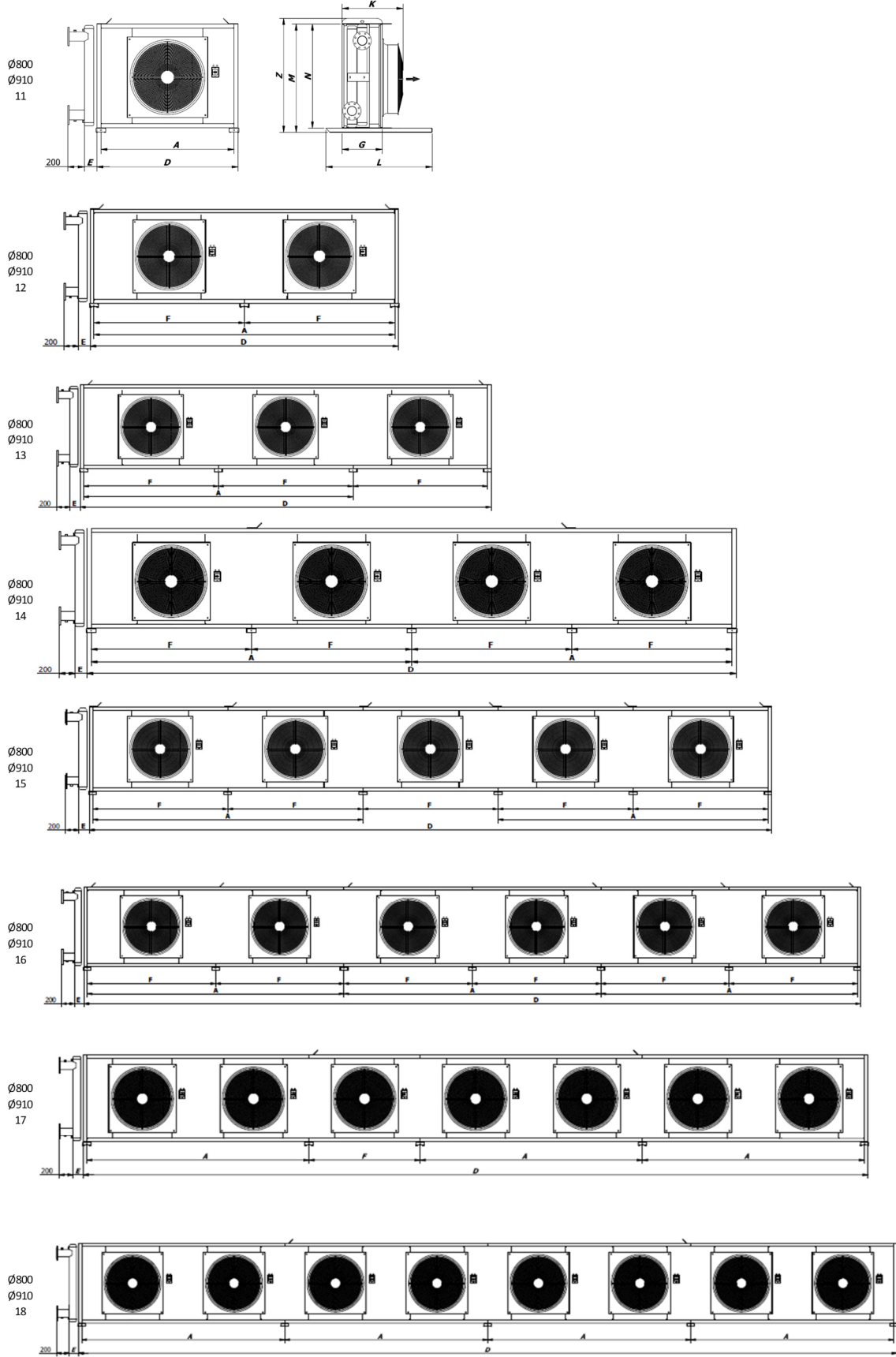
TEKNİK ÇİZİM •



[Metni yazın]

FDV 2E 1 Sıra Fanlı/ 1 Row Fan

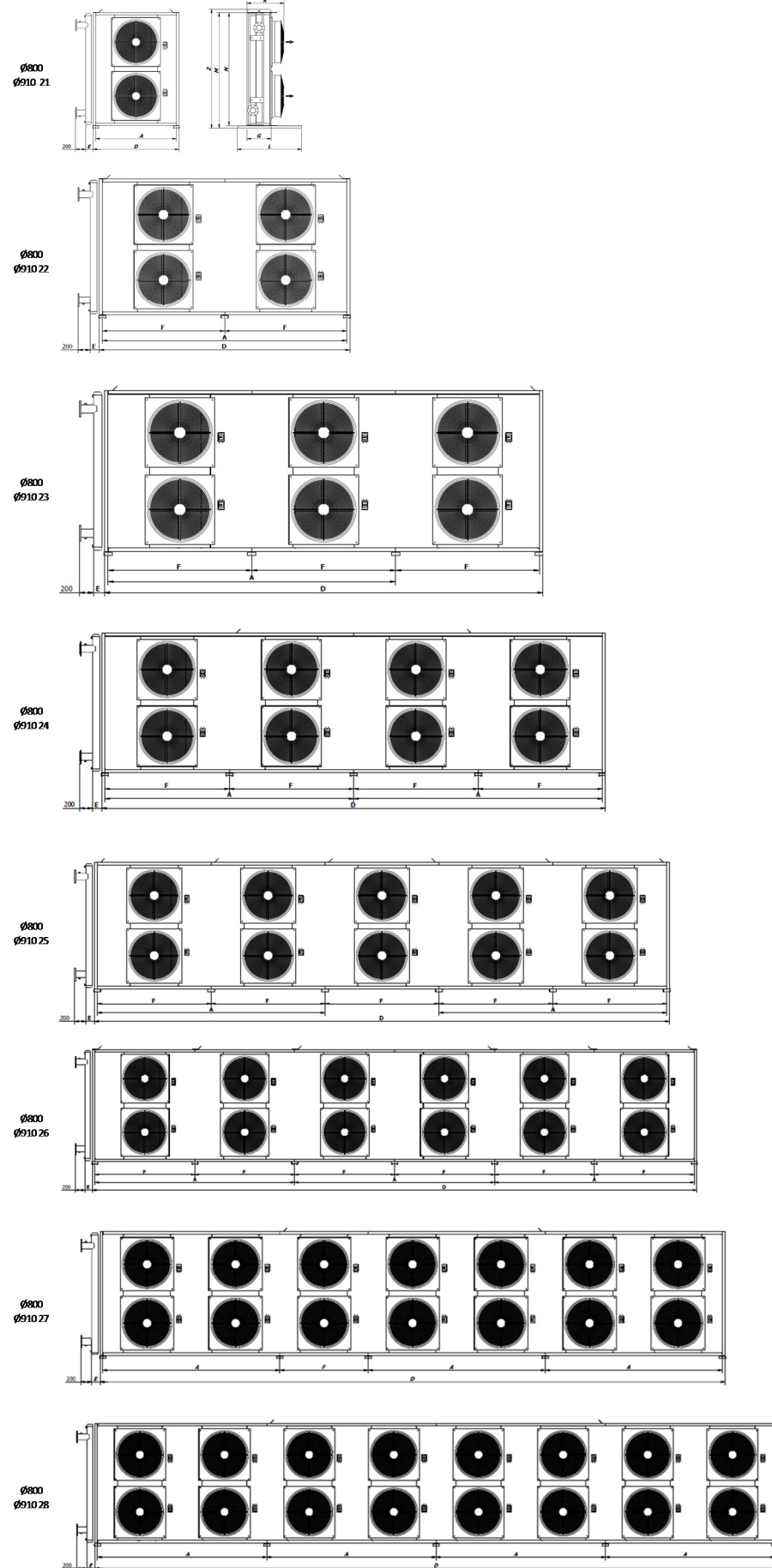
TEKNİK ÇİZİM • DRAWING



[Metni yazın]

FDV 2E 2 Sıra Fanlı/2 Row Fans

TEKNİK ÇİZİM • DRAWING



FDH/FDV 2E											BOYUTLAR • DIMENSIONS	
MODEL MODEL		D	A	F	B	I	L	M	N	Z	AYAK SAYILARI	
		mm	mm	mm	mm	mm	mm	mm	mm	mm	YATIK	DİK
80/91 12	E111	2900	2800	-	2300	2350	1275	1305	1255	1375	4	2
	E211	2900	2800	-	2300	2350	1275	1305	1255	1375	4	2
	E121	3300	3200	-	2300	2350	1275	1305	1255	1375	4	2
	E221	3300	3200	-	2300	2350	1275	1305	1255	1375	4	2
	E131	3700	3600	-	2300	2350	1275	1305	1255	1375	4	2
	E231	3700	3600	-	2300	2350	1275	1305	1255	1375	4	2
	E331	3700	3600	-	2300	2350	1275	1305	1255	1375	4	2
	E241	4100	-	2000	2300	2350	1275	1305	1255	1375	6	3
	E341	4100	-	2000	2300	2350	1275	1305	1255	1375	6	3
	E251	4500	-	2200	2300	2350	1275	1305	1255	1375	6	3
	E351	4500	-	2200	2300	2350	1275	1305	1255	1375	6	3
80/91 13	E111	4300	2800	1400	2300	2350	1275	1305	1255	1375	6	3
	E211	4300	2800	1400	2300	2350	1275	1305	1255	1375	6	3
	E121	4900	3200	1600	2300	2350	1275	1305	1255	1375	6	3
	E221	4900	3200	1600	2300	2350	1275	1305	1255	1375	6	3
	E131	5500	3600	1800	2300	2350	1275	1305	1255	1375	6	3
	E231	5500	3600	1800	2300	2350	1275	1305	1255	1375	6	3
	E331	5500	3600	1800	2300	2350	1275	1305	1255	1375	6	3
	E241	6100	-	2000	2300	2350	1275	1305	1255	1375	8	4
	E341	6100	-	2000	2300	2350	1275	1305	1255	1375	8	4
	E251	6700	-	2200	2300	2350	1275	1305	1255	1375	8	4
	E351	6700	-	2200	2300	2350	1275	1305	1255	1375	8	4
80/91 14	E111	5700	2800	-	2300	2350	1275	1305	1255	1375	6	3
	E211	5700	2800	-	2300	2350	1275	1305	1255	1375	6	3
	E121	6500	3200	-	2300	2350	1275	1305	1255	1375	6	3
	E221	6500	3200	-	2300	2350	1275	1305	1255	1375	6	3
	E131	7300	3600	-	2300	2350	1275	1305	1255	1375	6	3
	E231	7300	3600	-	2300	2350	1275	1305	1255	1375	6	3
	E331	7300	3600	-	2300	2350	1275	1305	1255	1375	6	3
	E241	8100	-	2000	2300	2350	1275	1305	1255	1375	10	5
	E341	8100	-	2000	2300	2350	1275	1305	1255	1375	10	5
	E251	8900	-	2200	2300	2350	1275	1305	1255	1375	10	5
	E351	8900	-	2200	2300	2350	1275	1305	1255	1375	10	5
80/91 15	E111	7100	2800	1400	2300	2350	1275	1305	1255	1375	8	4
	E211	7100	2800	1400	2300	2350	1275	1305	1255	1375	8	4
	E121	8100	3200	1600	2300	2350	1275	1305	1255	1375	8	4
	E221	8100	3200	1600	2300	2350	1275	1305	1255	1375	8	4
	E131	9100	3600	1800	2300	2350	1275	1305	1255	1375	8	4
	E231	9100	3600	1800	2300	2350	1275	1305	1255	1375	8	4
	E331	9100	3600	1800	2300	2350	1275	1305	1255	1375	8	4
	E241	10100	-	2000	2300	2350	1275	1305	1255	1375	12	6
	E341	10100	-	2200	2300	2350	1275	1305	1255	1375	12	6
	E251	11100	-	2200	2300	2350	1275	1305	1255	1375	12	6
	E351	11100	-	2200	2300	2350	1275	1305	1255	1375	12	6

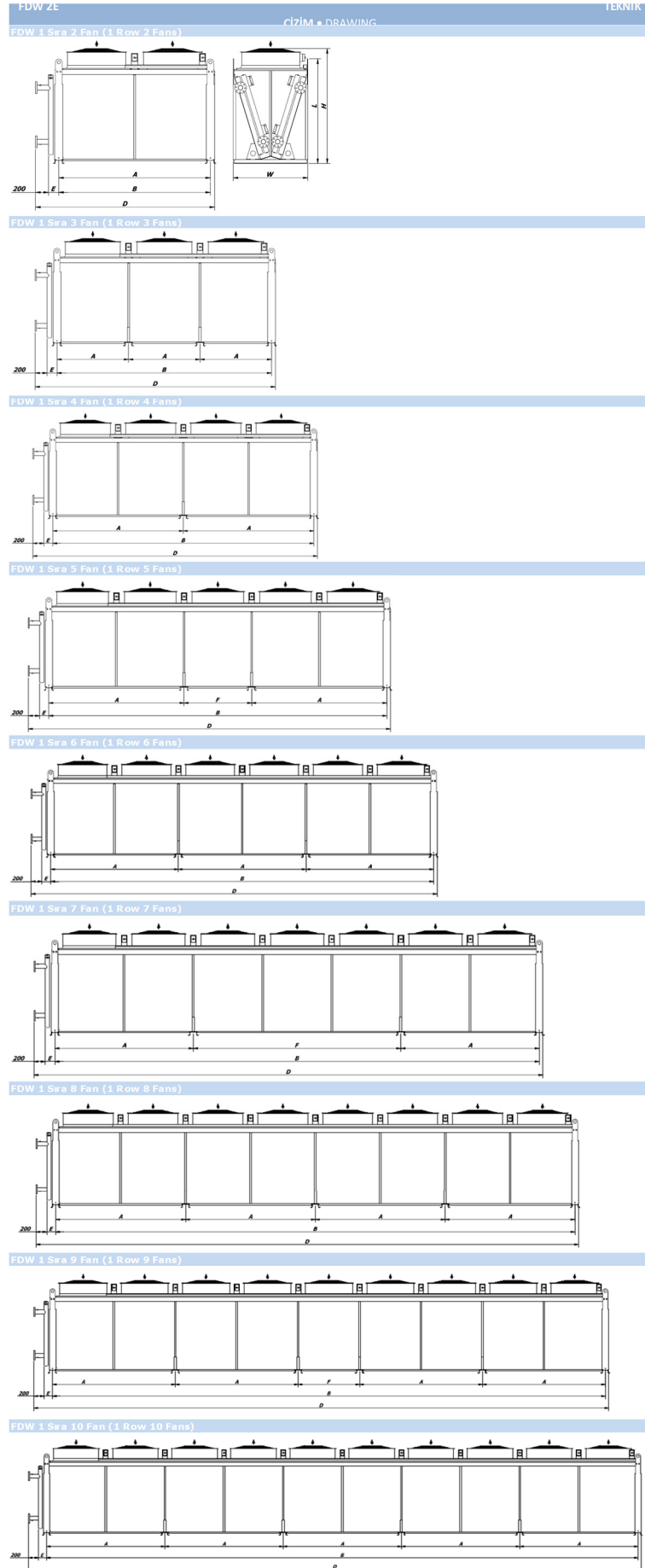
80/91 16	E111	8500	2800	-	2300	2350	1275	1305	1255	1375	8	4
	E211	8500	2800	-	2300	2350	1275	1305	1255	1375	8	4
	E121	9700	3200	-	2300	2350	1275	1305	1255	1375	8	4
	E221	9700	3200	-	2300	2350	1275	1305	1255	1375	8	4
	E131	10900	3600	-	2300	2350	1275	1305	1255	1375	8	4
	E231	10900	3600	-	2300	2350	1275	1305	1255	1375	8	4
	E331	10900	3600	-	2300	2350	1275	1305	1255	1375	8	4
	E241	12100	-	2000	2300	2350	1275	1305	1255	1375	14	7
	E341	12100	-	2000	2300	2350	1275	1305	1255	1375	14	7
80/91 17	E111	9900	2800	1400	2300	2350	1275	1305	1255	1375	10	5
	E211	9900	2800	1400	2300	2350	1275	1305	1255	1375	10	5
	E121	11300	3200	1600	2300	2350	1275	1305	1255	1375	10	5
	E221	11300	3200	1600	2300	2350	1275	1305	1255	1375	10	5
	E131	12700	3600	1800	2300	2350	1275	1305	1255	1375	10	5
	E231	12700	3600	1800	2300	2350	1275	1305	1255	1375	10	5
	E331	12700	3600	1800	2300	2350	1275	1305	1255	1375	10	5
80/91 18	E111	11300	2800	-	2300	2350	1275	1305	1255	1375	10	5
	E211	11300	2800	-	2300	2350	1275	1305	1255	1375	10	5
	E121	12900	3200	-	2300	2350	1275	1305	1255	1375	10	5
	E221	12900	3200	-	2300	2350	1275	1305	1255	1375	10	5
						E	C	G	H		K	
						mm	mm	mm	Ø800	Ø910	Ø800	Ø910
1"						70	795	480	1540	1580	740	780
1 1/4"						80	795	480	1540	1580	740	780
1 1/2"						85	795	480	1540	1580	740	780
2"						95	795	480	1540	1580	740	780
2 1/2"						110	795	480	1540	1580	740	780
3"						125	795	480	1540	1580	740	780
4"						150	795	480	1540	1580	740	780
5"						200	895	600	1760	1800	860	900

[Metni yazın]

FDH/FDV 2E													BOYUTLAR • DIMENSIONS													
MODEL MODEL	D	A	F	B	I	L	M	N	Z	AYAK SAYILARI			MODEL MODEL	D	A	F	B	I	L	M	N	Z	AYAK SAYILARI			
	mm	mm	mm	mm	mm	mm	mm	mm	mm	YATIK	DİK			mm	mm	mm	mm	mm	mm	mm	mm	mm	YATIK	DİK		
80/ 91 21	E111	1500	1400	-	2300	2350	1275	2295	2245	2365	4	2		E112	1500	1400	-	2450	2500	1275	2450	2400	2520	4	2	
	E211	1500	1400	-	2300	2350	1275	2295	2245	2365	4	2		E212	1500	1400	-	2450	2500	1275	2450	2400	2520	4	2	
	E121	1700	1600	-	2300	2350	1275	2295	2245	2365	4	2		E122	1700	1600	-	2450	2500	1275	2450	2400	2520	4	2	
	E221	1700	1600	-	2300	2350	1275	2295	2245	2365	4	2		E222	1700	1600	-	2450	2500	1275	2450	2400	2520	4	2	
	E131	1900	1800	-	2300	2350	1275	2295	2245	2365	4	2		E132	1900	1800	-	2450	2500	1275	2450	2400	2520	4	2	
	E231	1900	1800	-	2300	2350	1275	2295	2245	2365	4	2		E232	1900	1800	-	2450	2500	1275	2450	2400	2520	4	2	
	E331	1900	1800	-	2300	2350	1275	2295	2245	2365	4	2		E332	1900	1800	-	2450	2500	1275	2450	2400	2520	4	2	
	E241	2100	2000	-	2300	2350	1275	2295	2245	2365	4	2		E242	2100	2000	-	2450	2500	1275	2450	2400	2520	4	2	
	E341	2100	2000	-	2300	2350	1275	2295	2245	2365	4	2		E342	2100	2000	-	2450	2500	1275	2450	2400	2520	4	2	
	E251	2300	2200	-	2300	2350	1275	2295	2245	2365	4	2		E252	2300	2200	-	2450	2500	1275	2450	2400	2520	4	2	
	E351	2300	2200	-	2300	2350	1275	2295	2245	2365	4	2		E352	2300	2200	-	2450	2500	1275	2450	2400	2520	4	2	
80/ 91 22	E111	2900	2800	-	2300	2350	1275	2295	2245	2365	4	2		E112	2900	2800	-	2450	2500	1275	2450	2400	2520	4	2	
	E211	2900	2800	-	2300	2350	1275	2295	2245	2365	4	2		E212	2900	2800	-	2450	2500	1275	2450	2400	2520	4	2	
	E121	3300	3200	-	2300	2350	1275	2295	2245	2365	4	2		E122	3300	3200	-	2450	2500	1275	2450	2400	2520	4	2	
	E221	3300	3200	-	2300	2350	1275	2295	2245	2365	4	2		E222	3300	3200	-	2450	2500	1275	2450	2400	2520	4	2	
	E131	3700	3600	-	2300	2350	1275	2295	2245	2365	4	2		E132	3700	3600	-	2450	2500	1275	2450	2400	2520	4	2	
	E231	3700	3600	-	2300	2350	1275	2295	2245	2365	4	2		E232	3700	3600	-	2450	2500	1275	2450	2400	2520	4	2	
	E331	3700	3600	-	2300	2350	1275	2295	2245	2365	4	2		E332	3700	3600	-	2450	2500	1275	2450	2400	2520	4	2	
	E241	4100	-	2000	2300	2350	1275	2295	2245	2365	6	3		E242	4100	-	2000	2450	2500	1275	2450	2400	2520	6	3	
	E341	4100	-	2000	2300	2350	1275	2295	2245	2365	6	3		E342	4100	-	2000	2450	2500	1275	2450	2400	2520	6	3	
	E251	4500	-	2200	2300	2350	1275	2295	2245	2365	6	3		E252	4500	-	2200	2450	2500	1275	2450	2400	2520	6	3	
	E351	4500	-	2200	2300	2350	1275	2295	2245	2365	6	3		E352	4500	-	2200	2450	2500	1275	2450	2400	2520	6	3	
80/ 91 23	E111	4300	2800	1400	2300	2350	1275	2295	2245	2365	6	3		E112	4300	2800	1400	2450	2500	1275	2450	2400	2520	6	3	
	E211	4300	2800	1400	2300	2350	1275	2295	2245	2365	6	3		E212	4300	2800	1400	2450	2500	1275	2450	2400	2520	6	3	
	E121	4900	3200	1600	2300	2350	1275	2295	2245	2365	6	3		E122	4900	3200	1600	2450	2500	1275	2450	2400	2520	6	3	
	E221	4900	3200	1600	2300	2350	1275	2295	2245	2365	6	3		E222	4900	3200	1600	2450	2500	1275	2450	2400	2520	6	3	
	E131	5500	3600	1800	2300	2350	1275	2295	2245	2365	6	3		E132	5500	3600	1800	2450	2500	1275	2450	2400	2520	6	3	
	E231	5500	3600	1800	2300	2350	1275	2295	2245	2365	6	3		E232	5500	3600	1800	2450	2500	1275	2450	2400	2520	6	3	
	E331	5500	3600	1800	2300	2350	1275	2295	2245	2365	6	3		E332	5500	3600	1800	2450	2500	1275	2450	2400	2520	6	3	
	E241	6100	-	2000	2300	2350	1275	2295	2245	2365	8	4		E242	6100	-	2000	2450	2500	1275	2450	2400	2520	8	4	
	E341	6100	-	2000	2300	2350	1275	2295	2245	2365	8	4		E342	6100	-	2000	2450	2500	1275	2450	2400	2520	8	4	
	E251	6700	-	2200	2300	2350	1275	2295	2245	2365	8	4		E252	6700	-	2200	2450	2500	1275	2450	2400	2520	8	4	
	E351	6700	-	2200	2300	2350	1275	2295	2245	2365	8	4		E352	6700	-	2200	2450	2500	1275	2450	2400	2520	8	4	
80/ 91 24	E111	5700	2800	-	2300	2350	1275	2295	2245	2365	6	3		E112	5700	2800	-	2450	2500	1275	2450	2400	2520	6	3	
	E211	5700	2800	-	2300	2350	1275	2295	2245	2365	6	3		E212	5700	2800	-	2450	2500	1275	2450	2400	2520	6	3	
	E121	6500	3200	-	2300	2350	1275	2295	2245	2365	6	3		E122	6500	3200	-	2450	2500	1275	2450	2400	2520	6	3	
	E221	6500	3200	-	2300	2350	1275	2295	2245	2365	6	3		E222	6500	3200	-	2450	2500	1275	2450	2400	2520	6	3	
	E131	7300	3600	-	2300	2350	1275	2295	2245	2365	6	3		E132	7300	3600	-	2450	2500	1275	2450	2400	2520	6	3	
	E231	7300	3600	-	2300	2350	1275	2295	2245	2365	6	3		E232	7300	3600	-	2450	2500	1275	2450	2400	2520	6	3	
	E331	7300	3600	-	2300	2350	1275	2295	2245	2365	6	3		E332	7300	3600	-	2450	2500	1275	2450	2400	2520	6	3	
	E241	8100	-	2000	2300	2350	1275	2295	2245	2365	10	5		E242	8100	-	2000	2450	2500	1275	2450	2400	2520	10	5	
	E341	8100	-	2000	2300	2350	1275	2295	2245	2365	10	5		E342	8100	-	2000	2450	2500	1275	2450	2400	2520	10	5	
	E251	8900	-	2200	2300	2350	1275	2295	2245	2365	10	5		E252	8900	-	2200	2450	2500	1275	2450	2400	2520	10	5	
	E351	8900	-	2200	2300	2350	1275	2295	2245	2365	10	5		E352	8900	-	2200	2450	2500	1275	2450	2400	2520	10	5	

80/91 25	E111	7100	2800	1400	2300	2350	1275	2295	2245	2365	8	4	E112	7100	2800	1400	2450	2500	1275	2450	2400	2520	8	4
	E211	7100	2800	1400	2300	2350	1275	2295	2245	2365	8	4	E212	7100	2800	1400	2450	2500	1275	2450	2400	2520	8	4
	E121	8100	3200	1600	2300	2350	1275	2295	2245	2365	8	4	E122	8100	3200	1600	2450	2500	1275	2450	2400	2520	8	4
	E221	8100	3200	1600	2300	2350	1275	2295	2245	2365	8	4	E222	8100	3200	1600	2450	2500	1275	2450	2400	2520	8	4
	E131	9100	3600	1800	2300	2350	1275	2295	2245	2365	8	4	E132	9100	3600	1800	2450	2500	1275	2450	2400	2520	8	4
	E231	9100	3600	1800	2300	2350	1275	2295	2245	2365	8	4	E232	9100	3600	1800	2450	2500	1275	2450	2400	2520	8	4
	E331	9100	3600	1800	2300	2350	1275	2295	2245	2365	8	4	E332	9100	3600	1800	2450	2500	1275	2450	2400	2520	8	4
	E241	10100	-	2000	2300	2350	1275	2295	2245	2365	12	6	E242	10100	-	2000	2450	2500	1275	2450	2400	2520	12	6
	E341	10100	-	2200	2300	2350	1275	2295	2245	2365	12	6	E342	10100	-	2200	2450	2500	1275	2450	2400	2520	12	6
	E251	11100	-	2200	2300	2350	1275	2295	2245	2365	12	6	E252	11100	-	2200	2450	2500	1275	2450	2400	2520	12	6
	E351	11100	-	2200	2300	2350	1275	2295	2245	2365	12	6	E352	11100	-	2200	2450	2500	1275	2450	2400	2520	12	6
80/91 26	E111	8500	2800	-	2300	2350	1275	2295	2245	2365	8	4	E112	8500	2800	-	2450	2500	1275	2450	2400	2520	8	4
	E211	8500	2800	-	2300	2350	1275	2295	2245	2365	8	4	E212	8500	2800	-	2450	2500	1275	2450	2400	2520	8	4
	E121	9700	3200	-	2300	2350	1275	2295	2245	2365	8	4	E122	9700	3200	-	2450	2500	1275	2450	2400	2520	8	4
	E221	9700	3200	-	2300	2350	1275	2295	2245	2365	8	4	E222	9700	3200	-	2450	2500	1275	2450	2400	2520	8	4
	E131	10900	3600	-	2300	2350	1275	2295	2245	2365	8	4	E132	10900	3600	-	2450	2500	1275	2450	2400	2520	8	4
	E231	10900	3600	-	2300	2350	1275	2295	2245	2365	8	4	E232	10900	3600	-	2450	2500	1275	2450	2400	2520	8	4
	E331	10900	3600	-	2300	2350	1275	2295	2245	2365	8	4	E332	10900	3600	-	2450	2500	1275	2450	2400	2520	8	4
	E241	12100	-	2000	2300	2350	1275	2295	2245	2365	14	7	E242	12100	-	2000	2450	2500	1275	2450	2400	2520	14	7
	E341	12100	-	2000	2300	2350	1275	2295	2245	2365	14	7	E342	12100	-	2000	2450	2500	1275	2450	2400	2520	14	7
	E111	9900	2800	1400	2300	2350	1275	2295	2245	2365	10	5	E112	9900	2800	1400	2450	2500	1275	2450	2400	2520	10	5
80/91 27	E211	9900	2800	1400	2300	2350	1275	2295	2245	2365	10	5	E212	9900	2800	1400	2450	2500	1275	2450	2400	2520	10	5
	E121	11300	3200	1600	2300	2350	1275	2295	2245	2365	10	5	E122	11300	3200	1600	2450	2500	1275	2450	2400	2520	10	5
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	E131	12700	3600	1800	2300	2350	1275	2295	2245	2365	10	5	E132	12700	3600	1800	2450	2500	1275	2450	2400	2520	10	5
	E231	12700	3600	1800	2300	2350	1275	2295	2245	2365	10	5	E232	12700	3600	1800	2450	2500	1275	2450	2400	2520	10	5
	E331	12700	3600	1800	2300	2350	1275	2295	2245	2365	10	5	E332	12700	3600	1800	2450	2500	1275	2450	2400	2520	10	5
80/91 28	E111	11300	2800	-	2300	2350	1275	2295	2245	2365	10	5	E112	11300	2800	-	2450	2500	1275	2450	2400	2520	10	5
	E211	11300	2800	-	2300	2350	1275	2295	2245	2365	10	5	E212	11300	2800	-	2450	2500	1275	2450	2400	2520	10	5
	E121	12900	3200	-	2300	2350	1275	2295	2245	2365	10	5	E122	12900	3200	-	2450	2500	1275	2450	2400	2520	10	5
	E221	12900	3200	-	2300	2350	1275	2295	2245	2365	10	5	E222	12900	3200	-	2450	2500	1275	2450	2400	2520	10	5

	E	C	G	H		K	
	mm	mm	mm	ø800	ø910	ø800	ø910
1"	70	795	480	1540	1580	740	780
1 1/4"	80	795	480	1540	1580	740	780
1 1/2"	85	795	480	1540	1580	740	780
2"	95	795	480	1540	1580	740	780
2 1/2"	110	795	480	1540	1580	740	780
3"	125	795	480	1540	1580	740	780
4"	150	795	480	1540	1580	740	780
5"	200	895	600	1760	1800	860	900



[Metni yazın]



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6.4 Electrical Connection

The electrical connection must comply with the relevant instructions and ground wires must be installed correctly.

- The fan speed control could be managed by implementing the FMM (Friterm Motor Management) system.
- The wiring of fans should be done in accordance with the related rules.
- The main power supply cable should be determined according to the electrical power requirements of the product specified on the label.
- A protection thermal relay should be used where absent for the operational protection of the fan.
- Electrical wiring connections/junctions should be under protection with minimum IP54 class boxes.



Risk of injury by electric shock

When connecting the electronic control to the power supply, injuries by electric shock are possible because of the voltage supply.

- All electrical connections on the product must be made by a qualified electrician in accordance with the electrical engineering rules.

The main power switch should be turned off unless needed before the a repairing/maintenance action.



The electrical connection must not be done unless the legs are mounted.

Given nuts, bolts and spangles, must be completely used for mounting.

For the horizontal (H) type mounting:

- The product must be fixed with 4 lifting eyes, afterwards must be lifted approximately 1m so as to begin leg mounting.
- Use two spangles and a nut for each bolt while leg mounting.
- Be sure that all legs are equally far away from the surface
- Lower down the product slowly.
- The position control must be maintained with a water gauge on the product. The dry cooler must be positioned parallel to the surface.

[Metni yazın]

- Fix the product to the surface.

For the vertical (V) type mounting:

- Fix the product with 2 lifting eyes and afterwards begin foot mounting.
- Use 2 spangles and a nut for each bolt must be used.
- Lower down the product slowly.
- The position control must be maintained with a water gauge placed on the product. The product must be positioned parallel to the surface.
- Fix the product to the surface.

6.5 Water Spray System

Two types of water spray system can be used with dry coolers manufactured by Friterm A.Ş; Ecomesh Water Spray System and Direct Adiabatic Water Spray System.

For the instructions for installation, operating and maintenance of the products with Spraying Systems please look at the “Water Spray System- Installation, Operation and Maintenance instructions” document of Friterm A.Ş.

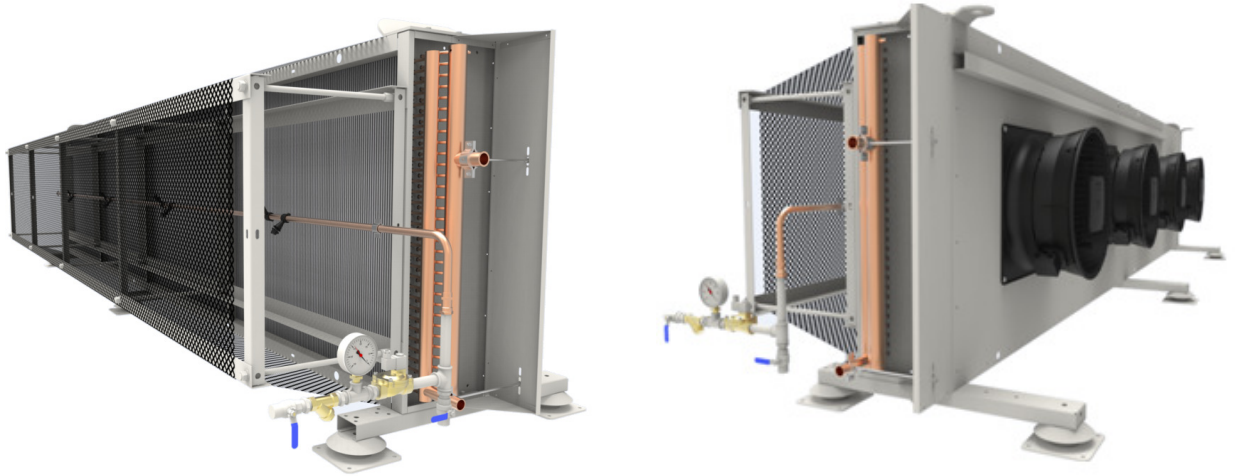


Figure 1- Ecomesh Water Spray System for Vertical Type Dry Coolers



Figure 3- Ecomesh Water Spray System for V Type Dry Coolers

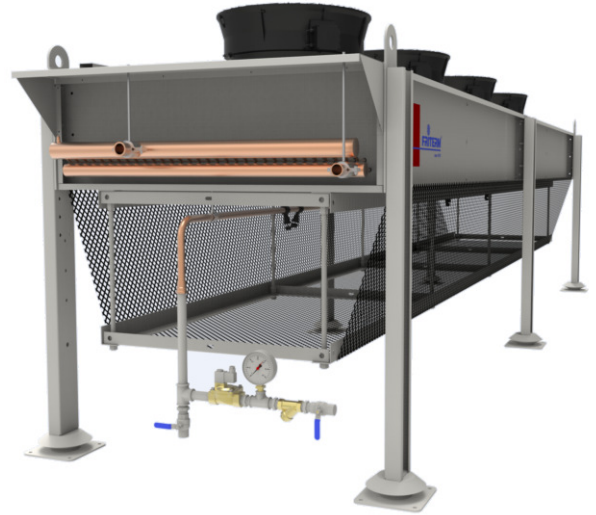


Figure 2- Ecomesh Water Spray system for Horizontal Type Dry Coolers

7. OPERATION

7.1 Initial commissioning

Before running the unit for the first time, be sure that all guards, motor mountings and electrical covers are secure, installation and electrical connection are done properly, internal wiring is kept away from the fans and the fans can rotate freely.

Make sure that all the mechanical connections are done in accordance with the rules. Piping is consistent with the guidelines. Before the start-up you may run the fans individually to make sure that they are running properly. Turn on the fluid valves and let the fluid flow right before running the fans. In case you may encounter any problem or disfunction please refer to the manufacturer for the resolution of the problem.



Products that do not have the "Ex" label on the label are not suitable for operation in explosive and flammable environments.

7.2 Regular commissioning

If the product is stationary for long periods in a humid atmosphere, the fans must be switched ON for **minimum of four hours in every month** to remove any moisture that may have condensed within the motors.

While the fans are running, anything that could pass through the finger guards, like a piece of cloth or long hair, must be kept away from the fans.

- Switch on the main power switch
- Make sure that the fluid is flowing inside the pipes.
- Switch on the fans.

7.3 Shutting down

Fan connection must be disconnected and working fluid circulation must be stopped to shut the product down.



After shutting the unit down the operating pressure must be observed whether the operating pressure exceeds maximum operating pressure or not.



Stay away from the air direction of the fans while the fans are running.



Before touching, it is recommended to ensure that the headers and the connection pipes are neither too hot nor too cold due to working conditions of the fluid inside.

The operation must be stopped and the supplier must be informed in case of any unusual working condition, such as abnormal operating noise. Intensive vibrations due to out-of- balance running of the fans may lead to outage.

Maintenance must not be performed while the product is in use **(See part 8 for details)**.

As it is not possible to evacuate fluid fully, antifreeze must be added to product for safety. **(See part 8 for details)**

NOTICE

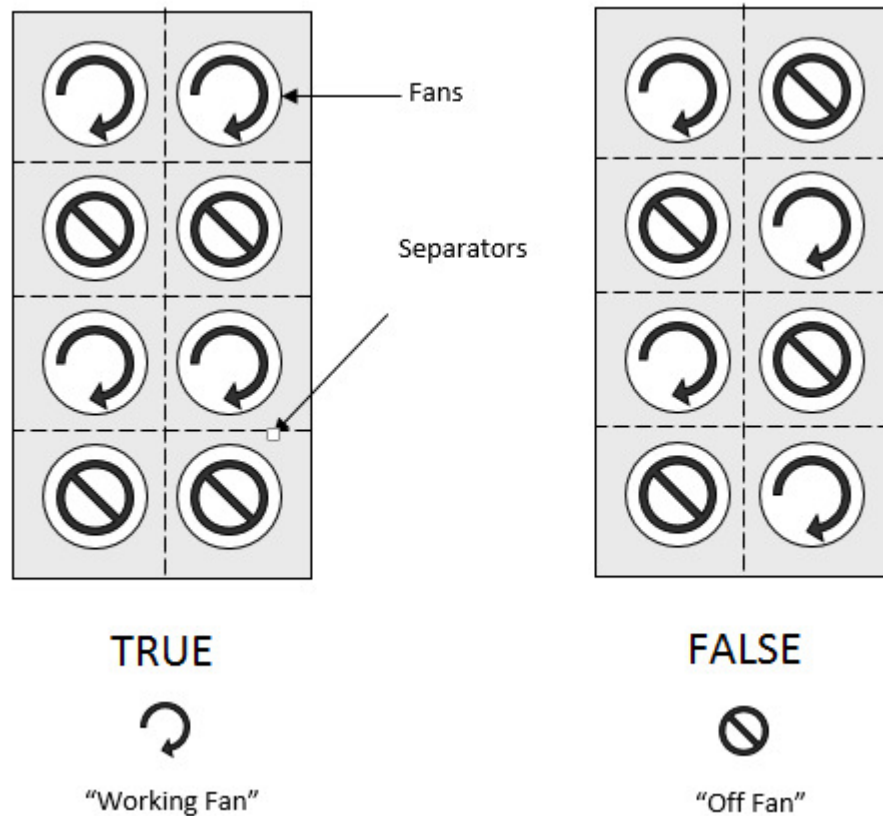
Recommended starting value for fans is 6 per hour while maximum is 10.

7.4 Friterm Motor Management System

7.4.1 FMM Step control application (If Applicable)

In step controlled applications; the fan groups that will be working and not working must be arranged according to scheme given below which is defined as "TRUE". Otherwise the problems given below will be observed:

1. The air will not be fully absorbed from by the fans. Hence the efficiency will decrease.
2. When a fan is taken into the circuit which rotates in contrary directions, the fan will be damaged because of constriction.



FMM step control is a control system progressing for AC external motor and standard motors. This system ensures 'ON/OFF' regulation of fans according to input signal. Thermostat consists of 5 stages. Firstly, the specified number of fan is started low speed owing to star connection and then activated all fans at high speed with delta connection. Finally, ecomesh system activates optionally. Besides, FMM Step Control has low investment costs and long service life. Also this system is monitored and controlled remotely by the supervisor.

7.4.2 FMM Voltage Control

The FMM voltage control system is used for AC external motor to ensure linear regulation the speed of fans to control according to pressure or temperature sensor's values. This system ensures high operational reliability owing to integrated bypass function in case of fan failure. Also this system is monitored and controlled by the supervisor.

7.4.3 FMM Frequency Control

FMM frequency control is used for standard motors to ensure high efficiency owing to continuous regulation of fan speed. This system provides considerable energy savings thanks to continuous modulation of all the fans. FMM Frequency Control System also is equipped with bypass functions for any fan failures. Also this system is monitored and controlled by the supervisor.

8. MAINTENANCE

8.1 Maintenance intervals

Maintenance operation is to be performed by qualified personnel only. Please be sure that safety regulations and the worker's protection rules are obeyed during the maintenance and service (DIN EN 50110).

The fluid circulation must be stopped and it must be ensured that no electrical supply connection exists during maintenance. It is advisable to wait till the product comes to thermal balance with its surroundings if possible.

Freezing Protection; Since it is not possible to drain all of liquid from the system, dry coolers have freezing threaten. Therefore fluid must be protected against freezing by adding adequately amount of antifreeze to the fluid. On the other hand, quantity of added antifreeze must be checked whether it decreases or not.

ATTENTION !!! It must be chosen 7-10 °C lower temperature in order to provide safely antifreeze (glycol) ratio.

Mixture Freezing Points For Different Antifreeze Ratios	
Volumetric Mixing Ratio	Freezing Temperature
%100 Water	0 °C
% 80 Water + % 20 Glycol	-7 °C
% 70 Water + % 30 Glycol	-14 °C
% 60 Water + % 40 Glycol	-22 °C
% 50 Water + % 50 Glycol	-33 °C
% 40 Water + % 60 Glycol	-48 °C

Reference: ASHRAE

NOTICE

If the tubes within the product or the connection pipes are to be repaired, the fluid in the line must be drained beforehand.

8.2 Fan motor maintenance

- Regarding the bearings, the fans are maintenance-free for 30000-40000 hours under normal operating conditions. Lifetime lubrication is not necessary within this period, and when this period expires or the bearings are damaged, it is necessary to replace the bearings with original parts.
- If the fans are to be maintained, the instruction manual prepared by the fan manufacturer must be followed. Please contact manufacturer when needed.
- After maintenance is performed, ensure that no tools or other foreign materials are left in or near the product.

NOTICE

Follow to Initial Commissioning before operating the product after maintenance.

8.3 Periodical controls (Once a year)

- Corrosion on the fins and tubes should be inspected. If the tubes are worn-out, leakage may occur.
- The pipeline must be controlled for damage and leakage.
- Mechanical and electrical connections of the fans must be checked. Fans must be able to rotate freely and finger guard must be stable.
- All the fixings, especially fan motor mountings and product installation fixings must be ensured to be secure.

8.4 Clean up

Cleaning the fins

- One of the effective methods to clean up the fins is to spray pressurized air. This action should be conducted after stopping the fans and turning off the fluid supply valves. The air jet should be provided to be parallel to the fins for the best cleaning results.
- Fins could also be cleaned up by pressurized water jet. The water jet should be provided to be parallel to the fins for best result. . This action should be conducted after stopping the fans and turning off the fluid supply valves. The cleaning action should be carried out inside-out. Some harmless solvent/detergents could be added to the water to ease the removal of hardened dirt. Any known corrosive/aggressive chemicals should be avoided to be used in cleaning action.
- The wiring and fans should not be wetted during the cleaning process.

Cleaning up the Fans

- Fans should be cleaned with the aid of pressurized air and a soft brush.

9. TROUBLESHOOTING

<i>Faults</i>	<i>Causes</i>	<i>Treatment</i>
Insufficient Capacity	Fans are not running properly	Repair or change fans
	Polluted coils	Clean
	Different brine working pressure	Adjust brine pressurising values to reference values
Fan motor is not working	Fan blade stuck	Enable fan to rotate freely
	Power supply cut off	Fix power supply
Vibration	Fan blades defect	Modify or change fan blades
Fluid Leakage	Parts of carrying refrigerant tools are leaking	Turn off the fans and refrigerant feed, prevent leakage

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