OUTDOOR UNIT VRF

MV6-XMi 252T-2700T Series

MANUAL
FOR INSTALLATION, USE AND MAINTENANCE

M0VS40P17-02 -09-20

INTRODUCTION

Dear Customer,
Thank you for choosing a **CLIVET** product.
The model which you have chosen is a high performance product of advanced design and technology, high reliability and quality construction.
We suggest that you entrust its management and maintenance to professionally qualified personnel you trust, who, when necessary, only use original spare parts.
This manual contains important information and tips that must be followed for easier installation and the best possible use of the appliance.

SERIES

	VRF systems
MV6 unit	from 252T to 2700T

SYMBOLS USED IN THE MANUAL AND THEIR MEANING

WARNING
To indicate special information.

CAUTION
To indicate particularly important and delicate operations.

CAUTION DANGER
To indicate actions which, if not carried out correctly, may result in general accidents or may cause malfunctions or material damage to the device; therefore, they require special attention and adequate preparation.

ATTENTION ELECTRIC DANGER
To indicate actions which, if not carried out correctly, may result in accidents of electrical origin; therefore, they require special attention and adequate preparation.

IT IS PROHIBITED TO
indicate actions that MUST NOT be performed.

WARRANTY

The product **CLIVET** is covered by a **conventional warranty**, valid from the date of purchase of the appliance, the conditions of which are specified in the GENERAL CONDITIONS OF SALE available at **www.clivet.com**

WARNING

– The warranty is void if the appliance has been used without following the instructions in this manual.
– The warranty will be forfeited if the customer makes changes and/or attempts to repair the product himself or through third parties not authorised by the manufacturer/authorised dealer.
– The product must be intended for the use intended by **CLIVET** for which it was expressly made. Any contractual and non-contractual liability **CLIVET** for damage caused to persons, animals or property by installation, adjustment, maintenance and misuse errors is excluded.

INDEX

1 GENERAL DETAILS

1.1 General warnings and safety rules

WARNING

– This manual is the property of CLIVET and reproduction or transfer to third parties of the contents of this document is prohibited. All rights reserved. It is an integral part of the product; make sure that it is always supplied with the appliance, even in case of sale/transfer to another owner, so that it can be consulted by the user or by personnel authorised to carry out maintenance and repairs.

– Read this manual carefully before using the unit to ensure its safe operation.

– Periodically check the integrity of the power supply cable. If the power cable is damaged, it may only be replaced by the manufacturer or the local distributor who sold the appliance or by authorised maintenance and repair personnel.

– Installation must be in accordance with the IEC 61000-3-12 standard.

– The installation must be carried out by an authorised dealer or a qualified technician. Incorrect installation may cause water leakage, electric shock and fire, or cause the unit to malfunction.

– The installation must be carried out according to the instructions provided. An incorrect installation may cause water leaks, electric shock or fire.

– Perform the installation using only the supplied accessories and parts specified. The use of non-standard components may cause water leakage, electric shock or fire and cause the unit to malfunction.

– Perform the installation taking into account any possible natural events such as strong winds, typhoons and earthquakes. The appliance could fall and be damaged as well as cause damage to property or physical injury.

– If installing in areas prone to thunderstorms, take measures to protect the appliance from lightning.

– Work on the refrigerant circuit must only be carried out by persons with a valid certification, issued by an accredited body, certifying their competence to handle refrigerants safely in compliance with the specifications in force in the sector.

– Use a vacuum pump with a non-return valve to evacuate the system. Do not perform an air purge using refrigerant.

– Use deoxidised phosphorous copper piping for the refrigerant (seamless copper alloy piping and tubing). Keep the inner and outer surface of the pipes clean and free of contaminants.

– Store the piping indoors and keep both ends of the pipes sealed until it is time to flare or weld.

– Do not use any means other than those recommended by the manufacturer to accelerate the defrosting process or to clean the unit.

– The appliance must be placed in a room that does not contain any ignition sources (e.g. open flames, gas appliances or electric heaters).

– Weld the pipes purging with nitrogen to avoid oxidation.

– Keep the interconnection cable away from the copper pipe. The temperature of the refrigerant circuit is high.

– Note that the refrigerants are odourless.

– Use only the refrigerants indicated in the manual.

– Recharge the refrigerant when it is in the liquid state.

– After installation, verify that there are no refrigerant leaks.

– Do not touch the components of the refrigerant line during or immediately after operation of the appliance. There is a risk of burns or frostbite.

– Install the connection joints and manifolds referring to the installation manual.

– Install the drainage pipe according to the instructions in this manual. Incorrect draining can cause water seepage or flooding with possible damage to the home and other property.

– Insulate the piping to avoid condensation.

– The direction of the flow of liquid is indicated with words or symbols on the housing of the appliance.

– Always use the specified cables for all electrical work. Connect the cables securely and secure them in a stable manner to prevent the terminals from being damaged by external forces. Incorrect electrical connection may cause overheating conditions and may result in fire and electrocution.

– Install the electrical cables making sure that they are not taut. Otherwise, they could break or overheat causing smoke or fire.
– The cables must be arranged so that the control board cover can close properly. If the control board cover is not closed properly, corrosion may occur and the connection points on the terminals may become hot, ignite or cause electric shock.
– Always disconnect all power supply circuits before touching the terminals for any reason.
– It is advisable to install a Class B or F differential magnetothermic circuit breaker on the power supply line of the appliance.
– For electrical work, comply with the provisions of the national electrical code, local regulations, current regulations and the requirements contained in the installation manual. It is necessary to use an independent circuit and a single power outlet. Do not connect other appliances to the same electrical outlet. Insufficient electrical capacity or faulty electrical installation may cause risk of electric shock or fire.
– Incorporate in the wiring an omnipolar isolator switch with a separation distance of at least 3mm between all poles and a residual current device (RCD) with a value greater than 10mA. Observe the domestic regulations.
– Replace the fuses only with others of the same value and technical characteristics.
– Install the appliance and its power cables at least one metre away from other electrical equipment in order to avoid interference or noise.
– The appliance must be stored in such a way as to prevent any mechanical damage.
– Consult a qualified technician for unit repair or maintenance.
– Do not modify or alter the safety or protection devices.
– Do not touch the appliance with wet or damp parts of the body as to do so could lead to electric shock.
– Make sure that the power is disconnected before performing any service or maintenance.
– If you notice any anomalies (e.g. a burning smell), stop the appliance, turn off the power switch and consult your dealer.
– Make sure that the air inlet and outlet are not blocked as this could trigger the protective device that stops the appliance.
– This appliance is intended for use on commercial premises by experienced or suitably trained users
– This appliance is designed to cool or heat spaces intended for the presence of human beings. It must not be used to cool or heat food, plants, animals, machinery, equipment or works of art.
– Install the appliance in such a way that the noise and heat is generates does not disturb people living in the vicinity and does not affect the growth of animals or plants.
– Read this manual carefully before using the unit to ensure its safe operation.

CAUTION DANGER

– When connecting refrigerant piping,keep substances or gases other than the specified refrigerant from entering the unit. The presence of other gases or substances can reduce unit performance and cause an abnormal increase in pressure in the refrigeration cycle. This can lead to explosion hazards and resulting injuries.

– Install the unit on a stable stand that can support its weight. If the chosen stand cannot support the weight of the unit, or if the installation is not performed correctly, the unit may fall and cause injury and serious damage.

– Do not pierce or ignite the device.

– The appliance must be placed in a well-ventilated room whose dimensions correspond to those specified for operation.

– The product must be installed with earthing in accordance with the law to avoid the risk of electrocution. Do not connect the earth cable to gas or water mains, lightning rods or phone earth cables.

– Install an earthing connection switch. Failure to install this can result in electric shock.

– Do not operate the appliance if the protections have been removed.

– Do not install the unit:

- in a location that can be exposed to combustible gas leaks. Any accumulation of combustible gas around the unit may cause a fire hazard;

- near the coast (except in the case of corrosion resistant models);

- near a source of hot water due to the presence of caustic gas in the air;

- in the presence of strong electromagnetic waves;

- in the presence of significant voltage flicker;

- in the presence of acid or alkaline liquid that evaporates;

- in the presence of flammable materials or gas.

– Wear the required PPE (protective gloves) during installation and maintenance. High pressure piping poses a risk of burns during operation.

– Measure the insulation resistance and make sure it is at least 1M Ω once the wiring work is done.

– Do not use flammable paints, enamels, sprays or other products that may release flammable fumes or vapours near the appliance as they could cause fires.

– Do not install open flame units near the appliance. The heat released could ruin it.

– Do not insert your fingers between the fans during operation. This could lead to injury.

– Do not allow children to play near the unit as it may cause injury.

IT IS PROHIBITED TO

– Make changes and/or repair attempts to the product. Any repairs must be carried out by a qualified technician.

– Touch the device with wet, damp and/or barefoot body parts. If you notice current leakage that can be detected on contact with metal parts of the appliance, disconnect the switch, unplug it from the power supply socket and contact an authorised dealer.

– Disperse in the environment and leave within the reach of children the packaging material as it may be a potential source of danger. It must therefore be disposed of in accordance with current legislation.

– Use the same electrical outlet for other equipment. Incorrect or insufficient power supply may cause fire or electric shock hazard.

– Connect the electric air conditioner to the power supply before having finished wiring the power lines and pipes. Connect the cables of the outdoor unit and then those of the indoor unit.

– Perform maintenance in the rain. Electrical leakage, electric shock, short circuit, malfunction, smoke or fire may occur.

Notes on fluorinated gases

– This air conditioner contains fluorinated gas. For specific information on gas types and quantities, please refer to the plate found on the unit. It is always necessary to comply with national regulations regarding the use of gases.

– Installation, service, maintenance and repair of the unit must be performed by a qualified technician.

– The uninstallation and recycling of the product must be carried out by qualified technical personnel.

– If a leak detection device is installed in the system, it is necessary to check that there are no leaks at least every 12 months. When checking the unit for leaks, it is recommended to keep a detailed record of all inspections.

– Pay attention to the fact that refrigerant R410A is odourless.

1.2 Description of system components

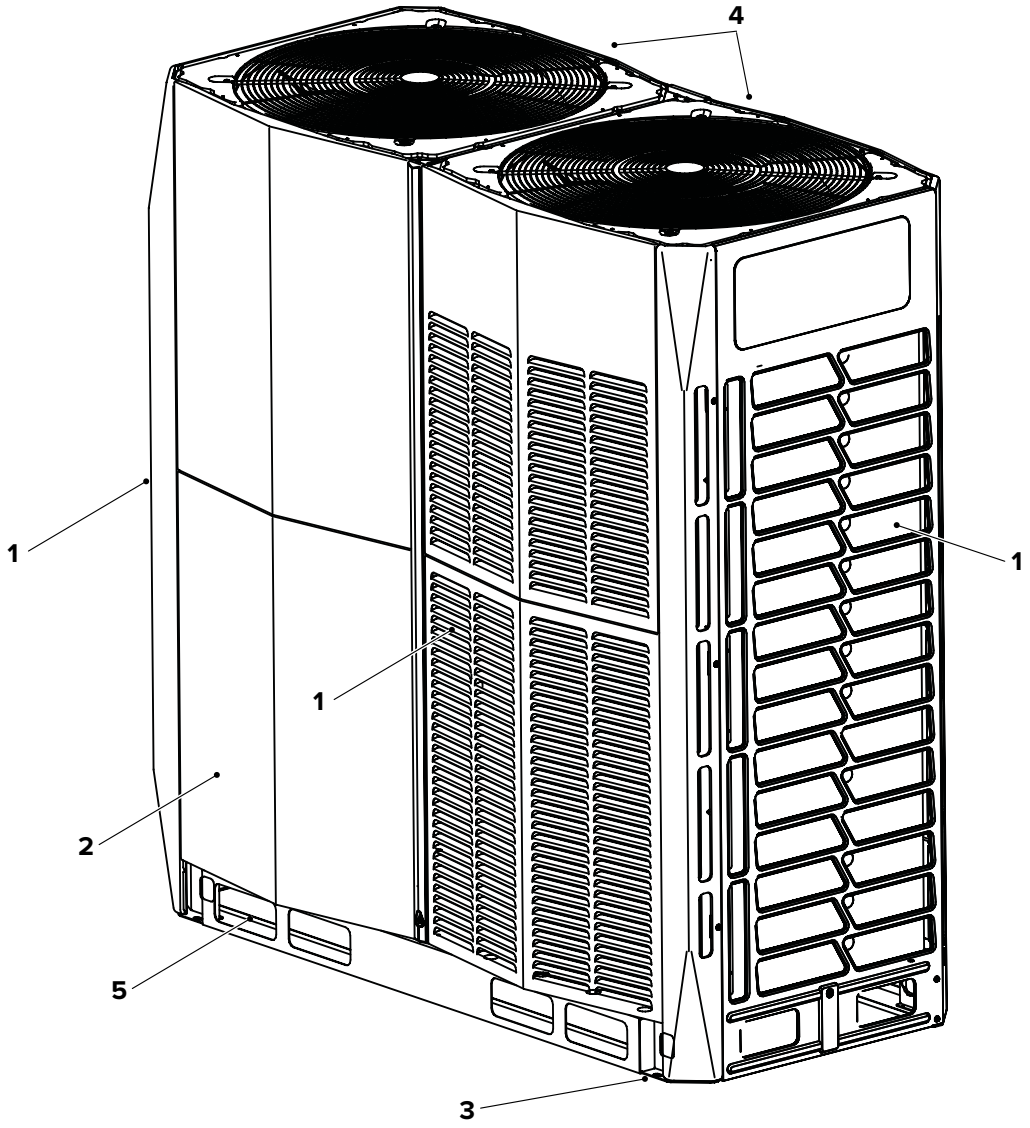


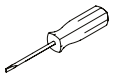
Fig. 1

1 Air inlets
2 Door for connection of the refrigeration lines and wiring
3 Fixed foot for securing to the ground
4 Air outlet
5 Holes for handling with a fork lift truck

WARNING
The images in this manual are provided for illustrative purposes only. The appearance of your device may differ slightly from the illustrations shown here. Refer to the actual characteristics of the unit.

1.3 Accessories

The air conditioning system is provided with the following accessories. Use all specified installation components and accessories to install it.

Description	Aspect	Quantity
Flat blade screwdriver		1
Elbow at 90°		1
Sealed cap		8
Connecting pipe		2
Suitable resistance		2
Key		1
Bag of screws (accessory)		1
Installation manual		1

1.4 Identification

The outdoor unit can be identified by the serial number label (1) that shows the technical and performance data of the unit and what is required by the legislation in force.

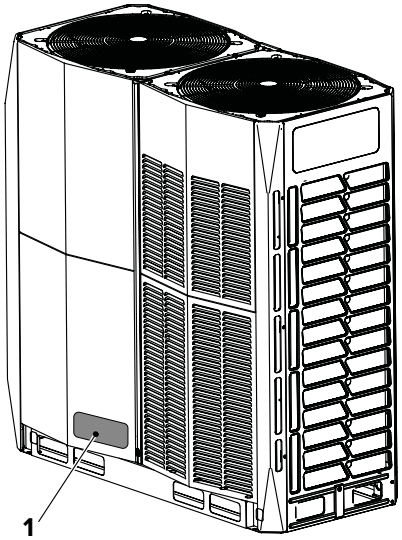


Fig. 2

CAUTION
Tampering, removal, lack of identification labels or anything else that does not allow safe product identification, makes any installation and maintenance operation difficult.

2 PRELIMINARYINDICATIONS

2.1 Combinations of outdoor/indoor units

The table on the next page indicates:

- the maximum power obtainable by installing several outdoor units in series (Total power);
- the maximum quantity of indoor units that can be installed in relation to the power of the outdoor units installed (Max indoor units);
- the combination of the various models to be used to reach the desired total power (Single unit power).

WARNING
When all the outdoor units in the system are running at the same time, the total power of the indoor units must be less than or equal to the total power of the outdoor units. Otherwise the cooling/heating effect would be compromised.

When all the indoor units of the system are not running at the same time, the maximum total power of the indoor units can reach 130% of the total power of the outdoor units.

If the system is used in an environment where there is an extreme climate (outdoor air temperature too high or below -10°C), the total power of the indoor units must be less than the total power of the outdoor units.

For example, the total power of 96Hp will be obtained by combining in series three 900T outdoor units of 32Hp each. With this configuration it will be possible to manage up to a maximum of 64 indoor units.
For complete information on the maximum power of the indoor units and therefore their number, refer to the TECHNICAL BULLETIN.

Balancing of operating times
In multi-module systems, the operating logic of the compressors allows correct rotation and distribution of operating hours. The use of each component is optimised and the operational life of the entire system is extended. The system cyclically alternates the workload of the units installed in series.

Example of balancing with cyclical alternation of units:

Cycle 1
The first unit works at full capacity, the second works at medium capacity and the third remains idle.

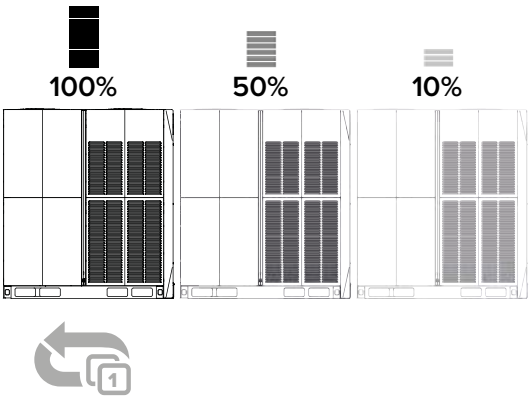


Fig. 3

Cycle 2
The first unit remains idle, the second works at full capacity and the third works at medium capacity.

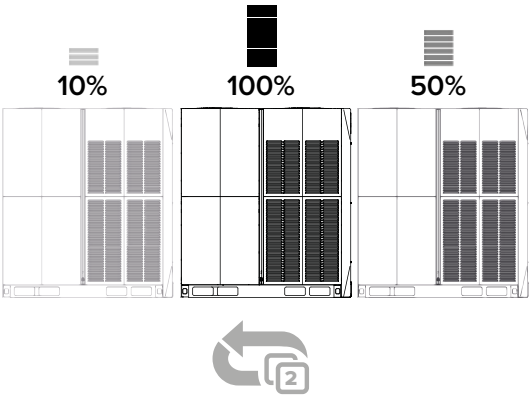


Fig. 4

Cycle 3
The first unit works at medium capacity, the second remains idle and the third works at full capacity.

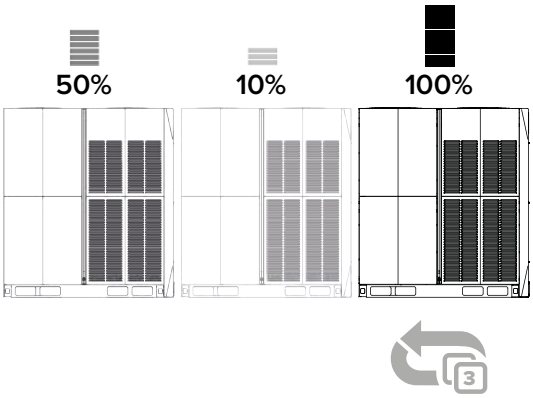


Fig. 5

Total power (Hp)	Single unit power (Hp)													Max indoor units
	252T 8Hp	280T 10Hp	335T 12Hp	400T 14Hp	450T 16Hp	500T 18Hp	560T 20Hp	615T 22Hp	670T 24Hp	730T 26Hp	785T 28Hp	850T 30Hp	900T 32Hp	
8	●													13
10		●												16
12			●											20
14				●										23
16					●									26
18						●								29
20							●							33
22								●						36
24									●					39
26										●				43
28											●			46
30												●		50
32													●	53
34			●					●						56
36				●				●						59
38					●			●						63
40			●								●			64
42							●	●						64
44								●●						64
46								●	●					64
48								●		●				64
50								●			●			64
52										●●				64
54										●	●			64
56											●●			64
58											●	●		64
60											●		●	64
62												●	●	64
64													●●	64
66			●					●					●	64
68				●				●					●	64
70					●			●					●	64
72			●								●		●	64
74							●	●					●	64
76								●●					●	64
78								●	●				●	64
80								●		●			●	64
82								●			●		●	64
84										●●			●	64
86										●	●		●	64
88											●●		●	64
90											●	●	●	64
92											●		●●	64
94												●	●●	64
96													●●●	64

2.2 Unit dimensions

252T - 280T - 335T

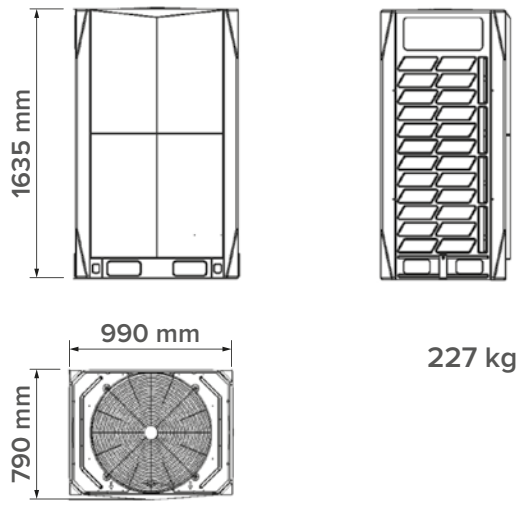


Fig. 6

400T - 450T

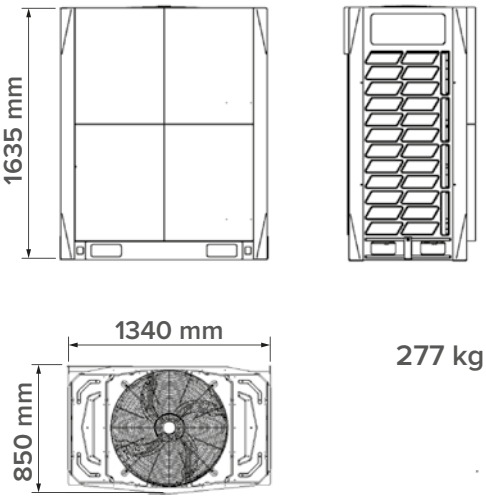


Fig. 7

500T - 560T - 615T

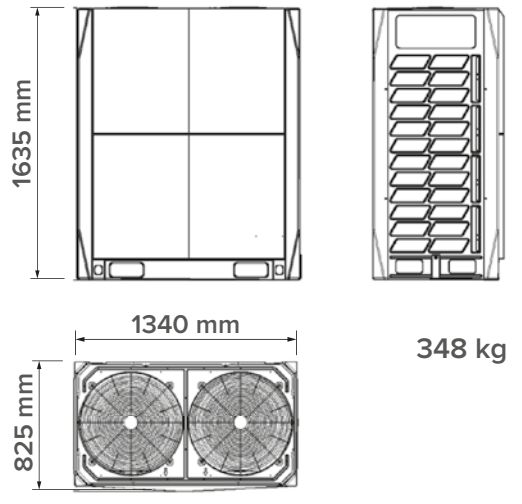


Fig. 8

670T - 730T - 785T - 850T - 900T

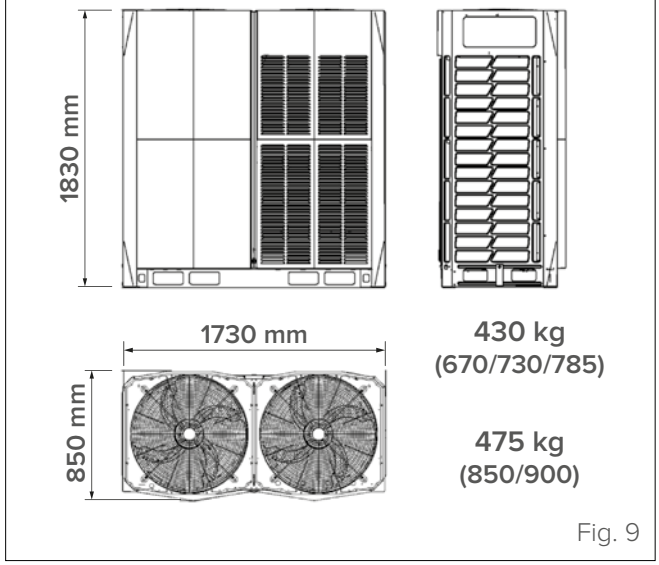


Fig. 9

2.3 Master and slave units

In systems with several outdoor units, these must be placed in descending order, from the unit with the highest power to the unit with the lowest power.
The unit with the highest power must be placed in the first branch and must be set as the master unit, while the others must be set as the slave units.

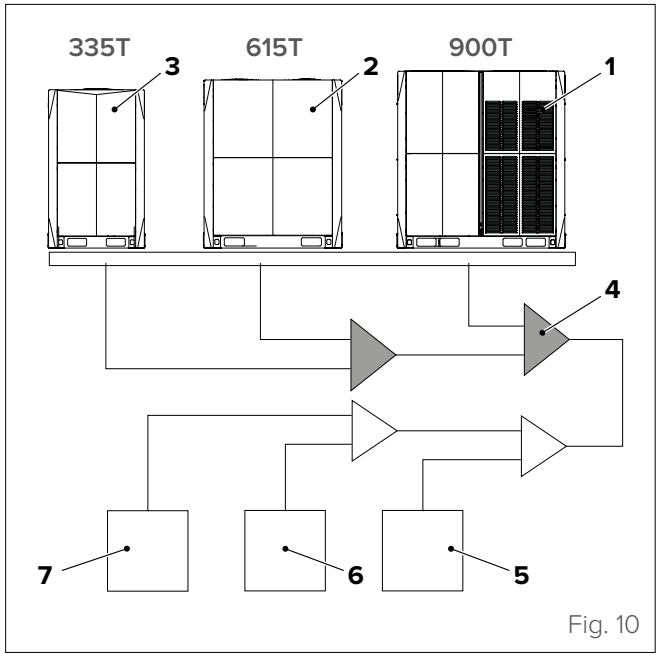


Fig. 10

1 Master outdoor unit (e.g. size 900T)
2 Slave outdoor unit (e.g. size 615T)
3 Slave outdoor unit (e.g. size 335T)
4 First outdoor branch joint
5 First indoor unit
6 Second indoor unit
7 Third indoor unit

Model identification

Model	kW	Power supply
252T	25.2	400V + N Three-phase
280T	28	400V + N Three-phase
335T	33.5	400V + N Three-phase
400T	40	400V + N Three-phase
450T	45	400V + N Three-phase
500T	50	400V + N Three-phase
560T	56	400V + N Three-phase
615T	61.5	400V + N Three-phase
670T	67	400V + N Three-phase
730T	73	400V + N Three-phase
785T	78.5	400V + N Three-phase
850T	85	400V + N Three-phase
900T	90	400V + N Three-phase

2.4 Operating range

The system is designed to function properly under the following climatic conditions

Mode	Outdoor temp. °C	Indoor temp. °C	Relative indoor ambient humidity
Cooling	-15 to +48	17 to 32	< 80%
Heating	-25 to +24	15 to 30	/

If the system is operated outside of the ranges indicated, the protection function is activated and the unit stops.

2.5 Dimensions of the connection pipe

252T - 280T - 335T (1)
400T - 450T - 600T - 560T - 615T (2)
670T - 730T - 785T - 850T - 900T (3)

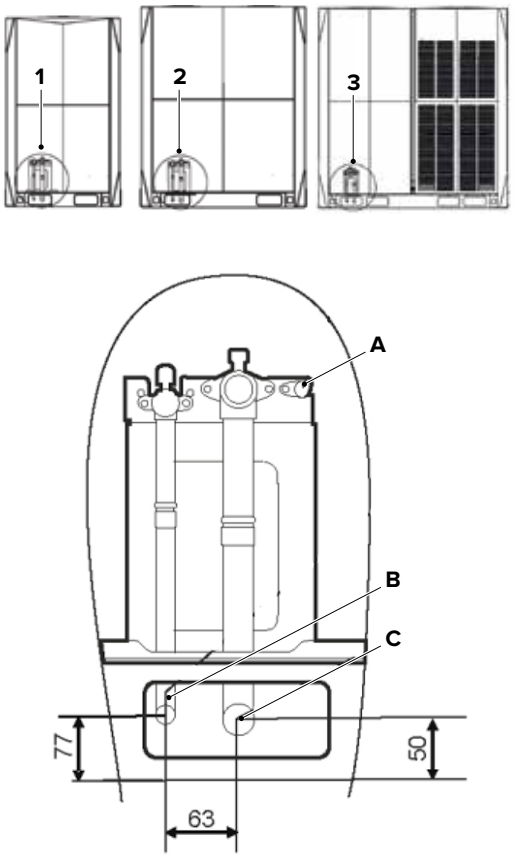


Fig. 11

(A) Service valve. (Used to measure system pressure, to charge refrigerant and to create suction)

(B) Connection of the liquid pipe

(C) Connection of the gas pipe

Ø (mm)	Model					
	252T 280T	335T	400T 450T	500T 560T 615T 670T	730T 785T	850T 900T
B	12.7	15.9	15.9	19.1	22.2	22.2
C	25.4	28.6	31.8	31.8	31.8	38.1

2.6 Length of refrigeration piping

In order to function correctly the system must take into account:

- the total length of the pipes (1);
- the maximum difference in height between the outdoor and indoor units (2) (3);
- the maximum lengths after the first Y-joint (4);
- the maximum difference in height between the indoor units (5).

Installation with outdoor units at the top

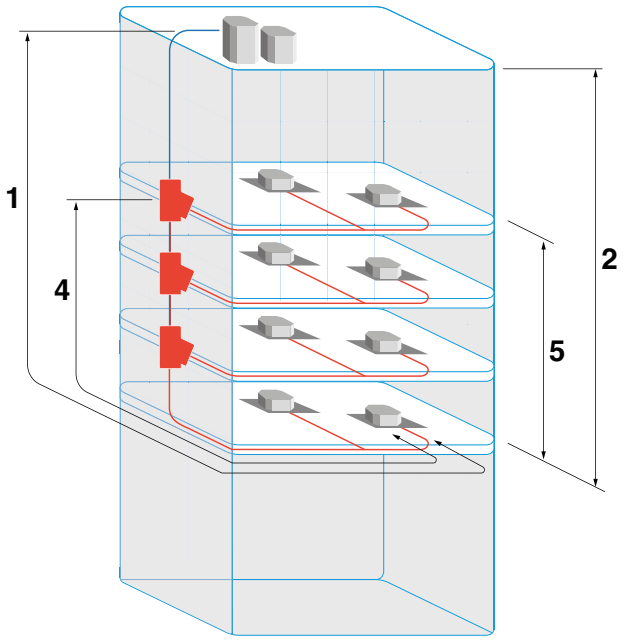


Fig. 12

Installation with outdoor units at the bottom

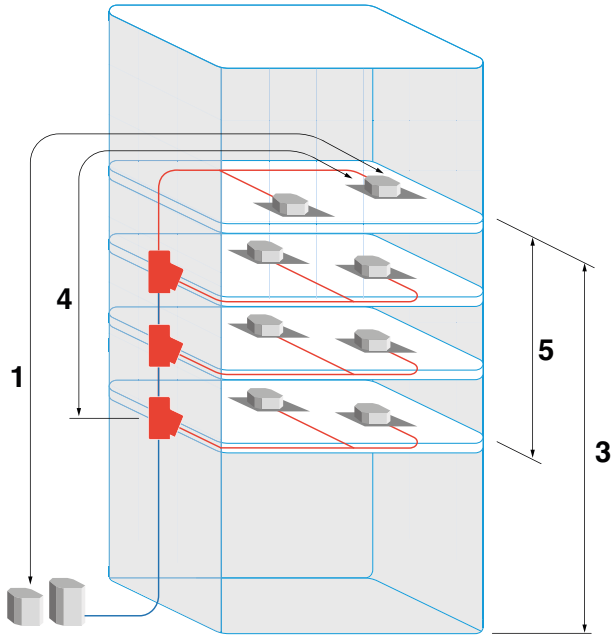


Fig. 13

Ref.	Pipe length	Value
1	Total length of pipes	1000m
2	Maximum difference in height between outdoor units (located at the top) and indoor units	90m
3	Maximum difference in height between outdoor units (located at the bottom) and indoor units	110m
4	Maximum length after first Y-joint.	40/90m **(*)**
5	Maximum difference in height between indoor units	30m

(*) *The maximum length of the standard pipe is 40m, but it is possible to reach up to 90m (see "4.1 Installation of the refrigerant piping" page 23).*

3 INSTALLATION

3.1 Preliminary warnings

CAUTION
All installation operations must be carried out with the appliance completely stopped and after disconnecting all external power supplies.
Before any installation work, pay close attention to the labels on the appliance.
During the activities you must not tamper with or disconnect safety devices for any reason, create by-passes, or use them for purposes other than those envisaged by the manufacturer.

Below are the guidelines for achieving a compliant installation.

- ❑ **Identify a suitable area for installation.**
  See "3.4 Dimensions of the installation area" page 17
- ❑ **Put the appliance in place.**
  See "3.5 Specifications for fixing" page 18
- ❑ **Lay the refrigerant piping.**
  See "4 Refrigerant piping" page 23
- ❑ **Perform correct installation of the condensate drain piping.**
- ❑ **Clean the refrigerant piping.**
  See "6.1 Flushing the pipes." page 43
- ❑ **Make the refrigerating connections.**
  See "4.1 Installation of the refrigerant piping" page 23
- ❑ **Test the tightness of the system at the pressures indicated by the manufacturer.**
  See "6.2 Gas leak test" page 43
- ❑ **Carry out the correct pressurisation of the system.**
  See "6.3 Vacuum operation" page 44
- ❑ **Carry out the electrical wiring, configurations and addressing according to the diagrams provided.**
  See "5 Electrical connections" page 35

3.2 Receiving the product

The appliance is supplied packed. Handling must be carried out by appropriate means in view of the overall weight of the package.

Upon receiving the appliance, check the perfect integrity of all parts.
Check that the model, specifications and quantity delivered conform to the order placed.
In case of damage to the equipment or missing material, please contact your authorised dealer promptly.

WARNING
The manual is an integral part of the product and therefore it is recommended that you read it before installing and commissioning the device and keep it with care for future reference or transfer to another Owner or User.

3.3 Handling

Transport, lifting and handling must be carried out with all due care. Improper use and failure to comply with the instructions will void the warranty.

The areas set aside for handling and installing the appliance must be identified and inspected in advance in order to detect the presence of possible dangers.

The general rules for lifting and handling the appliance are given below.

- Make sure that the safe working load of the lifting equipment is greater than the mass of the equipment to be lifted
- Take all necessary measures to ensure maximum stability of the load.
- Handling must be performed smoothly, without jerking or sudden movements.

The appliance must be taken as close as possible to the place set aside for installation

If a forklift is used, make sure to insert the forks so that the load is balanced between them

The packaging that covers the appliance and any straps or clamps securing parts of it must only be removed after handling at the site of use.

Before positioning the appliance, consider its overall dimensions and the space necessary for the operator's manoeuvres.

IT IS PROHIBITED TO
disperse the packaging material in the environment and leave it within the reach of children as it can be a potential source of danger. It must be disposed of in accordance with current legislation.

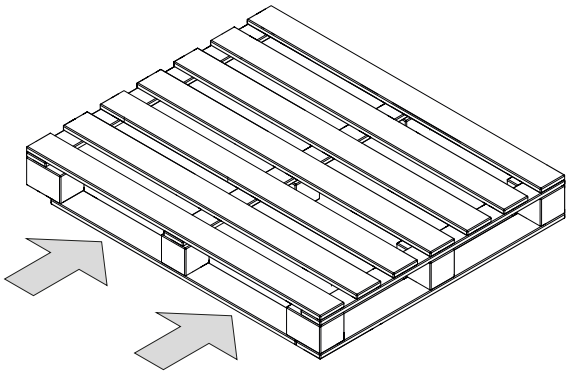


Fig. 14

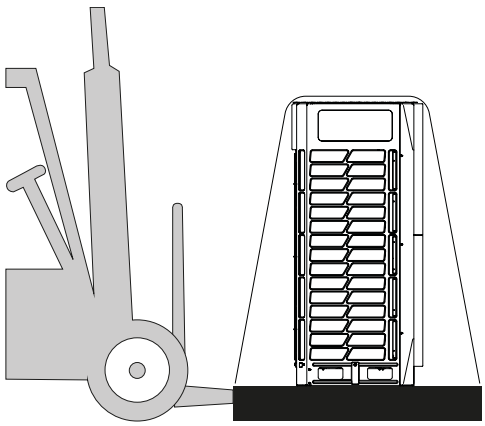


Fig. 15

WARNING
During all handling operations, use the appropriate PPE such as hard hat, gloves and safety shoes.

WARNING
Before use, remove the six pieces of PE foam in the back of the unit that protect the condenser. Be careful not to damage the fins or the efficiency of heat exchange could be compromised.

It is PROHIBITED to install the outdoor unit in the following places:

– near an obstacle blocking the air inlets and outlets;
– near a public road, crowded areas or places where the noise from the unit may cause disturbance to others;
– near animals or plants that may be disturbed by the hot air coming out;
– near combustible gas sources;
– in very dusty places;
– in places excessively exposed to salty air.

3.4 Dimensions of the installation area

The appliance must be installed in such a way that a sufficient amount of air can flow through the unit itself.
If there is a side wall adjacent to the appliance, the latter must be at least 800mm higher than the side wall.

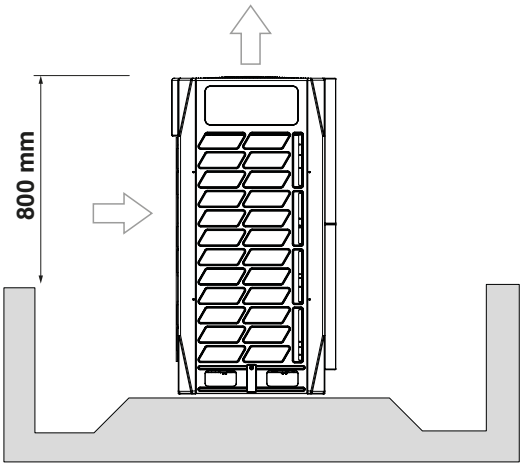


Fig. 16

The distance between the appliance and the side walls must be at least 1m.
If several appliances are installed in a line, the following distances must be observed:

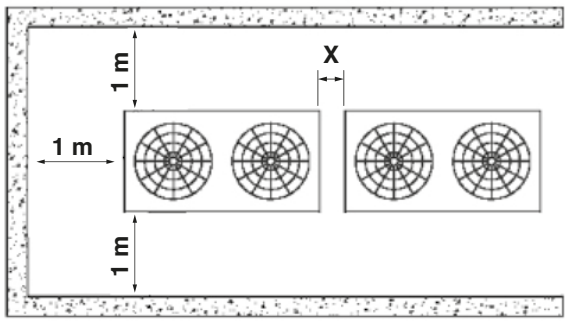


Fig. 17

Model	Distance (X)
252T to 900T	from 100 mm to 500 mm

In the case of several rows of appliances, there must be a distance of at least 1m between each row.

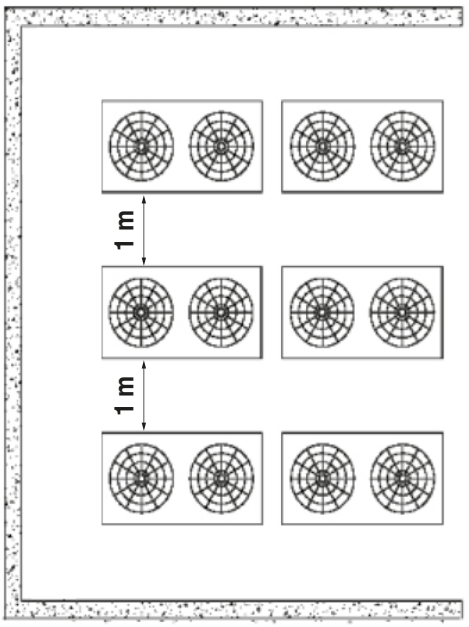


Fig. 18

In the case of forced installation less than one metre from a higher wall of the appliance, it is recommended to make a duct for the correct discharge of air. The vertical section of the duct must extend higher than the wall. If the static pressure is higher than 20Pa, the ducting must be adapted according to this pressure. For more information see paragraph “3.6 Ducting of outdoor unit” page 19

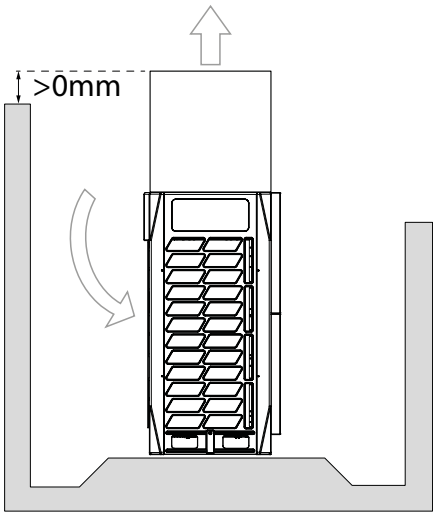


Fig. 19

If there is a structure above the appliance at a distance of less than 800mm, ducting must be installed.

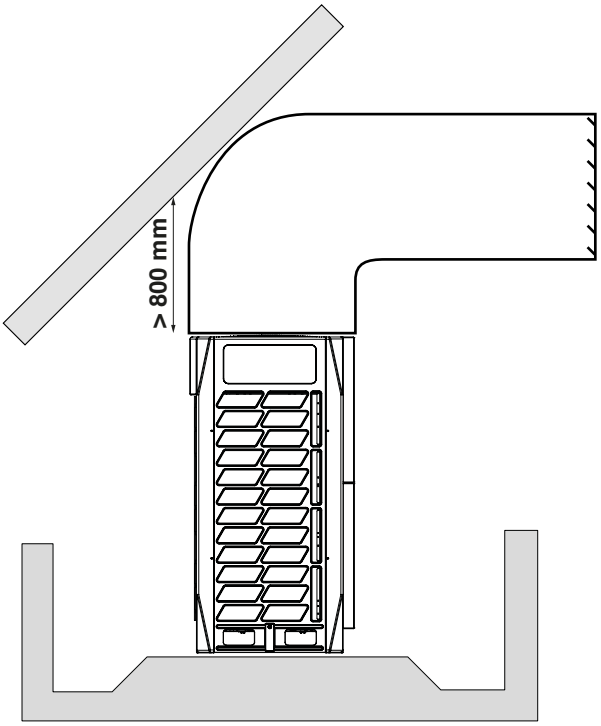


Fig. 20

3.5 Specifications for fixing

For correct installation of the unit on the base, the latter must:

- Be placed on solid ground or structures capable of supporting its weight (1);
- be made of concrete or steel;
- have a minimum height of 200mm and a minimum thickness of 80mm (2). These dimensions allow for sufficient access during installation of the piping;
- have rounded edges;
- be perfectly level. The support points must ensure uniform distribution of the weight.

For fixing, use 10mm diameter expansion plugs (3) and anti-vibration rubber pads (4).
In case of installation of several units in line, these must be on the same plane and at the same level.

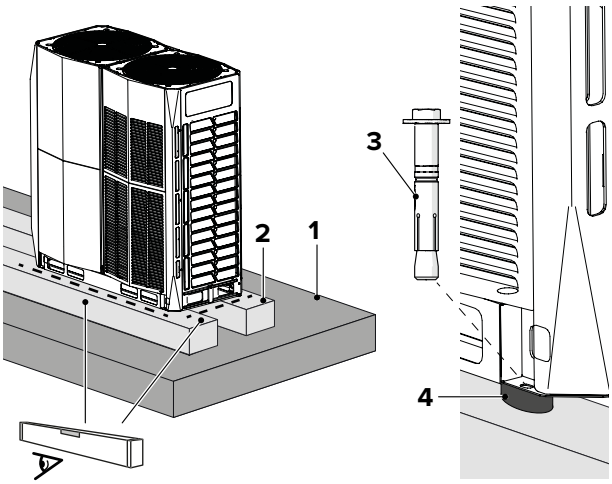


Fig. 21

CAUTION
When drilling holes. It is recommended to always use eye protection.

- Mark the positions of the four expansion anchors according to the measurements shown in the following table.
- Drill the holes for the expansion anchors.
- Remove any dust in the holes.
- Insert a nut on the end of each expansion anchor.
- Hammer the expansion anchors into the holes made.
- Remove the nuts from the expansion anchors and place the outdoor unit on the anchors.
- Insert the rubber pads on each expansion anchor and reapply the nuts.
- Using a spanner, tighten the nuts firmly.

– The location of the fixing holes in the appliance is indicated in the table below

Ref.	Model		
	252T 280T 335T	400T 450T 500T 560T 615T	670T 730T 785T 850T 900T
A	990mm	1340mm	1730mm
B	740mm	1090mm	1480mm
C	790mm	825mm	850mm
D	723mm	723mm	723mm

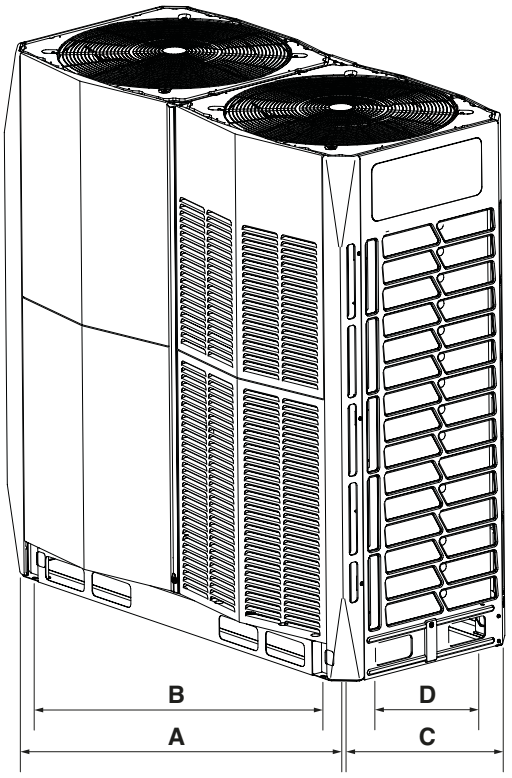


Fig. 22

(A) Width of appliance

(B) Location of holes on long side

(C) Depth of appliance

(D) Location of holes on short side

3.6 Ducting of outdoor unit

If it is necessary to duct the outdoor unit, the following instructions must be observed:

– Remove the fan protection grille (1), otherwise the flow of air will be negatively conditioned;

– lay the ducting in such a way that it has only one curve (2);

– add insulation (3) between the appliance and the ducting to avoid vibrations;

– prepare separate ducting for each unit (4). It is not possible to share ducting among several units;

– The ventilation fins of the air outlet should be installed at an angle of 15° or less on the horizontal plane (5) to minimise the impact on the air flow. The distance between two fins must be 100mm (6). The fins must have a length of 90mm (7).

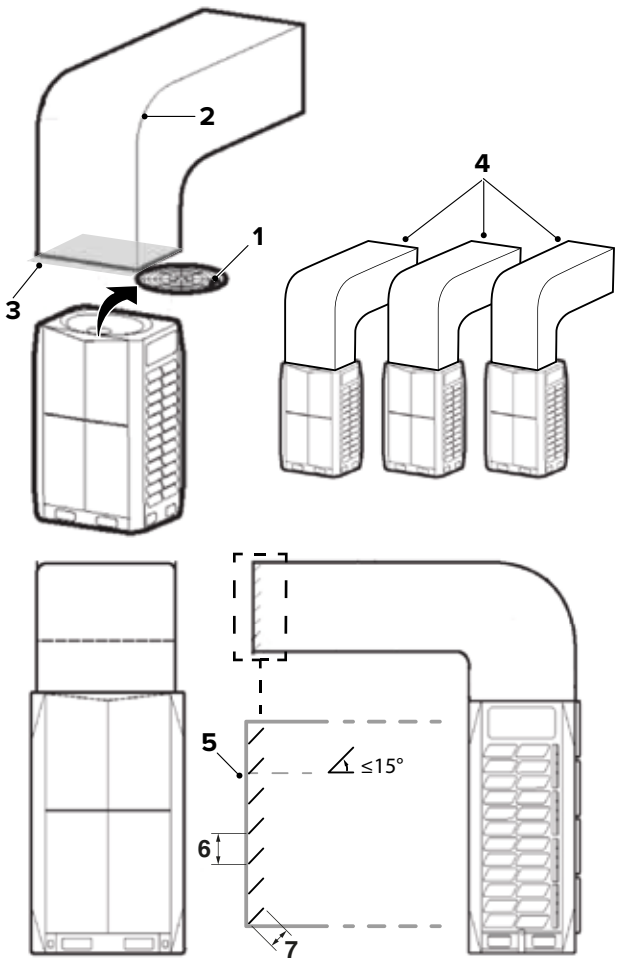


Fig. 23

Depending on requirements, two different types of ducting can be laid: transverse or longitudinal

Static pressure	Note
0 Pa	Factory conditions (without ducting)
0 - 20 Pa	Remove the grille and connect to the duct
20 - 40 Pa	Remove the grille and configure at the dip switches (see "7.1.2 Static pressure" page 47)

Table 1

The following graphs show the performance of fans with a ducted unit. The static pressure (Pa) on the ordinate axis, the air flow rate (m^3/h) on the abscissa axis. Curve (1) indicates the average (custom) E.S.P. value, curve (2) indicates the low E.S.P. value (factory setting)

252T - 280T - 335T

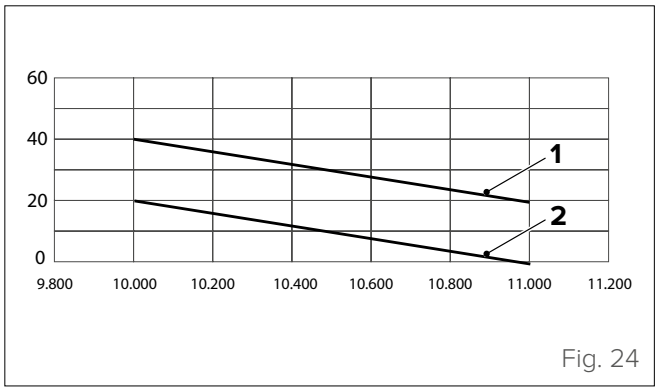


Fig. 24

400T - 450T

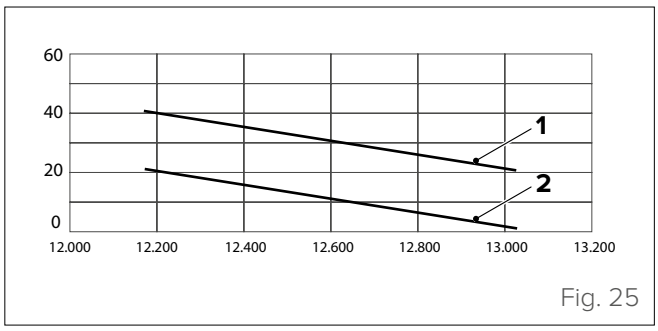


Fig. 25

500T - 560T - 615T

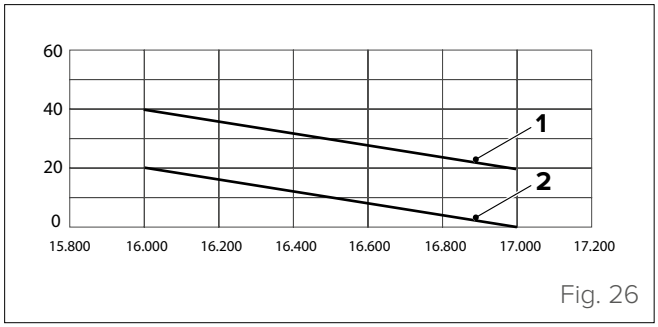


Fig. 26

670T - 730T - 785T

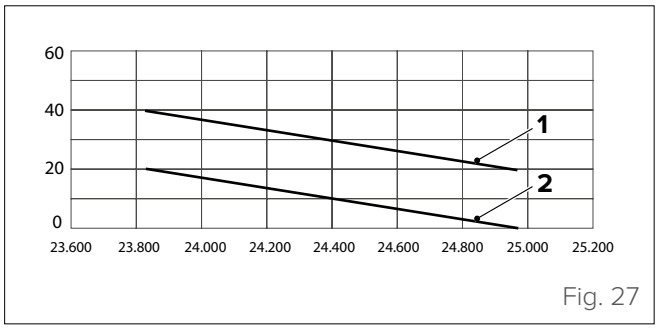


Fig. 27

850T - 900T

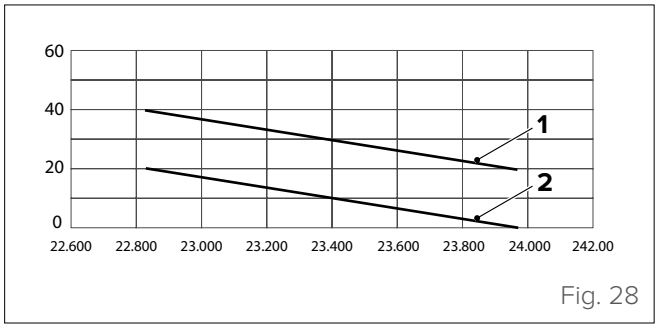


Fig. 28

3.6.1 Transverse ducting

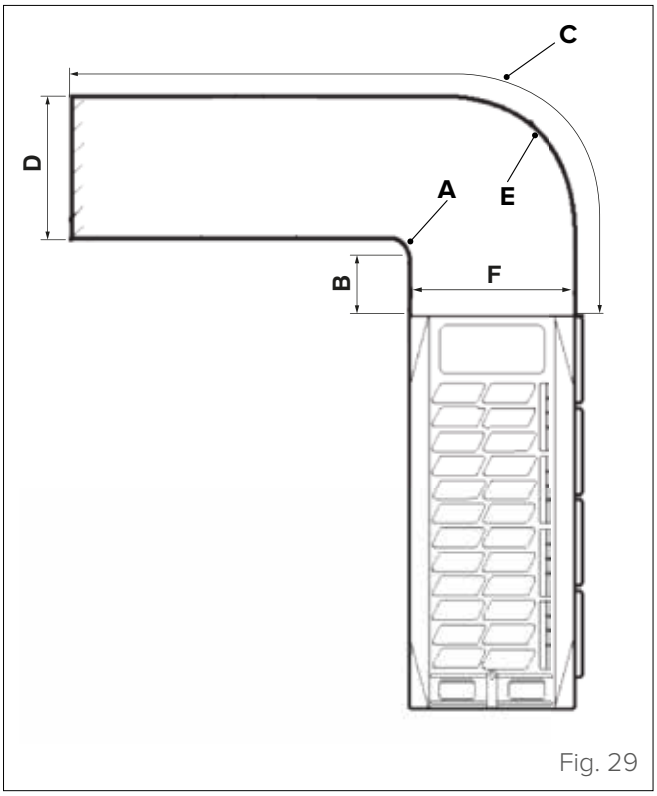


Fig. 29

Ref.	Description	Value (mm)
252T - 280T - 335T		
A	Radius of inner curve	≥ 300
B	Straight portion before the curve	≥ 250
C	Total length of ducting	≤ 3000
D	Exit hole	≥ 731 / ≤ 770
E	Radius of outer curve	A + 731
F	Width of duct	731
400T - 450T		
A	Radius of inner curve	≥ 300
B	Straight portion before the curve	≥ 250
C	Total length of ducting	≤ 3000
D	Exit hole	≥ 770 / ≤ 800
E	Radius of outer curve	A + 770
F	Width of duct	770
500T - 560T - 615T		
A	Radius of inner curve	≥ 300
B	Straight portion before the curve	≥ 250
C	Total length of ducting	≤ 3000
D	Exit hole	≥ 630 / ≤ 660
E	Radius of outer curve	A + 630
F	Width of duct	630
670T - 730T - 785T - 850T - 900T		
A	Radius of inner curve	≥ 300
B	Straight portion before the curve	≥ 250
C	Total length of ducting	≤ 3000
D	Exit hole	≥ 740 / ≤ 770
E	Radius of outer curve	A + 740
F	Width of duct	740

3.6.2 Longitudinal ducting

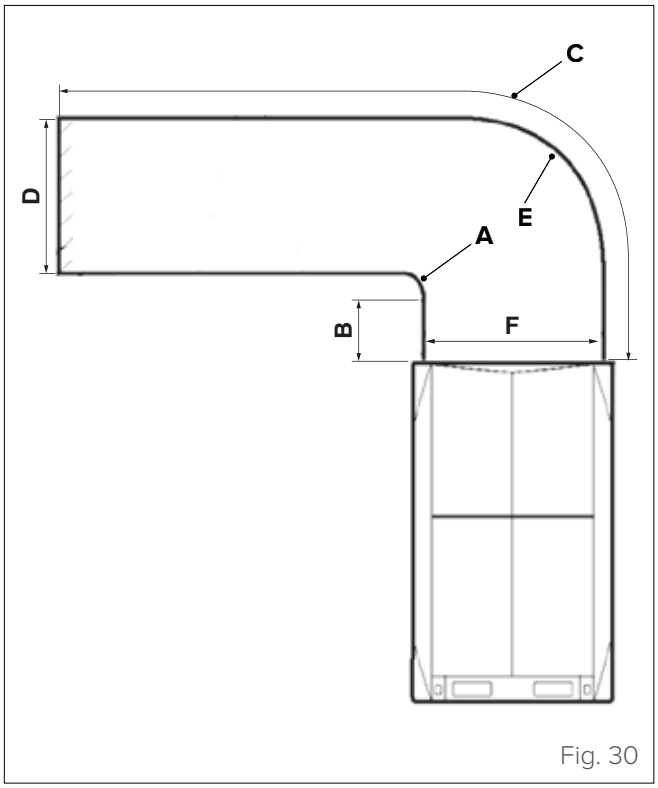


Fig. 30

Ref.	Description	Value (mm)
252T - 280T - 335T		
A	Radius of inner curve	≥ 300
B	Straight portion before the curve	≥ 250
C	Total length of ducting	≤ 3000
D	Exit hole	≥ 750
E	Radius of outer curve	A + 750
F	Width of duct	750
400T - 450T		
A	Radius of inner curve	≥ 300
B	Straight portion before the curve	≥ 250
C	Total length of ducting	≥ 3000
D	Exit hole	≥ 1290
E	Radius of outer curve	A + 1290
F	Width of duct	1290
500T - 560T - 615T		
A	Radius of inner curve	≥ 300
B	Straight portion before the curve	≥ 250
C	Total length of ducting	≤ 3000
D	Exit hole	≥ 1290
E	Radius of outer curve	A + 1290
F	Width of duct	1290

Longitudinal ducting is not envisaged for models **670T - 730T - 785T - 850T - 900T**.

Use self-tapping screws ST3.9 (1) to fasten the duct to the appliance

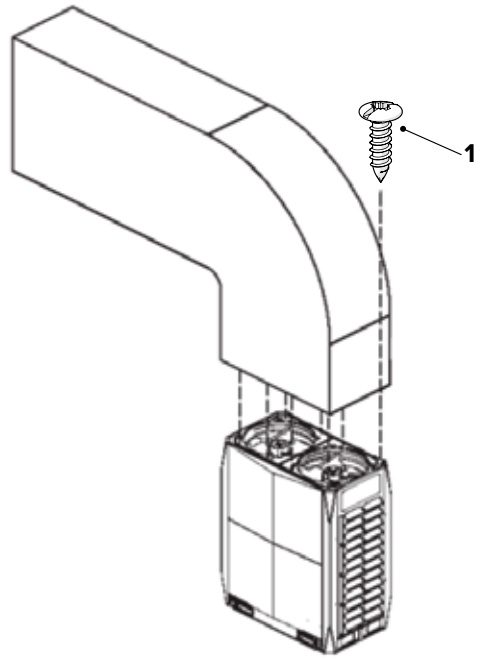


Fig. 31

3.7 Disassembly of panels

The panels must be removed in order to connect the refrigerant piping, make the electrical connections and carry out maintenance on the unit.

– loosen the screws and remove the right (1) and left (2) uprights. Rotate and lift them slightly to remove them. For models 670T - 730T - 78T - 850T - 900T loosen the screw and also remove the central upright (3);

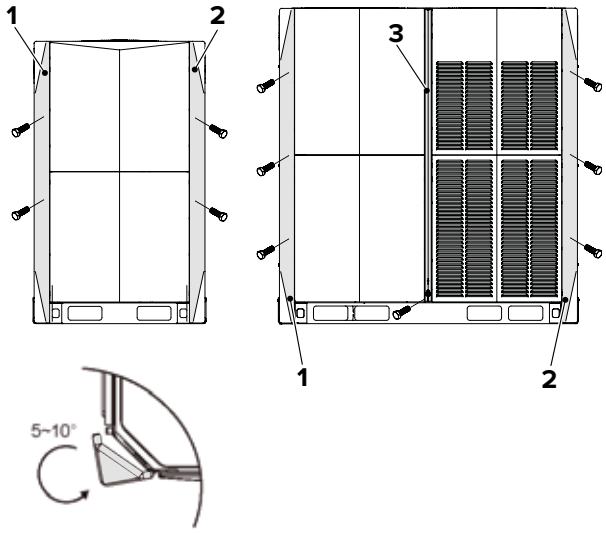


Fig. 32

– loosen the screws and remove the right (4) and left (5) upper panels. Then remove the lower panels (6) and (7).

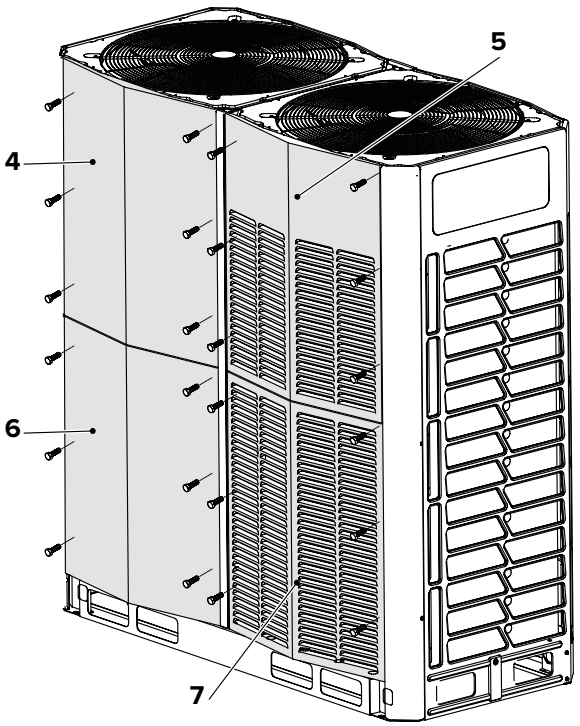


Fig. 33

The number of fixing screws depends on the model.

the panels are fixed with clips to the right and left uprights (8) and to the central upright (9) and with hooks to the lower panel (10).

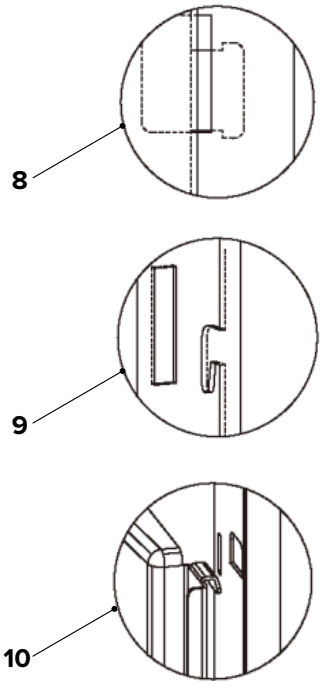


Fig. 34

4 REFRIGERANT PIPING

4.1 Installation of the refrigerant piping

Below are the guidelines for compliant installation of the refrigerant piping

- ❑ **Put the outdoor unit in place**
- ❑ **Put the indoor unit in place**
- ❑ **Put the pipes in place**
- ❑ **Blow with nitrogen**
- ❑ **Perform welding**
- ❑ **Make the connection to the units**
- ❑ **Perform the tightness test**
- ❑ **Carry out pressing and pressurisation**

To perform all the operations correctly, you need the following equipment:

- Pipe cutter
- Flaring tool
- Tube bending machine
- Two-stage vacuum pump with minimum flow rate of 80-120 litres/minute
- Digital vacuum gauge
- Manifold and fittings
- Cylinder of nitrogen
- Electronic leak detector with sensitivity according to current regulations.

In systems with several outdoor units, these must be placed in descending order, from the unit with the highest power to the unit with the lowest power.
The unit with the highest power must be placed in the first branch and must be set as the master unit, while the others must be set as the slave units.

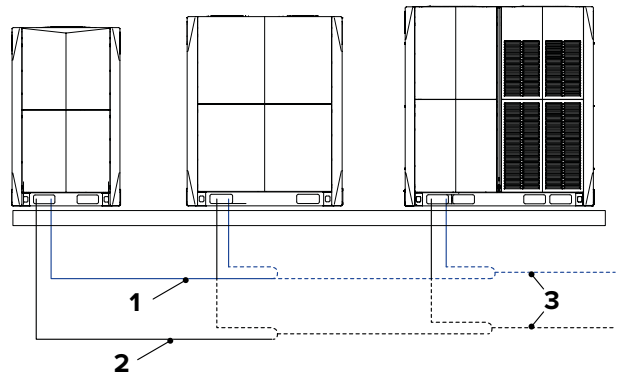


Fig. 35

1 *refrigerant*
2 *gas*
3 *main section*

WARNING
Pay attention to the maximum measurements of the cooling line. See paragraph “2.6 Length of refrigeration piping” page 14 .

WARNING
Use deoxidised phosphorous copper piping for the refrigerant (seamless copper alloy piping and tubing) compliant with local regulations.

WARNING
Use piping suitable for use with R410A.

To install the lines, use copper pipes for air conditioning. Keep the ends of the pipes sealed until installation to prevent the ingress of polluting agents such as dust, water and dirt.

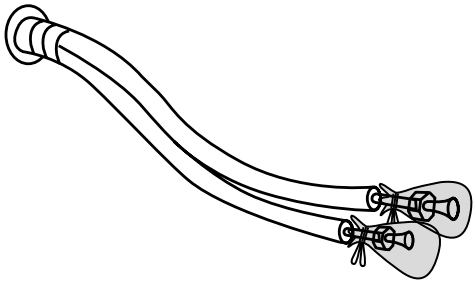


Fig. 36

For the diameter to be used refer to the following table

Ø (mm)	Ø (inches)	Radial thickness (mm)
6.35	1/4”	0.8
9.52	3/8”	0.8
12.7	1/2”	0.8
15.9	5/8”	1.0
19.1	3/4”	1.0
22.2	7/8”	1.2
25.4	1”	1.2
28.6	1” - 1/8”	1.3
31.8	1” - 1/4”	1.5
38.1	1” - 3/8”	1.5
41.3	1” - 5/8”	1.5
44.5	1” - 3/4”	1.5
54.0	2” - 1/8”	1.8

Blow nitrogen through the sections pre-welded in the workshop to expel any dust.
Pipes should only be cut using roller pipe cutters (do not use a hacksaw).

Dirt that penetrates the pipes when in use could clog the expansion valves or capillaries rather than enter the compressor, causing the latter to malfunction.

Eliminate any residual moisture in the lines. Copper plating, formation of acid sludge, freezing of the laminating devices, formation of acids that corrode metals and deteriorate the insulation of the electric motor can occur in the case of non-compliant installation with the presence of moisture. See paragraph “6.3 Vacuum operation” page 44

Avoid weld undercutting that cannot be inspected; all the piping must be accessible for inspection.

In case of laying the lines before making the connection to the units, keep the ends sealed until the time of connection.
It is good practice to pinch the ends in case the lines are laid a long time before the connection.

CAUTION
Use only nitrogen as a cleaning agent.

If residual moisture is found when cleaning with the blowing of nitrogen, or if a long time has passed between the laying of the lines and the connection, proceed with the “triple vacuum”.
This procedure consists in filling with nitrogen and emptying twice before carrying out the final emptying operation.
Make sure that the pressure does not rise during this operation.

It is important that the joints are created to standard to ensure a good seal.
For more information see paragraph “6.1 Flushing the pipes.” page 43 and “6.2 Gas leak test” page 43

WARNING
For connection of the lines, only “braze” welding is allowed.

Brazing (1) consists in connecting metal pieces with the help of a filler metal without melting the pieces to be assembled. The filler metal penetrates by capillarity between the pieces to be assembled.
The filler metal must be phosphorous copper or “rods of silver alloy”.

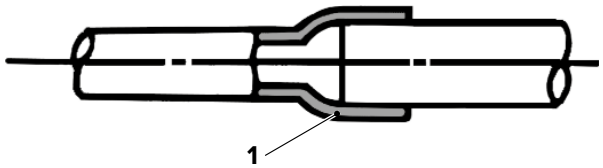


Fig. 37

Welding must be done in a neutral atmosphere (nitrogen). An inert atmosphere (free of moisture and oxygen) must be created inside the pipeline. In this way, no oxide formations are created during welding

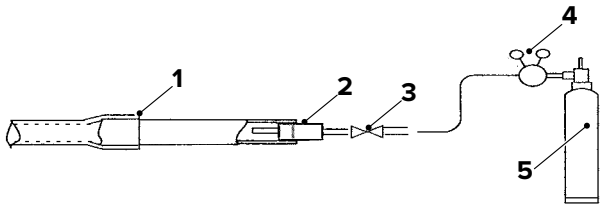


Fig. 38

1 Weld point

2 Rubber cap

3 Pressure reducer (operating pressure 0.2/0.5bar)

4 Pressure reducer on the cylinder

5 Cylinder of nitrogen

If it is necessary to bend the piping, the risk of excessive deformation must be avoided. The maximum deformation allowed is 2/3rds of the diameter of the pipe itself.

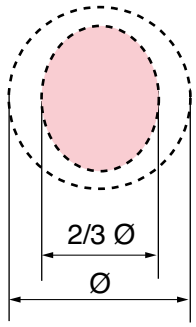


Fig. 39

Pipes can be bent respecting the following bending radii (1)

Pipe diameter (mm)	Radius (mm)
9.52	≥ 30
12.7	≥ 30
15.9	≥ 40
19.1	≥ 50

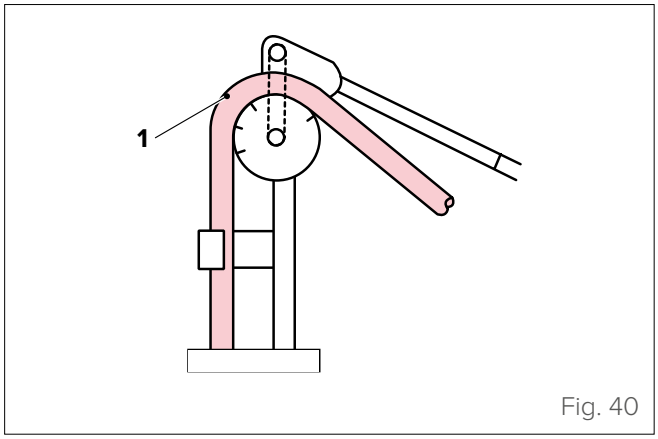


Fig. 40

CAUTION
Do not use or integrate existing pipes. The old refrigerant and oil in the piping contain a large amount of chlorine which will cause the fluid in the new unit to deteriorate.

WARNING
Do not use solenoid valves to avoid the backflow of oil.

4.1.1 Sizing of the refrigerant piping

			Allowed value	Piping
Pipe length	Total length of pipes (Total extended length)		1000m	L_1 + **2x** (L_2, L_3, L_4, L_5, L_6, L_7, L_8, L_9, L_{10}, L_{11}, L_{12}, L_{13}, L_{14}, L_{15}, L_{16},) + (a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q)
	Maximum pipe length (L)	Effective length	175m	$L_1 + L_9 + L_{10} + L_{11} + L_{12} + L_{13} + k$
		Equivalent length	200m	
	Pipe length (between the furthest indoor unit and the first branch joint)		40/90m	$L_9 + L_{10} + L_{11} + L_{12} + L_{13} + k$
Level difference	Difference in level between indoor/ outdoor unit	Outdoor unit up	90m	
		Outdoor unit down	110m	
	Difference in height between indoor units		30m	

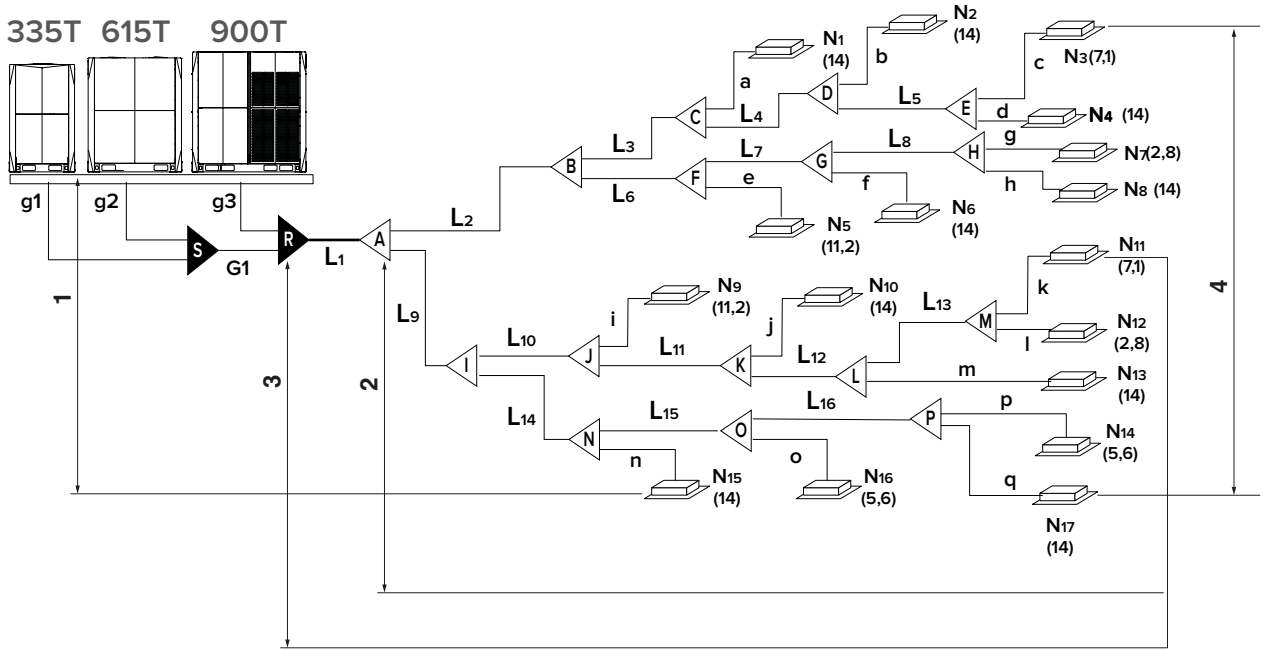


Fig. 41

Ref.	Pipe length	Value
(1)	Maximum difference in height between outdoor units (located at the top) and indoor units	90m
	Maximum difference in height between outdoor units (located at the bottom) and indoor units	110m
(2)	Maximum length after first Y-joint.	90m
(3)	Maximum equivalent length of the pipe between the outdoor unit and the furthest indoor unit	200m
(5)	Maximum difference in height between indoor units	30m

Ref.	Description
L_1	Main pipe
L_1 .... L_{16}	Internal main pipes
a .... q	Internal auxiliary pipes
A .... P	Internal branch joints
S, R	External branch joints
g1, g2, g3, G1	External connection pipes
N_1 .... N_{17}	Indoor units (the power in kW in brackets)

The maximum length of the connection pipes between the branch joint and the furthest indoor unit must not exceed 175m (200m of equivalent length).

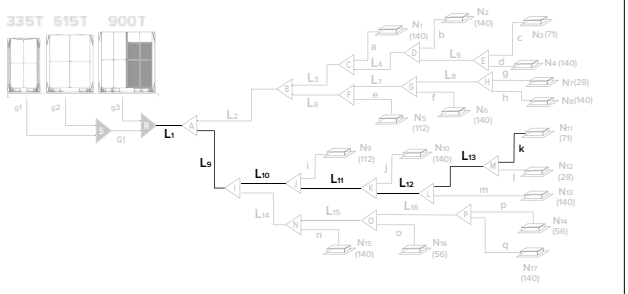


Fig. 42

WARNING
The length of each branch joint is 0.5m.
The indoor units should be as similar as possible to permit installation of the branch joint on both sides.

CAUTION
The length of the piping between the furthest indoor unit and the first internal branch joint should not exceed 40m. In order to extend this length to 90m, follow the instructions below.

- Each internal auxiliary pipe must not be more than 20m away from the internal branch joint (e.g. $L_{11}$and J)
- The difference in length between the internal main pipe (e.g. L_9) from the first internal branch joint (e.g. A) of the furthest indoor unit (e.g. N_{11}) and the internal main pipe (e.g. L_2) of the first internal branch joint (e.g. A) of the nearest indoor unit (e.g. N_1) does not exceed 40m.

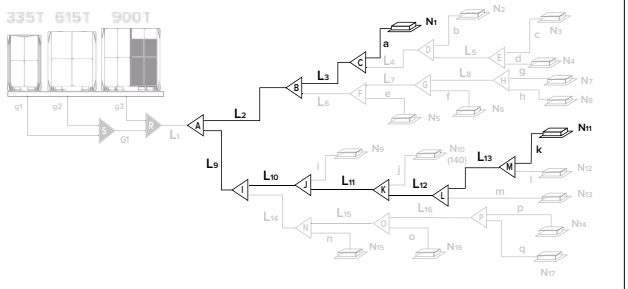


Fig. 43

CAUTION
In case of exceeding 40m, increase the diameter of the internal main pipes by one measure.
Perform this operation only on pipes that are smaller than the main pipe.

Selection of kits with main pipe (L1), internal main pipes (L2 to L16) and internal branch joint

The dimensions of the main pipe and of the internal main pipes are indicated in the following table. Use the specified branch joint kit. Use only pipes with the dimensions indicated.

Total power of indoor units (kW).	Gas side (Ø mm)	Liquid side (Ø mm)	Branch joint kit
< 16.8	15.9	9.5	FQZHN-01D
16.8 to 22.3	19.1	9.5	FQZHN-01D
22.4 to 32.9	22.2	9.5	FQZHN-02D
33.0 to 46.9	28.6	12.7	FQZHN-03D
47.0 to 70.9	28.6	15.9	FQZHN-03D
71.0 to 103.9	31.8	19.1	FQZHN-03D
104.0 to 153.9	38.1	19.1	FQZHN-04D
154.0 to 179.9	41.3	19.1	FQZHN-05D
180.0 to 244.9	44.5	22.2	FQZHN-05D
245.0 to 268.9	54.0	25.4	FQZHN-06D
≥269.0	54.0	28.6	FQZHN-07D

Table 2

CAUTION
If the outdoor unit is installed higher than the indoor units and the difference in height is greater than 20m, it is recommended to install a return bend in the gas pipe of the main piping every 10m as shown in the figure.

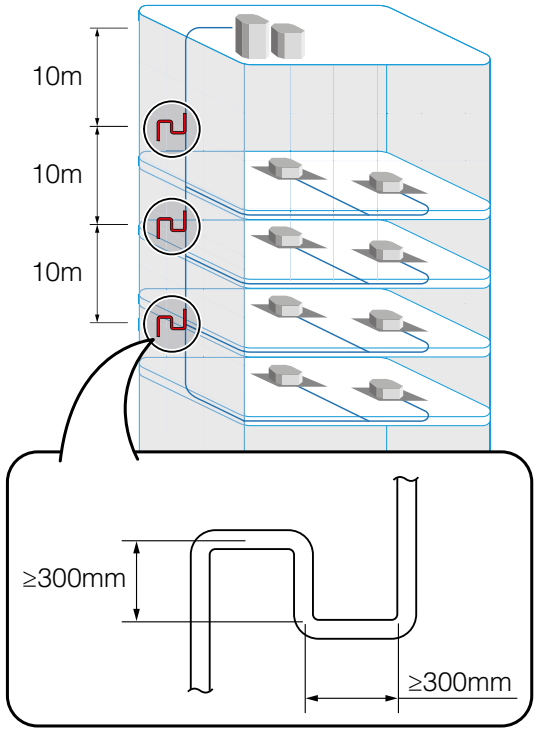


Fig. 44

CAUTION
If the outdoor unit is installed below the indoor units and the difference in height is greater than 40m, the diameter of the main pipe (L1) must be increased by one measure.

Selection of main pipe (L1) and first internal branch joint (A)

If the equivalent length of all liquid pipes is **less than 90m**, use only the measurements of the main pipe and of the internal main pipes indicated in the following table. Use the specified branch joint kit. Use only pipes with the dimensions indicated.

Total power of outdoor units (Hp)	Gas side (Ø mm)	Liquid side (Ø mm)	Branch joint kit
8	19.1	9.53	FQZHN-02D
10	22.2	9.53	FQZHN-02D
12 to 14	25.4	12.7	FQZHN-02D
16	28.6	12.7	FQZHN-03D
18 to 24	28.6	15.9	FQZHN-03D
26 to 34	31.8	19.1	FQZHN-03D
36 to 54	38.1	19.1	FQZHN-04D
56 to 66	41.3	19.1	FQZHN-05D
68 to 82	44.5	22.2	FQZHN-05D
84 to 96	50.8	25.4	FQZHN-05D

Table 3

If the equivalent length of all liquid pipes is **more than 90m**, use only the measurements of the main pipe and of the internal main pipes indicated in the following table. Use the specified branch joint kit. Use only pipes with the dimensions indicated.

Total power of outdoor units (Hp)	Gas side (Ø mm)	Liquid side (Ø mm)	Branch joint kit
8	22.2	12.7	FQZHN-02D
10	25.4	12.7	FQZHN-02D
12 to 14	28.6	15.9	FQZHN-03D
16	31.8	15.9	FQZHN-03D
18 to 24	31.8	19.1	FQZHN-03D
26 to 34	38.1	22.2	FQZHN-04D
36 to 54	41.3	22.2	FQZHN-04D
56 to 66	44.5	22.2	FQZHN-05D
68 to 82	54.0	25.4	FQZHN-06D
84 to 96	54.0	28.6	FQZHN-07D

Table 4

Selection of the external branch pipe

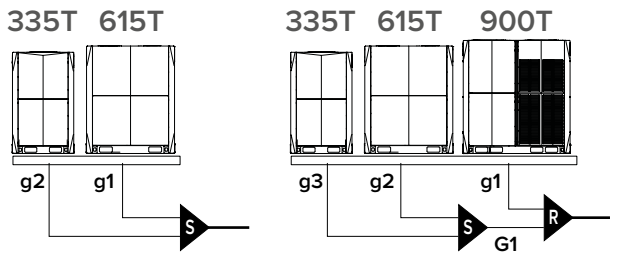


Fig. 45

Use connection pipes with the diameter indicated in the table:

External connection pipes	Power of single outdoor unit (Hp)	Gas side (Ø mm)	Liquid side (Ø mm)
g1, g2, g3	8 to 12	25.4	12.7
	14 to 22	31.8	15.9
	24 to 32	38.1	19.1
G1		41.3	22.2

Table 5

For systems with at least two outdoor units, external branch joints are required (sold separately).

Depending on the quantity of outdoor units, one or two external branch joints (R, S) can be used

No. of outdoor units	Branch joint kit	
2	S	FQZHW-02N1E
3	S + R	FQZHW-03N1E

Table 6

Example:

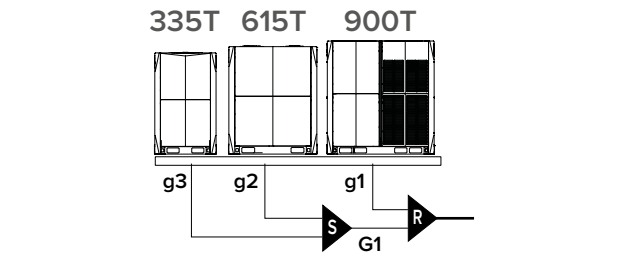


Fig. 46

Pipes	Power of outdoor unit (Hp)	Gas side (Ø mm)	Liquid side (Ø mm)
g3	**335T** of 12Hp	25.4	12.7
g2	**615T** of 22Hp	31.8	15.9
g1	**900T** of 32Hp	38.1	19.1
double joint S + R = FQZHW-03N1E			

Table 7

Selection of internal auxiliary pipes

The internal auxiliary pipes (a ... q) must respect the diameter indicated in the table, based on the overall power of the indoor units.

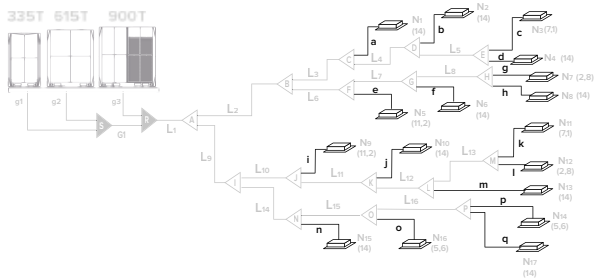


Fig. 47

With branch joint of less than 10 metres

Power of indoor unit (kW)	Gas side (Ø mm)	Liquid side (Ø mm)
≤ 4.5	12.7	6.4
≥ 5.6	15.9	9.5

Table 8

With branch joint greater than 10 metres

Power of indoor unit (kW)	Gas side (Ø mm)	Liquid side (Ø mm)
≤ 4.5	15.9	9.5
≥ 5.6	19.1	12.7

Table 9

EXAMPLE OF SIZING OF REFRIGERANT PIPING

The example below illustrates the piping selection procedure for a system consisting of three outdoor units (32HP + 22HP + 12HP) and 17 indoor units. The total equivalent length of the liquid piping of the system is greater than 90m; the length of the piping between the furthest indoor unit and the first internal branch joint is less than 40m and the length of each internal auxiliary pipe (from each indoor unit to its closest branch joint) is less than 10m .

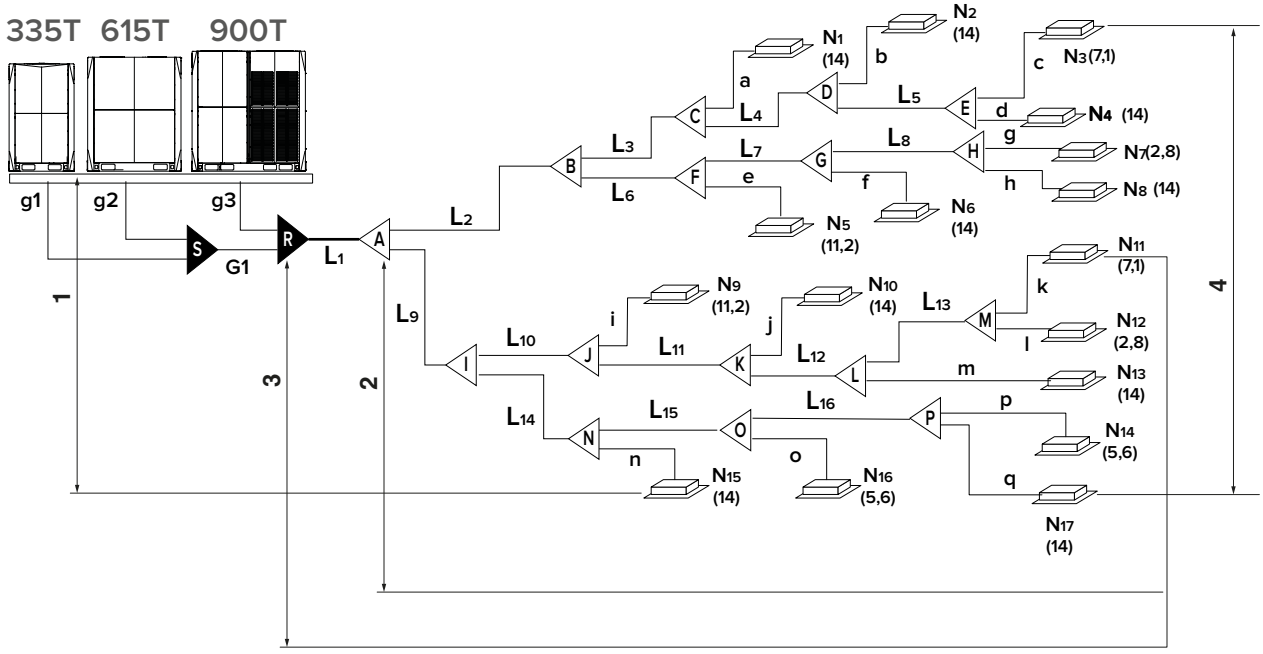


Fig. 48

❑ **Select the main pipe and the internal branch joint A**

The total power of the indoor units (N1 to N17) downstream of the internal branch joint A is equal to 14 x 9 + 11.2 x 2 + 7.1 x 2 + 5.6 x 2 + 2.8 x 2 = 179.4 kW.
The total equivalent length of the system's piping is more than 90m.
The total power of the outdoor units is 32 + 22 + 12 = 66HP. See "Table 2" and "Table 4" .
The main pipe L1 is Ø 41.3 / Ø 19.1 in "Table 2" and Ø 44.5 / Ø 22.2 in "Table 4" . Choose the largest size, i.e. Ø 44.5 / Ø 22.2. Internal branch joint A is FQZHN - 05D.

❑ **Select internal main pipes and internal branch joints B to P**

The total power of the indoor units (N3 and N4) downstream of the internal branch joint E is equal to 14 + 7.1 = 21.1 kW.
See "Table 2".

The dimension of the main pipe L5 is Ø 19.1 / Ø 9.5. Internal branch joint E is FQZHN - 01D.

The total power of the indoor units (from N1 to N8) downstream of the internal branch joint B is equal to 14 x 5 + 11.2 + 7.1 + 2.8 = 91.1 kW.
See "Table 2".
The dimension of the main pipe L2 is Ø 31.8 / Ø 19.1. Internal branch joint B is FQZHN - 03D.

Other internal main pipes and other internal branch joints are selected in the same way.

❑ **Select the external connecting pipes and external branch joints**

The master unit is 32HP and the slave units are 22HP and 12HP.
See "Table 5".

External connection pipes: g1 is Ø 25.4 / Ø 12.7, g2 is Ø 31.8 / Ø 15.9 and g3 is Ø 38.1 / Ø 19.1.
External connection pipe: G1 is Ø 41.3 / Ø 22.2.
There are three outdoor units in the system. See "Table 5".

The external branch joints L and M are FQZHW - 03N1E.

❑ **Select the internal auxiliary pipes**

See "Table 8" and "Table 9" to select the internal auxiliary pipes (a-q)

CONNECTION BETWEEN OUTDOOR UNITS

Pipes from multiple outdoor units must be installed so that oil does not accumulate inside the pipe.

- the pipe from the outdoor units must be sloped downward towards the indoor units. Otherwise, oil can build up in the pipe when, for example, unit (A) is running and unit (C) is stopped.
- The distance between the bottom of the unit (1) and the pipe (2) must be 0.2m maximum. Otherwise, for example, oil can accumulate in units (A) and (B) when they are stopped and unit (C) is running.

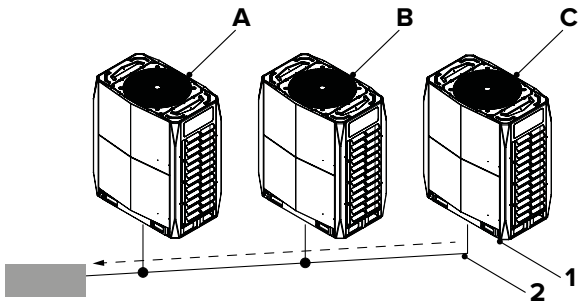


Fig. 49

The vertical separation (3) between the units must be less than 0.1m. Otherwise, for example, oil can accumulate in unit (A) when the unit is stopped and unit (C) is running.

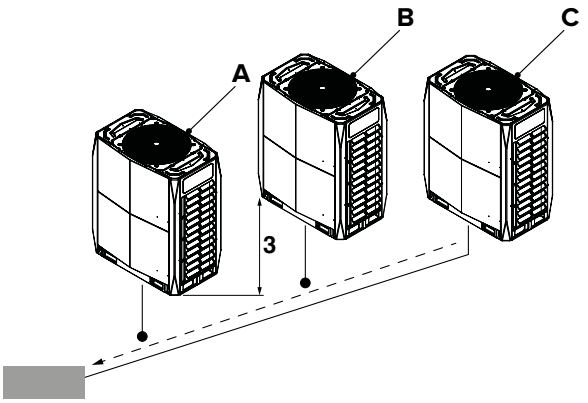


Fig. 50

The pipes connecting the outdoor units must be horizontal and must not be placed higher than the refrigerant outlets. If necessary, the piping can be moved vertically below the outlets to avoid obstacles. When vertical misalignment is inevitable to avoid an obstacle, it is necessary to move all the external piping and not just the section adjacent to the obstacle.

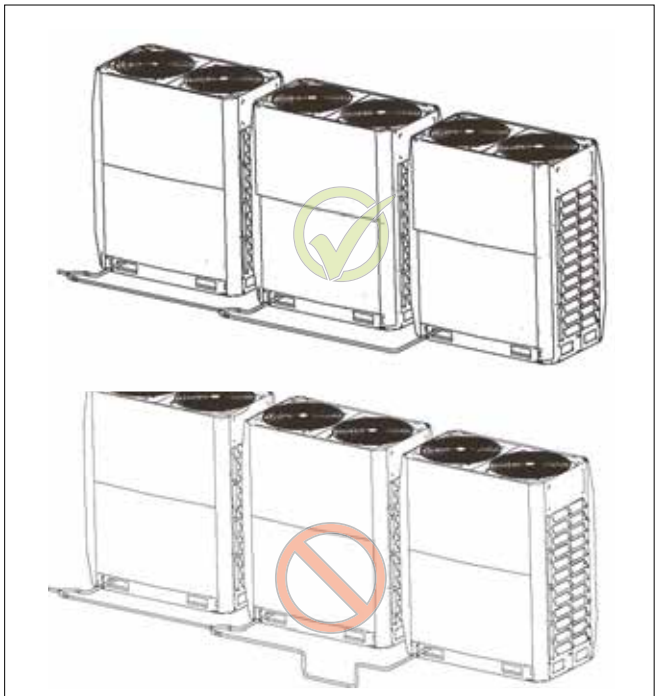


Fig. 51

Fig. 52

USE OF BRANCH JOINTS

– The branch joints must be installed at a maximum horizontal angle (α) of 10° to avoid uneven distribution of the refrigerant.

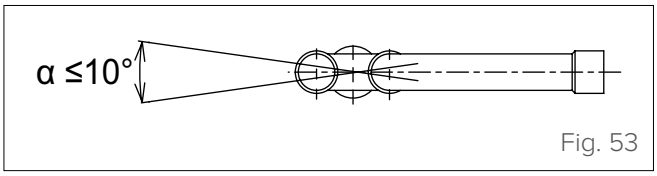


Fig. 53

– The branch joints should be installed lower than the refrigerant pipe outlet of the outdoor unit.

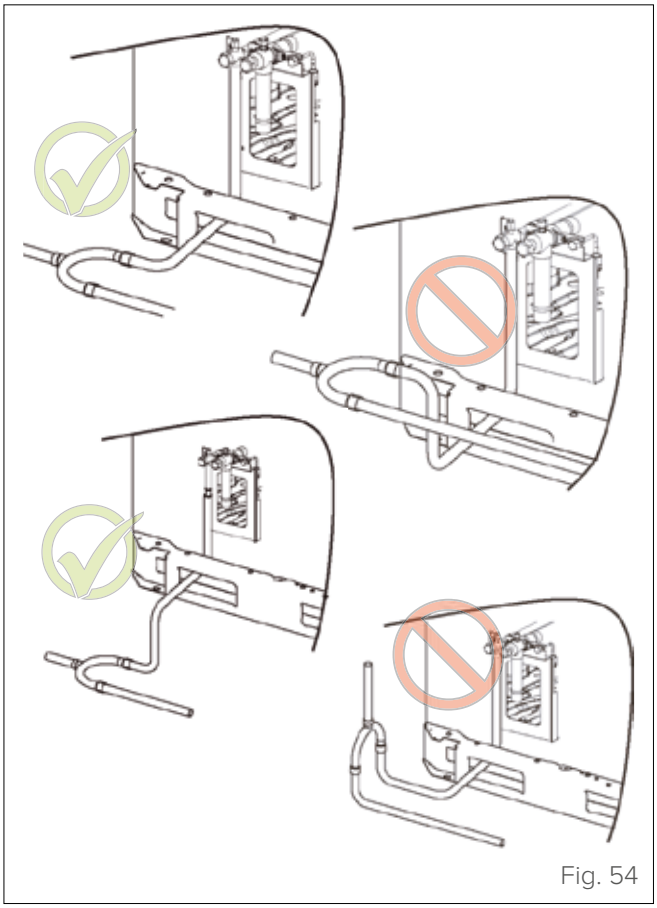


Fig. 54

USE OF MANIFOLDS

To install the refrigeration lines it is possible to use 4 or 8 branch manifolds. For more information, refer to the relevant manual.
Below is an example of use

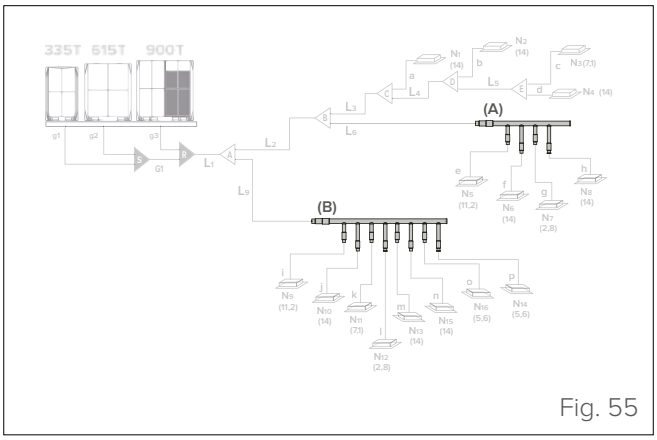


Fig. 55

A *Header 4 branches*
B *Manifold with 8 branches*

WARNING
The distance between the manifold and indoor unit is equal to the distance between the first joint and the indoor unit.

CAUTION
It is not possible to make branches (1) or insert caps (2) after the branch of the manifold (3).

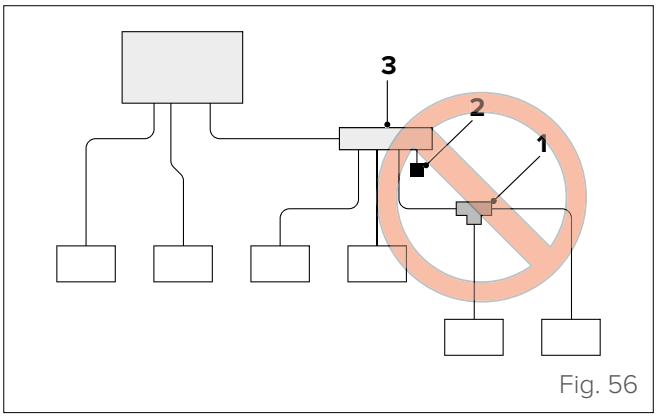


Fig. 56

4.2 Thermal insulation of the pipes

Insulate the refrigerant and gas piping separately with insulating polyethylene foam materials. Incorrect or missing insulation causes condensation and subsequent dripping.

WARNING
Pipes laid in ceilings are particularly sensitive to condensation.

The thickness of the insulating material must be at least 10/15mm and able to withstand heat of 120°C.
In conditions of high temperatures or humidity it is necessary to increase the thickness of the material.

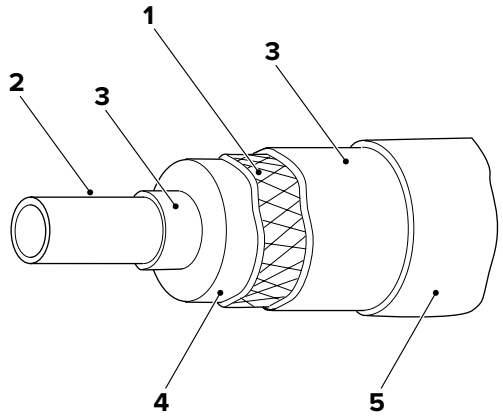


Fig. 57

1 Steel wire
2 Piping
3 Oily bituminous mastic or bitumen
4 Type A insulation material
5 Type B insulation material

Insulation material	External piping	Internal piping
A	Fibreglass and steel fibre	
	Adhesive, heat resistant polyethylene foam and adhesive tape	
B	Vinyl tape	Waterproof hemp cloth, zinc plate and oily paint

Do not insulate the electrical cables (6)

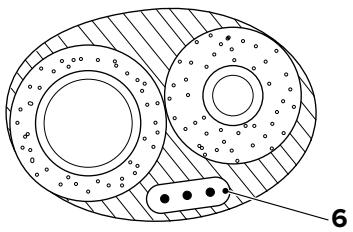


Fig. 58

Make sure that the pipe connections are completely isolated from the indoor unit.

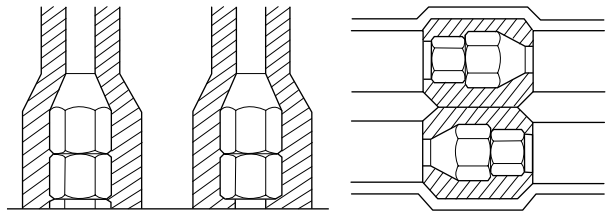


Fig. 59

If the pipe passes through a wall, take the following precautions

Concealed internal wall

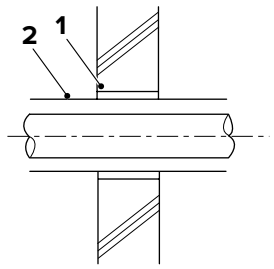


Fig. 60

External wall

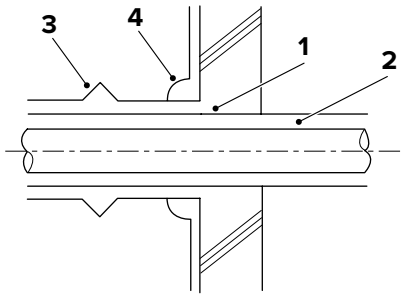


Fig. 61

External wall (exposed)

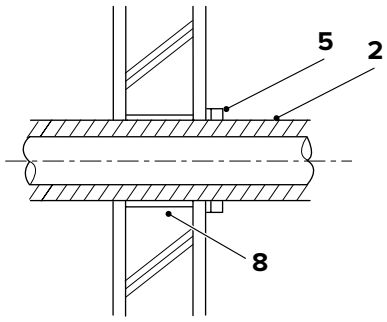


Fig. 62

Waterproof floor

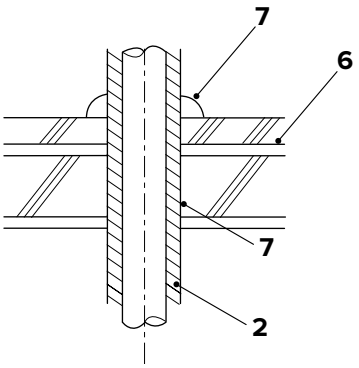


Fig. 63

Roof pipe

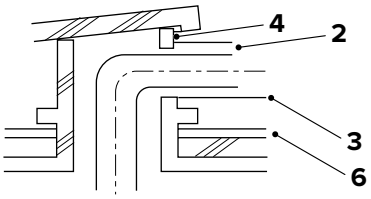


Fig. 64

Protections of parts that penetrate an area with combustible material or a partition wall

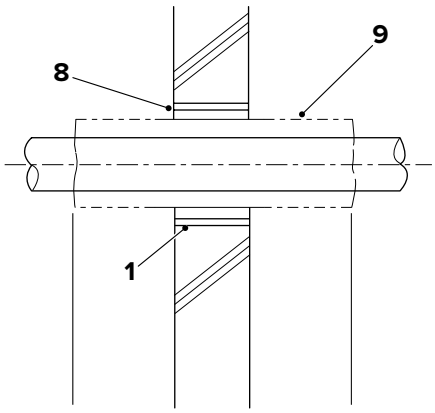


Fig. 65

1 Insulating sheath
2 Insulating material
3 Coating
4 Grouting material
5 Tape
6 Waterproof layer
7 Sleeve with a flange
8 Grouting with a non-flammable material (e.g. mortar)
9 Non-flammable insulating material

5 ELECTRICAL CONNECTIONS

5.1 Preliminary information

ATTENTION ELECTRIC DANGER

- All electrical connections must be done by a licensed electrician according to the provisions of national and local electrical codes.
- All electrical connections must be made according to the wiring diagram on the panels of the indoor and outdoor units.
- If the electrical system has serious safety problems, stop work immediately. Explain the situation to the customer and refuse to install the unit until the safety problem has been resolved.
- The power supply must be between 342 V and 440 V. Insufficient power supply can cause malfunction, electric shock or fire.
- Install overcurrent protection and a main power switch (see "5.2 Power supply line" page 38).
- The power supply line must have a special protection upstream against short circuits and earthing leakage that sections the system with respect to other utilities. The technician must choose an approved differential circuit-breaker or main circuit breaker.
- The air conditioner must be properly grounded.
- All cables and conductors must be connected securely. Loosening a conductor may cause the terminal to overheat, which in turn may result in fire hazards or product malfunction.
- The electrical cables must not touch or rest against the refrigerant pipes, the compressor or any moving parts of the unit.
- The voltage difference between N and T must not exceed 3 V. Higher values indicate suboptimal earthing and can cause failure of the electronics.

ATTENTION ELECTRIC DANGER

Before making electrical connections, turn off the main switch of the system.

In order to make the electrical connections, the cover of the electrical panel must be removed.

Loosen the screws (1), lift the cover (2) and remove it by pulling it towards you.

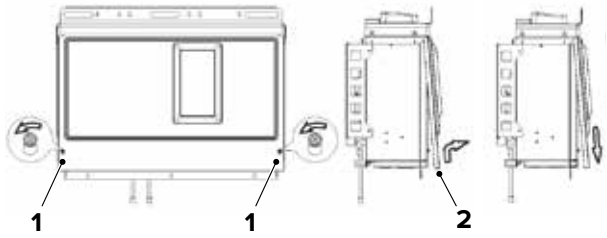


Fig. 66

The following are visible:

- the main control board of the outdoor unit (A)
- the power filter (B)
- the main power connector (C)
- the communication connector (D).

Loosen the screws (3) of the central partition (4) to the maximum twist angle (5).

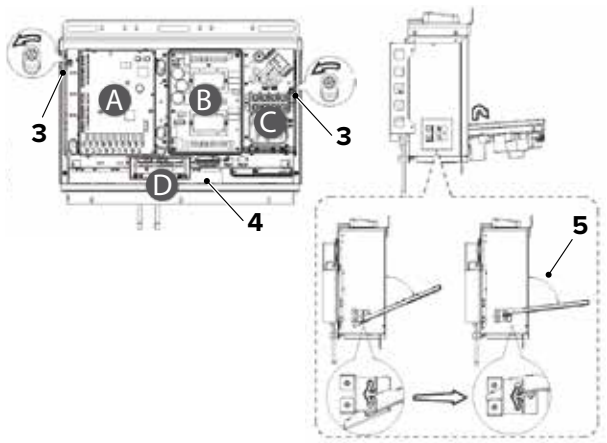


Fig. 67

At this point you can see:

- the first frequency conversion unit of the compressor (E)
- the second frequency conversion unit of the compressor (F)
- the first variable frequency conversion unit of the fan (G)
- the second variable frequency conversion unit of the fan (H)
- the first electric ballast (I)
- the second electric ballast (L).

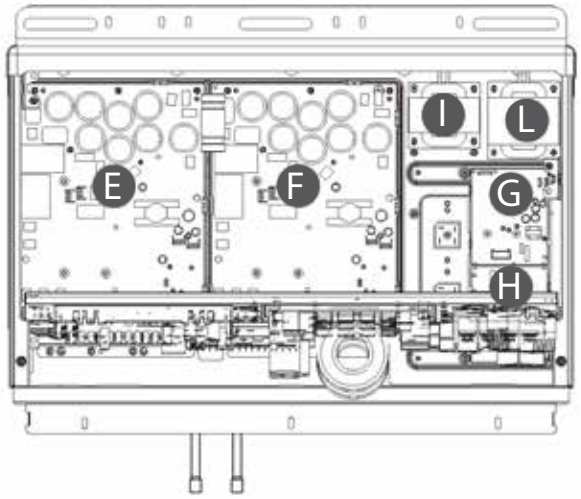


Fig. 68

CAUTION
In order to remove the entire electrical panel:
– empty the refrigeration circuit, making sure to recover the refrigerant;
– desolder the pipe connected to the heat sink which cools the electrical panel
– disconnect the electrical cables.

In the main control board of the outdoor unit (A) are:

– the dip-switches ("7.1 Configuration of the dip-switches" page 47)
– the digital displays ("7.2 Digital display" page 51)

WARNING
The electrical system can be divided into two sub-families: the power supply line and the communication bus network. Be careful during the installation process.

WARNING
Installation and wiring must be carried out by duly qualified, certified and accredited professionals, in compliance with current regulations.

CAUTION
The wiring diagrams shown in this manual represent a general guide to connection. They are not intended for a specific installation and do not describe all the details.

CAUTION
The refrigerant piping, power cables and communication cables are usually laid in parallel. The power and communication cables must be laid in separate conduits to avoid signal interference. If the power supply is less than 10A, the two conduits must be at least 300mm apart. In case of a higher power supply rating (between 10 and 50A), the two conduits must be at least 500mm apart.

ATTENTION ELECTRIC DANGER
– Make sure that the unit is earthed. Keep the earth wire away from gas and water pipes, lightning rods, telephone cables or other earth wires. Incorrect earthing may cause electric shocks.
– Automatic overcurrent and differential switches (earthing switches) must be used in accordance with all the regulations in force

CAUTION
Operation of the outdoor units is based on inverter technology. Pay attention to the power supply line as the presence of any electronic circuits, typical for example of uninterruptible power supplies, can damage the power electronics.

CAUTION
Equip each outdoor unit with an electrical disconnector. The installation of this is mandatory to ensure compliance with the safety standards and to disable each module in case of failure, avoiding system shutdown.

This appliance complies with **EN/IEC 61000-3-12** (electromagnetic compatibility EMC) if the following condition is met:

– the short-circuit power Ssc at the point at which the customer's system is connected to the mains is greater than or equal to the minimum value Ssc;

Model	Minimum value Ssc (KWA)
252 T	5207
280 T	5447
335T	5687
400T	5863
450T	6023
500T	6183

For each model, select a power cable according to the applicable standards.

The diameter and length of the wiring shown in the table indicate the condition where the voltage drop range is within 2%. If the length of the wiring is greater than that indicated in the table, select the cable diameter according to the relevant standards.

We remind you that the international technical standards set the limits of the harmonic currents produced by appliances connected to low voltage mains with input current > 16A and≤ 75A per phase. They also set the limits for voltage fluctuations and flickers in low-voltage mains for appliances with rated current ≤ 75A.

ATTENTION ELECTRIC DANGER
The power line must be connected to the L - N terminals of the internal sections.
Be careful not to confuse the terminal blocks for the power supply with those for the bus line.

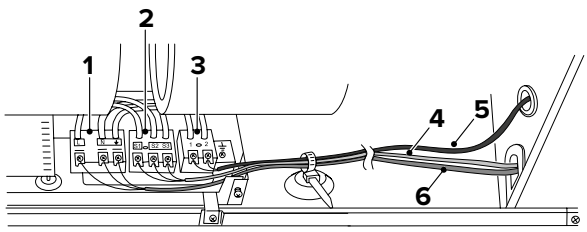


Fig. 69

1 Terminal block of the power line (with electric coil) 230 V circuit.

2 Terminal block of the connection line between the indoor unit and outdoor unit.

3 Terminal block for remote control.

4 Connection line between the indoor and outdoor units.

5 Connection line for remote control.

6 Power supply line.

ATTENTION ELECTRIC DANGER
Separate power sources must be provided for indoor and outdoor units.

All indoor units linked to the same outdoor unit must all be connected to the same power circuit (1) with the same power supply, manual switch (2), overcurrent and differential protection (3). The starting and stopping of indoor units must be simultaneous to avoid the risk of stopping a single indoor unit. Otherwise, the refrigerant returning from the deactivated unit to the compressor can cause water hammer and damage as a result.

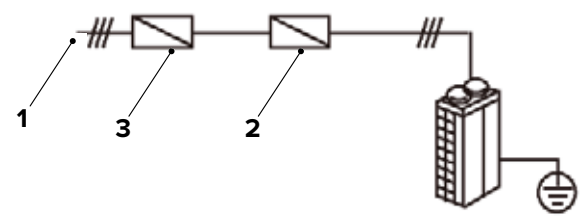


Fig. 70

CAUTION
Make sure to set the address of each outdoor unit for the combination of outdoor units.

5.2 Power supply line

The cable must be connected to the terminal block using only crimped cables with eyelet wire terminals.

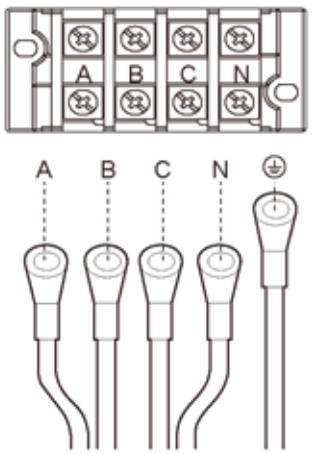


Fig. 71

CAUTION

First connect the power cord and terminals, then secure the cables.

When installing the main power cable, strip the proper amount of insulation according to the method of attachment and positioning of the cable clip.

When tightening the three screws, the twist length must ensure that when 100N of force is applied on the cable, the sagging is less than 2mm. Excessive tightening of the screws can damage the protective cover of the power cable.

The lower part of the clip (1) is fixed on the electrical panel, under the terminals. The upper part (2) is supplied together with the other accessories. Secure the top with the M4*30 screws (3) supplied.

If the cross-section of the cable (4) is less than 10 mm^2, fix the cables together

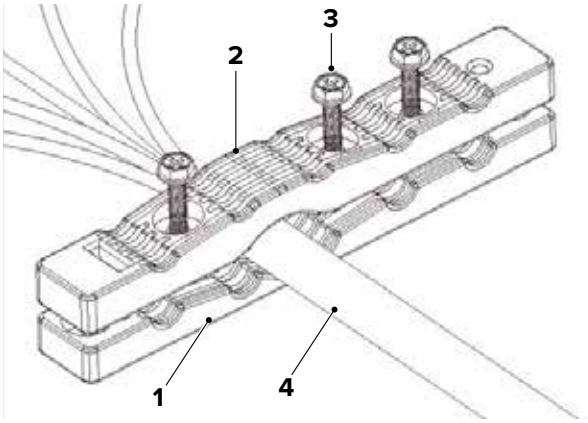


Fig. 72

If the cross-section of the cable (4) is greater than 10 mm^2, fix the cables separately.

When stripping the outer insulation sheath, make sure that the length of the stripping plus the length of the terminal is between 100 and 200 mm

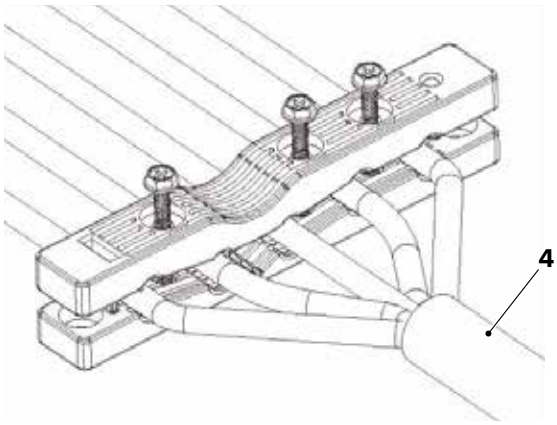


Fig. 73

Calibration of the power cable and automatic switch of the outdoor unit must be selected according to the regulations in force and the table below

Model	Outdoor unit			Power supply			Compressor		OFM	
	Voltage (V)	Hz	Min / Max (V)	MCA (A)	TOCA (A)	MFA (A)	MSC (A)	RLA (A)	KW	FLA (A)
252 T	380 ~ 415	50	342 / 440	24	30.9	32	/	10	0.56	6.3
280 T	380 ~ 415	50	342 / 440	25.2	30.9	32	/	10.6	0.56	6.3
335T	380 ~ 415	50	342 / 440	26.4	31.5	32	/	15.4	0.56	6.9
400T	380 ~ 415	50	342 / 440	33.1	40.3	40	/	25.8	0.92	7.3
450T	380 ~ 415	50	342 / 440	33.1	40.3	40	/	25.8	0.92	7.3
500T	380 ~ 415	50	342 / 440	40.8	59.3	50	/	14 + 13	0.56 + 0.56	10.1
560T	380 ~ 415	50	342 / 440	43.9	60.1	50	/	17 + 16	0.56 + 0.56	10.9
615T	380 ~ 415	50	342 / 440	47.9	60.1	63	/	19 + 18	0.56 + 0.56	10.9
670T	380 ~ 415	50	342 / 440	48.4	62.3	63	/	17.4 + 16.6	0.92 + 0.92	13.1
730T	380 ~ 415	50	342 / 440	52.9	62.3	63	/	20 + 19.8	0.92 + 0.92	13.1
785T	380 ~ 415	50	342 / 440	58.7	64.1	63	/	22 + 21.8	0.92 +0.92	14.9
850T	380 ~ 415	50	342 / 440	64.9	72.5	80	/	20 + 30	0.92 + 0.92	14.9
900T	380 ~ 415	50	342 / 440	66.9	72.5	80	/	22 + 30	0.92 + 0.92	14.9

- MCA: Max circuit amps (A)
- TOCA: Total overcurrent current amps (A) for each OC set
- MFA: Max fuse amps (A). It is used to select the main overcurrent and differential switches
- MSC: Max starting current (A) of the compressor
- RLA: Rated load amps (A). It is based on the following conditions: internal temperature 27°C DB, 19°C WB, external temperature 35°C DB.
- OFM: Outdoor fan motor
- FLA: Full load amps (A)
- KW: Rated motor output (kW)

The units are suitable for use with electrical systems where the voltage supplied to the unit terminals is not below or above the given range limits. The maximum allowed voltage variation between phases is 2%
Select the cable size according to the MCA value

5.3 Communication bus network

The cables of the bus network (transmission line) must be laid in such a way as to avoid electromagnetic interference.

CAUTION
Do not lay transmission and power cables in the same conduit.

Connect the cables as follows:

- The combinations between internal and external sections must be the same in terms of the refrigerating connections and electrical connections.
- Use the “in and out” type of connection even if the lines work with connection in parallel.
- In case of connection with a controller of a higher level (centraliser), a transmission line is required between each external line.
- Do not connect the power cables to the terminal block of the bus network.
- Do not perform joints but only carry out soldering using a heat shrink sheath. Respect the lengths indicated in the technical manuals.
- Junction boxes are not allowed.
- Correctly address the components of the system.
- The cable used must be of a type suitable for data transmission with RS 485. If not suitable for such use it can cause interference and difficulties in the transmission of packets.
- The insulation and voltage characteristics of the cable must be in accordance with the electrical regulations in force.
- The insulation of the cable must have flame or fire retarding characteristics, commensurate with the electrical standards of reference for the type of system used.
- The cable must be laid to standard.
- The cable must be laid separately from other cables, especially from power cables or from cables of different voltages.
- The cable must be laid far from cables or devices that can cause electromagnetic interference.
- The RS485 serial line must always be of the “Bus in-out” topology. Different topologies are not allowed (star or ring-type, etc.).
- The serial line must be laid by personnel trained and qualified in data communication networks.

Connecting the shield

- For the bus network, use 0.75 mm^3 3-pole shielded cables. Using other types of cables may result in interference or malfunctions.
- The shield of the bus cable used for serial communication must be connected to an earth free from interference.
- The shield must be earthed at one point only.
- The continuity of the shield must be ensured the entire length of the bus cable.

WARNING
These requirements are generally valid. In some areas characterised by the presence of particular types of EMI coupling, a different type of connection of the shield may be required.

CAUTION
Make sure that the metal braiding of the cables does not touch any live points.
Use dedicated wire terminals.

CAUTION
Earth only at one point in the system since multiple points can generate transmission noise.

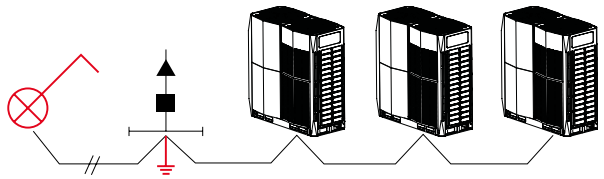


Fig. 74

CAUTION
Do not earth communication cables P and Q.

The shielding networks of the communication cables must be connected together and earthed. For earthing, join the adjacent metal casing with terminals P, Q, E of the electrical panel of the outdoor unit.

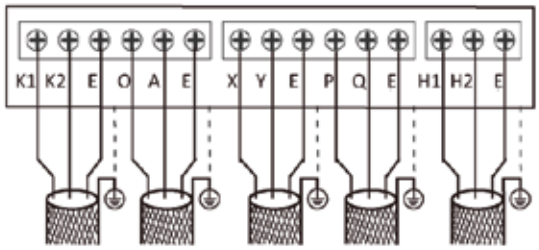


Fig. 75

Terminals	Connection
K1 K2 E	Centralised monitoring of the outdoor unit **(*)**
O A E	Digital energy meter
X Y E	Centralised control unit of the indoor unit (and of the outdoor unit if K1 K2 E is not present)
P Q E	Indoor units with the master outdoor unit
H1 H2 E	Master + slave outdoor units (of the same VRF system)

(*) *if not present, the monitoring function of the outdoor unit is integrated in the terminal block X Y E.*

CAUTION
Within a group, connect only indoor units of the same type (wall, ducted, recessed).

Connect the various indoor and outdoor units as shown in the diagram below.

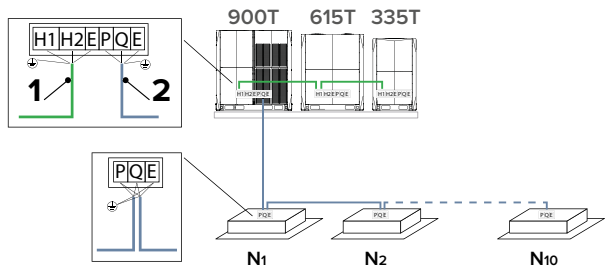


Fig. 76

1 Bus between outdoor units

2 Bus between master outdoor unit and indoor units

Close the chain between P and Q in the last indoor unit with the 120Ω resistor supplied with the outdoor unit.
Do not return the bus to the outdoor unit.

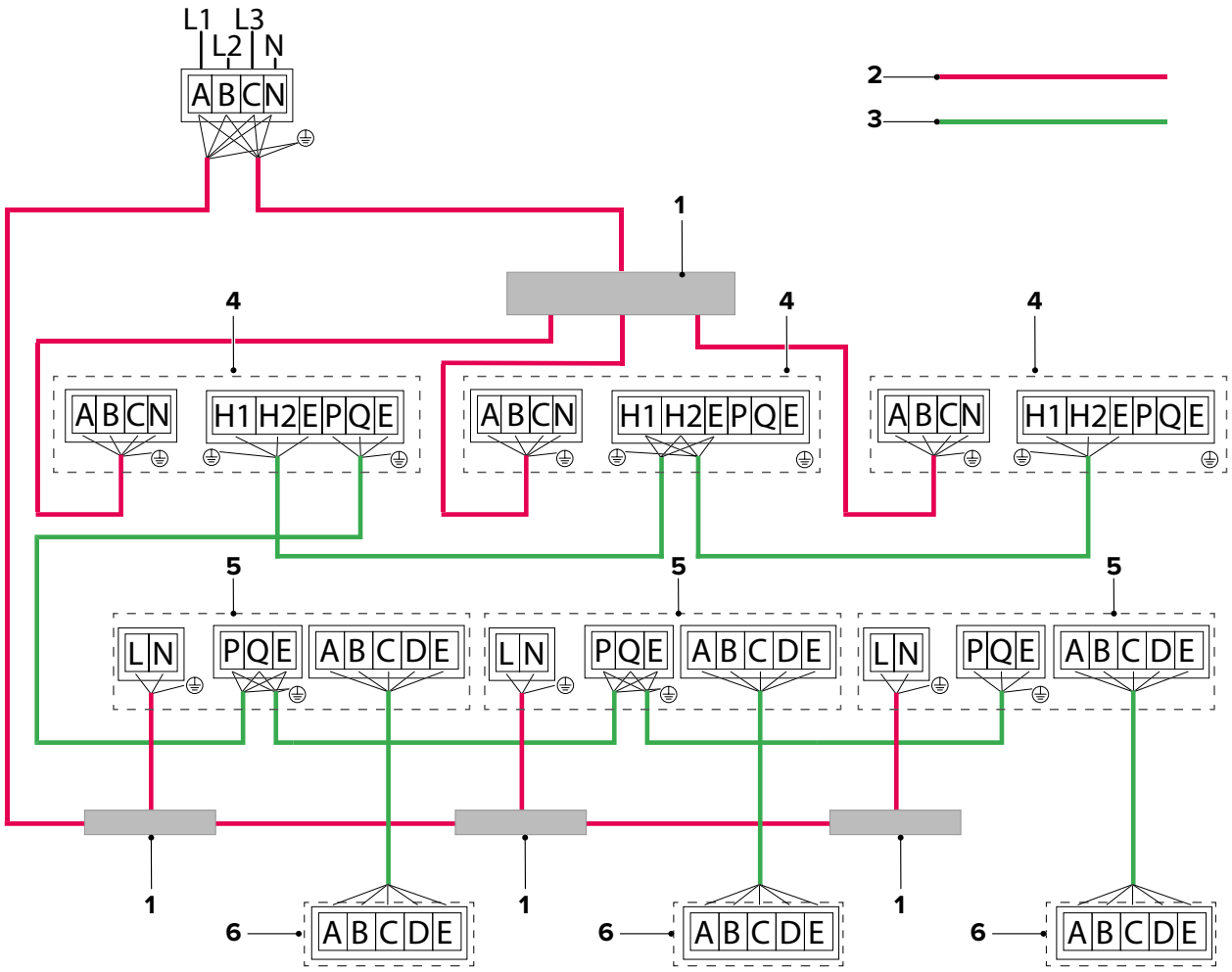


Fig. 77

1 Junction box

2 Power cable

3 Communication cable

4 Outdoor unit terminals

5 Indoor unit terminals

6 Wired remote control terminals

WARNING

"Fig. 77" is purely for explanatory purposes and, specifically, refers to the wiring of a first generation wired remote control. For the correct wiring of the wired remote controls, refer to the relative installation manuals.

CAUTION

It is possible to start with only one bus from the outdoor unit.

CAUTION

Earth at one point free of interference.

6 STARTING UP THE SYSTEM

6.1 Flushing the pipes.

The refrigerant piping must be flushed with nitrogen to remove dust, moisture and other particles that could cause the compressor to malfunction if not eliminated before the system is put into operation.
Flushing should be carried out after completing connection of the piping, with the exception of final connections to indoor units.

WARNING
Flushing must be performed before connecting to indoor units.

CAUTION
Use only nitrogen for flushing. Do not use carbon dioxide since it can create condensation in the pipes. Oxygen, refrigerant, flammable gases and toxic gases must not be used for flushing. The use of such gases can cause fire or explosion.

The flushing procedure is as follows:

1. Cover the inlets and outlets for the indoor units to prevent dirt from being sucked inside during flushing of the pipes.
2. Attach a pressure reducing valve to the cylinder of nitrogen.
3. Connect the outlet of the pressure reducing valve to the inlet on the liquid (or gas) side of the outdoor unit.
4. Use blanking plugs to block all openings on the liquid (gas) side except for the opening on the indoor unit which is farthest from the outdoor unit (N_{11}).
5. Begin to open the valve of the cylinder of nitrogen before gradually bringing the pressure to 0.5bar.
6. Allow the nitrogen to flow to the opening of the indoor unit (N_{11}).
7. Clean the opening with a cloth until no more dirt or moisture comes out. Check with a clean cloth that the opening is clean.
8. Seal the opening

Repeat steps 7 and 8 for all the outlets of the indoor units, from the furthest to the closest to the outdoor unit.

9. Seal all the openings.

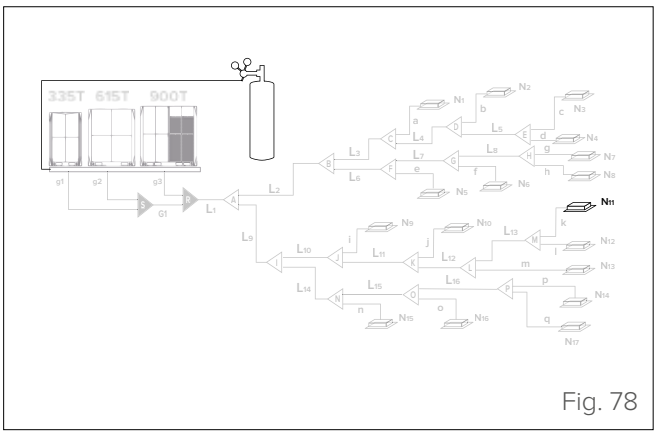


Fig. 78

6.2 Gas leak test

A leak test must be carried out before the system is put into operation, in order to avoid failures caused by the leaking of refrigerant.

CAUTION
Use dry nitrogen only. Do not use oxygen, flammable gases and toxic gases. The use of such gases can cause fire or explosion.

CAUTION
Make sure that all the stop valves of the outdoor unit are closed tightly.

– Connect the indoor units and outdoor units and create a vacuum in the piping at -0.1Mpa.

A vacuum pump with a minimum capacity of 80-120 litres/minute is required for vacuum operations.
If the required value is not reached, it is recommended to carry out further drying using the triple vacuum procedure.

– Fill the internal piping with nitrogen at 0.3Mpa via the needle valve of the liquid stop valves (3). Leave to act for at least 3 minutes.

Do not open the liquid (1) or gas (2) stop valves. Observe the pressure gauge to check for significant leaks. If there is such a leak, the hand of the pressure gauge will go down rapidly.

– Fill the system with nitrogen at 1.5Mpa and leave to act for at least 3 minutes.

Observe the pressure gauge to check for small leaks. If there is such a leak, the hand of the pressure gauge will go down rapidly.

– Fill the system with nitrogen at 4.4Mpa and leave to act for at least 24 hours.

Check for micro leaks and adjust the reference pressure to 0.01MPa for a difference of 1°C, thereby modifying the ambient temperature. If the observed pressure value and the set reference pressure are the same, the piping does not have any leaks. If the pressure is lower, the gas (4) or liquid (5) piping has a micro leak.

– Perform vacuum drying. See paragraph "6.3 Vacuum operation" page 44

If drying cannot be carried out immediately, reduce the pressure to 0.5-0.8MPa until drying is possible.

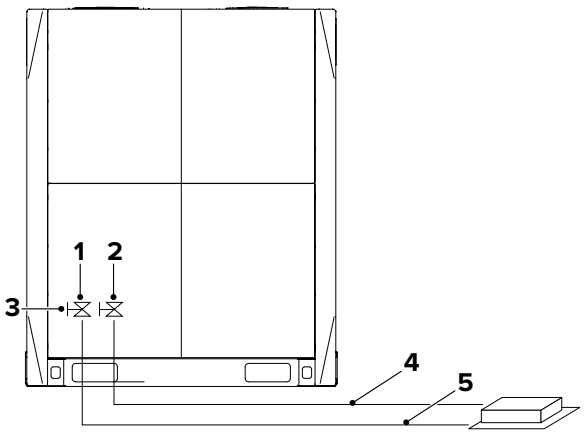


Fig. 79

In order to detect nitrogen leaks, proceed as follows:

– it is possible to hear a noise when there are significant leaks;
– put your hands on the joints to feel for gas leaks;
– distribute soapy water on the joint. If bubbles form, there are small leaks

6.3 Vacuum operation

Perform drying to remove moisture and non-condensable gases from the system. The elimination of moisture prevents the formation of ice and the oxidation of copper pipes or other internal components.
The presence of ice particles in the system could cause malfunctions.
Oxidised copper particles can cause damage to the compressor.
Non-condensable gases present in the system could cause pressure fluctuations and lead to poor performance of the heat exchanger.
The combination of a vacuum operation and a gas leak test facilitates the detection of leaks.

CAUTION
Before vacuum drying, make sure that all the stop valves of the outdoor unit are closed.

CAUTION
Use only one-way valves. Once the procedure is complete and the pump stops, the low pressure can draw the lubricant from the pump into the system. The same situation arises if the pump suddenly stops during the procedure.
Mixing of the pump lubricant with the compressor oil can cause the compressor to malfunction.

To perform drying, a vacuum pump is used to lower the pressure in the pipes until all the moisture present evaporates.
It is necessary to use a vacuum pump capable of maintaining a pressure equal to or less than -756 mmHg below atmospheric pressure. At -755 mmHg below atmospheric pressure, water reaches its boiling point at 0°C.
We recommend using a vacuum pump with a discharge rate greater than 4 litres/s and an accuracy level of 0.02 mmHg

To carry out the vacuum operation, proceed as follows:

– Connect a three-way pressure gauge (1) to the gas pipe stop valve (2) of the master unit via the low pressure pipe (blue) and to the liquid pipe stop valve (3) via the high pressure pipe (red) and to the vacuum pump (4) via the vacuum refrigerant pipe (yellow).

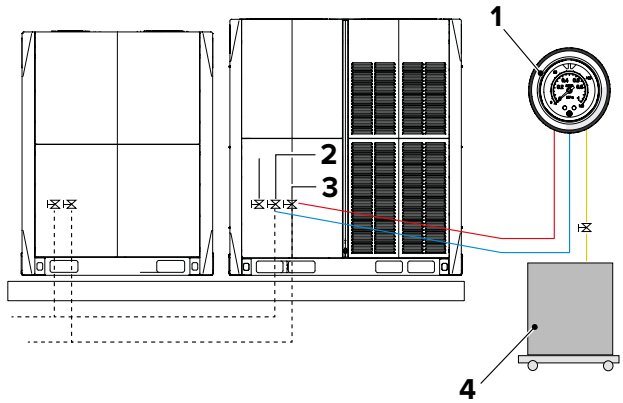


Fig. 80

– Activate the vacuum pump. Open the valves of the pressure gauge to start creating a vacuum in the system.
– After 30 minutes close the valves of the pressure gauge.
– If within 5/10 minutes the pressure gauge returns to zero, there are leaks in the system. Proceed with repair
– Open the pressure gauge valves again and continue drying for at least two hours and in any case until a pressure difference of 0.1 Mpa is exceeded. Once this pressure is reached, continue for another two hours.
– Close the pressure gauge valves
– Stop the vacuum pump
– If the pressure in the piping has not increased after one hour, the procedure is over. If the pressure has increased, there are leaks in the system.

When done, it is possible to keep the high and low pressure hoses connected to the pressure gauge and to the stop valves of the master unit for the purpose of charging with refrigerant

6.4 Charging with refrigerant

CAUTION
Charge the refrigerant only after having done "6.2 Gas leak test" page 43 and "6.3 Vacuum operation" page 44.

CAUTION
Do not charge more refrigerant than necessary because to do so can seriously compromise the correct functioning of the refrigeration circuit.

CAUTION
Use only R410A refrigerant. Charging with other substances may cause an explosion and fire.

CAUTION
When charging the refrigerant, wear suitable PPE such as gloves and protective goggles.

CAUTION
Open the refrigerant containers slowly.

WARNING
Use only instruments and appliances designed for use with R410A refrigerant.

WARNING
The refrigerant must be treated in compliance with the regulations in force.

The outdoor unit is supplied with a basic refrigerant charge.

Model	Factory pre-charge (Kg)	CO_2 equivalent (tons)
252T	11	22.97
280T	11	22.97
335T	11	22.97
400T	13	27.14
450T	13	27.14
500T	17	35.5
560T	17	35.5
615T	17	35.5
670T	22	45.94
730T	22	45.94
785T	22	45.94
850T	25	52.2
900T	25	52.2

An additional charge must be made based on the length and diameter of the internal and external piping

Diameter of pipes (mm)	Additional charge per metre of length (Kg)
6.4	0.022
9.5	0.057
12.7	0.11
15.9	0.17
19.1	0.26
22.2	0.36
25.4	0.52
28.6	0.68

The additional charge is obtained by multiplying the length of the internal main tube (L_x) by the value of the additional charge. This operation must be carried out for each internal section up to the last internal branch joint. The sum of these results gives the total additional charge

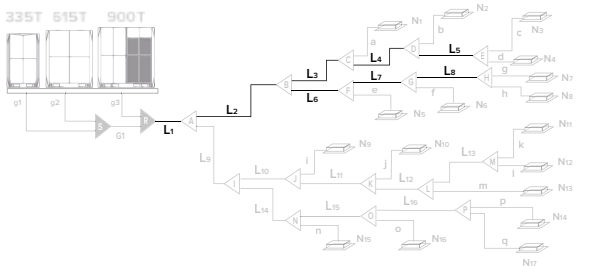


Fig. 81

Once the value has been obtained, proceed as follows:

– Place a tank of R410A refrigerant on a scale. In this way the refrigerant will be charged in the liquid state.

WARNING
The correct composition is in the liquid state, not gaseous. For this reason it is advisable to stop charging when approximately 5% by weight of the initial content remains in the cylinder. Otherwise there is a risk of transferring the refrigerant in its gaseous state.

– Connect (1) to the gas pipe stop valve (2) of the master unit via the low pressure pipe (blue) and to the liquid pipe stop valve (3) via the high pressure pipe (red) and to the refrigerant tank (4) via the vacuum refrigerant pipe (yellow).

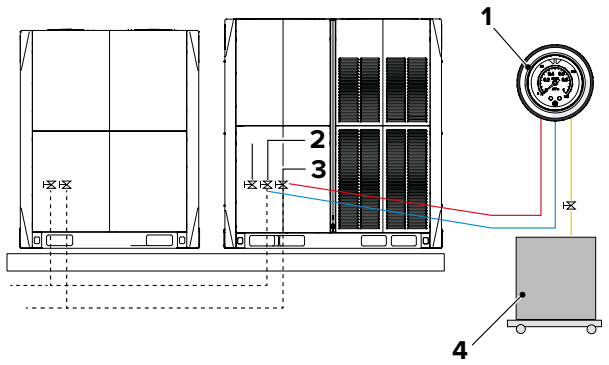


Fig. 82

– Before opening the service valve on the R410A cylinder, it is recommended to put the hoses under vacuum, using the special pump, to avoid the introduction of air and other non-condensable products into the refrigeration circuit.

CAUTION
Danger of freezing. Slowly open the tank and use PPE.

– Open the three valves on the pressure gauge to start charging the refrigerant.

– Close the valves once the desired quantity is reached.

In case the refrigerant tank is insufficient for a complete charge, close the three valves on the pressure gauge, start the outdoor units in cooling mode, then open the yellow and blue valves.
Connect the yellow pipe to a new tank and resume charging until the desired charge is complete. Close the yellow and blue valves.

CAUTION
Before starting the system, make sure to complete all the checks/controls required before initial start-up (see paragraph "8.1 Start-up preparations" page 55) and make sure to open all the stop valves. Starting the system with the stop valves closed can cause damage to the compressor.

FULL REFRIGERANT CHARGE

If a full charge of refrigerant is required (e.g. after moving/replacing the unit or after a leak), the total refrigerant charge will be the sum of the factory refrigerant pre-charge + the additional charge.

IT IS PROHIBITED TO
mix different types of refrigerant

R410A refrigerant is chemically stable, of low toxicity and non-flammable, and belongs to the family of HFCs. R410A is a mixture of R32 refrigerant (50%) and R125 (50%), with properties very close to that of an azeotropic mixture (it behaves almost as a pure gas) with a negligible glide temperature (about 0.2 Celsius degrees with the split system under normal operating conditions). It is also neither explosive nor inflammable, it has low toxicity (safety lass A1, like R22) and it is not corrosive under normal conditions. The permitted limit of exposure is the same as that of R407C and R22.

R410A is a "nearly azeotropic" mixture of two refrigerant gases (R32 and R125). The "nearly azeotropic" condition refers to a state in which the dew point curve and the boiling point curve (gas/liquid equilibrium curves at constant pressure) almost overlap. With this chemical characteristic, the refrigerant mixture undergoes negligible changes in composition when a change of state occurs (evaporation or condensation). Consequently, even when a loss of refrigerant in the gas phase occurs, the composition of the refrigerant undergoes a negligible change.

Therefore, in the event of small leaks of refrigerant, R410A can be treated in the same way as pure refrigerant R22, and can be topped up in small quantities. On the other hand, in case of replacement of a component of the refrigeration circuit, or a more serious leak, the normal procedures must be observed, recovering all the refrigerant fluid. After eliminating the leak or carrying out the repair, the system must be completely evacuated to eliminate the air and then recharged with virgin gas. The recovered gas cannot be reused.

7 SPECIAL FUNCTIONS

7.1 Configuration of the dip-switches

The dip-switches can be configured in various ways at the switches on the main control board of the outdoor unit.

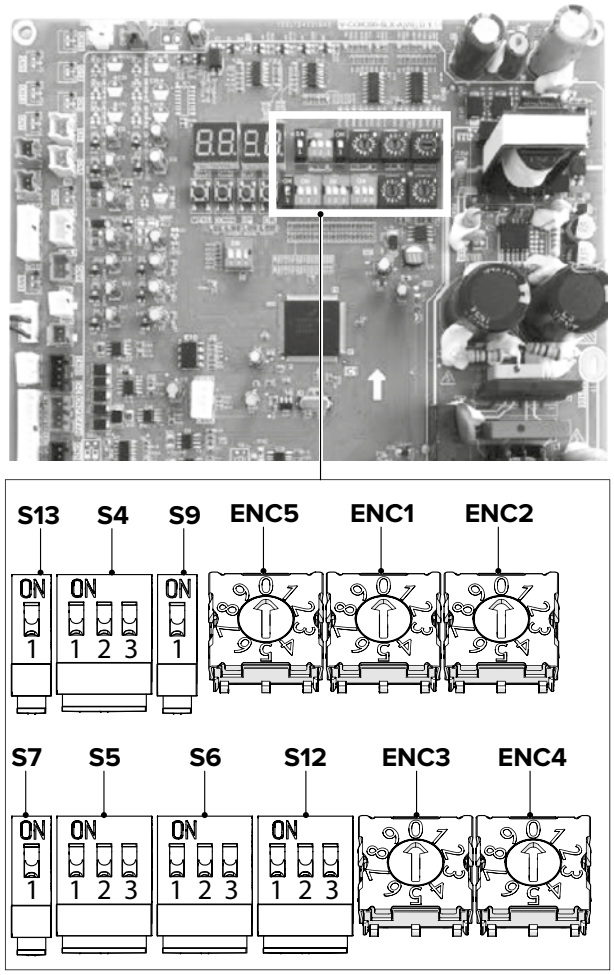
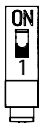


Fig. 83

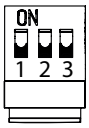
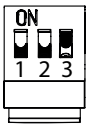
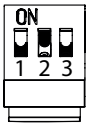
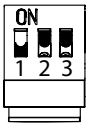
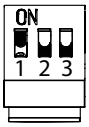
S13 Controller type
S4 Static pressure
S3 Reserved
ENC5 Silent mode
ENC1 Outdoor unit address
ENC2 Outdoor unit capacity
S7 Reserved
S5 Priority mode
S6 Addressing mode
S12 Number of indoor units
ENC3 Number of indoor units
ENC4 Network address

Legend	
	Dip-switch ON (1)
	Dip-switch OFF (0)

7.1.1 Controller type

Switch	Settings	Description
S13		Use the new centralised controller
		Use the old centralised controller

7.1.2 Static pressure

Switch	Settings	Description
S4		Standard static pressure (default)
		Low static pressure (reserved)
		Average static pressure (reserved)
		High static pressure (reserved)
		Ultra high static pressure (reserved)

7.1.3 Silent mode

This function allows you to limit operation of the compressor and cooling fan to reduce noise.
By specifying the number of hours that must elapse between the daily heat peak and activation, and the number of hours before reactivation, it is possible to set both activation and deactivation of silent mode.

The image shows the default setting. The silent mode function is activated 6 hours after the maximum daily heat peak (1) and remains active for 10 hours (2) before returning to normal operating mode.

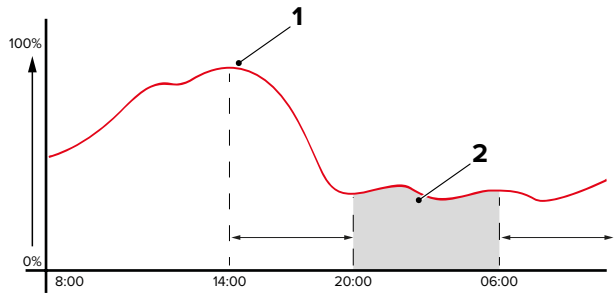


Fig. 84

The hours of a day are indicated on the abscissa axis, and the maximum operating capacity is indicated on the ordinate axis.

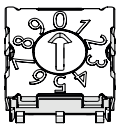
If the system pressure is over 3.5MPa, the system automatically deactivates the silent mode function.

It is possible to set the operating parameters as indicated in the table below

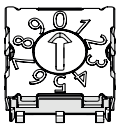
Switch	Pos.	Description	Maximum fan speed (rpm)						Compressor frequency
			252T 280T	335T	400T 450T	500T - 560T 615T	670T 730T	785T - 850T 900T	
ENC5	0	Silent mode 6h / 10h (default)	28	28	28	22	28	28	100%
	1	Silent mode 6h / 12h	28	28	28	22	28	28	100%
	2	Silent mode 8h / 10h	28	28	28	22	28	28	100%
	3	Silent mode 8h / 12h	28	28	28	22	28	28	100%
	4	No silent mode	30	31	30	30	30	31	100%
	5	Silent mode 1 (limitation of the maximum fan speed)	28	28	28	27	28	28	100%
	6	Silent mode 2 (limitation of the maximum fan speed)	26	26	26	25	26	26	100%
	7	Silent mode 3 (limitation of the maximum fan speed)	24	24	24	23	24	24	100%
	8	Super Silent mode 1 (limitation of the maximum fan speed and compressor frequency)	28	28	28	22	28	28	80%
	9	Super Silent mode 2 (limitation of the maximum fan speed and compressor frequency)	27	27	27	21	27	27	70%
	A	Super Silent mode 3 (limitation of the maximum fan speed and compressor frequency)	26	26	26	20	26	26	60%
	B	Super Silent mode 4 (limitation of the maximum fan speed and compressor frequency)	25	25	25	19	25	25	50%

The compressor frequency can also be set in menu mode. See paragraph “7.2 Digital display” page 51

7.1.4 Outdoor unit address

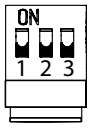
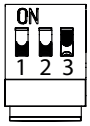
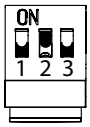
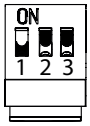
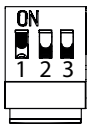
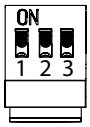
Switch	Settings	Description
ENC1		Set the address of the outdoor unit. Use only 0/1/2 0 (default) master 1/2 slave

7.1.5 Outdoor unit capacity

Switch	Settings	Description
ENC2		Set the power of the outdoor unit. The value is set by default and should not be changed 0 - 252T 1 - 280T 2 - 335T 3 - 400T 4 - 450T 5 - 500T 6 - 560T 7 - 615T 8 - 670T 9 - 730T A - 785T B - 850T C - 900T

7.1.6 Priority mode

With this configuration, the operation of the outdoor unit can be changed according to the command received from the indoor unit.

Switch	Settings	Description
S5		Auto priority (default)
		Cooling priority
		Vip priority or voting priority
		Heating only
		Cooling only
		Set priority mode via centralised controller (ND)

Auto priority

The system works in Cooling priority or Heating priority mode depending on the outdoor temperature and in accordance with the following criteria:

- Below 13°C - Heating priority until the outdoor temperature reaches 18°C
- Above 18°C - Cooling priority until the temperature drops below 13°C
- Between 13 and 18°C - the appliance restarts in the same mode in which it stopped, except in the case of initial start-up when it starts in Heating priority mode.

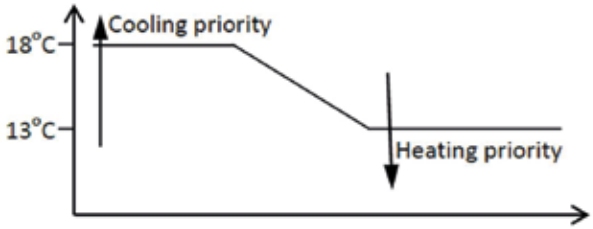


Fig. 85

Cooling priority

with system in heating mode:

– if an indoor unit is started in cooling mode, the outdoor unit stops and restarts in cooling mode after 5 minutes. All units started in cooling mode are started. Units set to heating mode display a “Mode Error” warning.

with the system in cooling mode:

– if an indoor unit is started in heating mode, this request is ignored. The unit displays the “Mode Error” warning. If all the units started in cooling mode are switched off and the request to start in heating mode remains, after 5 minutes the outdoor unit is set in heating mode.

Vip priority and voting priority

The identification of a VIP indoor unit is foreseen. This unit must have the address 63. The VIP unit controls operation of the indoor units when the whole system is running. Units that require a different mode display a “Mode Error” warning.
If no VIP unit has been configured or this is in stand-by, the system works in voting priority mode. This means that the system works in the mode required by most of the units in operation.

Heating only

The system works only in heating mode. Units set to cool or fan only mode display the “Mode error” warning.

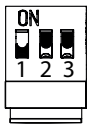
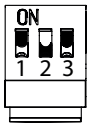
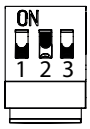
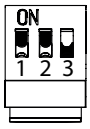
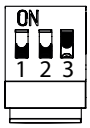
Cooling only

The system works only in cooling mode. Units set to heat or fan only mode display a “Mode Error” warning.

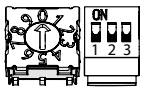
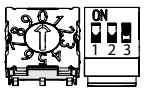
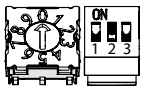
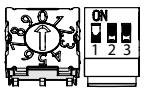
Set priority mode via centralised controller

Setting this option enables centralised control.

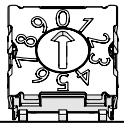
7.1.7 Addressing mode

Switch	Settings	Description
S6		Reserved
		No action (default)
		Delete indoor unit addresses
		Automatic address search (default). The maximum time is about 10 minutes.
		Manual address search

7.1.8 Number of indoor unit

Switch	Settings	Description
ENC4 S12		Indoor units between 0 and 15 0/9 indicates units 0 to 9 A/F indicates units 10 to 15
		Indoor units between 16 and 31 0/9 indicates units 16 to 25 A/F indicates units 26 to 31
		Indoor units between 32 and 47 0/9 indicates units 32 to 41 A/F indicates units 42 to 47
		Indoor units between 48 and 63 0/9 indicates units 48 to 57 A/F indicates units 58 to 63

7.1.9 Network address

Switch	Settings	Description
ENC4		Values from 0 to 7 can be selected 0 (default)

7.2 Digital display

Specific functions can be accessed by pressing the buttons on the main control board of the outdoor unit

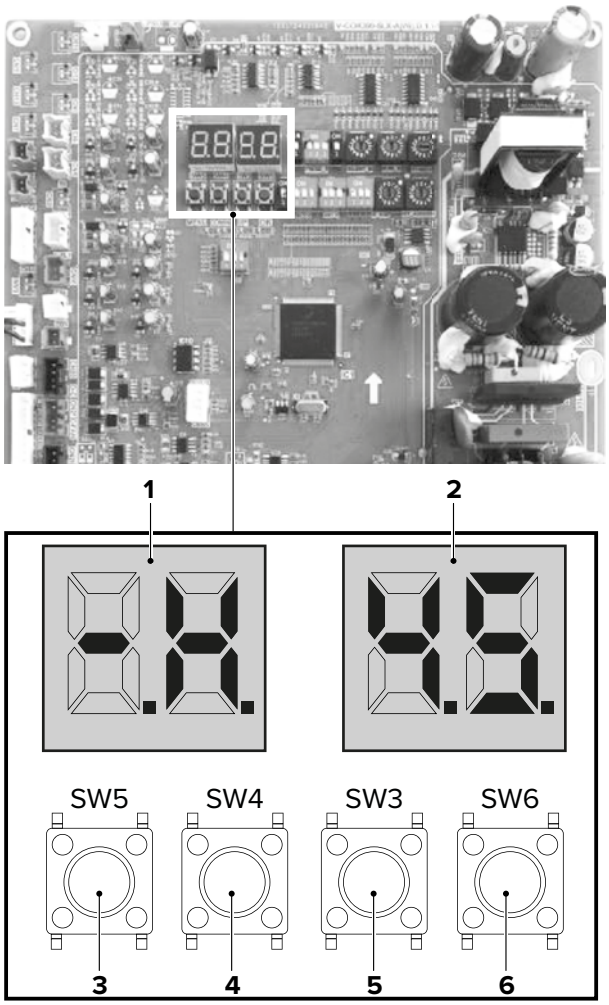


Fig. 86

1 Display 1

2 Display 2

3 Menu button

4 Down button

5 Up button

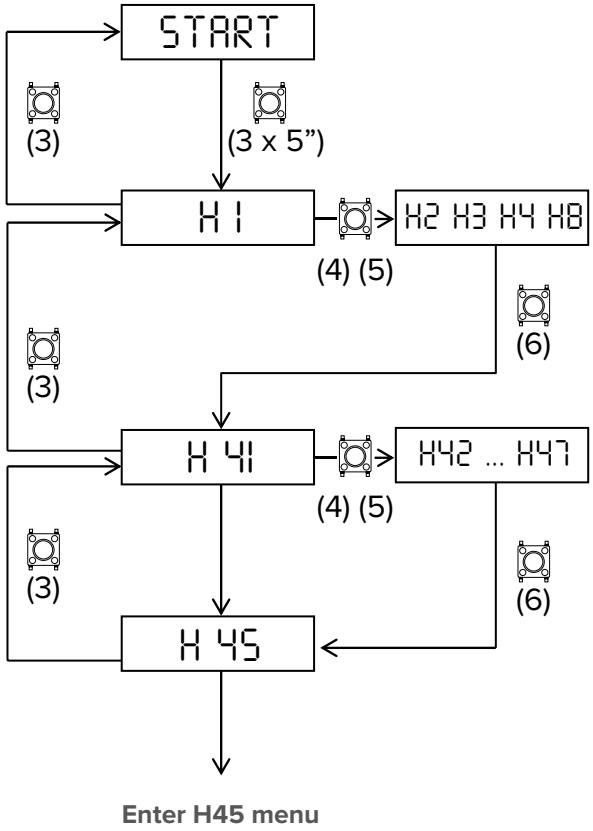
6 OK button

To enter the operating mode menu, press and hold the button (3) for 5 seconds.

To return to the previous menu, press the button (3)

The complete range of functions is only available for the Master outdoor unit. Only the display of error codes is available for the slave units.

The following image shows the procedure for entering, for example, the H45 operating modes



Enter H45 menu

Fig. 87

7.2.1 Menu mode

Menu 1	Description	Note
H. 1.4.	Debug mode 1	1
H. 1.5.	Debug mode 2	2
H. 1.6.	Maintenance mode	3

Menu 2	Description	Note
H. 2.4.	Reserved	
H. 2.5.	Reserved	
H. 2.6.	Run backup	4
H. 2.7.	Vacuum mode	R006

Menu 3	Description	Note
H. 3.1.	Code history	
H. 3.2.	Clear error history	
H. 3.3.	Reserved	
H. 3.4.	Factory reset	5

Menu 4	Description	Note
H. 4.1.	Power restriction mode 1	6
H. 4.2.	Power restriction mode 2	7
H. 4.3.	Power restriction mode 3	8
H. 4.4.	Power restriction mode 4	9
H. 4.5.	Power restriction mode 5	10
H. 4.6.	Power restriction mode 6	11
H. 4.7.	Power restriction mode 7	12

Hb menu	Description	Note
H. 8.1.	Fahrenheit °F	5
H. 8.2.	Celsius°C	5
H. 8.3.	Exit automatic power saving mode*	5
H. 8.4.	Enter automatic power saving mode **(*)**	5
H. 8.5.	Snow removal mode 1 with automatic ventilation	13
H. 8.6.	Snow removal mode 2 with automatic ventilation	14
H. 8.7.	Exit snow removal mode with automatic ventilation	
H. 8.8.	VIP address setting	15

HF menu	Description	Note
H. F.1.	Reserved	
H. F.2.	Reserved	

Notes

1 Only for master unit. (All indoor units work in cooling mode.

2 Only for master unit. (If all indoor units are second generation they will operate in heating mode. If there are first generation units, all units will operate in forced cooling mode).

3 Only for master unit. The system does not check the number of indoor units.

4 Available only for outdoor unit with two compressors. In the event of a malfunction of one of the two compressors, the other compressor will work for 4 days, after which it will stop.

5 Available for master unit only.

6 Available for master unit only, 100% production capacity

7 Available for master unit only, 90% production capacity

8 Available for master unit only, 80% production capacity

9 Available for master unit only, 70% production capacity

10 Available for master unit only, 60% production capacity

11 Available for master unit only, 50% production capacity

12 Available for master unit only, 40% production capacity

13 Depending on the outdoor temperature, the external fans stop periodically for 15 minutes and run for 2 minutes

14 Depending on the outdoor temperature, the external fans stop periodically for 30 minutes and run for 2 minutes

15 The digital display will show “I0XX”.
“XX” indicates the VIP address. Use button (4) and (5) to change the VIP address. Press the button (6) to confirm the specified VIP address.

(*) When automatic energy saving mode is set, the evaporation temperature (cooling) and the condensing temperature (heating) are automatically adjusted according to the indoor and outdoor temperature to maximise comfort and energy efficiency.
When exiting automatic energy saving mode, the evaporating temperature (cooling) and the condensing temperature (heating) are fixed.

7.2.2 System control mode

Exit the operating mode menu and press buttons (4) and (5) to enter the system control mode.

Display 1	Parameters shown on Display 2
0	Unit address. 0 = master unit
1	Capacity of outdoor unit. 0 = 8Hp ... C = 32Hp
2	Number of outdoor units
3	Number of indoor units (as set on PCB)
4	Total capacity of outdoor unit Displayed on the master unit only.
5	Total power required by the indoor units. Displayed on the master unit only.
6	Correct total power required by the indoor units. Displayed on the master unit only.
7	Operating mode. 0 = Off, 2 = cooling, 3 = heating, 4 = forced cooling
8	Current operating capacity of the outdoor unit
9	Fan speed index A
10	Fan speed index B
11	Tube temperature of the indoor heat exchanger in °C
12	Tube temperature of the main heat exchanger in °C
13	Outdoor temperature in °C
14	Inlet temperature of the refrigerant in °C
15	Outlet temperature of the refrigerant in °C
16	Inverter A compressor discharge temperature in °C
17	Inverter B compressor discharge temperature in °C
18	Inverter A heat sink temperature in °C
19	Inverter B heat sink temperature in °C
20	Difference between the inlet and outlet temperature of the refrigerant in °C
21	Degree of discharge superheating??
22	Inverter A compressor current (amp)
23	Inverter B compressor current (amp)
24	EXVA position. Opening angle of EEV. Actual value = Display value x 4 (480P) or x 24 (3000P)
25	Position of EXVB. Opening angle of EEV. Actual value = Display value x 4 (480P) or x 24 (3000P)
26	EXVC position. Opening angle of EEV. Actual value = Display value x 4 (480P) or x 24 (3000P)
27	Compressor discharge pressure (Mpa). Actual value = Display value x 0.1 Mpa
28	Reserved
29	Number of indoor units currently communicating with the master outdoor unit
30	Number of indoor units currently in operation. Displayed on the master unit only
31	Priority mode (see paragraph “7.1.6 Priority mode” page 49)
32	Silent mode (see paragraph “7.1.3 Silent mode” page 48)
33	Static pressure mode (see paragraph “7.1.2 Static pressure” page 47)
34	Reserved
35	Reserved
36	Bus A voltage in direct current. Actual value = Displayed value x 10 V
37	Bus B voltage in direct current. Actual value = Displayed value x 10 V
38	Reserved
39	Address of VIP indoor unit
40	Reserved
41	Reserved
42	Quantity of refrigerant (0 = normal, 1 = slightly excessive, 2 = significantly excessive, 3 = slightly insufficient, 4 = significantly insufficient, 5 = critically insufficient)
43	Reserved
44	Power mode. Production power: 0=100%, 1=90%, 2=80%, 3=70%, 4=60%, 5=50%, 6=40%. Automatic power saving 10 = 100%, 11 = 90%, 12 = 80%, 13 = 70%, 14 = 60% 15 = 50%, 16 = 40%
45	Most recent error or protection code
-	End

7.2.3 Output digital display

The parameters visible on the two displays according to the status of the outdoor unit are listed below

Status of outdoor unit		Display 1 parameters	Display 2 parameters
Standby		Unit address	Number of indoor units communicating with the outdoor unit
Operating	Unit with single compressor	/	Compressor operating speed (rpm)
	Double compressor unit	Operating speed of compressor A (rpm)	Operating speed of compressor B (rpm)
Protection error		--	Error code "7.2.4 Error codes"
Menu mode		"7.2.1 Menu mode" page 52	"7.2.1 Menu mode" page 52
System control mode		"7.2.2 System control mode" page 53	"7.2.2 System control mode" page 53

7.2.4 Error codes

Code	Description
E0	Communication error between outdoor units
E1	Phase sequence error
E2	Communication error between an indoor unit and the master unit
E4	T3/T4 temperature sensor error
E5	Abnormal power supply voltage
E6	Reserved
E7	Discharge temperature sensor error
E8	Outdoor unit address error
xE9	Compressor EEPROM mismatch
xF1	DC bus voltage error
F3	T6B temperature sensor error
F5	T6A temperature sensor error
F6	Electronic expansion valve (EEV) connection error
xH0	Communication error between main board and compressor drive panel
H2	Outdoor unit quantity reduction error
H3	Outdoor unit quantity increase error
xH4	Inverter module protection
H5	3 cases of P2 protection in 60 minutes
H6	3 cases of P4 protection in 100 minutes
H7	Quantity of indoor units does not match
H8	High pressure sensor error
H9	10 cases of P9 protection in 120 minutes
yHd	Slave unit malfunction (1HD indicates 1 slave unit error)
C7	3 cases of PL protection in 100 minutes
P1	High pressure protection or discharge temperature protection switch
P2	Low pressure protection
xP3	Compressor current protection
P4	Discharge temperature protection
P5	Condenser high temperature protection
xP9	Fan module protection
xPL	Inverter module temperature protection
PP	Insufficient protection against compressor discharge superheating
xL0	Inverter compressor module error
xL1	DC bus low voltage protection
xL2	DC bus high voltage protection
xL4	MCE error
xL5	Zero speed protection
xL7	Phase sequence protection
xL8	Compressor frequency variation protection greater than 15Hz within one second
xL9	Effective compressor frequency protection different from target frequency by more than 15Hz

The error codes E2, H2, H3, H7 and yHd are displayed only on the master unit in error mode.
The E0 code is displayed only on the slave unit in error mode.
The letter "x" in the code indicates the compressor system and related electrical components.
The letter "y" in the code indicates the address (1 or 2) of the slave unit reporting the error.

For some error codes a manual restart is required to resume operation of the system.

WARNING
If there are any error or protection codes, contact your dealer for service and maintenance.

8 START-UP

8.1 Start-up preparations

CAUTION
Make sure that the insulation resistance is at least 1 M Ω

WARNING
Turn on the outdoor unit at least 12 hours before putting it into operation. Keep the power on for the entire station of use.

Carry out the following checks:

- ❑ **Check mechanical assembly of the outdoor unit.**
  See "3 Installation" page 15
- ❑ **Check correct installation of the refrigerant piping.**
  See "4 Refrigerant piping" page 23
- ❑ **Check laying of the electrical wiring.**
  See "5 Electrical connections" page 35
- ❑ **Check the system for gas leaks.**
  See "6.2 Gas leak test" page 43
- ❑ **Before start-up, set the address of each outdoor unit**
  See paragraph "7.1.4 Outdoor unit address" page 49
- ❑ **Check that the power of each outdoor unit is correct**
  See paragraph "7.1.5 Outdoor unit capacity" page 49

For installations involving multiple refrigerant systems, each independent cooling system (i.e. each system consisting of up to 3 outdoor units and their respective indoor units) must be given a test run. The multi system can then be started at the same time.

WARNING
Make sure you have a cylinder of R410A refrigerant gas available.

WARNING
Make sure you have the complete system layout, piping and wiring diagrams.

8.2 Commissioning

WARNING
It is necessary to fill in the commissioning report as a record the of operating status of the system once the procedure is completed.

WARNING
If the combination ratio is less than 100%, start all the indoor units. If the ratio exceeds 100%, start all the indoor units with total power equal to the total power of the outdoor units.

Carry out the following procedure:

- Open the gas and refrigerant valves of the outdoor unit;
- start the outdoor unit;
- if the manual address search has been set (see "7.1.7 Addressing mode" page 50), set the addresses of each indoor unit;
- operate the system in cooling mode by setting the temperature to 17°C and the fan speed to high;
- after one hour, check the system parameters using the buttons on the digital display (see paragraph "7.2 Digital display" page 51). Check each outdoor unit for errors, referring to table "7.2.2 System control mode" page 53 and "7.2.3 Output digital display" page 54;
- operate the system in heating mode by setting the temperature to 30°C and the fan speed to high.
- after one hour, check the system parameters using the buttons on the digital display (see paragraph "7.2 Digital display" page 51). Check each outdoor unit for any errors referring to table "7.2.2 System control mode" page 53 and "7.2.3 Output digital display" page 54;

8.3 VRF system addressing procedure in AUTOMATIC mode

Carry out the following procedure:

- Turn off all outdoor units (ODUs) and all indoor units (IDUs);
- Set, on the Master outdoor unit only, the number of indoor units using the ENC3 rotary-switch and the S12 dip-switch and following the instructions in the description of the diagram on the cover of the electrical panel or in this manual.

WARNING
Indoor units (IDUs) with a cooling capacity greater than 20kW (included) are recognised as 2 indoor units and must therefore be counted as doubles.

- Set switch S6 to “Auto Addressing”;
- Power up all the IDUs and wait at least 20 seconds;
- Power up the ODUs and wait for the addressing operation to be completed: the operation ends when all the IDUs have the “operation” LED flashing slowly and (if they have a display) the two dashes “-” in steady state.

WARNING
The duration of the addressing procedure by the Master outdoor unit can take several minutes (up to 10'). The duration depends on the number of IDUs and the overall length of the communication bus.

- Operation concluded.

Practical case 1)
16 IDUs (all with power of less than 20kW)
S12: 001 -- ENC3:0

Practical case 2)
2 IDUs (both with power greater than 20kW)
S12: 000 -- ENC3: 4

Practical case 3)
14 IDUs (12 of a power less than 20kW and 2 of more than 20kW)
S12: 001 -- ENC3: 0

9 MAINTENANCE

It is good practice to periodically clean both the internal and external parts of the appliance. This guarantees its proper operation and durability.
Carry out periodic maintenance of the appliance in accordance with the regulations in force.

Maintenance must be carried out by qualified technical personnel.
Improper maintenance or service can cause electric shock, fire or water leakage.

ATTENTION ELECTRIC DANGER
Before cleaning or maintenance, always switch off the air conditioner and disconnect it from the power supply.

Carry out maintenance at the frequency indicated in the table

Component	Frequency	Maintenance / replacement
Fan motor	1 year	20000 hours
Compressor casing heater	1 year	8 years
EXV	1 year	8 years
Electromagnetic valve	1 year	8 years
Heat exchanger	1 year	5 years
PCB	1 year	10 years
Sensor	1 year	5 years
fuses	1 year	10 years

This unit contains R410A fluorinated gas. It is forbidden to release it into the environment.
The GWP (Global warming potential) over a temporal period of 100 years is equal to 2090 units
As it does not contain chlorine atoms, this mixture does not damage the ozone layer.

For equipment that contains fluorinated greenhouse gases in quantities of 5 tons of CO_2 or more but in any case less than 50 tons, a test must be carried out to check for the leaking of refrigerant once every 12 months. If a leak detection system is installed, the test must be carried out every 24 months.
For equipment that contains fluorinated greenhouse gases in quantities of 50 tons of CO2 or more but in any case less than 500 tons, a test must be carried out to check for the leaking of refrigerant once every 6 months. If a leak detection system is installed, the test must be carried out every 12 months.

Below are some things that **do not** represent malfunctions

The outdoor unit makes a hissing noise . It can be caused:

- by expansion due to heat or by contraction due to cooling of the heat exchanger, depending on the temperature variations;
- by the 4-way valve at the beginning or at the end of the defrosting process. At the beginning or at the end of this process, a sound similar to that emitted by a flow of water can be heard which will be amplified after a few minutes;
- by the flow of refrigerant or the discharge of drain water.

The heat exchanger of the outdoor unit discharges mist or water. It can be caused:

- by defrosting of the outdoor unit.

The power indicator of the indoor unit flashes. It can be caused:

- by restarting after an abnormal shutdown;
- by mode conflict;
- by stopping of the fan to avoid spreading cold air.

Automatic starting or stopping. It can be caused:

- by activation of the timer.

The system is not working. It can be caused:

- by the lack of power;
- by closing of the manual power switch;
- by the presence of a blown fuse;
- by the presence of a start time programmed in the timer.

Insufficient cooling or heating capacity. It can be caused:

- by dirt in the heat exchanger;
- by blockage of the unit's inlet, outlet or filter;
- by low fan speed;
- by the “fan only” operating mode;
- by inappropriate setting of the temperature.

10 DISPOSAL

The manufacturer is registered on the National EEE Register, in compliance with implementation of Directive 2012/19/EU and pertinent national regulations on electrical and electronic equipment waste.
This Directive requires electrical and electronic equipment to be disposed of properly.
Equipment bearing the crossed-out wheelie bin symbol must be disposed of separately at the end of its lifecycle to prevent damage to human health and to the environment.

Electrical and electronic equipment must be disposed of together with all of its parts.
To dispose of "household" electrical and electronic equipment, the manufacturer recommends contacting an authorised dealer or an authorised ecological site.

"Professional" electrical and electronic equipment must be disposed of by authorised personnel through established waste disposal authorities around the country.
In this regard, here is the definition of household WEEE and professional WEEE.

WEEE from private households: WEEE originating from private households and WEEE which comes from commercial, industrial, institutional and other sources which, because of its nature and quantity, is similar to that from private households. Subject to the nature and quantity, where the waste from EEE was likely to have been used by both a private household and users of other than private households, it will be classed as private household WEEE;

Professional WEEE: all WEEE which comes from something other than private households.
This equipment may contain:

- refrigerant gas, the entire contents of which must be recovered in suitable containers by specialised personnel with the necessary qualifications;
- lubrication oil contained in compressors and in the refrigeration circuit to be collected;
- mixtures with antifreeze in the water circuit, the contents of which are to be collected;
- mechanical and electrical parts to be separated and disposed of as authorised.

When the components to be replaced for maintenance purposes are removed or when the entire unit reaches the end of its life and needs to be removed from the installation, waste should be separated by its nature and disposed of by authorised personnel at existing collection centres.

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