Manual	**M 34**
Issue	**05.98**
Supersedes	----.----

SPLIT SYSTEM

Operating,

installation and

Maintenance Manual

Air/air split systems

Direct expansion false-ceiling horizontal ductable internal sections

Scroll compressors

AIR BLUE
air conditioning

ICIM
ISO 9002-Cert.N.0603/0

TECHNICAL DATA

MODEL		21	31	36	41	61	81	91	101	141	161
Cooling											
Total capacity	kW	6.0	9.2	10.8	13.1	16.0	19.3	23.6	33.5	41.5	49.3
Sensible capacity	kW	4.4	6.8	8.0	9.7	11.8	14.3	17.5	24.8	30.7	36.5
Compressor power imput	kW	1.4	2.2	2.5	3.1	3.8	4.6	5.6	7.8	9.7	11.3
Heating											
Heating capacity	kW	5.7	8.7	10.4	12.5	15.2	18.6	22.9	32.2	39.9	47.4
Compressor power imput	kW	1.4	2.1	2.5	3.0	3.5	4.4	5.4	7.5	9.3	10.9
OUTDOOR UNIT											
Compressor type		Scroll hermetic	Scroll hermetic	Scroll hermetic	Scroll hermetic	Scroll hermetic	Scroll hermetic	Scroll hermetic	Scroll hermetic	Scroll hermetic	Scroll hermetic
Oil charge	Kg	1.0	1.1	1.1	3.0	3.5	4.4	4.0	4.0	4.0	4.0
Condenser type		Finned coil	Finned coil	Finned coil	Finned coil	Finned coil	Finned coil	Finned coil	Finned coil	Finned coil	Finned coil
Max operating pressure	bar	27	27	27	27	27	27	27	27	27	27
Fan type		Axial	Axial	Axial	Axial	Axial	Axial	Centrifugal	Centrifugal	Centrifugal	Centrifugal
Fan motor nominal power	n°xkW	1 x 0.14	1 x 0.14	1 x 0.14	1 x 0.37	1 x 0.37	1 x 0.37	1 x 0.53	1 x 0.53	2 x 0.53	2 x 0.53
Fan type		Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Axial	Axial	Axial	Axial
Fan motor nominal power	n°xkW	1 x 0.52	1 x 0.52	1 x 0.52	1 x 1.1	1 x 1.1	1 x 1.1	1 x 1.1	1 x 1.1	2 x 3.0	2 x 3.0
INDOOR UNIT											
Fan type		Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal
Speed number	n°	3	3	3	3	3	3	1	1	1	1
Nominal power input	kW	0.09	0.42	0.42	0.6	0.6	0.6	0.75	1.1	1.1	1.5
Max available static pressure	Pa	70	125	90	167	120	95	72	80	72	82

CAPACITY REFERRED TO: COOLING: evaporator air inlet 26 b.s / 19 b.u. °C; ambient air temperature 35 °C. HEATING: ambient air temperature 8 °C DB, 6 °WB; condenser air inlet 20 °C

ELECTRICAL DATA

MODEL		21	31	36	41	61	81	91	101	141	161
OUTDOOR UNIT											
Maximum absorbed power (1)	kW	2.1	3.1	3.6	4.5	5.6	6.6	8.1	11.2	14.3	16.5
Maximum absorbed current (2)	A	14.4	20.2	9.8	12.5	14.5	16.1	20.9	27.5	35.5	41
Maximum starting current	A	45.6	76.6	44.1	52.7	61.2	72.2	96.7	129.7	162.4	192
Max. absorbed power mod. CF(1)	KW	2.5	3.5	4.0	5.2	6.3	7.3	8.7	11.8	16.2	18.5
Maximum absorbed current mod. CF (2)	A	16.5	23.0	12.7	14.0	16.0	17.7	21.5	28.1	36.5	42.0
Maximum starting current mod.CF	A	48.5	79.5	47.0	54.0	63.0	74.0	97.0	130.0	165.0	195.0
Compr. nominal. absorb. power*	kW	1.4	2.2	2.5	3.1	3.8	4.6	5.6	7.8	9.7	11.3
Compr. nominal. absorb. power**	KW	1.4	2.1	2.5	3.0	3.5	4.4	5.4	7.5	9.3	10.9
Compr. nominal. absorb. current*	A	6.8	10.1	4.7	6.0	7.5	8.2	11.5	14.1	16.8	19.9
Compr. nominal. absorb. current**	A	6.6	9.9	4.6	5.9	7.2	7.7	11.2	13.7	16.2	19.1
Fan motor nomin. abs. power	n°xkW	1 x 0.14	1 x 0.14	1 x 0.14	1 x 0.37	1 x 0.37	1 x 0.37	1 x 0.53	1 x 0.53	2 x 0.53	2 x 0.53
Fan motor max. absorbed current	n°xA	1 x 0.62	1 x 0.62	1 x 0.62	1 x 1.7	1 x 1.7	1 x 1.7	1 x 2.7	1 x 2.7	2 x 2.7	2 x 2.7
Fan motor nomin. abs. power mod.CF	n°xkW	1 x 0.52	1 x 0.52	1 x 0.52	1 x 1.1	1 x 1.1	1 x 1.1	1 x 1.1	1 x 1.1	1 x 3.0	1 x 3.0
Fan motor max. absorb. current mod.CF	n°xA	1 x 3.5	1 x 3.5	1 x 3.5	1 x 3.3	1 x 3.3	1 x 3.3	1 x 3.3	1 x 3.3	1 x 6.4	1 x 6.4
Electric supply	V/Ph/Hz	230/1/50		400/3+N/50				400/3+N/50			
Electric supply auxiliary	V/Ph/Hz	230/1/50						230/1/50			
INDOOR UNIT											
Fan motor nom.absorbed power	KW	0.09	0.42	0.42	0.60	0.60	0.60	0.75	1.1	1.1	1.5
Fan motor max. absorbed current	A	1	3.7	3.7	5.5	5.5	5.5	2.0	2.7	2.7	3.8
Electric supply	V/Ph/Hz	230/1/50						400/3/50			
Electric heater power	KW	1.5	1.5	1.5	5.0	5.0	5.0	5.0	5.0	10.0	10.0
Electric heater absorbed current	A	6.5	6.5	6.5	7.2	7.2	7.2	7.2	7.2	14.5	14.5
Electric heater power supply	V/Ph/Hz	230/1/50		400/3/50				400/3/50			

(1) Referred to maximum declared operating conditions (2) Referred to cut-off compressor internal protection

* DATA REFERRED TO: COOLING: user air inlet 26°C BS 19°C BU ; ambient air temperature 32°C. ** DATA REFERRED TO: HEATING: ambient air temperature 8 °C DB, 6 °WB; user air inlet 20°C

CONTENTS

THE SPLIT SYSTEM SERIES

The split system air-conditioner and heat pump series is available in several sizes with cooling capacities ranging from 6.0 to 49.0 kW in the following versions and combinations:

ALFA LE / ALFA CF LE + UTA
Condensing unit cooled by air with axial flow or centrifuge fans (outdoor section) + terminal unit for air treatment with direct expansion (indoor section).

ALFA LE HP / ALFA CF LE HP + UTAH
Condensing unit with cycle reversal with axial flow or centrifuge fans (outdoor section) + terminal unit for air treatment with heat pump (indoor section).

FIELD OF APPLICATION

SPLIT SYSTEM air-conditioners are units with two sections, designed and made for residential and commercial applications that are small in size and easy to install.
They are recommended for use within the operating limits given in paragraph 4.7. of this manual.

1. GENERALLY

- At the time of installation or when work needs to be done on the air-conditioner, it is necessary to keep strictly to the rules given in this manual, observe the instructions on the unit and anyhow take all the relevant precautions;
- The pressure in the chiller circuit and the electrical components can create hazardous situations during installation and maintenance work;
- Any work on the unit must therefore be done by qualified personnel. Non-qualified personnel can carry out simple maintenance work such as cleaning or replacing filters;
- NEVER move the machine on your own if it weighs more than 35 kg;
- If the appliance needs to be dismantled, protect your hands with work gloves, and wait for the heat exchanger to cool down;
- The fans can reach dangerous speeds, put neither objects nor your hands into the fans;
- Failure to comply with the rules given in this manual and any modification to the unit not authorized beforehand immediately forfeit warranty.

Att.: Before doing any work on the unit, make sure you have cut off the power supply.

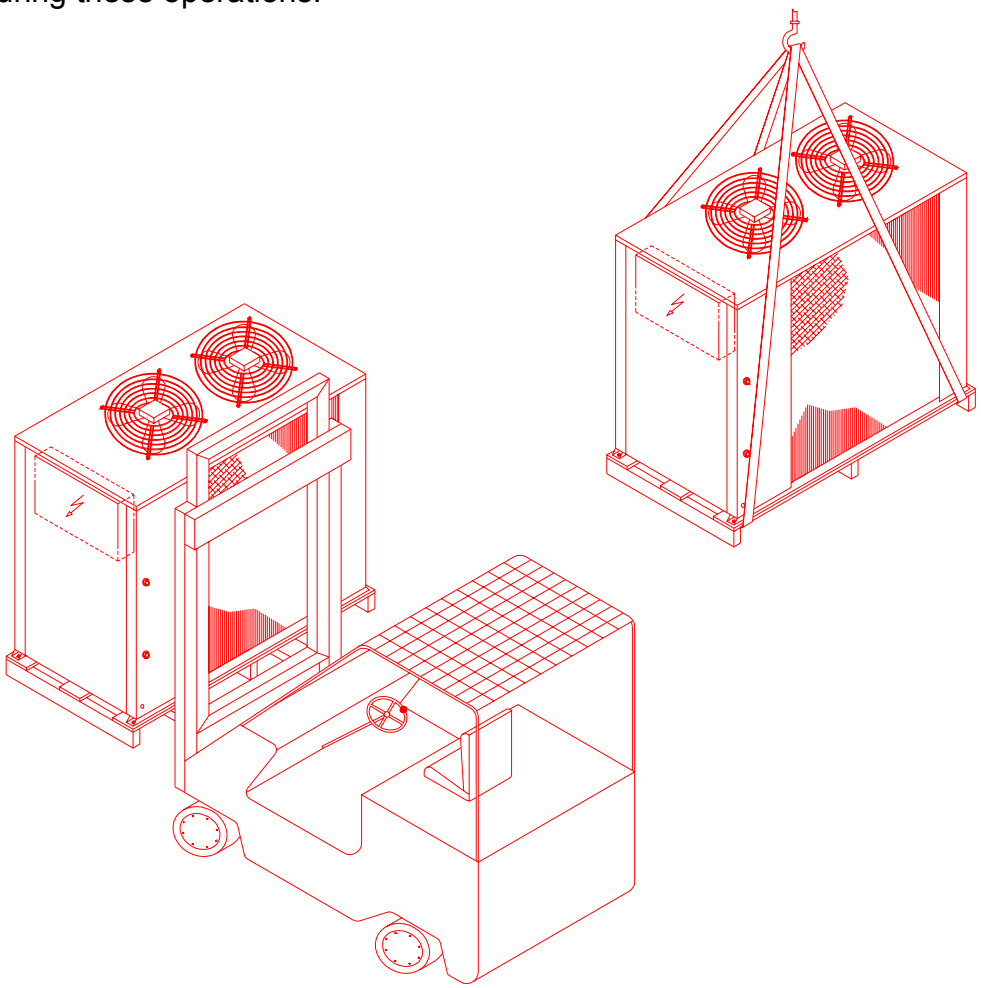
2. INSPECTION, HANDLING, LIFTING

2.1. Inspection

When you receive the unit, check its integrity: the machine left the factory in perfect condition. Any damage must be claimed from the carrier immediately and noted on the Delivery Sheet before signing it.
Air Blue or its Agent must be notified about the extent of the damage as soon as possible.
The Customer must draw up a written report on any significant damage.

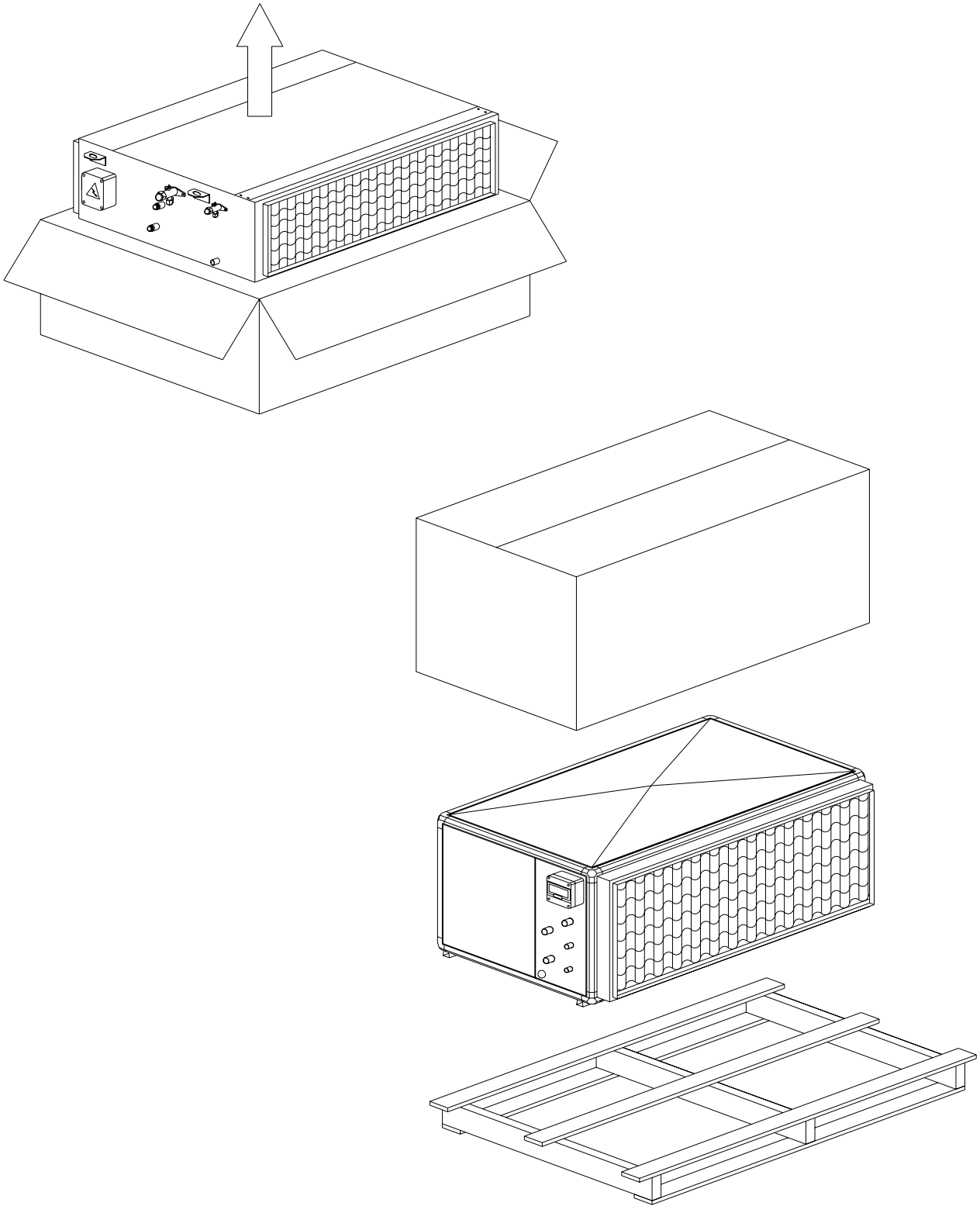
2.2. Lifting and Handling

When unloading and positioning the unit, take the utmost care to avoid amy sharp movements or jolting. Internal handling should be done carefully and gently, without using the machine's components as strong points.
THE OUTDOOR UNIT can be lifted with the aid of a fork-lift truck, inserting the forks into the supporting pallet or, alternatively, by slinging it with belts, taking care not to damage the sides and cover of the unit (as shown in the figures below). In this connection, refer to the weights given in the dimensional drawings. It is necessary to take care not to tilt the machine during these operations.



Att.: Throughout lifting, make sure you have securely anchored the unit, to prevent it accidentally tipping over or falling.

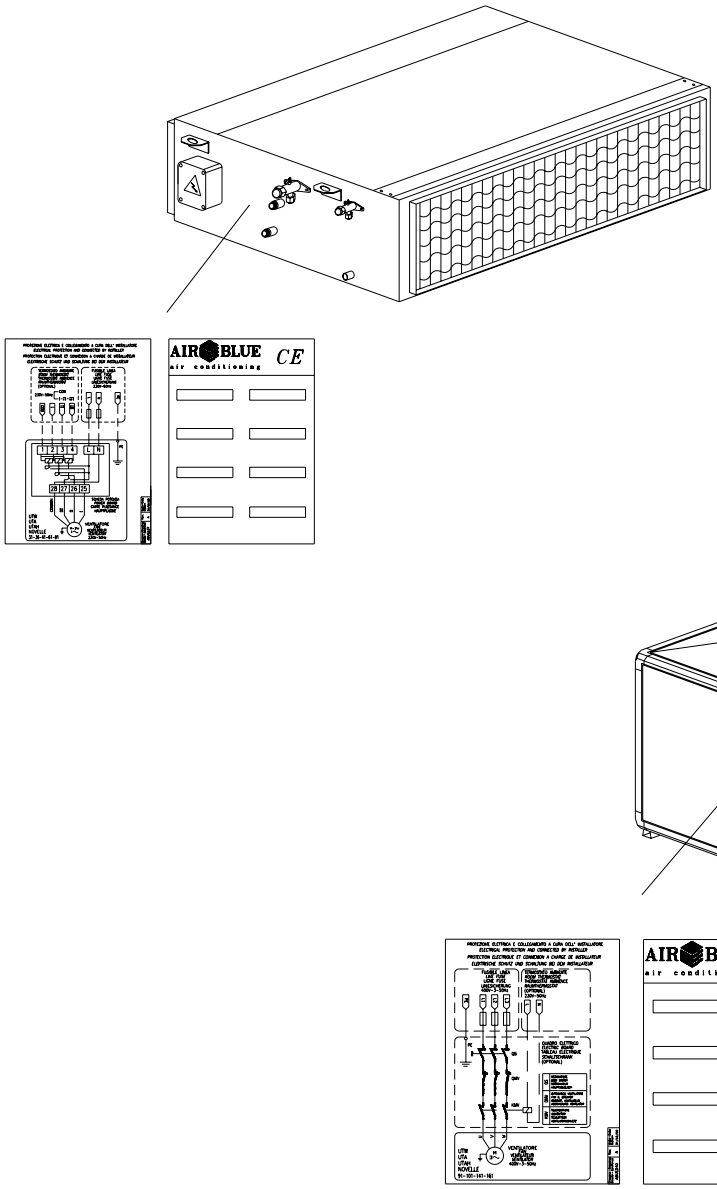
THE INDOOR UNIT is shipped, transported and delivered closed in protective packing that must be kept sound until positioning at the place of installation. Check there is no damage and that the machine's marking corresponds to the model ordered.

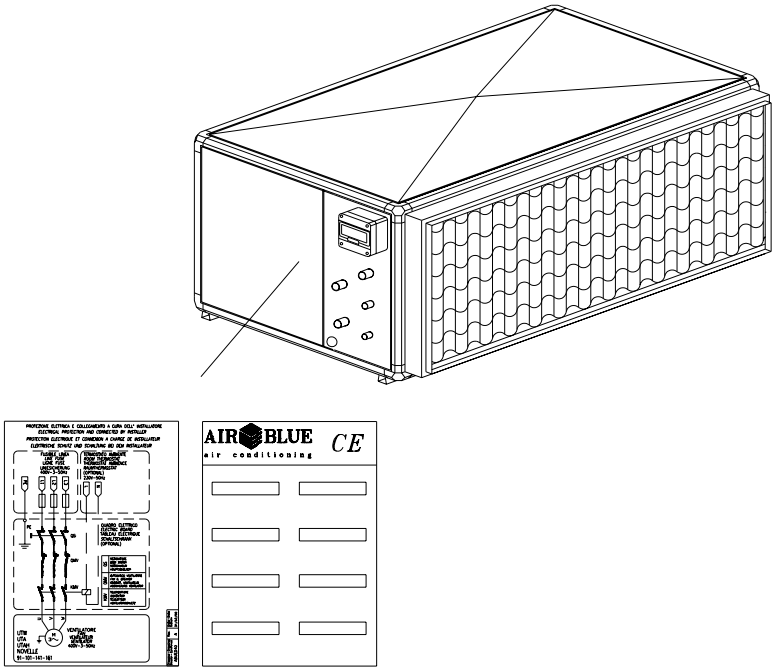


An identification label is affixed on each single machine showing the:

- Manufacturer's data;
- Machine model;
- Identification code;
- Technical data;
- Wiring diagrams.

In the event of damage or the wrong marking, call your dealer. Handling must be done with the utmost care without using the machine's components as strong points.





2.3. Unpacking

The unit's packing must be removed carefully without causing any damage to the machine. The packing is composed of materials of different nature: wood, cardboard, nylon, etc.
It is a good rule to keep them separately and to deliver them for disposal and possibly recycling to specialized companies, thereby reducing their environmental impact.

2.4. Positioning

2.4.1. Outdoor unit

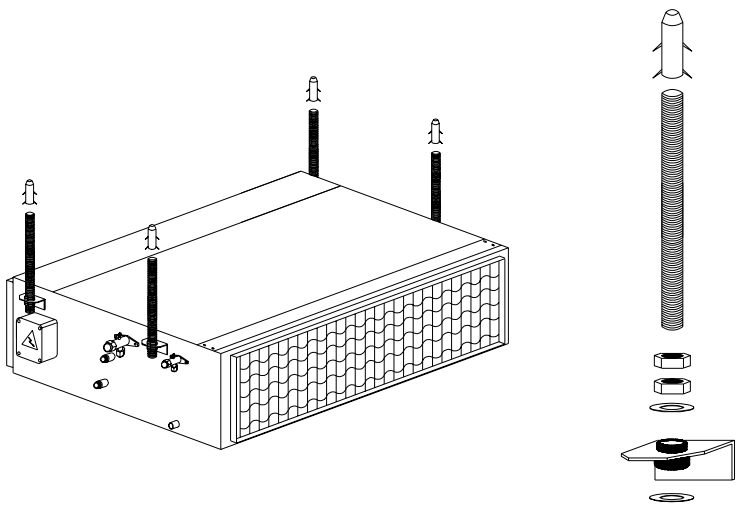
It is wise to pay attention to the following points to determine the best site for installing the unit and its connections:
- location of the electricity supply;
- accessibility for maintenance or repairs;
- solidity of the supporting surface;
- ventilation of the air cooled condenser;
- possible noise reverberation.

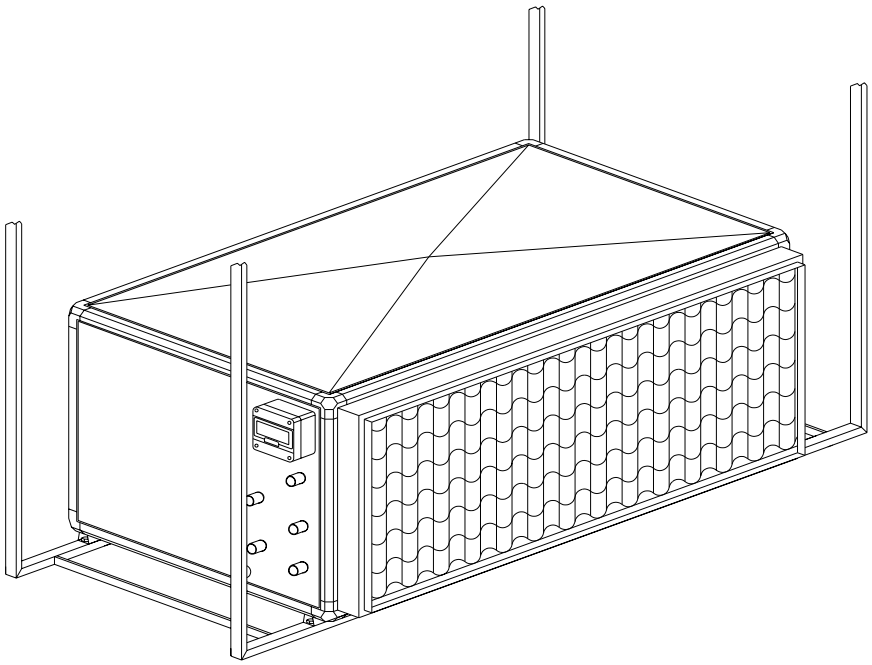
ALFA LE units are designed and made for outdoor installations (patios, gardens). Therefore, they must not be covered with roofing or positioned close to walls (even if they only partially cover the unit) so as to prevent the possibility or air recirculating.
Whereas, ALFA CF LE units are designed for indoor installation. In the case of outdoor installation the unit must be suitably protected against the rain.
It is a good rule to create a proper base of suitable size for the unit. This precaution is essential when locating the unit on unstable ground (various types of land, gardens, etc.).
These units transmit a low level of vibration to the ground. However, it is advisable to fit a rigid rubber band between the supporting surface and the base frame, or to use the vibration-damping supports supplied by the manufacturer (on request).

Att.: It is moreover wise to avoid installation in confined spaces to avoid reverberation.

2.4.2. Indoor unit

The indoor unit should be positioned so as not to impair air intake and emission.
For models 21-81 drill for wall plugs, secure the unit with nut and lock nut. Adjust closure to the ceiling so as to give the unit a slight slant towards the outlet pipe to aid condensation water drainage.
For models 91-161 positioning has essentially been envisaged on the floor. If you wish to position the unit on the ceiling, prepare a system of brackets like the one in the figure. The condensation water drainage outlet is positioned under the pan.





3. INSTALLATION

3.1. Outdoor unit

3.1.1. Installation space

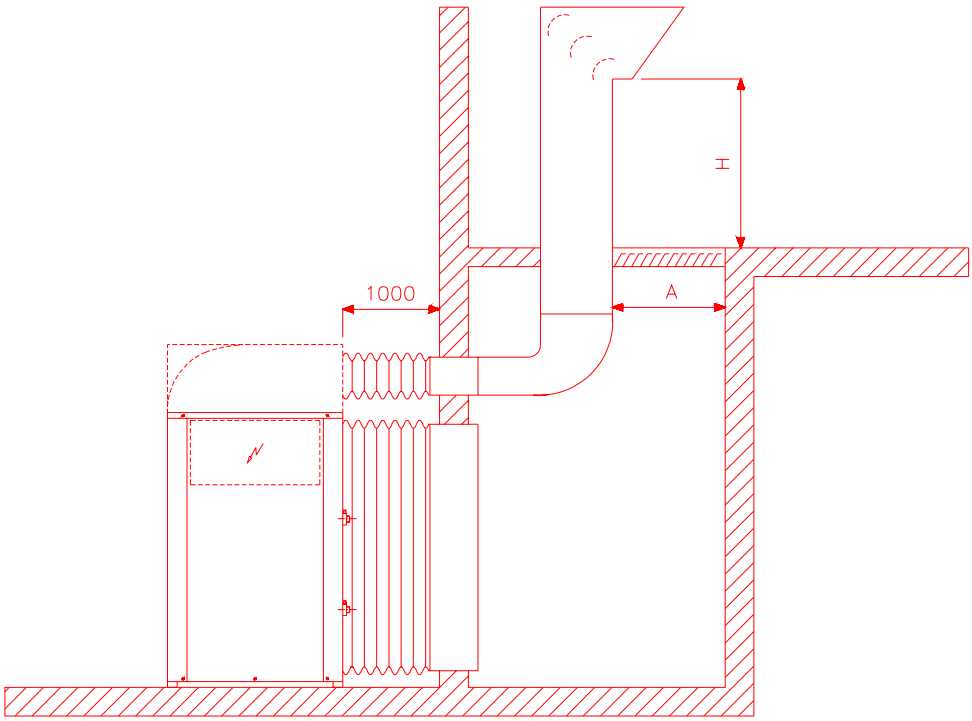
It is extremely important to avoid re-circulation between intake and delivery, or the unit's performance will suffer and it may even stop working. In this connection, it is necessary to ensure service space (refer to the dimensional drawings). Units in the ALFA series are designed and made for outdoor installation. Units in the ALFA CF series are designed and made for indoor installation. Depending on the solution adopted, it is wise to keep to the following provisions:

→ *Outdoor installation of the ALFA LE unit*

It is extremely important to ensure an adequate volume of air entering and leaving the condensing coil.

It is preferable not to install the unit in areas where water may stagnate (or fall from gutters) or where snow may accumulate (e.g. corners of buildings with sloping roofs: in these cases raise the machine off the ground with a base of approximately 20-30 cm depending on the case. The place of installation must have no leaves, dust, threads, etc, that could clog or cover the coils. In very windy areas, install the units (mod. 21-81) with the air flow horizontal with the direction of the wind.

→ *Indoor installation of the ALFA CF unit*



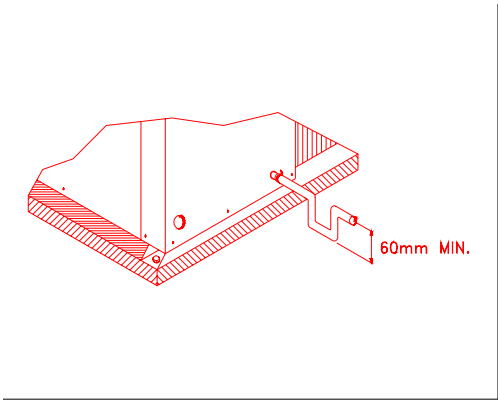
TECHNICAL ROOM INSTALLATION

Both the intake and the delivery of the condensing coil can be ducted for this type of installation. The ducting must be connected to the outside through appropriate holes or

existing openings in the walls. If the intake is ducted, the size of the duct must be the same as that of the condensing coil. The ducts must be appropriately sized in relation to their length and dimensions. In this connection, the units are manufactured in a standard version with an available head of 50 Pa. If greater load losses are envisaged, you should call our Engineering Department.
If the unit needs to be installed in technical rooms or compartments it is necessary to use ducting that reduces the speed in order to limit losses of load and noise. The free air flow section must be at least twice that of the machine inlet. Between the outlet and the surface of least cross-section there must always be H min. equal to 2 metres, verifying that H » 2A (see the Figure on this page).

3.1.2. Condensation outlet
(only ALFA CF LE units with heat pump)

ALFA CF LE units with a heat pump are equipped with a condensation collection basin at the base of the coil. This pan has the job of collecting the condensation that forms during normal operation with the heat pump and during defrosting cycles. For units installed indoors, it will be necessary to have an outlet pipe, fitted with a siphon, ensuring a slope of at least 3% in order to avoid condensation remaining (see the figure below). The siphon will need to be at least 50-60 mm deep to prevent the pressure drop created by the fan from hindering drainage of the condensation and causing uptake of drain gases. For units installed outdoors, the outlet can be open and, where possible, it is wise to make a gravel trench.



3.2. Indoor unit

The indoor section can be installed in a false ceiling with ducting or emission of air directly into the room for *models 21 ÷ 81* and either on the ceiling or floor for *models 91 ÷ 161* in both cases it is necessary to ensure the following clearance:
- above or below the machine: sufficient room to permit removing the filters;
- air intake and delivery side: ensuring the necessary room for servicing the ducting, if needed.

The indoor section (*Mod. 21 ÷ 81*) must be mounted with special attention, taking care to angle the section by at least 10÷20 mm towards the hole to drain off the condensation.
In this connection, refer to the figures on page 13.

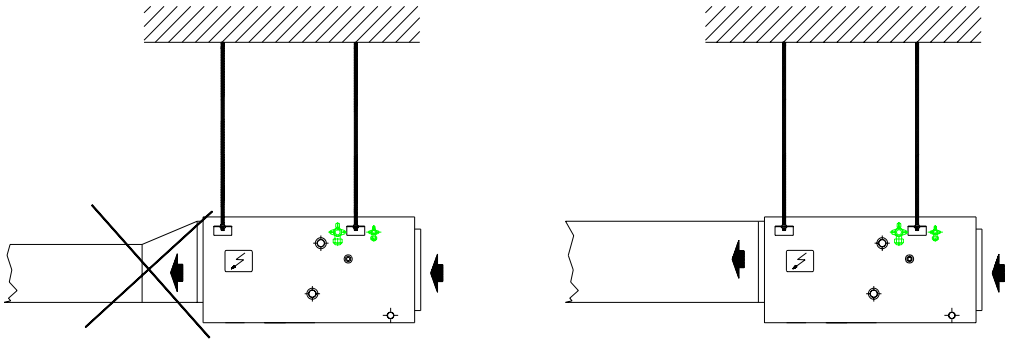
3.2.1. Ducting the indoor unit

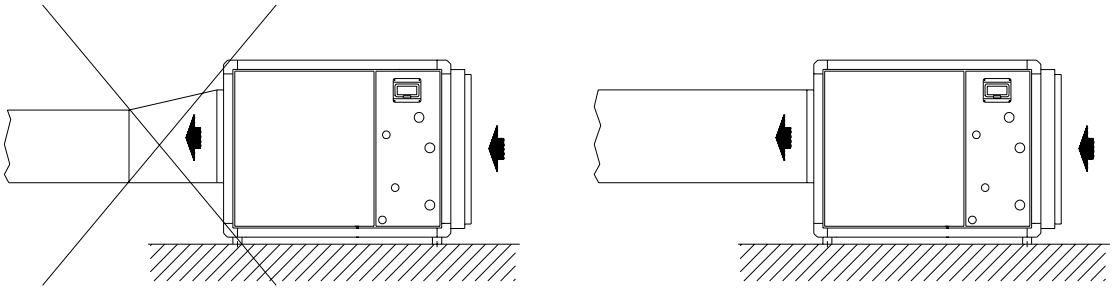
The ducting must be adequately sized.

For this reason the losses of load in the ducting must not exceed the useful head supplied by the fans (for special applications please call our Engineering Department). Otherwise the air flow rate would be insufficient and trouble could arise such as frosting on the coil (on cooling) or the safety devices tripping (on heating). During installation, therefore, measure the actual flow rate of air and, if necessary, inhibit operation of the lower operating speeds *(for mod. 21 ÷ 81).*

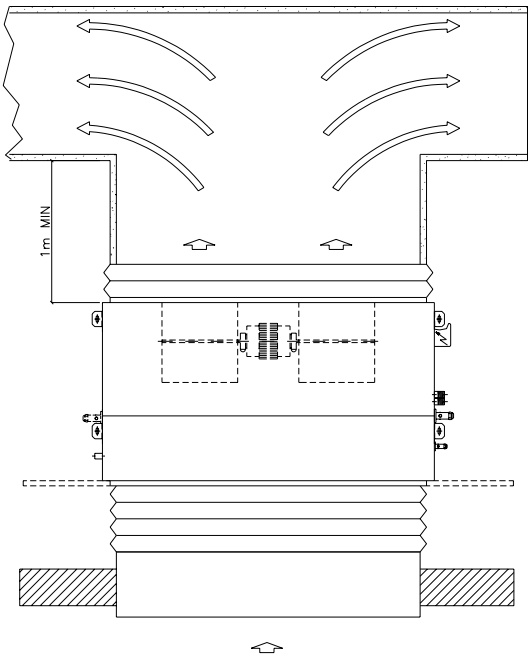
Correct ducting installation should conform to the following recommendations:

- The dimensions of the ducting must be at least equal to the flange on the intake and the fan openings on the delivery side;

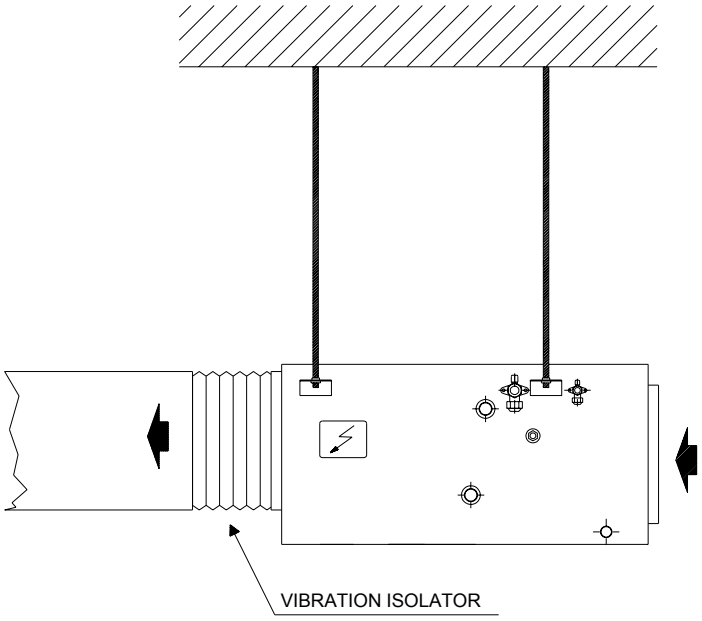


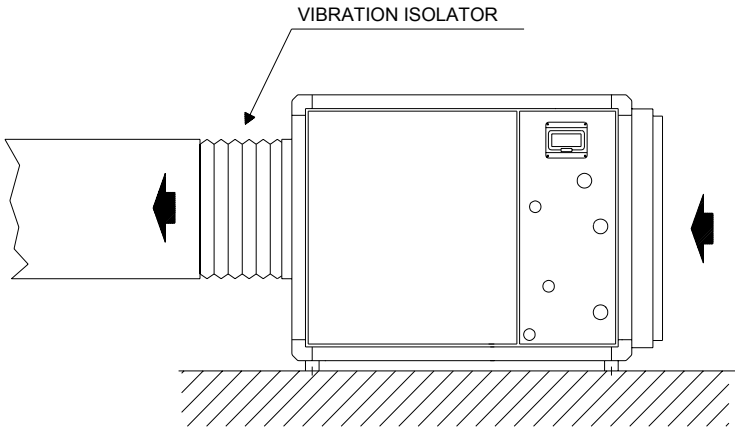


- There must be no branching at less than 1 metre from the delivery outlet; otherwise use deflectors or deadening (see the figure on this page);

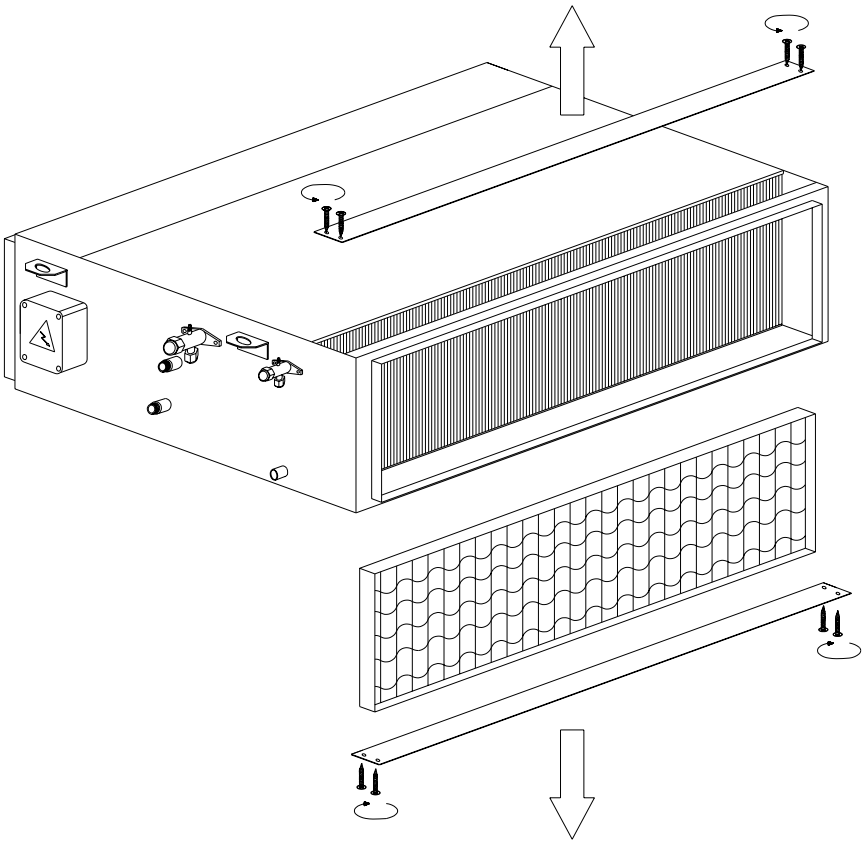


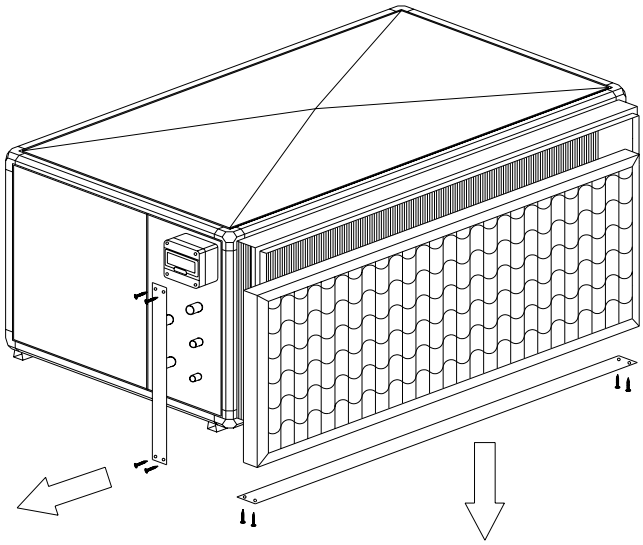
- The ducting must be connected to the unit with a vibration isolator in between in order to reduce the transmission of vibration from the unit to the ducting;





- The pick-up ducting should be connected to the appropriate flange, while the unit needs to be connected directly on the delivery;
- Always seal the joints so as to prevent air escaping from the ducting;
- Use insulated ducting to prevent condensation from forming;
- Always provide adequate clearance to be able to inspect the filter on the intake.





3.2.2. External air intake

External air may be taken in through the mixing section (supplied on request for *mod. 21 ÷ 81)* for units located in rooms at a lower pressure than the outside. The flow rate of external air should not exceed 25÷30% of the unit's flow rate to avoid problems of frost during operation as an air-conditioner in the wintertime.
It is always wise to fit a filter in the ducting of the external air intake.

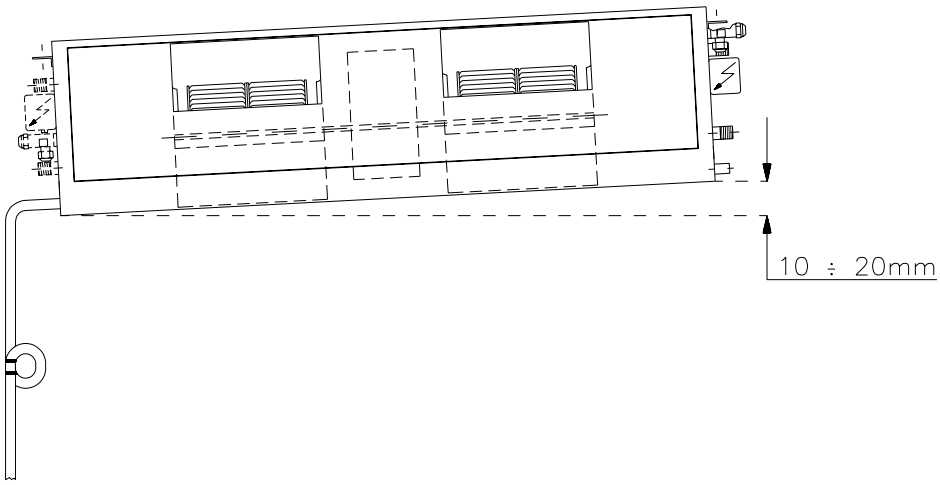
3.2.3 Removing and cleaning the filters

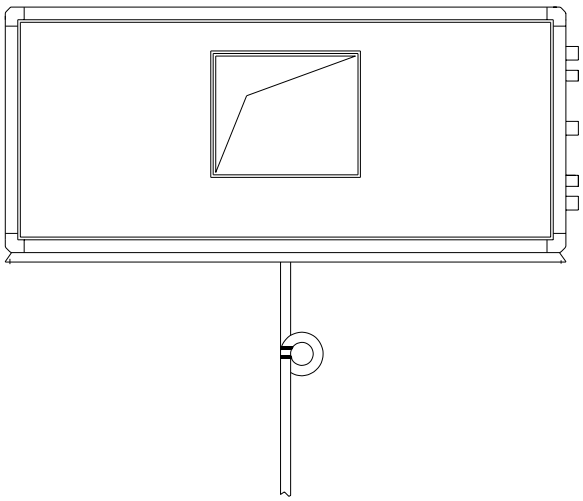
The filters need to be checked frequently to be able to see whether they have clogged up. It needs to be cleaned at least once a month or more often if the unit is installed in a very dusty place. Use a brush or preferably a vacuum cleaner for the cleaning. If the filter is damaged, request a genuine part. Remember to fit the filter back on before starting up the unit.

3.2.4 Discharging condensation

Indoor units are equipped with a condensation tray at the base of the coil. This pan is for collecting the condensation that forms during normal operation.

- The condensation drain pipe must *(for mod. 21-81)* be tilted downwards with no uphill sections or constrictions to permit a regular flow;
- The condensation outlet should be siphoned;
- The condensation outlet should be connected to a rainwater drainage network. Do not use water or sewage drains to prevent possible uptake of bad smells if the water in the siphon evaporates;





- At the end of the work, check condensation flows off easily by pouring water into the tray.

3.3. Chiller connections

The indoor and outdoor units need to be connected to each other with chiller pipes in order to operate.

3.3.1. Pipe routing, distance and maximum differences in level between sections

Chiller pipe routing is conditioned by the location of the sections and by the structure of the building.
In any case the pipes need to be as short as possible so as to minimize the amount of refrigerant in the chiller circuit.

Excess refrigerant could, due to the affinity between it and lubricating oil, cause it to dangerously migrate towards the compressor casing with the risk of this breaking at start-up.
For this reason a maximum length of the piping of 15 metres is admitted.
The maximum admitted difference in level between sections is 6 metres: higher values would lead to significant hydrostatic heads, with problems of supplying the thermostatic valve if the evaporating section were installed higher than the condensing section.
On vertical, rising sections, there must be siphons to help oil transfer. On vertical down-flowing sections there should be pits to prevent liquid refrigerant from being able to reach the compressor and damage it at start-up. On the horizontal sections of the suction line there should be a slope of at least 1% to help oil return to the compressor.
The diameter of the piping can be obtained from the Tables below according to the chosen model and the length of the connecting pipes.

RECOMMENDED DIAMETERS FOR R22

PIPE CONNECTIONS EQUIVALENT LENGTH [m]				
Ø mm	*ELBOW*	BEND	TEE	
			Main flow	Derived flow
12	0.70	0.40	0.3	0.8
16	0.76	0.48	0.3	0.9
18	0.80	0.50	0.3	0.9
22	1.00	0.60	0.4	1.2
28	1.20	0.80	0.5	1.5
35	1.70	1.00	0.7	2.1
42	1.90	1.20	0.8	2.4

RECOMMENDED DIAMETER [Ø mm]						
	10 m equivalent length		20 m equivalent length		30 m equivalent length	
Mod.	Suction line	Liquid line	Suction line	Liquid line	Suction line	Liquid line
21	16	12	18	12	22	12
31	16	12	18	12	22	12
36	16	12	18	12	22	12
41	18	12	22	12	28	12
61	18	12	22	12	28	12
81	18	12	22	12	28	12
91	22	16	28	16	35	16
101	22	16	28	16	35	16
141	28	16	35	16	42	16
161	28	16	35	16	42	16

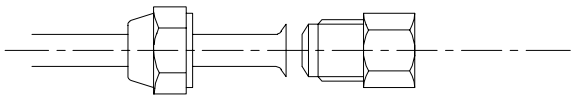
Our Engineering Department is at your disposal for any information in this connection, also if you need to make applications that come outside the above limits.

3.3.2. Laying pipes

Pipe laying is one of the most important operations for successful installation.
The pipes must be laid extremely carefully, without crushing them in any way. The pipes must be cut to size with a special pipe cutter. They then need to be thoroughly cleaned so as to eliminate any impurity or shavings. Dirt in the circuit can be extremely dangerous for the integrity of the system.
Bending must be done with a special pipe bender, using pulleys with races of the same size as the pipes.
The suction pipe must always be isolated.

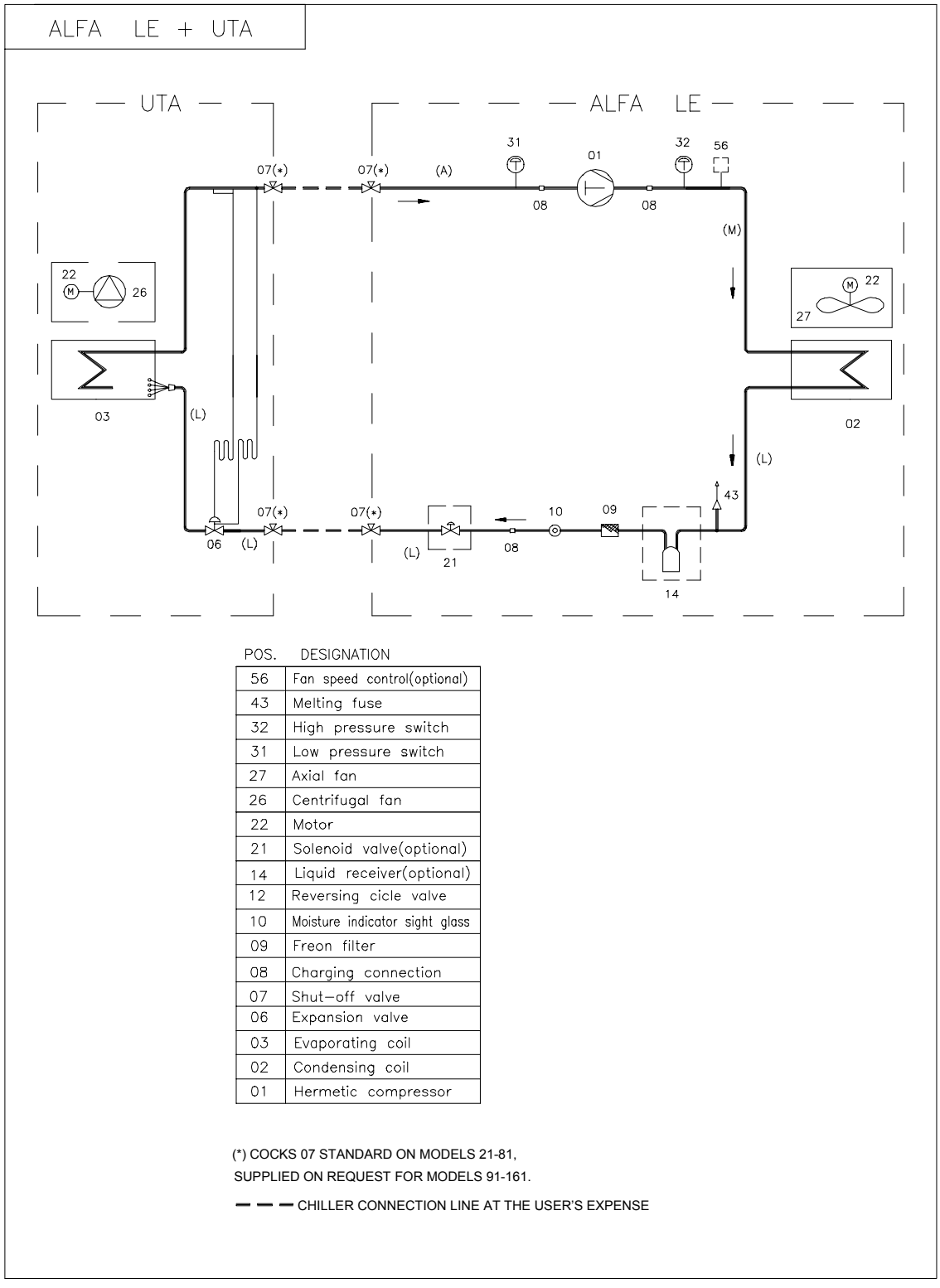
3.3.3. Connecting pipes

After laying the pipes, they need to be connected to both indoor and outdoor units. The connections are pipe unions complete with shut-off cocks for models 21-81 and are made by welding for models 91-161. For models 21-81 it will then be necessary to prepare a binder of the size mentioned at the ends of the pipes after inserting the pipe unions into the piping and applying filling connections at the ends of the pipes in the evaporating section (see the figure on this page).



After making the connections, it is necessary to apply a vacuum on the lines (recommended degree of vacuum: 1 mbar) with the above-mentioned filling connections and the ones already present in the evaporating section. At this stage you need to open the cocks on the condensing section and in the indoor unit at the chiller piping connection.
For models 91-161 the vacuum operation should be extended to the entire system.
The refrigerant gas will now be present throughout the chiller circuit.
At this stage you need to check the seal of the chiller connections with a leak finder using either flame or foam, or an electronic leak finder would be even better.

3.3.4. Chiller diagrams

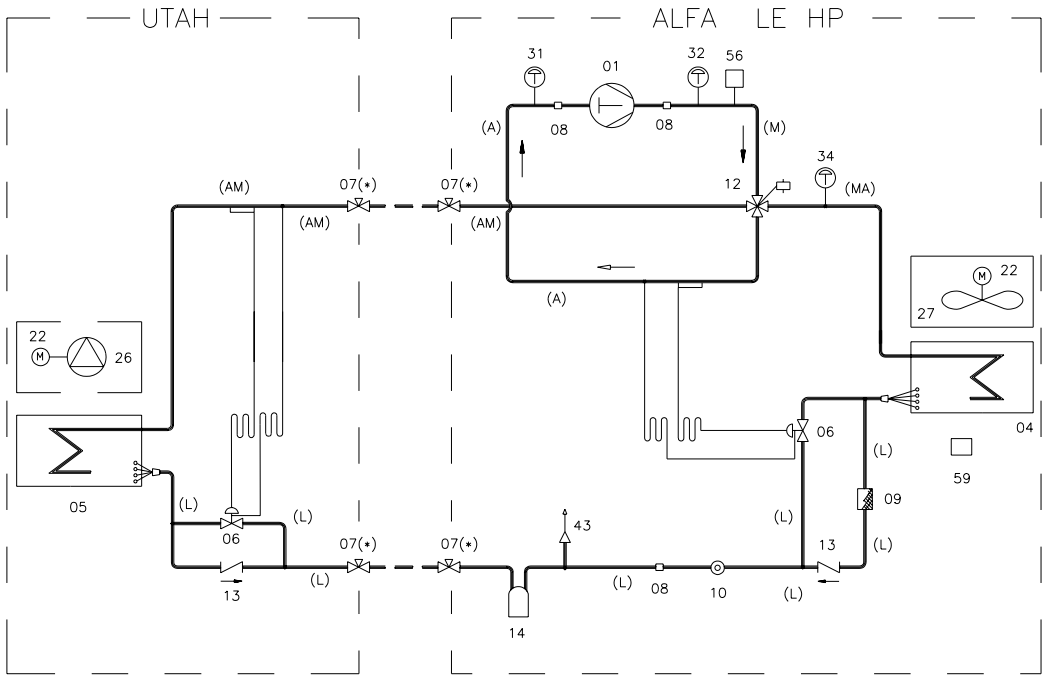


POS.	DESIGNATION
56	Fan speed control(optional)
43	Melting fuse
32	High pressure switch
31	Low pressure switch
27	Axial fan
26	Centrifugal fan
22	Motor
21	Solenoid valve(optional)
14	Liquid receiver(optional)
12	Reversing cicle valve
10	Moisture indicator sight glass
09	Freon filter
08	Charging connection
07	Shut–off valve
06	Expansion valve
03	Evaporating coil
02	Condensing coil
01	Hermetic compressor

(*) COCKS 07 STANDARD ON MODELS 21-81,
SUPPLIED ON REQUEST FOR MODELS 91-161.

— — — CHILLER CONNECTION LINE AT THE USER'S EXPENSE

ALFA LE HP + UTAH

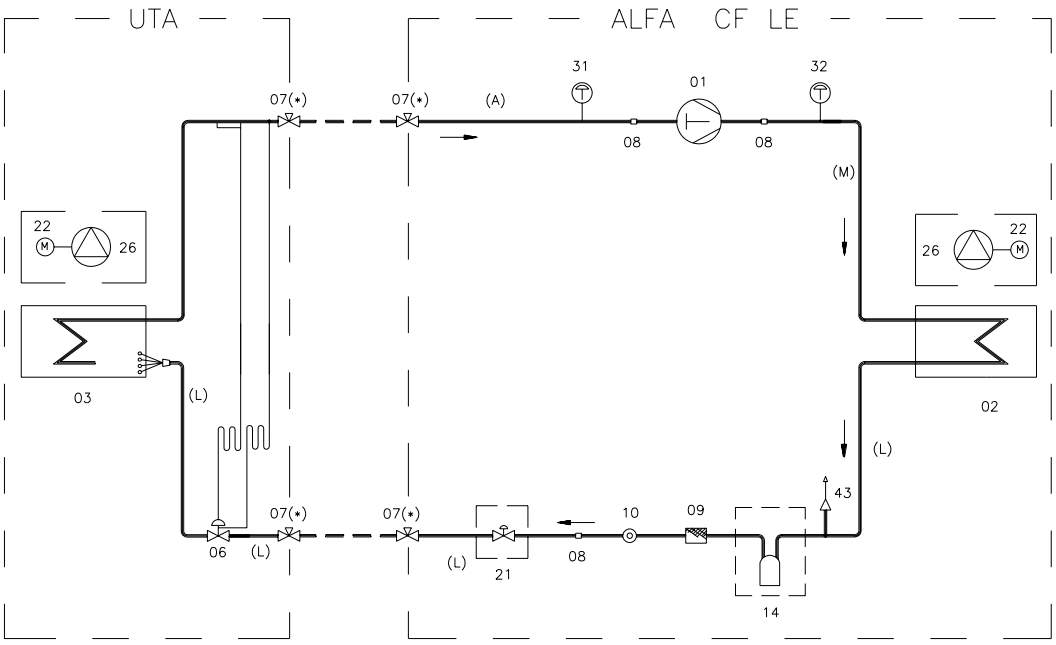


POS.	DESIGNATION
56	Fan speed control probe
59	Defrosting probe
43	Melting fuse
34	Defrost pressure switch
32	High pressure switch
31	Low pressure switch
27	Axial fan
26	Centrifugal fan
22	Motor
14	Liquid receiver
13	Check valve
12	Reversing cicle valve
10	Moisture indicator sight glass
09	Freon filter
08	Charging connection
07	Shut–off valve
06	Expansion valve
05	Evap / Cond. coil
04	Cond/evap coil
01	Hermetic compressor

(*) COCKS 07 STANDARD ON MODELS 21-81,
SUPPLIED ON REQUEST FOR MODELS 91-161.

— — — CHILLER CONNECTION LINE AT THE USER'S EXPENSE

ALFA CF LE + UTA

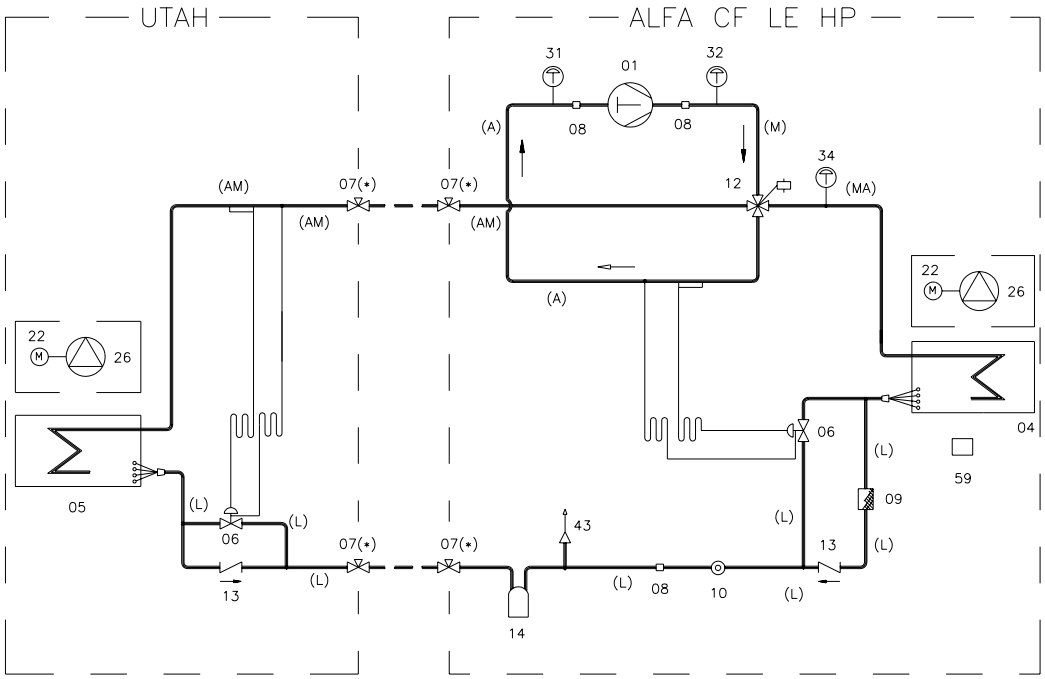


POS.	DESIGNATION
43	Melting fuse
32	High pressure switch
31	Low pressure switch
26	Centrifugal fan
22	Motor
21	Solenoid valve(optional)
14	Liquid receiver(optional)
12	Reversing cicle valve
10	Moisture indicator sight glass
09	Freon filter
08	Charging connection
07	Shut–off valve
06	Expansion valve
03	Evaporating coil
02	Condensing coil
01	Hermetic compressor

(*) COCKS 07 STANDARD ON MODELS 21-81,
SUPPLIED ON REQUEST FOR MODELS 91-161.

— — — CHILLER CONNECTION LINE AT THE USER'S EXPENSE

ALFA CF LE HP + UTAH



POS.	DESIGNATION	DENOMINAZIONE
59	Defrosting probe	Sonda di sbrinamento
43	Melting fuse	Tappo fusibile
34	Defrost pressure switch	Pressostato sbrinamento
32	High pressure switch	Pressostato alta pressione
31	Low pressure switch	Pressostato bassa pressione
26	Centrifugal fan	*Ventilatore centrifugo*
22	Motor	Motore elettrico
14	Liquid receiver	Ricevitore di liquido
13	Check valve	Valvola di ritegno
12	Reversing cicle valve	Valvola a quattro vie
10	Moisture indicator sight glass	Indicatore di umidita'
09	Freon filter	Filtro freon
08	Charging connection	Presa di carica
07	Shut-off valve	Rubinetto split
06	Expansion valve	Valvola termostatica
05	Evap / Cond. coil	Batteria evap/cond
04	Cond/evap coil	Batteria cond/evap
01	Hermetic compressor	Compressore ermetico

(*) COCKS 07 STANDARD ON MODELS 21-81,
SUPPLIED ON REQUEST FOR MODELS 91-161.

— — — CHILLER CONNECTION LINE AT THE USER'S EXPENSE

3.4. Electrical connections

3.4.1. Outdoor unit

Att.: Before doing any work on electrical parts, make sure there is no power.

Check that the supply voltage corresponds to the unit's nominal data (voltage, number of phases, frequency) shown on the plate on the machine.
For cable entry, use the diaphragm cable guides on the machine's upright and on the panel.

Att.: The cross-section of the cable and protection of the power supply line must be in conformity with the instructions on the wiring diagram.

The cross-section of the cable must be adequate for the maximum current drawn so as not to overheat the cable and for its length so as not to create an excessive drop in voltage.
Supply voltage must not vary by more than ±5% and the unbalance between phases must always be less than 2%.
Should this not be the case, call our engineering department to choose appropriate protection.

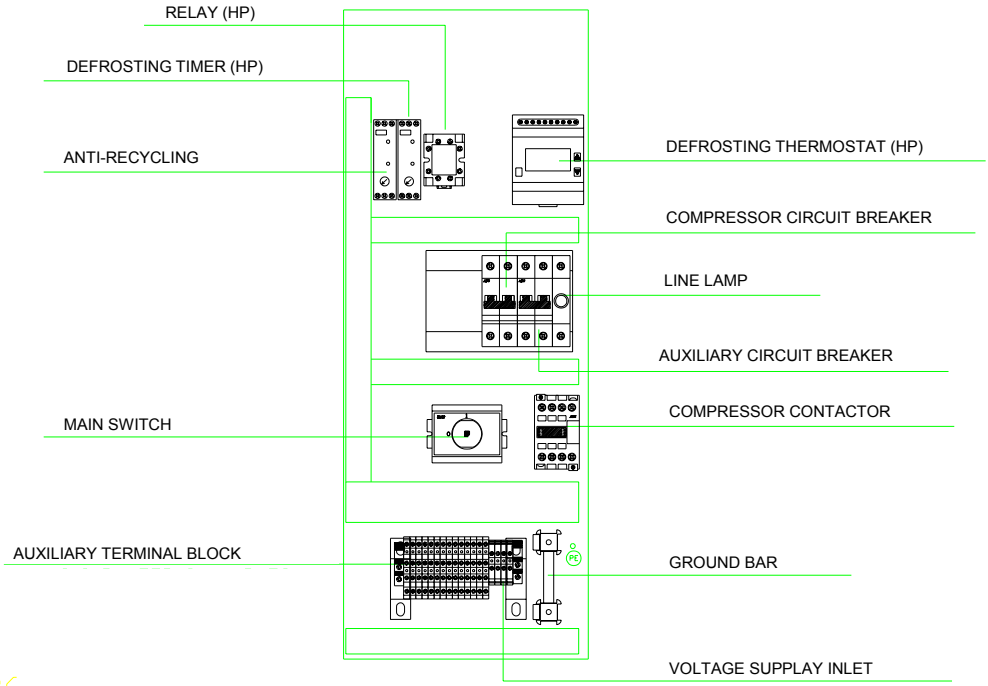
Att.: Operation must take place within the above-mentioned values, otherwise warranty is immediately forfeit.

The electrical connections must be made according to the information given on the wiring diagram enclosed with the unit.
Grounding is compulsory by law. The installer must connect the earth cable to the ground bar located in the electrical panel.
Supply of the control circuit is derived from the power line via a transformer located in the electrical panel. The control circuit is protected by an automatic main circuit breaker, and the base board by a fuse 5x20T 2A.
To prevent possible breakage of the scroll compressor if the rotor turns the wrong way (indicated by a loud noise), all the units with a three-phase supply (mod. 36-161) are equipped with an electronic device, known as a phase sequence relay, that prevents reverse rotation of the compressor by cutting off power to the microprocessor if the supply phase sequence is not correct.
The start enable signal from the relay (located in the electrical panel) is highlighted by a green LED coming on. Otherwise, it is necessary to swap over the connection of two phases on the terminal board.

→ *Electrical panel layouts*

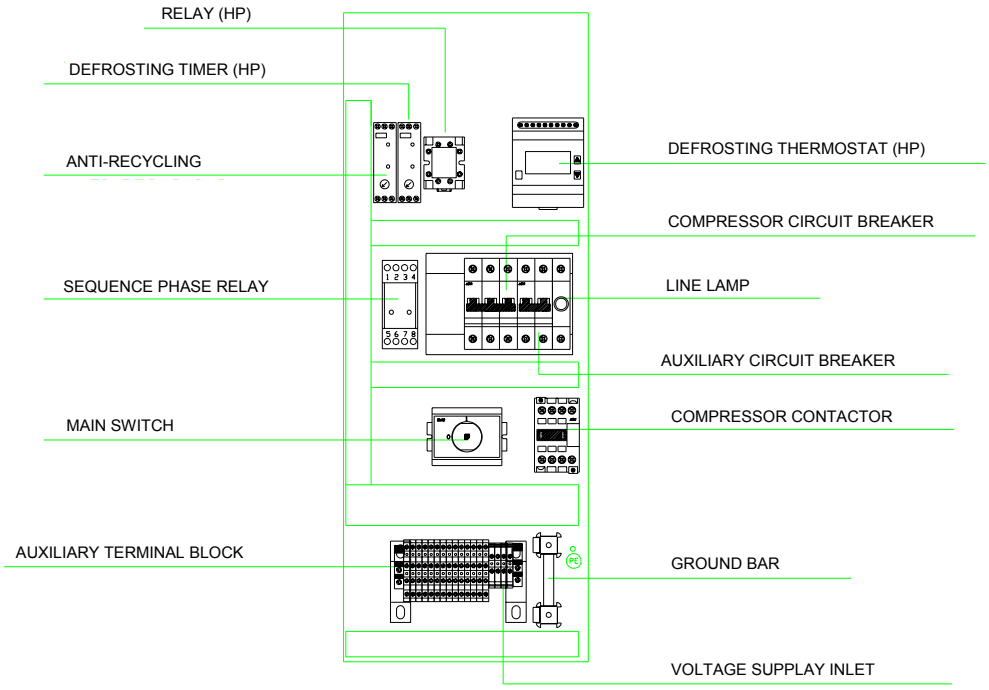
ALFA 21-31

ELECTRICAL PANEL LAYOUTS



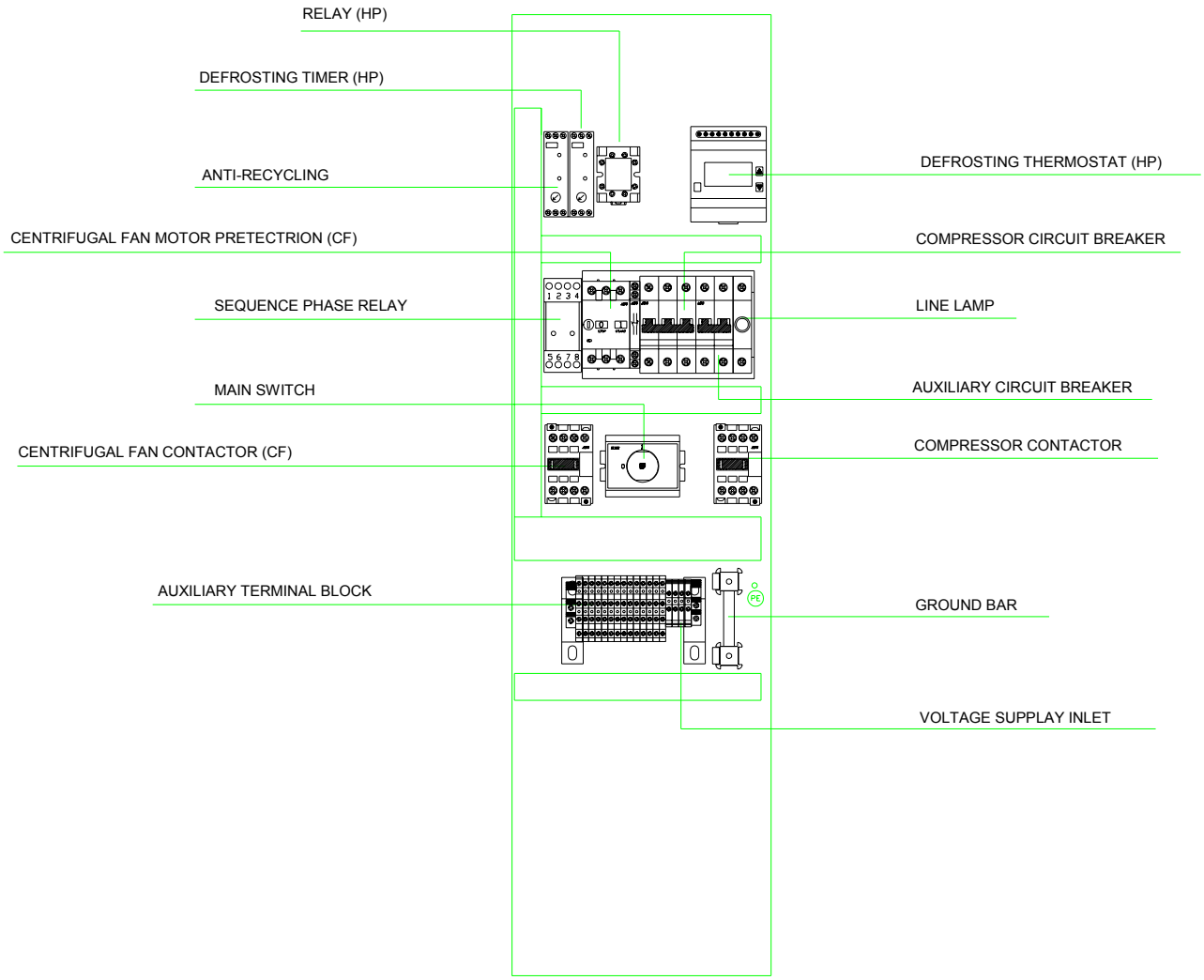
ALFA 36

ELECTRICAL PANEL LAYOUTS



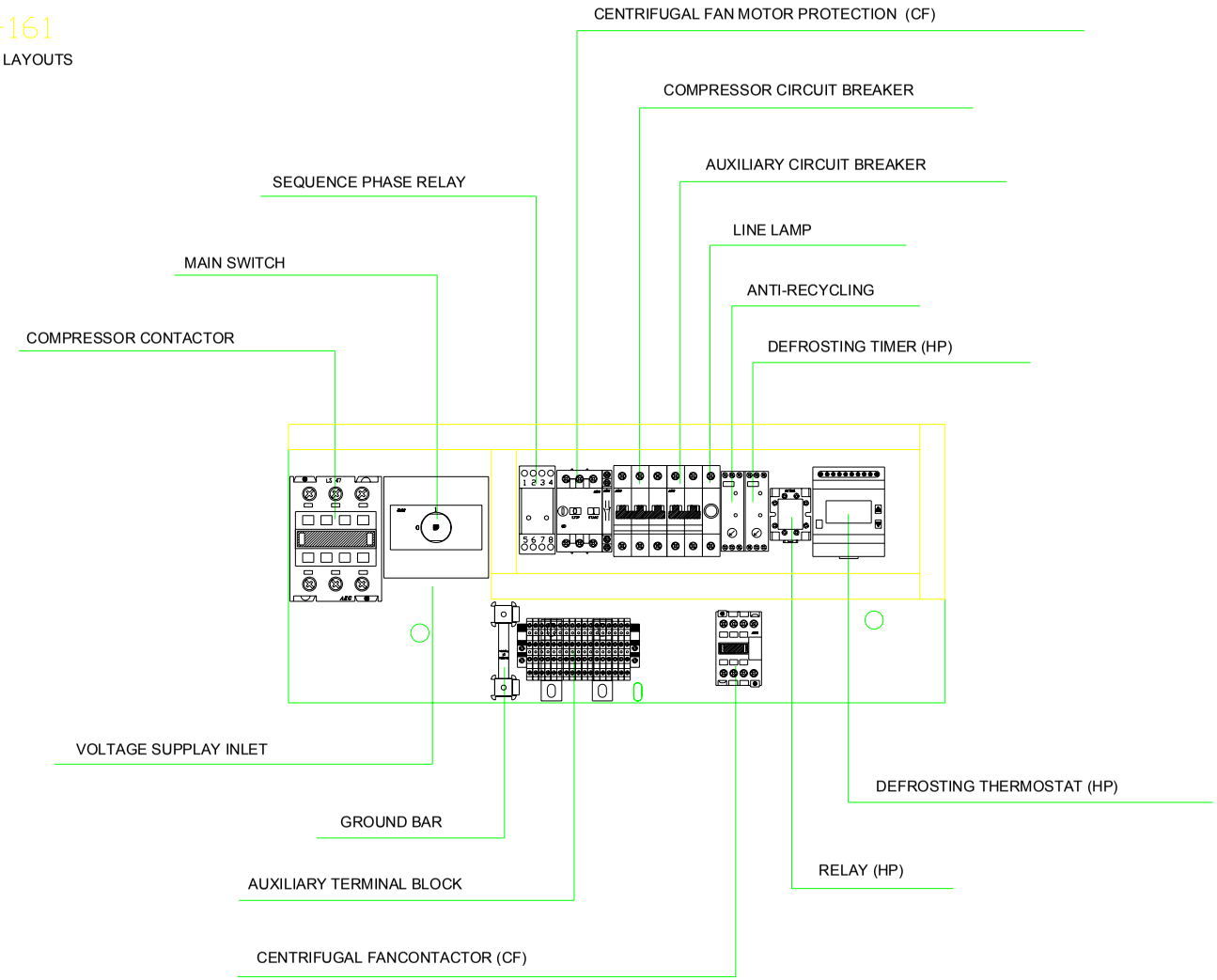
ALFA 41-81

ELECTRICAL PANEL LAYOUTS



ALFA 91-161

ELECTRICAL PANEL LAYOUTS

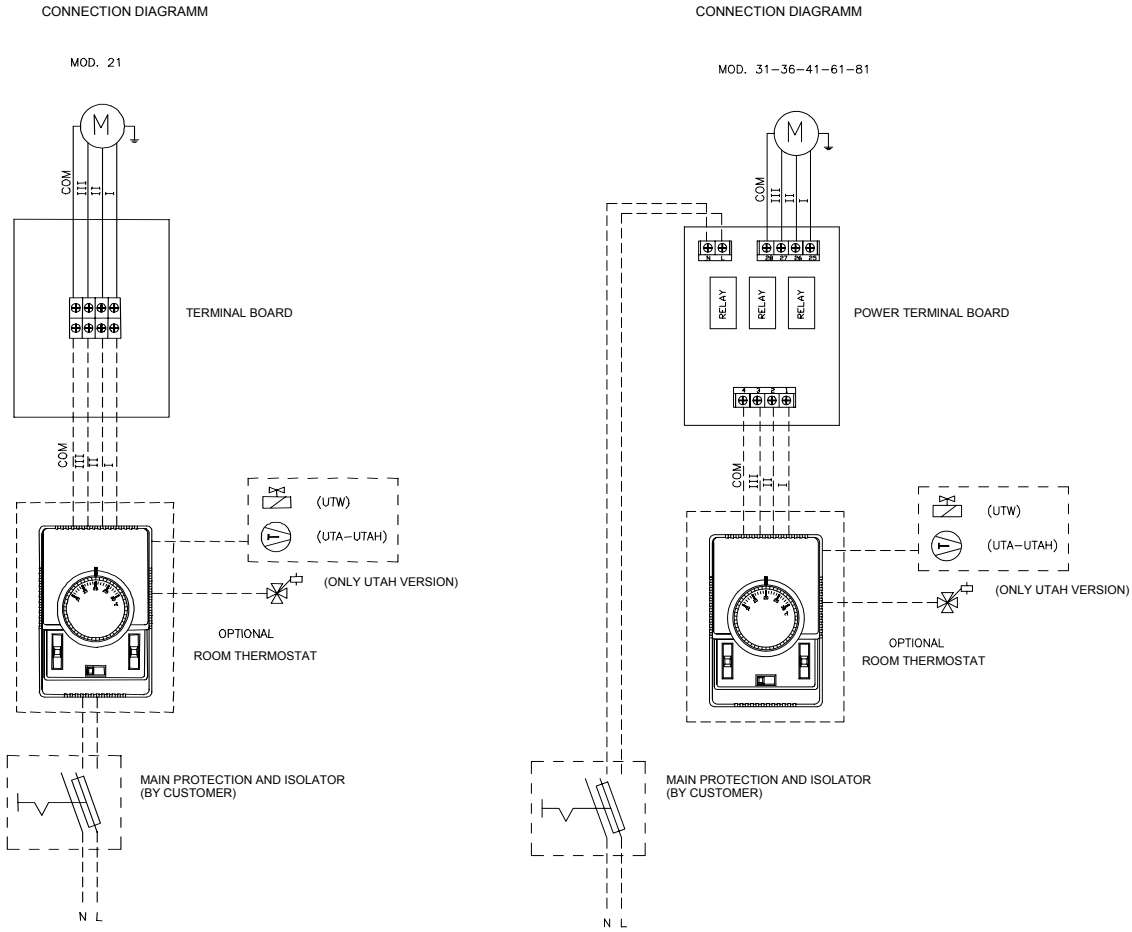


3.4.2. Indoor unit

Att.: Before doing any work on electrical parts, make sure there is no power.

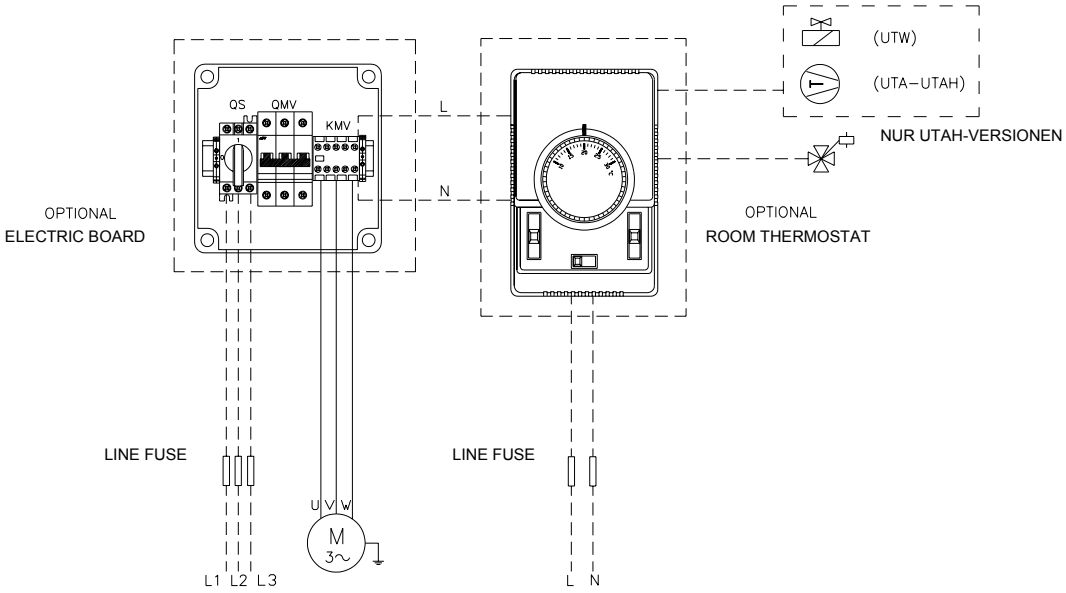
- Verify grounding;
- Check that the electricity mains specifications conform to the unit's rating;
- Check that the mains is 220V / 1 ph / 50 Hz for models 21-81 and 400V / 3 ph/ 50 Hz for models 91-161 and that the voltage comes within ±5%;
- Operating the unit with voltages outside the above limits forfeits warranty;
- Make sure the electrical system is capable of delivering not only the operating current required by the unit but also the necessary current to supply other appliances already in use;
- Never expose the unit to inflammable gases, nor use jets of water as this could cause electric shock or damage;
- Bear in mind that electrical and mechanical modification or tampering in general forfeit warranty,

3.4.3. Thermostat electrical connection (optional)

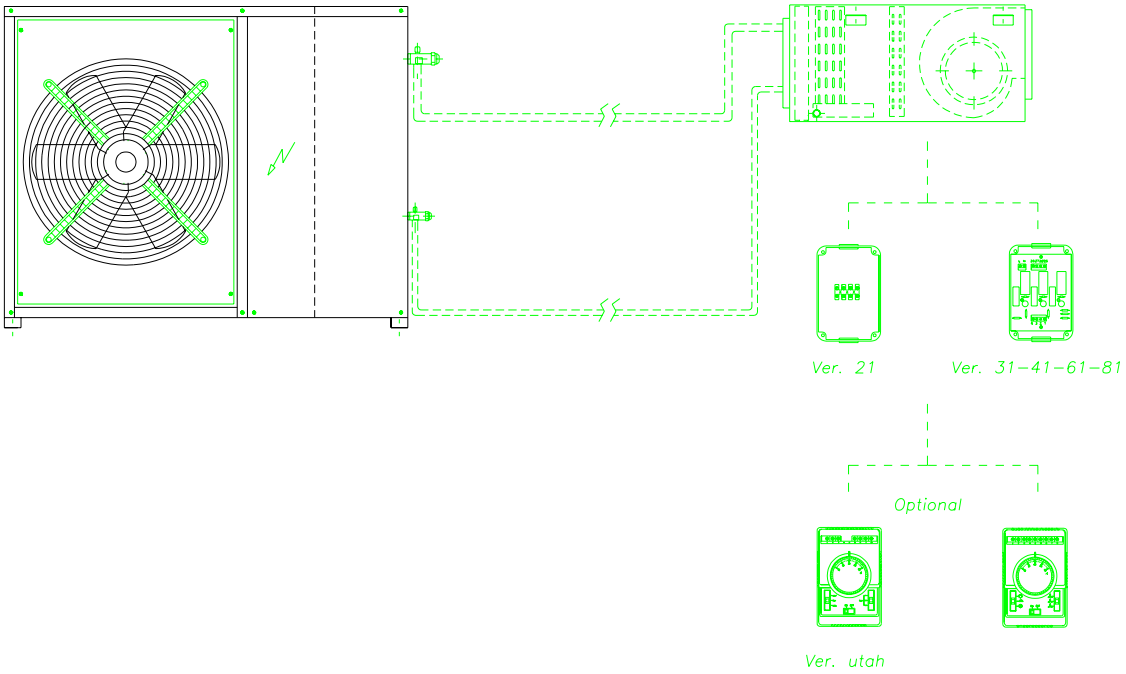


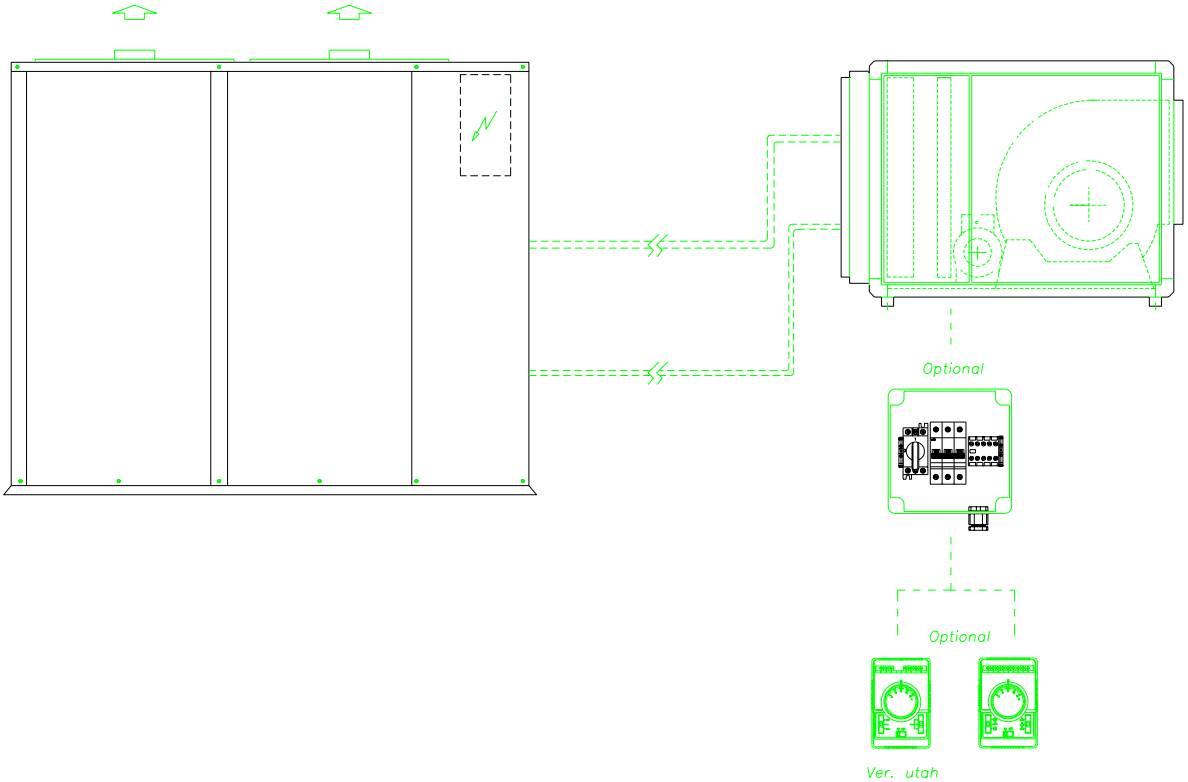
CONNECTION DIAGRAMM

MOD. 91–101–141–161



The electrical connections between the thermostat (supplied on request) and the electrical panel of the indoor unit (standard for models 21-81 / on request for models 91-161) should be made by connecting the corresponding numbered terminals on the respective terminal boards, as shown on the wiring diagram on the machine.
The cross-section of the connecting cables must be no lower than 1.5 mm².
The thermostat should be installed at a height off the floor of the air-conditioned room of 1.5 m., at a significant point for measuring the temperature of the room. The thermostat must therefore not be positioned close to windows or doors, direct solar radiation or sources of interference for measuring the ambient temperature.


Ver. 21
Ver. 31–41–61–81
Optional
Ver. utah


Optional
Optional
Ver. utah

3.4.4. Electric heater connection (OPTIONAL)

Electric heaters (if present in the unit) should be connected by supplying them independently of the outdoor section and appropriately connecting the enabling signals as specified on the wiring diagrams.

3.5. Hot water coil connections (OPTIONAL)

The hot water coils of mod 21-81 have 3/4” BSP M connections while mod 91-161 have 1” BSP M connections, normally located on the left-hand side, on request they can be mounted on the right-hand side of the unit.
It will be necessary to pay special attention so that the water it contains does not freeze for any reason whatsoever. **For this purpose it is necessary to add a suitable percentage of anti-freeze fluid.**

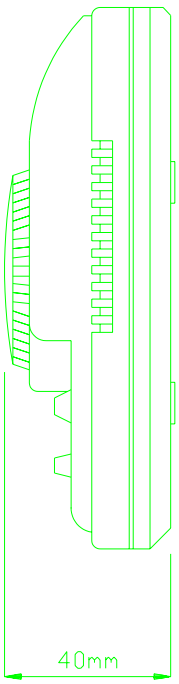
4. START-UP

4.1. Preliminary checks

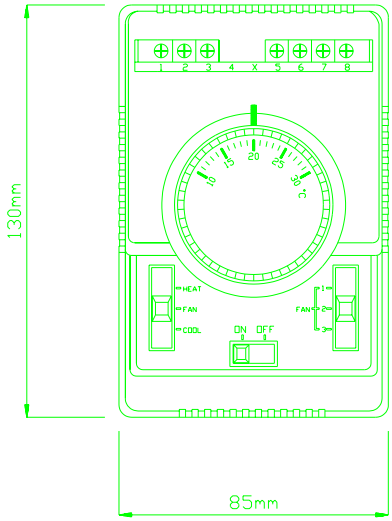
- Check that the electrical hook-up has been made correctly and that all the terminals are tightened properly;
- Check that the voltage on the terminals is 400 V ± 5%, which can be done with a tester: If the voltage is subject to frequent variation, call our Engineering Department to choose the appropriate protection;
- Check there is no leakage of refrigerant, possibly with the aid of a leak finder;
- Check that all the cocks in the refrigerant circuit are open;
- Check that the casing heaters (if any) are supplied correctly. The heaters should be activated at least 12 hours before start-up, and this takes place automatically on turning on the main switch, taking care to turn the thermostat switch onto “OFF”. To check that the heaters work properly, verify that the bottom of the compressors is warm and in any case 10/15 °C higher than ambient temperature.

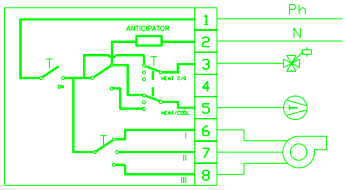
4.2. Starting

To start the unit you need to proceed as follows with the thermostat (see the figures below):

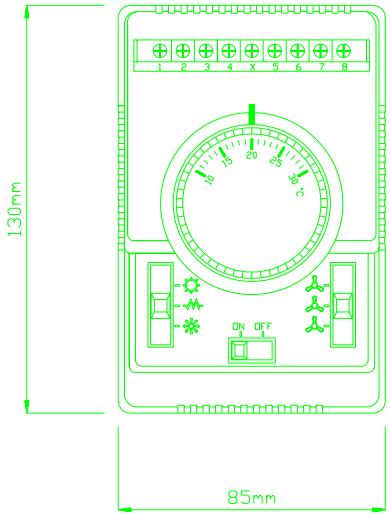


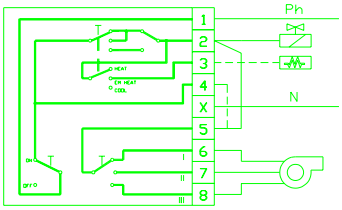
THERMOSTAT B1003





THERMOSTAT B1151





- Turn the ventilation switch onto “ON”. The evaporating section fans should now start up.

After this operation, the outdoor unit will start up if the setting permits it;

Outdoor + indoor unit	*Thermostat B1151*			*Thermostat B1003*				
	I.U. (*)		O.U. (*)	I.U. (*)		O.U. (*)		
	Start-up	Heaters or valve		Start-up	Heaters or valve	Hot	Cold	Ventilation
ALFA LE + UTA ALFA CF LE +UTA	ON		(1)					
ALFA LE HP + UTA ALFA CF LE HP +UTA				ON	HEAT (2)	HEAT	COOL	FAN

- (*) - I.U. = Indoor unit / O.U. = Outdoor unit;
- (1) - Do not select operation in heating mode (selector on ☼);
- (2) - At full power during the defrosting cycle.

- Set the desired ambient temperature on the thermostat;
- To start up the unit for summertime operation, turn the switch onto COOL for thermostat B1003 or ❄ for thermostat B1151 (refer to the above table);
- To start up the unit for wintertime operation, turn the switch onto HEAT;

Att.: Switching over the operating cycle should be done seasonally. Frequently passing from summertime to wintertime operation and vice versa can damage the compressors.

- If the unit has electric heaters, turn the heater thermostat switch onto “**on**”. The heaters will only be enabled for operation with the thermostat selector on HEAT for B1003 or ∿ for B1151

It is recommended not to cut off power to the unit during stoppages, but only in the case of lengthy stops (e.g. seasonal stoppages). To switch off the unit temporarily, carefully follow the instructions given in paragraph 4.6.

4.3. Checks during operation

- With the thermostat switch on COOL or  , check that the fans are turning;
- For models 91-161, check the direction of rotation of the fans: if this is not as it should be, cut off power and swap over two phases of the three-pole input cable. Never alter the internal electrical connections or warranty is forfeit;
- If there are electric heaters, check they come on and measure their power draw.

4.4. Checking the refrigerant

- After a few hours' operation, check that the sight glass moisture indicator has a green ring: yellow shows there is moisture in the circuit. In this case it is necessary to have the circuit dried out by qualified personnel;
- Check that no bubbles appear in the sight glass. Continuous bubbling may be an indication of a shortage of refrigerant and the need to top it up. A few bubbles, however, are admitted;
- A few minutes after starting up the compressors, in the summer cooling cycle, check that the condensation temperature measured at the pressure gauge is approximately 15 °C higher than the temperature of the air entering the condenser. In addition, check that the evaporation temperature measured at the pressure gauge is approximately 19 °C lower than the temperature of the air entering the evaporator;
- Check that refrigerant super-heating is between 5 and 8 °C: to do this, read the temperature measured by a contact thermometer on the compressor suction pipe and that shown on a graduated pressure gauge also connected on the suction side (saturation temperature corresponding to the suction pressure). The difference between them is the super-heating value.
- Check that refrigerant sub-cooling is between 5 and 8 °C: to do this, read the temperature measured by a contact thermometer on the condenser outlet pipe and that shown on a graduated pressure gauge connected on the liquid connection at the condenser outlet (saturation temperature corresponding to the condenser outlet pressure). The difference between them is the sub-cooling value.

4.5. Defrosting

(heat pump units only)

When the unit is working in heating mode (winter operation), the finned coil functions as an evaporator, cooling and dehumidifying the external air. Depending on external air temperature and humidity conditions, some condensation or frost could form.
The frost accumulating on the coil decreases air flow, the heat exchange surface area and consequently the thermal efficiency, and it can irreparably damage the heat exchanger.
All heat pump units are equipped with a control that automatically defrosts the coil if necessary. This control has a temperature probe on the finned coil air outlet. When the air temperature measured by this probe is equal to or under its set point (see table V), a signal enables defrosting, which will only be actuated if a minimum delay-time (set in the control: 30 minutes) has passed since the last defrosting. At this point:
- the outdoor unit source side fans stop;
- the 4-way diversion valve is excited, the cycle is reversed and so the finned coil on the source side now acts as a condenser. The condensation heat melts the frost on the coil;
- when the condensation pressure reaches the set-point of the end-of-defrosting pressure switch or of the defrosting probe, the diversion valve is again excited and heating mode (winter operation) is restored.

The defrosting cycle lasts on average from 1 to 3 minutes and is anyhow stopped on reaching the probe temperature set-point.
If electric heaters are installed in the indoor unit, they are activated during defrosting so as to attenuate the decrease in temperature of the user air.

4.6. Stopping the unit

Stop the unit by turning the thermostat switch onto OFF.

Att.: To stop the unit, never turn it off with the main switch: this would cut off power to the casing heaters and impair the integrity of the compressor when it is restarted.

4.7. Operating limits

The units are designed to be able to operate satisfactorily in a wide range of operation. In spite of this, there are limits, both for the user air temperature and for the external air temperature, which must never be exceeded: otherwise, the unit could stop due to protection tripping or even get seriously damaged. These limits are shown in the Table.
If it is necessary to operate outside these limits, please call our Engineering Department.

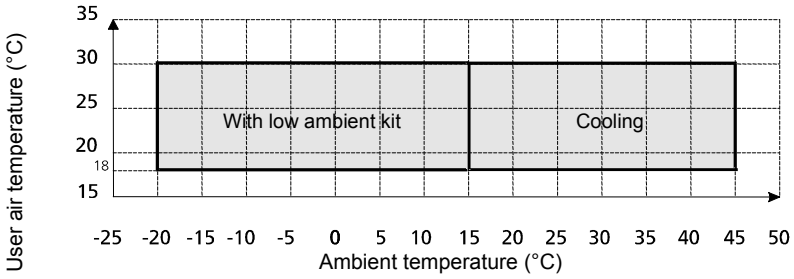
	Cooling		Heating	
	min	**max**	**min**	**max**
User air inlet temperature °C	18	30	15	40(2)
Ambient temperature				
Air conditioner °C	15(1)	45	---	---
Heat pump °C	15(1)	42	-10	20

(1) With low ambient kit: T ambient min. -20 °C
(2) See the table below

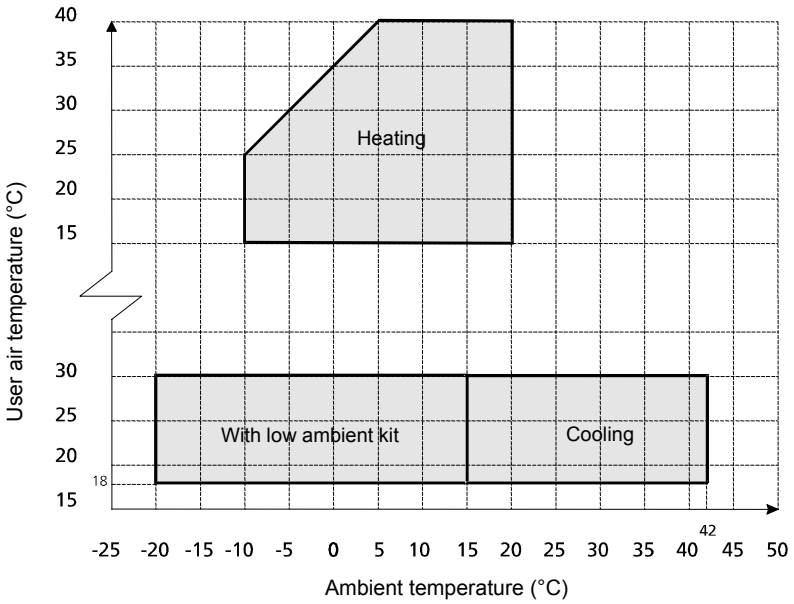
OPERATING RANGE IN HEATING

Inlet user air temperature max	°C	40	35	30	25
Ambient temperature min	°C	5	0	-5	-10

Air conditioner version



Heat pump version



Att.: The air flow rates must not differ by more than 15% from the nominal values given in the technical data table.

5. SETTING CONTROLS

5.1. Generally

All the control equipment is set and tested in the factory before shipping the machine. However, after the unit has been running for a reasonable length of time, it is possible to check the operating and safety devices. The settings are shown in the relevant Table.

All service operations on the control equipment must be carried out by qualified personnel: erroneous settings can seriously damage the unit.

CONTROL AND SAFETY DEVICE FACTORY SETTINGS

CONTROL DEVICE		SET POINT	DIFFERENTIAL	RESET TYPE
High pressure switch	bar	26	1,0	manual
Low pressure switch	bar	0,7	1,0	automatic
Defrosting thermostat	°C	5,0	19,0	automatic
Defrosting pressure switch	bar	14-19	--	automatic

5.2. High pressure switch

The high pressure switch stops the compressor when the delivery pressure exceeds the setting.
To check it is working correctly, shut off the flow of air in the condensers, with the compressors in operation, noting on the compressor delivery pressure gauge (previously installed) that the pressure switch stops the compressors in correspondence with the setting.

Att.: During this operation, be ready to manually switch off the compressor at issue in order to stop the compressor if the safety device fails to trigger.

In addition, check that the pressure gauges work correctly. Reset is manual and can only be done when the pressure has fallen under the device reset value (see the relevant Table).

5.3. Low pressure switch

The low pressure switch stops the compressor when the suction pressure drops under the setting.
To check it is working correctly, start up the compressor and after approximately 5 minutes slowly close the corresponding refrigerant line, noting on the compressor suction pressure gauge (previously installed) that the pressure switch stops the compressor in correspondence with the setting.

Att.: During this operation, be ready to manually switch off the compressor at issue in order to stop the compressor if the safety device fails to trigger.

In addition, check that the pressure gauges work correctly. Reset is automatic and can only be done when the pressure has risen above the device reset value (see the relevant Table).

5.4. Delay timer

The function of this device is to prevent the compressor starting and stopping too frequently.
This device makes it possible to start the compressor after it has stopped only after a certain length of time has passed (approximately 6 minutes).

Never change the factory set delay: wrong values could seriously damage the unit.

5.5. Defrosting thermostat
(heat pump units only)

This device signals the need for defrosting.
To verify its operation, check that, once the air entering the evaporator has reached its set-point, defrosting starts within 30 minutes.

5.6. End-of-defrosting pressure switch
(heat pump units only)

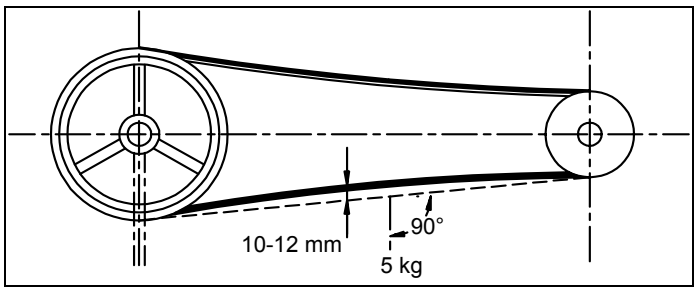
This device stops defrosting.
To verify its operation, check that defrosting is stopped when the condensation pressure reaches the setting for this device. In this situation the 4-way diversion valve must get excited and restore the heating cycle (heat pump).

6. MAINTENANCE AND PERIODICAL CHECKS

6.1. Generally

It is a good rule to carry out periodical checks to verify the unit works correctly: these operations should always be carried out by qualified personnel.

- Check that all the control and safety equipment works correctly as described above (monthly);
- Check the tightness of the electrical terminals both inside the electrical panel and on the compressor terminal boards. The sliding and fixed terminals of the contactors must be cleaned periodically and replaced if they show any signs of deterioration (monthly);
- Check the refrigerant charge through the sight glass (monthly);
- Check there is no oil leakage from the compressor (monthly);
- Check the compressor casing heaters (monthly);
- Clean the condensation pan and the relative drainage piping (monthly);
- Clean the metallic filters on the finned coil;
- Clean the filters on the evaporating section;
- Carry out the defrosting test (monthly).
- For models 91-161 check the tension and wear of the drive belts. As regards belt tension: press on the middle of the belt at right angles to it with a force of approximately 5 kg. The belt should move by approximately 10/12 mm (see the figure below). (Check every 4 months);



- For models 91-161 check the condition, fixing and alignment of the fan rotors and pulleys (every 4 months);
- Check the colour of the sight glass moisture indicator (green=dry, yellow=moist). If the indicator is not green, as directed on the label, replace the filter (every 4 months);
- Check that the noise the unit makes is regular (every 4 months).

6.2. Repairing the refrigerant circuit

If the refrigerant circuit has been repaired, it is necessary to carry out the following operations:
- leakage test;
- vacuum and drying of refrigerant circuit;
- refrigerant charge.

If it is necessary to drain the system, always recover the refrigerant in the circuit using appropriate equipment.

6.2.1. Leakage test

Load the circuit with nitrogen dioxide using a gas bottle fitted with a pressure reducing valve to reach a pressure of 15 bar. Any leakage must be identified with a bubble leak finder. Any bubbles or foam show the location of leaks.
If any leaks are found, discharge the circuit before welding with appropriate alloys.

Never use oxygen instead of nitrogen: explosions may occur.

6.2.2. Refrigerant circuit drying and vacuum

In order to get a high vacuum in the refrigerant circuit, it is necessary to have a high-level vacuum pump capable of reaching an absolute pressure of 0.1 mbar with a flow rate of 10 m³/h. With this kind of pump, just one vacuum cycle is normally required to reach an absolute pressure of 0.1 mbar.
If this kind of vacuum pump is not available, or if the circuit has been left open for a long time, it is highly recommended to follow the triple evacuation method. This method is also recommended when there is moisture in the circuit.
The vacuum pump should be connected to the charging valves. Follow this procedure:
- Evacuate the circuit to reach an absolute pressure of at least 35 mbar; now introduce nitrogen into the circuit to reach a relative pressure of approximately 1 bar;
- Repeat the procedure just described;
- Repeat this procedure a third time, but in this case trying to reach the greatest vacuum possible;

With this procedure it is possible to easily evacuate 99% of pollutants.

6.2.3. Filling with refrigerant

- Connect the refrigerant gas bottle to the male 1/4 SAE charging valve on the liquid line, letting a little gas come out to eliminate the air in the connecting pipe;
- Turn over the bottle and charge in liquid form to reach 75% of the total charge;
- Now connect the refrigerant bottle to the charging valve on the suction line and, keeping the bottle upright, complete the charge until no more bubbles appear on the liquid sight glass.

6.2.4. Environmental protection

The law governing the use of substances depleting stratospheric ozone prohibits dispelling refrigerant gases into the atmosphere and compels holders to recover and deliver them, at the end of their service life, to the seller or to special collection centres.
R22 refrigerant is mentioned in the law as one of the substances to be kept under control and must therefore be subjected to the above regulations.

Special care is therefore recommended during maintenance in order to limit leakage of refrigerant as much as possible.

7. DECOMMISSIONING THE UNIT

When the unit has reached the end of its envisaged life and then needs to be removed and replaced, the following measures should be taken:

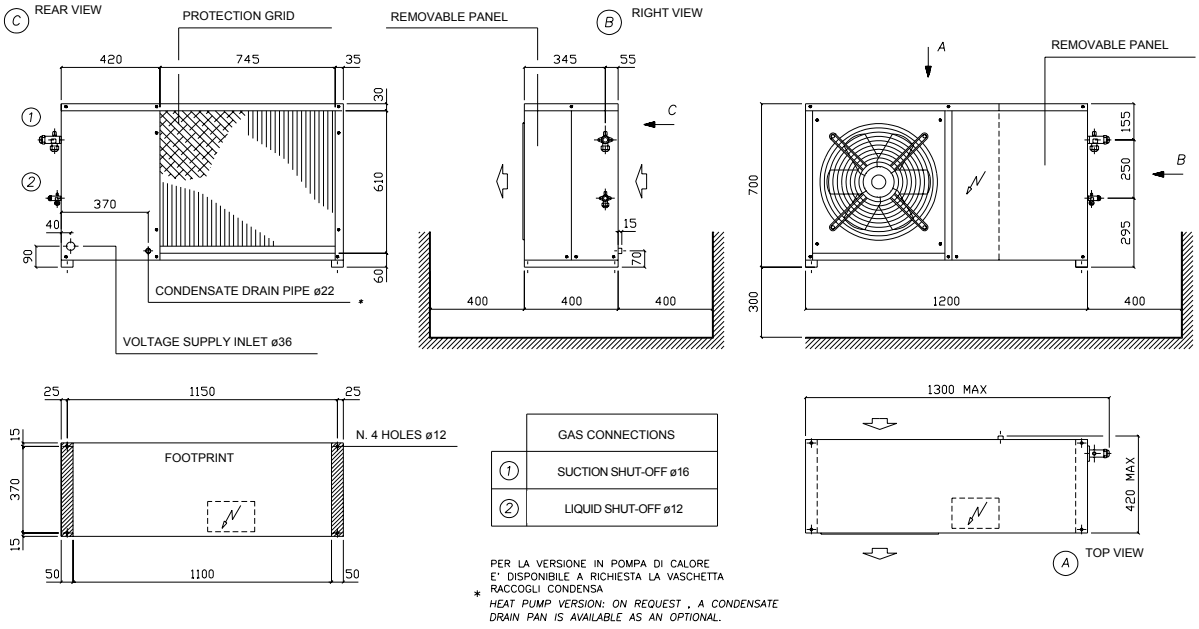
- The refrigerant gas it contains should be recovered by specialized personnel and sent to a collection centre;
- The compressor lubricating oil should also be recovered and sent to a collection centre;
- The framework and various components, if they cannot be used, should be dismantled and separated according to their nature: particularly copper and aluminium of which there are significant amounts.

This is to help the collection, disposal and recycling centres and to reduce environmental impact to a minimum.

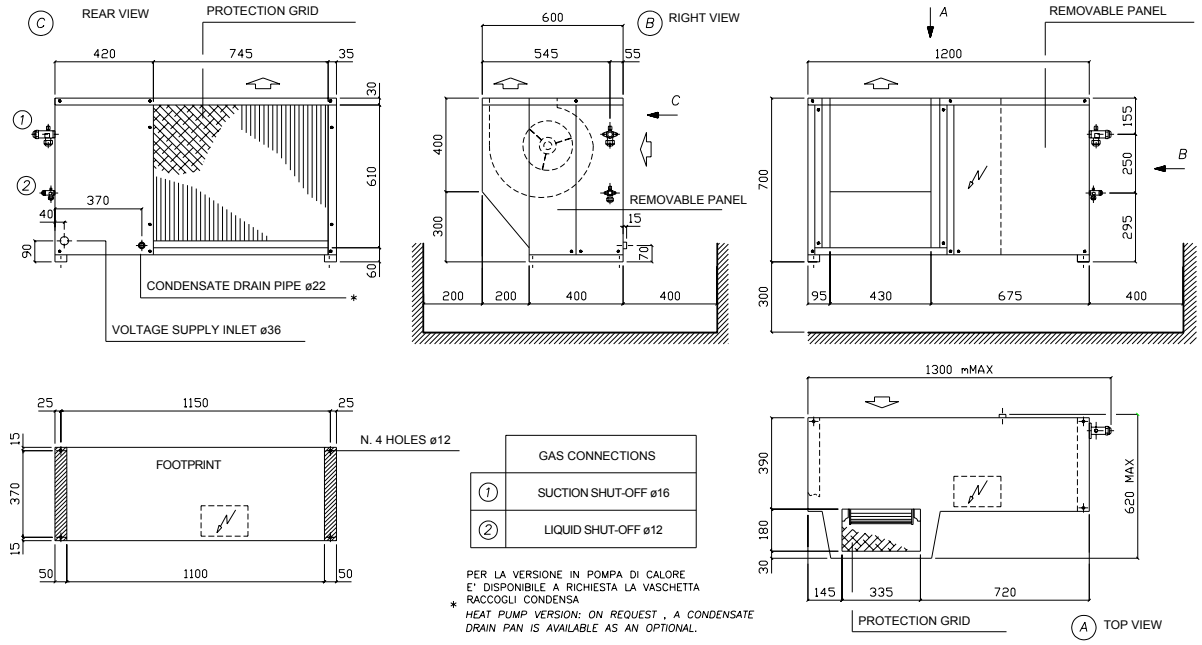
8. DIMENSIONAL DRAWINGS

8.1. Outdoor unit

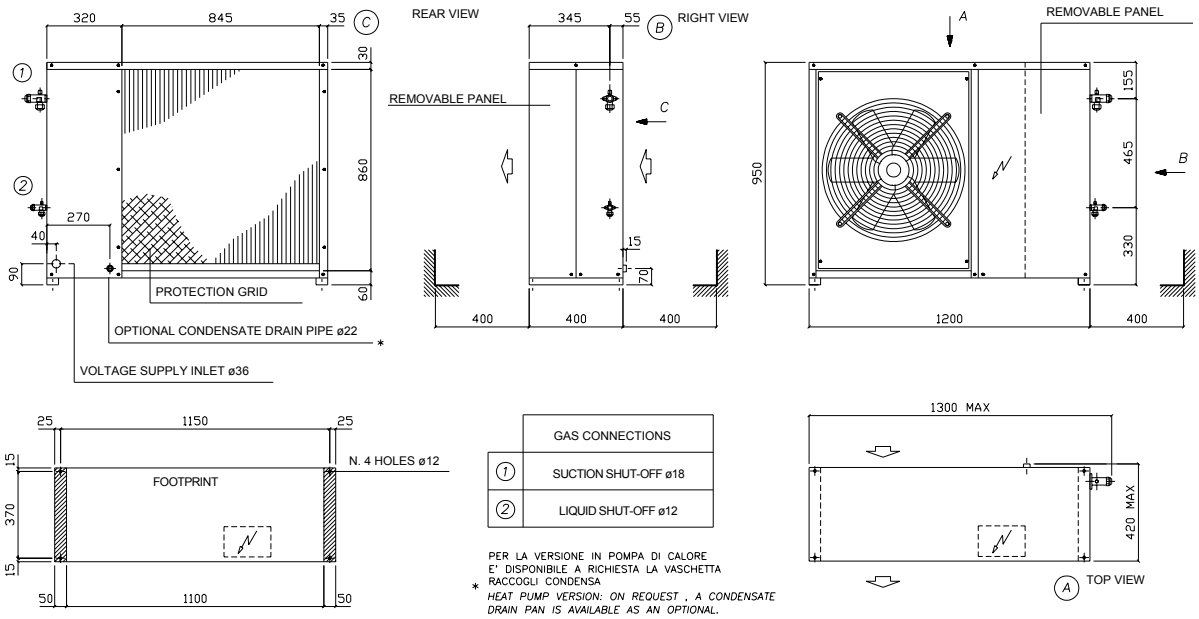
ALFA 21-31-36 LE/ALFA LE HP



ALFA CF 21-31-36 LE/ALFA CF LE HP



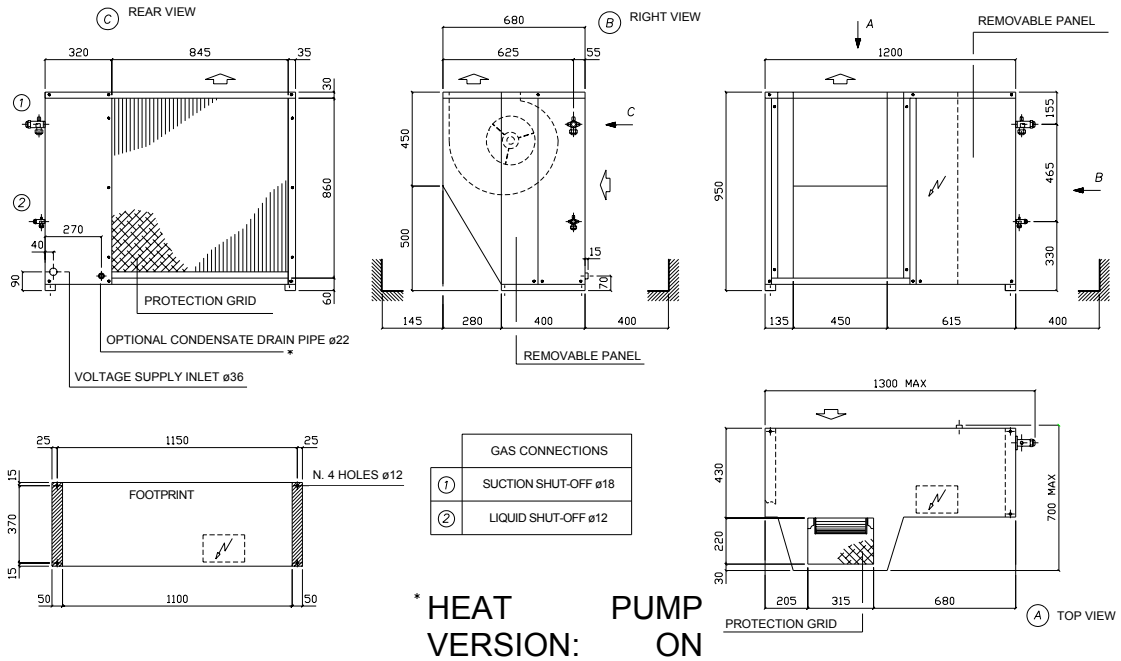
ALFA 41-61-81 LE/ALFA LE HP



PER LA VERSIONE IN POMPA DI CALORE E' DISPONIBILE A RICHIESTA LA VASCHETTA RACCOGLI CONDENSA

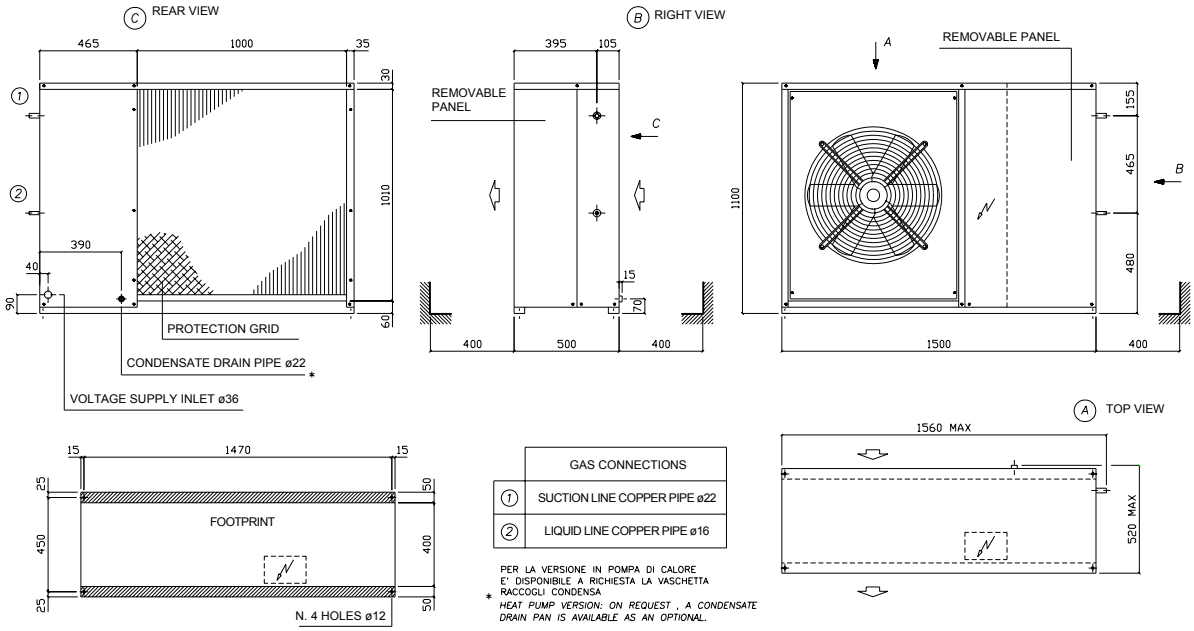
* *HEAT PUMP VERSION: ON REQUEST , A CONDENSATE DRAIN PAN IS AVAILABLE AS AN OPTIONAL.*

ALFA CF 41-61-81 LE/ALFA CF LE HP

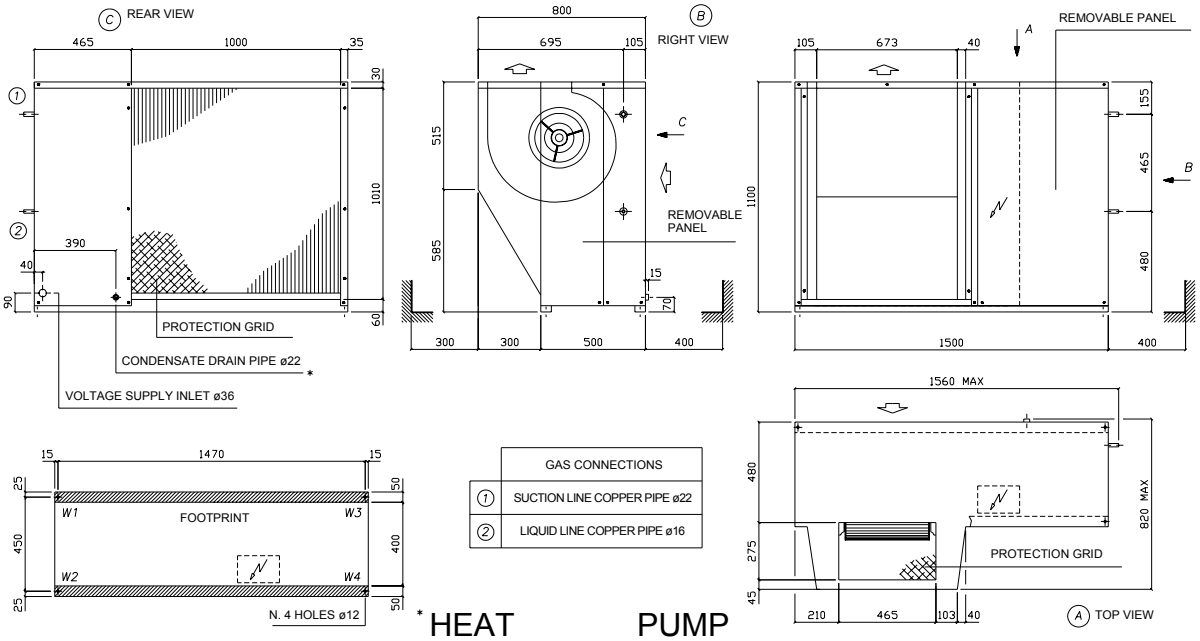


* HEAT PUMP VERSION: ON

ALFA LE 91-101/ALFA LE HP

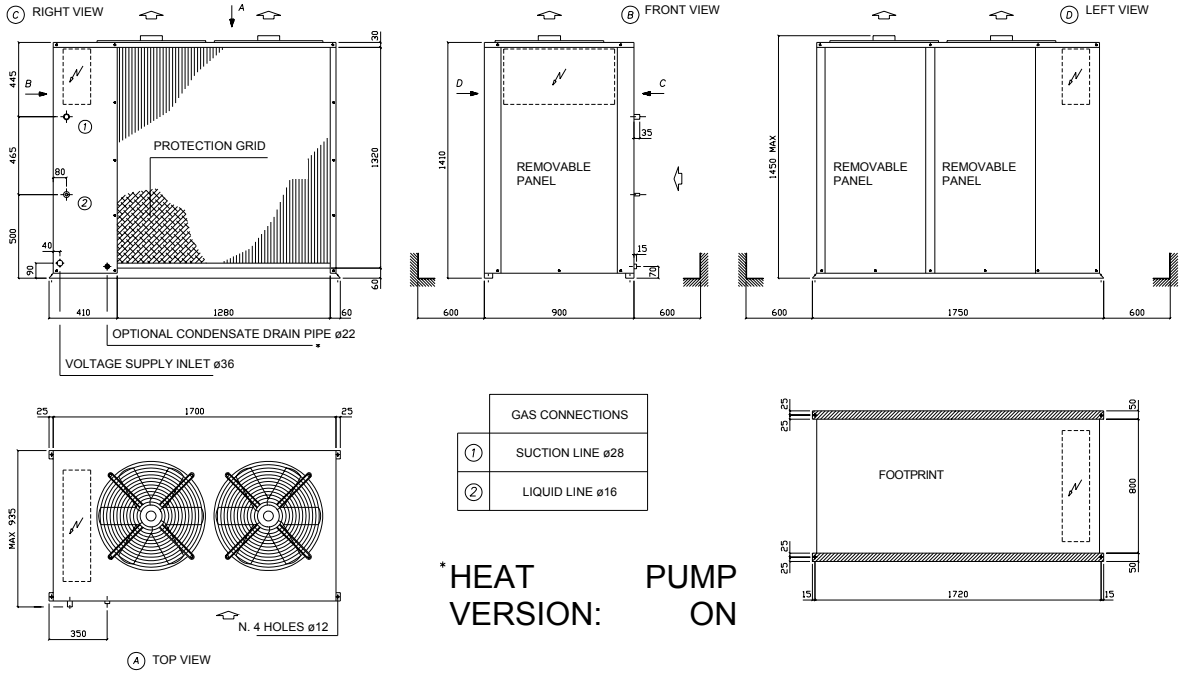


ALFA CF 91-101 LE/ALFA CF LE HP



* HEAT PUMP VERSION: ON

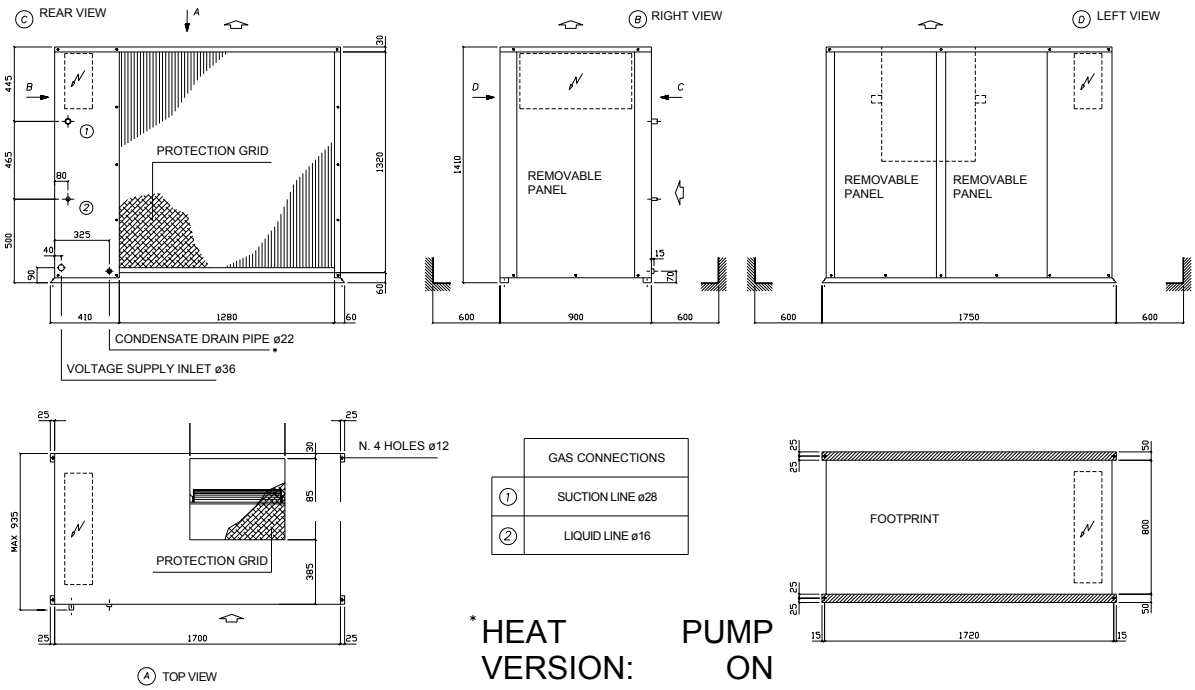
ALFA 141-161 LE/ALFA LE HP



GAS CONNECTIONS	
1	SUCTION LINE ø28
2	LIQUID LINE ø16

*HEAT PUMP VERSION: ON

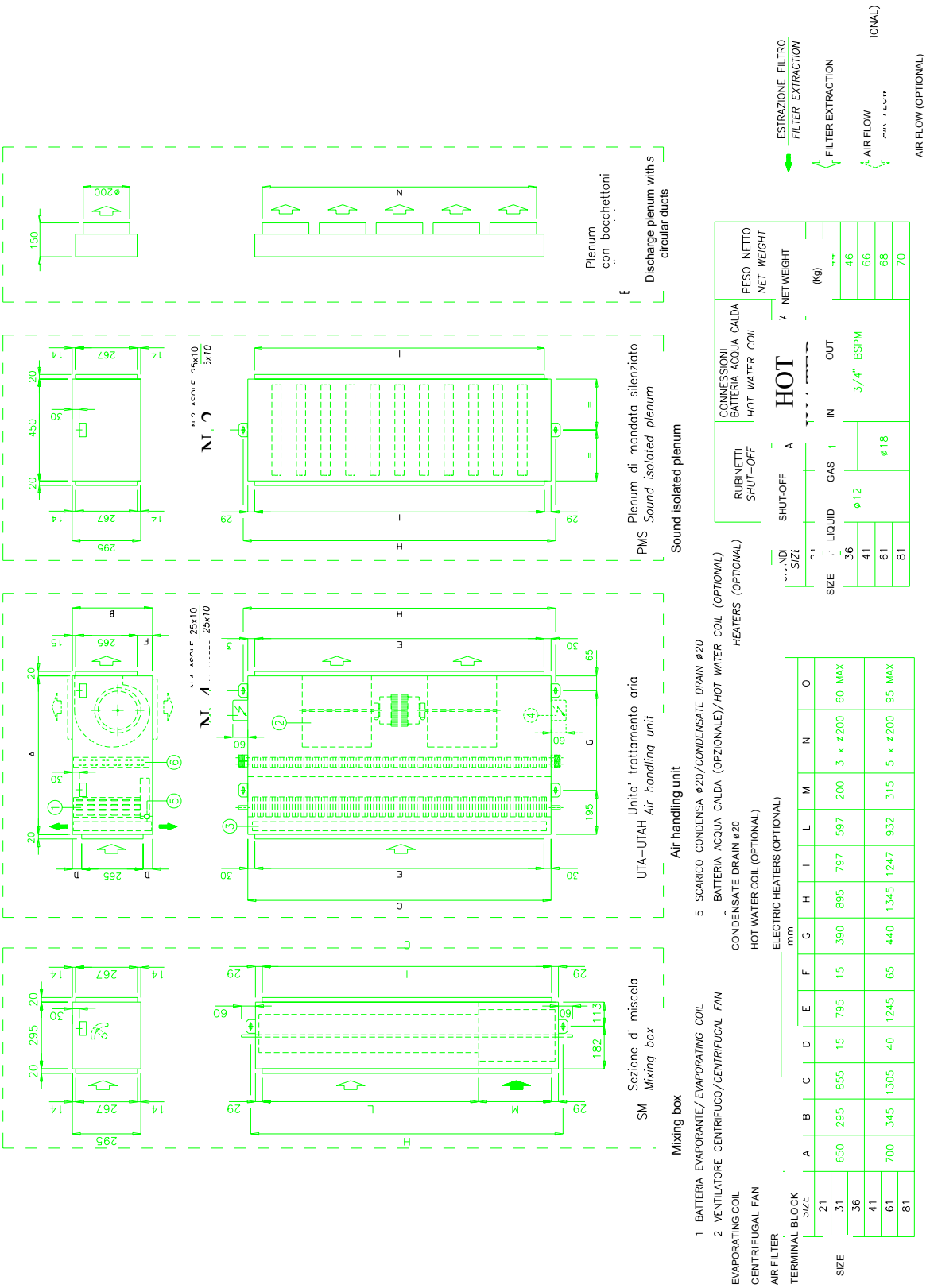
ALFA CF 141-161 LE/ALFA CF LE HP



GAS CONNECTIONS	
1	SUCTION LINE ø28
2	LIQUID LINE ø16

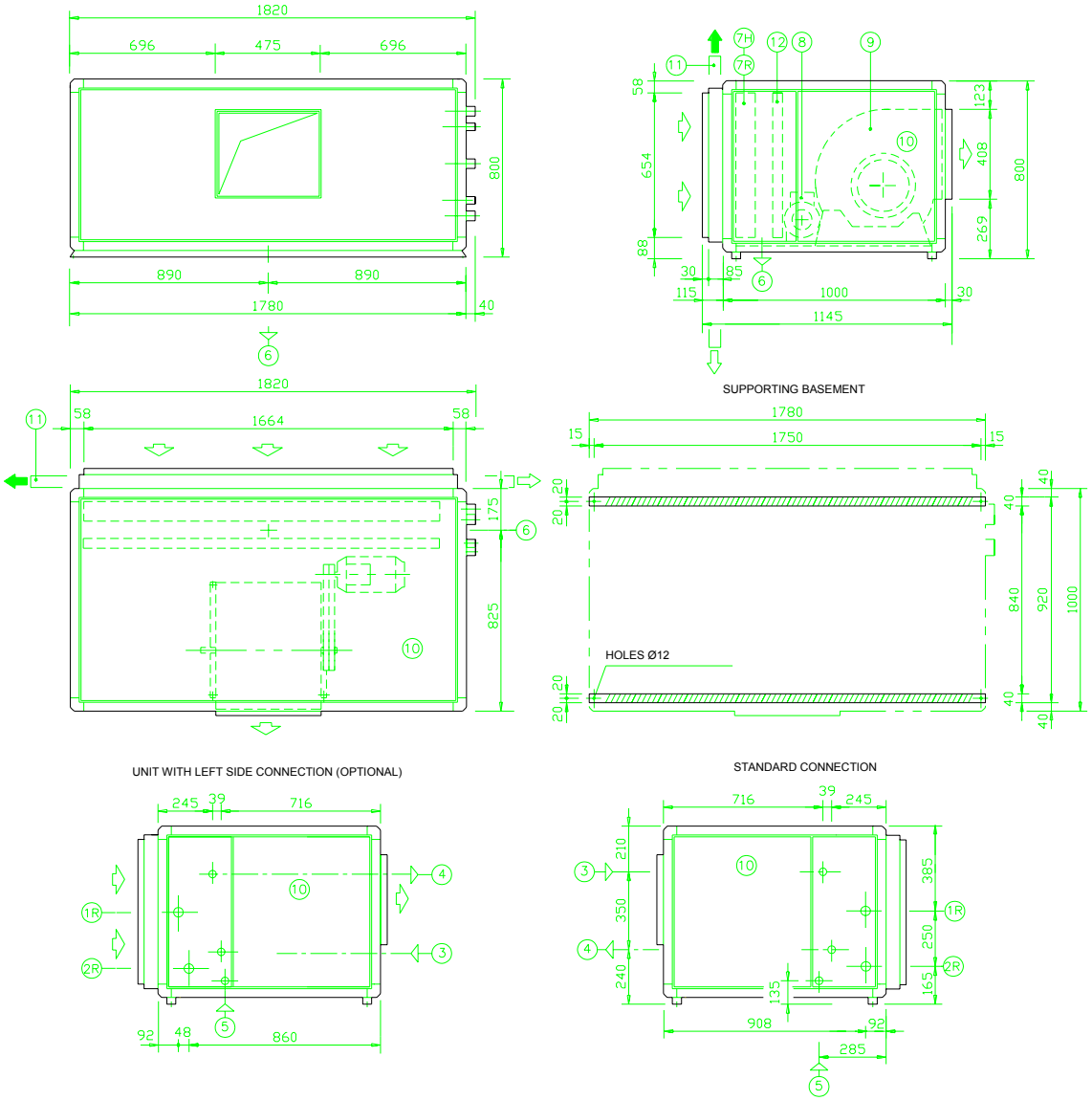
*HEAT PUMP VERSION: ON

8.2. Indoor unit



SIZE	A	B	C	D	E	F	G	H	I	L	M	N	O
21	650	295	855	15	795	15	390	895	797	597	200	3 x ø200	60 MAX
31													
36													
41	700	345	1305	40	1245	65	440	1345	1247	932	315	5 x ø200	95 MAX
61													
81													

SIZE	LIQUID	GAS	IN	OUT	NET WEIGHT (Kg)
36	ø12	1	3/4" BSPM		46
41					66
61	ø18				68
81					70



NOTES

- 1R UTA–UTAH GAS LINE
- 2R UTA–UTAH LIQUID LINE
- 3 HOT WATER INLET
- 4 HOT WATER OUTLET
- 5 ELECTRICAL SUPPLY INLET
- 6 CONDENSATE DRAINING OUTLET
- 7R UTA EVAPORATING COIL
- 7H UTAH EVAPORATING / CONDENSINC COIL
- 8 ELECTRIC MOTOR
- 9 CENTRIFUGAL FAN
- 10 REMOVABLE PANELS
- 11 AIR FILTER
- 12 HOT WATER COIL (OPTIONAL) / ELECTRIC HEATERS (OPTIONAL)

AIR FLOW

FILTER EXTRACTION (STANDARD)

FILTER EXTRACTION (OPTIONAL)

MODEL	WEIGHT UTA–UTAH	1R	2R	3 4	5	6
161	165	ø28	ø16	BSP M. ø 1"	HOLE ø48	PIPE ø22
141	160					
101	145	ø22				
91	135					

TECHNICAL DATA MAY CHANGE WITHOUT NOTICE.

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