DxAir Coolers

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

HFC & CO_2

FES,CXS Series

www.friterm.com

CONTENTS

1. ABOUT THIS MANUAL

This document specifies the instructions for installation, operating and maintenance of the air coolers (FES, CXS series) 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. 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/standard-unit-air-coolers/standard-unit-air-coolers/9/10050)

- 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 month. 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 staff.
- 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 period will start counting down if the product(s) is stored in manufacturers place more than one month.
- 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 supplies should not deviate 10% from the values given on the label.
- This document and annexed given installation, operation and maintenance conditions as long as the warranty specified in the sales contract is valid.

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.

⚠ WARNING	Indicates a hazardous situation which, if not avoided, may result in serious injury.
⚠ CAUTION	Indicates a hazardous situation which, if not avoided, may result in moderate or minor injury.
NOTICE	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.

⚠ WARNING

- 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 Sign


Head Protection

Eye

Protection


Foot Protection

High

Visibility Clothing


Protective Clothing

Hand Prote



Respiratory Protection

2.2.2 Warning Signs


No SmokingFlammable


High VoltageHot Surfaces


Hand İnjuries

Poisoning

Danger


Fire Risk


Frostbite Hazard

Ex tentialCorrosive Substances

/ -UpIrritant Substances

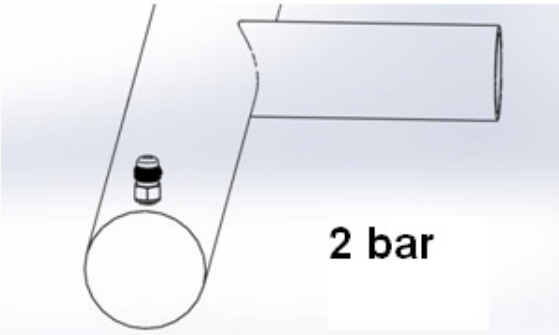
2.3. Warnings

- 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.

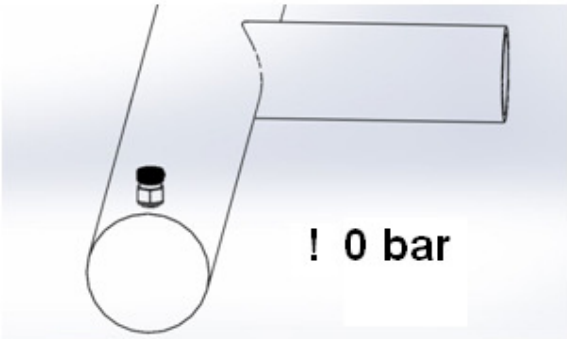
⚠ WARNING

Products delivered to our customers with positive pressure inside. The pressure relief valve must be opened before starting the installation.If there is no pressurized air in the tube side please stop installation process and inform the manufacturer about the situation.

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

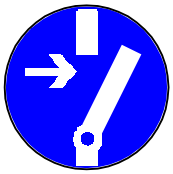
Danger of cutting hands and fingers.Lids should be unscrewed by an authorized technician.

ınd protection.

WARNING

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.



Activate the electrical system and secure against switching on again before starting installation, maintenance and repair work.

WARNING

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.

WARNING

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.

2.6. Environmental Protection

WARNING

Danger of injuries and damage to property!

The unit contains ammonia as a refrigerant (NH_3). Ammonia is a potentially explosive and fire-risk substance. Unintentionally carried in oil residues and unintentionally carried in refrigerant can ignite. An explosion can cause the most serious injuries and loss of limb.

Ammonia is a corrosive, toxic irritant gas. From an ammonia concentration of 0.2 vol % in the ambient air or with a long stay in the ammonia-containing ambient air ammonia can be life-threatening or fatal.

Have experienced, trained personnel with prescribed protective clothing perform all necessary protective and other measures:

- Use respiratoryprotection.
- Use a room air-independent breathing apparatus with maintenance work in high ammonia concentrations in the room air.
- Ensure the set-up room is well ventilated.
- Divert escaped refrigerant vapour and escaped refrigerant liquid safely

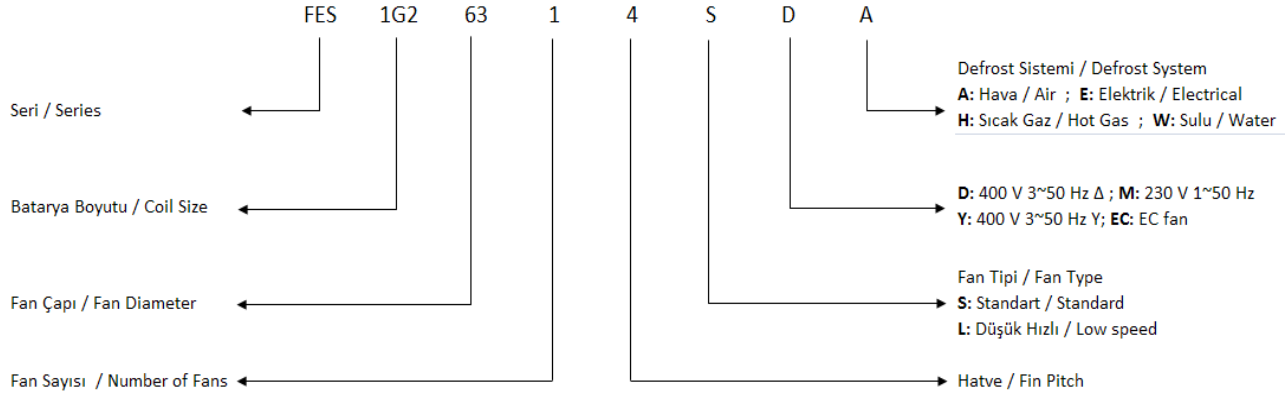
⚠ WARNING

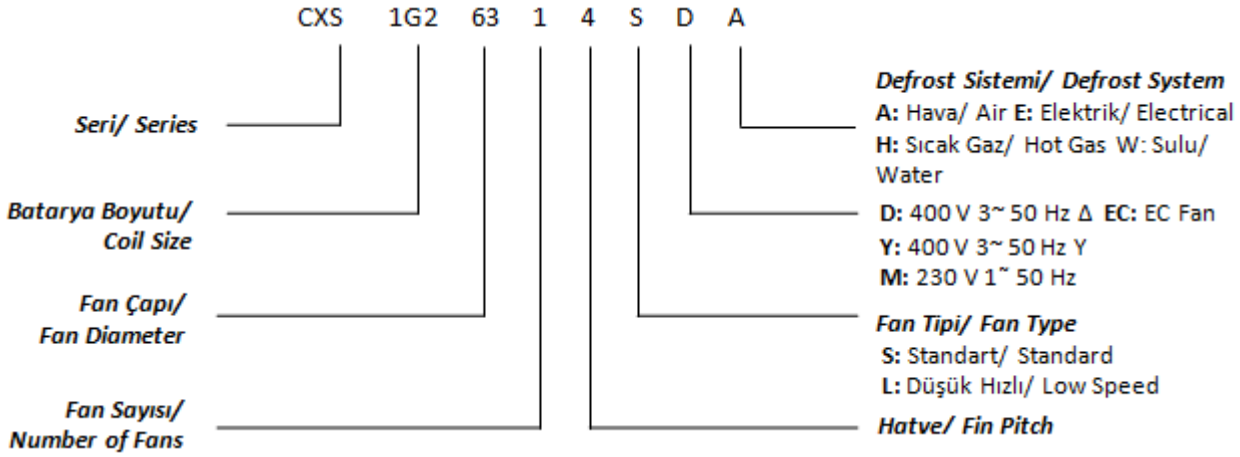
Instructions for dealing withinjuries:

- Call an emergency doctorimmediately!
- Liquidammoniacancausefrostbiteorcorrosiveinjuriesontheskinoreyes.
- The injured person must keep breathing apparatus on until further notice to pre- vent inhalation of vapours from ammonia contaminated clothing.
- Shower the injured person for five to fifteen minutes with water. Remove the clothing careful during the shower. If ammonia-contaminated clothing is removed without wetting with water first, the injury can worsen, as firmly frozen skin may be torn away.

3. LABELLING

3.1. Product Code





3.2. Type Plate

FRİTERM® since 1979

Type	FES ...	Fan speed	rpm
Serial Nr.		Total Fan Power	kW
TS min/ max	°C	Electric Heater Power	kW
Weight	kg	Power Supply	... V AC ... Ph ... Hz
Internal Vol.	L	Max. Opr. Pr.	Bar
Medium	Refrigerant /	Test Pr. / Medium	Bar
Prod. Year			

CE

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

- 2014/68/EU PED (Pressure Equipment Directive)
- TS EN 378 “Refrigeration systems and heat pumps, technical safety and environmental requirements”
- Capacity standard for evaporators is defined according to the EN 328 standard (Test procedures for establishing the performance of forced convection unit air coolers for refrigeration)
- 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 thermal load of warm air in the room to the refrigerant by the aid of a heat exchanger employing axial fans.Its working principle is that the air blown by fans cools down by the refrigerant evaporating within the tubes while passing through the fins.

The unit is designed and delivered to the end user for operation at a specific operating point.

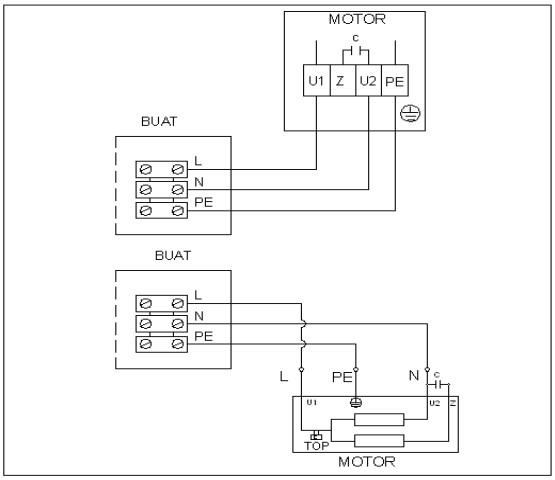
4.3. Fans

- High efficient axialZiehlAbegg, EBM or equivalent fans are used.
- Fan diameters: 300/ 350/ 400/ 450/ 500/ 630/ 800 mm.
- 400V 3~50/ 60Hz, 230V 1~50/ 60Hz

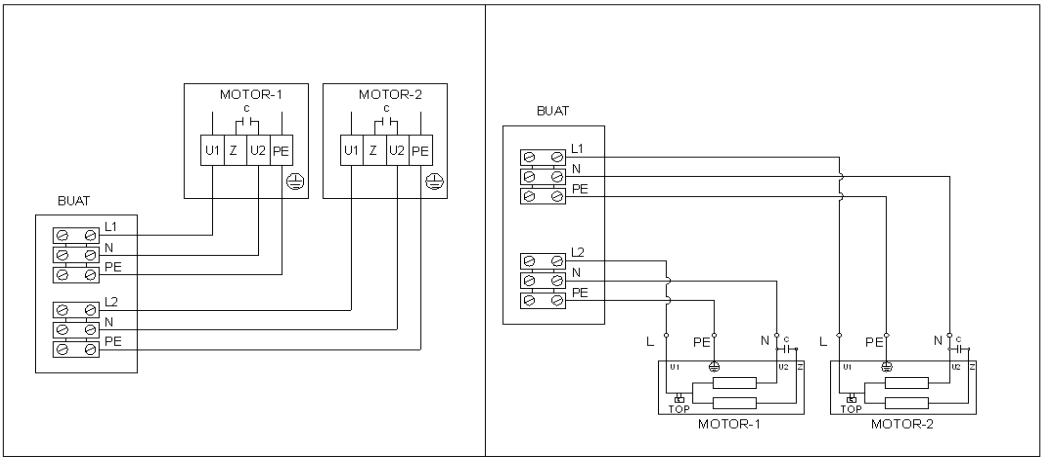
- Three phase fans can work at two different speeds. Furthermore, providing speed control is optional for EC fans.
- Variable fan speed regulation can be achieved using three phase fans with frequency inverter and sine filter.
- Variable voltage speed control system could be used as an alternative fan 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 ºC and +50 ºC - +70 ºC.
- 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 month.
- 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

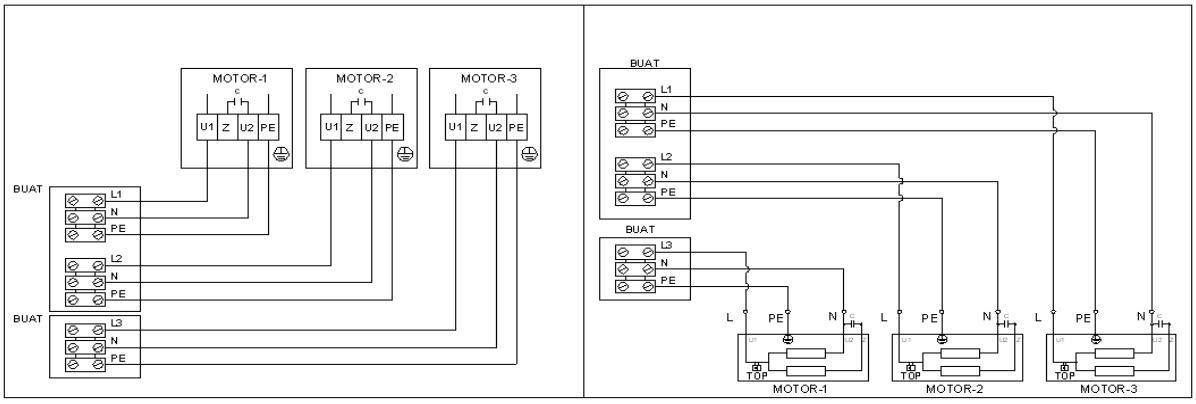
4.3.1.1. EBM Fan Connection Diagrams



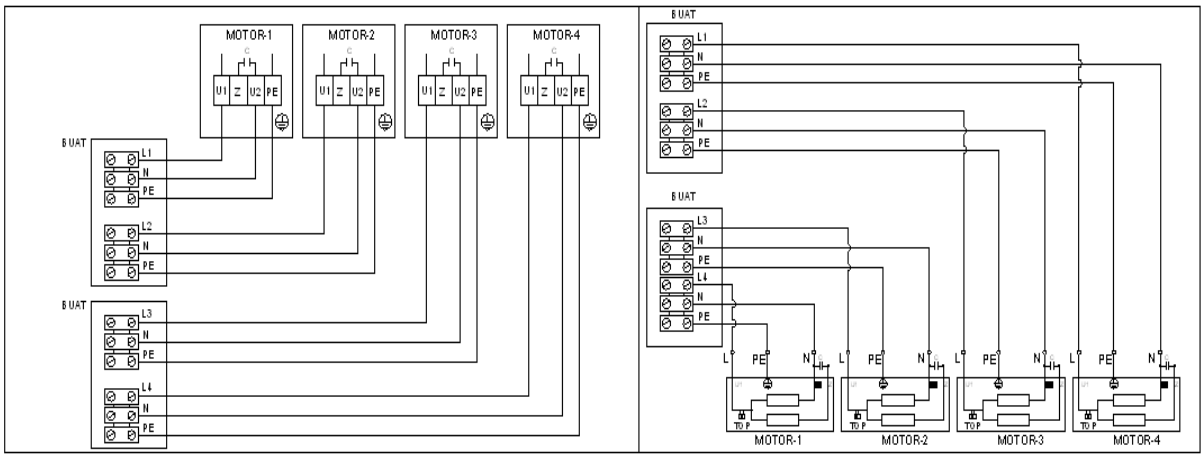
EBM 230V Internal Thermistor EBM Fan (1 Fan)



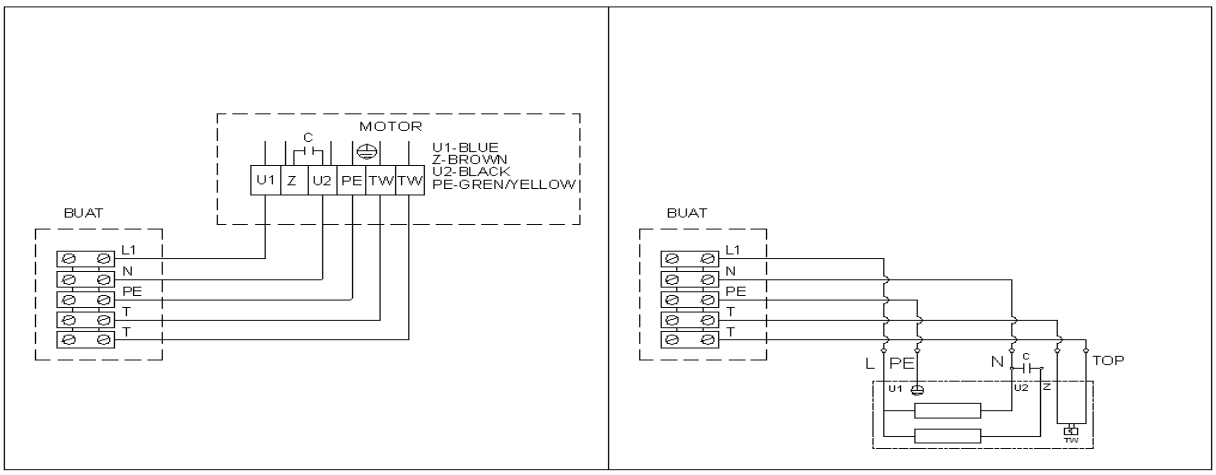
EBM 230V *Internal Thermistor Fan Connection* (2 Fan)



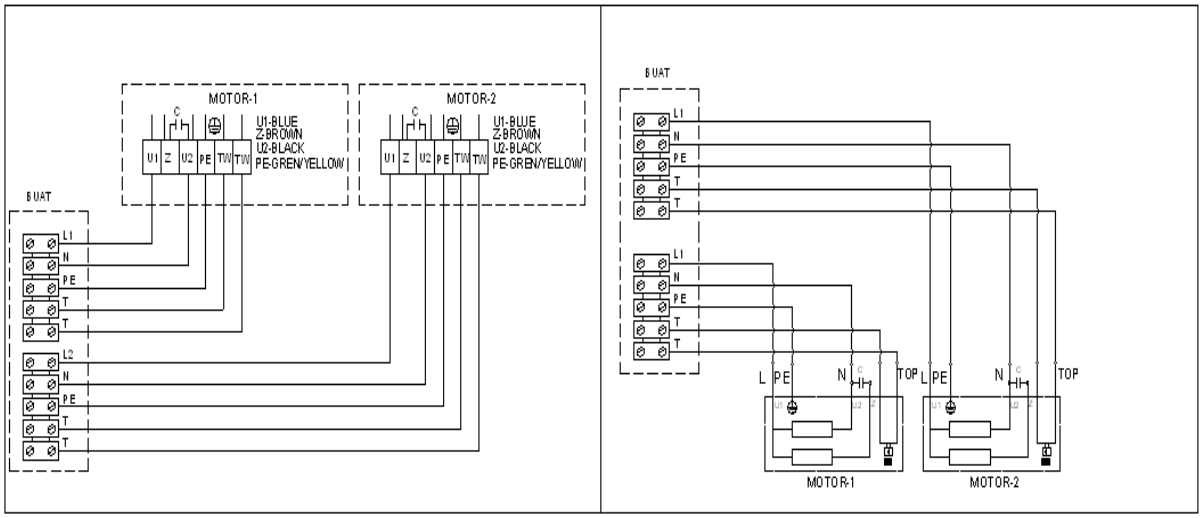
EBM 230V *Internal Thermistor Fan Connection* (3 Fan)



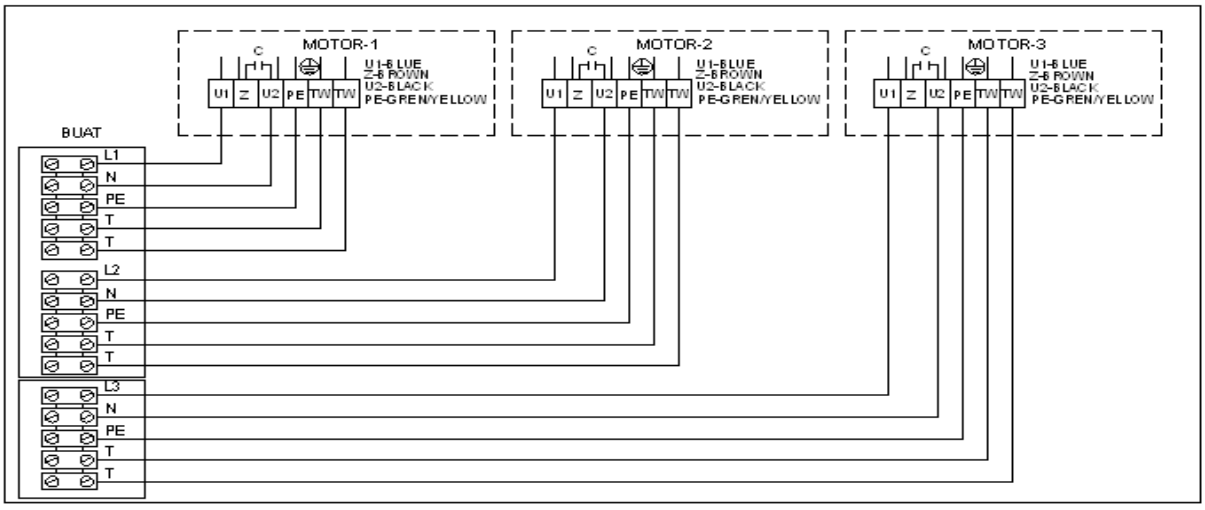
EBM 230V *Internal Thermistor Fan Connection* (4 Fan)



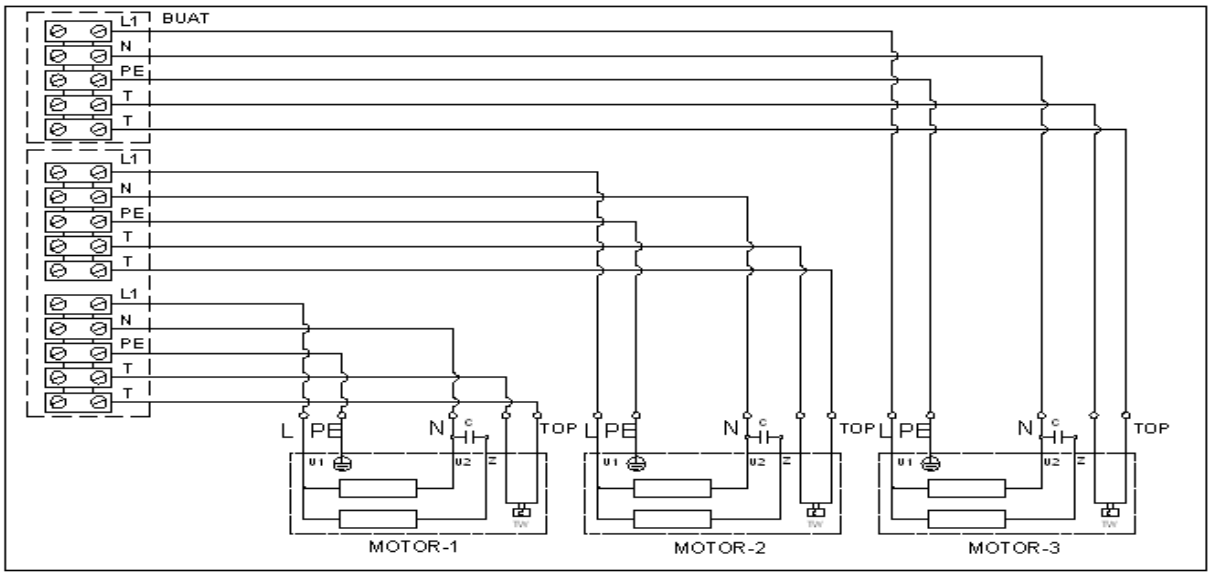
EBM 230V*External Thermistor Fan Connection* (1 Fan)



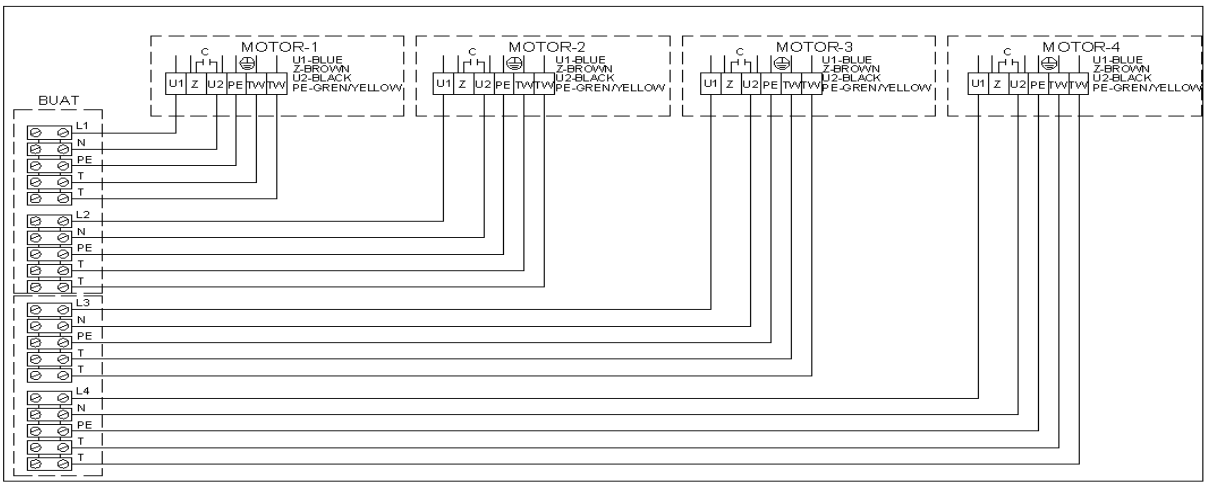
EBM 230V *External Thermistor Fan Connection* (2 Fan)



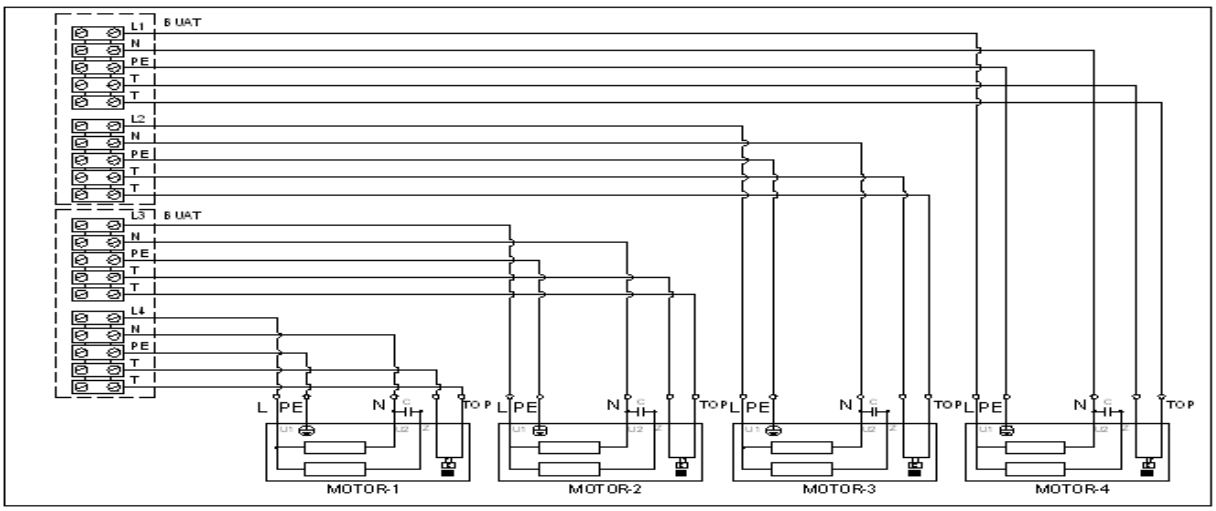
EBM 230V *External Thermistor Fan Connection* (3 Fan)



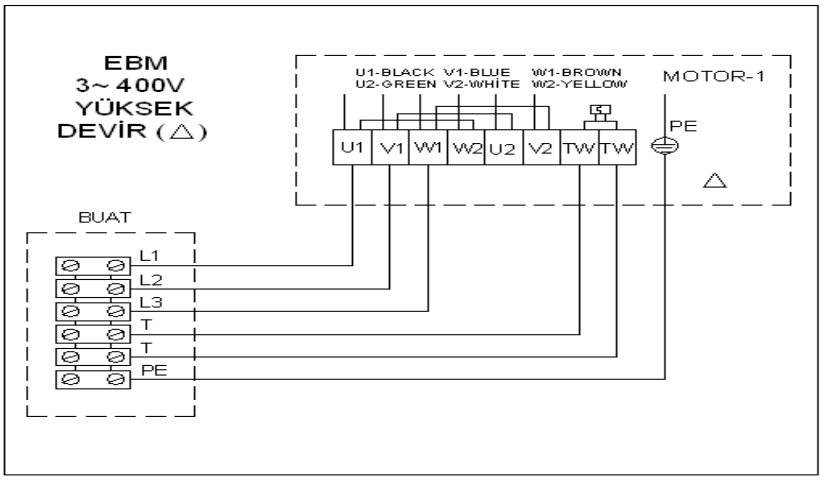
EBM 230V *External Thermistor Fan Connection* (3 Fan)



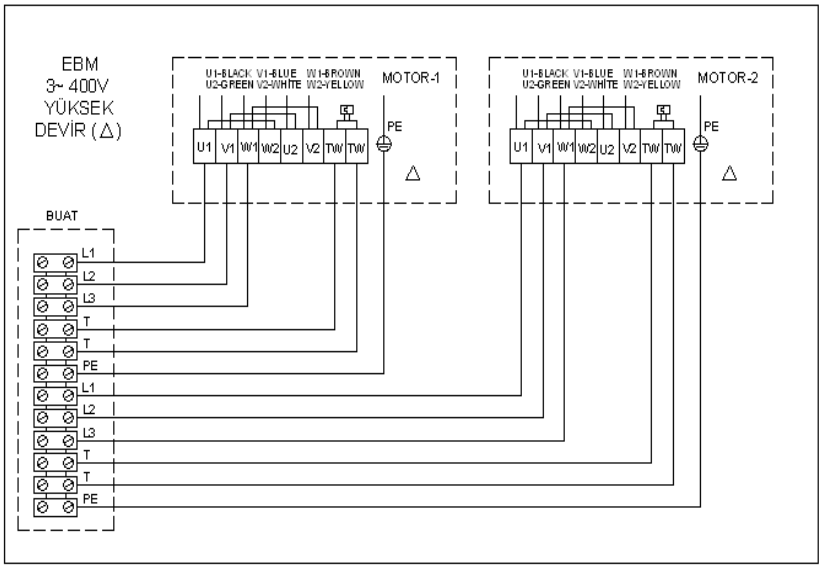
EBM 230V *External Thermistor Fan Connection* (4 Fan)



EBM 230V *External Thermistor Fan Connection* (4 Fan)



EBM 400V *Thermistor Fan Connection* (1 Fan)

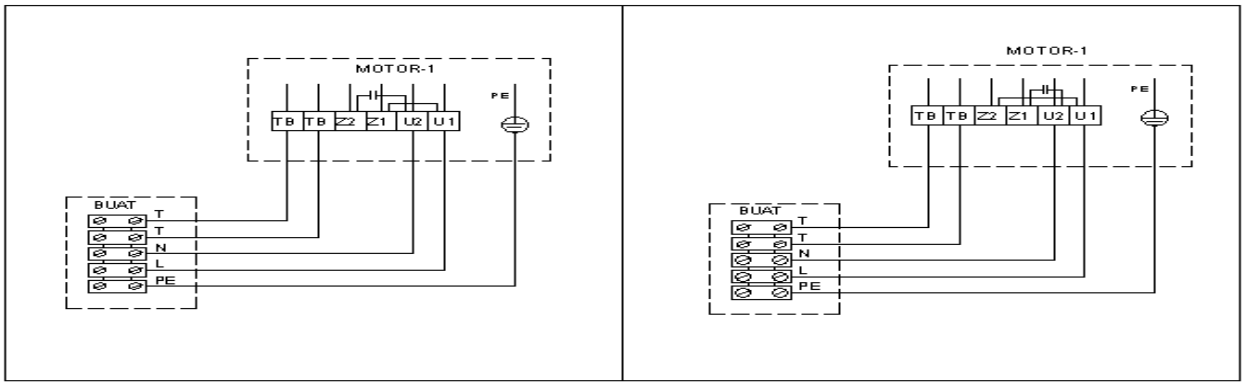


EBM 400V *Thermistor Fan Connection* (2 Fan)

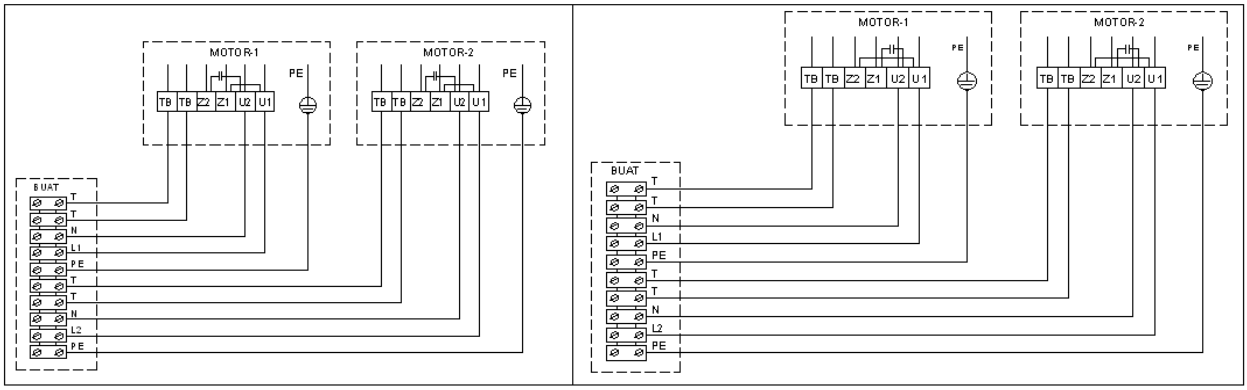
NOTICE

For the products with 3 fans,one 1 fan diagram and one 2 fan diagram should be used, For the products with 4 fans, two 2 fan diagrams should be used.

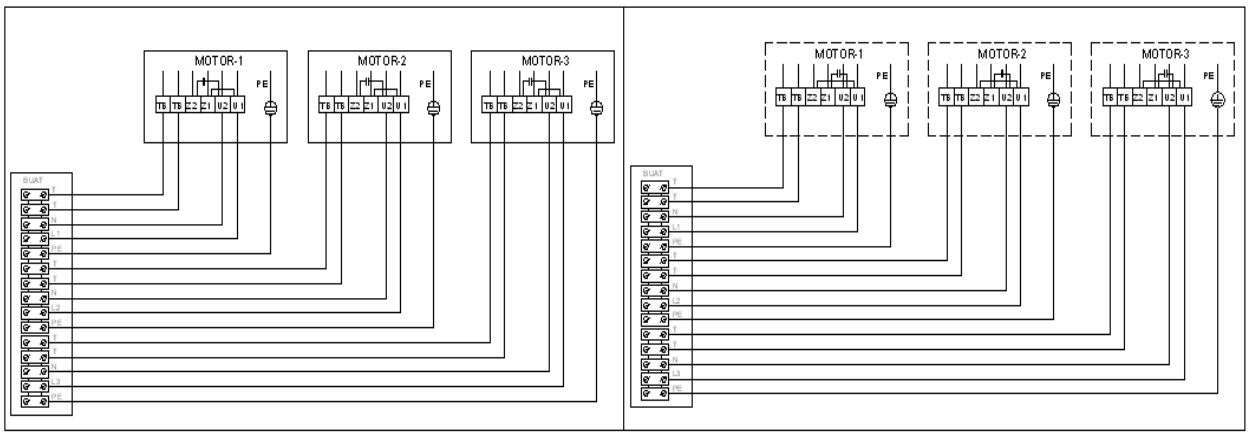
4.3.1.2. Z. ABEGG Fan Connection Diagrams



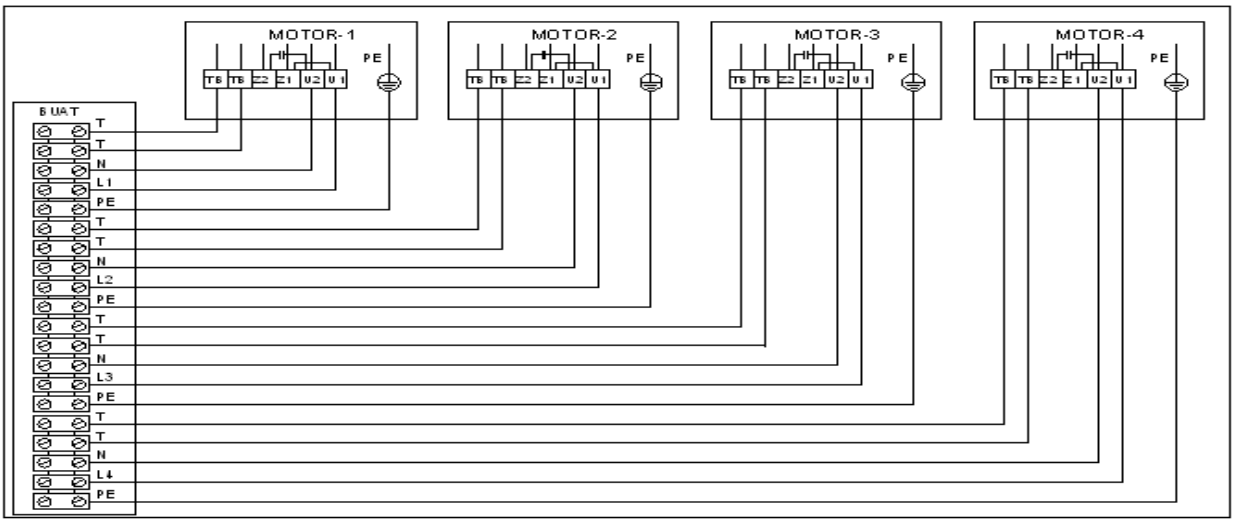
Z.ABEGG 230V Suction/Blowing Fan Connection (1 Fan)



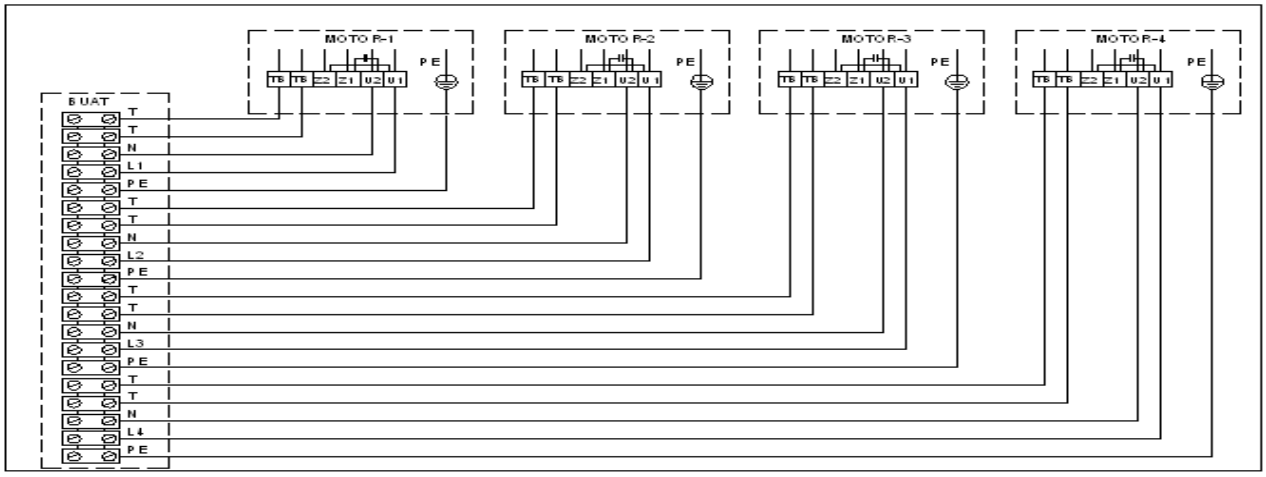
Z.ABEGG 230V Suction/BlowingFan Connection (2 Fan)



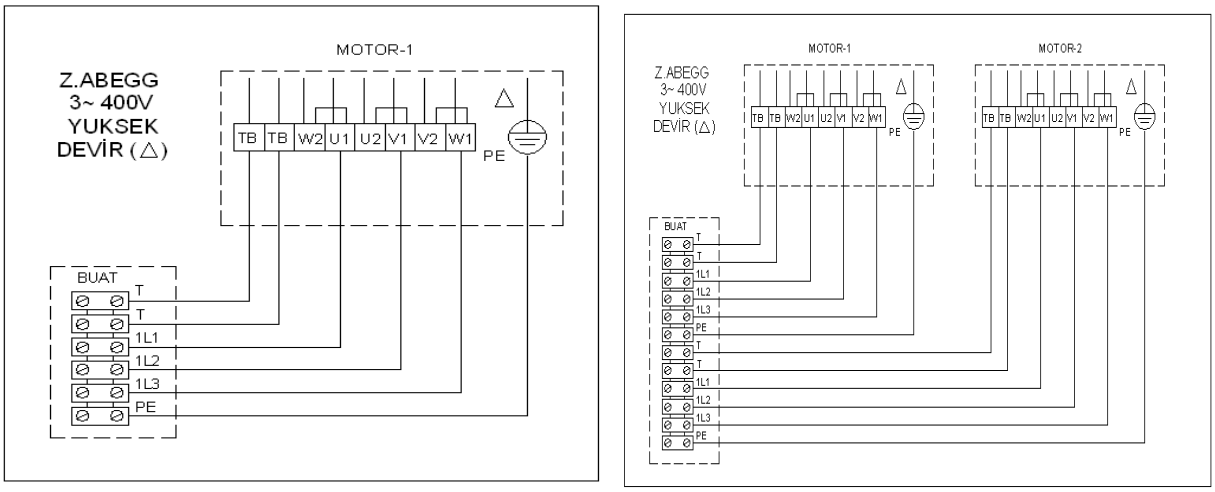
Z.ABEGG 230V Suction/Blowing Fan Connection (3 Fan)



Z.ABEGG 230V Suction Fan Connection (4 Fan)



Z.ABEGG 230V Blowing Fan Connection (4 Fan)



Z.ABEGG 400V *Fan Connection* (1 Fan) -(2 Fan

NOTICE

For the products with 3 fans, one 1 fan diagram and one 2 fan diagram should be used.
For the products with 4 fans, two 2 fan diagrams should be used.

NOTICE

Electrical fan connection diagrams shown in the table are for standard serial products. The other suitable fans could be installed based on the same diagrams.Product catalogue could be referred for fan number and diameter.

⚠ CAUTION

Installation of the product while the thermistor connection must be done. Otherwise, fan failures and overheating can be encountered similar problems.

NOTICE

When the hoods on the fan heater used, the heating system must be work in operation during defrost and other operation time.

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.

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

Sp = parallelpiped surface(3 m)
Sr = Surface reference ($1m^2$)

Sound pressure levels given shows the average values on a parallelpiped surface at 3 m distancce from the unit in open air over a reflecting plain.

NOTICE

The values given in the table are only for giving an idea of magnitude; the actual values might vary depending on the environmental conditions and installation characteristics.

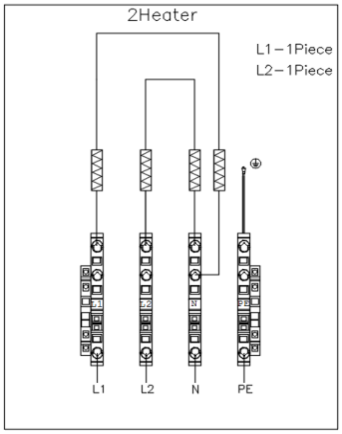
Table of sound pressure level

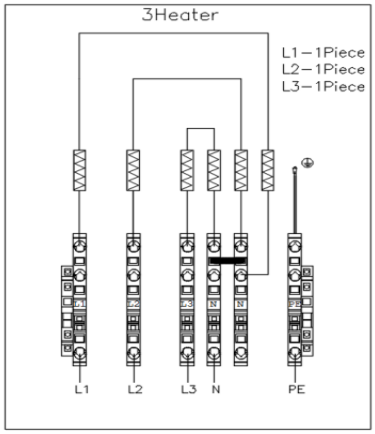
Fan Diameter(mm)	Fan Speed(rpm)	Sound Power Level LwA dB(A)	Number of Fan	1	2	3	4
800	890/ Δ	79	Sound Pressure Level dB(A) (Distance at3 m)	57	60	62	63
	690/ Y	74		52	55	57	58
630	1340/ Δ	90		68	71	73	74
	1070/ Y	85		63	66	68	69
630	900/ Δ	74		52	55	57	58
	720/ Y	69		47	50	52	53
500	1330/ Δ	77		55	58	60	61
	940/ Y	71		49	52	54	55
450	1310	68		47	50	52	53
	900	61		39	42	44	45
400	1430	74		52	55	57	58
	870	59		37	40	42	43
350	1340	64		43	46	48	49
	910	53		32	35	37	38
300	1320	61		40	43	45	46

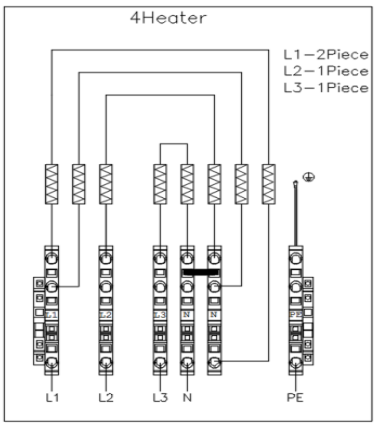
4.5. Heater Connection Diagrams

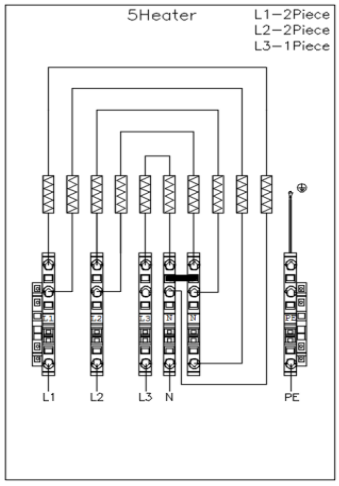
4.5.1 Diagrams

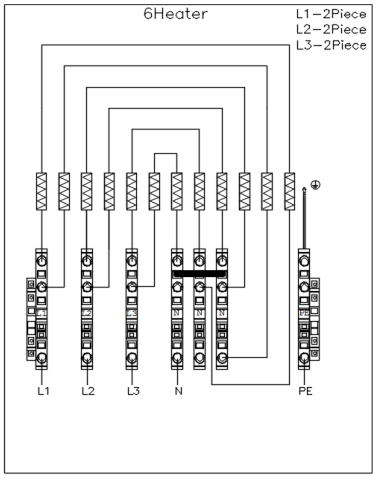
Electric defrost heater connection diagrams show as follows.

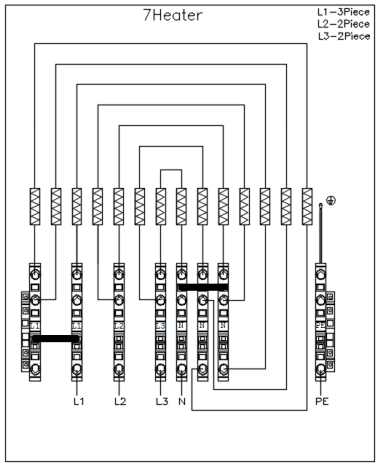


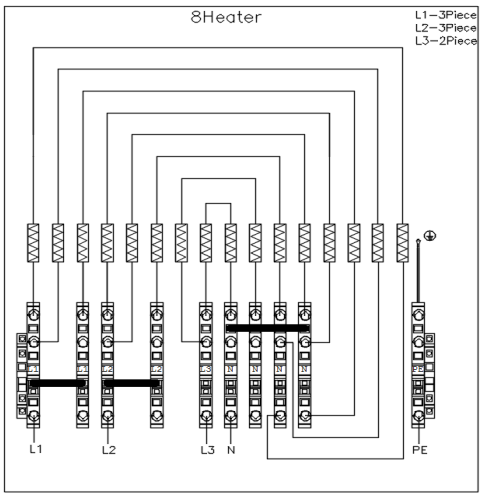


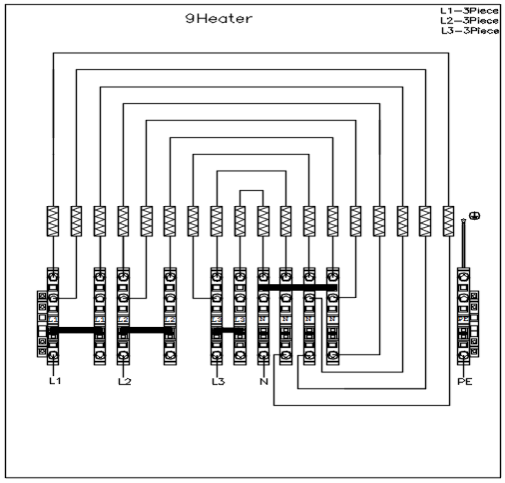




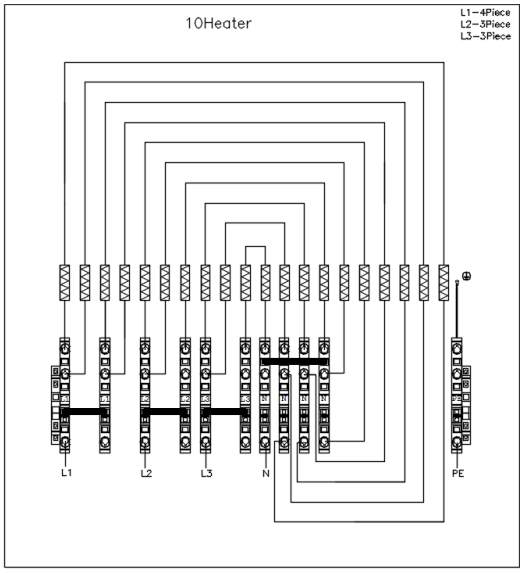




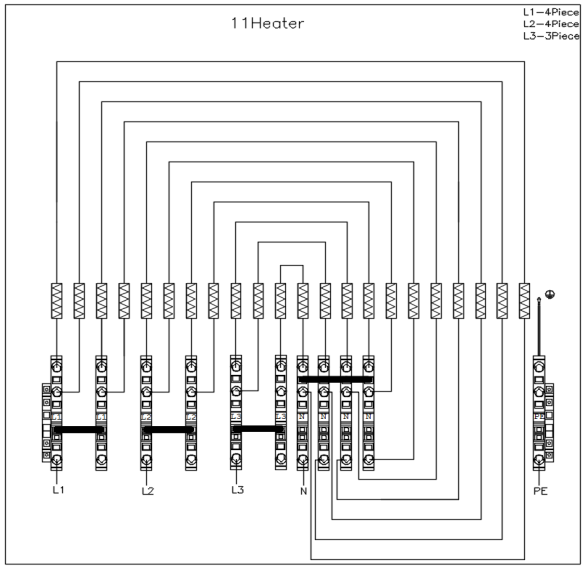




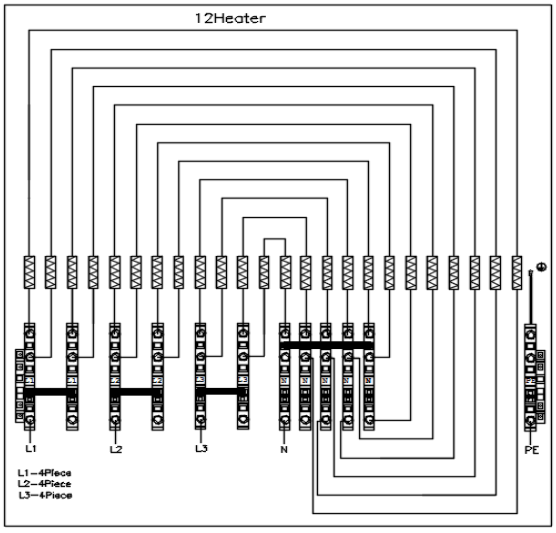
10Heater



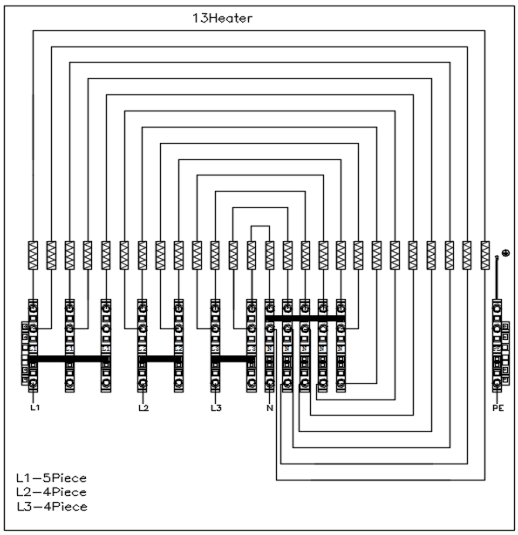
11Heater



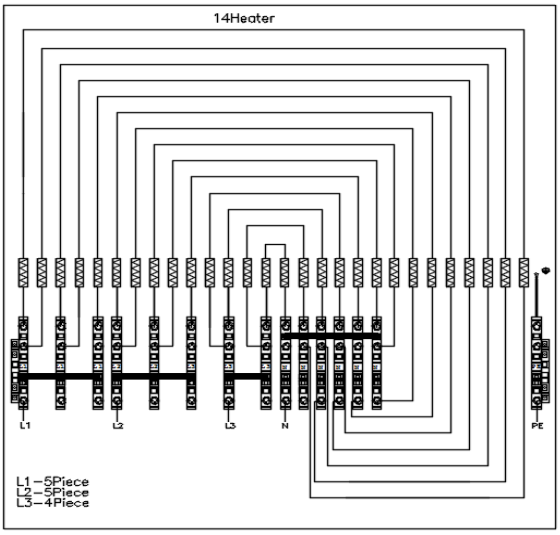
12Heater



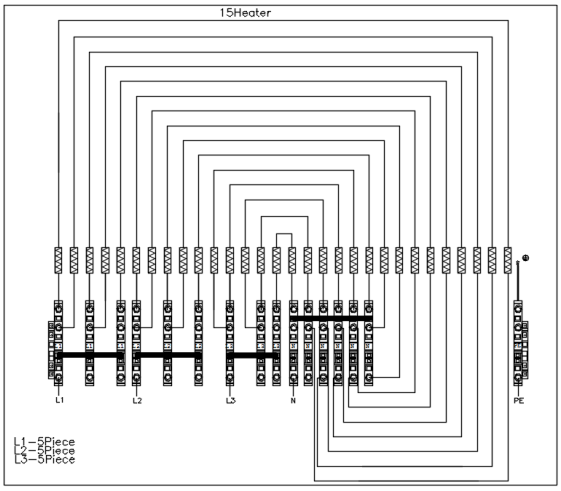
13Heater



14Heater



15Heater



NOTICE

Please refer to product catalogue for the heater power.The difference in current between two phases is allowed to be at most the ampere drawn by a heater.

⚠ CAUTION

The heaters are fixed with segments.The segment plier should be use to disassemble segments before removing heaters.When the heater is replaced by a new one, the segments must be fixed again.

⚠ WARNING

The electrical connections must comply with related specifications and the earthing connection must be made carefully and elaborately.

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

DANGER

Suitable transport equipment must be used.

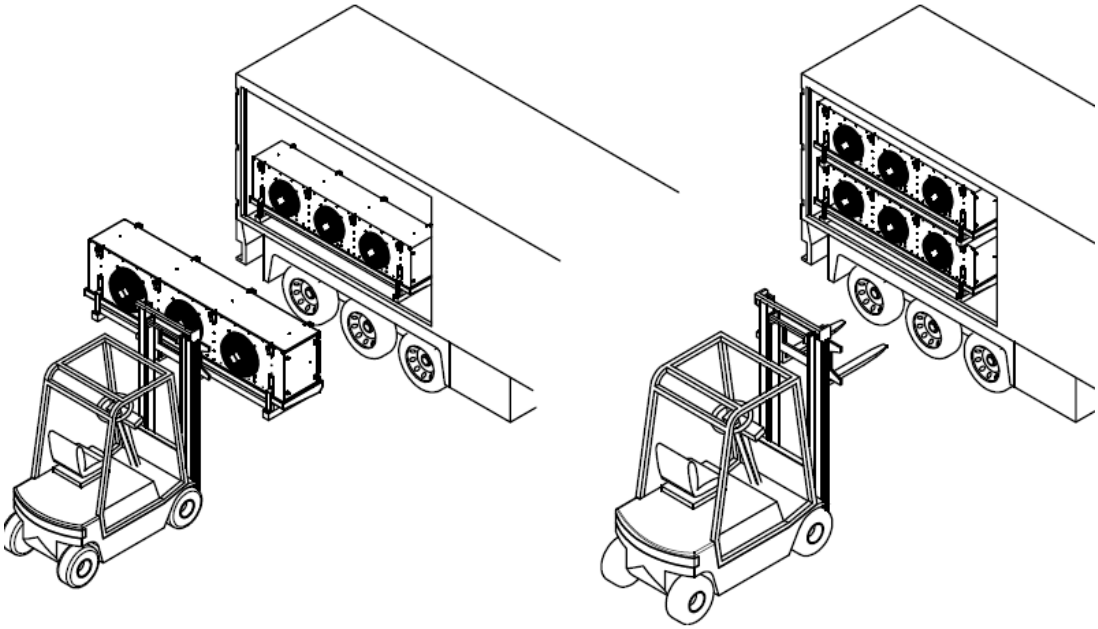
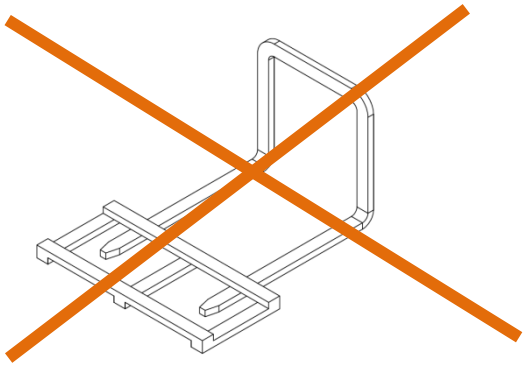


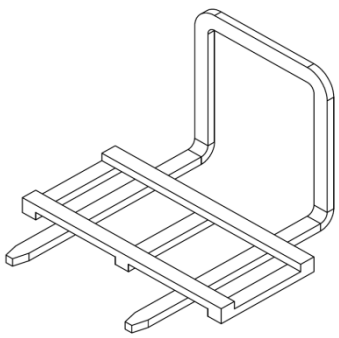
Figure1- Transport Position

CAUTION

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



FALSE



TRUE

DANGER

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.
- 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.)

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 cooler or cooler 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 and rigidceiling.
- All measures should be taken during the installation in order to avoid any vibration in operation.
- The working fluid, the maximum working pressure and the voltage declared by the producer should be proper for the working environment.

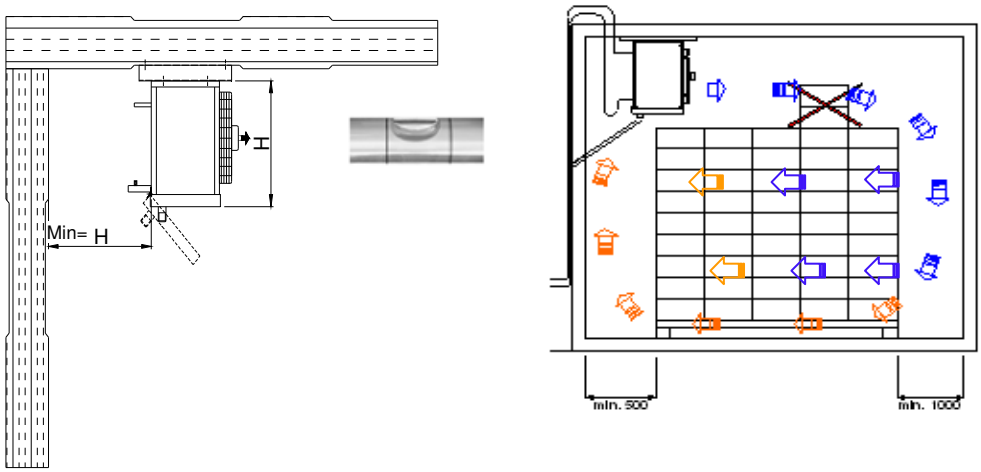
⚠ DANGER

The working area should not contain any hazardous substances or explosives.

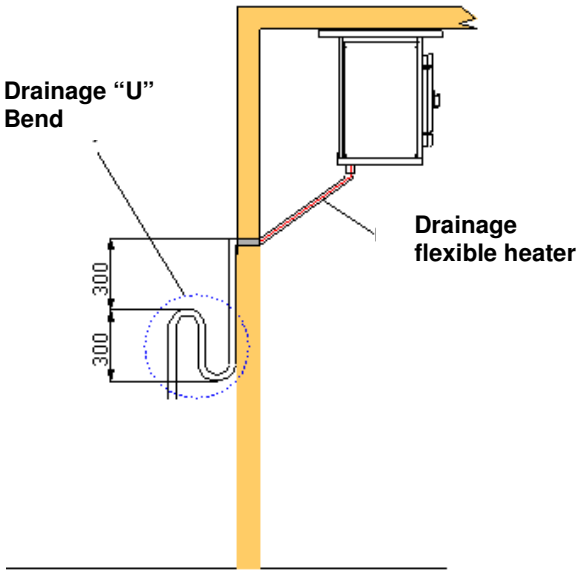
- Air motion should not be adversely affected by obstructions and inlet air should not be undesirably heated or cooled by some other product.
- The site where the installation process is being carried out should be provided as clean as possibleand low humidity.

6.2. Requirements at the Setup Point

The standard air coolers must be installed as shown in following figures. The coolers should be leveled during mounting.



Air coolers layout plan

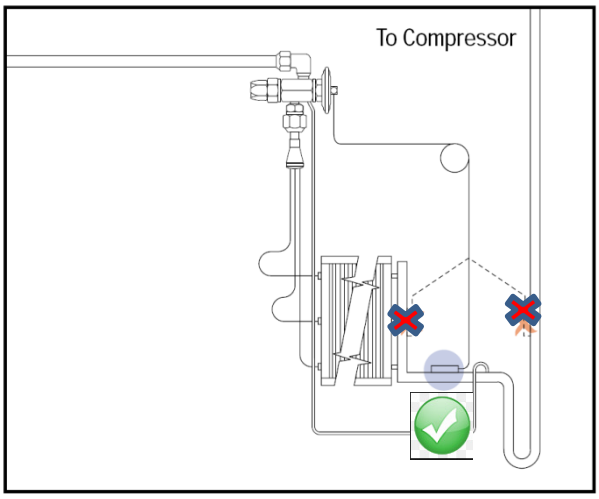


Drain line connection details.

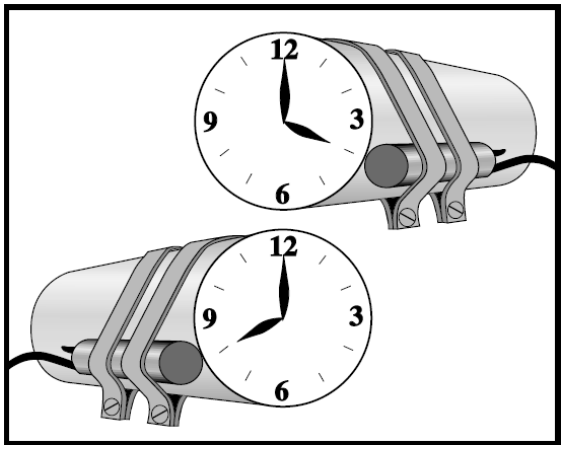
CAUTION

In case of using Thermostatic expansion valve please follow the instructions of the Expansion valve supplier. In case of absence of instructions please install the Expansion device according to the following instructions. Improper installation of the expansion device may result in poor cooling capacity.

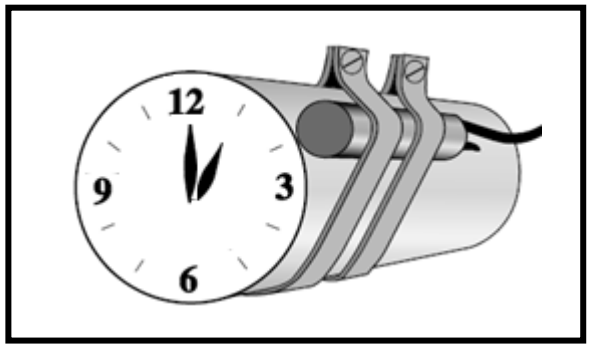
The sensing bulb of the expansion device should be placed on the horizontal part of the unit cooler outlet pipe in between the coil and the pressure balance capillary pipe connection. İn addition the sensing bulb **MUST BE thermally insulated** against the ambient temperature.



The bulb should be placed tightly on the evaporator outlet pipe at 4 O'clock position if the pipe diameter is 7/8" and bigger. If the pipe diameter is smaller than 7/8" then the bulb should be positioned at 1 O'clock position.



Pipe diameter larger than 7/8"



Pipe diameter smaller than 7/8"

6.3. Mounting

The system installer is responsible for the installation and safety information with the compliance standard instructions **(TS EN 12100-1/2)**.

Operator should consider**2004-108 EC** directive.

Before the installation, the technical specifications of the product must be ensured that they are compatible with the desired working conditions.

Stability of units must be provided by users during installation against to any possible vibration.

Air flow should not be blocked by any obstacle.

Additional air flow resistance should not be allowed 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.

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.

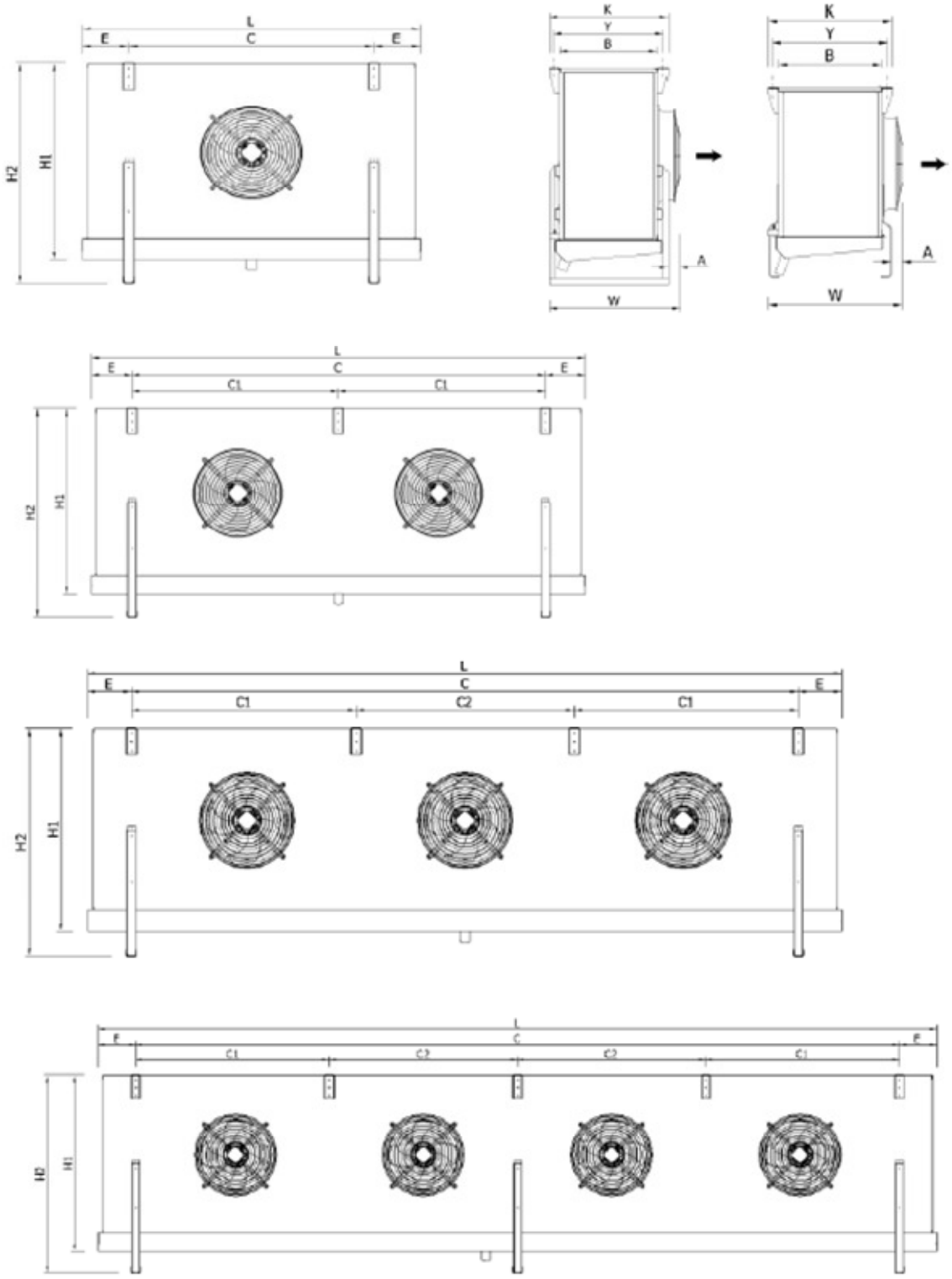
The product must be mounted in such a way that no vibration would be carried to the product (vibration dampers can be used if required).

Carrier legs and lifting lugs are delivered as mounted on product. The carrier legs with galvanized color should be removed after installation.

Electrical connections must not be done before mounting the product to the ceiling through the hooks.

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

FES 4 • 7 • 10 • 12 mm **TEKNİK ÇİZİM** • DRAWING



FES 4 • 7 • 10 • 12 mm — BOYUTLAR • DIMENSIONS

	MODEL / MODEL	L	C	C1	C2	E	H1	H2	W	K	Y	B	A	Dişli Drenaj Bağlantısı / Drain (G-Thread) Connection	Ağırlık* / Weight*			
															4 mm	7 mm	10 mm	12 mm
		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	inch	kg	kg	kg	kg
X 1	1F1.30.1-	714	450	0	-	132	505	-	460	400	346	280	110	1"	15	15	-	-
	1F2.30.1-	714	450	0	-	132	505	-	460	400	346	280	110	1"	16	16	-	-
	1F4.30.1-	714	450	0	-	132	505	-	530	470	416	350	110	1"	20	19	-	-
	1F1.35.1-	814	550	0	-	132	575	-	460	400	346	280	120	1"	21	20	-	-
	1F2.35.1-	814	550	0	-	132	575	-	460	400	346	280	120	1"	24	22	-	-
	1F4.35.1-	814	550	0	-	132	575	-	530	470	416	350	120	1"	29	26	-	-
	1F2.40.1-	1100	700	0	-	200	651	740	605	515	475	415	100	1 1/4"	34	34	-	-
	1F3.40.1-	1100	700	0	-	200	651	740	605	515	475	415	100	1 1/4"	37	37	-	-
	1F4.40.1-	1100	700	0	-	200	651	740	605	515	475	415	100	1 1/4"	40	39	37	37
	1F6.40.1-	1100	700	0	-	200	659	740	705	615	575	515	100	1 1/4"	-	47	45	44
	1F2.45.1-	1250	850	0	-	200	721	810	635	515	475	415	130	1 1/4"	42	-	-	-
	1F3.45.1-	1250	850	0	-	200	721	810	635	515	475	415	130	1 1/4"	46	45	-	-
	1F4.45.1-	1250	850	0	-	200	721	810	635	515	475	415	130	1 1/4"	50	49	47	45
	1F6.45.1-	1250	850	0	-	200	729	810	735	615	575	515	130	1 1/4"	-	59	55	54
X 2	1F1.30.2-	1114	850	0	-	132	505	-	460	400	346	280	110	1"	24	24	-	-
	1F2.30.2-	1114	850	0	-	132	505	-	460	400	346	280	110	1"	26	26	-	-
	1F4.30.2-	1114	850	0	-	132	505	-	530	470	416	350	110	1"	33	32	-	-
	1F1.35.2-	1314	1050	0	-	132	575	-	460	400	346	280	120	1"	37	34	-	-
	1F2.35.2-	1314	1050	0	-	132	575	-	460	400	346	280	120	1"	42	37	-	-
	1F4.35.2-	1314	1050	0	-	132	575	-	530	470	416	350	120	1"	52	45	-	-
	1F2.40.2-	1750	1350	675	-	200	651	740	605	515	475	415	100	1 1/4"	58	57	-	-
	1F3.40.2-	1750	1350	675	-	200	651	740	605	515	475	415	100	1 1/4"	63	62	-	-
	1F4.40.2-	1750	1350	675	-	200	651	740	605	515	475	415	100	1 1/4"	68	67	63	62
	1F6.40.2-	1750	1350	675	-	200	659	740	705	615	575	515	100	1 1/4"	-	81	76	74
	1F2.45.2-	2050	1650	825	-	200	721	810	635	515	475	415	130	1 1/4"	73	-	-	-
	1F3.45.2-	2050	1650	825	-	200	721	810	635	515	475	415	130	1 1/4"	79	79	-	-
	1F4.45.2-	2050	1650	825	-	200	721	810	635	515	475	415	130	1 1/4"	87	86	80	78
	1F6.45.2-	2050	1650	825	-	200	729	810	735	615	575	515	130	1 1/4"	-	103	96	93
X 3	1F1.30.3-	1514	1250	0	-	132	505	-	460	400	346	280	110	1"	34	34	-	-
	1F2.30.3-	1514	1250	0	-	132	505	-	460	400	346	280	110	1"	38	37	-	-
	1F4.30.3-	1514	1250	0	-	132	505	-	530	470	416	350	110	1"	47	46	-	-
	1F1.35.3-	1814	1550	0	-	132	575	-	460	400	346	280	120	1"	54	50	-	-
	1F2.35.3-	1814	1550	0	-	132	575	-	460	400	346	280	120	1"	62	54	-	-
	1F4.35.3-	1814	1550	0	-	132	575	-	530	470	416	350	120	1"	76	66	-	-
	1F2.40.3-	2400	2000	675	650	200	651	740	605	515	475	415	100	1 1/4"	83	82	-	-
	1F3.40.3-	2400	2000	675	650	200	651	740	605	515	475	415	100	1 1/4"	90	89	-	-
	1F4.40.3-	2400	2000	675	650	200	651	740	605	515	475	415	100	1 1/4"	99	98	92	89
	1F6.40.3-	2400	2000	675	650	200	659	740	705	615	575	515	100	1 1/4"	-	117	109	106
	1F2.45.3-	2850	2450	825	800	200	721	810	635	515	475	415	130	1 1/4"	103	-	-	-
	1F3.45.3-	2850	2450	825	800	200	721	810	635	515	475	415	130	1 1/4"	113	112	-	-
	1F4.45.3-	2850	2450	825	800	200	721	810	635	515	475	415	130	1 1/4"	124	123	115	112
	1F6.45.3-	2850	2450	825	800	200	729	810	735	615	575	515	130	1 1/4"	-	148	137	133
X 4	1F1.30.4-	1914	1650	825	-	132	505	-	460	400	346	280	110	1"	44	43	-	-
	1F2.30.4-	1914	1650	825	-	132	505	-	460	400	346	280	110	1"	48	48	-	-
	1F4.30.4-	1914	1650	825	-	132	505	-	530	470	416	350	110	1"	60	60	-	-
	1F1.35.4-	2314	2050	1025	-	132	575	-	460	400	346	280	120	1"	69	64	-	-
	1F2.35.4-	2314	2050	1025	-	132	575	-	460	400	346	280	120	1"	79	70	-	-
	1F4.35.4-	2314	2050	1025	-	132	575	-	530	470	416	350	120	1"	99	85	-	-
	1F2.40.4-	3050	2650	675	650	200	651	740	605	515	475	415	100	1 1/4"	106	105	-	-
	1F3.40.4-	3050	2650	675	650	200	651	740	605	515	475	415	100	1 1/4"	116	115	-	-
	1F4.40.4-	3050	2650	675	650	200	651	740	605	515	475	415	100	1 1/4"	127	126	118	114
	1F6.40.4-	3050	2650	675	650	200	659	740	705	615	575	515	100	1 1/4"	-	151	141	136
	1F2.45.4-	3650	3250	825	800	200	721	810	635	515	475	415	130	1 1/4"	134	-	-	-
	1F3.45.4-	3650	3250	825	800	200	721	810	635	515	475	415	130	1 1/4"	147	146	-	-
	1F4.45.4-	3650	3250	825	800	200	721	810	635	515	475	415	130	1 1/4"	162	160	149	144
	1F6.45.4-	3650	3250	825	800	200	729	810	735	615	575	515	130	1 1/4"	-	193	178	173

FES 4 • 7 • 10 • 12 mm — BOYUTLAR • DIMENSIONS

	MODEL / MODEL	L	C	C1	C2	E	H1	H2	W	K	Y	B	A	Dişli Drenaj Bağlantısı / Drain (G-Thread) Connection	Ağırlık* / Weight* 4 mm S	4 mm L	7 mm S	7 mm L	10 mm S	10 mm L	12 mm S	12 mm L
		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	inch	kg	kg	kg	kg	kg	kg	kg	kg
X 1	1F2.50.1-	1450	1050	0	0	200	800	880	745	615	575	515	140	1 1/4"	90		89		-		-	
	1F3.50.1-	1450	1050	0	0	200	800	880	745	615	575	515	140	1 1/4"	95		-		-		-	
	1F4.50.1-	1450	1050	0	0	200	800	880	745	615	575	515	140	1 1/4"	100		99		95		94	
	1F5.50.1-	1450	1050	0	0	200	800	880	745	615	575	515	140	1 1/4"	-		109		-		-	
	1F6.50.1-	1450	1050	0	0	200	800	880	745	615	575	515	140	1 1/4"	-		119		114		112	
	1G2.63.1-	1750	1270	0	0	240	1108	1250	775	665	615	545	110	2"	182	166	-		-		-	
	1G3.63.1-	1750	1270	0	0	240	1108	1250	775	665	615	545	110	2"	195	179	195	179	184	168	-	
	1G4.63.1-	1750	1270	0	0	240	1125	1250	975	865	815	745	110	2"	228	212	228	212	214	198	209	193
	1G6.63.1-	1750	1270	0	0	240	1125	1250	975	865	815	745	110	2"	-		253	237	235	219	228	212
	1G2.80.1-	2150	1670	0	0	240	1315	1450	973	765	715	645	230	2"	278		-		-		-	
	1G3.80.1-	2150	1670	0	0	240	1315	1450	973	765	715	645	230	2"	297		297		279		-	
	1G4.80.1-	2150	1670	0	0	240	1331	1450	1173	965	915	845	230	2"	342		341		320		312	
	1G6.80.1-	2150	1670	0	0	240	1331	1450	1173	965	915	845	230	2"	-		381		352		341	
X 2	1F2.50.2-	2450	2050	1025	0	200	800	880	745	615	575	515	140	1 1/4"	150		149		-		-	
	1F3.50.2-	2450	2050	1025	0	200	800	880	745	615	575	515	140	1 1/4"	159		-		-		-	
	1F4.50.2-	2450	2050	1025	0	200	800	880	745	615	575	515	140	1 1/4"	170		168		161		158	
	1F5.50.2-	2450	2050	1025	0	200	800	880	745	615	575	515	140	1 1/4"	-		185		-		-	
	1F6.50.2-	2450	2050	1025	0	200	800	880	745	615	575	515	140	1 1/4"	-		202		192		188	
	1G2.63.2-	2950	2470	1235	0	240	1108	1250	775	665	615	545	110	2"	308	276	-		-		-	
	1G3.63.2-	2950	2470	1235	0	240	1108	1250	775	665	615	545	110	2"	332	300	332	300	310	278	-	
	1G4.63.2-	2950	2470	1235	0	240	1125	1250	975	865	815	745	110	2"	387	355	387	355	360	328	350	318
	1G6.63.2-	2950	2470	1235	0	240	1125	1250	975	865	815	745	110	2"	-		436	404	400	368	386	354
	1G2.80.2-	3750	3270	1635	0	240	1315	1450	973	765	715	645	230	2"	490		-		-		-	
	1G3.80.2-	3750	3270	1635	0	240	1315	1450	973	765	715	645	230	2"	527		528		491		-	
	1G4.80.2-	3750	3270	1635	0	240	1331	1450	1173	965	915	845	230	2"	603		603		560		543	
	1G6.80.2-	3750	3270	1635	0	240	1331	1450	1173	965	915	845	230	2"	-		681		623		600	
X 3	1F2.50.3-	3450	3050	1025	1000	200	800	880	745	615	575	515	140	1 1/4"	211		209		-		-	
	1F3.50.3-	3450	3050	1025	1000	200	800	880	745	615	575	515	140	1 1/4"	225		-		-		-	
	1F4.50.3-	3450	3050	1025	1000	200	800	880	745	615	575	515	140	1 1/4"	239		238		226		222	
	1F5.50.3-	3450	3050	1025	1000	200	800	880	745	615	575	515	140	1 1/4"	-		262		-		-	
	1F6.50.3-	3450	3050	1025	1000	200	800	880	745	615	575	515	140	1 1/4"	-		286		270		264	
	1G2.63.3-	4150	3670	1235	1200	240	1108	1250	775	665	615	545	110	2"	434	386	-		-		-	
	1G3.63.3-	4150	3670	1235	1200	240	1108	1250	775	665	615	545	110	2"	469	421	469	421	435	387	-	
	1G4.63.3-	4150	3670	1235	1200	240	1125	1250	975	865	815	745	110	2"	546	498	546	498	505	457	489	441
	1G6.63.3-	4150	3670	1235	1200	240	1125	1250	975	865	815	745	110	2"	-		617	569	563	515	542	494
	1G2.80.3-	5350	4870	1635	1600	240	1315	1450	973	765	715	645	230	2"	700		-		-		-	
	1G3.80.3-	5350	4870	1635	1600	240	1315	1450	973	765	715	645	230	2"	758		758		703		-	
	1G4.80.3-	5350	4870	1635	1600	240	1331	1450	1173	965	915	845	230	2"	865		865		800		774	
	1G6.80.3-	5350	4870	1635	1600	240	1331	1450	1173	965	915	845	230	2"	-		978		892		858	
X 4	1F2.50.4-	4450	4050	1025	1000	200	800	880	745	615	575	515	140	1 1/4"	271		270		-		-	
	1F3.50.4-	4450	4050	1025	1000	200	800	880	745	615	575	515	140	1 1/4"	290		-		-		-	
	1F4.50.4-	4450	4050	1025	1000	200	800	880	745	615	575	515	140	1 1/4"	310		307		292		286	
	1F5.50.4-	4450	4050	1025	1000	200	800	880	745	615	575	515	140	1 1/4"	-		338		-		-	
	1F6.50.4-	4450	4050	1025	1000	200	800	880	745	615	575	515	140	1 1/4"	-		369		348		340	
	1G2.63.4-	5350	4870	1235	1200	240	1108	1250	775	665	615	545	110	2"	563	499	-		-		-	
	1G3.63.4-	5350	4870	1235	1200	240	1108	1250	775	665	615	545	110	2"	611	547	610	546	566	502	-	
	1G4.63.4-	5350	4870	1235	1200	240	1125	1250	975	865	815	745	110	2"	709	645	709	645	655	591	634	570
	1G6.63.4-	5350	4870	1235	1200	240	1125	1250	975	865	815	745	110	2"	-		804	740	733	669	704	640
	1G2.80.4-	6950	6470	1635	1600	240	1315	1450	973	765	715	645	230	2"	916		-		-		-	
	1G3.80.4-	6950	6470	1635	1600	240	1315	1450	973	765	715	645	230	2"	-		992		919		-	
	1G4.80.4-	6950	6470	1635	1600	240	1331	1450	1173	965	915	845	230	2"	1131		1131		1044		1010	
	1G6.80.4-	6950	6470	1635	1600	240	1331	1450	1173	965	915	845	230	2"	-		1283		1167		1122	

6.4. Electrical Connection

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

- The wiring of fans should be done in accordance with the related rules..
- The main power supply cable should be determined according to electrical power requirements of the product specified on the label.
- A protection thermal relay should be used where absent forthe operational protection of fan.
- Electrical wiring connections/junction 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.

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 expansion device if fed by refrigerant.
- Switch on the fans.
- Defrost and heating systems should be checked and ensured that its work.
- Alternating operating states, e.g. usage changes at the set-up point, must also be considered. The defrosting frequency can be influenced by effects on the air side.
- Defrosting the unit with proper timing guarantees continuous operational reliability and the prevention of inaccessibilities that could result in a shutdown and disruptions. As the local conditions have a very big influence on the unit's performance and the need for defrosting, the operation must be checked regularly and settings of defrost period and the duration should be adjusted according to a monitoring of frost and/or icing on the heat exchanger at least 2 weeks in operation.
- Unless taking necessarymeasures could result iniceformation within the product's drainage system. Part of the drainage system in cold room must be insulated. The use of flexible heater within the drainage pipe to prevent icing is recommended for room temperatures below zero degree celcius.

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

7.3. Defrost System

7.3.1. Defrost Control

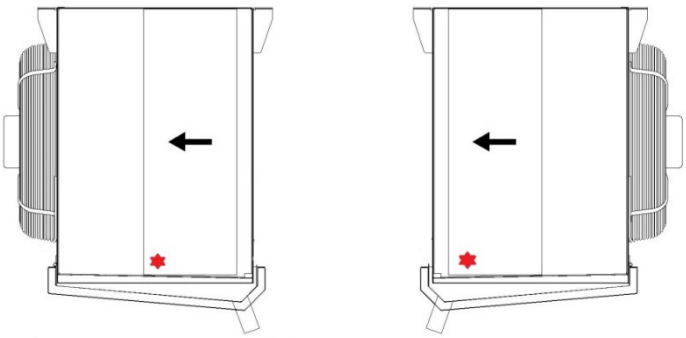
- The defrosting process is started at pre-set intervals or asrequired.
- The process completion must be ensured twice (time/temperature and temperature/time),
- For defrost operation (circulation air, electric, hot gas (optional)) the correct on-site

Installation of the defrosting sensor must be ensured.

- The defrost probe temperature setpoint of 35 ℃ and defrosting time of 30 minutes is recommended in case of room volume change of 1 time per 4 hours. In case of more frequent air volume change or very humid product please set the defrosting period to a shorter time.
- Before the defrost operation the system must be ensured that stopped by a PUMP-DOWN operation and all the refrigerant is evacuated from the cooler unit.

7.3.2. Circulation Air Defrost

- With operation of the units at room temperatures in the plus range (plus-cold storage rooms) and evaporation temperatures t_0= 0 to -5℃.
- Circulation air defrosting is usually sufficient with shut-off working fluid-carrying lines the required defrosting heat is generated by the fan heat flow and the air temperature in the plus range. But it also applies here: the refrigerating operation may be restarted, as described, only after complete defrosting.

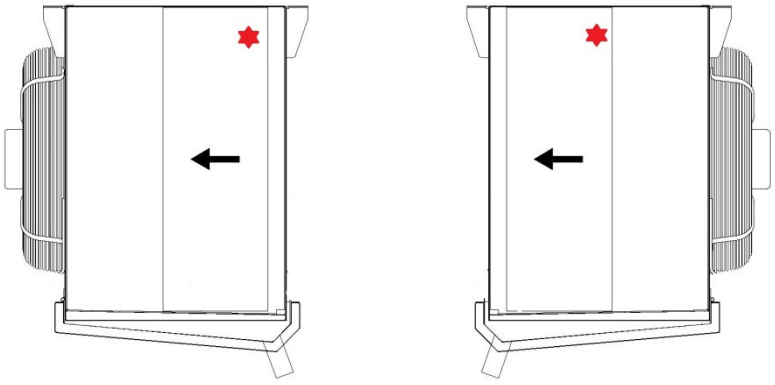


Proposed defrosting sensor positioning

7.3.3. Electric Defrost

- With several units per room with electric defrosting alternating defrosting should be avoided, as otherwise reciprocal influences can have a negative effect here.
- Defrost may result in a slight increase in the surface and ambient temperatures. High surface temperature during drip time may cause humidity release to the room.
- Group defrosting is recommended instead of alternating. Several units are grouped here in a defrosting group. If a group is in defrost, the other groups must be switched off.
- A separate control of the coil and tray defrosting is possible (see note in electric connection plan).

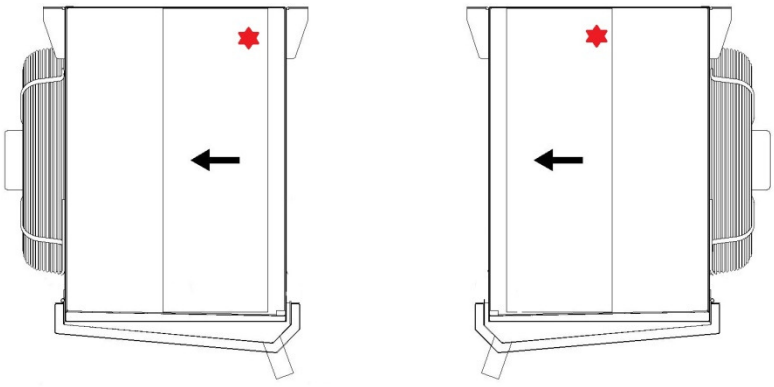
- With average usage conditions a reduced defrosting capacity in the coil can be adjusted with a simple wiring change .



Proposed defrosting sensor positioning

7.3.4. Hot Gas Defrost

- With defrosting hot gas it must be ensured that at the point of defrosting enough other consumers are in the cold operation so that a big enough hot gas volume is available.
- The reciprocal influences of units in the refrigeration and cooling units in defrosting operation in conjunction with short defrosting times with hot gas operation are therefore limited to a low range of effect. These influences result on one hand from the extraction of the heat from the units to be defrosted and therefore in a defrost delay, and on the other hand in an additional stress with heat and moist air on the units in cooling/refrigerating operation.



Proposedhot gas defrosting sensor positioning

7.3.5. Water Defrost

- Actual defrost times must be determined from careful observation of defrost operation and adherence to the previously mentioned guidelines.

- Frost is usually heaviest on the air-entering side of the coil, and inspection of fins on this side can usually be used to determine if complete defrost has occurred.

- Periodic observation of the defrost cycle throughout the year is necessary to maintain a properly operating defrost system.

- If more than fifteen minutes is required to completely remove frost, it is an indication that something may be wrong, such as inadequate water supply.

- The frequency of defrosting will seldom exceed once per day for storage rooms with average traffic. Small rooms with heavy service may require a defrost cycle twice per day and only in unusual circumstances will more than two be required.

- Water flow rate is controlled by adjusting the balancing valve at each unit. Adjust flow rate to fully saturate the coil fin surfaces in defrost water, making sure not to overflow the distribution pan, which can result in undesirable splashing.

- In some areas, the water pressure may become very low during daytime hours due to usage in the same building or neighborhood. In such instances, it may be necessary to set the timer to defrost when adequate water pressure isavailable.

Water supply should be pressurizedbetween 1 barand 1,5 bar.

7.4. Shutting Down

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

Danger of cutting off, pulling in!

There is a danger of cutting off fingers on the rotating fan blades, injury hazard for the hands and pulling in danger for loose elements such as hair, necklaces or clothing parts.

Do not operate fans without guard grille. Pinch/trap point hazard!

With automatic fan start during maintenance work there is a danger of pinching/trap- ping for the hands and fingers.

CAUTION

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

WARNING

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).***

NOTICE

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

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.

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

8.2. Fan motor Maintenance

- Regarding the bearings, the fans are maintenance-free for 30000-40000 hours under normal operating conditions.
- 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.

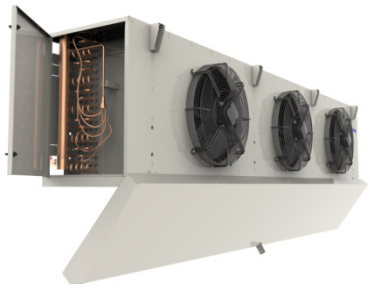
Follow to Initial Commissioning before operating the product after maintenance.

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.

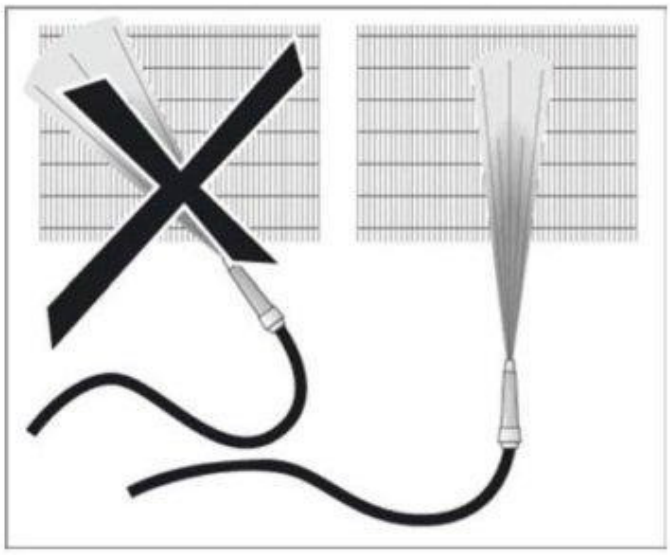
8.4. Cleaning

- Accessories with hinged can make cleaning easier.



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



The cleaning operation must be done parallel to fin surface.

Cleaning Up the Fans

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

- Electrical connections and fan motors should not be wetted during cleaning

9. TROUBLESHOOTING

Faults	***Possible Causes***	***Remedy***
Unit capacity not achieved	Fans are not running properly	Repair or change fans
	Polluted coils	Clean
	Different brine working pressure	Adjust brine pressurising values to reference values
	Heat exchanger is very dirty, frosted, iced on the air side	Clean, defrost heat exchanger
Fan motor is not working	Fan blade stuck	Enable fan to rotate freely
	Power supply cut off	Fix power supply
Unusual noise	Defective Fan bearing	Replacebearing or fans
Vibration	Defective fan blades	Modify or change fan blades
	Fan fixtures loosened	Tighten the fixtures
Working fluid escaping	Unit working fluid-carrying components leaking	Switch off working fluid feed and fans, close leak

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