

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS



FCH, FCV, FCW

www.friterm.com

CONTENTS

1. ABOUT THIS MANUAL/GENERAL.....	1
1.1 Examining the operating manual.....	1
1.2 Responsibilities.....	1
1.2.1 Manufacturer's Responsibilities.....	1
1.2.2 Contractor's Responsibilities (Installation, Commissioning)	2
1.2.3 Operator's or Owner's Responsibilities (Operation and Maintenance)	2
1.3 Warranty	3
2. SAFETY REGULATIONS.....	4
2.1 Symbols and warning signs.....	4
2.2 Personal protection	5
2.2.1 Personal protection signs	5
2.3 Warnings	6
2.4 Improper use.....	8
2.4.1 Hazardous rotating machinery.....	8
2.4.2 Hazardous voltage.....	8
2.4.3 Hazardous thermal	8
2.4.4 Hazardous refrigerant	9
2.5 Environmental protection	9
3. LABELLING.....	10
3.1 Product code.....	10
3.2 Type plate.....	10
3.3 Friterm Logo.....	10
4. TECHNICAL DATA	11
4.1 Standards.....	11
4.2 Product	11
4.3 Fans	11
4.3.1 Fan connection diagrams	12
4.4 Sound pressure level.....	14
4.5 Sound power level	16
5. TRANSPORT AND STORAGE.....	16
5.1 Check for completeness and transport damage	16
5.2 Transport.....	17
5.3 Storage	20
6. INSTALLATION.....	21

6.1 Location	21
6.2 Requirements at the set up point.....	22
6.2.1 Outdoor set up of FCH unit	22
6.2.2 Set up next to wall	22
6.2.3 Set up in pit-hallow	23
6.2.4 Several FCH units.....	24
6.2.5 Requirements at the set up point (FCW units)	24
6.2.6 Several FCW units.....	25
6.2.7 Requirements at the set up point (FCV units)	25
6.2.8 Side-by-side setup (FCV units).....	26
6.3 Mounting.....	26
6.3.1 Ideal mounting scheme.....	29
6.3.2 Leg mounting.....	30
6.4 Electrical Connection.....	42
6.5 Water Spray System.....	43
7. OPERATION	44
7.1 Initial commissioning	44
7.2 Regular commissioning.....	44
7.3 Shutting down	45
7.4 Step control application (If Applicable)	45
8. MAINTENANCE.....	46
8.1 Maintenance intervals	46
8.2 Fan motor maintenance	47
8.3 Periodical controls (Once a year)	47
8.4 Clean up	47
9. TROUBLESHOOTING.....	48

1. ABOUT THIS MANUAL

This document specifies the instructions for installation, operating and maintenance of the Condensers (FCH, FCV, FCW models) manufactured by FRITERM A.Ş., Turkey.

The instructions below must be followed strictly for the 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.
- 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 are 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.
- 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 defect including transport damages. For hidden defects, he/she must notify the defect in written form and in details 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 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.
- The power supply which the product is supplied should not deviate 10% from the values given on the label.
- 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.

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.



- 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

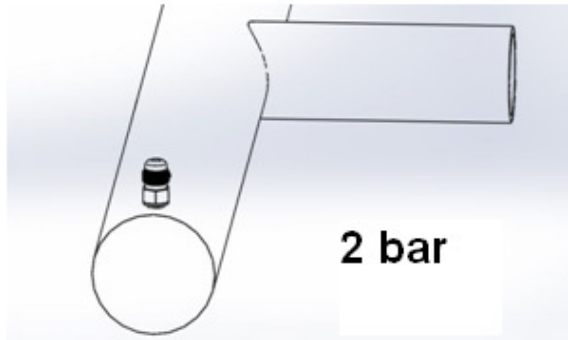
2.3 Warnings

- 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.

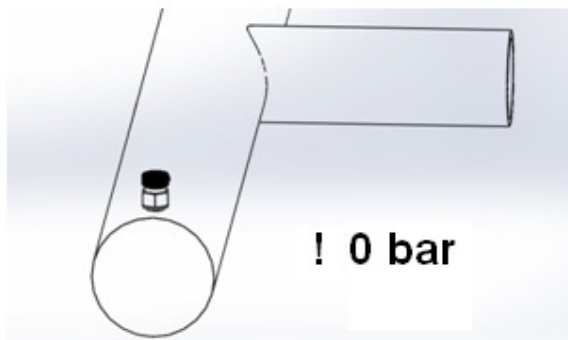
- In case of using any other coolant may cause damage, leakage, danger and environmental pollution.
- No modification is allowed on the product without written permission from the manufacturer.
- Operational conditions are limited within the specified range by the manufacturer. In case of need to operate the product out of the range, a confirmation should be asked from FRITERM A.Ş.



The product is delivered with 2 bar pressure. Upon receipt, it must be checked with schrader valve.



After checking, unless the product has 2 bar pressure Friterm must be notified immediately.



2.4 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.



Use hand 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 in case of high volume leakage during maintenance or because of defect. Since the pressure of liquid refrigerant will drop suddenly down to atmospheric pressure (uncontrolled expansion) the temperature will drop well below zero which may cause frostbites on skin. Protective gloves should be used.



2.4.4 Hazardous refrigerant



Direct exposure to some types of HFC refrigerants can cause unconsciousness, shortness of breath, and irregular heartbeat. It can also cause confusion, drowsiness, coughing, sore throat, difficulty breathing, and eye redness and pain. Direct skin contact with some types of refrigerants can cause frostbite or dry skin. Hence, respiratory mask must be worn.



If the concentration of refrigerant increase there will be a risk of asphyxia due to reduced oxygen concentration. Hence, ensure working rooms are well-ventilated.



No smoking.

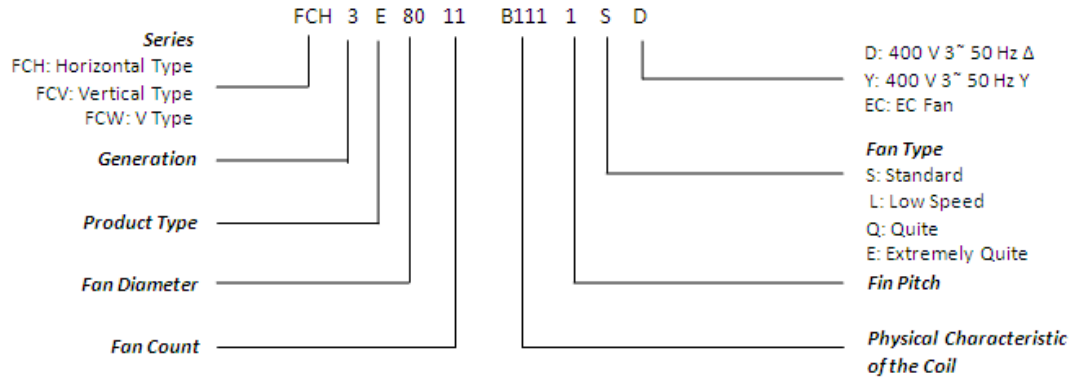
2.5 Environmental protection

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 underground 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	FCV 3E 50 23 B011 2 QY	Fan speed	(Δ/ Y) 660/ 510 rpm
Serial Nr.		Total Power	(Δ/ Y) 0.84/ 0.54 kW
TS min/ max	-40/ +100 °C	Power Supply	400 V AC 3 Ph 50 Hz
Weight	294 kg	Max. Opr. Pr.	28 Bar
Internal Vol.	25.4 L.	Test Pr. / Medium	34 Bar / Dry Air
Medium	Refrigerant / Fluid G2	Prod. Year	2016



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



4. TECHNICAL DATA

4.1 Standards

- 97/23/EC PED (Pressure Equipment Directive)
- EN 378 “Refrigeration systems and heat pumps, technical safety and environmental requirements”
- Capacity standard for condensers is defined according to the EN 327 standard (Heat Exchangers - Forced Convection Air Cooled Refrigerant Condensers - Test Procedure for Establishing 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 refrigerant 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 refrigerant 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:

- Condensation point
- Superheating point
- Air inlet temperature and air volumetric flow

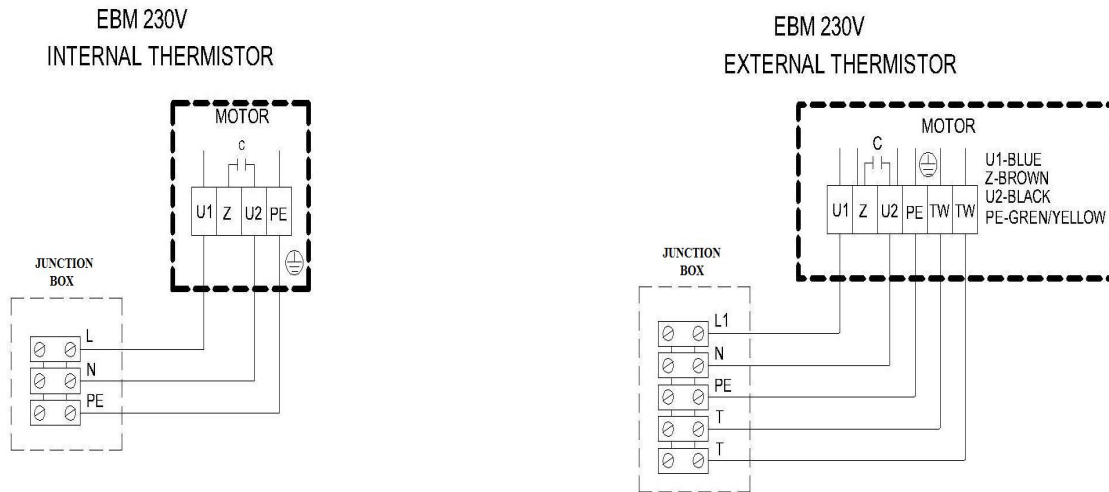
4.3 Fans

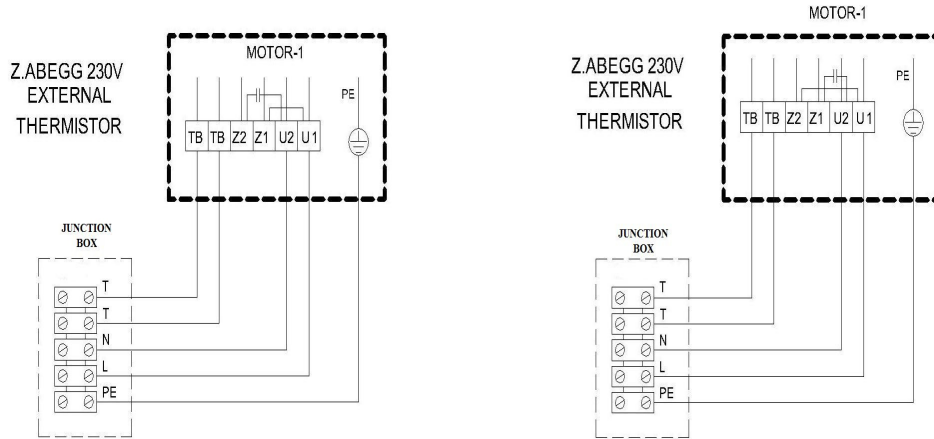
- Highly efficient axial Ziehl Abegg, EBM or equivalent fans are used.
- Fans are arranged for standard draw through air configuration.
- Fans diameters: Ø500/ Ø630/ Ø800/ Ø910 mm
- 400V 3~50Hz,
- Triphase fans can work at two different speeds. Furthermore, providing speed control is optional for EC 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.
- 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

230V Fan Connection Diagram

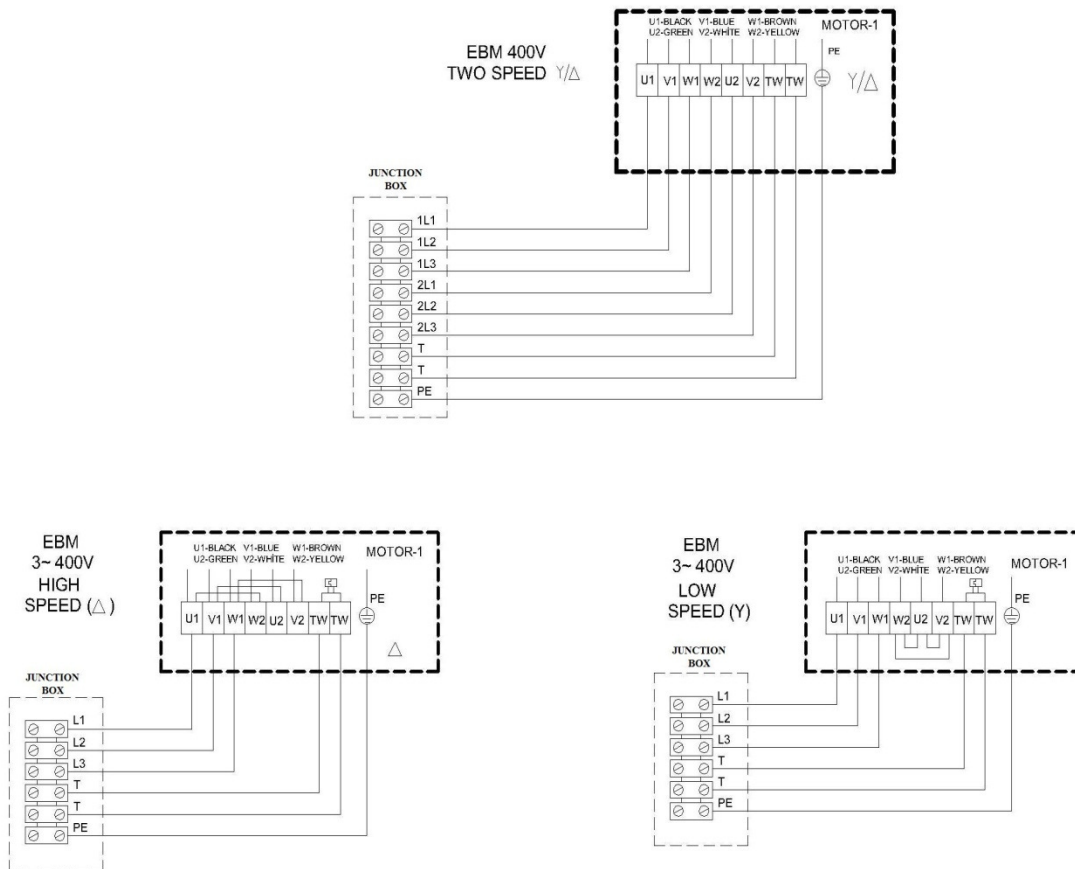




NOTICE

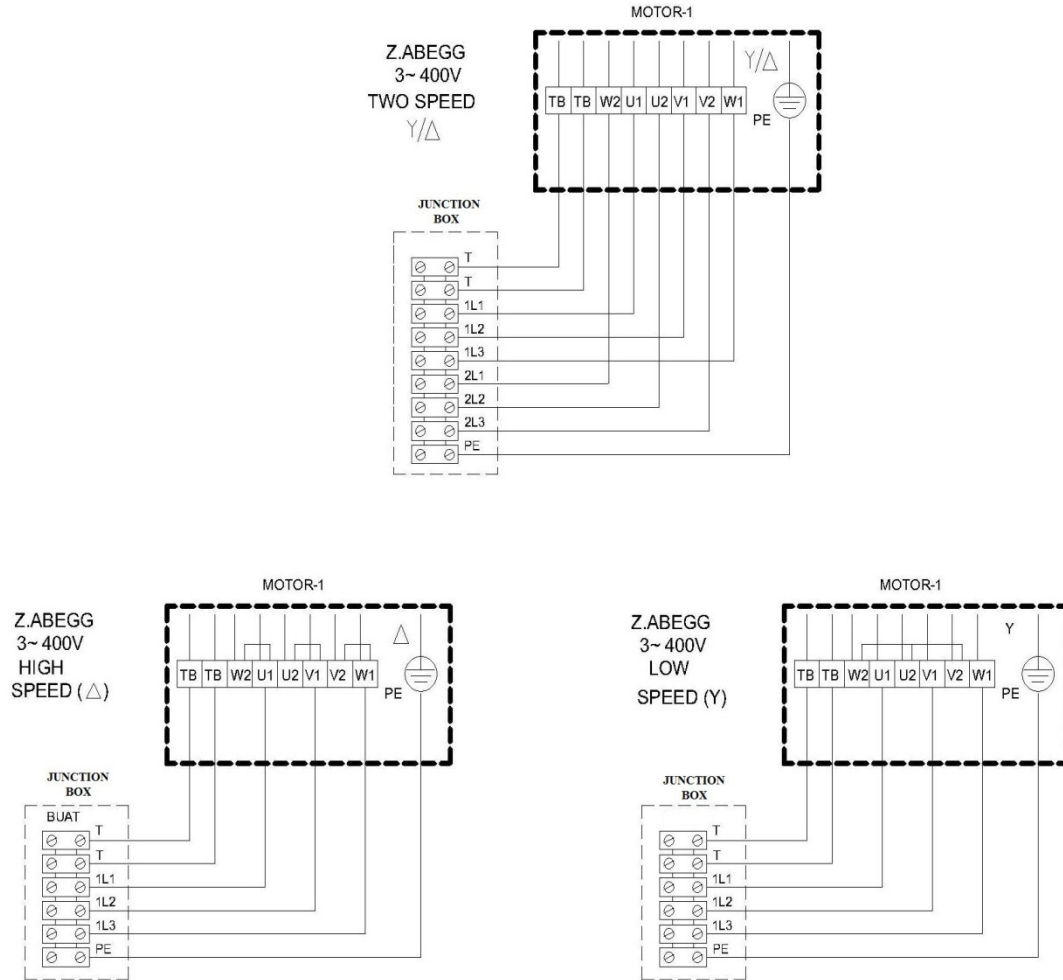
: Only specified section in bold lines are scope of supply.

400V Fan Connection Diagram



NOTICE

: Only specified section in bold lines are scope of supply.



NOTICE

: Only specified section in bold lines are scope of supply.

4.4 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 = parallelepiped 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.

SES BASINÇ SEVİYESİ • SOUND PRESSURE LEVEL

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	500 mm / Δ	(1330 rpm)	45	48	50	51	52	53	53	54	54	55	56	57	57	58	58	
SY	500 mm / Y	(940 rpm)	39	42	44	45	46	47	47	48	48	49	50	51	51	52	52	
LD	500 mm / Δ	(870 rpm)	34	37	39	40	41	42	42	43	43	44	45	46	46	47	47	
LY	500 mm / Y	(590 rpm)	23	26	28	29	30	31	31	32	32	33	34	35	35	36	36	
QD	500 mm / Δ	(660 rpm)	26	29	31	32	33	34	34	35	35	36	37	38	38	39	39	
QY	500 mm / Y	(510 rpm)	20	23	25	26	27	28	28	29	29	30	31	32	32	33	33	
SD	630 mm / Δ	(1310 rpm)	57	60	62	63	64	65	65	66	66	67	68	69	69	70	70	
SY	630 mm / Y	(1000 rpm)	50	53	55	56	57	58	58	59	59	60	61	62	62	63	63	
LD	630 mm / Δ	(900 rpm)	42	45	47	48	49	50	50	51	51	52	53	54	54	55	55	
LY	630 mm / Y	(720 rpm)	37	40	42	43	44	45	45	46	46	47	48	49	49	50	50	
QD	630 mm / Δ	(660 rpm)	34	37	39	40	41	42	42	43	43	44	45	46	46	47	47	
QY	630 mm / Y	(490 rpm)	27	30	32	33	34	35	35	36	36	37	38	39	39	40	40	
ED	630 mm / Δ	(430 rpm)	23	26	28	29	30	31	31	32	32	33	34	35	35	36	36	
EY	630 mm / Y	(320 rpm)	17	20	22	23	24	25	25	26	26	27	28	29	29	30	30	
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)	40	43	45	46	47	48	48	49	49	50	51	52	52	53	53	
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)	48	51	53	54	55	56	56	57	57	58	59	60	60	61	61	
LY	910 mm / Y	(685 rpm)	41	44	46	47	48	49	49	50	50	51	52	53	53	54	54	
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)	22	25	27	28	29	30	30	31	31	32	33	34	34	35	35	

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

4.5 Sound power level

SES GÜCÜ SEVİYESİ • 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	Υ	Δ	Υ	Δ	Υ	Δ	Υ	Δ	Υ	Δ	Υ	Δ	Υ	Δ	Υ	Δ	Υ		
500	1330	940	60	51	63	63	64	63	68	65	72	64	72	62	67	55	59	46	77	71
500	870	590	49	35	51	47	52	47	56	46	62	51	60	47	52	38	44	28	66	55
500	660	510	39	31	40	43	48	43	50	44	54	48	50	43	44	35	32	26	58	52
630	1310	1000	73	72	81	73	75	71	78	70	80	74	80	73	76	69	69	61	89	82
630	900	720	54	46	50	54	62	55	65	64	70	64	68	62	62	55	55	47	74	69
630	660	490	44	43	51	47	54	48	60	51	62	56	60	52	52	44	44	35	66	59
630	430	320	28	24	39	33	45	39	48	43	50	45	49	42	41	34	31	28	55	49
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.

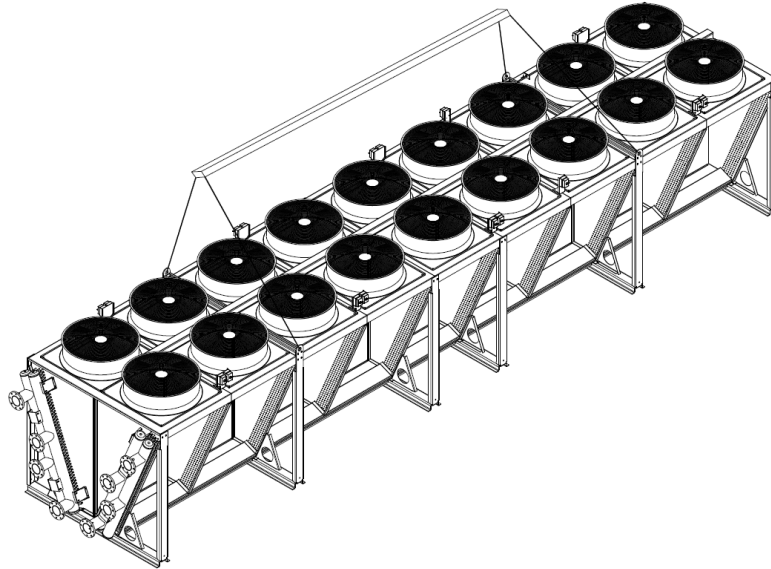
5.2 Transport

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

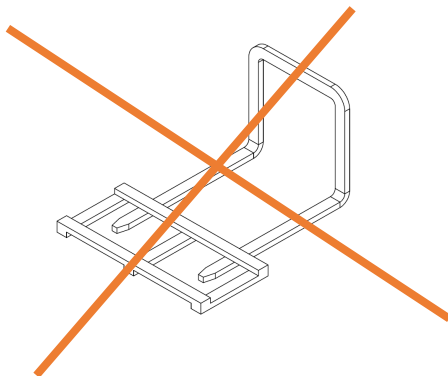
1. are authorised to operate crane systems,
2. are authorised to drive motorised handling product
3. Also know the transport and lifting instructions according to the operating manual and the assembly drawing.



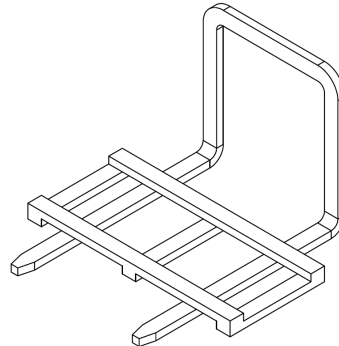
Suitable transport equipment must be used.



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



FALSE



TRUE



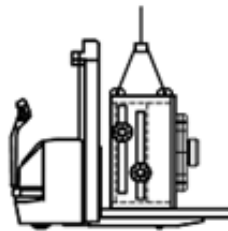
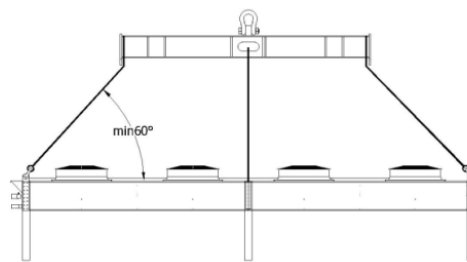
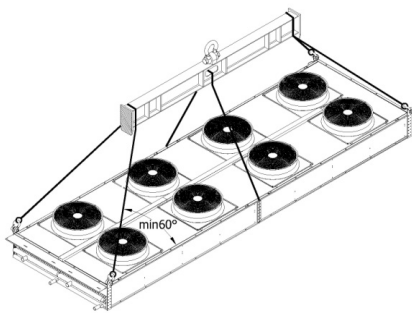
Risk of accident due to falling load

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.



Handling scheme during carriage

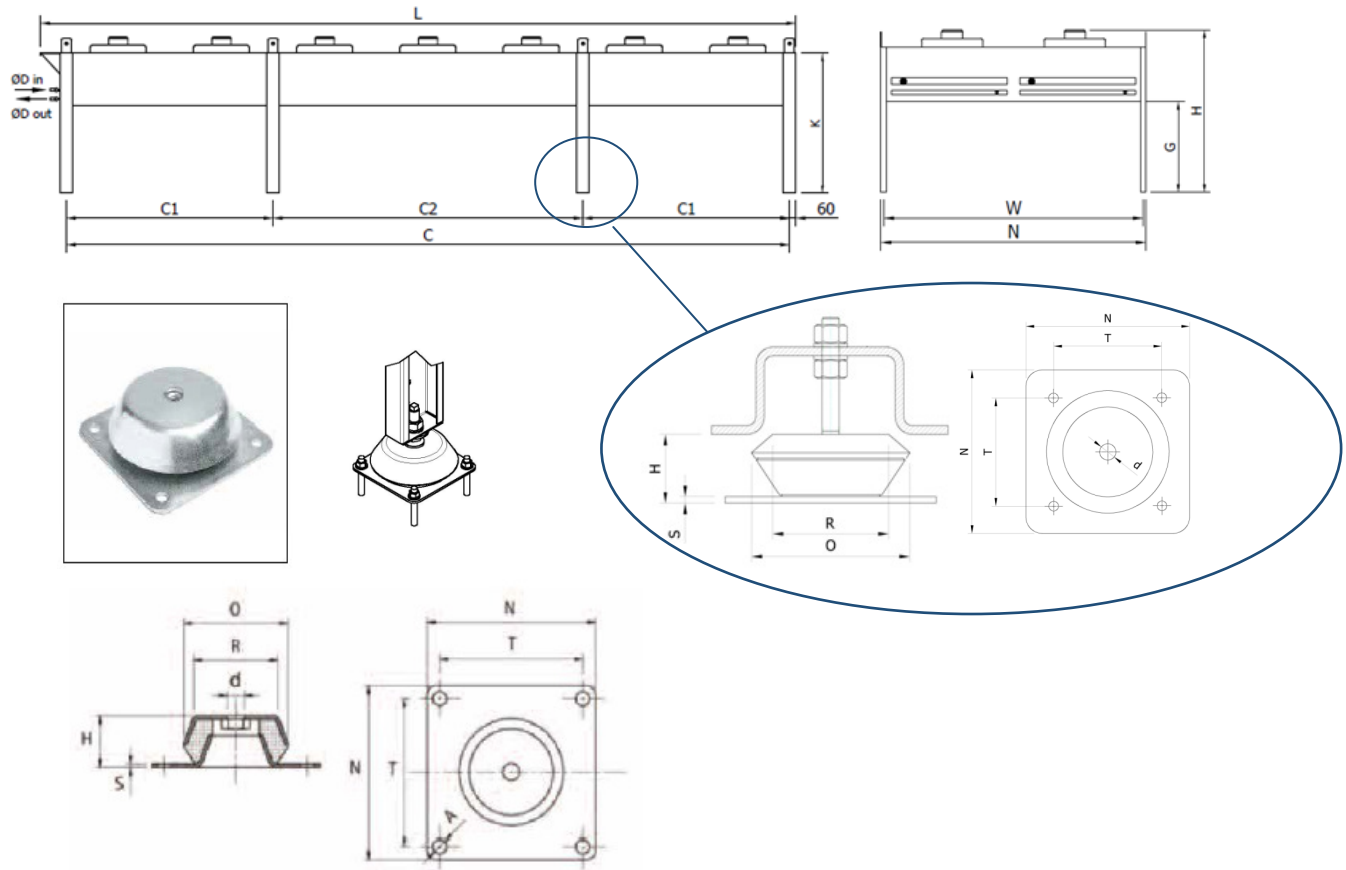
If lightweight product is to be handled without a lifting vehicle, excessive care should be taken and suitable gloves should be used.

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

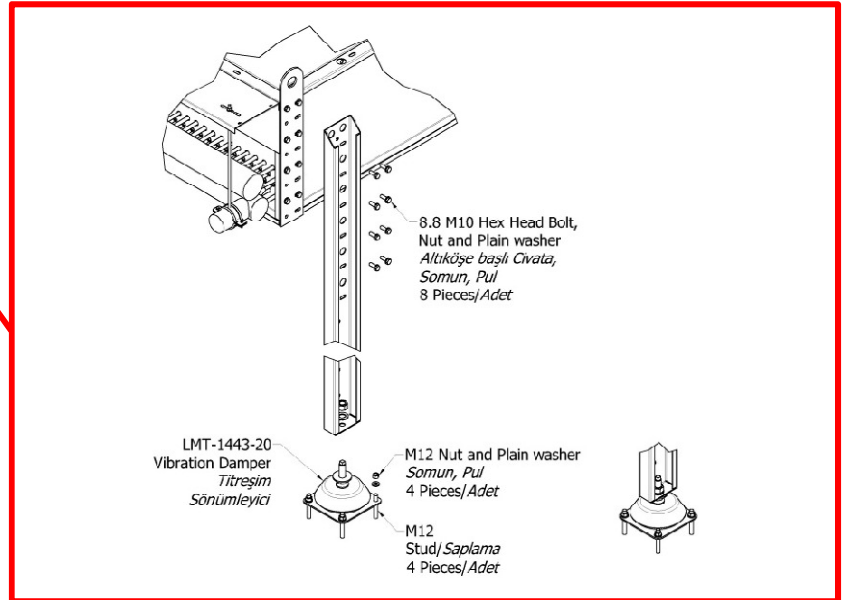
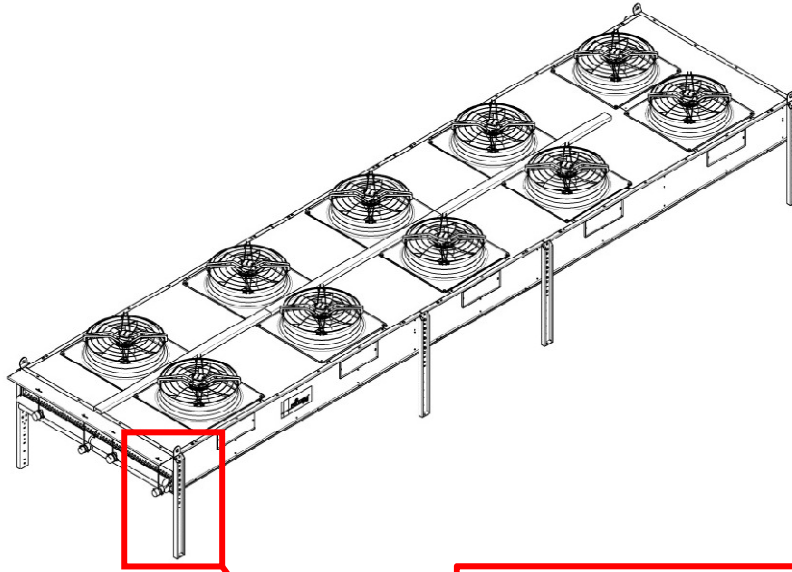
Vibration absorber stand mounting detail is given as follows



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

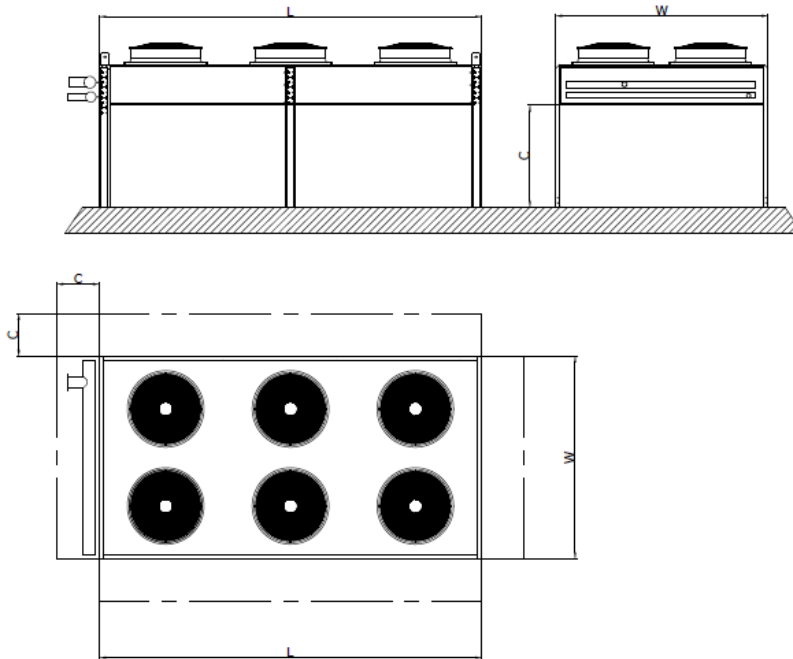
The working area should be well ventilated and should not be contained any hazardous substances or explosives.

- Air motion should not be adversely affected by obstructions and inlet air should not be undesirably heated or cooled by some other product.

- 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



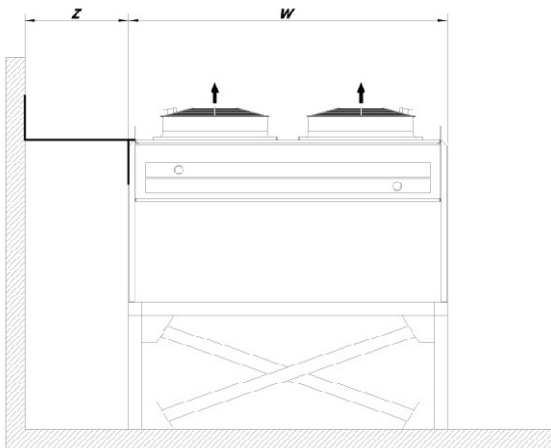
$$A_1 = L * W \text{ (m}^2\text{)}$$

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

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

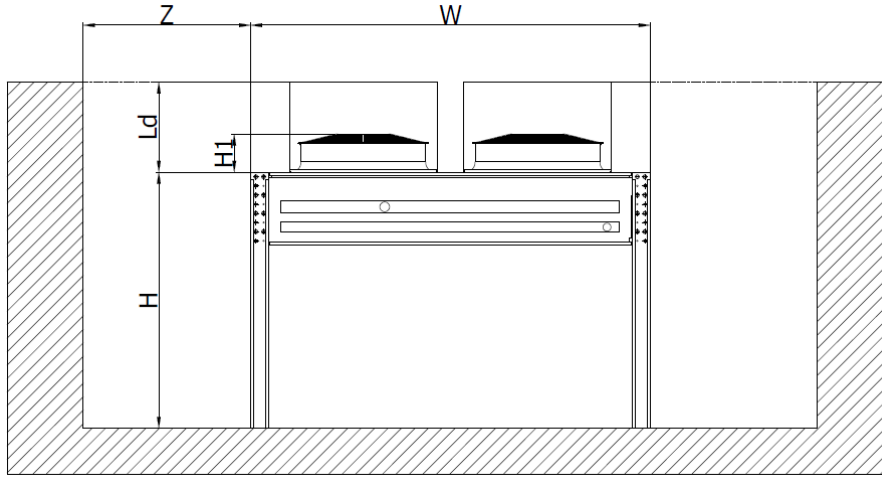
6.2.2 Set up next to wall

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 condenser) or higher extended legs must be used (700-1200 mm).



$$K \geq W/2$$

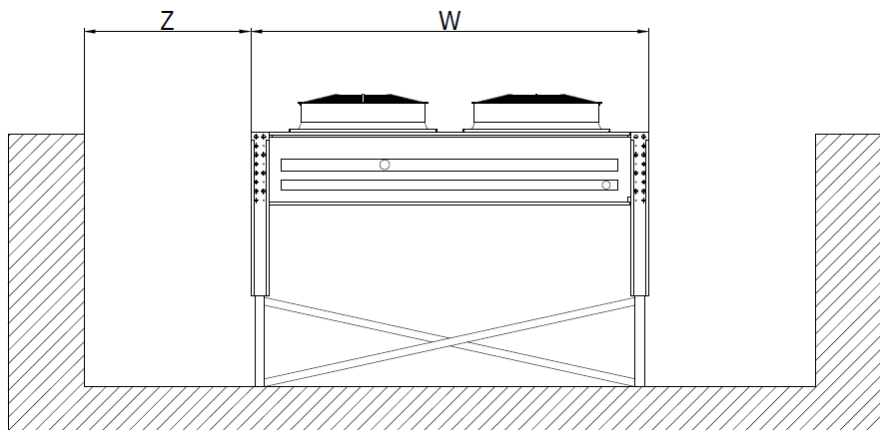
6.2.3 Set up in pit-hallow



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

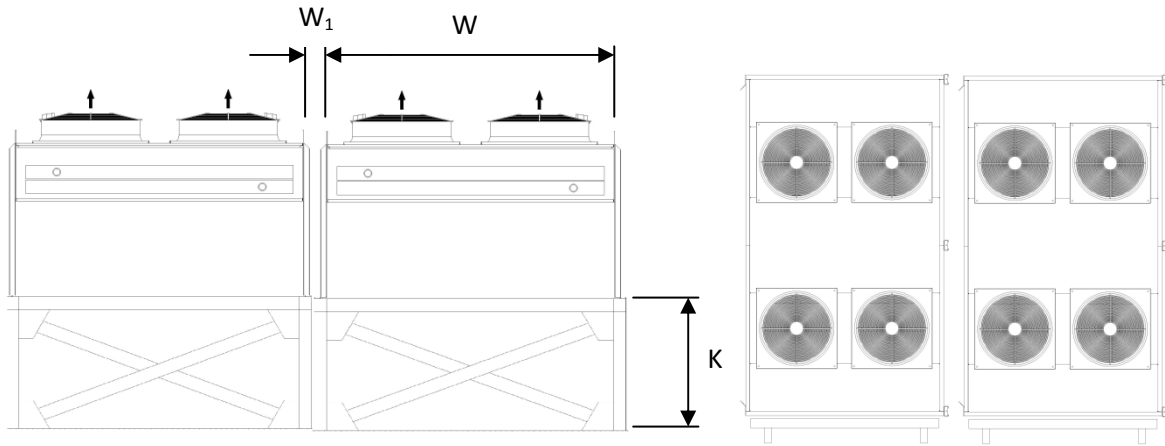
Streamer:

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

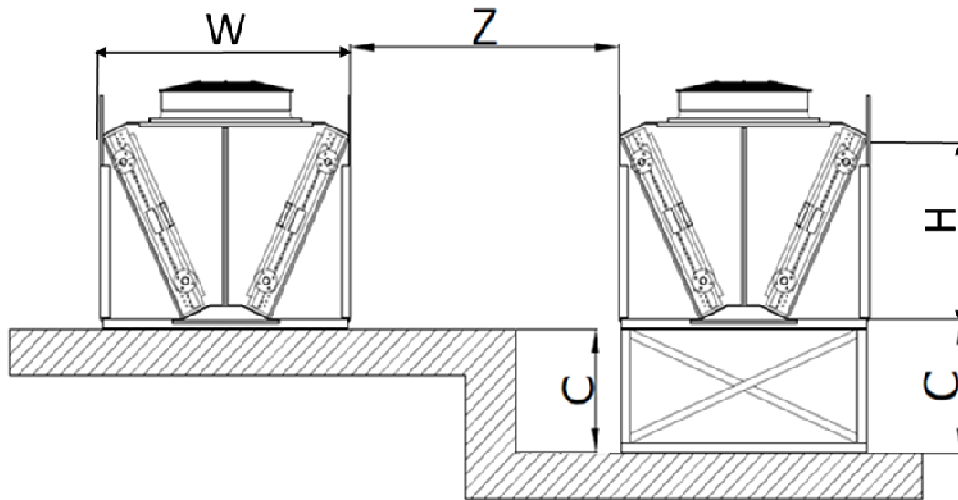
6.2.4 Several FCH units

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

$$K \geq W/2$$



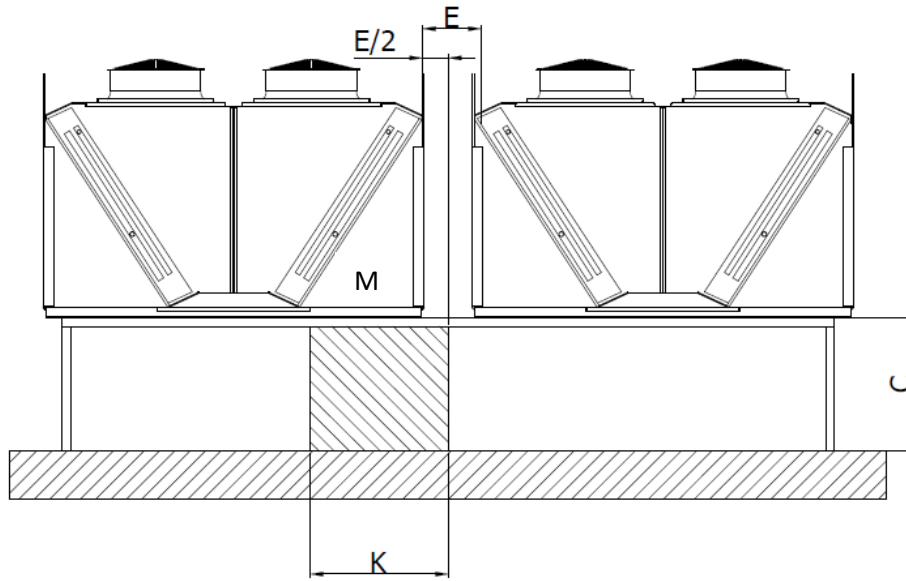
6.2.5 Requirements at the set up point (FCW units)



$$Z = 2 \times W$$

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 FCW units



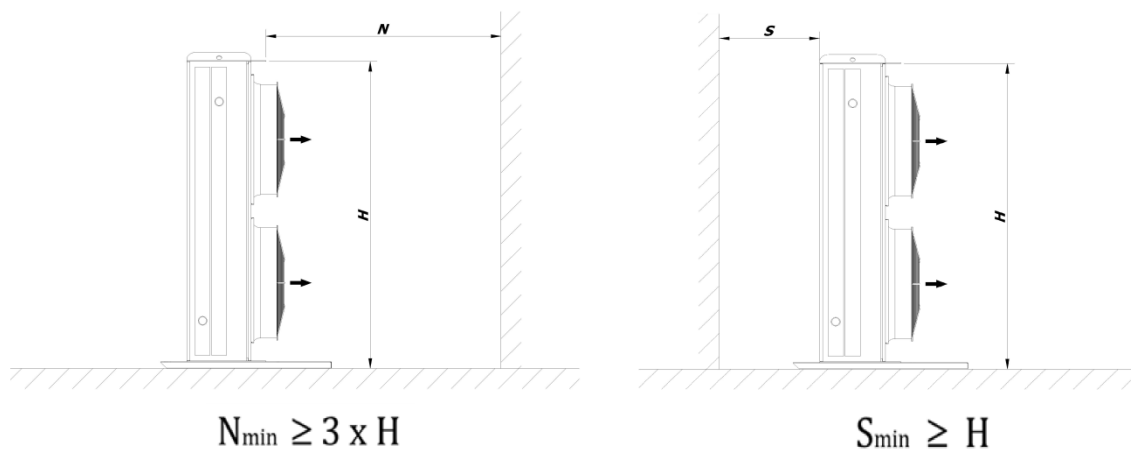
Flow Area = Finned Length x Finned Height

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

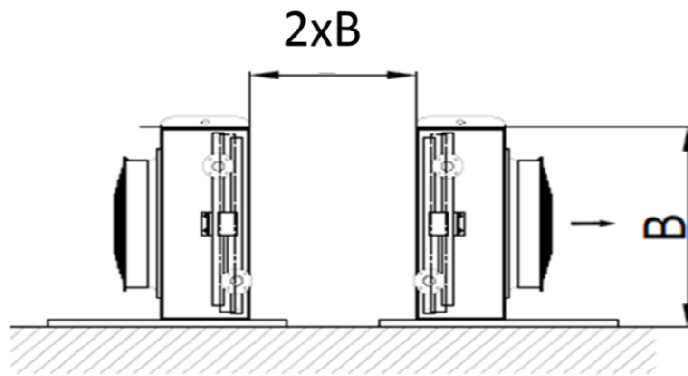
E = 100 mm
n = Number of
dry cooler

$$C = (n - 1) \frac{\text{Flow Area}}{K \times 2}$$

6.2.7 Requirements at the set up point (FCV units)



6.2.8 Side-by-side setup (FCV 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.

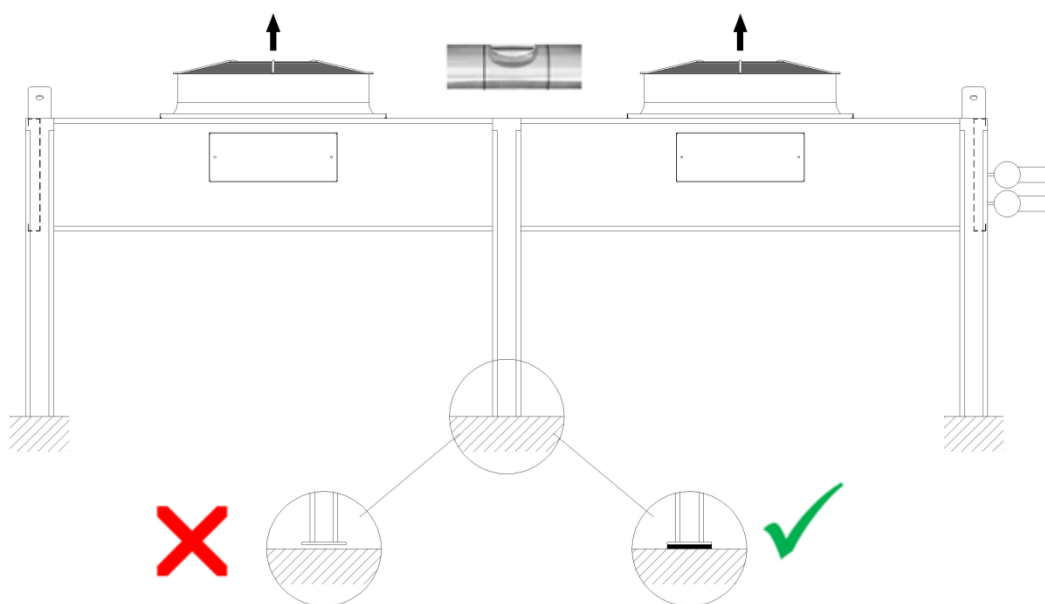
Additional pressure should not be created by fans or motors which are located next to the product.

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.

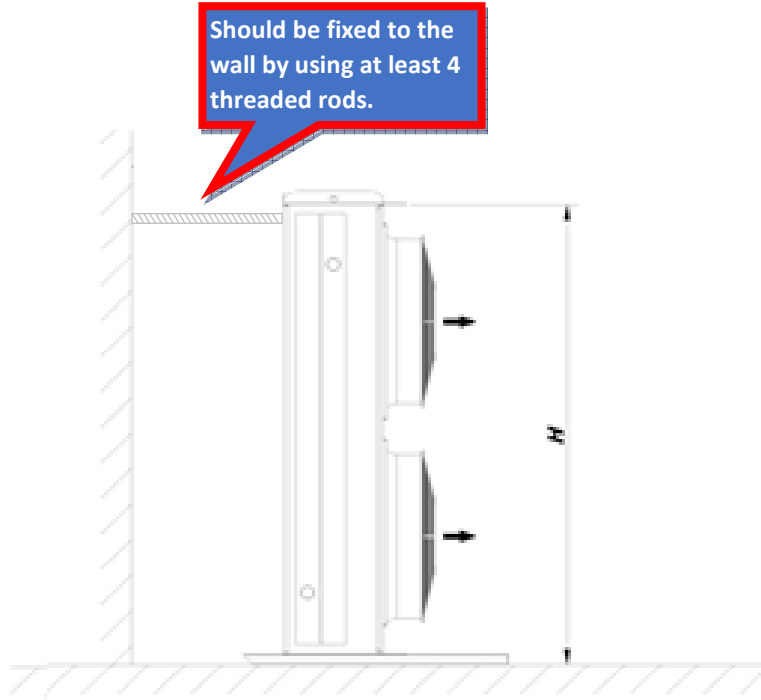
NOTICE

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



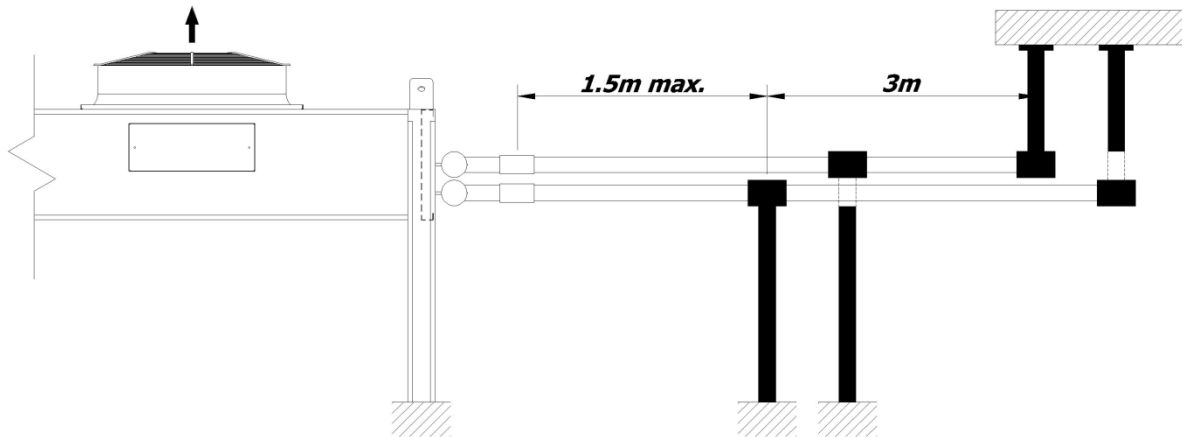
NOTICE

In case of operating in a windy site (Wind speed > 20 km/h) , the vertically mounted condensers 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.



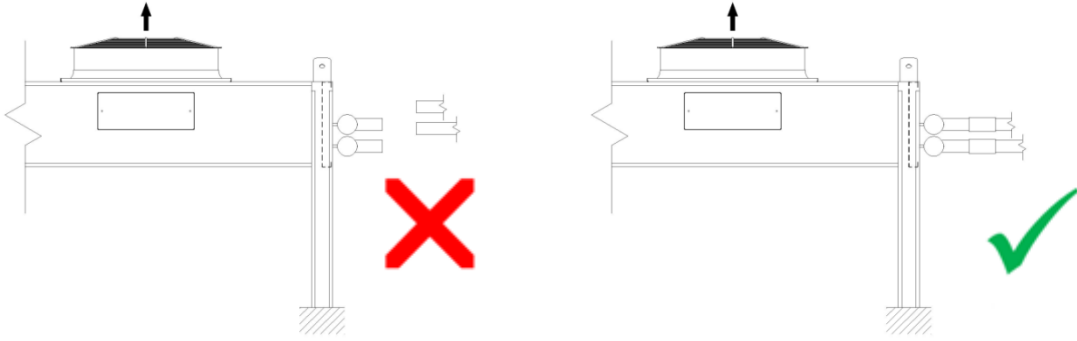
NOTICE

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.

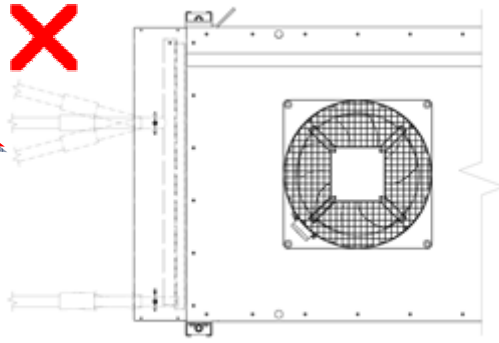


NOTICE

The header connection to the condenser should be made at perfect facing position. Cpllectors should not be soldered by forcing them to face the piping.

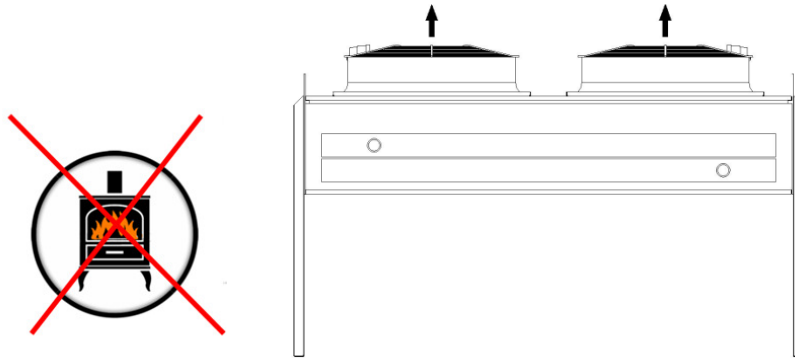


Do not bend the connection pipes while mounting. The pipe connection must be in line.



NOTICE

There should be NO Heat Source close to the condenser, 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

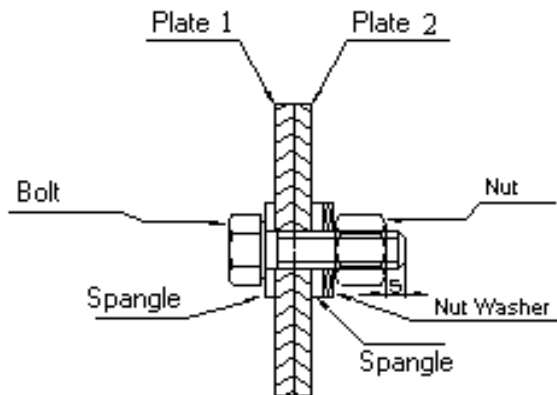
Electrical connections must not be done before mounting the product to the ground with the legs.

CAUTION

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

NOTICE

6.3.1 Ideal mounting scheme



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

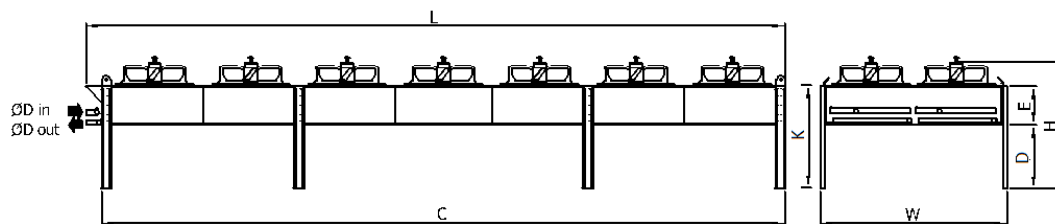
While mounting the product, number of legs that must be used depending on current fan counts is specified in the table given below.

NOTICE

Number of Legs According to Fan Counts				
Fan Diameter	Row	Fan Count	FCH Leg count	FCV Leg count
Ø500/ Ø630	1	1	4	2
	1	2		
	1	3	4 and 6*	2 and 3*
	1	4	6	3
	2	1	4	2
	2	2		
	2	3	4 and 6*	2 and 3*
	2	4	6	3
Ø800/ Ø910	1	1	4	2
	1	2		
	1	3	6	3
	1	4		
	2	1	4	2
	2	2		
	2	3	6	3
	2	4		
	2	5	6	3
	2	6	8	4
	2	7		

*For some condensers 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.

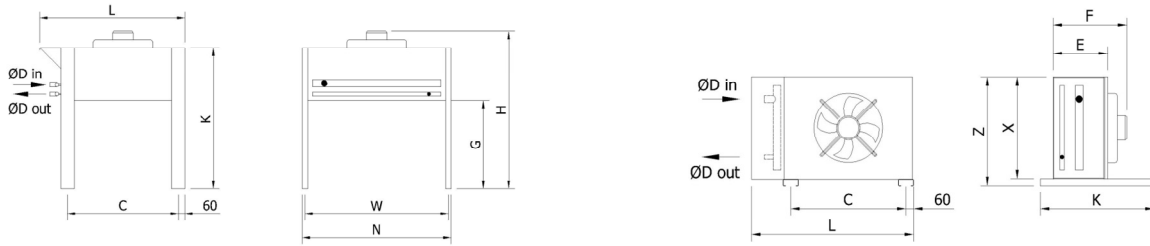


Schematic representation of the legs

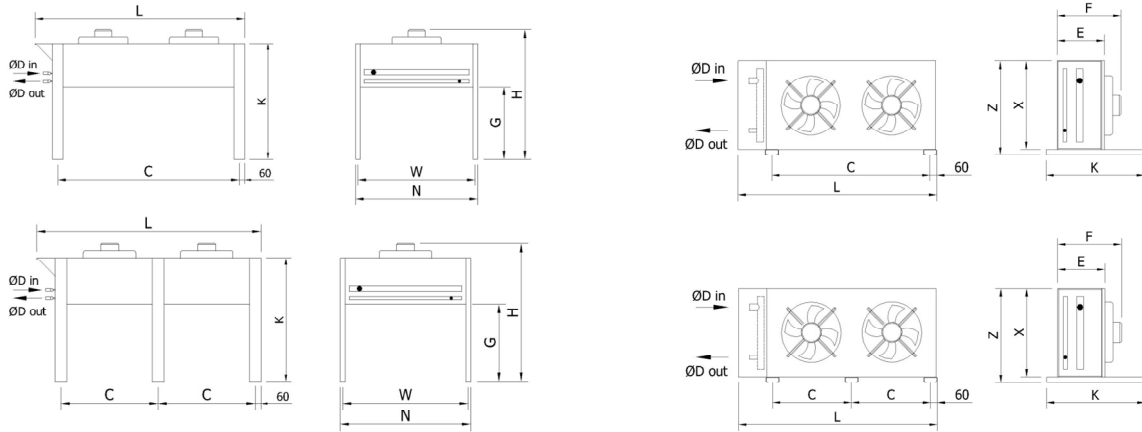
FCH/ FCV 2E

TEKNİK ÇİZİM • DRAWING

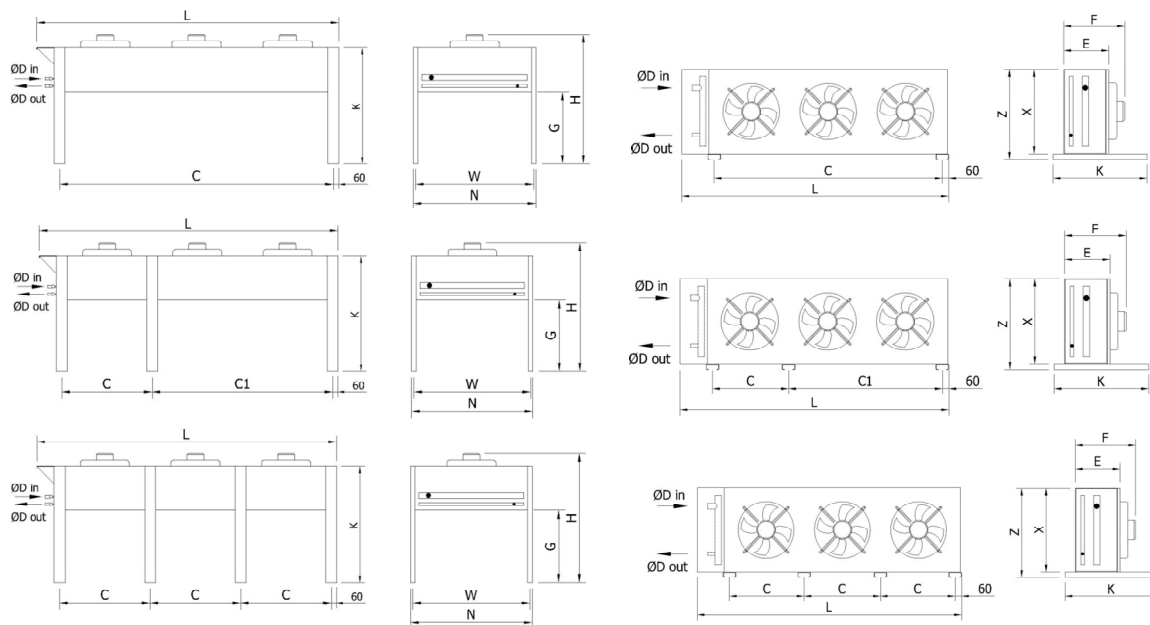
FCH/ FCV 1 Sıra* 1 Fan (1 Row* 1 Fan)



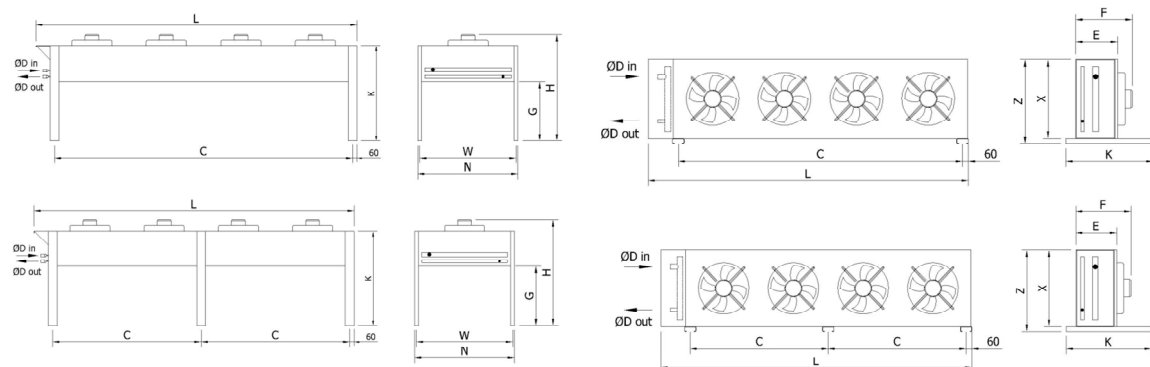
FCH/ FCV 1 Sıra* 2 Fan (1 Row* 2 Fans)



FCH/ FCV 1 Sıra* 3 Fan (1 Row* 3 Fans)



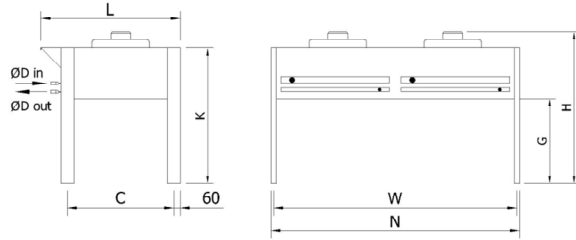
FCH/ FCV 1 Sıra* 4 Fan (1 Row* 4 Fans)



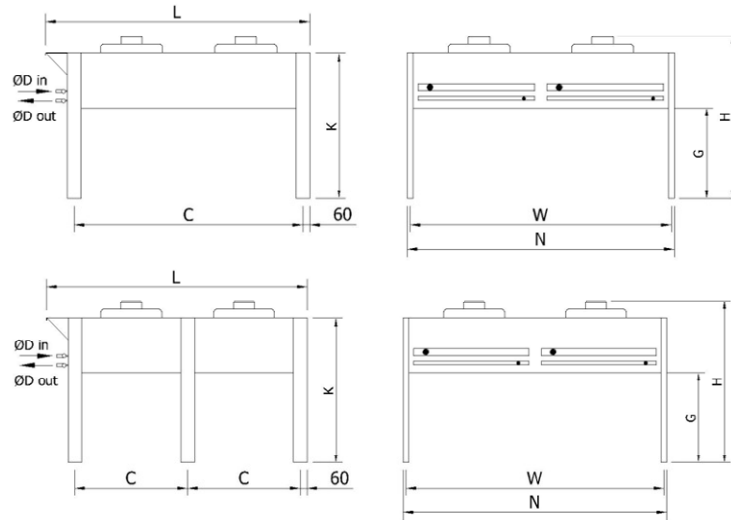
FCH 2E

TEKNİK ÇİZİM • DRAWING

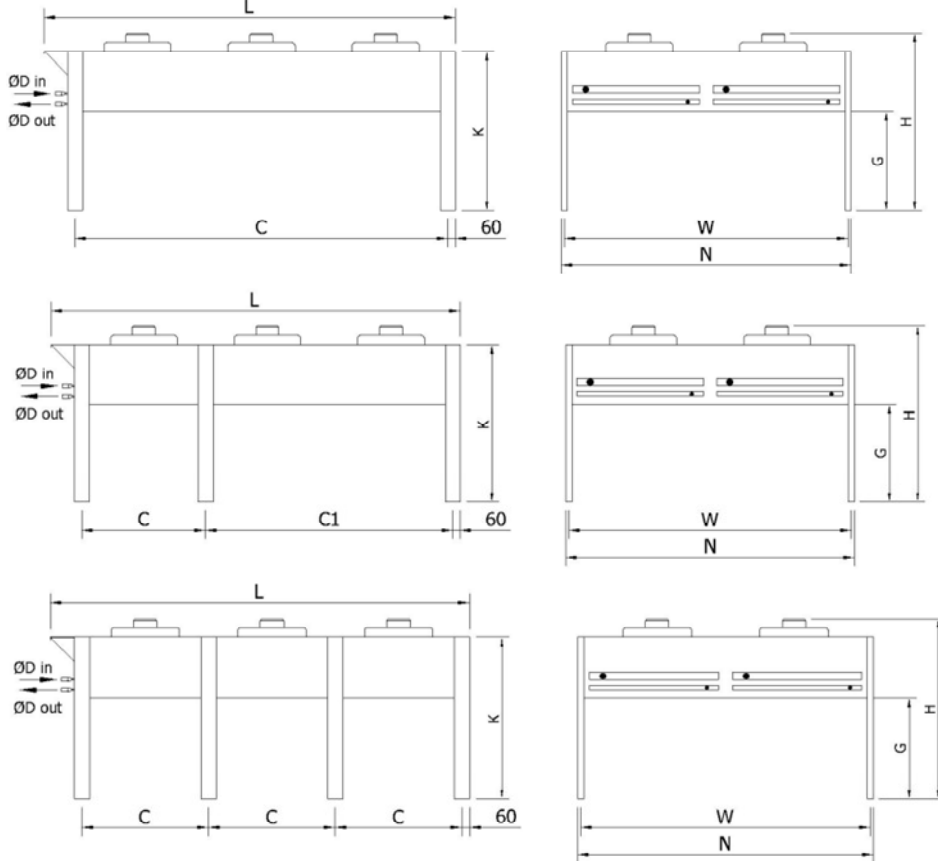
FCH 2 Sıra * 1 Fan (2 Row * 1 Fan)



FCH 2 Sıra * 2 Fan (2 Row * 2 Fan)



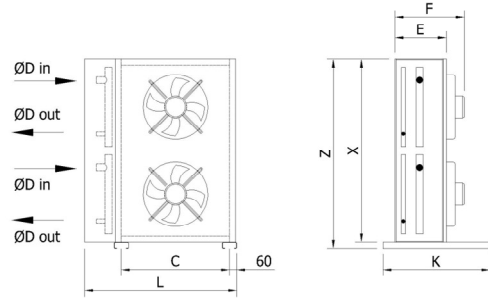
FCH 2 Sıra * 3 Fan (2 Row * 3 Fan)



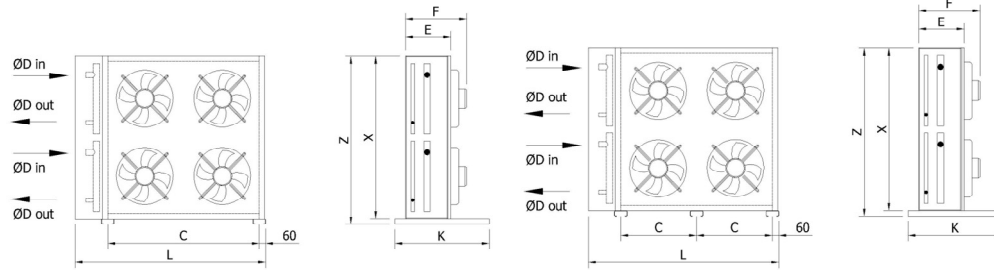
FCV 2E

TEKNİK ÇİZİM • DRAWING

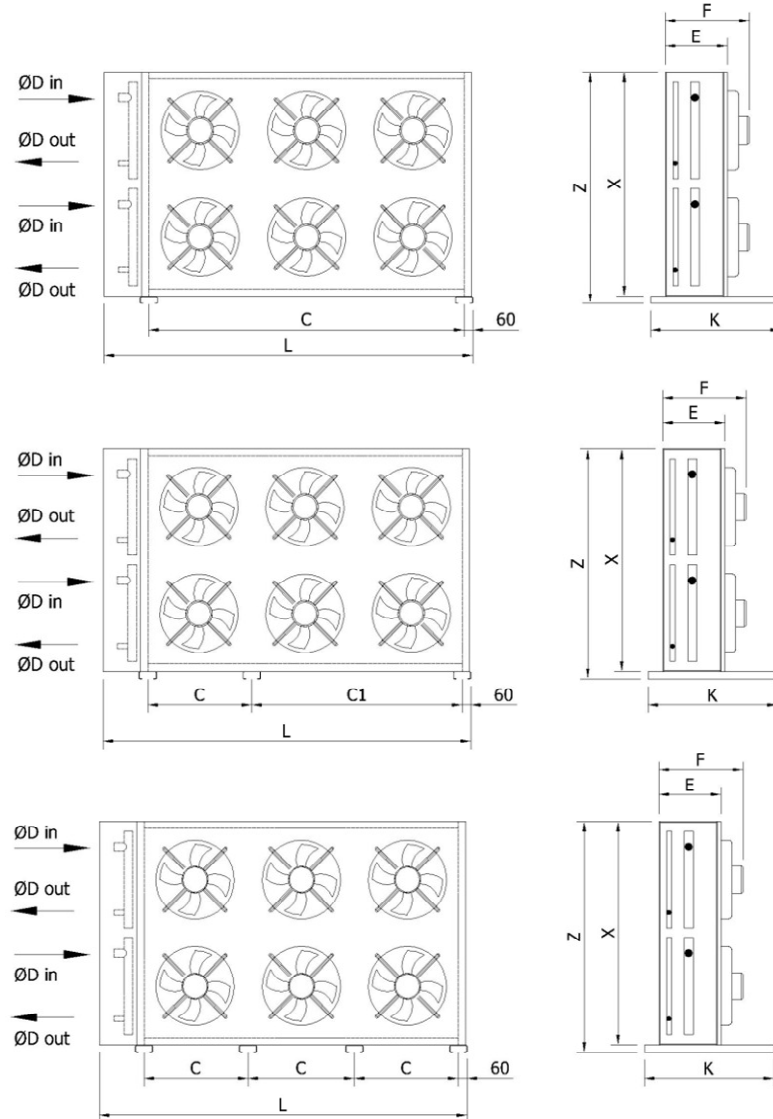
FCV 2 Sıra * 1 Fan (2 Row * 1 Fan)



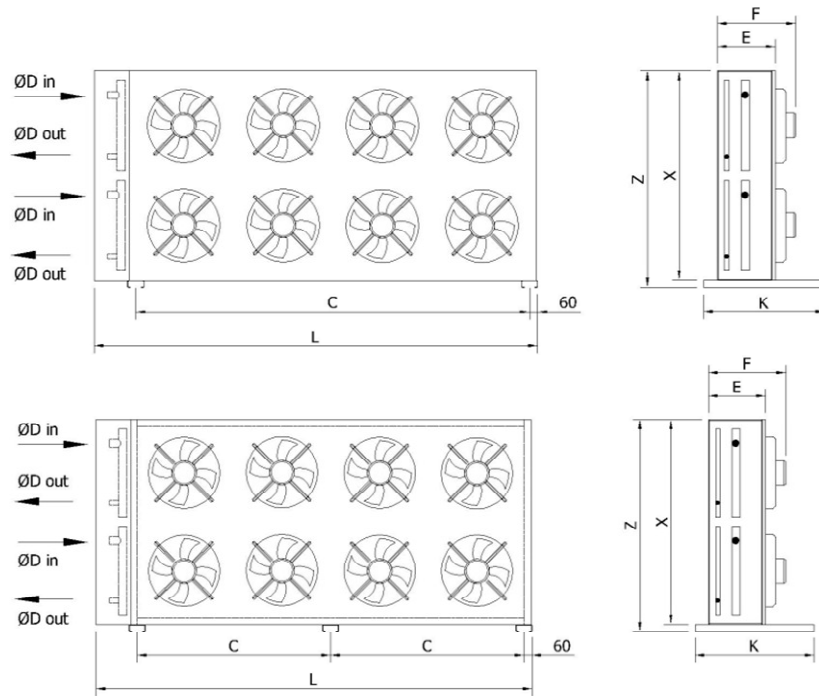
FCV 2 Sıra * 2 Fan (2 Row * 2 Fan)



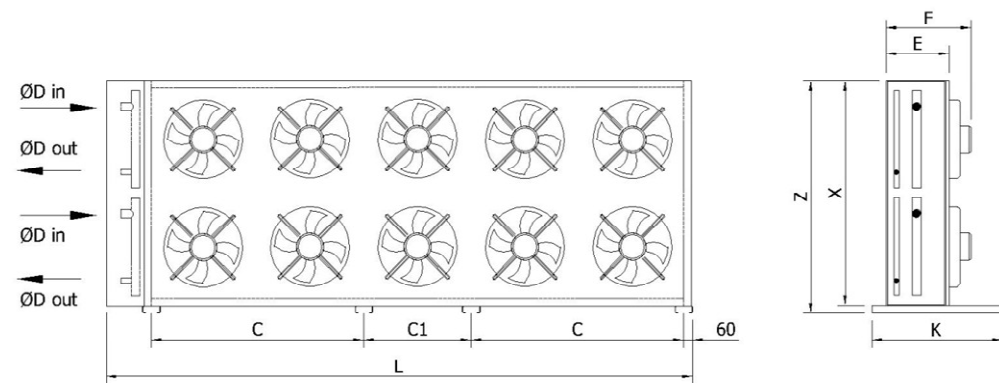
FCV 2 Sıra * 3 Fan (2 Row * 3 Fan)



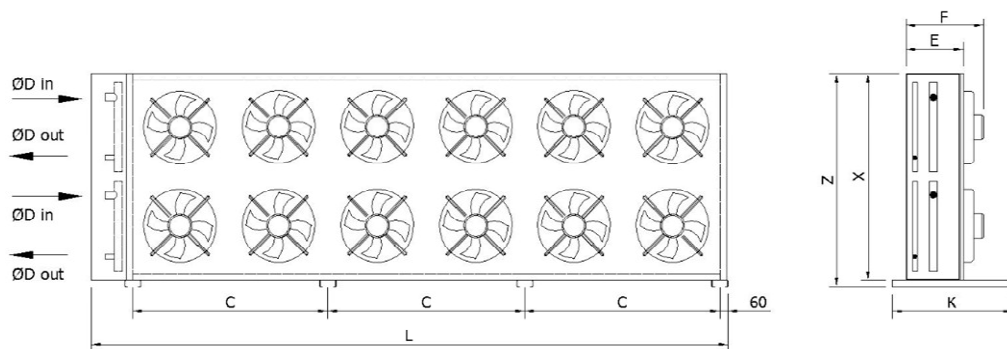
FCV 2 Sıra * 4 Fan (2 Row* 4 Fan)



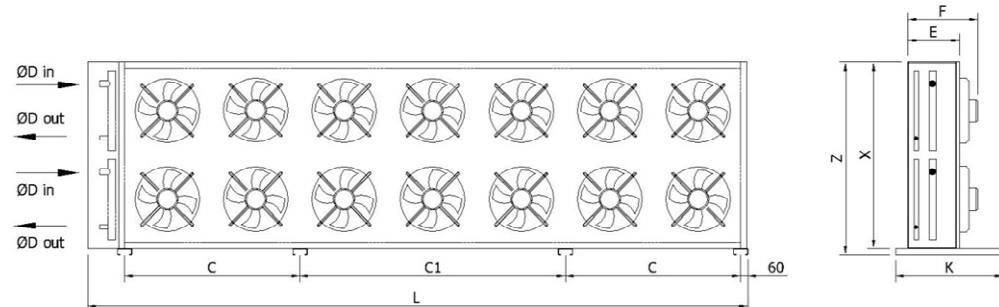
FCV 2 Sıra * 5 Fan (2 Row* 5 Fan)



FCV 2 Sıra * 6 Fan (2 Row* 6 Fan)



FCV 2 Sıra * 7 Fan (2 Row* 7 Fan)



FCH/V 2E		BOYUTLAR • DIMENSIONS										
MODEL MODEL		L	C	W	N	X	Z	H	G	E	F	K
		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
50 11	B001	1115	900	912	962	766	816	1150	600	320	550	920
	B101	1115	900	912	962	766	816	1150	600	320	550	920
	B201	1115	900	912	962	766	816	1150	600	320	550	920
	B011	1315	1100	912	962	766	816	1150	600	320	550	920
	B111	1315	1100	912	962	766	816	1150	600	320	550	920
	B211	1315	1100	912	962	766	816	1150	600	320	550	920
	B021	1515	1300	912	962	766	816	1150	600	320	550	920
	B121	1515	1300	912	962	766	816	1150	600	320	550	920
	B221	1515	1300	912	962	766	816	1150	600	320	550	920
	B001	1915	1700	912	962	766	816	1150	600	320	550	920
50 12	B101	1915	1700	912	962	766	816	1150	600	320	550	920
	B201	1915	1700	912	962	766	816	1150	600	320	550	920
	B011	2315	2100	912	962	766	816	1150	600	320	550	920
	B111	2315	2100	912	962	766	816	1150	600	320	550	920
	B211	2315	2100	912	962	766	816	1150	600	320	550	920
	B021	2715	2500	912	962	766	816	1150	600	320	550	920
	B121	2715	2500	912	962	766	816	1150	600	320	550	920
	B221	2715	2500	912	962	766	816	1150	600	320	550	920
	B001	2715	2500	912	962	766	816	1150	600	320	550	920
	B101	2715	2500	912	962	766	816	1150	600	320	550	920
50 13	B201	2715	2500	912	962	766	816	1150	600	320	550	920
	B011	3315	3100	912	962	766	816	1150	600	320	550	920
	B111	3315	3100	912	962	766	816	1150	600	320	550	920
	B211	3315	3100	912	962	766	816	1150	600	320	550	920
	B021	3915	3700	912	962	766	816	1150	600	320	550	920
	B121	3915	3700	912	962	766	816	1150	600	320	550	920
	B221	3915	3700	912	962	766	816	1150	600	320	550	920
	B001	3515	3200	912	962	766	816	1150	600	320	550	920
	B101	3515	3200	912	962	766	816	1150	600	320	550	920
	B201	3515	3200	912	962	766	816	1150	600	320	550	920
50 14	B011	4315	4000	912	962	766	816	1150	600	320	550	920
	B111	4315	4000	912	962	766	816	1150	600	320	550	920
	B211	4315	4000	912	962	766	816	1150	600	320	550	920
	B021	5115	2400	912	962	766	816	1150	600	320	550	920
	B121	5115	2400	912	962	766	816	1150	600	320	550	920
	B221	5115	2400	912	962	766	816	1150	600	320	550	920
	B001	1115	800	1674	1724	1624	1674	1150	600	320	550	920
	B101	1115	800	1674	1724	1624	1674	1150	600	320	550	920
	B201	1115	800	1674	1724	1624	1674	1150	600	320	550	920
	B011	1315	1000	1674	1724	1624	1674	1150	600	320	550	920
50 21	B111	1315	1000	1674	1724	1624	1674	1150	600	320	550	920
	B211	1315	1000	1674	1724	1624	1674	1150	600	320	550	920
	B021	1515	1200	1674	1724	1624	1674	1150	600	320	550	920
	B121	1515	1200	1674	1724	1624	1674	1150	600	320	550	920
	B221	1515	1200	1674	1724	1624	1674	1150	600	320	550	920
	B001	1915	1600	1674	1724	1624	1674	1150	600	320	550	920
	B101	1915	1600	1674	1724	1624	1674	1150	600	320	550	920
	B201	1915	1600	1674	1724	1624	1674	1150	600	320	550	920
	B011	2315	2000	1674	1724	1624	1674	1150	600	320	550	920
	B111	2315	2000	1674	1724	1624	1674	1150	600	320	550	920
50 22	B211	2315	2000	1674	1724	1624	1674	1150	600	320	550	920
	B021	2715	2400	1674	1724	1624	1674	1150	600	320	550	920
	B121	2715	2400	1674	1724	1624	1674	1150	600	320	550	920
	B221	2715	2400	1674	1724	1624	1674	1150	600	320	550	920
	B001	2715	2400	1674	1724	1624	1674	1150	600	320	550	920
	B101	2715	2400	1674	1724	1624	1674	1150	600	320	550	920
	B201	2715	2400	1674	1724	1624	1674	1150	600	320	550	920
	B011	3315	3000	1674	1724	1624	1674	1150	600	320	550	920
	B111	3315	3000	1674	1724	1624	1674	1150	600	320	550	920
	B211	3315	3000	1674	1724	1624	1674	1150	600	320	550	920
50 23	B021	3915	3600	1674	1724	1624	1674	1150	600	320	550	920
	B121	3915	3600	1674	1724	1624	1674	1150	600	320	550	920
	B221	3915	3600	1674	1724	1624	1674	1150	600	320	550	920
	B001	3515	1600	1674	1724	1624	1674	1150	600	320	550	920
	B101	3515	1600	1674	1724	1624	1674	1150	600	320	550	920
	B201	3515	1600	1674	1724	1624	1674	1150	600	320	550	920
	B011	4315	2000	1674	1724	1624	1674	1150	600	320	550	920
	B111	4315	2000	1674	1724	1624	1674	1150	600	320	550	920
	B211	4315	2000	1674	1724	1624	1674	1150	600	320	550	920
	B021	5115	2400	1674	1724	1624	1674	1150	600	320	550	920
50 24	B121	5115	2400	1674	1724	1624	1674	1150	600	320	550	920
	B221	5115	2400	1674	1724	1624	1674	1150	600	320	550	920

FCH/V 2E								BOYUTLAR • DIMENSIONS				
MODEL MODEL		L	C	W	N	X	Z	H	G	E	F	K
		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
63 11	B011	1515	1200	1166	1216	1116	1166	1270	660	360	610	1020
	B111	1515	1200	1166	1216	1116	1166	1270	660	360	610	1020
	B211	1515	1200	1166	1216	1116	1166	1270	660	360	610	1020
	B021	1715	1400	1166	1216	1116	1166	1270	660	360	610	1020
	B121	1715	1400	1166	1216	1116	1166	1270	660	360	610	1020
	B221	1715	1400	1166	1216	1116	1166	1270	660	360	610	1020
63 12	B000	2315	2100	912	962	766	816	1150	600	320	550	920
	B100	2315	2100	912	962	766	816	1150	600	320	550	920
	B200	2315	2100	912	962	766	816	1150	600	320	550	920
	B010	2715	2400	1166	1216	1116	1166	1270	660	360	610	1020
	B110	2715	2400	1166	1216	1116	1166	1270	660	360	610	1020
	B210	2715	2400	1166	1216	1116	1166	1270	660	360	610	1020
	B011	2715	2400	1166	1216	1116	1166	1270	660	360	610	1020
	B111	2715	2400	1166	1216	1116	1166	1270	660	360	610	1020
	B211	2715	2400	1166	1216	1116	1166	1270	660	360	610	1020
	B021	3115	2800	1166	1216	1116	1166	1270	660	360	610	1020
	B121	3115	2800	1166	1216	1116	1166	1270	660	360	610	1020
	B221	3115	2800	1166	1216	1116	1166	1270	660	360	610	1020
63 13	B000	3315	3100	912	962	766	816	1150	600	320	550	920
	B100	3315	3100	912	962	766	816	1150	600	320	550	920
	B200	3315	3100	912	962	766	816	1150	600	320	550	920
	B010	3915	3600	1166	1216	1116	1166	1270	660	360	610	1020
	B110	3915	3600	1166	1216	1116	1166	1270	660	360	610	1020
	B210	3915	3600	1166	1216	1116	1166	1270	660	360	610	1020
	B011	3915	3600	1166	1216	1116	1166	1270	660	360	610	1020
	B111	3915	3600	1166	1216	1116	1166	1270	660	360	610	1020
	B211	3915	3600	1166	1216	1116	1166	1270	660	360	610	1020
	B021	4515	4200	1166	1216	1116	1166	1270	660	360	610	1020
	B121	4515	4200	1166	1216	1116	1166	1270	660	360	610	1020
	B221	4515	4200	1166	1216	1116	1166	1270	660	360	610	1020
63 14	B011	5115	2400	1166	1216	1116	1166	1270	660	360	610	1020
	B111	5115	2400	1166	1216	1116	1166	1270	660	360	610	1020
	B211	5115	2400	1166	1216	1116	1166	1270	660	360	610	1020
	B021	5915	2800	1166	1216	1116	1166	1270	660	360	610	1020
	B121	5915	2800	1166	1216	1116	1166	1270	660	360	610	1020
	B221	5915	2800	1166	1216	1116	1166	1270	660	360	610	1020
63 21	B011	1515	1200	2182	2232	2132	2182	1270	660	360	610	1020
	B111	1515	1200	2182	2232	2132	2182	1270	660	360	610	1020
	B211	1515	1200	2182	2232	2132	2182	1270	660	360	610	1020
	B021	1715	1400	2182	2232	2132	2182	1270	660	360	610	1020
	B121	1715	1400	2182	2232	2132	2182	1270	660	360	610	1020
	B221	1715	1400	2182	2232	2132	2182	1270	660	360	610	1020
63 22	B011	2715	2400	2182	2232	2132	2182	1270	660	360	610	1020
	B111	2715	2400	2182	2232	2132	2182	1270	660	360	610	1020
	B211	2715	2400	2182	2232	2132	2182	1270	660	360	610	1020
	B021	3115	2800	2182	2232	2132	2182	1270	660	360	610	1020
	B121	3115	2800	2182	2232	2132	2182	1270	660	360	610	1020
	B221	3115	2800	2182	2232	2132	2182	1270	660	360	610	1020
63 23	B011	3915	3600	2182	2232	2132	2182	1270	660	360	610	1020
	B111	3915	3600	2182	2232	2132	2182	1270	660	360	610	1020
	B211	3915	3600	2182	2232	2132	2182	1270	660	360	610	1020
	B021	4515	4200	2182	2232	2132	2182	1270	660	360	610	1020
	B121	4515	4200	2182	2232	2132	2182	1270	660	360	610	1020
	B221	4515	4200	2182	2232	2132	2182	1270	660	360	610	1020
63 24	B011	5115	2400	2182	2232	2132	2182	1270	660	360	610	1020
	B111	5115	2400	2182	2232	2132	2182	1270	660	360	610	1020
	B211	5115	2400	2182	2232	2132	2182	1270	660	360	610	1020
	B021	5915	2800	2182	2232	2132	2182	1270	660	360	610	1020
	B121	5915	2800	2182	2232	2132	2182	1270	660	360	610	1020
	B221	5915	2800	2182	2232	2132	2182	1270	660	360	610	1020

FCH/V 2E										BOYUTLAR • DIMENSIONS			
MODEL MODEL		L	C	C1	W	N	X	Z	H	G	E	F	K
		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
80 11	B011	1715	1400	-	1293	1343	1243	1293	1555	795	480	760	1275
	B111	1715	1400	-	1293	1343	1243	1293	1555	795	480	760	1275
	B211	1715	1400	-	1293	1343	1243	1293	1555	795	480	760	1275
	B021	2115	1800	-	1293	1343	1243	1293	1555	795	480	760	1275
	B121	2115	1800	-	1293	1343	1243	1293	1555	795	480	760	1275
	B221	2115	1800	-	1293	1343	1243	1293	1555	795	480	760	1275
80 12	B011	3115	2800	-	1293	1343	1243	1293	1555	795	480	760	1275
	B111	3115	2800	-	1293	1343	1243	1293	1555	795	480	760	1275
	B211	3115	2800	-	1293	1343	1243	1293	1555	795	480	760	1275
	B021	3915	3600	-	1293	1343	1243	1293	1555	795	480	760	1275
	B121	3915	3600	-	1293	1343	1243	1293	1555	795	480	760	1275
	B221	3915	3600	-	1293	1343	1243	1293	1555	795	480	760	1275
80 13	B011	4515	1400	2800	1293	1343	1243	1293	1555	795	480	760	1275
	B111	4515	1400	2800	1293	1343	1243	1293	1555	795	480	760	1275
	B211	4515	1400	2800	1293	1343	1243	1293	1555	795	480	760	1275
	B021	5715	1800	3600	1293	1343	1243	1293	1555	795	480	760	1275
	B121	5715	1800	3600	1293	1343	1243	1293	1555	795	480	760	1275
	B221	5715	1800	3600	1293	1343	1243	1293	1555	795	480	760	1275
80 14	B011	5915	2800	-	1293	1343	1243	1293	1555	795	480	760	1275
	B111	5915	2800	-	1293	1343	1243	1293	1555	795	480	760	1275
	B211	5915	2800	-	1293	1343	1243	1293	1555	795	480	760	1275
	E221	7515	3600	-	1293	1343	1243	1293	1555	795	480	760	1275
	E321	7515	3600	-	1293	1343	1243	1293	1555	795	480	760	1275
	B011	1715	1400	-	2284	2334	2234	2284	1555	795	480	760	1275
80 21	B111	1715	1400	-	2284	2334	2234	2284	1555	795	480	760	1275
	B211	1715	1400	-	2284	2334	2234	2284	1555	795	480	760	1275
	B021	2115	1800	-	2284	2334	2234	2284	1555	795	480	760	1275
	B121	2115	1800	-	2284	2334	2234	2284	1555	795	480	760	1275
	B221	2115	1800	-	2284	2334	2234	2284	1555	795	480	760	1275
	B011	3115	2800	-	2284	2334	2234	2284	1555	795	480	760	1275
80 22	B111	3115	2800	-	2284	2334	2234	2284	1555	795	480	760	1275
	B211	3115	2800	-	2284	2334	2234	2284	1555	795	480	760	1275
	B021	3915	3600	-	2284	2334	2234	2284	1555	795	480	760	1275
	B121	3915	3600	-	2284	2334	2234	2284	1555	795	480	760	1275
	B221	3915	3600	-	2284	2334	2234	2284	1555	795	480	760	1275
	B011	4515	1400	2800	2284	2334	2234	2284	1555	795	480	760	1275
80 23	B111	4515	1400	2800	2284	2334	2234	2284	1555	795	480	760	1275
	B211	4515	1400	2800	2284	2334	2234	2284	1555	795	480	760	1275
	B021	5715	1800	3600	2284	2334	2234	2284	1555	795	480	760	1275
	B121	5715	1800	3600	2284	2334	2234	2284	1555	795	480	760	1275
	B221	5715	1800	3600	2284	2334	2234	2284	1555	795	480	760	1275
	B011	5915	2800	-	2284	2334	2234	2284	1555	795	480	760	1275
80 24	B111	5915	2800	-	2284	2334	2234	2284	1555	795	480	760	1275
	B211	5915	2800	-	2284	2334	2234	2284	1555	795	480	760	1275
	E221	7515	3600	-	2284	2334	2234	2284	1555	795	480	760	1275
	E321	7515	3600	-	2284	2334	2234	2284	1555	795	480	760	1275
	E211	7315	2800	4200	2284	2334	2234	2284	1555	795	480	760	1275
	E221	9315	3600	5400	2284	2334	2234	2284	1555	795	480	760	1275
80 25	E321	9315	3600	5400	2284	2334	2234	2284	1555	795	480	760	1275
	E211	8715	2800	-	2284	2334	2234	2284	1555	795	480	760	1275
	E221	8715	2800	-	2284	2334	2234	2284	1555	795	480	760	1275
80 26	E321	11115	3600	-	2284	2334	2234	2284	1555	795	480	760	1275
	E211	10115	2800	4200	2284	2334	2234	2284	1555	795	480	760	1275
	E221	10115	2800	4200	2284	2334	2234	2284	1555	795	480	760	1275
80 27	E321	12915	3600	5400	2284	2334	2234	2284	1555	795	480	760	1275

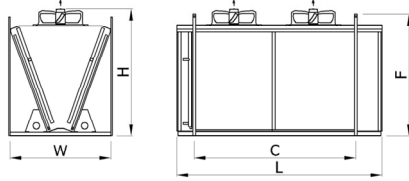
FCH/V 2E		BOYUTLAR • DIMENSIONS											
MODEL		L	C	C1	W	N	X	Z	H	G	E	F	K
MODEL		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
91 11	B021	2115	1800	-	1293	1343	1243	1293	1560	675	480	780	1275
	B121	2115	1800	-	1293	1343	1243	1293	1560	675	480	780	1275
	B221	2115	1800	-	1293	1343	1243	1293	1560	675	480	780	1275
	B031	2515	2200	-	1293	1343	1243	1293	1560	675	480	780	1275
	B131	2515	2200	-	1293	1343	1243	1293	1560	675	480	780	1275
	B231	2515	2200	-	1293	1343	1243	1293	1560	675	480	780	1275
91 12	B021	3915	3600	-	1293	1343	1243	1293	1560	675	480	780	1275
	B121	3915	3600	-	1293	1343	1243	1293	1560	675	480	780	1275
	B221	3915	3600	-	1293	1343	1243	1293	1560	675	480	780	1275
	B031	4715	2200	-	1293	1343	1243	1293	1560	675	480	780	1275
	B131	4715	2200	-	1293	1343	1243	1293	1560	675	480	780	1275
	B231	4715	2200	-	1293	1343	1243	1293	1560	675	480	780	1275
91 13	B021	5715	1800	3600	1293	1343	1243	1293	1560	675	480	780	1275
	B121	5715	1800	3600	1293	1343	1243	1293	1560	675	480	780	1275
	B221	5715	1800	3600	1293	1343	1243	1293	1560	675	480	780	1275
	E331	6915	2200	-	1293	1343	1243	1293	1560	675	480	780	1275
91 14	E221	7515	3600	-	1293	1343	1243	1293	1560	675	480	780	1275
	E321	7515	3600	-	1293	1343	1243	1293	1560	675	480	780	1275
	E331	9115	4400	-	1293	1343	1243	1293	1560	675	480	780	1275
91 21	B021	2115	1800	-	2284	2334	2234	2284	1560	675	480	780	1275
	B121	2115	1800	-	2284	2334	2234	2284	1560	675	480	780	1275
	B221	2115	1800	-	2284	2334	2234	2284	1560	675	480	780	1275
	B031	2515	2200	-	2284	2334	2234	2284	1560	675	480	780	1275
	B131	2515	2200	-	2284	2334	2234	2284	1560	675	480	780	1275
	B231	2515	2200	-	2284	2334	2234	2284	1560	675	480	780	1275
91 22	B021	3915	3600	-	2284	2334	2234	2284	1560	675	480	780	1275
	B121	3915	3600	-	2284	2334	2234	2284	1560	675	480	780	1275
	B221	3915	3600	-	2284	2334	2234	2284	1560	675	480	780	1275
	B031	4715	2200	-	2284	2334	2234	2284	1560	675	480	780	1275
	B131	4715	2200	-	2284	2334	2234	2284	1560	675	480	780	1275
	B231	4715	2200	-	2284	2334	2234	2284	1560	675	480	780	1275
91 23	B021	5715	1800	3600	2284	2334	2234	2284	1560	675	480	780	1275
	B121	5715	1800	3600	2284	2334	2234	2284	1560	675	480	780	1275
	B221	5715	1800	3600	2284	2334	2234	2284	1560	675	480	780	1275
	E331	6915	2200	-	2284	2334	2234	2284	1560	675	480	780	1275
91 24	E221	7515	3600	-	2284	2334	2234	2284	1560	675	480	780	1275
	E321	7515	3600	-	2284	2334	2234	2284	1560	675	480	780	1275
	E331	9115	4400	-	2284	2334	2234	2284	1560	675	480	780	1275
91 25	E221	9315	3600	1800	2284	2334	2234	2284	1560	675	480	780	1275
	E321	9315	3600	1800	2284	2334	2234	2284	1560	675	480	780	1275
	E331	11315	4400	2200	2284	2334	2234	2284	1560	675	480	780	1275
91 26	E221	11115	3600	-	2284	2334	2234	2284	1560	675	480	780	1275
	E321	11115	3600	-	2284	2334	2234	2284	1560	675	480	780	1275
	E331	13515	4400	-	2284	2334	2234	2284	1560	675	480	780	1275
91 27	E221	12915	3600	5400	2284	2334	2234	2284	1560	675	480	780	1275
	E321	12915	3600	5400	2284	2334	2234	2284	1560	675	480	780	1275

FCH/ FCV 2E

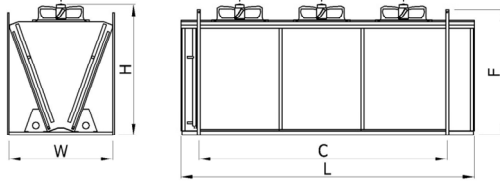
TEKNİK

ÇİZİM • DRAWING

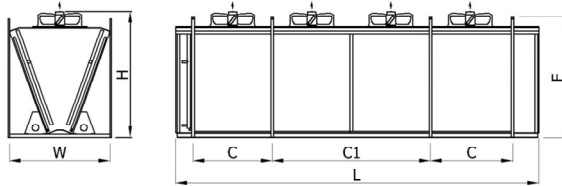
FCH/ FCV 1 Sıra* 2 Fan (1 Row* 2 Fans)



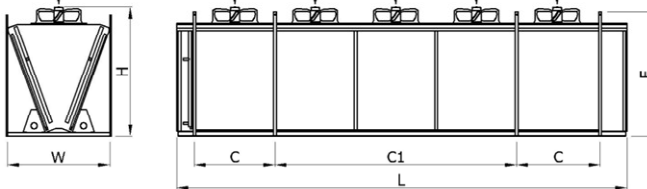
FCH/ FCV 1 Sıra* 3 Fan (1 Row* 3 Fans)



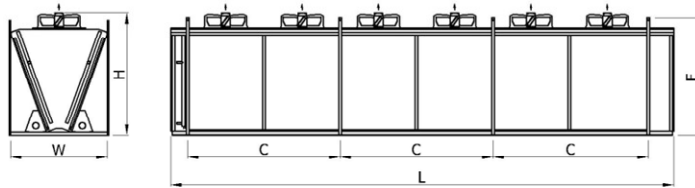
FCH/ FCV 1 Sıra* 4 Fan (1 Row* 4 Fans)



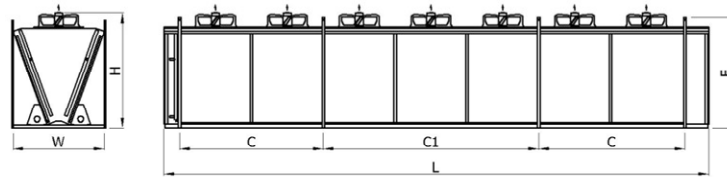
FCH/ FCV 1 Sıra* 5 Fan (1 Row* 5 Fans)



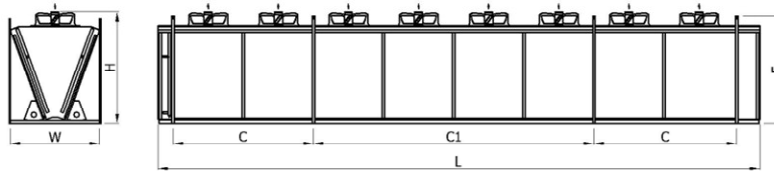
FCH/ FCV 1 Sıra* 6 Fan (1 Row* 6 Fans)



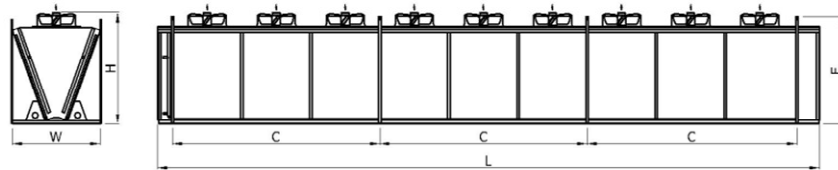
FCH/ FCV 1 Sıra* 7 Fan (1 Row* 7 Fans)



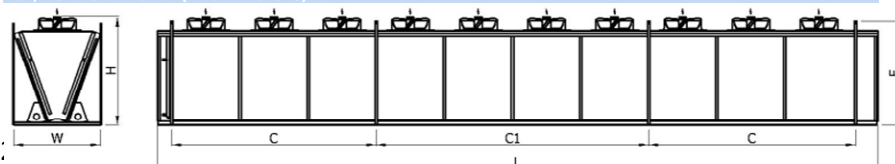
FCH/ FCV 1 Sıra* 8 Fan (1 Row* 8 Fans)



FCH/ FCV 1 Sıra* 9 Fan (1 Row* 9 Fans)



FCH/ FCV 1 Sıra* 10 Fan (1 Row* 10 Fans)



Rev. Tarihi: :

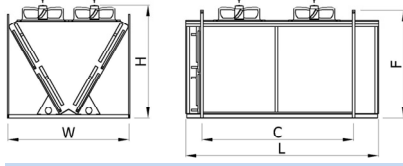
KL.V.003.ENG

FCH/ FCV 2E

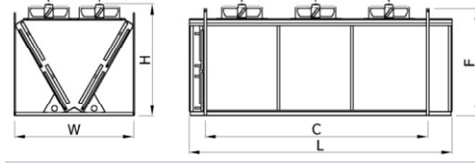
TEKNİK

ÇİZİM • DRAWING

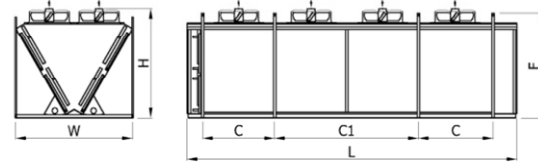
FCH/ FCV 1 Sıra* 2 Fan (1 Row* 2 Fan)



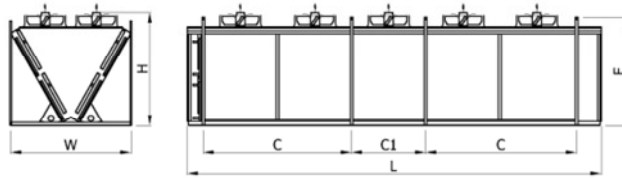
FCH/ FCV 1 Sıra* 3 Fan (1 Row* 3 Fans)



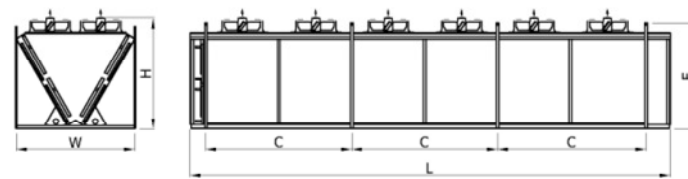
FCH/ FCV 1 Sıra* 4 Fan (1 Row* 4 Fans)



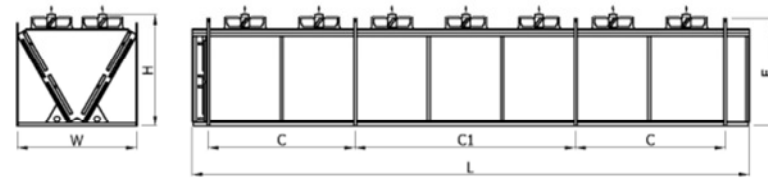
FCH/ FCV 1 Sıra* 5 Fan (1 Row* 5 Fans)



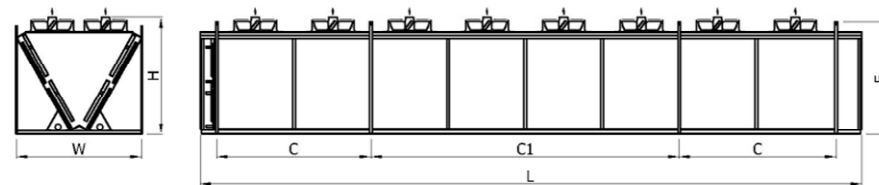
FCH/ FCV 1 Sıra* 6 Fan (1 Row* 6 Fans)



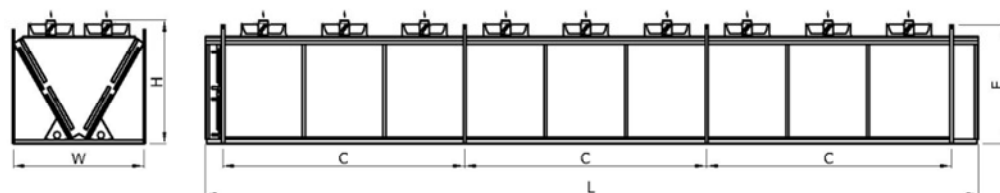
FCH/ FCV 1 Sıra* 7 Fan (1 Row* 7 Fans)



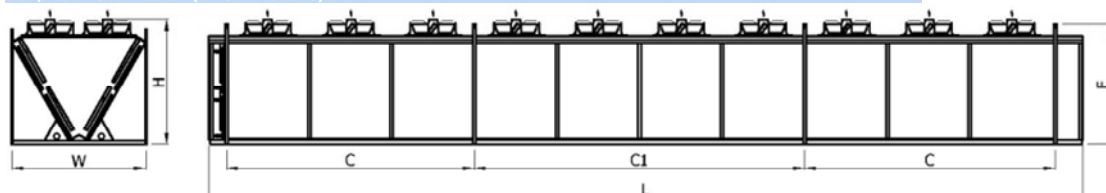
FCH/ FCV 1 Sıra* 8 Fan (1 Row* 8 Fans)



FCH/ FCV 1 Sıra* 9 Fan (1 Row* 9 Fans)



FCH/ FCV 1 Sıra* 10 Fan (1 Row* 10 Fans)



FDW 2E																
MODEL MODEL		FCW- 800							MODEL MODEL		FCW- 910					
		L	C	C1	F	W	H				L	C	C1	F	W	H
		mm	mm	mm	mm	mm	mm				mm	mm	mm	mm	mm	mm
80 12	E111	2760	2400	-	1650	1182	765		91 12	E111	2760	2400	-	1650	1182	1785
	E211	2760	2400	-	1650	1182	765			E211	2760	2400	-	1650	1182	1785
80 13	E111	3960	3600	-	1650	1182	765		91 13	E111	3960	3600	-	1650	1182	1785
	E211	3960	3600	-	1650	1182	765			E211	3960	3600	-	1650	1182	1785
80 14	E111	5160	1200	2400	1650	1182	765		91 14	E111	5160	1200	2400	1650	1182	1785
	E211	5160	1200	2400	1650	1182	765			E211	5160	1200	2400	1650	1182	1785
80 15	E111	6360	1200	3600	1650	1182	765		91 15	E111	6360	1200	3600	1650	1182	1785
	E211	6360	1200	3600	1650	1182	765			E211	6360	1200	3600	1650	1182	1785
80 16	E111	7560	2400	-	1650	1182	765		91 16	E111	7560	2400	-	1650	1182	1785
	E211	7560	2400	-	1650	1182	765			E211	7560	2400	-	1650	1182	1785
80 17	E111	8760	2400	3600	1650	1182	765		91 17	E111	8760	2400	3600	1650	1182	1785
	E211	8760	2400	3600	1650	1182	765			E211	8760	2400	3600	1650	1182	1785
80 18	E111	9960	2400	4800	1650	1182	765		91 18	E111	9960	2400	4800	1650	1182	1785
	E211	9960	2400	4800	1650	1182	765			E211	9960	2400	4800	1650	1182	1785
80 19	E111	11160	3600	-	1650	1182	765		91 19	E111	11160	3600	-	1650	1182	1785
	E211	11160	3600	-	1650	1182	765			E211	11160	3600	-	1650	1182	1785
80 110	E111	12360	3600	4800	1650	1182	765		91 110	E111	12360	3600	4800	1650	1182	1785
	E211	12360	3600	4800	1650	1182	765			E211	12360	3600	4800	1650	1182	1785
80 22	E111	2760	2400	-	1950	2284	2235		91 22	E111	2760	2400	-	1950	2284	2235
	E211	2760	2400	-	1950	2284	2235			E211	2760	2400	-	1950	2284	2235
	E212	2760	2400	-	1950	2287	2675			E212	2760	2400	-	1950	2287	2675
80 23	E111	3960	3600	-	1950	2284	2235		91 23	E111	3960	3600	-	1950	2284	2235
	E211	3960	3600	-	1950	2284	2235			E211	3960	3600	-	1950	2284	2235
	E212	3960	3600	-	1950	2287	2675			E212	3960	3600	-	1950	2287	2675
80 24	E111	5160	1200	2400	1950	2284	2235		91 24	E111	5160	1200	2400	1950	2284	2235
	E211	5160	1200	2400	1950	2284	2235			E211	5160	1200	2400	1950	2284	2235
	E212	5160	1200	2400	1950	2287	2675			E212	5160	1200	2400	1950	2287	2675
80 25	E111	6360	1200	3600	1950	2284	2235		91 25	E111	6360	1200	3600	1950	2284	2235
	E211	6360	1200	3600	1950	2284	2235			E211	6360	1200	3600	1950	2284	2235
	E212	6360	1200	3600	1950	2287	2675			E212	6360	1200	3600	1950	2287	2675
80 26	E111	7560	2400	-	1950	2284	2235		91 26	E111	7560	2400	-	1950	2284	2235
	E211	7560	2400	-	1950	2284	2235			E211	7560	2400	-	1950	2284	2235
	E212	7560	2400	-	1950	2287	2675			E212	7560	2400	-	1950	2287	2675
80 27	E111	8760	2400	3600	1950	2284	2235		91 27	E111	8760	2400	3600	1950	2284	2235
	E211	8760	2400	3600	1950	2284	2235			E211	8760	2400	3600	1950	2284	2235
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80 28	E111	9960	2400	4800	1950	2284	2235		91 28	E111	9960	2400	4800	1950	2284	2235
	E211	9960	2400	4800	1950	2284	2235			E211	9960	2400	4800	1950	2284	2235
	E212	9960	2400	4800	1950	2287	2675			E212	9960	2400	4800	1950	2287	2675
80 29	E111	11160	3600	-	1950	2284	2235		91 29	E111	11160	3600	-	1950	2284	2235
	E211	11160	3600	-	1950	2284	2235			E211	11160	3600	-	1950	2284	2235
	E212	11160	3600	-	1950	2287	2675			E212	11160	3600	-	1950	2287	2675
80 210	E111	12360	3600	4800	1950	2284	2235		91 210	E111	12360	3600	4800	1950	2284	2235
	E211	12360	3600	4800	1950	2284	2235			E211	12360	3600	4800	1950	2284	2235
	E212	12360	3600	4800	1950	2287	2675			E212	12360	3600	4800	1950	2287	2675

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 FMC (Friterm Motor Control) 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 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 condenser must be positioned parallel to the surface.
- 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 condensers 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.

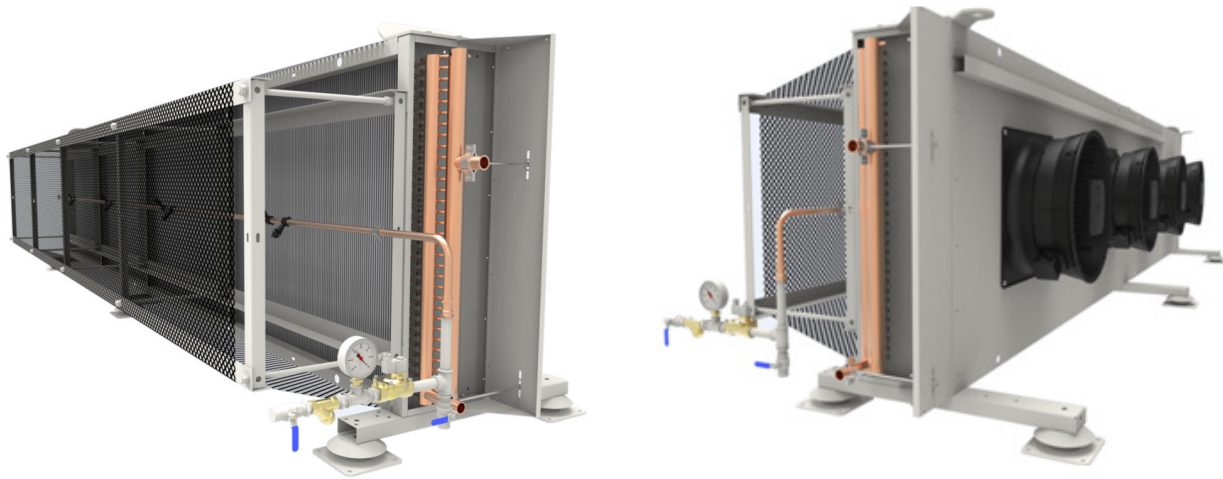


Figure 1- Ecomesh Water Spray System for Vertical Type Condensers



Figure 2- Ecomesh Water Spray System for V Type Condensers

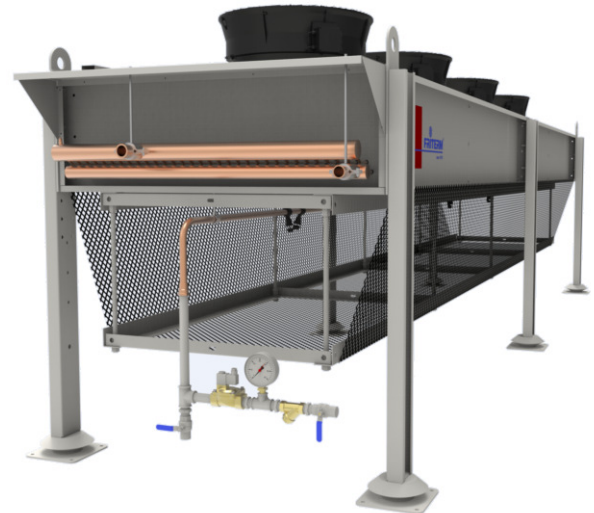


Figure 3- Ecomesh Water Spray system for Horizontal Type Condensers

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.

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*).

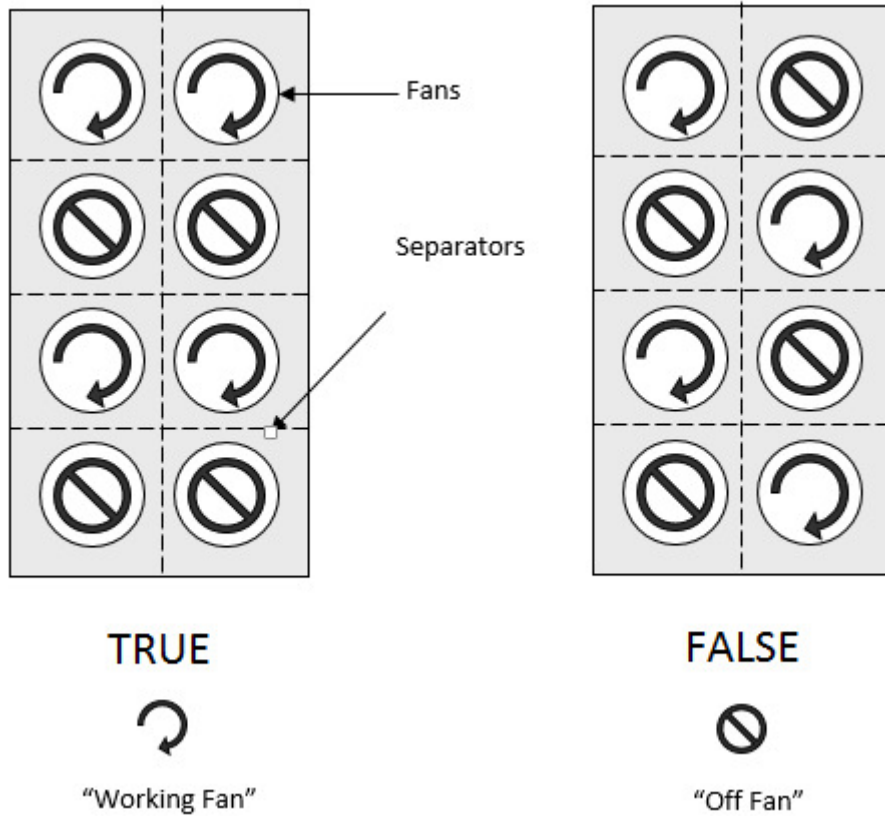


Recommended starting value for fans is 6 per hour while maximum is 10.

7.4 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.



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.

NOTICE

If the tubes within the product or the connection pipes are to be repaired, the refrigerant 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 chemical 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

Contact:

Address : Organize Deri Sanayi Bölgesi Kazlıçeşme Street No:18 X-12 Özel Parsel
Tuzla 34957 İSTANBUL, TURKEY

Telephone : (0216) 394 12 82

Fax : (0216) 394 12 87

E-mail : info@friterm.com

Web : www.friterm.com