

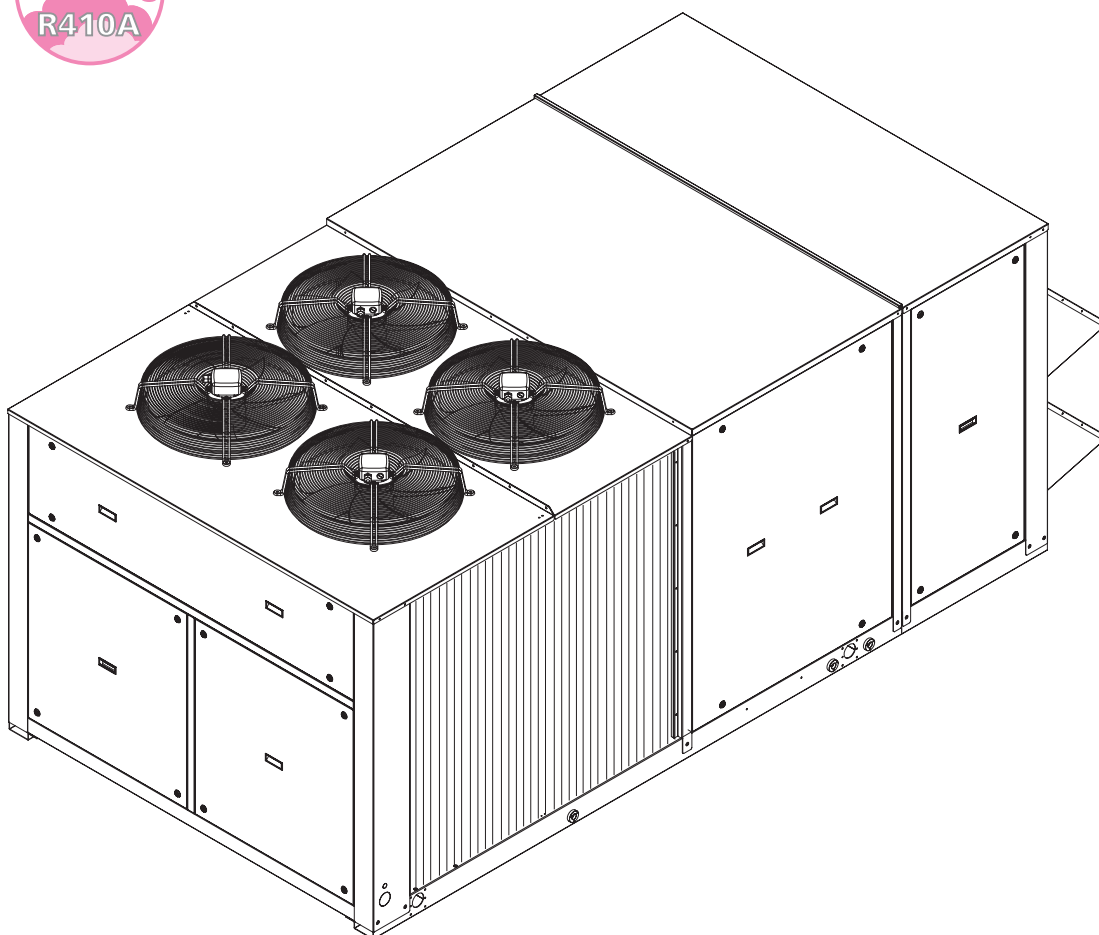


RFA

SINGLE PACKAGED ROOFTOP UNITS ROOF-TOP

34.4÷109.8 kW IN COOLING MODE

38.6÷117.8 kW IN HEATING MODE



INSTALLATION AND OPERATION MANUAL

Dear Customer,

Thank you for having purchased a **FERROLI** Industrial coolers. It is the result of many years experience, particular research and has been made with top quality materials and highly advanced technologies. The CE mark guaranteed that the appliances meets European Machine Directive requirements regarding safety.

The qualitative level is kept under constant surveillance. **FERROLI** products therefore offer SAFETY, QUALITY and RELIABILITY.

Due to the continuous improvements in technologies and materials, the product specification as well as performances are subject to variations without prior notice.

Thank you once again for your preference.

FERROLI S.p.A



GB

“CE” DECLARATION OF CONFORMITY

We, the undersigned, hereby declare under our responsibility, that the machine in question complies with the provisions established by Directives : 98/37/EC , 2006/95/EC , 2004/108/EC , 97/23/EC and subsequent modifications.

DE

“EG” KONFORMITÄTSERKLÄRUNG

Wir, die Unterzeichner dieser Erklärung, erklären unter unserer ausschließlichen Verantwortung, daß die genannte Maschine den Bestimmungen der folgenden EG-Richtlinien entspricht : 98/37/EC , 2006/95/EC , 2004/108/EC , 97/23/EC und anschließende Novellierungen.

FR

DECLARATION “CE” DE CONFORMITE

Nous soussignés déclarons, sous notre entière responsabilité, que la machine en objet est conforme aux prescriptions des Directives : 98/37/EC , 2006/95/EC , 2004/108/EC , 97/23/EC et modifications suivantes.

IT

DICHIARAZIONE “CE” DI CONFORMITÀ

Noi sottoscritti dichiariamo, sotto la nostra responsabilità, che la macchina in questione è conforme alle prescrizioni delle Direttive : 98/37/EC , 2006/95/EC , 2004/108/EC , 97/23/EC e successive modificazioni.

ES

DECLARACION “CE” DE CONFORMIDAD

Quienes subscribimos la presente declaracion, declaramos, bajo nuestra exclusiva responsabilidad, que la maquina en objeto respeta lo prescrito par las Directivas : 98/37/EC , 2006/95/EC , 2004/108/EC , 97/23/EC y sucesivas modificaciones.

PT

DECLARAÇÃO “CE” DE CONFORMIDADE

Nós, signatários da presente, declaramos sob a nossa exclusiva responsabilidade, que a máquina em questão está em conformidade com as prescrições das Directrizes : 98/37/EC , 2006/95/EC , 2004/108/EC , 97/23/EC e sucessivas modificações.

NL

“EG” CONFORMITEITSVERKLARING

Wij ondergetekenden verklaren hierbij op uitsluitend eigen verantwoording dat de bovengenoemde machine conform de voorschriften is van de Richtlijnen : 98/37/EC , 2006/95/EC , 2004/108/EC , 97/23/EC en volgende wijzigingen.

DK

“CE” OVERENSSTEMMELSESERKLERING

Underfegnede forsikrer under eget ansvar al den ovennævnte maskine er i overensstemmelse med vilkårene i direktiveme : 98/37/EC , 2006/95/EC , 2004/108/EC , 97/23/EC med ændringer.

SE

FÖRSÄKRAN OM “CE” ÖVERENSSTÄMMELSE

Underfegnade försäkrar under eget ansvar alt ovannämnda maskin överensstämmer med villkoren i direktiv : 98/37/EC , 2006/95/EC , 2004/108/EC , 97/23/EC med ändringar.

NO

BEKREFTELSE OM ÆCEØ OVERENSSTEMMELSE

Underfegnede forsikrer under eget ansvar al den ovennevnte maskinen er i overensstemmelse med vilkårene i direktivene : 98/37/EC , 2006/95/EC , 2004/108/EC , 97/23/EC med endringer.

FI

“CE” VAATIMUSTENMUKAISUUSVAKUUTUS

Allekirjoittaneet vakuutamme omalla vastuullamme että yllämainittu kone noudattaa ehtoja direktiiveissä : 98/37/EC , 2006/95/EC , 2004/108/EC , 97/23/EC muutoksin.

GR

ΔΗΛΩΣΗ ΣΥΜΒΑΤΟΤΗΤΑΣ “EE”

Εμετες που υπογραφουμε την παρούσα, δηλωνουμε υπο την αποκλειστικη μας ευθυνη, οτι το μηχανημα συμμορφουται οτα οσ α ορτζουν οι Οδηγιες : 98/37/EC , 2006/95/EC , 2004/108/EC , 97/23/EC και επακολονθες τροποποιησεις.

HR

IZJAVA O “CE” SUGLASNOSTI

Mi niže potpisani izjavljujemo, pod našom odgovornošću, da ova Mašina odgovara zahtjevima iz Direktiva : 98/37/EC , 2006/95/EC , 2004/108/EC , 97/23/EC i naknadne izmjene.

PL

DEKLARACJA ZGODNOŚCI “CE”

My niżej podpisani oświadczamy z pełną odpowiedzialnością, że niżej wymienione urządzenie w pełni odpowiada postanowieniom przyjętym w następujących Dyrektywach: 98/37/EC, 2006/95/EC, 2004/108/EC, 97/23/EC i kolejne modyfikacje.

Il legale rappresentante
Dante Ferrolì

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GENERAL FEATURES

Presentation of the unit

The air/air units of the RFA series are able to satisfy the air conditioning requirements of medium large spaces (shopping centers, hypermarkets, movie theaters, offices, cafeterias, restaurants, etc.) and allow functioning in heating mode by means of the inversion of the refrigeration circuit.

They are ideal for installation in any outside environment. The load-bearing structure and the paneling are constructed of galvanized and painted sheet metal, the fastening components are made of stainless steel or have been electrolytically galvanized, and the cabinet containing the electrical equipment and all the components exposed to the elements have a minimum protection rating of IP 54. The zone in contact with the treated air, which is easily accessible, is comprised of metal surfaces that can be easily cleaned and that are externally insulated to reduce heat loss to a minimum and to prevent the formation of condensate both inside and outside the structure.

Each size can be equipped with a large range of accessories and built in various configurations to adapt to various installation requirements.

The series is installed on two construction frames equipped with scroll compressors, each of which is placed on an independent refrigeration circuit. This makes it possible to maintain a constant ratio between total and sensible cooling capacity even with partial loads and guarantees better treatment of the air as well as greater reliability.

Each refrigeration circuit is equipped with a double thermostatic valve to optimize the two operating modes and with ball valves upline and downline from the external coils.

The units are equipped (standard features) with a variable speed switch for the external fans which permits operation in cooling mode with low outside temperatures and in heating mode with high outside temperatures and makes it possible to reduce the noise emissions under said operating conditions. The electric motors of the internal fan with power greater than or equal to 4 kW are equipped with starting by means of a star-triangle switching to reduce the surge starting current.

The units function with refrigerant gas R410A.

All the versions are supplied as self-contained units assembled and tested at the factory.

General instructions

This manual and the diagrams supplied with the unit must be kept in a dry place for possible future consultation.

This manual provides information on installation and all the instructions for correct use and maintenance of the unit. Before carrying out installation, please carefully read all the information contained in this manual which describes the procedures necessary for correct installation and use of the unit.

Carefully follow the instructions contained in the manual and comply with the current safety standards. This unit must be installed in compliance with the regulations in force in the country of use. Unauthorised tampering with the electrical or mechanical equipment INVALIDATES THE WARRANTY.

Check the electrical characteristics given on the dataplate before carrying out the electrical connections. Read the instructions given in the specific section on electrical connections.

Deactivate the equipment in case of a fault or poor operation.

If the unit has to be repaired, contact a specialised assistance centre approved by the manufacturer and use original replacement parts.

The unit must be placed outside and connected to a suitable air ducting system. Any use different from that permissible or outside the operating limits given in this manual is prohibited (unless previously agreed on with the firm).

The manufacturer declines any liability for damage or injury due to non-compliance with the information given in this manual.

Declaration of conformity

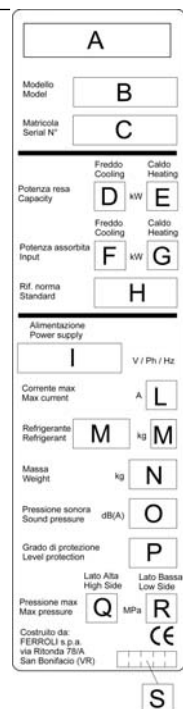
The company declares that the unit in question complies with the following directives :

- | | | |
|---|---|------------------------------|
| • | Machine directive | 98/37/EC |
| • | Low voltage directive | 73/23/EEC (amend. 93/68/EEC) |
| • | Electromagnetic compatibility directive (EMC) | 89/336/EEC |
| • | Pressurised equipment directive (PED) | 97/23/EC |

Unit dataplate

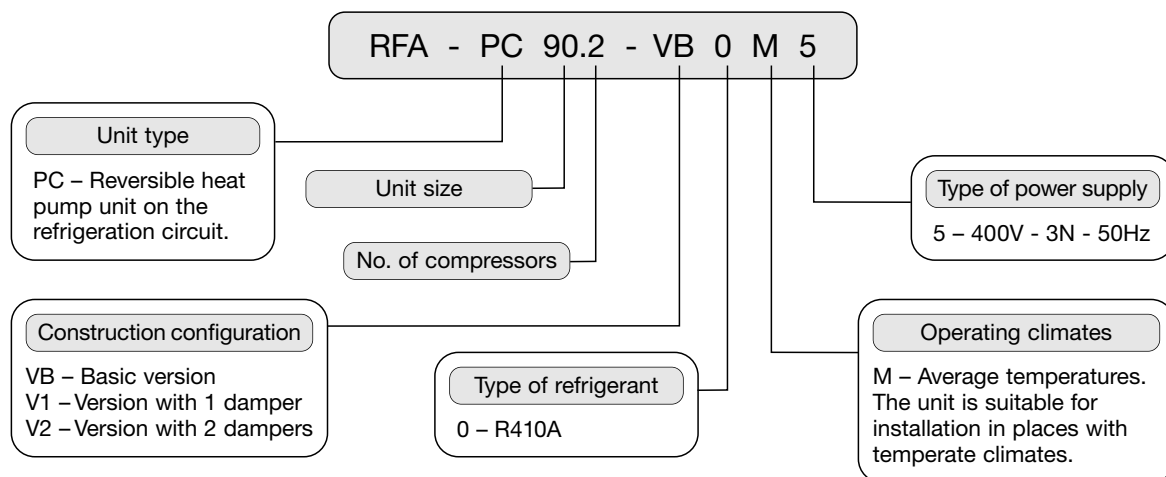
The figure opposite shows the fields given on the unit's dataplate :

- A - Trademark
- B - Model
- C - Serial no.
- D - Output in cooling
- E - Output in heating (heat pump)
- F - Input in cooling
- G - Input in heating (heat pump)
- H - Reference standard
- I - Power supply
- L - Max. absorbed current
- M - Type of refrigerant and charge weight
- N - Unit shipping weight
- O - Sound pressure level at 1 metre
- P - Protection rating IP
- Q - Max. pressure - high pressure side
- R - Max. pressure - low pressure side
- S - PED certification body



Unit identification code

The following is a description of the nomenclature for identifying the units and the meaning of the letters used.



Standard unit description

Structure

The load-bearing structure, the base, and the external paneling are constructed of hot galvanized steel sheet that has been painted with epoxy powders (color RAL 7035) to ensure total resistance to the elements. The inspection panels are all easily removable by means of $1/4$ -turn closures to allow complete access to the internal components. The zone in contact with the treated air is constructed of galvanized sheet metal to guarantee proper cleaning, in conformity with Italian Legislative Decree no. 626/94, and is externally insulated with foam panels and double panels with class 1 soundproofing and heat insulation placed between them.

External fan section

The external fan section is comprised of axial fans with sickle shaped aluminum blades, housed in an inlet cone constructed of galvanized and painted sheet metal and equipped with a protective safety screen. They are directly coupled to 6-pole single-phase motors (900 RPM max.), with external rotor, complete with internal overheating protection and firmly attached to the insulated sheet metal panels with rubber anti-vibration mounts.

The speed of rotation of the fans is continuously regulated by a phase cutting device that makes it possible to check the condensation pressure (in the cooling mode) and the evaporation pressure (in the heating mode) as a function of the value read from the temperature probe located on the liquid line.

Internal fan section

The internal fan section is comprised of a pair of double inlet centrifugal fans with blades curved forward, balanced both statically and dynamically in conformity with ISO 1940 standards, grade 6.3. The screw, the impeller, and the frame are constructed of galvanized sheet metal, while the shaft is built of C40 steel.

By means of a belt and pulleys the fan is coupled to a three-phase, 4-pole asynchronous electric motor attached to an appropriate belt tightening slide, with an IP55 protection rating, F insulation class, and suitable for continuous service (S1) with sufficient heating margins in case of an overload of limited duration. Starting by means of star-triangle switching is standard for powers greater than or equal to 4 kW to reduce the surge starting current and to ensure longer duration of the transmission.

The pulley installed on the motor is a variable diameter type pulley, and it makes it possible, within certain limits, to regulate the fan's rotation speed to obtain the desired air flow values and available head.

All the units can be configured with a front or downward outlet.

Filter section

All the units are equipped with corrugated type filter cells comprised of a frame made of galvanized sheet metal, a protective screen made of electrically welded galvanized steel wire and a reusable filter element made of polyester fiber stiffened with synthetic resins. G4 class efficiency according to standard CEN-EN 779 (Eurovent EU4 classification - 90% average weighted efficiency) and class 1 flame resistance.

The filter cells are easily accessible for the periodic cleaning and inspection operations. Once the advised final pressure drop has been reached, the synthetic fiber can be partially reused after treating with lukewarm water and detergents.

Compressors

These compressors are orbiting hermetic spiral scroll compressors, complete with overtemperature and over-current protection of the motor. A device for verifying the presence and the correct sequence of the power supply phases is contained in the electrical board to prevent the reverse rotation of the compressor.

They are anchored to the base by means of rubber anti-vibration mounts and are installed in a compartment separated from the air flow for better accessibility. They are also equipped with "belt" type electric elements that are activated when the compressor turns off, and their job is to maintain the oil at a sufficiently high temperature to prevent the migration of refrigerant during the stoppages and to cause to be evaporated any liquid that may be present in the casing to prevent any liquid impacts during startup.

Internal heat exchangers

Louvered coils constructed with copper tubes arranged equilaterally with aluminum louvers with grooved profile for increasing the heat exchange coefficient. To prevent condensate from being picked up, the frontal air speed does not exceed 2.7 m/s, even in the configuration with the maximum flow rate and under the most unfavorable thermohygrometric conditions. To collect the condensate there is a stainless steel drain pan with an inclined bottom, complete with threaded connector for the discharge.

External heat exchangers

Louvered coils constructed with copper tubes arranged equilaterally with aluminum louvers with grooved profile.

Thermostatic expansion valve

Thermostatic valves equipped with an external equalizer. These valves make it possible to adjust to various operating conditions while maintaining constant the set degree of overheating. The presence of two valves (one for cooling mode operation and one for heating mode operation) in each refrigeration circuit makes it possible to optimize the calibration to obtain maximum efficiency.

Dehydrator filters

Solid cartridge hermetic filters able to retain residues of impurities and any traces of humidity present in the circuit. There are two filters per circuit, placed upline from the thermostatic valves.

Pressure switches

Each refrigeration circuit is equipped with three pressure switches with fixed calibration to prevent the operation of the unit outside of the allowed operating range.

- high pressure: placed on the outlet tubes.
- low pressure for cooling mode operation: placed between the internal exchanger and the reverse valve.
- low pressure for heating mode operation: placed between the liquid separator and the compressor.

The activation of the pressure switch results in the turning off of the compressor of the circuit involved. The reset is manual (by means of the user interface) for the high pressure switch and automatic for the low pressure switches (they become manual only in the case of frequent activation).

Cocks

These devices are placed before and after each external coil to make it possible to stock all the refrigerant inside the coils so that maintenance or replacement operations can be carried out on all the components of the refrigeration circuit, without any need to dispose of them.

Liquid separator

Placed on the intake tubing of each compressor to protect it from backflow.

Reverse cycle valve

Makes it possible to switch the operating mode by reversing the refrigerant flow.

Sight glass

This device indicates the presence of liquid upline from each thermostatic valve and makes it possible to verify the subcooling and the correct refrigerant charge. It also indicates the refrigerant's humidity content by means of a change in its color.

Access fitting

The access fitting valves allow to create a loading or draining point rapidly at four points for each refrigeration circuit: compressor intake, compressor outlet, and upline from each thermostatic valve.

They are SAE 5/16" (equivalent to UNF 1/2" - 20) type valves, complete with valve core, and cup with gasket, as is required for the use of the refrigerant R410A.

Electrical board

The electrical board, placed inside the unit and protected by easily removed panels, is manufactured in conformity with the CEI EN 60204-1 standard and contains all the power, regulation, and safety components necessary to guarantee the unit's proper functioning.

The power section contains:

- General cutoff switch's door blocking mechanism
- Compressor control contactors
- Internal fan control contactors
- Compressor protection
- External fan protection
- Internal fan protection with magnetothermic switch
- External fan phase cutting cards

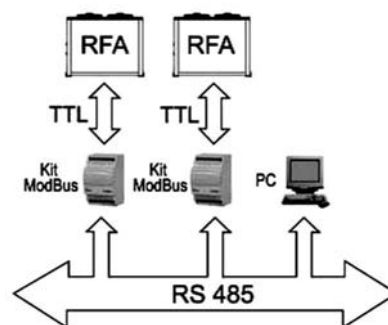
The control section contains:

- Electronic microprocessor controller
- Auxiliary circuit power supply transformer
- Auxiliary circuit protection
- Phase sequence and presence control device

Regulation and control system

The unit is managed by a microprocessor controller comprised of a card, located inside the electrical board, to which are connected all the pressures and the control devices, and a user interface that can be accessed by removing the electrical board's protection panel. It is possible to connect another interface to the board to remotely control the machine (refer to "Remote control" and "Remote thermostat" accessories).

The following are the main functions that are available: treated air temperature regulation, thermal free cooling, treated air humidity regulation (only with the enthalpic free cooling accessory), active alarms display, remote on-off, remote cooling and heating, recording the hours of operation, and serial communication by mean of the Modbus protocol.



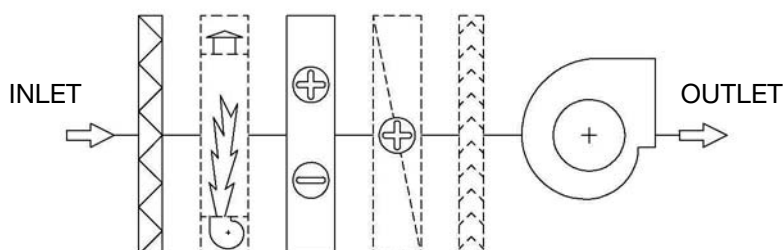
CONFIGURATIONS

Each unit can be supplied to the client with different configurations to satisfy the requirements of the systems. The various versions that can be obtained by combining additional modules with the basic version are always supplied already assembled, wired, and tested at the factory.

All the versions can be configured with a front or downward outlet.

The components outlined with dashes are accessories.

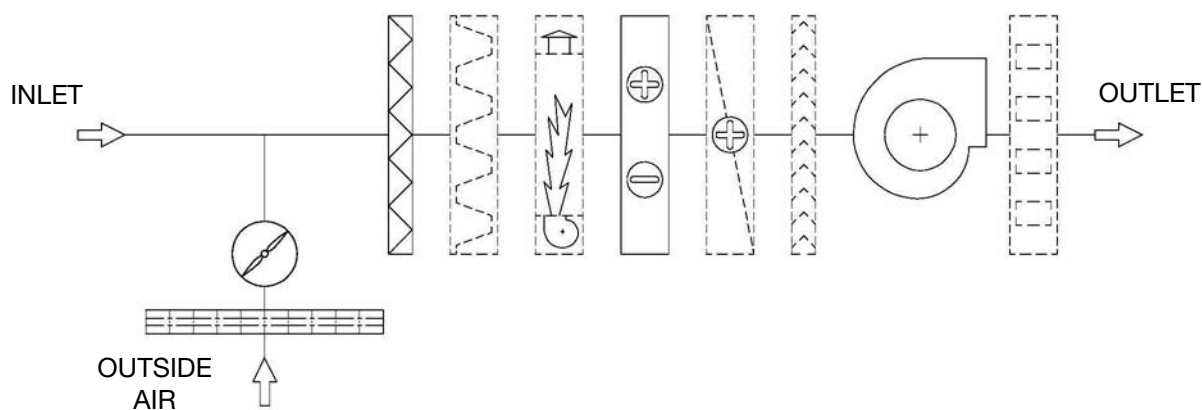
Basic version - VB



This version allows operation with 100% inlet air. It contains the standard filter section and the air-refrigerant coil that makes possible the heating or cooling and dehumidification treatments.

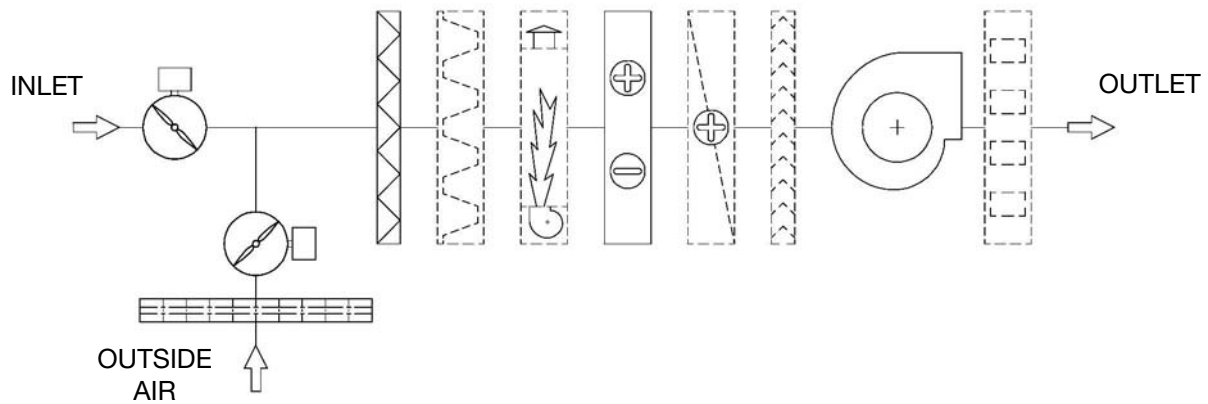
It is possible to add a further heating section (a water coil or a series of electric heaters) and a droplet separator. As an alternative to this heating section it is possible to add a condensation gas thermal module, positioning it between the filter section and the air-refrigerant coil.

Version with 1 damper - V1



This version allows operation with a percentage of outside air that can be set by manually adjusting the damper installed on the additional module. The outside air intake comes complete with a rainproof cover and a protective metal mesh. The discharge from the climate-controlled room of an air flow rate equal to the fresh air flow rate must occur independently from the unit through the overpressure openings or the removal devices.

Various types of special filters can be inserted in the additional module to complete the standard filter section. Also in this version it is possible to add a further heating section (a water coil or a electric heaters) and a droplet separator. As an alternative to this heating section it is possible to add a condensation gas thermal module, positioning it between the filter section and the air-refrigerant coil. Sound attenuator can be installed downline from the outlet fan to reduce the noise transmitted in the rooms to be climate-controlled by means of air ducts.



Two motorized dampers managed by the unit controller make possible operation with a minimum percentage of fresh outside air (which can be set by means of the user interface) and the implementation of thermal free cooling. The outside air intake, which comes complete with a rainproof cover and a protective metal mesh, is sized for 100% of the total flow rate and, therefore, makes possible operation in the free cooling mode with 100% outside air. The discharge from the climate-controlled room of an air flow rate equal to the fresh air flow rate must occur independently from the unit through the overpressure openings or the removal devices.

Various types of special filters can be inserted in the additional module to complete the standard filter section. Also in this version it is possible to add a further heating section (a water coil or electric heaters) and a droplet separator. As an alternative to this heating section it is possible to add a condensation gas thermal module, positioning it between the filter section and the air-refrigerant coil.

It is also possible to implement enthalpic free cooling by means of the installation of the appropriate humidity probes.

Sound attenuator can be installed downline from the outlet fan to reduce the noise transmitted in the rooms to be climate-controlled by means of air ducts.

OPTIONS AND ACCESSORIES

In this section are described all the components that can be installed on the unit. For further details consult the sections on technical data, overall dimensions, and connections. Always verify the possibility of combining each accessory with the configuration you have selected (according to the table below).

	Configuration		
	VB	V1	V2
Protection grills for the external coils	M	M	M
High and low pressure gauges	M	M	M
Spring vibration dampers	F	F	F
Internal fan with nonstandard motor and transmission	M	M	M
Droplet separator	M	M	M
Refrigeration circuit housing silencing kit	M	M	M
Outlet Sound attenuator	–	M	M
Filters differential pressure switch	M	M	M
Special filters	–	M	M
Air quality monitoring	–	–	M
Enthalpic Free cooling	–	–	M
Remote control	F	F	F
Remote thermostat	F	F	F
Clock controller	F	F	F
Modbus serial interface on RS485	F	F	F
2- or 3-row water coil for post-heating only	M	M	M
Heating coil with electric heaters	M	M	M
Gas thermal module	M	M	M
Downward outlet	M	M	M
Roof curb	F	F	F

M: Accessory assembled at the factory.

F: Supplied accessory (installation is the responsibility of the client).

Protection grills for the external coils

The external coils are protected by metal grills that have undergone black cataphoresis treatment.

High and low pressure gauges

Each refrigeration circuit is equipped with two analog gauges, located inside the refrigeration circuit housing, which measure the pressures in the compressors' intake and outlet tubes.

Spring vibration dampers

These mounts reduce the transmission to the unit's support surface of the mechanical vibrations generated by the compressor and by the fans during their normal operation. To maintain a degree of insulation of greater than 90%, the number and properties of the anti-vibration mounts change depending on the size of the unit, the construction configuration chosen, and the accessories installed. Different anti-vibration mounts may be necessary on the same unit due to the nonuniform distribution of the weights on the support points.

The choice of this accessory requires the use of anti-vibration joints on all the aeraulic and hydraulic connections. Furthermore, the height of the supports placed between the base of the unit and the support surface must be taken into account to properly arrange the air ducts. (H = 79 mm at rest and average deflection under pressure is approx. 20 mm).

Internal fan with nonstandard belt drive

To adjust the performance of the internal centrifugal fan to the effective air flow rate values and required available head, for each size there are three transmissions (standard, High capacity, and reduced) that are differentiated by the pulleys used and by the rated electric motor power. The pulley installed on the electric motor is a variable diameter type pulley and, therefore, it makes it possible, within certain limits, to modify the fan's curve to adapt it to the system's characteristic curve.

Droplet separator

It is advisable to use this component in the case of units that require air flow rates that are particularly high in comparison to the expected standard flow rate, i.e., high enough to generate an average air through speed of 2.7 m/s.

It prevents the picking up of condensate droplets that form on the exchange coil during cooling mode operation. It comes complete with a stainless steel condensate collection drain pan with an inclined bottom and a threaded connector for the discharge. It is never required if the water coil for post-heating only is installed.

Low noise kit

To reduce the noise emissions produced by the unit, it is possible to insulate the walls of the refrigeration circuit housing and wrap the compressors in special soundproofing enclosures.

Outlet sound attenuator

This accessory is comprised of soundproofing elements made of mineral wool covered with an anti-erosion film made of fiberglass placed downline from the centrifugal outlet fan. They make it possible to reduce the noise emissions transmitted in the rooms to be climate-controlled by means of air ducts. It is not available when the downward outlet is selected.

Filters differential pressure switch

This accessory measures the difference in pressure before and after the filter section. When the pressure drops exceed the maximum permitted value (set at the factory according to the type of filter installed on the unit), the pressure switch acts to prevent the machine from operating with an air flow rate that is excessively low in comparison to that required.

Special filters

To complete the standard filter section it is possible to insert, inside the additional modules, rigid bag filters of various efficiencies (F6, F7, F8, and F9: according to the EN 779 standard) or activated carbon filters class F7. The filter holder guide was designed to guarantee a perfect seal and easy lateral removal of the filters for the maintenance operations.

Air quality monitoring (CO₂)

In the versions that require a motorized damper on the inlet, it is possible to regulate the opening of the damper itself according to the percentage of CO₂ present in the rooms to be climate controlled and increase, if necessary, the percentage of fresh air. If free cooling (either thermal or enthalpic) is activated, the damper opening is determined by the combination of the two control logics.

Enthalpic Free cooling

Adopts the same regulation logic as thermal free cooling, but takes into consideration the enthalpies of the outside air and of the inlet instead of simply the temperatures. It makes it possible to increase the seasonal efficiency of the unit by means of a more extensive use and optimization of free cooling. The relative humidity (of the outside air and the inlet air), which is necessary for the calculation of the enthalpy, is measured by means of two capacitive humidity sensors.

Remote control

It is ideal for wall mounting and replicates all the functions available on the user interface that is normally installed on the unit. Therefore, it makes possible the complete remote control of the machine.

Remote thermostat

It is ideal for wall mounting and constitutes a remote interface that is simpler than that which is normally installed on the unit. It makes it possible to select the functioning mode, set a change with respect to the active set point, and view the functioning status and display the functioning status and the presence of active alarms.

Clock controller

Makes it possible to turn the unit on and off according to the set programming schedule, by using the remote on-off control found on all the units.

Modbus serial interface on RS485

Makes it possible to communicate with the unit's controller and to monitor the functioning conditions by means of the Modbus communication protocol. The use of the RS485 serial line ensures the signal's quality up to a distance of approximately 1200 meters (which can be further extended by means of specific repeaters).

2- or 3-row water coil for post-heating only

This coil, manufactured with copper tubes arranged equilaterally with aluminum louvers with grooved profile for increasing the heat exchange coefficient, is equipped with an automatic air vent and a water discharge device. The circuits allow complete emptying for normal maintenance operations. The coil includes a stainless steel drain pan with an inclined bottom and a threaded connector for the discharge of the condensate and the water contained in the hydraulic circuit. The structure allows easy lateral removal of the coil for any extraordinary maintenance operations that may be necessary. The connection between the coil's headers and the threaded hydraulic connectors on the machine is ensured by a pipes kit or a 3-way valve unit.

Pipe kit for water coil

This kit is comprised of all the necessary components to facilitate any extraordinary maintenance operations that may be necessary: a pair of automatic air vents, inlet and outlet ON / OFF ball valves, safety valve (calibration 6 bar), various inlet and outlet openings and connectors. The hydraulic circuit is opportunely insulated and protected by two inspection panels equipped with recessed handles and 1/4-turn closures separated by a support on which are attached the water inlet and outlet connectors.

Three-way valve for water coil

The motorized three-way ball valve, which is managed by the unit's controller according to an on-off logic, makes it possible to use the water coil both for heating (together with, or as a replacement for, the heat pump) and as frost protection. The valve is equipped with all the components specified in the pipes kit.

Heating coil with electric heaters

This component performs two functions: heating (together with, or as a replacement for, the heat pump) and frost protection. It is equipped with a safety thermostat and its over-current protection is provided by fuses inside the electrical board.

Gas thermal module

As an alternative to traditional accessories used for heating the air to be released into the room (water coil for post-heating only or electric heaters), it is possible to use a condensation gas thermal module which was specifically designed for this purpose and is suitable as a replacement for the heat pump.

It is included in a dedicated module inside the unit and consists of a modulating premixed gas burner and a stainless steel air-flue gas exchanger. The air to be released into the room flows over the external surface of the combustion chamber and the exchanger's tubes and is heated directly without intermediate exchanges.

The combustion chamber is constructed completely of AISI 430 stainless steel and the exchangers' tubes and the flue gas headers are constructed of AISI 304L stainless steel to give even greater resistance to the condensation products and their corresponding acid compounds. All the components are sealed and guarantee complete separation between the treated air flow and the combustion products. The modulating burner premixes air and gas according to optimal ratios, thereby making it possible to achieve infinite values of heating capacity within a wide operating range (1:3 - 1:5) and to exploit as much as possible the heat of condensation of the flue gas, even at reduced loads.

The thermal module is equipped with an electronic circuit board that is able to control all the management and regulation functions. Two safety thermostats with manual reset prevent high temperatures in the case of anomalies. A safety pressure switch controls the obstruction of the flue pipe.

The condensation technology makes it possible to reduce the loss of energy connected with the heat dispersed in the environment by means of the flue gas, lowering the discharge temperature and exploiting both the sensible heat and the latent heat (heat of condensation of the steam contained in the flue gas).

The following are its advantages in comparison with traditional air heaters:

- Considerably more compact.
- High yields due to the exploitation of the heat of condensation between 105% and 93.1% (min. and max. pressure).
- Extremely low level of pollutant emissions (absence of carbon monoxide and emissions of NOx of less than 30 ppm).

Methane gas is to be used with this accessory. Unless different instructions are specified at the time of the order, the modules will be tested and prepared for operation with G20 natural gas and a supply pressure of 20 mbar.

It can be supplied with a rapid conversion kit to use Liquefied Petroleum Gas (LPG). The module is built in accordance with UNI, UNICIG, and CEI standards, is in compliance with the Gas Directive 90/396/EEC, and is Gastec certified.



Downward outlet

All the units can be configured with this option. In this case the outlet plenum is closed by means of specific flanges, and the choice of this configuration does not permit the installation of the outlet Sound attenuator.

Roof curb

A metal structure to be applied to the units configured with its outlet facing downward to facilitate the installation of the machine and ensure a perfect seal between the air ducts and the unit itself. The correct positioning of the roof curb requires precise finishing of the installation zone.

TECHNICAL DATA AND PERFORMANCE

Nominal performance and technical data

Model	35.1	45.1	55.1	70.2	90.2	110.2	U.M.
Electrical power supply							
Cooling							
Total cooling capacity	34.4	45.1	55.8	69.0	90.4	109.8	kW
Sensible cooling capacity	24.0	31.4	39.1	47.2	62.2	76.3	kW
Compressors' power input	9.2	11.9	15.6	18.3	23.8	31.2	kW
Total power input	12.4	15.5	19.6	25.2	31.5	39.7	kW
Compressor EER	3.7	3.8	3.6	3.8	3.8	3.5	-
Total EER	2.8	2.9	2.8	2.7	2.9	2.8	-
Heating							
Heating capacity	38.6	49.8	59.4	77.2	99.4	117.8	kW
Compressors power input	9.8	12.4	15.9	19.6	24.8	31.8	kW
Total power input	13.0	16.0	19.9	26.5	32.5	40.3	kW
Compressor COP	3.9	4.0	3.7	3.9	4.0	3.7	-
Total COP	3.0	3.1	3.0	2.9	3.1	2.9	-
Compressors							
Type	SCROLL						-
Quantity	1			2			n°
Refrigeration circuits	1			2			n°
Unit steps	0 - 100			0 - 50 - 100			%
Compressor 1 oil quantity	3.25	4.14	4.70	3.25	4.14	4.70	l
Compressor 2 oil quantity	-	-	-	3.25	4.14	4.70	l
Refrigerant							
Type	R410A						-
Quantity	11	12	13	21	24	26	kg
External section fans							
Type	AXIAL						-
Quantity	2			4			n°
Total air flow rate in cooling mode	18300	17200	16100	36700	34500	32300	m ³ /h
Total air flow rate in heating mode	17600	16200	15000	35200	32500	30100	m ³ /h
Maximum rotation speed	900	900	900	900	900	900	rpm
Rated power for fan	0.8	0.8	0.8	0.8	0.8	0.8	kW
Internal section fans (OUTLET)							
Type	CENTRIFUGE						-
Quantity	2						n°
STANDARD air flow rate	6200	8100	10000	11000	14500	17000	m ³ /h
Available static head	200	200	200	200	200	200	Pa
Power input	1.4	1.8	2.2	3.5	4.3	5.1	kW
Rated capacity	1.5	1.85	2.2	4.0	5.5	5.5	kW

Standard conditions

Unit operating with 100% inlet air. Performance in reference to the BASIC version with STANDARD internal fan.

Cooling: External air temperature 35° C, dry bulb - Internal air temperature 27° C, dry bulb / 19° C, wet bulb.

Heating: External air temperature 7° C, dry bulb / 6° C, wet bulb - Internal air temperature 20° C, dry bulb.

Treated air flow rate (internal section fans)

Model	35.1	45.1	55.1	70.2	90.2	110.2	U.M.
MINIMUM flow rate	5200	6800	8400	9100	12100	14000	m ³ /h
STANDARD flow rate	6200	8100	10000	11000	14500	17000	m ³ /h
MAXIMUM flow rate	7200	9400	11700	13000	17000	20100	m ³ /h

Technical data and performance

Performance in COOLING MODE – STANDARD air flow rate

SIZE	TA Tbs / Tbu [°C]		OUTSIDE AIR TEMPERATURE - Tdb [°C]																	
			27			31			35			39			43			47		
			kWf	kWfs	kWa	kWf	kWfs	kWa	kWf	kWfs	kWa	kWf	kWfs	kWa	kWf	kWfs	kWa	kWf	kWfs	kWa
35.1	36	25	38.5	21.3	8.2	37.9	21.6	8.8	37.1	21.9	9.5	36.1	22.3	10.2	34.9	22.6	11.1	33.4	23.0	12.0
	33	23	37.6	21.9	8.1	37.0	22.3	8.7	36.2	22.6	9.4	35.2	23.0	10.1	34.1	23.3	11.0	32.7	23.7	11.9
	30	21	36.6	22.6	8.0	36.0	23.0	8.6	35.3	23.3	9.3	34.4	23.7	10.0	33.3	24.0	10.9	31.9	24.3	11.8
	27	19	35.7	23.3	7.9	35.1	23.7	8.5	34.4	24.0	9.2	33.5	24.3	9.9	32.5	24.7	10.7	31.2	25.0	11.6
	24	17	34.8	24.0	7.8	34.2	24.3	8.4	33.5	24.7	9.1	32.7	25.0	9.8	31.7	25.4	10.6	30.5	25.7	11.5
	21	15	33.8	24.7	7.7	33.3	25.0	8.4	32.7	25.4	9.0	31.9	25.7	9.7	30.9	26.1	10.5	29.7	26.4	11.4
45.1	36	25	50.1	27.8	10.6	49.4	28.3	11.4	48.6	28.7	12.3	47.5	29.2	13.3	46.1	29.6	14.4	44.4	30.1	15.5
	33	23	48.9	28.7	10.4	48.2	29.2	11.3	47.4	29.6	12.2	46.4	30.1	13.2	45.1	30.5	14.2	43.5	31.0	15.4
	30	21	47.6	29.6	10.3	47.0	30.1	11.1	46.2	30.5	12.0	45.2	31.0	13.0	44.0	31.4	14.1	42.5	31.8	15.2
	27	19	46.4	30.5	10.2	45.8	31.0	11.0	45.1	31.4	11.9	44.2	31.8	12.9	43.0	32.3	13.9	41.5	32.7	15.0
	24	17	45.2	31.4	10.1	44.7	31.8	10.9	44.0	32.3	11.8	43.1	32.7	12.7	42.0	33.2	13.7	40.6	33.6	14.9
	21	15	44.0	32.3	10.0	43.5	32.7	10.8	42.9	33.2	11.6	42.0	33.6	12.6	40.9	34.1	13.6	39.6	34.5	14.7
55.1	36	25	62.6	34.6	14.0	61.6	35.2	15.0	60.3	35.7	16.2	58.9	36.3	17.5	57.2	36.9	19.0	55.3	37.4	20.6
	33	23	61.0	35.7	13.8	60.0	36.3	14.8	58.8	36.9	16.0	57.4	37.4	17.3	55.8	38.0	18.7	54.0	38.5	20.3
	30	21	59.4	36.9	13.6	58.4	37.4	14.7	57.3	38.0	15.8	56.0	38.5	17.1	54.4	39.1	18.5	52.7	39.7	20.0
	27	19	57.8	38.0	13.5	56.9	38.5	14.5	55.8	39.1	15.6	54.5	39.7	16.8	53.1	40.2	18.2	51.4	40.8	19.8
	24	17	56.3	39.1	13.3	55.4	39.7	14.3	54.3	40.2	15.4	53.1	40.8	16.6	51.8	41.3	18.0	50.2	41.9	19.5
	21	15	54.7	40.2	13.2	53.9	40.8	14.1	52.9	41.3	15.2	51.7	41.9	16.4	50.4	42.5	17.8	48.9	43.0	19.3
70.2	36	25	77.3	41.8	16.2	76.0	42.5	17.5	74.4	43.2	18.9	72.4	43.8	20.4	70.0	44.5	22.0	67.0	45.2	23.9
	33	23	75.4	43.2	16.1	74.1	43.8	17.3	72.6	44.5	18.7	70.6	45.2	20.2	68.3	45.9	21.8	65.5	46.5	23.6
	30	21	73.4	44.5	15.9	72.3	45.2	17.1	70.8	45.9	18.5	68.9	46.5	20.0	66.7	47.2	21.6	64.0	47.9	23.4
	27	19	71.6	45.9	15.7	70.4	46.5	17.0	69.0	47.2	18.3	67.2	47.9	19.8	65.1	48.5	21.4	62.6	49.2	23.1
	24	17	69.7	47.2	15.6	68.6	47.9	16.8	67.2	48.5	18.1	65.6	49.2	19.6	63.5	49.9	21.2	61.1	50.6	22.9
	21	15	67.9	48.5	15.4	66.8	49.2	16.6	65.5	49.9	17.9	63.9	50.6	19.4	61.9	51.2	21.0	59.6	51.9	22.7
90.2	36	25	100.4	55.1	21.1	99.1	56.0	22.8	97.4	56.9	24.6	95.1	57.8	26.6	92.4	58.6	28.7	89.1	59.5	31.1
	33	23	97.9	56.9	20.9	96.7	57.8	22.5	95.0	58.6	24.3	92.9	59.5	26.3	90.3	60.4	28.4	87.1	61.3	30.7
	30	21	95.4	58.6	20.6	94.3	59.5	22.3	92.7	60.4	24.1	90.7	61.3	26.0	88.2	62.2	28.1	85.2	63.1	30.4
	27	19	93.0	60.4	20.4	91.9	61.3	22.0	90.4	62.2	23.8	88.5	63.1	25.7	86.1	64.0	27.8	83.3	64.9	30.0
	24	17	90.6	62.2	20.2	89.5	63.1	21.8	88.1	64.0	23.5	86.3	64.9	25.4	84.1	65.8	27.5	81.4	66.6	29.7
	21	15	88.2	64.0	20.0	87.2	64.9	21.5	85.9	65.8	23.3	84.2	66.6	25.1	82.1	67.5	27.2	79.5	68.4	29.4
110.2	36	25	123.3	67.6	28.0	121.1	68.7	30.1	118.7	69.8	32.4	115.8	70.9	35.0	112.6	71.9	37.9	108.7	73.0	41.1
	33	23	120.0	69.8	27.6	118.0	70.9	29.7	115.7	71.9	32.0	113.0	73.0	34.6	109.8	74.1	37.4	106.2	75.2	40.6
	30	21	116.9	71.9	27.3	115.0	73.0	29.3	112.7	74.1	31.6	110.1	75.2	34.1	107.1	76.3	36.9	103.7	77.4	40.1
	27	19	113.8	74.1	27.0	111.9	75.2	29.0	109.8	76.3	31.2	107.3	77.4	33.7	104.5	78.5	36.5	101.2	79.6	39.5
	24	17	110.7	76.3	26.6	109.0	77.4	28.6	106.9	78.5	30.8	104.6	79.6	33.3	101.8	80.7	36.0	98.7	81.8	39.0
	21	15	107.7	78.5	26.3	106.0	79.6	28.3	104.1	80.7	30.4	101.8	81.8	32.8	99.2	82.8	35.5	96.2	83.9	38.5

TA: Internal coil inlet air temperature [°C]
 KWf: Cooling capacity [kW]
 KWfs: Sensible cooling capacity [kW]
 KWa: Compressors power input [kW]

Technical data and performance

Performance in HEATING MODE – STANDARD air flow rate

SIZE	TA Tbs [°C]	OUTSIDE AIR TEMPERATURE - Tdb / Twb [°C]											
		-5	-6	-1	-2	3	2	7	6	11	10	15	14
		kWt	kWa	kWt	kWa	kWt	kWa	kWt	kWa	kWt	kWa	kWt	kWa
35.1	26	27.4	10.0	30.7	10.4	34.2	10.7	38.0	11.0	37.9	11.4	37.7	11.8
	23	27.4	9.5	30.8	9.8	34.4	10.1	38.3	10.4	38.2	10.7	38.0	11.1
	20	27.4	9.0	30.9	9.2	34.6	9.5	38.6	9.8	38.5	10.1	38.3	10.5
	17	27.4	8.5	30.2	9.9	34.8	9.0	38.9	9.3	38.7	9.6	38.6	9.9
	14	27.5	8.0	31.1	8.2	34.9	8.5	39.1	8.8	39.0	9.1	38.8	9.4
	11	27.5	7.6	31.2	7.8	35.1	8.0	39.3	8.3	39.2	8.6	39.1	8.9
45.1	26	35.3	12.0	39.7	12.6	44.3	13.2	49.3	13.8	49.2	14.3	49.0	14.7
	23	35.3	11.4	39.8	12.0	44.5	12.6	49.6	13.1	49.5	13.5	49.3	14.0
	20	35.4	10.9	39.9	11.4	44.7	11.9	49.8	12.4	49.7	12.8	49.6	13.2
	17	35.4	10.3	39.0	12.1	44.8	11.3	50.0	11.7	49.9	12.1	49.8	12.5
	14	35.4	9.8	39.9	10.3	44.8	10.7	50.1	11.1	50.1	11.5	50.0	11.9
	11	35.4	9.3	39.9	9.8	44.9	10.2	50.2	10.5	50.2	10.9	50.1	11.2
55.1	26	42.1	16.0	47.3	16.6	52.9	17.2	59.1	17.8	59.0	18.5	59.0	19.1
	23	41.9	15.1	47.2	15.7	52.9	16.2	59.2	16.8	59.2	17.4	59.1	18.0
	20	41.8	14.3	47.1	14.8	53.0	15.3	59.4	15.9	59.3	16.4	59.3	17.0
	17	41.7	13.5	46.3	15.8	53.1	14.5	59.6	15.0	59.5	15.5	59.4	16.1
	14	41.6	12.8	47.1	13.3	53.2	13.7	59.8	14.2	59.7	14.7	59.6	15.2
	11	41.5	12.1	47.1	12.6	53.3	13.0	60.0	13.5	59.9	13.9	59.8	14.4
70.2	26	54.7	20.1	61.4	20.7	68.4	21.4	76.0	22.0	75.7	22.8	75.4	23.6
	23	54.8	19.0	61.6	19.6	68.8	20.2	76.6	20.8	76.3	21.5	76.0	22.2
	20	54.8	17.9	61.8	18.5	69.2	19.0	77.2	19.6	76.9	20.3	76.6	21.0
	17	54.9	16.9	60.3	19.8	69.6	18.0	77.7	18.5	77.4	19.2	77.2	19.8
	14	55.0	16.0	62.1	16.5	69.9	17.0	78.2	17.5	77.9	18.1	77.7	18.7
	11	55.1	15.1	62.3	15.6	70.2	16.1	78.6	16.6	78.4	17.1	78.1	17.7
90.2	26	70.4	24.0	79.2	25.3	88.5	26.5	98.4	27.6	98.1	28.5	97.8	29.5
	23	70.5	22.8	79.4	24.0	88.9	25.1	98.9	26.2	98.7	27.0	98.4	27.9
	20	70.6	21.7	79.6	22.8	89.2	23.8	99.4	24.8	99.2	25.6	99.0	26.5
	17	70.7	20.7	77.9	24.2	89.4	22.6	99.8	23.5	99.6	24.3	99.4	25.1
	14	70.6	19.7	79.7	20.6	89.5	21.4	100.0	22.2	99.9	23.0	99.8	23.7
	11	70.6	18.7	79.7	19.5	89.6	20.3	100.2	21.1	100.1	21.8	100.1	22.5
110.2	26	83.4	32.1	93.7	33.2	104.9	34.4	117.1	35.7	117.1	37.0	117.1	38.3
	23	83.1	30.3	93.6	31.3	105.0	32.4	117.4	33.7	117.3	34.8	117.3	36.1
	20	82.8	28.6	93.5	29.6	105.1	30.7	117.8	31.8	117.7	32.9	117.5	34.0
	17	82.6	27.0	91.8	31.7	105.3	29.0	118.2	30.1	118.0	31.1	117.9	32.2
	14	82.5	25.6	93.5	26.5	105.5	27.5	118.6	28.5	118.4	29.4	118.2	30.4
	11	82.3	24.3	93.5	25.1	105.7	26.1	119.0	27.0	118.8	27.9	118.6	28.8

TA: Internal coil inlet air temperature [°C]
 KWt: Heating capacity [kW]
 KWa: Compressors power input [kW]

Technical data and performance

Performance in COOLING MODE – MINIMUM air flow rate

SIZE	TA Tbs / Tbu [°C]		OUTSIDE AIR TEMPERATURE - Tdb [°C]																	
			27			31			35			39			43			47		
			kWf	kWfs	kWa	kWf	kWfs	kWa	kWf	kWfs	kWa	kWf	kWfs	kWa	kWf	kWfs	kWa	kWf	kWfs	kWa
35.1	36	25	36.8	18.6	8.1	36.2	19.0	8.7	35.4	19.3	9.4	34.5	19.6	10.1	33.4	20.0	11.0	32.0	20.3	11.9
	33	23	35.9	19.3	8.0	35.3	19.6	8.6	34.6	20.0	9.3	33.7	20.3	10.0	32.6	20.6	10.9	31.2	20.9	11.8
	30	21	34.9	20.0	7.9	34.4	20.3	8.5	33.7	20.6	9.2	32.8	20.9	9.9	31.8	21.3	10.8	30.5	21.6	11.6
	27	19	34.0	20.6	7.8	33.5	20.9	8.4	32.8	21.3	9.1	32.0	21.6	9.8	31.0	21.9	10.6	29.8	22.2	11.5
	24	17	33.1	21.3	7.7	32.6	21.6	8.4	32.0	21.9	9.0	31.2	22.2	9.7	30.2	22.6	10.5	29.1	22.9	11.4
	21	15	32.2	21.9	7.7	31.8	22.2	8.3	31.1	22.6	8.9	30.4	22.9	9.6	29.4	23.2	10.4	28.4	23.6	11.3
45.1	36	25	47.9	24.4	10.4	47.3	24.9	11.3	46.5	25.3	12.2	45.4	25.7	13.1	44.2	26.1	14.2	42.6	26.6	15.4
	33	23	46.7	25.3	10.3	46.1	25.7	11.1	45.3	26.1	12.0	44.3	26.6	13.0	43.1	27.0	14.1	41.6	27.4	15.2
	30	21	45.5	26.1	10.2	44.9	26.6	11.0	44.2	27.0	11.9	43.3	27.4	12.9	42.1	27.9	13.9	40.7	28.3	15.0
	27	19	44.3	27.0	10.1	43.8	27.4	10.9	43.1	27.9	11.8	42.2	28.3	12.7	41.1	28.7	13.7	39.8	29.1	14.9
	24	17	43.1	27.9	10.0	42.6	28.3	10.8	42.0	28.7	11.6	41.1	29.1	12.6	40.1	29.6	13.6	38.8	30.0	14.7
	21	15	42.0	28.7	9.9	41.5	29.1	10.7	40.9	29.6	11.5	40.1	30.0	12.4	39.1	30.4	13.4	37.9	30.9	14.5
55.1	36	25	59.7	30.3	13.8	58.7	30.9	14.8	57.6	31.4	16.0	56.2	31.9	17.3	54.7	32.5	18.7	52.8	33.0	20.3
	33	23	58.2	31.4	13.6	57.2	31.9	14.6	56.1	32.5	15.8	54.8	33.0	17.0	53.3	33.5	18.5	51.6	34.1	20.0
	30	21	56.6	32.5	13.5	55.7	33.0	14.5	54.6	33.5	15.6	53.4	34.1	16.8	52.0	34.6	18.2	50.3	35.1	19.8
	27	19	55.1	33.5	13.3	54.2	34.1	14.3	53.2	34.6	15.4	52.0	35.1	16.6	50.7	35.7	18.0	49.1	36.2	19.5
	24	17	53.6	34.6	13.1	52.7	35.1	14.1	51.8	35.7	15.2	50.6	36.2	16.4	49.3	36.7	17.8	47.9	37.3	19.3
	21	15	52.1	35.7	13.0	51.3	36.2	13.9	50.4	36.7	15.0	49.3	37.3	16.2	48.1	37.8	17.5	46.6	38.3	19.0
70.2	36	25	73.8	36.7	16.1	72.6	37.3	17.3	71.1	38.0	18.7	69.2	38.6	20.2	66.9	39.2	21.8	64.1	39.9	23.6
	33	23	72.0	38.0	15.9	70.8	38.6	17.1	69.3	39.2	18.5	67.5	39.9	20.0	65.3	40.5	21.6	62.7	41.2	23.4
	30	21	70.1	39.2	15.7	69.0	39.9	17.0	67.6	40.5	18.3	65.8	41.2	19.8	63.7	41.8	21.4	61.2	42.5	23.2
	27	19	68.3	40.5	15.6	67.2	41.2	16.8	65.8	41.8	18.1	64.2	42.5	19.6	62.2	43.1	21.2	59.8	43.8	22.9
	24	17	66.5	41.8	15.4	65.4	42.5	16.6	64.1	43.1	17.9	62.5	43.8	19.4	60.6	44.4	21.0	58.3	45.0	22.7
	21	15	64.7	43.1	15.2	63.7	43.8	16.4	62.4	44.4	17.8	60.9	45.0	19.2	59.1	45.7	20.8	56.9	46.3	22.5
90.2	36	25	96.0	48.4	20.9	94.8	49.2	22.5	93.1	50.1	24.3	91.1	50.9	26.3	88.5	51.8	28.4	85.4	52.6	30.7
	33	23	93.5	50.1	20.6	92.4	50.9	22.3	90.8	51.8	24.1	88.9	52.6	26.0	86.4	53.5	28.1	83.5	54.3	30.4
	30	21	91.1	51.8	20.4	90.0	52.6	22.0	88.6	53.5	23.8	86.7	54.3	25.7	84.4	55.2	27.8	81.6	56.0	30.0
	27	19	88.8	53.5	20.2	87.7	54.3	21.8	86.4	55.2	23.5	84.6	56.0	25.4	82.4	56.9	27.5	79.7	57.7	29.7
	24	17	86.4	55.2	20.0	85.5	56.0	21.5	84.2	56.9	23.3	82.5	57.7	25.1	80.4	58.6	27.2	77.8	59.4	29.4
	21	15	84.1	56.9	19.7	83.2	57.7	21.3	82.0	58.6	23.0	80.4	59.4	24.9	78.4	60.3	26.9	75.9	61.1	29.0
110.2	36	25	117.6	59.2	27.6	115.6	60.3	29.7	113.3	61.3	32.0	110.6	62.3	34.5	107.6	63.4	37.4	104.0	64.4	40.5
	33	23	114.4	61.3	27.3	112.6	62.3	29.3	110.4	63.4	31.6	107.8	64.4	34.1	104.9	65.5	36.9	101.5	66.5	40.0
	30	21	111.4	63.4	26.9	109.6	64.4	28.9	107.5	65.5	31.2	105.1	66.5	33.7	102.3	67.5	36.4	99.0	68.6	39.5
	27	19	108.4	65.5	26.6	106.7	66.5	28.6	104.7	67.5	30.8	102.3	68.6	33.2	99.7	69.6	36.0	96.6	70.6	39.0
	24	17	105.4	67.5	26.3	103.8	68.6	28.2	101.9	69.6	30.4	99.6	70.6	32.8	97.1	71.7	35.5	94.2	72.7	38.5
	21	15	102.5	69.6	26.0	100.9	70.6	27.9	99.1	71.7	30.0	97.0	72.7	32.4	94.6	73.8	35.1	91.8	74.8	38.0

TA: Internal coil inlet air temperature [°C]
 KWf: Cooling capacity [kW]
 KWfs: Sensible cooling capacity [kW]
 KWa: Compressors power input [kW]

Technical data and performance

Performance in HEATING MODE – MINIMUM air flow rate

SIZE	TA Tbs [°C]	OUTSIDE AIR TEMPERATURE - Tdb / Twb [°C]											
		-5	-6	-1	-2	3	2	7	6	11	10	15	14
		kWt	kWa	kWt	kWa	kWt	kWa	kWt	kWa	kWt	kWa	kWt	kWa
35.1	26	27.3	10.5	30.6	10.9	34.1	11.2	37.8	11.5	37.6	11.9	37.5	12.4
	23	27.3	9.9	30.7	10.3	34.3	10.6	38.1	10.9	37.9	11.3	37.8	11.7
	20	27.4	9.4	30.8	9.7	34.4	10.0	38.4	10.3	38.2	10.6	38.1	11.0
	17	27.4	8.9	30.1	10.4	34.6	9.4	38.6	9.7	38.5	10.0	38.4	10.4
	14	27.4	8.4	31.0	8.6	34.8	8.9	38.9	9.2	38.8	9.5	38.6	9.8
	11	27.4	7.9	31.0	8.2	34.9	8.4	39.1	8.7	39.0	9.0	38.9	9.3
45.1	26	35.2	12.5	39.5	13.2	44.2	13.8	49.1	14.4	48.9	14.9	48.8	15.4
	23	35.2	11.9	39.7	12.5	44.4	13.1	49.4	13.7	49.3	14.1	49.1	14.6
	20	35.3	11.3	39.8	11.9	44.6	12.4	49.6	12.9	49.5	13.4	49.4	13.8
	17	35.3	10.7	38.9	12.6	44.7	11.8	49.8	12.3	49.7	12.7	49.6	13.1
	14	35.3	10.2	39.9	10.7	44.8	11.2	50.0	11.6	49.9	12.0	49.9	12.4
	11	35.3	9.7	39.9	10.2	44.8	10.6	50.1	11.0	50.1	11.4	50.0	11.7
55.1	26	42.2	16.8	47.3	17.4	52.9	18.0	59.0	18.7	59.0	19.4	59.0	20.1
	23	42.0	15.8	47.2	16.4	52.9	17.0	59.1	17.6	59.1	18.3	59.1	18.9
	20	41.8	15.0	47.1	15.5	52.9	16.0	59.3	16.6	59.2	17.2	59.2	17.8
	17	41.7	14.1	46.3	16.6	53.0	15.2	59.4	15.7	59.3	16.3	59.3	16.8
	14	41.6	13.4	47.1	13.8	53.1	14.3	59.6	14.9	59.5	15.4	59.4	15.9
	11	41.5	12.7	47.1	13.1	53.1	13.6	59.8	14.1	59.7	14.6	59.6	15.0
70.2	26	54.7	21.1	61.2	21.7	68.1	22.4	75.6	23.0	75.2	23.9	74.9	24.7
	23	54.7	19.9	61.4	20.5	68.5	21.1	76.2	21.7	75.9	22.5	75.6	23.3
	20	54.7	18.7	61.6	19.4	68.9	19.9	76.8	20.5	76.5	21.2	76.2	22.0
	17	54.7	17.7	60.2	20.8	69.2	18.8	77.3	19.4	77.0	20.1	76.7	20.8
	14	54.8	16.7	61.9	17.3	69.6	17.8	77.8	18.3	77.5	18.9	77.3	19.6
	11	54.9	15.8	62.1	16.3	69.9	16.8	78.2	17.3	78.0	17.9	77.7	18.5
90.2	26	70.2	24.9	78.9	26.3	88.2	27.6	98.0	28.8	97.7	29.8	97.3	30.7
	23	70.4	23.7	79.2	25.0	88.6	26.2	98.6	27.3	98.3	28.2	98.0	29.1
	20	70.5	22.6	79.4	23.8	88.9	24.9	99.1	25.9	98.8	26.7	98.6	27.6
	17	70.5	21.5	77.6	25.1	89.2	23.6	99.5	24.5	99.3	25.3	99.1	26.2
	14	70.6	20.4	79.6	21.4	89.4	22.4	99.8	23.2	99.7	24.0	99.5	24.8
	11	70.5	19.4	79.6	20.3	89.5	21.2	100.0	22.0	99.9	22.7	99.8	23.5
110.2	26	83.6	33.6	93.8	34.8	104.9	36.1	117.0	37.4	117.0	38.8	117.1	40.2
	23	83.3	31.7	93.6	32.8	104.9	34.0	117.2	35.2	117.2	36.5	117.2	37.8
	20	82.9	29.9	93.5	31.0	105.0	32.1	117.5	33.3	117.4	34.4	117.4	35.7
	17	82.7	28.3	91.9	33.2	105.1	30.3	117.8	31.4	117.7	32.5	117.6	33.7
	14	82.5	26.7	93.3	27.7	105.2	28.7	118.2	29.7	118.0	30.7	117.9	31.8
	11	82.3	25.3	93.3	26.2	105.4	27.2	118.6	28.2	118.4	29.1	118.2	30.1

TA: Internal coil inlet air temperature [°C]
 KWt: Heating capacity [kW]
 KWa: Compressors power input [kW]

Technical data and performance

Performance in COOLING MODE – MAXIMUM air flow rate

SIZE	TA Tbs / Tbu [°C]		OUTSIDE AIR TEMPERATURE - Tdb [°C]																	
			27			31			35			39			43			47		
			kWf	kWfs	kWa	kWf	kWfs	kWa	kWf	kWfs	kWa	kWf	kWfs	kWa	kWf	kWfs	kWa	kWf	kWfs	kWa
35.1	36	25	40.3	24.1	8.3	39.6	24.4	8.9	38.8	24.8	9.6	37.7	25.1	10.4	36.4	25.5	11.2	34.9	25.8	12.1
	33	23	39.3	24.8	8.2	38.7	25.1	8.8	37.8	25.5	9.5	36.8	25.8	10.2	35.6	26.2	11.1	34.1	26.6	12.0
	30	21	38.3	25.5	8.1	37.7	25.8	8.7	36.9	26.2	9.4	36.0	26.6	10.1	34.8	26.9	11.0	33.4	27.3	11.9
	27	19	37.4	26.2	8.0	36.8	26.6	8.6	36.0	26.9	9.3	35.1	27.3	10.0	34.0	27.6	10.9	32.6	28.0	11.7
	24	17	36.4	26.9	7.9	35.9	27.3	8.5	35.1	27.6	9.2	34.2	28.0	9.9	33.2	28.4	10.7	31.9	28.7	11.6
	21	15	35.5	27.6	7.8	34.9	28.0	8.4	34.2	28.4	9.1	33.4	28.7	9.8	32.4	29.1	10.6	31.1	29.4	11.5
45.1	36	25	52.4	31.4	10.7	51.7	31.9	11.5	50.7	32.4	12.4	49.6	32.9	13.4	48.1	33.3	14.5	46.3	33.8	15.7
	33	23	51.1	32.4	10.6	50.4	32.9	11.4	49.5	33.3	12.3	48.4	33.8	13.3	47.0	34.3	14.4	45.4	34.7	15.5
	30	21	49.8	33.3	10.4	49.2	33.8	11.3	48.4	34.3	12.2	47.3	34.7	13.2	46.0	35.2	14.2	44.4	35.7	15.4
	27	19	48.6	34.3	10.3	48.0	34.7	11.1	47.2	35.2	12.0	46.2	35.7	13.0	44.9	36.1	14.1	43.4	36.6	15.2
	24	17	47.4	35.2	10.2	46.8	35.7	11.0	46.0	36.1	11.9	45.1	36.6	12.9	43.9	37.1	13.9	42.4	37.5	15.0
	21	15	46.1	36.1	10.1	45.6	36.6	10.9	44.9	37.1	11.8	44.0	37.5	12.7	42.8	38.0	13.7	41.4	38.5	14.9
55.1	36	25	65.6	39.2	14.2	64.5	39.8	15.3	63.1	40.4	16.4	61.6	41.0	17.8	59.8	41.6	19.2	57.8	42.2	20.9
	33	23	63.9	40.4	14.0	62.8	41.0	15.1	61.6	41.6	16.2	60.1	42.2	17.5	58.4	42.7	19.0	56.4	43.3	20.6
	30	21	62.3	41.6	13.8	61.2	42.2	14.9	60.0	42.7	16.0	58.6	43.3	17.3	57.0	43.9	18.7	55.1	44.5	20.3
	27	19	60.7	42.7	13.7	59.7	43.3	14.7	58.5	43.9	15.8	57.2	44.5	17.1	55.6	45.1	18.5	53.8	45.7	20.0
	24	17	59.1	43.9	13.5	58.1	44.5	14.5	57.0	45.1	15.6	55.7	45.7	16.9	54.2	46.3	18.2	52.5	46.8	19.8
	21	15	57.5	45.1	13.3	56.6	45.7	14.3	55.5	46.3	15.4	54.3	46.8	16.6	52.9	47.4	18.0	51.3	48.0	19.5
70.2	36	25	80.9	47.3	16.4	79.5	48.0	17.7	77.8	48.7	19.1	75.6	49.4	20.6	73.1	50.1	22.3	70.0	50.8	24.1
	33	23	78.9	48.7	16.2	77.6	49.4	17.5	75.9	50.1	18.9	73.9	50.8	20.4	71.4	51.5	22.0	68.5	52.2	23.8
	30	21	76.9	50.1	16.1	75.7	50.8	17.3	74.1	51.5	18.7	72.1	52.2	20.2	69.8	53.0	21.8	67.0	53.7	23.6
	27	19	75.0	51.5	15.9	73.8	52.2	17.1	72.3	53.0	18.5	70.4	53.7	20.0	68.1	54.4	21.6	65.4	55.1	23.4
	24	17	73.1	53.0	15.7	71.9	53.7	17.0	70.5	54.4	18.3	68.7	55.1	19.8	66.5	55.8	21.4	63.9	56.5	23.1
	21	15	71.2	54.4	15.6	70.1	55.1	16.8	68.7	55.8	18.1	67.0	56.5	19.6	64.9	57.2	21.2	62.4	57.9	22.9
90.2	36	25	105.0	62.3	21.4	103.6	63.2	23.1	101.7	64.1	24.9	99.4	65.1	26.9	96.4	66.0	29.1	92.9	66.9	31.4
	33	23	102.5	64.1	21.1	101.1	65.1	22.8	99.3	66.0	24.6	97.1	66.9	26.6	94.3	67.9	28.7	90.9	68.8	31.1
	30	21	99.9	66.0	20.9	98.6	66.9	22.5	96.9	67.9	24.3	94.8	68.8	26.3	92.2	69.7	28.4	88.9	70.7	30.7
	27	19	97.4	67.9	20.7	96.2	68.8	22.3	94.6	69.7	24.1	92.5	70.7	26.0	90.0	71.6	28.1	87.0	72.5	30.4
	24	17	94.9	69.7	20.4	93.8	70.7	22.0	92.3	71.6	23.8	90.3	72.5	25.7	87.9	73.4	27.8	85.0	74.4	30.0
	21	15	92.5	71.6	20.2	91.4	72.5	21.8	90.0	73.4	23.5	88.1	74.4	25.4	85.8	75.3	27.5	83.1	76.2	29.7
110.2	36	25	129.1	76.6	28.4	126.8	77.7	30.5	124.2	78.8	32.9	121.2	80.0	35.5	117.7	81.1	38.4	113.7	82.3	41.7
	33	23	125.8	78.8	28.0	123.7	80.0	30.1	121.1	81.1	32.5	118.2	82.3	35.1	114.9	83.4	37.9	111.1	84.6	41.2
	30	21	122.6	81.1	27.7	120.5	82.3	29.7	118.1	83.4	32.0	115.3	84.6	34.6	112.2	85.7	37.5	108.5	86.8	40.6
	27	19	119.4	83.4	27.3	117.4	84.6	29.4	115.1	85.7	31.6	112.5	86.8	34.2	109.4	88.0	37.0	105.9	89.1	40.1
	24	17	116.2	85.7	27.0	114.3	86.8	29.0	112.2	88.0	31.2	109.6	89.1	33.7	106.7	90.3	36.5	103.4	91.4	39.6
	21	15	113.1	88.0	26.7	111.3	89.1	28.6	109.2	90.3	30.8	106.8	91.4	33.3	104.0	92.6	36.0	100.9	93.7	39.1

TA: Internal coil inlet air temperature [°C]
 KWf: Cooling capacity [kW]
 KWfs: Sensible cooling capacity [kW]
 KWa: Compressors power input [kW]

Technical data and performance

Performance in HEATING MODE – MAXIMUM air flow rate

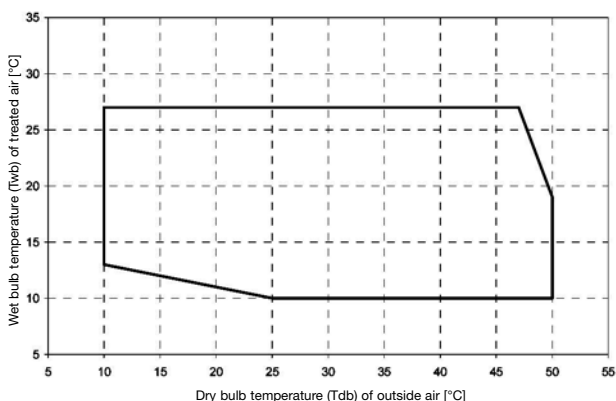
SIZE	TA Tbs [°C]	OUTSIDE AIR TEMPERATURE - Tdb / Twb [°C]											
		-5	-6	-1	-2	3	2	7	6	11	10	15	14
		kWt	kWa	kWt	kWa	kWt	kWa	kWt	kWa	kWt	kWa	kWt	kWa
35.1	26	27.4	9.6	30.8	9.9	34.4	10.2	38.2	10.5	38.1	10.9	37.9	11.2
	23	27.4	9.1	30.9	9.3	34.6	9.6	38.5	9.9	38.4	10.3	38.2	10.6
	20	27.5	8.6	31.0	8.8	34.8	9.1	38.8	9.4	38.7	9.7	38.5	10.0
	17	27.5	8.1	30.3	9.5	34.9	8.6	39.1	8.8	38.9	9.2	38.8	9.5
	14	27.6	7.6	31.2	7.9	35.1	8.1	39.3	8.4	39.2	8.7	39.0	8.9
	11	27.6	7.2	31.3	7.5	35.2	7.7	39.5	7.9	39.4	8.2	39.3	8.5
45.1	26	35.4	11.6	39.8	12.2	44.5	12.7	49.5	13.2	49.4	13.7	49.2	14.1
	23	35.4	11.0	39.9	11.5	44.7	12.1	49.7	12.5	49.6	13.0	49.5	13.4
	20	35.5	10.5	40.0	11.0	44.8	11.4	49.9	11.9	49.9	12.3	49.8	12.7
	17	35.5	9.9	39.1	11.6	44.9	10.8	50.1	11.2	50.0	11.6	50.0	12.0
	14	35.4	9.4	40.0	9.9	44.9	10.3	50.2	10.7	50.2	11.0	50.1	11.4
	11	35.4	9.0	40.0	9.4	44.9	9.7	50.3	10.1	50.3	10.4	50.2	10.8
55.1	26	42.0	15.3	47.2	15.8	53.0	16.4	59.2	17.0	59.1	17.6	59.1	18.3
	23	41.9	14.4	47.2	15.0	53.0	15.5	59.4	16.1	59.3	16.6	59.2	17.2
	20	41.8	13.7	47.2	14.1	53.1	14.7	59.6	15.2	59.5	15.7	59.4	16.3
	17	41.7	12.9	46.3	15.1	53.2	13.9	59.8	14.4	59.7	14.9	59.6	15.4
	14	41.6	12.3	47.2	12.7	53.3	13.2	60.0	13.7	59.9	14.1	59.8	14.6
	11	41.5	11.6	47.2	12.1	53.4	12.5	60.2	13.0	60.1	13.4	60.0	13.8
70.2	26	54.8	19.2	61.6	19.8	68.8	20.4	76.5	21.0	76.2	21.7	75.9	22.5
	23	54.9	18.1	61.8	18.7	69.2	19.3	77.1	19.8	76.8	20.5	76.5	21.2
	20	55.0	17.1	62.0	17.7	69.5	18.2	77.6	18.7	77.4	19.4	77.1	20.0
	17	55.1	16.2	60.5	18.9	69.9	17.2	78.1	17.7	77.9	18.3	77.6	18.9
	14	55.1	15.3	62.4	15.8	70.2	16.3	78.6	16.7	78.3	17.3	78.1	17.9
	11	55.2	14.4	62.5	14.9	70.4	15.4	79.0	15.8	78.7	16.4	78.5	16.9
90.2	26	70.6	23.1	79.4	24.3	88.8	25.4	98.8	26.5	98.5	27.3	98.3	28.2
	23	70.7	22.0	79.6	23.1	89.1	24.1	99.3	25.1	99.1	25.9	98.8	26.8
	20	70.8	20.9	79.8	21.9	89.4	22.9	99.7	23.8	99.5	24.5	99.3	25.4
	17	70.8	19.9	78.0	23.2	89.5	21.7	100.0	22.5	99.9	23.2	99.7	24.0
	14	70.7	18.9	79.8	19.7	89.6	20.5	100.2	21.3	100.1	22.0	100.0	22.7
	11	70.6	17.9	79.7	18.7	89.6	19.5	100.4	20.2	100.3	20.8	100.3	21.5
110.2	26	83.2	30.6	93.7	31.7	105.0	32.8	117.4	34.1	117.3	35.3	117.2	36.5
	23	83.0	28.9	93.6	29.9	105.2	31.0	117.7	32.2	117.6	33.3	117.5	34.4
	20	82.8	27.3	93.6	28.3	105.3	29.3	118.2	30.4	118.0	31.5	117.8	32.5
	17	82.6	25.9	91.7	30.3	105.5	27.8	118.6	28.8	118.4	29.8	118.2	30.8
	14	82.5	24.5	93.6	25.4	105.8	26.3	119.0	27.3	118.8	28.2	118.6	29.1
	11	82.4	23.3	93.6	24.1	106.0	25.0	119.5	25.9	119.2	26.8	119.0	27.6

TA: Internal coil inlet air temperature [°C]
 KWt: Heating capacity [kW]
 KWa: Compressors power input [kW]

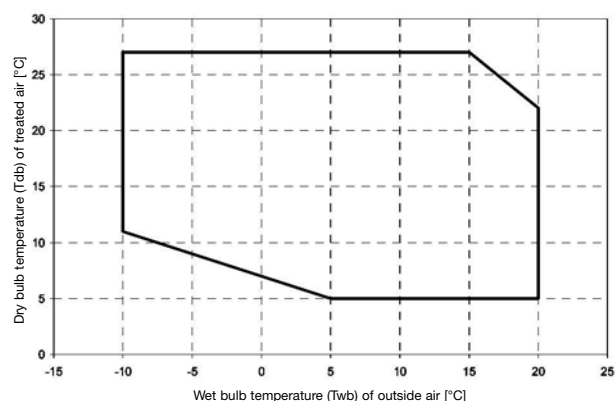
Technical data and performance

Operational limits

Functioning in COOLING MODE



Functioning in HEATING MODE



The above limits are indicative and refer to the STANDARD treated air flow rate.

Electrical data

Model	35.1	45.1	55.1	70.2	90.2	110.2	U.M.	
Electrical power supply	400V - 3ph+N - 50Hz						V-ph-Hz	
F.L.A. - Maximum current requirement								
Compressor 1	23.0	28.0	37.0	23.0	28.0	37.0	A	
Compressor 2	-	-	-	23.0	28.0	37.0	A	
Individual external fan	3.5	3.5	3.5	3.5	3.5	3.5	A	
Internal fan	Reduced	2.7	3.6	4.2	6.4	6.4	8.6	A
	Standard	3.6	4.2	4.9	8.6	11.4	11.4	A
	High capacity	4.9	6.4	6.4	11.4	17.1	17.1	A
Electric heaters	Standard	13.0	13.0	13.0	26.0	26.0	26.0	A
	High capacity	26.0	26.0	26.0	45.5	45.5	45.5	A
F.L.I. - Maximum power input								
Compressor 1	13.4	16.9	22.6	13.4	16.9	22.6	kW	
Compressor 2	-	-	-	13.4	16.9	22.6	kW	
Individual external fan	0.8	0.8	0.8	0.8	0.8	0.8	kW	
Internal fan	Reduced	1.4	1.9	2.3	3.6	3.6	4.8	kW
	Standard	1.9	2.3	2.7	4.8	6.4	6.4	kW
	High capacity	2.7	3.6	3.6	6.4	9.5	9.5	kW
Electric heaters	Standard	9.0	9.0	9.0	18.0	18.0	18.0	kW
	High capacity	18.0	18.0	18.0	31.5	31.5	31.5	kW
L.R.A. - Surge starting current								
Compressor 1	118.0	198.0	225.0	118.0	198.0	225.0	A	
Compressor 2	-	-	-	118.0	198.0	225.0	A	
Individual external fan	7.5	7.5	7.5	7.5	7.5	7.5	A	
Internal fan	Reduced	11.1	16.6	20.2	33.3	33.3	33.7	A
	Standard	16.6	20.2	25.0	33.7	49.5	49.5	A
	High capacity	25.0	33.3	33.3	49.5	67.4	67.4	A
TOTAL*								
F.L.A. - Total maximum current requirement	34	39	49	69	81	99	A	
F.L.I. - Total maximum power input	17	21	27	35	43	55	kW	
M.I.C. - Total maximum surge starting current	125	206	233	153	241	277	A	

* BASIC version with STANDARD internal fan and without any accessories.

Technical data and performance

Performance of water coil for post-heating only

2 ROWS		Air flow rate								
Water: 80 - 60 °C		Minimum			Standard			Maximum		
Model	Inlet air temperature	Capacity	Water flow rate	Water pressure drop	Capacity	Water flow rate	Water pressure drop	Capacity	Water flow rate	Water pressure drop
	[°C]									
35.1	10	65.3	2867	8	73.1	3212	10	80.4	3532	12
	15	59.2	2599	7	66.3	2912	8	72.9	3202	10
	20	53.2	2335	6	59.5	2616	7	65.5	2875	8
45.1	10	84.7	3722	8	94.9	4167	10	104.2	4578	11
	15	76.8	3374	6	86.0	3777	8	94.5	4150	10
	20	69.0	3031	6	77.2	3392	7	84.8	3726	8
55.1	10	104.2	4577	7	116.6	5121	10	128.1	5625	11
	15	94.5	4149	6	105.7	4642	8	116.1	5099	10
	20	84.8	3727	5	94.9	4169	6	104.2	4578	7
70.2	10	110.7	4864	29	125.9	5531	36	139.8	6141	43
	15	100.6	4419	24	114.4	5025	30	127.0	5579	36
	20	90.6	3979	20	103.0	4524	25	114.3	5023	30
90.2	10	145.6	6396	29	164.3	7217	35	181.5	7972	42
	15	132.3	5811	24	149.3	6556	30	164.9	7242	35
	20	119.1	5231	20	134.4	5902	25	148.4	6518	30
110.2	10	172.6	7581	26	195.5	8587	32	216.5	9510	38
	15	156.8	6887	22	177.6	7800	28	196.7	8638	32
	20	141.2	6200	18	159.8	7021	23	177.0	7775	28

2 ROWS		Air flow rate								
Water: 80 - 60 °C		Minimum			Standard			Maximum		
Model	Inlet air temperature	Capacity	Water flow rate	Water pressure drop	Capacity	Water flow rate	Water pressure drop	Capacity	Water flow rate	Water pressure drop
	[°C]									
35.1	10	40.8	1771	4	45.7	1985	5	50.1	2176	6
	15	33.3	1448	2	38.3	1664	4	42.7	1855	4
	20	25.4	1102	1	29.4	1279	2	33.3	1448	2
45.1	10	52.7	2292	4	59.2	2571	5	64.8	2817	5
	15	43.0	1869	2	49.4	2147	4	55.2	2400	4
	20	32.6	1417	1	37.8	1644	2	42.8	1861	2
55.1	10	64.7	2812	4	72.7	3157	5	79.6	3457	5
	15	52.7	2290	2	60.5	2631	4	67.8	2946	4
	20	39.8	1731	1	46.2	2008	2	52.3	2274	2
70.2	10	70.8	3075	14	80.2	3484	18	88.8	3858	20
	15	60.8	2641	11	68.8	2991	13	76.2	3309	16
	20	50.8	2208	8	57.5	2498	10	63.6	2762	12
90.2	10	92.9	4038	14	104.5	4541	17	115.1	5003	20
	15	79.8	3467	11	89.7	3896	13	98.7	4290	16
	20	66.7	2898	8	74.9	3253	10	82.4	3579	11
110.2	10	110.2	4788	13	124.4	5404	16	137.4	5969	19
	15	94.6	4111	10	106.7	4637	12	117.8	5118	14
	20	79.1	3436	7	89.1	3871	8	98.3	4269	11

Technical data and performance

3 ROWS		Air flow rate								
Water: 80 - 60 °C		Minimum			Standard			Maximum		
Model	Inlet air temperature	Capacity [kW]	Water flow rate [l/h]	Water pressure drop [kPa]	Capacity [kW]	Water flow rate [l/h]	Water pressure drop [kPa]	Capacity [kW]	Water flow rate [l/h]	Water pressure drop [kPa]
	[°C]									
35.1	10	85.7	3765	19	97.7	4293	24	109.1	4791	30
	15	77.8	3419	17	88.8	3899	20	99.1	4351	25
	20	70.1	3080	13	79.9	3511	17	89.2	3918	20
45.1	10	111.5	4899	19	127.1	5581	24	141.7	6224	29
	15	101.3	4449	16	115.4	5068	20	128.7	5652	24
	20	91.2	4007	13	103.9	4564	17	115.8	5088	20
55.1	10	137.3	6032	19	156.4	6868	24	174.3	7656	29
	15	124.7	5478	16	142.0	6237	19	158.3	6952	24
	20	112.3	4934	13	127.8	5616	17	142.5	6259	20
70.2	10	146.0	6413	70	169.4	7440	90	191.2	8399	112
	15	132.8	5833	59	154.0	6766	77	173.9	7638	95
	20	119.8	5261	49	138.9	6102	64	156.8	6888	79
90.2	10	192.8	8468	70	221.6	9736	89	248.7	10924	109
	15	175.3	7701	59	201.6	8854	76	226.1	9934	92
	20	158.1	6945	49	181.8	7984	62	203.9	8957	77
110.2	10	227.5	9992	64	262.7	11538	82	295.6	12984	101
	15	206.9	9087	54	238.9	10492	70	268.8	11807	85
	20	186.6	8196	46	215.4	9462	58	242.4	10646	71

3 ROWS		Air flow rate								
Water: 80 - 60 °C		Minimum			Standard			Maximum		
Model	Inlet air temperature	Capacity [kW]	Water flow rate [l/h]	Water pressure drop [kPa]	Capacity [kW]	Water flow rate [l/h]	Water pressure drop [kPa]	Capacity [kW]	Water flow rate [l/h]	Water pressure drop [kPa]
	[°C]									
35.1	10	55.6	2417	10	63.2	2745	12	70.3	3054	14
	15	47.9	2081	7	54.4	2362	10	60.4	2626	11
	20	40.0	1737	6	45.6	1982	7	50.6	2201	8
45.1	10	72.3	3141	10	82.0	3564	12	91.2	3962	14
	15	62.2	2705	7	70.6	3067	10	78.4	3407	11
	20	51.9	2253	5	59.2	2572	7	65.7	2854	8
55.1	10	88.9	3865	10	100.9	4384	12	112.1	4871	14
	15	76.6	3328	7	86.8	3771	8	96.4	4187	11
	20	63.7	2769	5	72.8	3161	7	80.7	3506	8
70.2	10	95.8	4164	36	110.7	4812	47	124.6	5416	56
	15	82.8	3599	28	95.7	4156	36	107.6	4675	44
	20	69.9	3039	20	80.6	3504	26	90.6	3937	32
90.2	10	126.4	5491	36	144.8	6291	46	162.0	7038	55
	15	109.2	4745	28	125.0	5432	35	139.8	6074	43
	20	92.1	4004	20	105.4	4578	26	117.7	5114	31
110.2	10	149.2	6484	32	171.7	7458	42	192.6	8369	52
	15	129.0	5603	25	148.2	6441	32	166.2	7223	40
	20	108.8	4729	19	124.9	5429	24	140.0	6082	29

Technical data and performance

Electric heaters performance

Model	35.1 - 45.1 - 55.1	70.2 - 90.2 - 110.2	U.M.
Standard coil	9.0	18.0	kW
High capacity coil	18.0	31.5	kW

Performance of gas thermal module

Model		35.1 - 45.1 - 55.1		70.2 - 90.2 - 110.2		U.M.
		Standard	High capacity	Standard	High capacity	
Rated heating capacity	max	44.8	54.0	93.4	145.0	kW
	min	15.5	16.3	31.5	46.3	kW
Yield	max	94.3	93.1	95.3	93.5	%
	min	105.0	105.0	105.0	105.2	%
Gas consumption (15°C – 1013 mbar)	max	5.03	6.14	10.37	16.40	m ³ /h
	min	1.57	1.64	3.17	4.66	m ³ /h
Condensate produced		1.45	1.45	2.60	3.87	l/h
Flue gas discharge pressure available		120	120	120	100	Pa

The listed data refer to the use of the module with G20 natural gas and a supply pressure of 20 mbar.

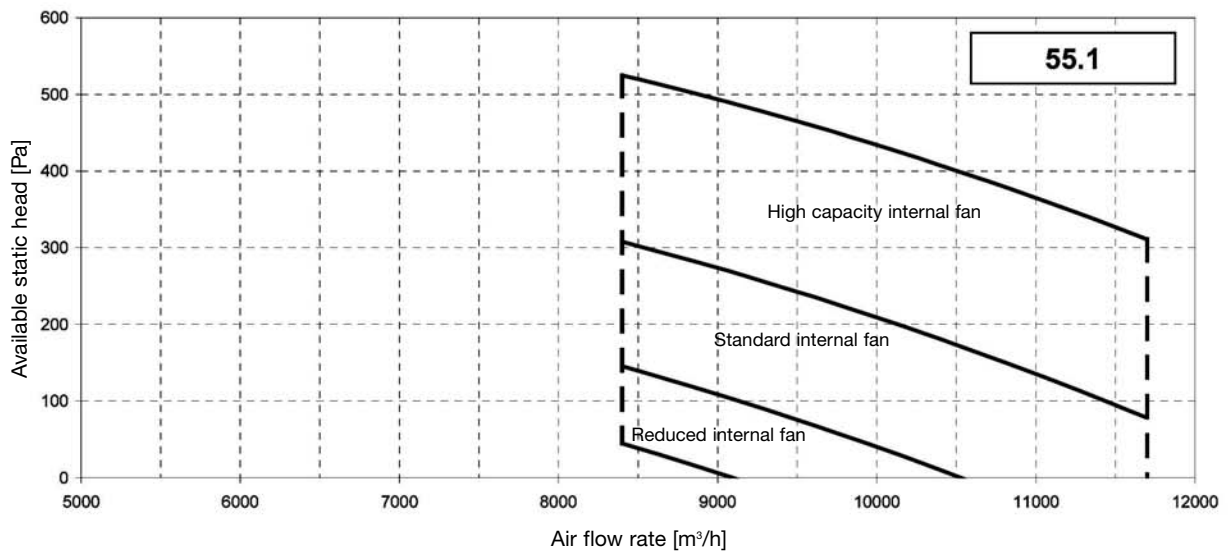
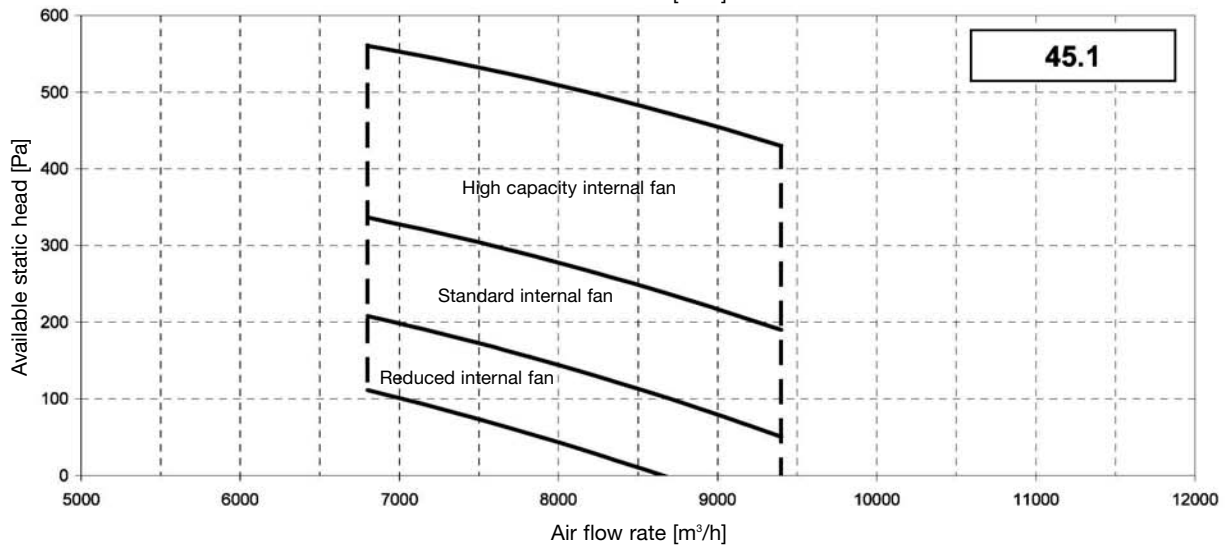
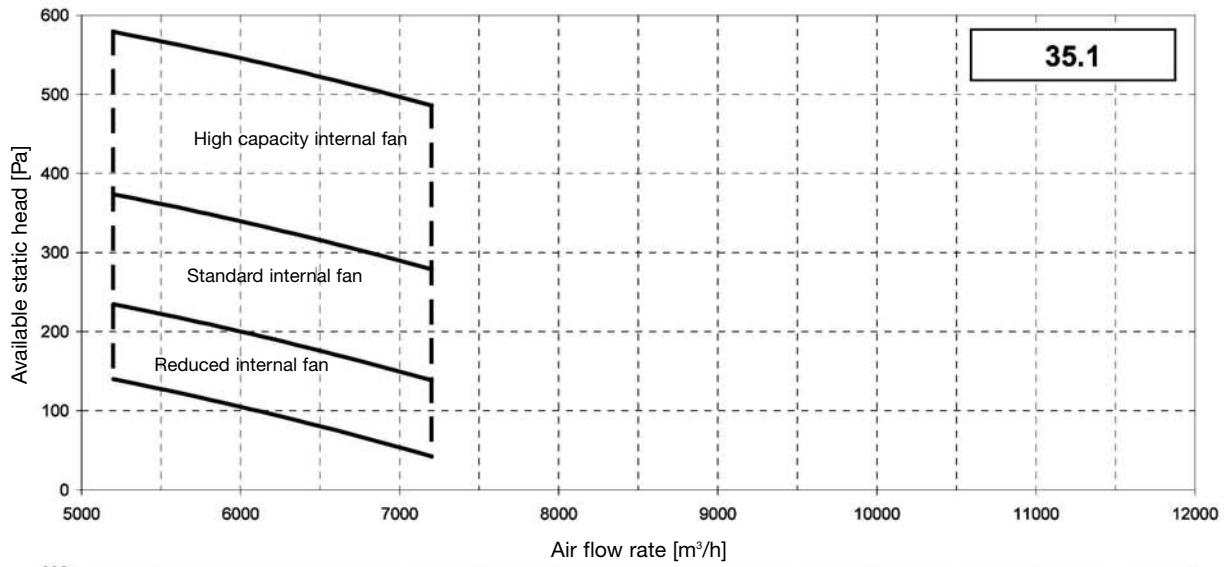
Aeraulic performance of the internal fan section

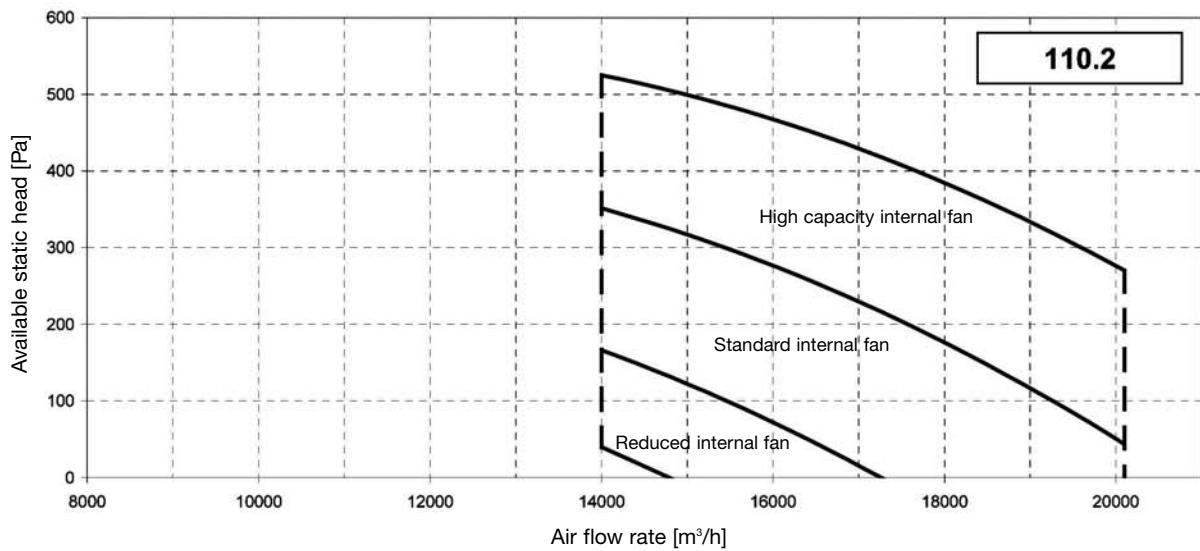
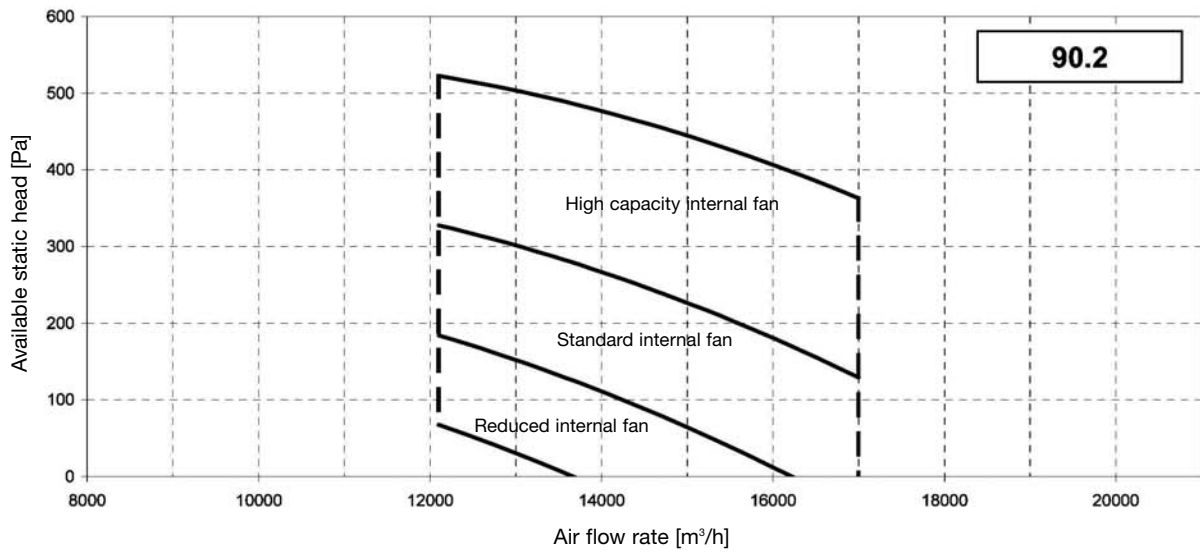
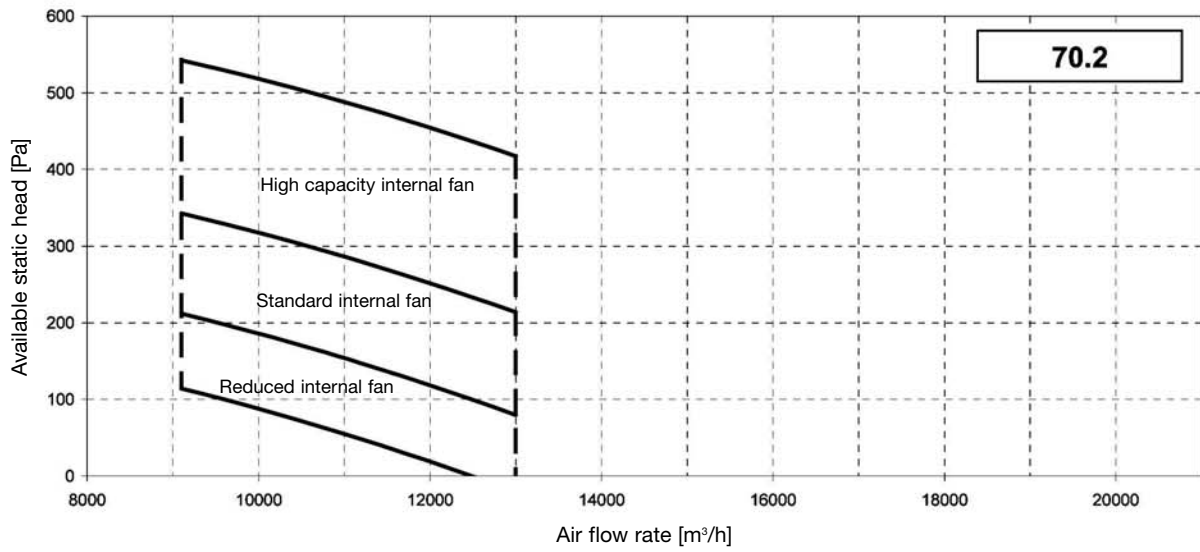
To select the internal fan, carry out the following procedure:

- Define the required treated air flow rate.
- Define the available head required by the unit.
- Calculate the air side pressure drop of all the accessories selected according to the air flow rate and the unit model (refer to the diagrams in the section on air side pressure drop).
- Calculate the total head required by the unit as the sum of the available head and the pressure drop of the accessories.
- Select the internal fan according to the unit model, the air flow rate, and the total head required (refer to the diagrams below).

The following diagrams illustrate the characteristic aeraulic curves of all the models. These curves are obtained by subtracting the pressure drop of the standard G4 filters, the pressure drop of the internal coil, and the unit's own pressure drop from the head provided by the internal fan.

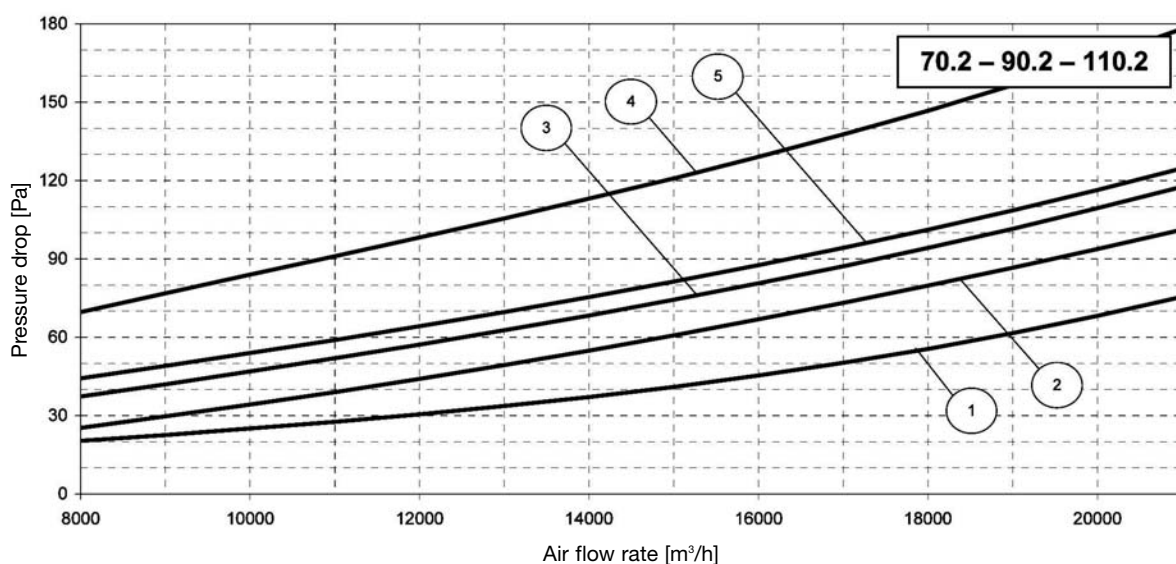
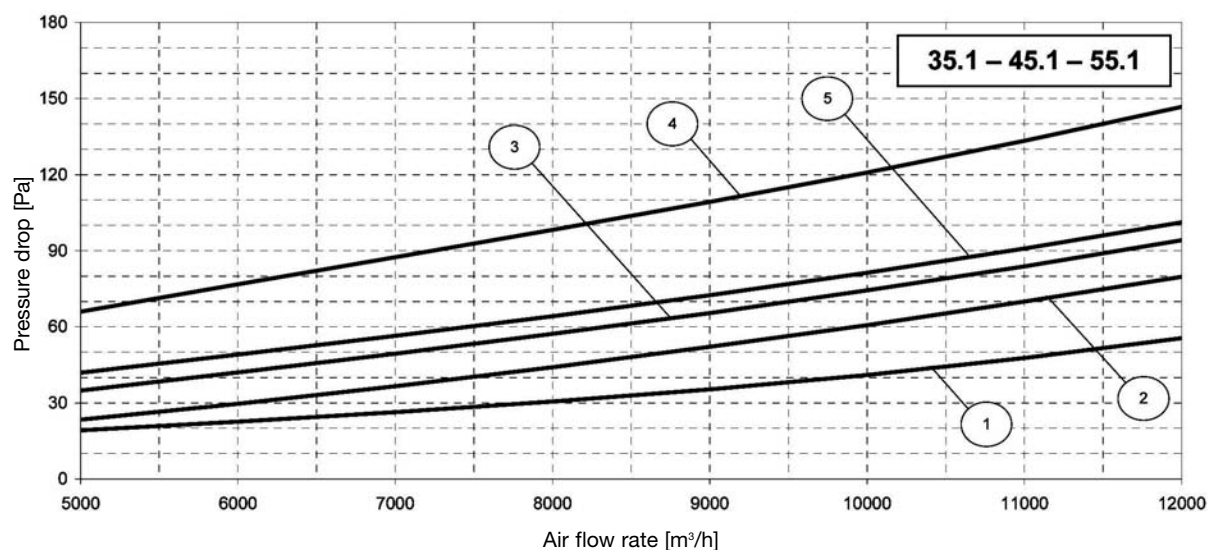
N.B. The curves refer to the BASIC version with a dry internal coil, but without accessories.





Air side pressure drop

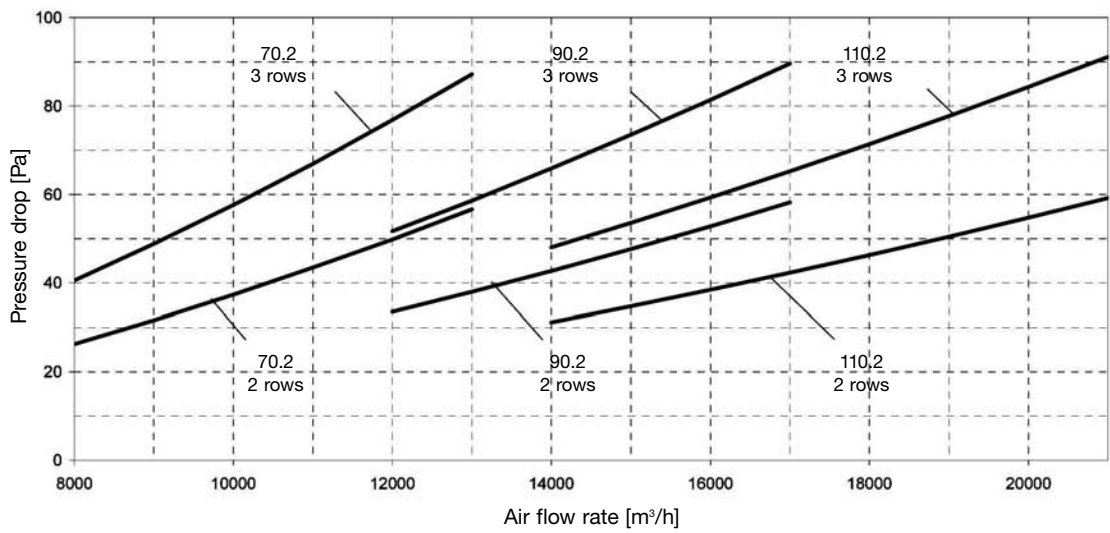
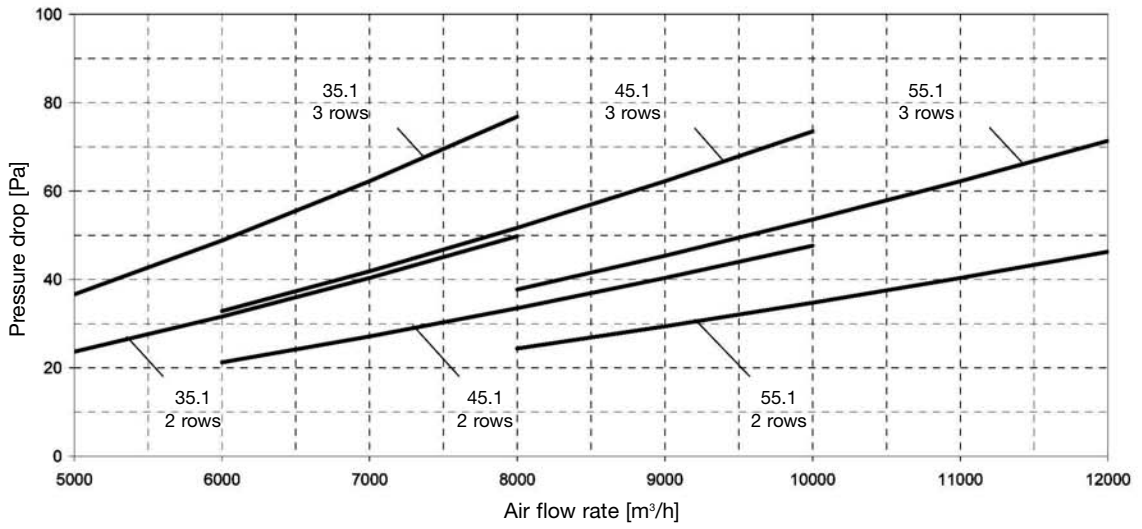
Air filters



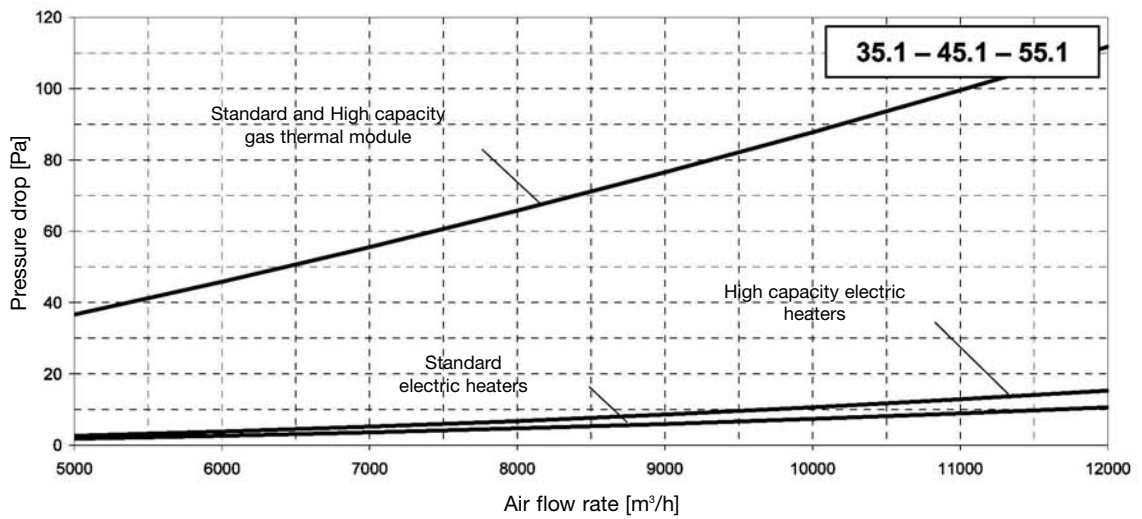
	Filter type	EN 779 efficiency	Em average efficiency [%] (for particles of 0.4 μ m)	Eurovent classification
1	Rigid bag filter	F 6	$60 \leq Em < 80$	EU 6
2	Rigid bag filter	F 7	$80 \leq Em < 90$	EU 7
3	Rigid bag filter	F 8	$90 \leq Em < 95$	EU 8
4	Rigid bag filter	F 9	$95 \leq Em$	EU 9
5	Rigid bag filter with activated charcoal	F 7	$80 \leq Em < 90$	EU 7

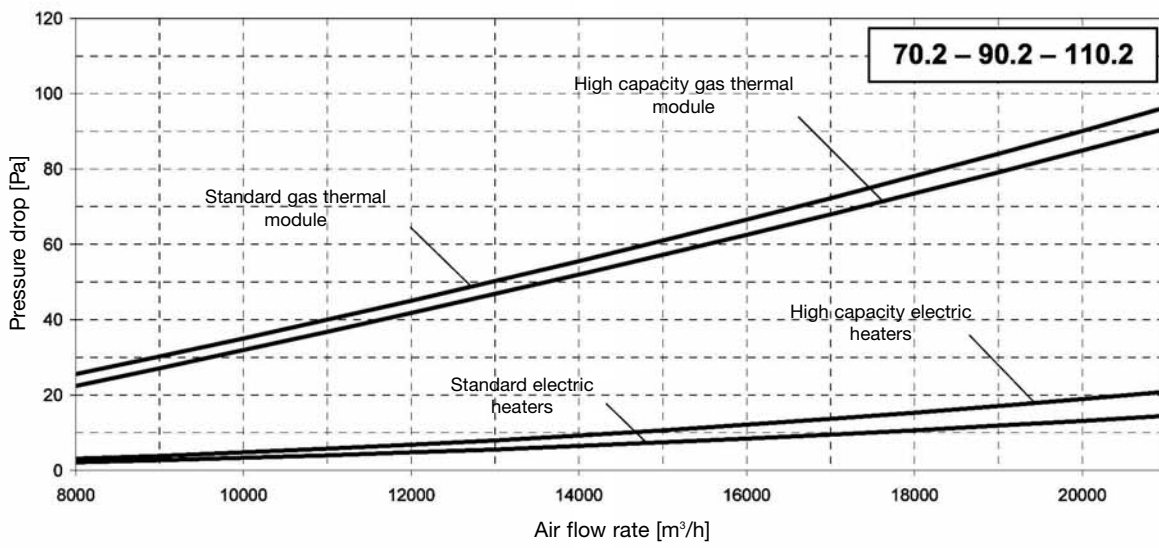
The specified pressure drop refers to clean filters. It is recommended to clean or replace the filters when the pressure drop exceeds 600 Pa.

Water coil for post-heating only

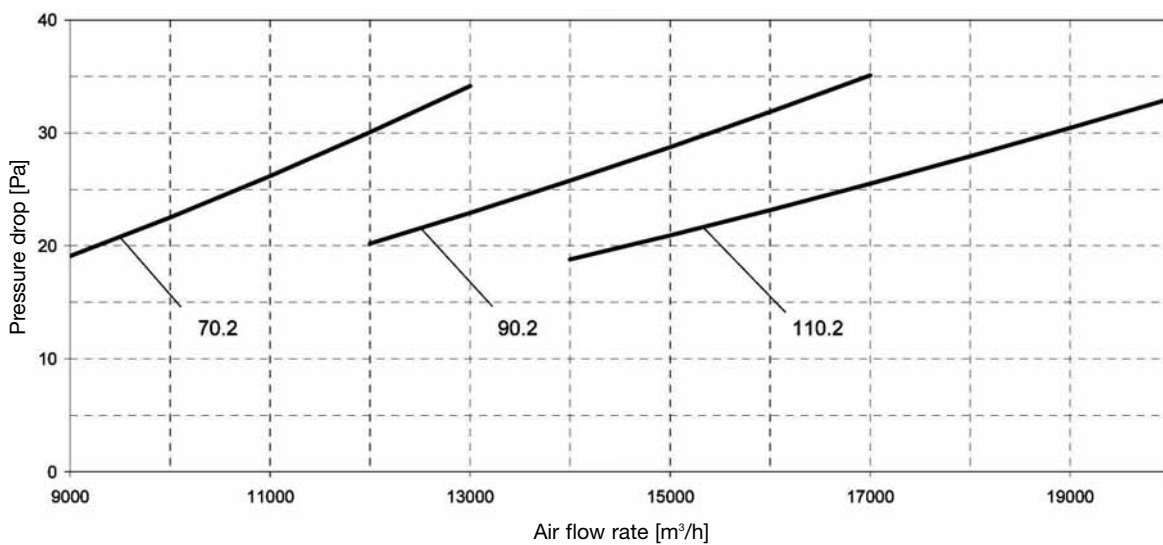
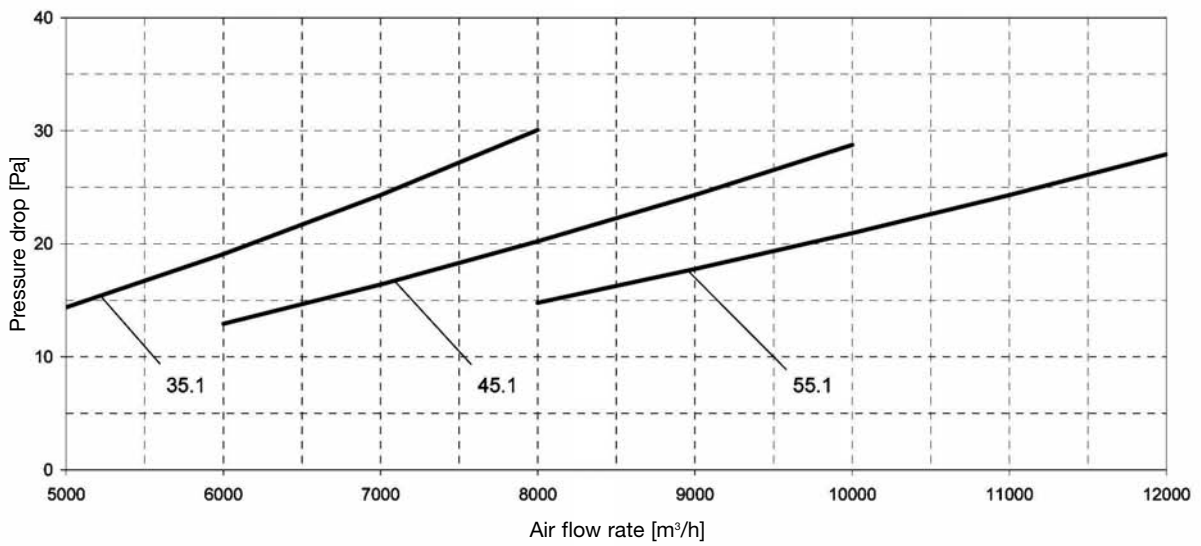


Electric heaters – Gas thermal module

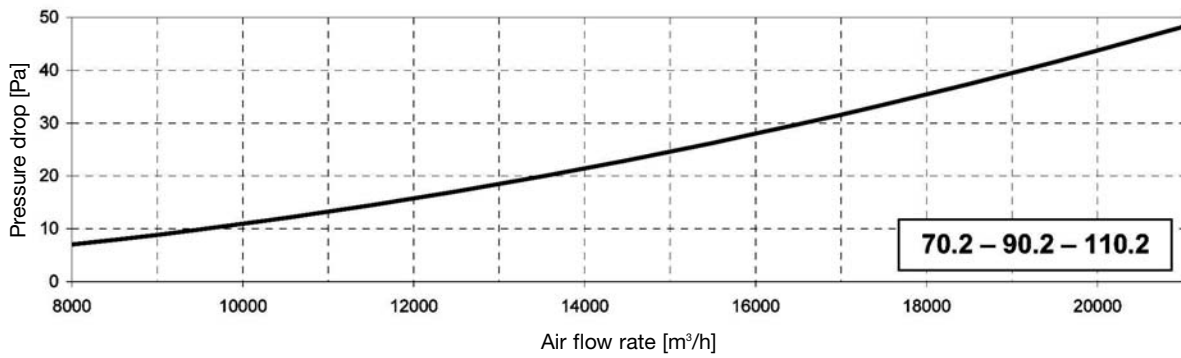
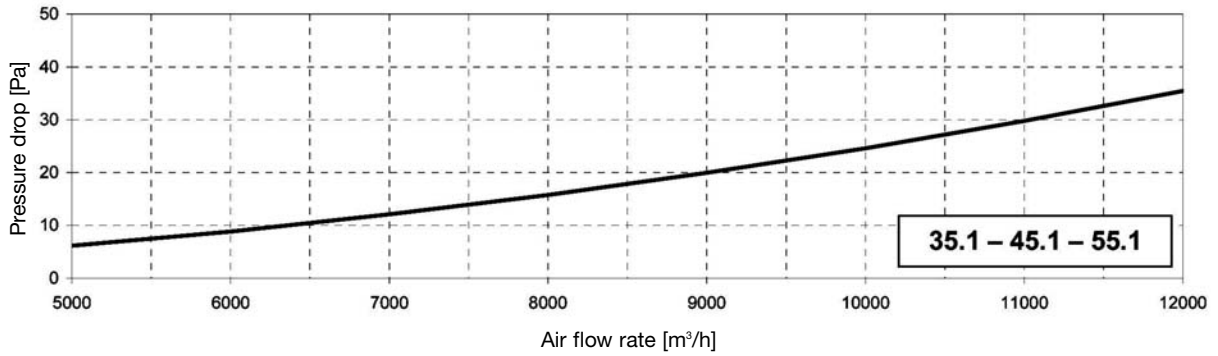




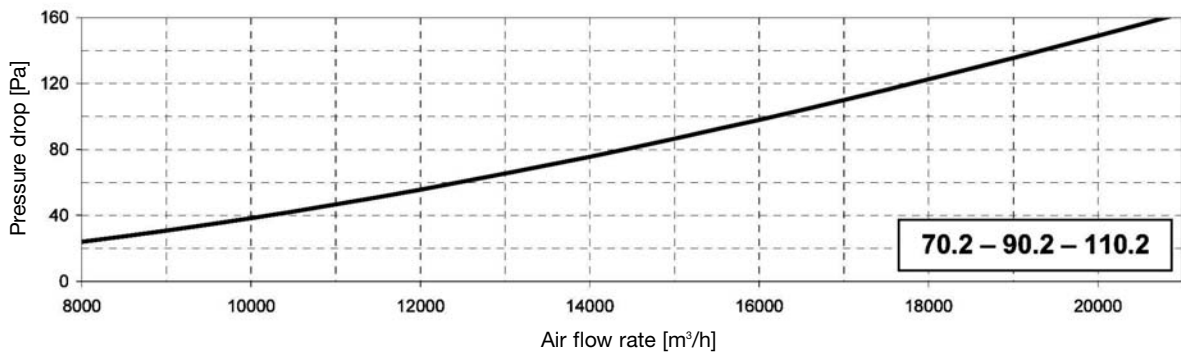
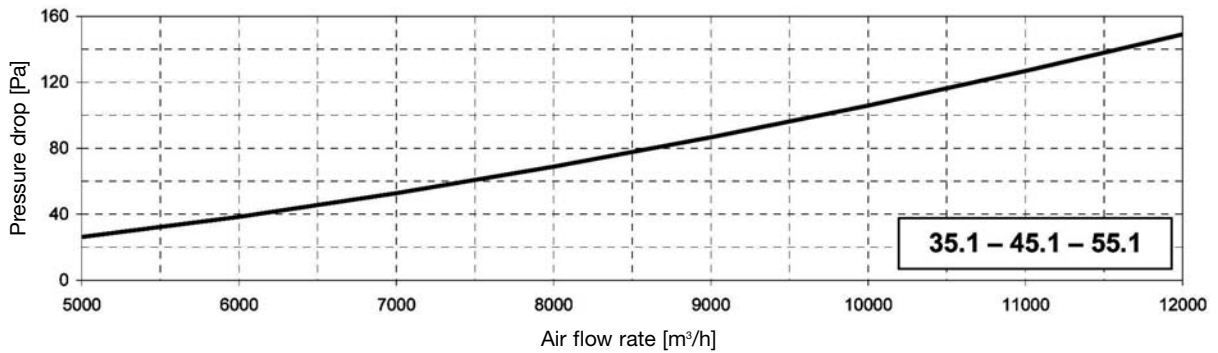
Internal coil: Additional pressure drop due to the formation of condensate



Droplet separator



Outlet Sound attenuator



Technical data and performance

Noise levels

Noise levels of the unit

Model	Level of sound power SPL [dB] for octave bands [Hz]								Level of sound power		Sound pressure level at 1 meter
	63	125	250	500	1000	2000	4000	8000	[dB]	[dB(A)]	[dB(A)]
35.1	88.6	87.7	89.7	84.9	85.6	81.5	74.7	67.4	95	89	72
45.1	91.6	88.4	90.2	85.4	85.9	81.9	75.6	68.4	96	90	72
55.1	93.2	89.2	90.7	86.0	86.2	82.4	76.6	69.3	97	90	73
70.2	91.2	90.4	92.6	87.7	88.5	84.3	77.3	70.2	98	92	74
90.2	94.3	91.1	93.1	88.3	88.8	84.7	78.3	71.2	99	93	75
110.2	96.0	91.7	93.5	88.8	89.0	85.2	79.1	72.0	100	93	75

Standard conditions

Performance in reference to the BASIC version operating in the cooling mode under NOMINAL conditions with STANDARD available static head and air flow rate.

Unit placed in free-field conditions on a reflective surface (a directionality factor of 2) with intake and outlet openings ducted for 2 meters.

The level of sound power is measured according to Standard ISO 3744. The sound pressure level is calculated according to Standard ISO 3744 (Eurovent 8/1) at a distance of 1 meter from the unit's external surface.

Noise levels of the unit

Model	Level of sound power SPL [dB] for octave bands [Hz]								Level of sound power	
	63	125	250	500	1000	2000	4000	8000	[dB]	[dB(A)]
35.1	84.4	82.8	83.0	76.2	76.0	75.1	72.0	65.9	89	82
45.1	84.5	82.7	83.6	78.1	78.4	78.3	76.0	70.9	90	85
55.1	86.6	83.4	85.5	80.2	81.1	81.0	79.4	75.1	92	87
70.2	84.9	86.4	80.7	78.6	75.2	75.3	73.2	67.4	90	82
90.2	83.8	86.7	82.8	82.5	78.7	78.7	76.9	71.5	91	86
110.2	84.3	88.4	84.2	85.2	80.7	80.9	79.5	74.7	93	88

Standard conditions

Performance in reference to the BASIC version operating in the cooling mode under NOMINAL conditions with STANDARD available static head and air flow rate.

The level of sound power is calculated beginning from the data provided by the manufacturer of the fans.

Noise reduction of the outlet Sound attenuator

Model	Noise reduction [dB] for octave bands [Hz]								
	63	125	250	500	1000	2000	4000	8000	
35.1 - 45.1 - 55.1	3	4	16	19	25	24	16	12	
70.2 - 90.2 - 110.2	3	2	15	14	16	18	13	9	

Technical data and performance

Weights

Unit

Model		35.1	45.1	55.1	70.2	90.2	110.2	U.M.
Construction configuration								
Basic version	VB	724	807	874	1052	1220	1345	kg
Version with 1 damper	V1	916	999	1066	1316	1484	1609	kg
Version with 2 dampers	V2	927	1010	1077	1327	1495	1620	kg

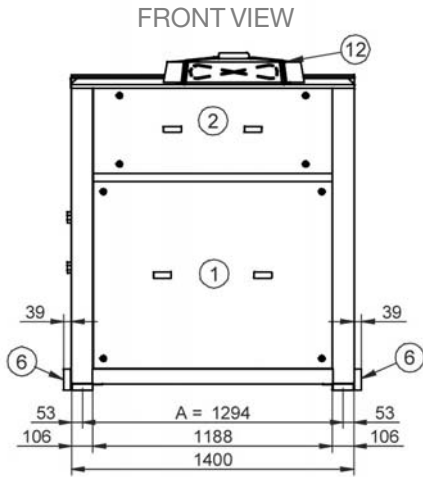
Options and accessories

Model		35.1	45.1	55.1	70.2	90.2	110.2	U.M.
Internal fan	Reduced	-3	-6	-2	-6	-17	-11	kg
	High capacity	9	7	7	11	49	49	kg
Water coil for post-heating only	2 rows with pipes kit	31	35	38	39	44	49	kg
	2 rows with 3-way valve	36	40	43	47	52	57	kg
	3 rows with pipes kit	36	41	46	46	53	61	kg
	3 rows with 3-way valve	41	46	51	54	61	69	kg
Electric heaters	Standard	21	21	21	37	37	37	kg
	High capacity	34	34	34	52	52	52	kg
Gas thermal module	Standard	270	270	270	402	402	402	kg
	High capacity	275	275	275	442	442	442	kg
Protection grills for the external coils		8	8	8	16	16	16	kg
Droplet separator		29	29	29	41	41	41	kg
Rigid bag filters		21	21	21	31	31	31	kg
Outlet Sound attenuator		27	27	27	36	36	36	kg

The total weight of the unit, obtained by adding together the weight of the unit in the chosen construction configuration and the weight of any accessories selected, refers to the shipping weight.
The weights of accessories not included in the table above can be ignored for the purposes of the calculation of the unit's total weight.

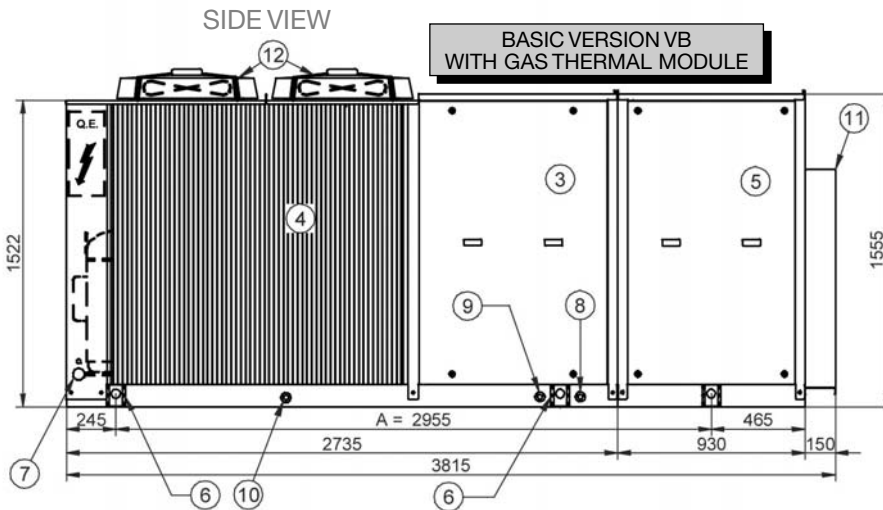
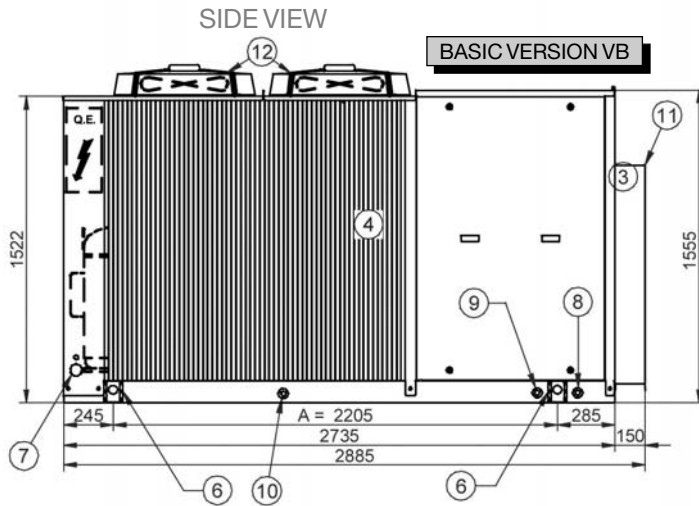
OVERALL DIMENSIONS

OVERALL DIMENSIONS FOR RFA 35.1, 45.1, 55.1
CONSTRUCTION CONFIGURATION VB - BASIC VERSION

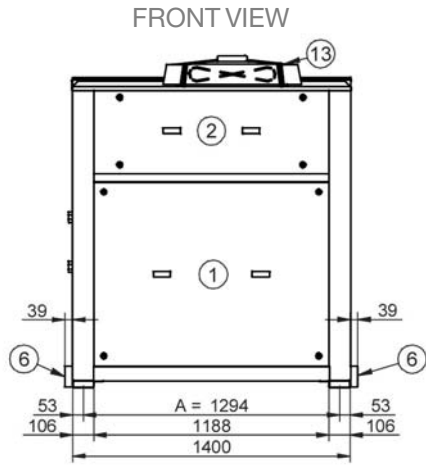


LEGEND	
POS.	DESCRIPTION
1	COOLING CIRCUIT HOUSING INSPECTION PANEL
2	ELECTRICAL BOARD CABINET INSPECTION PANEL
3	INTERNAL FAN INSPECTION PANEL
4	EXTERNAL HEAT EXCHANGER
5	CONDENSATION GAS THERMAL MODULE
6	HOISTING BRACKETS
7	ELECTRICAL POWER SUPPLY HOLES
8	INTERNAL SECTION CONDENSATE DISCHARGE (STANDARD)
9	INTERNAL SECTION CONDENSATE DISCHARGE (OPTIONAL)
10	EXTERNAL SECTION CONDENSATE DISCHARGE
11	STANDARD FILTERS FRAME
12	EXTERNAL FANS

A = SPRING ANTI-VIBRATION HOLES CENTER DISTANCE

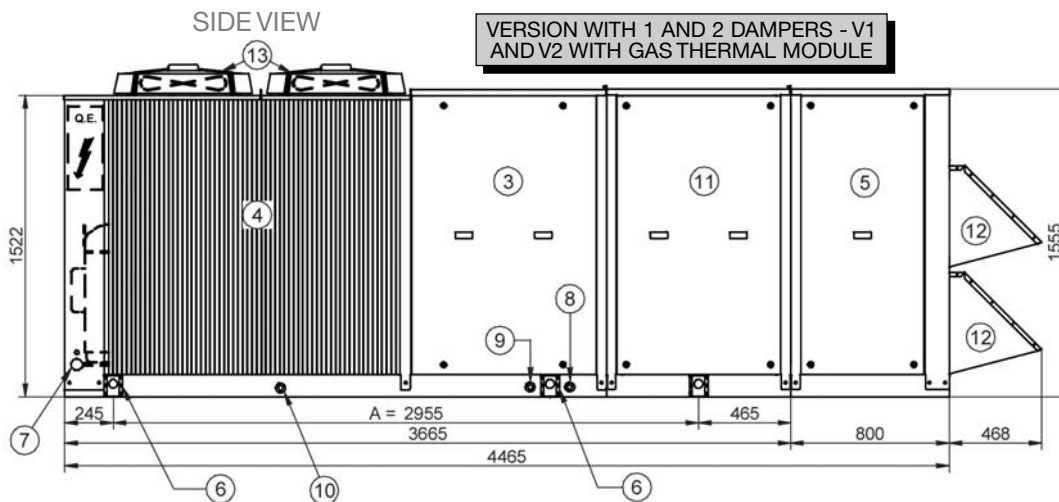
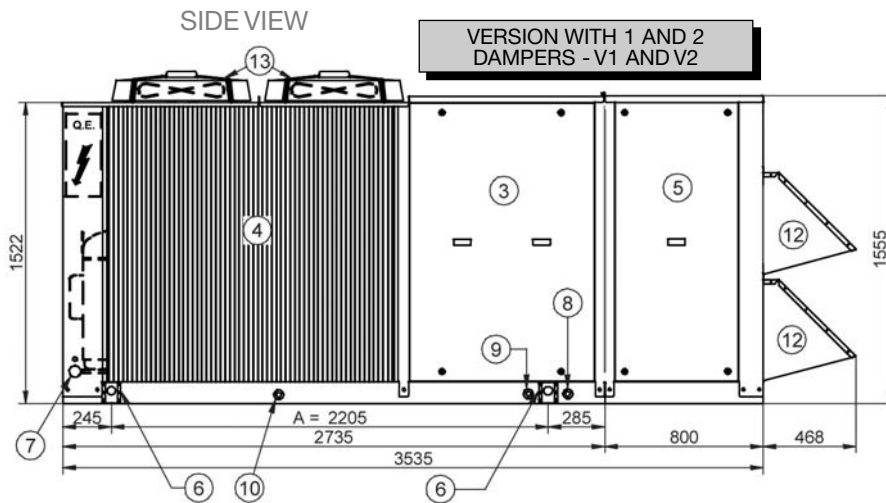


OVERALL DIMENSIONS FOR RFA 35.1, 45.1, 55.1
CONSTRUCTION CONFIGURATION V1 - V2

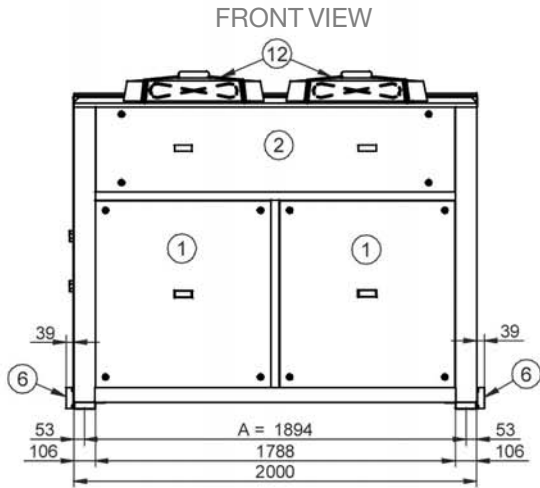


LEGEND	
POS.	DESCRIPTION
1	COOLING CIRCUIT HOUSING INSPECTION PANEL
2	ELECTRICAL BOARD CABINET INSPECTION PANEL
3	INTERNAL FAN INSPECTION PANEL
4	EXTERNAL HEAT EXCHANGER
5	DAMPERS AND FILTER SECTION OPTIONAL MODULE
6	HOISTING BRACKETS
7	ELECTRICAL POWER SUPPLY HOLES
8	INTERNAL SECTION CONDENSATE DISCHARGE (STANDARD)
9	INTERNAL SECTION CONDENSATE DISCHARGE (OPTIONAL)
10	EXTERNAL SECTION CONDENSATE DISCHARGE
11	CONDENSATION GAS THERMAL MODULE
12	OUTSIDE AIR COVER
13	EXTERNAL FANS

A = SPRING ANTI-VIBRATION HOLES CENTER DISTANCE

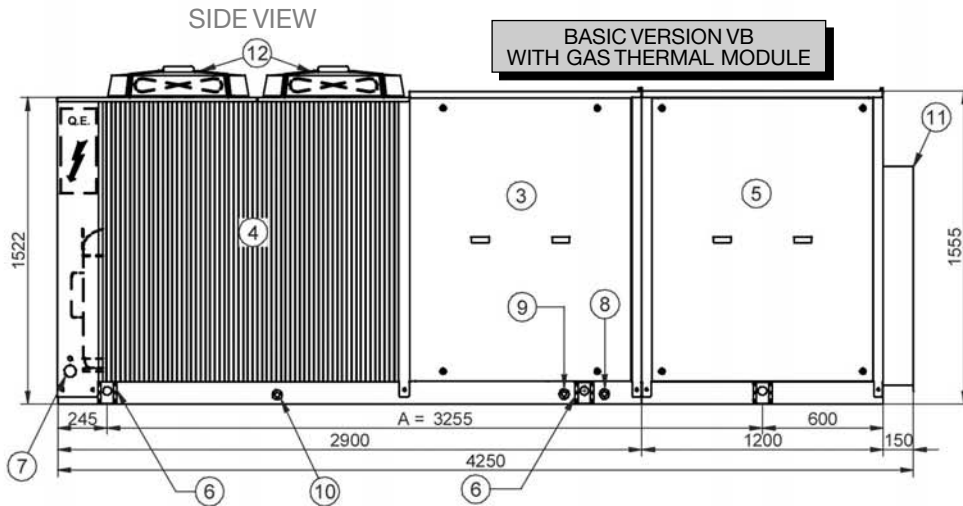
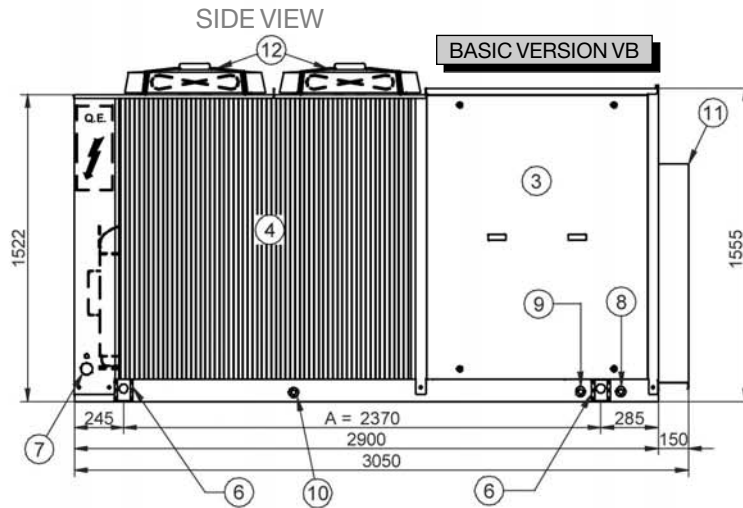


OVERALL DIMENSIONS FOR RFA 70.2, 90.2, 110.2
CONSTRUCTION CONFIGURATION VB - BASIC VERSION

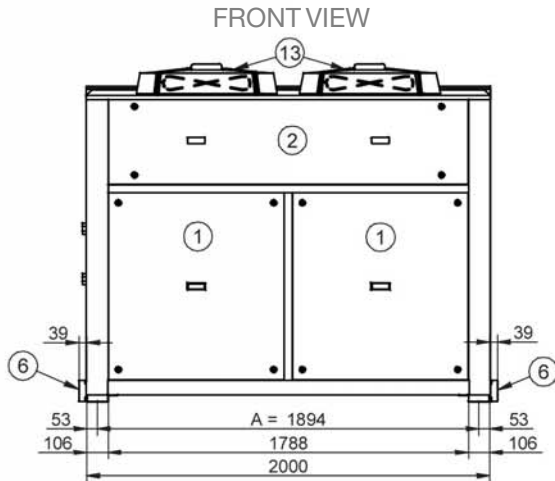


LEGEND	
POS.	DESCRIPTION
1	COOLING CIRCUIT HOUSING INSPECTION PANEL
2	ELECTRICAL BOARD CABINET INSPECTION PANEL
3	INTERNAL FAN INSPECTION PANEL
4	EXTERNAL HEAT EXCHANGER
5	CONDENSATION GAS THERMAL MODULE
6	HOISTING BRACKETS
7	ELECTRICAL POWER SUPPLY HOLES
8	INTERNAL SECTION CONDENSATE DISCHARGE (STANDARD)
9	INTERNAL SECTION CONDENSATE DISCHARGE (OPTIONAL)
10	EXTERNAL SECTION CONDENSATE DISCHARGE
11	STANDARD FILTERS FRAME
12	EXTERNAL FANS

A = SPRING ANTI-VIBRATION HOLES CENTER DISTANCE

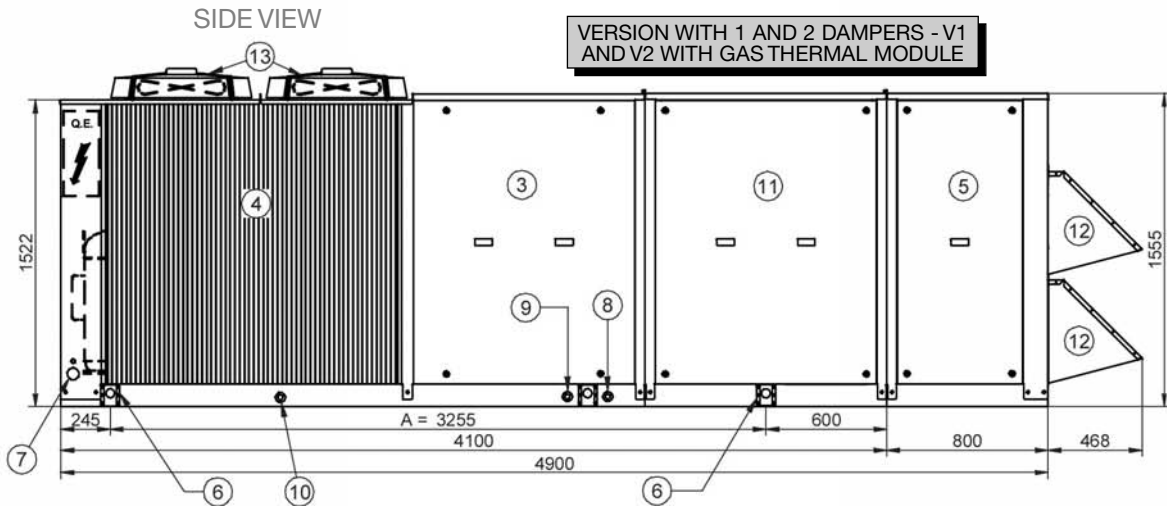
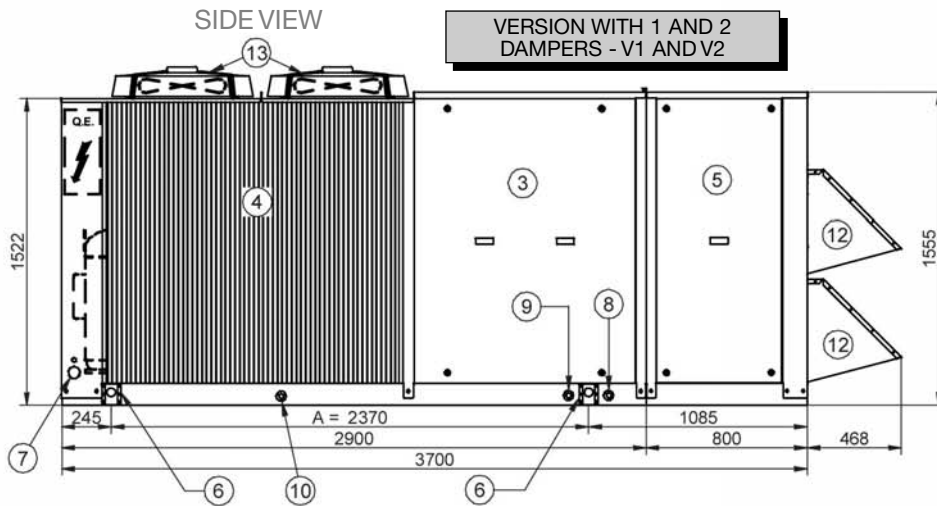


OVERALL DIMENSIONS FOR RFA 70.2, 90.2, 110.2
CONSTRUCTION CONFIGURATION V1 - V2



LEGEND	
POS.	DESCRIPTION
1	COOLING CIRCUIT HOUSING INSPECTION PANEL
2	ELECTRICAL BOARD CABINET INSPECTION PANEL
3	INTERNAL FAN INSPECTION PANEL
4	EXTERNAL HEAT EXCHANGER
5	DAMPERS AND FILTER SECTION OPTIONAL MODULE
6	HOISTING BRACKETS
7	ELECTRICAL POWER SUPPLY HOLES
8	INTERNAL SECTION CONDENSATE DISCHARGE (STANDARD)
9	INTERNAL SECTION CONDENSATE DISCHARGE (OPTIONAL)
10	EXTERNAL SECTION CONDENSATE DISCHARGE
11	CONDENSATION GAS THERMAL MODULE
12	OUTSIDE AIR COVER
13	EXTERNAL FANS

A = SPRING ANTI-VIBRATION HOLES CENTER DISTANCE



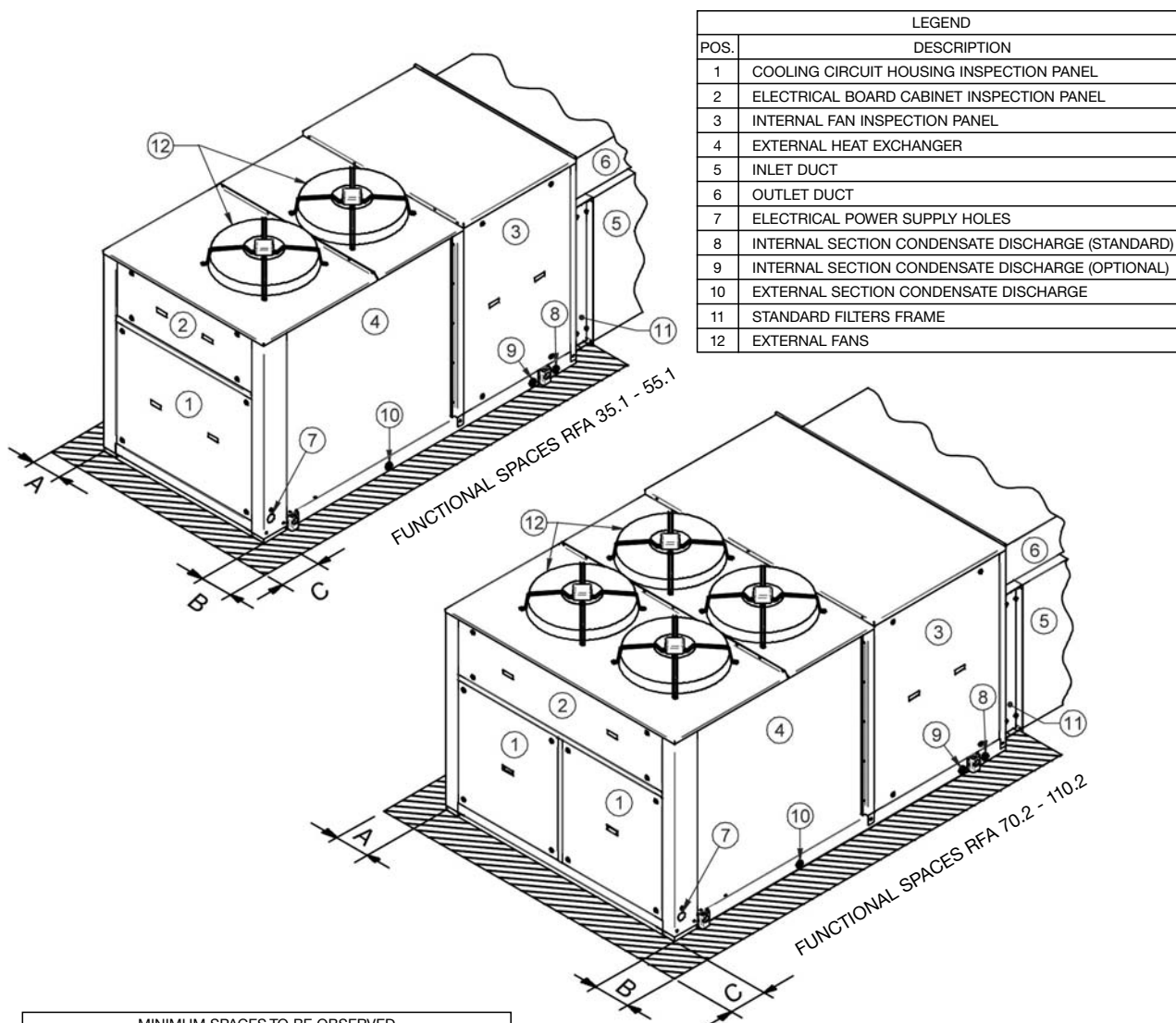
FUNCTIONAL SPACES

The choice of the unit's location is fundamentally important in guaranteeing its proper functioning. Obstacles to the airflow, difficulties with the air circulation, leaves or other foreign bodies that could obstruct the exchange coils, winds that blow against or excessively favor the airflow, stratification or air circulation phenomena, and nearby heat sources are all causes of anomalous functioning or machine shutdowns caused by:

- During summer operation - increases in the condensation pressure with a loss of performance and possible blockage due to high pressure.
- During winter operation - a decrease in the evaporation pressure accompanied by an increase in the number of defrosting operations and a consequent loss of performance and possible blockage due to low pressure.

For this reason, placement under the ground level or near very high walls must be evaluated very carefully. If the heat pump operates at temperatures below freezing for extended periods of time, it is important to facilitate the discharge of the water produced by the defrosting operations to prevent the buildup of ice near the bottom of the machine. During winter operation the heat pump produces a considerable amount of water condensate; make sure that this does not cause any problems to people or property. The units require the following minimum space for their correct functioning or to permit ease of maintenance:

- External coil side: min. 1.5 m.
- Refrigeration circuit and electrical board side: min. 1 m.
- Upper side: there must not be any obstacle to the discharge.
- Intake and outlet side: guarantee that there is sufficient space to perform any maintenance on the ducts.



MINIMUM SPACES TO BE OBSERVED			
Pos.	U.M.	RFA 35.1 ÷ 55.1	RFA 70.2 ÷ 110.2
A	mm	1000	1500
B	mm	1500	1500
C	mm	1000	1000

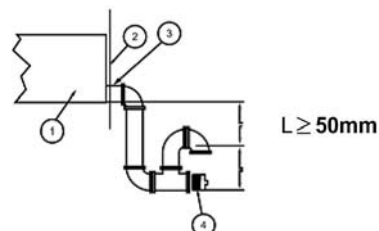
HYDRAULIC CONNECTIONS

Internal coil condensate discharge connection (compulsory)

It is very important that this operation be performed with particular care by specialized personnel. For the sequence follow these instructions:

- Connect the condensate discharge tube.
- Use a siphon to eliminate the negative pressure created by the fan, thereby preventing the intake of gas by the discharge tube and ensuring the regular discharge of the condensate.
- Connect the opening to a drain pipe discharge network. Do not use white water or sewage drains so as to prevent the intake of odors in case of water evaporation.
- After the first hours of operation in the cooling mode, check that the siphon is effective.

1. Condensate collection drain pan inside the unit is constructed of stainless steel and has been opportunely inclined to facilitate drainage.
2. External surface of the longitudinal member for the base.
3. Opening attached to the longitudinal member.
4. Example of a siphon made with PVC components, including a cap for cleaning (under the responsibility of the user).



IMPORTANT:

- Place the discharge tube so as not to cause mechanical stress on the unit's discharge connector.
- When the accessories for the water coil for post-heating only and the droplet separator are present, repeat the instructions listed above also for the second discharge outlet.
- See the drawings below for the position and dimensions of the connectors.

External coil condensate discharge connection (optional)

The drainage of the external coil is guaranteed by a drain pan equipped with a connector.

This discharge outlet (one for each external coil) was included to make it possible to convey the external coil's runoff and condensate. This connection is optional and at the discretion of the engineer and/or installer. It is possible to use also white water or sewage drains, because no danger exists of contamination with the treated air. Use a siphon to compensate for the negative pressure created by the fan, thereby preventing the intake of outside air by the discharge tube and ensuring the regular discharge of the condensate ($fP_{max} = 150 \text{ Pa}$). If no siphon is installed, the regular discharge of the condensate will be conditional upon the amount of water collected in the drain pan.

IMPORTANT:

- Place the discharge tube so as not to cause mechanical stress on the unit's discharge connector.
- See the drawings below for the position and dimensions of the connectors.
- Do not cap unless there is a connection to some type of discharge tube.

Connection of water coil for post-heating only (optional)

The water coil for post-heating only is installed at the factory and positioned vertically in the internal fan's intake section. The connection between the coil and the water inlet and outlet openings, located on the machine, is ensured by a tubes unit or a 3-way valve unit, which is also installed at the factory. The position of the connectors for both solutions is the same. For their placement and dimensions, refer to the drawings below.

Connect the coil using the tube diameters listed in the table shown below, categorized by sizes:

Model	Ø of tubes
35.1 – 45.1 – 55.1	1"
70.2 – 90.2 – 110.2	1 1/4"

Remove the caps on the openings only immediately before making the hydraulic connections.

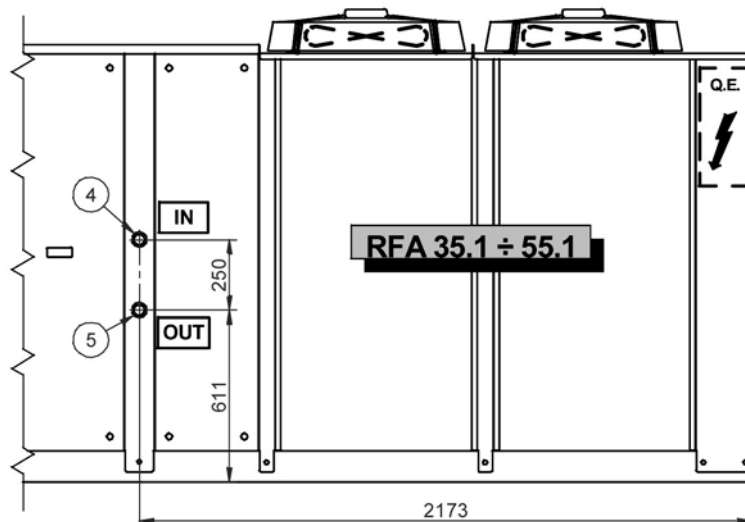
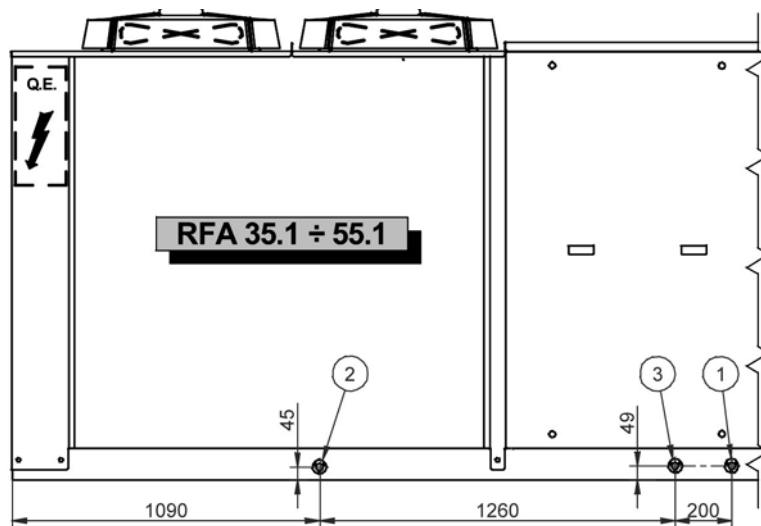
The connection tubes must not cause vibrations to the coils due to its own weight or due to thermal expansion. Install any necessary supports and expansion compensators. Attach suitable connectors to allow easy disconnection and removal of the coils. When making the connections, do not twist the connectors and be sure to observe the proper direction of the inlet and outlet flows.

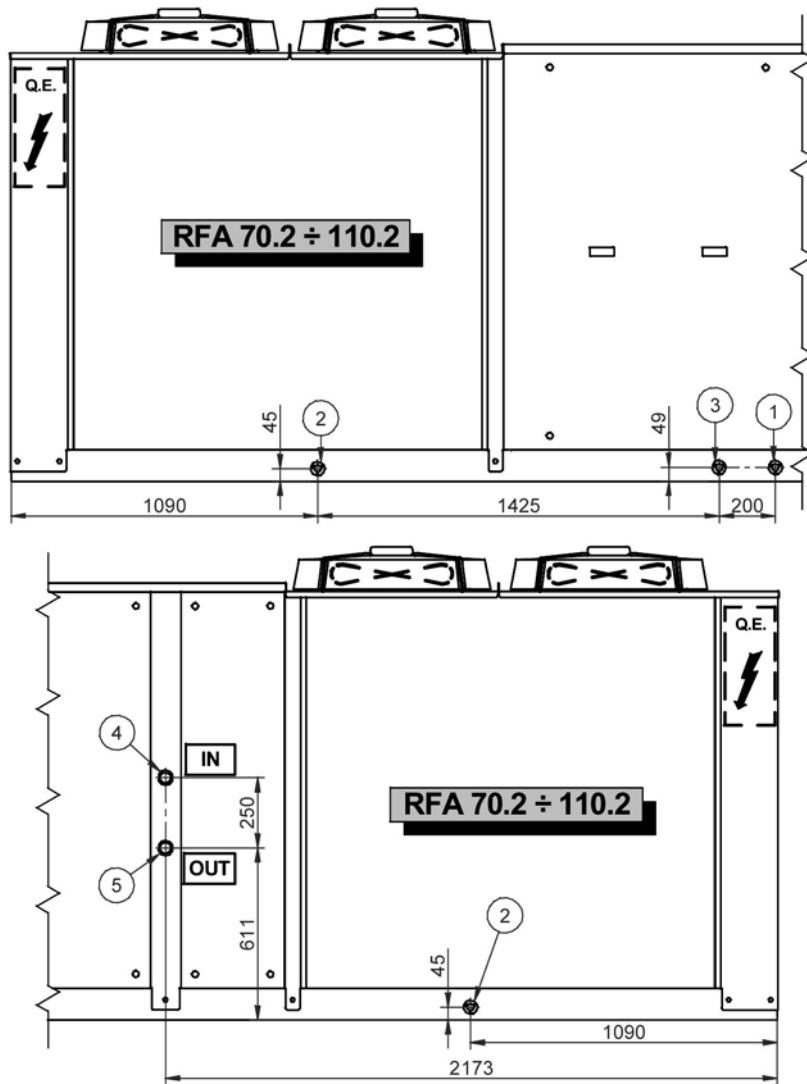
The water coil circuit can be used with water or with glycol solutions if required by the installation. If the water used causes erosion or deposits, it is advisable to engage the services of a specialist in water treatment. Insulate all the water tubes that could be exposed to freezing temperatures so as to prevent the freezing of the coil and heat loss. The water distribution network must be equipped with vents at the points in which it is probable that air could become trapped

IMPORTANT

- IF THE UNIT IS SUPPORTED BY ANTI-VIBRATION MOUNTS, TAKE PARTICULAR NOTE THAT ALSO THE WATER CONNECTIONS MUST HAVE ANTI-VIBRATION JOINTS INSTALLED.
- IT IS OBLIGATORY TO MOUNT A METAL MESH FILTER WITH A MESH OF NO MORE THAN 1 MM ON THE WATER INLET TUBE, AT THE RISK OF THE CANCELLATION OF THE WARRANTY.

LEGEND FOR HYDRAULIC CONNECTORS RFA 35.1 - 110.2			
Pos.	Description		UNI ISO 7/1 thread
1	Internal coil condensate discharge	Standard	Gas 3/4" F
2	External coil condensate discharge	Standard	Gas 3/4" F
3	Droplet separator condensate discharge	Optional	Gas 3/4" F
4	Water coil inlet	Optional	Gas 1 1/4" F
5	Water coil outlet	Optional	Gas 1 1/4" F





AERAUIC CONNECTIONS

All the units, in their various configurations, are equipped with an intake that is always frontal, and an outlet that can be frontal or downward. The edges of the outlet and inlet openings are designed in such a manner as to permit the proper attachment of the ducts. The sizes of the ducts must be determined according to the required air flow rate and the corresponding static pressure available to the unit.

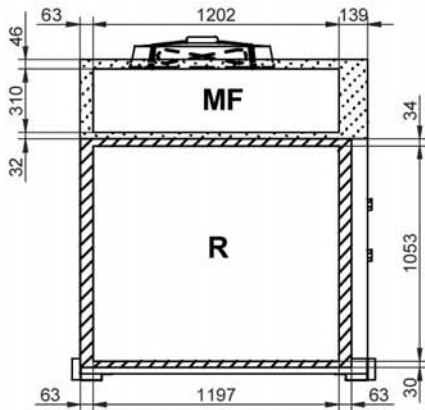
The heads and the flow rates that can be obtained from each model are listed in the technical data section. However, it is absolutely necessary to follow these recommendations:

- Regardless of the type of duct used, the material of which it is constructed must not be inflammable and must not generate toxic gases in the case of a fire. The inner surfaces of the ducts must be smooth and must not contaminate the air flowing through them in any way. In any case, we recommend the use of sheet metal ducts that are adequately insulated to prevent condensation and heat loss.
- It is advisable to connect the unit to the air ducts using flexible joints between them to absorb the vibrations, to prevent the generation of sounds in the ducts, and to allow easier access. These recommendations become obligatory if the unit is equipped with spring anti-vibration mounts.
- If possible, avoid curves near the unit, design them to have the largest curve radius possible, and install deflectors inside the ducts when they are of sufficient size.

NOTE: The size of the entire network of ducts and the entire system design must be planned by an expert.

The following is a list of the position and sizes of the flanges necessary for proper design and subsequent connection of the air ducts.

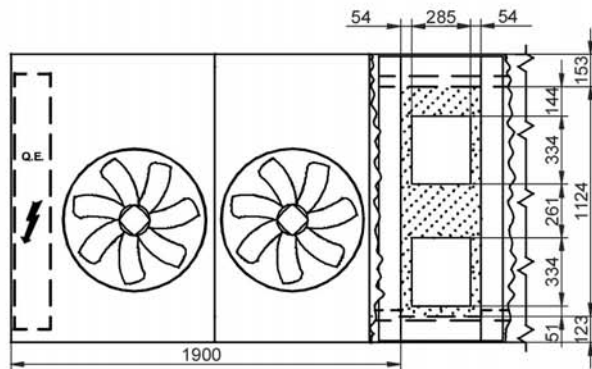
REAR VIEW
DUCT ANCHORING SIDE



AEROLIC CONNECTIONS RFA 35.1, 45.1, 55.1

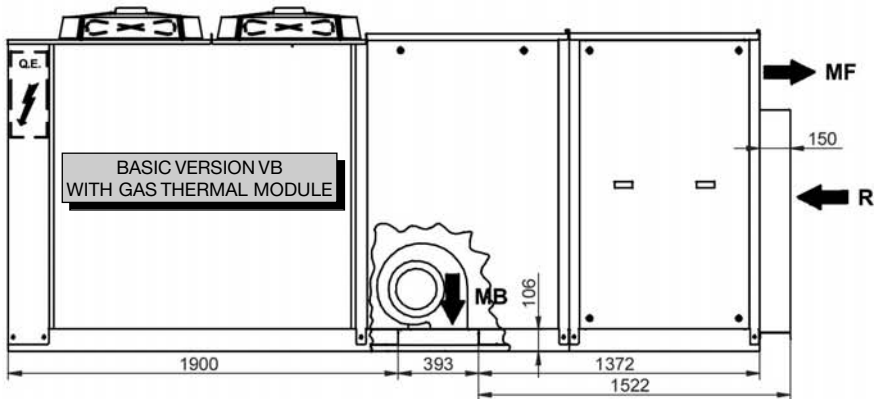
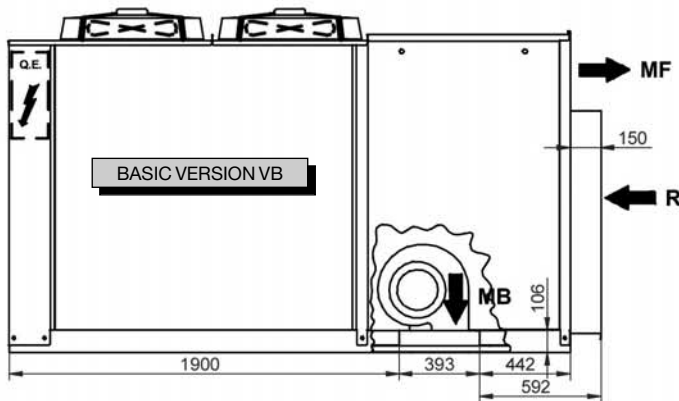
CONSTRUCTION CONFIGURATION
VB - BASIC VERSION

LEGEND	
ABBREV. SYMBOL	DESCRIPTION
	= SPACE AVAILABLE FOR ANCHORING THE OUTLET DUCT
	= SPACE AVAILABLE FOR ANCHORING THE INLET DUCT
R	= INLET AIR
MF	= FRONT OUTLET
MB	= DOWNWARD OUTLET

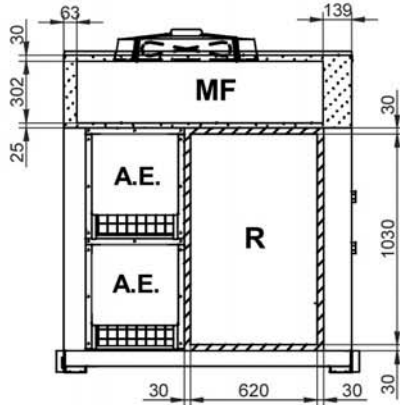


VIEW FROM ABOVE
DUCT ANCHORING
DOWNWARD OUTLET

VALID FOR:
 • BASIC VERSION VB
 • BASIC VERSION VB WITH GAS THERMAL MODULE

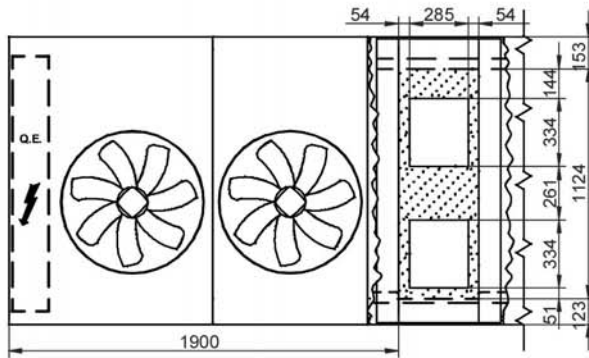


REAR VIEW
DUCT ANCHORING SIDE



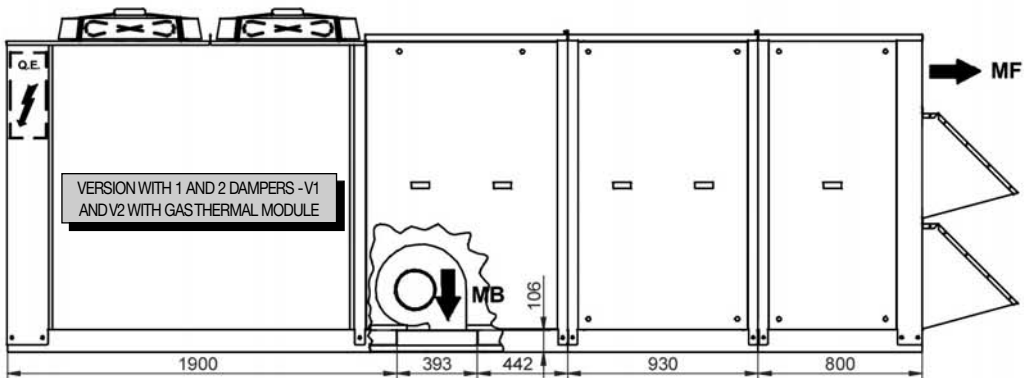
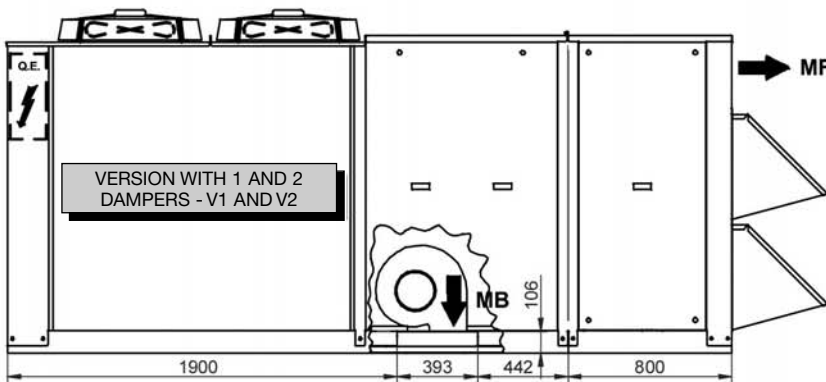
AEROLIC CONNECTIONS RFA 35.1, 45.1, 55.1
CONSTRUCTION CONFIGURATION V1 - V2

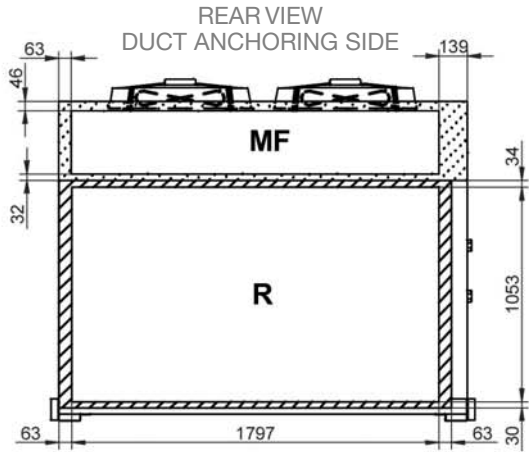
LEGEND	
ABBREV. SYMBOL	DESCRIPTION
	= SPACE AVAILABLE FOR ANCHORING THE OUTLET DUCT
	= SPACE AVAILABLE FOR ANCHORING THE INLET DUCT
R	= INLET AIR
MF	= FRONT OUTLET
MB	= DOWNWARD OUTLET
AE	= OUTSIDE AIR



VIEW FROM ABOVE
DUCT ANCHORING
DOWNWARD OUTLET

VALID FOR:
 • VERSION WITH 2 DAMPERS - V1 AND V2
 • VERSION WITH 2 DAMPERS - V1 AND V2 WITH GASTHERMAL MODULE

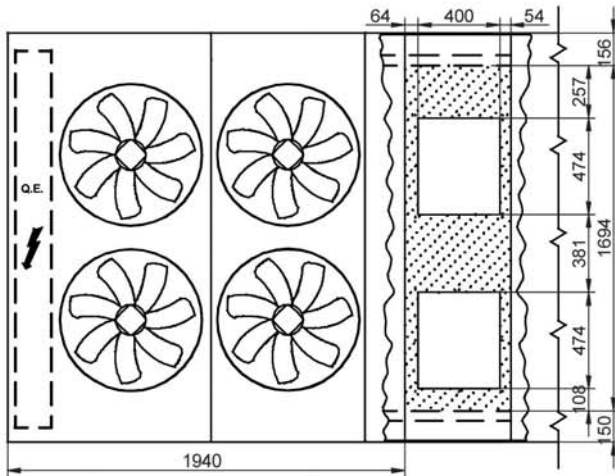




AERAUIC CONNECTIONS RFA 70.2, 90.2, 110.2

CONSTRUCTION CONFIGURATION
VB - BASIC VERSION

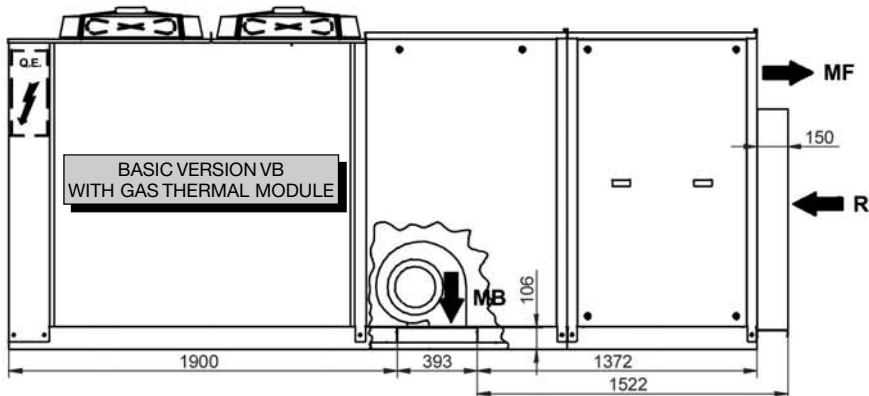
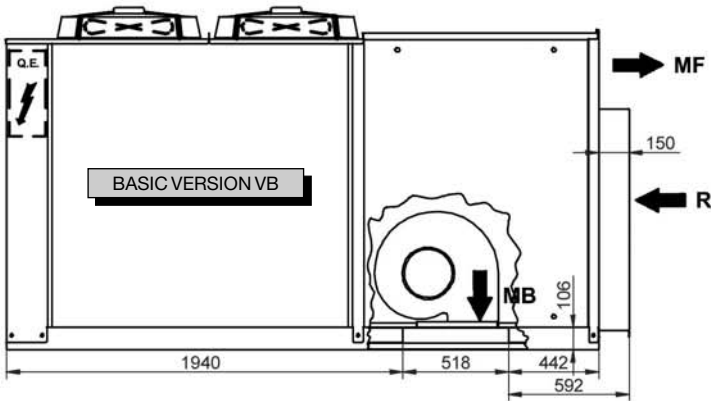
LEGEND	
ABBREV. SYMBOL	DESCRIPTION
	= SPACE AVAILABLE FOR ANCHORING THE OUTLET DUCT
	= SPACE AVAILABLE FOR ANCHORING THE INLET DUCT
R	= INLET AIR
MF	= FRONT OUTLET
MB	= DOWNWARD OUTLET

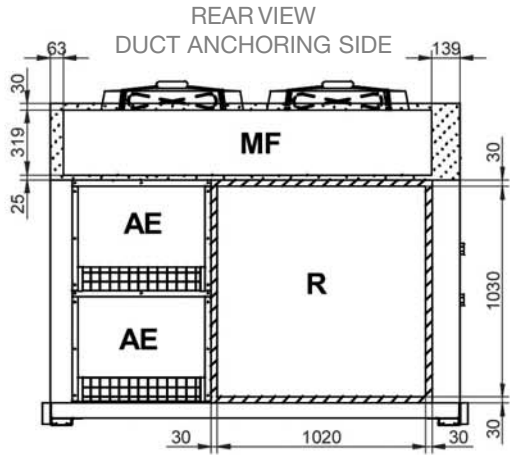


VIEW FROM ABOVE

DUCT ANCHORING
DOWNWARD OUTLET

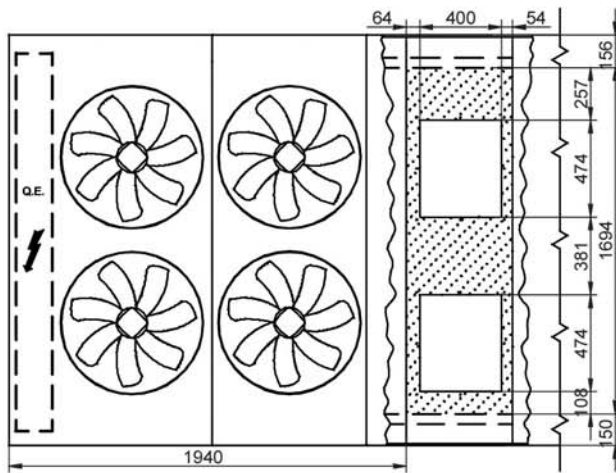
VALID FOR:
• BASIC VERSION VB
• BASIC VERSION VB WITH
GAS THERMAL MODULE



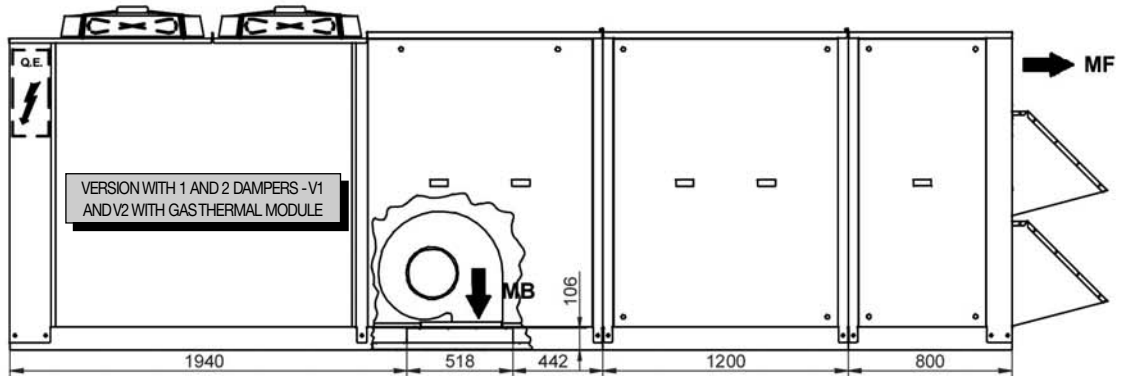
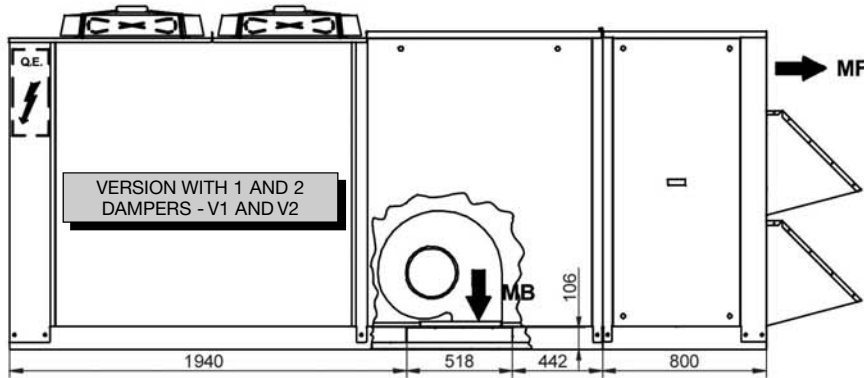


AERAUIC CONNECTIONS RFA 70.2, 90.2, 110.2
CONSTRUCTION CONFIGURATION V1 - V2

LEGEND	
ABBREV. SYMBOL	DESCRIPTION
	= SPACE AVAILABLE FOR ANCHORING THE OUTLET DUCT
	= SPACE AVAILABLE FOR ANCHORING THE INLET DUCT
R	= INLET AIR
MF	= FRONT OUTLET
MB	= DOWNWARD OUTLET
AE	= OUTSIDE AIR



VALID FOR:
 • VERSION WITH 2 DAMPERS - V1 AND V2
 • VERSION WITH 2 DAMPERS - V1 AND V2 WITH GASTHERMAL MODULE



ELECTRICAL CONNECTIONS

General standards

The electric wiring must be installed by qualified personnel according to the standards that are in force at the time of installation in the destination country. Before beginning any work on the electrical system, first make sure that the unit's power supply line is isolated at the source.

N.B.: Refer to the wiring diagram attached to the unit.

Connection to mains power

The units have been completely wired in the factory and prepared for connection to the power supply line. The electrical board is protected by an external panel that can be removed by means of rotating a wrench for screws by $\frac{1}{2}$ turn and can be inspected by means of the general cutoff switch's door blocking mechanism.

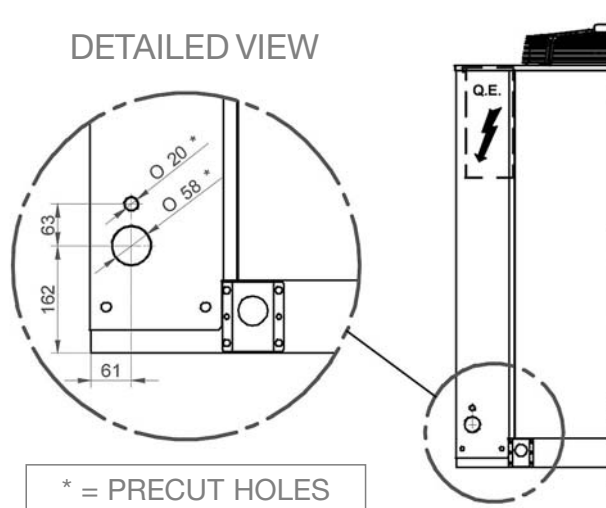
Power supply system

The power cables of the machine's power supply line must be selected by a symmetrical 3 phase voltages system equipped with a neutral wire and separate protective ground conductor.

$$V = 400 V \pm 10\%$$

$$f = 50 \text{ Hz}$$

The power cables must enter the unit through the precut holes located in the lower part of the support. These holes must be protected with the use of bushings of an adequate size, and it is advisable to anchor the cables firmly to the machine's structure.



The cable terminals must enter the electrical board's box through the existing holes located in the lower part of the box, and must be attached to the terminals of the general cutoff switch located inside the electrical board.

The neutral wire included in the line must be connected to the neutral terminal marked "N" corresponding to the fourth pin of the general cutoff switch.

The protective conductor, originating from the power supply line, must be connected directly to the ground screw marked "PE" so as to guarantee the equipotential connections of all the metal masses and the structural components of the machine.

IMPORTANT

The connection cables must have a cross-section that is suitable for the unit's power input and must be of a size that is in compliance with current regulations.

The electronic data provided in the technical documentation refer to the standard unit without accessories. To select the size of the power supply line always refer to the FLI and FLA values listed on the data plate, which can also be calculated from the input values of the standard units, taking into consideration all the nonstandard accessories and components that have been installed.

Upline protection

Before the above mentioned line it is necessary to install an automatic switch that is suitable for providing over-current protection and protection against indirect contacts.

The coordination between the line and switch must be executed in compliance with current regulations on electrical safety with regard to the type of installation and the environmental conditions of the installation.

Connections that are the user's responsibility

All'interno del quadro elettrico è prevista una morsettiera (XU) dedicata ai seguenti collegamenti:

General alarm

Contact free of voltage. Maximum voltage at the terminal ends: 24V. Maximum current: 5A.

Contact open: alarm not activated.

Contact closed: alarm activated.

On-off remote

It is possible to connect a remote device for turning the unit on and off (selector switch, clock controller, centralized monitoring device, etc.) that is equipped with a contact that is free of voltage and that is suitable for switching extremely low power loads.

Contact open: unit is turned off (OFF).

Contact closed: unit is turned on (ON).

The bridge between the terminals, which was installed at the factory, must be removed if remote control is used.

Remote summer-winter

It is possible to remotely switch between cooling mode operation and heating mode operation by connecting a device equipped with a contact that is free of voltage and that is suitable for switching extremely low power loads.

Contact open: heating mode operation.

Contact closed: cooling mode operation.

The bridge between the terminals is not necessary, because this function must be activated by means of a parameter (refer to the Regulation section). If this function is used, it will no longer be possible to switch the operating mode by means of the keyboard.

Economizer

It is possible to translate the set point (both in cooling mode and in heating mode) by means of a device equipped with a contact that is free of voltage and that is suitable for switching extremely low power loads (refer to the Regulation section for further details).

Contact open: set point translated.

Contact closed: set point unchanged.

The bridge between the terminals, which was installed at the factory, must be removed if this function is used.

Forcing damper open

It is possible to force open the outside air damper by means of a device equipped with a contact that is free of voltage and that is suitable for switching extremely low power loads.

Contact open: damper open.

Contact closed: damper closed.

The bridge between the terminals, which was installed at the factory, must be removed if this function is used.

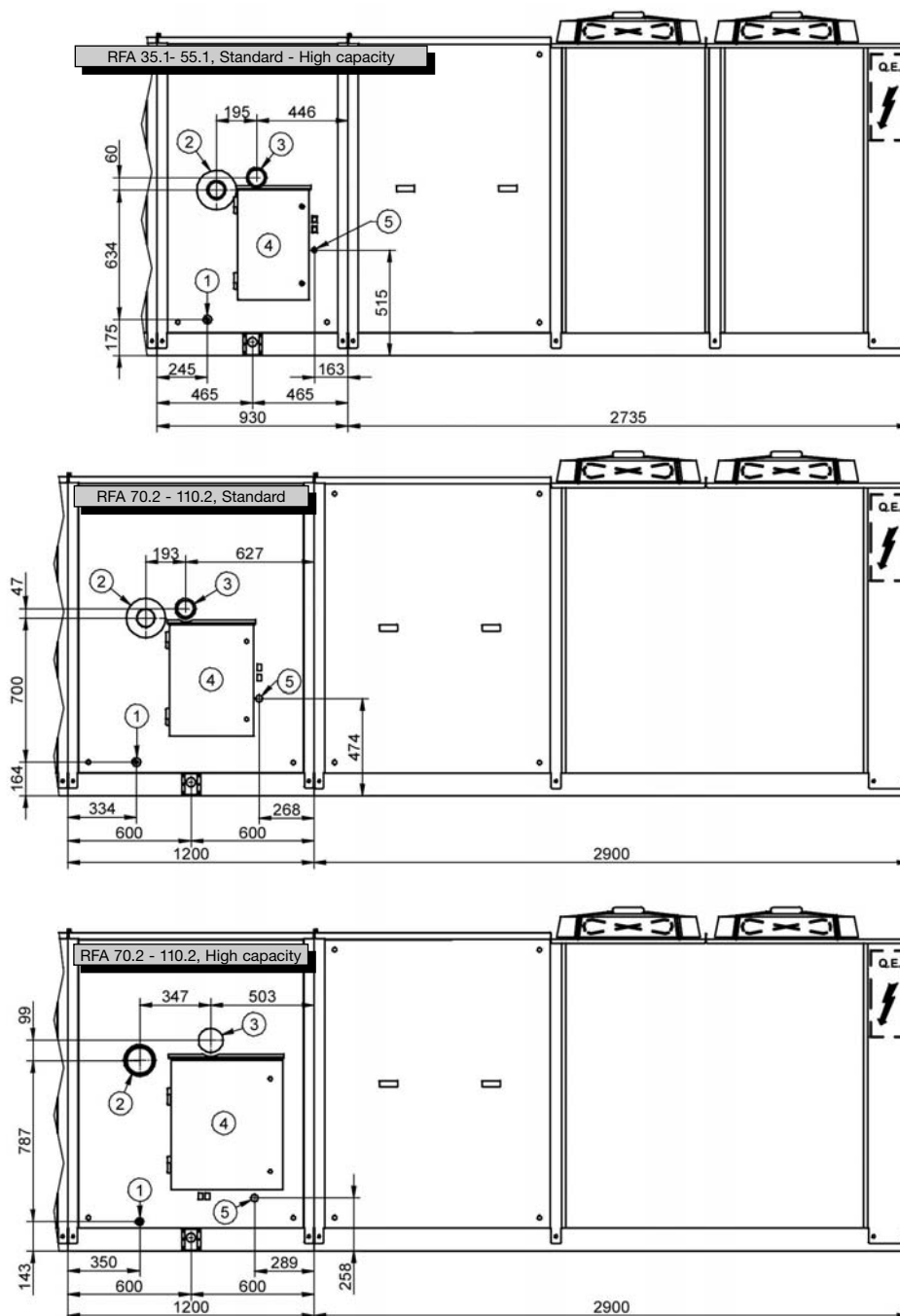
Remote thermostat or keyboard

It is possible to connect devices (accessories) to the unit that replicate the commands that are available on board the machine (see the Regulation section for further details).

GAS THERMAL MODULE CONNECTIONS

No.	Description	U.M.	Condensation gas thermal module		
			RFA 35.1 ÷ 55.1	RFA 70.2 ÷ 110.2	RFA 70.2 ÷ 110.2
			Standard - High capacity	Standard	High capacity
1	Condensate discharge	mm	Ø 10	Ø 18	Ø 18
2	Flue gas discharge	mm	Ø 80	Ø 100	Ø 130
3	Intake	mm	Ø 80	Ø 100	Ø 130
4	Inspection panel	-	-	-	-
5	Gas inlet	-	UNI ISO 7/1 - 3/4" M	UNI ISO 7/1 - 1" M	UNI ISO 7/1 - 1" M

N.B.: The modules are tested and prepared for operation with G20 natural gas and a supply pressure of 20 mbar, unless different requirements have been specified. Per ulteriori approfondimenti si rimanda al manuale d'installazione e uso allegato all'unità.



RECEIVING

Checks on receiving

On receiving the unit, make sure the shipment is complete by carefully checking its agreement with that ordered. Carefully check the load for any damage. In case of goods with visible damage, promptly report it to the carrier, writing "Collection with reserve due to clearly visible damage" on the note. Delivery ex factory implies compensation for damages borne by the insurance, in accordance with the provisions of the law.

Safety prescriptions

Comply with current safety regulations regarding the equipment to be used for handling the unit and the operating procedures to be implemented.

Handling

Before starting handling operations, check the weight of the unit given on the dataplate and in the technical documentation. Make sure the unit is handled with care and without banging, to avoid damaging its functional parts.

The units are arranged for lifting and positioning in worksites with a crane or similar equipment, using metal pipes or lifting hooks to be inserted in the special brackets fitted standard on all units.

Using metal pipes

Place metals pipes of max. external diameter 44 mm in the special holes in the base of the unit. The ends of the pipes must protrude enough to allow insertion of the safeties and to hold the lifting straps.

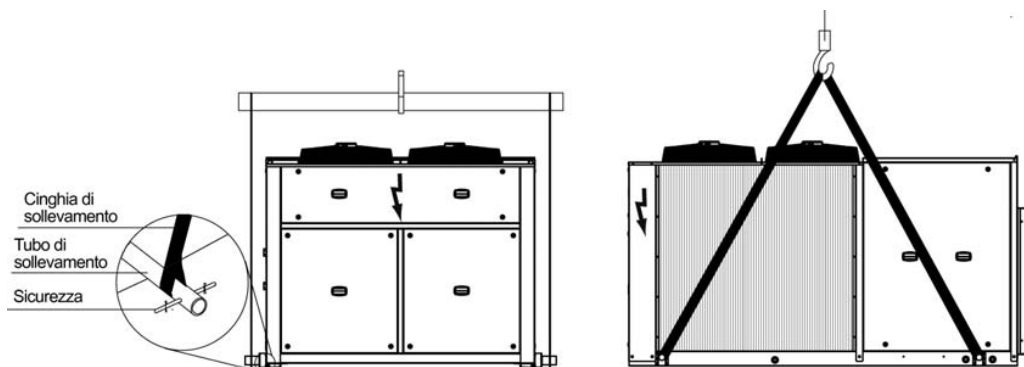
Using the special lifting brackets

Connect the lifting straps to the brackets fitted on the base by means of eye-hooks.

Use spacer bars at the top of the unit to avoid crushing and damaging the exchangers and the parts provided for covering the unit.

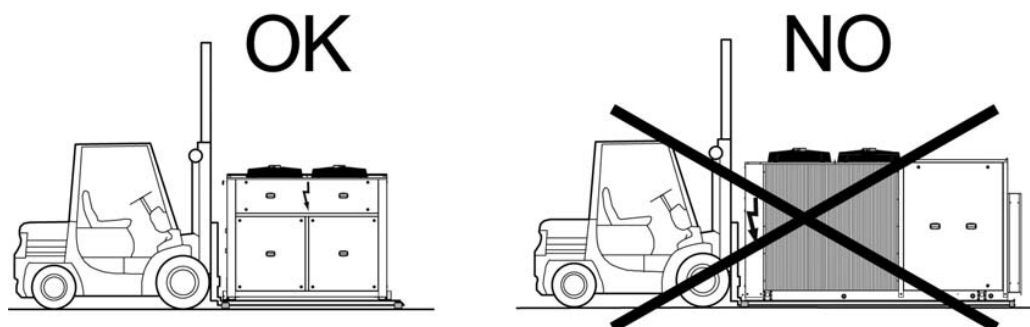
For the centre of gravity position refer to the dataplates on the base.

Tighten the straps gradually, checking their correct position, then start lifting.



Using a fork-lift truck

Alternatively, the units can be lifted with a lift truck, making sure to always position them sideways so that their centre of gravity is in the middle of the forks.



Receiving and positioning

Storage

Keep the units in a dry place away from direct sunlight, rain, sand or wind.

Do not stack the units

Max. temperature	=	60 °C
Min. temperature	=	- 10 °C
Max. humidity	=	90 %

Unpacking

Remove the packing, taking care not to damage the unit.

Check for any visible damage.

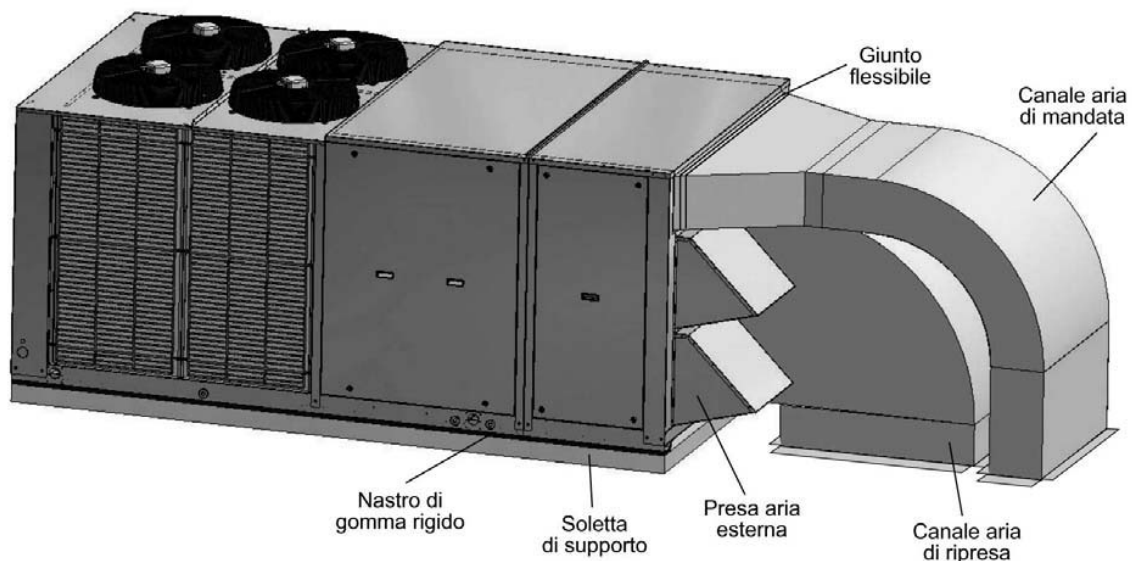
Dispose of the packing materials by taking them to a specialised centre for collection or recycling (comply with current regulations).

POSITIONING

All RFA series units are designed for outside installation. To ensure correct installation:

- Make sure the support surface is perfectly level and that it can take the weight of the unit. It is advisable to create a base of suitable size for the unit. This precaution is indispensable when placing the unit on unstable ground (various types of ground, gardens, etc.). The units transmit a low level of vibrations to the ground: in any case it is advisable to place a strip of rigid rubber between the base frame and the support surface. Whenever more efficient insulation is required, it is advisable to use vibration-damping spring supports. Do not place the units near private offices, bedrooms or areas where noise levels must be low. It is also inadvisable to install the unit in narrow or confined spaces, in order to avoid reverberation.
 - Pay attention to its orientation and exposure to sun radiation: insofar as possible, the condensing coil should not be exposed to direct sunlight. To avoid operating overtemperatures, do not place the unit on dark ground (e.g. tarred surfaces).
 - Do not cover the unit with roofs or place it near plants (even if they only partially cover the unit), in order to reduce the possibility of air recirculation.
 - Respect the functional areas and make sure the place of installation is not subject to flooding.
 - Position the unit so that is protected against any prevailing winds.
 - Secure the unit to the ground.
-

Typical roof installation with front inlet and outlet



COMMISSIONING

General rules

The operations described below must only be carried out by adequately trained personnel. For the contractual warranty to be valid, commissioning must be carried out by an authorised assistance centre .
Before calling, it is advisable to ensure that all the installation steps have been completed (positioning and levelling the unit, electrical, aeraulic and plumbing connections)

Preliminary checks before switching on

Make sure :

- the unit was not damaged (visual check) due to transport or positioning
- the unit is positioned on a flat surface able to take its weight
- the minimum operating spaces are respected
- the ambient conditions comply with the operating limits provided for
- the air inlet and outlet ducts are properly connected
- the condensate drain connection is correctly carried out

Disconnect the supply line of the unit at the start and make sure :

- the unit's power supply line complies with the current standards
- the screws fixing the electrical cables to the components inside the electrical panel are secured (vibration during transport may have caused loosening)

Close the electric line disconnecting devices and make sure :

- the supply line voltage complies with the machine's rated voltage
- the unbalance between the phases is less than 2% (a higher value causes excessive current absorption in one or more phases, resulting in possible damage to the electrical parts of the unit)

NOTE : Phase unbalance calculation example

- Read the value of the three line voltages using a voltmeter :

$$\text{line voltage between the phases } L_1 \text{ and } L_2 : V_{1-2} = 390V$$

$$\text{line voltage between the phases } L_2 \text{ and } L_3 : V_{2-3} = 397V$$

$$\text{line voltage between the phases } L_3 \text{ and } L_1 : V_{3-1} = 395V$$

- Calculate the difference between the minimum and maximum value of the line voltages measured :

$$\Delta V_{\max} = \max(V_{1-2}; V_{2-3}; V_{3-1}) - \min(V_{1-2}; V_{2-3}; V_{3-1}) = V_{2-3} - V_{1-2} = 397 - 390 = 7V$$

- Calculate the mean value of the line voltage :

$$V_{\text{media}} = \frac{V_{1-2} + V_{2-3} + V_{3-1}}{3} = \frac{390 + 397 + 395}{3} = 394V$$

- Calculate the unbalance percentage value :

$$\frac{\Delta V_{\max}}{V_{\text{media}}} \cdot 100 = \frac{7}{394} \cdot 100 = 1,78\% \leq 2\%$$

Switching on

Close the unit's main disconnecting switch (position I).

A wrong sequence of the power supply phases is immediately detected by the sequence meter (standard on all units) and indicated on the controller display. To eliminate the error invert any two phases of the supply line.

Put the controller on stand-by and check the temperature of the oil in the crankcase of the compressors : the temperature of the compressor casing, at the bottom, must be at least 8-10°C higher than the outside temperature (with the unit fed and on stand-by the heating elements take up to 8-10 hours to heat the oil).

Activate the unit in cooling or heating mode by means of the keyboard on the machine and setting a set point requiring 100% of the unit's power.

Checks and settings after switching on

Refrigerant circuit

For each refrigerant circuit, make sure :

- there are no gas leaks (all the caps of the pressure points must be fitted and secured)
- the saturation temperature (dew point) corresponding to the condensation pressure is approx. 10-15°C higher than the outside air temperature in cooling and approx. 30-35°C higher than the inlet air temperature in heating
- the saturation temperature (dew point) corresponding to the evaporation pressure is approx. 25-30°C lower than the inlet air temperature in cooling and approx. 10-15°C lower than the outside air temperature in heating
- overheating is between 5°C and 10°C
- subcooling is between 5°C and 10°C in cooling and between 10°C and 20°C in heating
- the fluid indicator is full and does not show the presence of humidity
- the compressor discharge temperature is 30-40°C higher than the saturation temperature (dew point) corresponding to the condensation pressure

N.B. The values given are only approximate and valid for units operating with all inlet air and temperatures close to nominal.

Aeraulic circuit

Setting of the air flow in the inlet and outlet ducts must be carried out by a specialised technician equipped with suitable measurement instruments.

STANDARD version

The outlet air flow (coinciding with that of inlet) can be set by operating on the transmission of the internal centrifugal fan. Modify the opening of the expanding pulley fitted on the electric motor. If the design delivery cannot be obtained in this way, replace the fixed pulley, fitted on the fan, with one of a different diameter.

Version 1 SHUTTER

The outlet air flow can be set as described for the standard version.

To adjust the inlet air flow, manually adjust the opening of the outside air shutter until obtaining the design value.

Check the outlet air flow again and if necessary repeat the two setting operations until obtaining the required values for both deliveries.

Version 2 SHUTTERS

The outlet air flow can be set as described for the standard version.

To adjust the inlet air flow modify the parameter that defines the minimum opening of the outside air shutter until obtaining the design value (during this phase make sure free-cooling is disabled by means of the parameter).

Check the outlet air flow again and if necessary repeat the two setting operations until obtaining the required values for both deliveries.

NOTE. The outlet air flow must always be higher than or equal to the inlet air flow for obtaining a correct intake of the outside air.

Electrical circuit

Using a tester check that the current absorbed by the compressors and fans is less than the max. permissible values (FLA), indicated in the section "Technical data".

ADJUSTMENT AND CONTROL

Description

Control system

The unit is managed by a controller with microprocessor consisting of a card, inside the electrical panel, to which all the loads and control devices are connected and a user interface accessed by removing the electrical panel protection panel. A further interface can be connected to the card for remote control of the machine.

Standard user interface

All the units are supplied with a standard interface (EKP400 RT type keyboard) equipped with two buttons and a display (3-digit with sign and decimal point + 7 LEDs) through which it is possible to :

- display and modify the operating parameters of the unit
- display the analogue and digital inputs
- set the operating mode



Mode button



Used to select the operating mode if the "remote Cooling-Heating" control is not used and the "remote Thermostat" accessory is not connected (EKF400 RT type keyboard). Pressing the button gives the following sequence:

Standby → Cooling → Heating → Standby

Heating mode is only present for units with heat pump.

In menu mode the button is used to scroll the menu up or to increase the value of the parameter selected.

Set button



Press once to reset all the manual-reset alarms no longer active.

Keep the button pressed for 2 seconds to display the set point of the set operating mode. The value can be modified (with the "mode" and "set" buttons) and saved (by pressing both buttons at the same time or when the display of set point disappears for time-out).

In menu mode the button is used to scroll the menu down or to decrease the value of the parameter selected.

Mode button + set button



Press and release both buttons within 2 seconds to go down one level on the menu. Keep both buttons pressed for more than 2 seconds to go up one level. If the last level of a menu is being displayed, pressing and releasing within 2 seconds will make it go up one level in any case.

Display

The following are shown in normal display :

- the temperature adjustment, or the inlet air temperature (in tenths of degrees Celsius with decimal point or in degrees Fahrenheit without decimal point)
- the alarm code, if at least one of them is active (if several alarms are active the code of the first one according to the Table of Alarms is displayed)

In the menu mode, the display depends on the position (see menu structure).

COOLING mode LED



ON : unit in Cooling mode

HEATING mode LED



ON : unit in Heating mode

If the Cooling LED and Heating LED are not lit the unit is on STANDBY.

LED step 1 : compressor circuit 1



ON	:	compressor circuit 1 on	
OFF	:	compressor circuit 1 off	
FLASHING at a frequency of 1 Hz (1 per second)	:		timing in progress
FLASHING at low frequency (< 1 Hz)	:		defrost in progress on circuit 1

Led step 3 : compressor circuit 2



ON	:	compressor circuit 2 on	
OFF	:	compressor circuit 2 off	
FLASHING at a frequency of 1 Hz (1 per second)	:		timing in progress
FLASHING at low frequency (< 1 Hz)	:		defrost in progress on circuit 2

Heating elements / gas heating module LED



ON	:	heaters on / gas heating module on
OFF	:	heaters off / gas heating module off

The LEDs of step 2 and step 4 are not used.

Accessories user interfaces

Remote control

This is the standard wall-mounted interface version. The only difference is the presence of 4 buttons : in addition to the mode and set buttons, up and down buttons are available for scrolling the menus and increasing or decreasing the value of the parameter selected.



Remote thermostat

This is a simplified wall-mounted interface used to :

- set the operating mode
- set a deviation with respect to the set point
- display the operating status and the presence of active alarms

The selector A is used to set the device to one of the 4 possible states :

0	standby
I	ON
(night purging
eco	Economy mode

The selector B is used to set the device to one of the 4 possible operating modes :

auto	automatic mode
☀	heating mode
☀	cooling mode
☀	ventilation mode

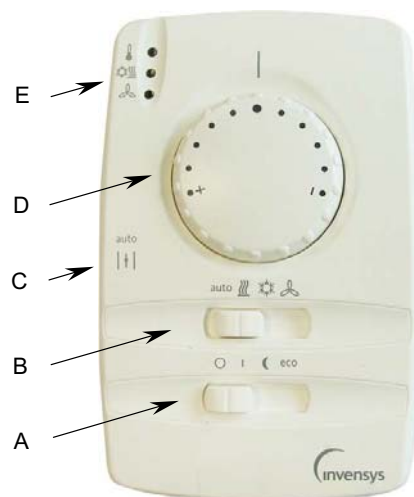
The selector C is used to define the outside air shutter opening mode :

auto	automatic adjustment by the controller
	shutter completely open

The knob D is used to set a deviation with respect to the set point of the operating mode selected. The deviation is algebraically added to the active set point and its max. value (from the midpoint to each stop) is ± 5°C.

The status LEDs E indicate respectively :

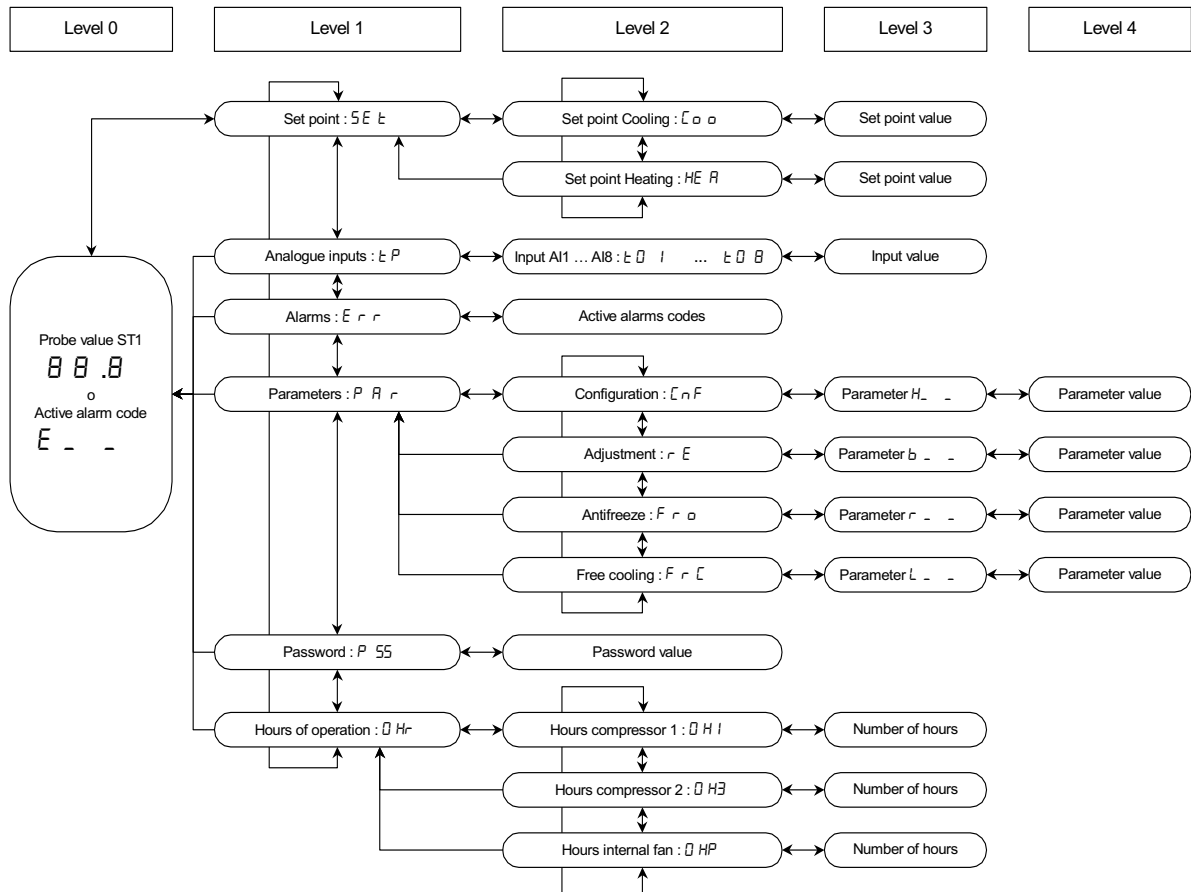
🔦	off	adjustment resources off
	green	adjustment resources active
⚙️	off	standby
	green	cooling
	red	heating
🌀	off	inside fan off
	green	inside fan active
	red	alarm status



Menu structure

The menu of the control system has a tree structure based on four different levels. By scrolling the menu with the “mode” and “set” buttons it is possible to display and modify :

- set point
- analogue inputs (probes for temperature, humidity, CO₂ ...)
- active alarms
- operating parameters
- hours of operation



To go from one level to that below, press the “mode” and “set” buttons at the same time. To go to the level above, keep the two buttons pressed for at least 2 seconds.

To scroll the menu up and down, inside the same level, use the “mode” and “set” buttons respectively.

Adjustment and control

Inputs and outputs

To monitor the unit, the controller is equipped with the following inputs and outputs :

- Analogue inputs : 8
- Digital inputs : 11
- Analogue outputs : 3
- Digital outputs : 8

DESCRIPTION			CHARACTERISTICS
Analogue inputs			
AI1	STR	T _{s.b. probe} inlet air	NTC temperature sensor (-30°C ÷ 90°C)
AI2	STM	T _{s.b. probe} outlet air	NTC temperature sensor (-30°C ÷ 90°C)
AI3	SL1	fluid probe circuit 1	NTC temperature sensor (-30°C ÷ 90°C)
AI4	STE	T _{s.b. probe} outside air	NTC temperature sensor (-30°C ÷ 90°C)
AI5	CO2	CO ₂ probe	live input : 0 ÷ 5 Vdc
AI6	SL2	fluid probe circuit 2	NTC temperature sensor (-30°C ÷ 90°C)
AI7	SUR	inlet air humidity probe	input current : 4 ÷ 20 mA
AI8	SUE	outside air humidity probe	input current : 4 ÷ 20 mA
Digital inputs			
ID1	PA1	High pressure switch circuit 1	voltage free digital input
	TCP1	Compressor thermal cut-out 1	
	TVE1	External fans thermal cut-out circuit 1	
ID2	PB1F	Low pressure switch circuit 1 - cooling	voltage-free digital input
	PB1C	Low pressure switch circuit 1 - heating	
	SEQ	Sequence meter	
ID3	PA2	High pressure switch circuit 2	voltage-free digital input
	TCP2	Compressor thermal cut-out 2	
	TVE2	External fans thermal cut-out circuit 2	
ID4	PB2F	Low pressure switch circuit 2 - cooling	voltage-free digital input
	PB2C	Low pressure switch circuit 2 - heating	
ID5	TVI	Internal fan thermal cut-out	voltage-free digital input
	TVR	Inlet fan thermal cut-out	
ID6	PDF	Filters differential pressure switch	voltage-free digital input
ID7	TBRE	Heaters thermal cut-out	voltage-free digital input
	AMTG	Gas-fired heating module alarm	
ID8	ECO	Economy mode	voltage-free digital input
ID9	EF	Shutter forced opening	voltage-free digital input
ID10	ON-OFF	Remote On-Off	voltage-free digital input
ID11	E-I	Remote Cooling- Heating	voltage-free digital input
Analogue outputs			
TC1	VE1	External fans circuit 1	PWM output for external module
TC2	VE2	External fans circuit 2	PWM output for external module
AN3	SR	Outside air shutter	output voltage: 0 ÷ 10 Vdc
Digital outputs			
RL1	CP1	compressor circuit 1	relays 5 A resistive 230V~ (1/4 hp 230V~; 1/8 hp 125V~)
RL2	CP2	compressor circuit 2	relays 5 A resistive 230V~ (1/4 hp 230V~; 1/8 hp 125V~)
RL3	VIC1	Reverse cycle valve circuit 1	relays 5 A resistive 230V~ (1/4 hp 230V~; 1/8 hp 125V~)
RL4	VIC2	Reverse cycle valve circuit 2	relays 5 A resistive 230V~ (1/4 hp 230V~; 1/8 hp 125V~)
RL5	VI	Internal fan	relays 5 A resistive 230V~ (1/4 hp 230V~; 1/8 hp 125V~)
	VR	Inlet fan	
RL6	BRE	Heaters	relays 5 A resistive 230V~ (1/4 hp 230V~; 1/8 hp 125V~)
	MTG	Gas-fired heating module	
RL7	V3W	Hot water 3-way valve	relays 5 A resistive 230V~ (1/4 hp 230V~; 1/8 hp 125V~)
RL8	ALL	Alarm	relays 5 A resistive 230V~ (1/4 hp 230V~; 1/8 hp 125V~)

Controller technical data

Description	Typical	Min.	Max.
Power supply voltage *	12.0 V~	10.8 V~	13.2 V~
Power supply frequency	50 Hz / 60 Hz	-	-
Power	11 VA	-	-
Insulation class	1	-	-
Protection rating	Front IP0	-	-
Ambient operating temperature	25 °C	-10 °C	60 °C
Ambient operating humidity (non-condensing)	30 %	10 %	90 %
Ambient storage temperature	25 °C	-20 °C	85 °C
Ambient storage temperature (non-condensing)	30 %	10 %	90 %

* The controller is powered by a suitable isolation transformer.

Diagnostics and alarms

Alarm activation and reset

The controller can carry out complete diagnostics on the machine, detecting all operating anomalies and signalling a number of alarms.

Activation of an alarm involves :

- blocking of loads concerned
- indication of alarm code of the display

Alarms that can damage the unit or system require manual resetting or an intervention by the operator to reinstate the controller by pressing the “set” button. It is advisable to carefully check the cause of the alarm and make sure the problem has been eliminated before restarting the unit.

Less critical alarms are automatic reset . As soon as the cause of the alarm has been eliminated the unit resumes working and the alarm code goes off the display. Some of these alarms become manual reset if the events per hour exceed a given limit.

Events per hour

The count of events is provided for some alarms : if the number of events in the last hour has reached a limit, the alarm goes from automatic to manual reset.

Alarm sampling occurs every 225 seconds. If an alarm is activated several times in a sampling period (225 seconds), it is counted only once.

Example. If a number of events per hour equal to 3 is set, for the alarm to go from automatic to manual it must have a duration of between 2*225 seconds and 3*225 seconds.

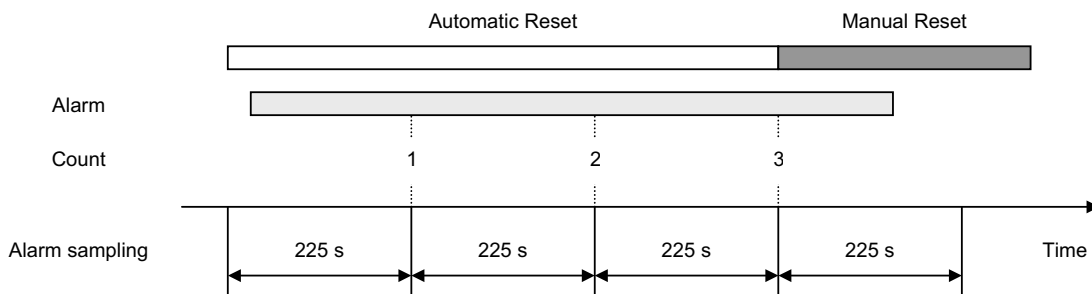


Table of alarms

CODE	ALARM	RESET ⁽¹⁾	INPUT	Loads BLOCKED									
				compressor circuit 1	compressor circuit 2	Reverse cycle valve circuit 1	Reverse cycle valve circuit 2	Internal fan Inlet fan	Heaters Gas-fired heating module	Hot water 3-way valve	External fans circuit 1	External fans circuit 2	Outside air shutter
				RL1	RL2	RL3	RL4	RL5	RL6	RL7	TC1	TC2	AN3
E00	Remote ON-OFF	A	ID10	x	x			x	x	x	x	x	x
E01	High pressure circuit 1 Compressor thermal cut-out circuit 1 External fans thermal cut-out circuit 1	M	ID1	x									
E02	Low pressure circuit 1 Sequence meter	AS (3)	ID2	x							x		
E05	Outlet air low temperature	AS (3) ⁽²⁾	AI2	x	x						x	x	
E06	Outlet air temperature probe fault	A	AI2	x	x			x	x		x	x	x
E07	Fluid probe fault circuit 1	A	AI3	x	x			x			x	x	x
E21	High pressure circuit 2 Compressor thermal cut-out circuit 2 External fans thermal cut-out circuit 2	M	ID3		x							x	
E22	Low pressure circuit 2	AS (3)	ID4		x							x	
E26	CO2 probe fault	A	AI5	x	x			x	x	x	x	x	x
E27	Fluid probe fault circuit 2	A	AI6	x	x			x			x	x	
E40	Inlet air temperature probe fault	A	AI1	x	x			x	x	x	x	x	x
E41	Filters differential pressure switch	M	ID6	x	x			x	x	x	x	x	x
E42	Outside air temperature probe fault	A	AI4	x	x			x	x	x	x	x	x
E43	Internal fan thermal cut-out Inlet fan thermal cut-out	M	ID5	x	x			x	x	x			
E46	Inlet air high temperature	A	AI1	x	x				x	x	x	x	
E48	Inlet air humidity probe fault	A	AI7										
E49	Outside air humidity probe fault	A	AI8										
E63	Heaters thermal cut-out Gas-fired heating module alarm	M	ID7						x				

⁽¹⁾ A = automatic reset , M = manual reset , AS (x) = automatic until reaching x events per hour, then manual

⁽²⁾ Manual reset can also be carried out by means of remote On-Off (ID10) or remote Cooling-Heating (ID11)

Adjustment and control

Alarm diagnostics

Intervention of a safety device indicates an operation fault. Before resetting the alarm it is necessary to carry out a check and eliminate the cause of the alarm.

Given below is a list of possible problems and causes, as a troubleshooting guide for some faults that could occur in the unit. The list does not cover all possible faults.

ALARM	CAUSE	POSSIBLE ACTION OR CHECK
<p>E00</p> <p>remote ON-OFF</p>	<ol style="list-style-type: none"> 1. remote ON-OFF digital input open. 2. No bridge between the remote ON-OFF control digital input terminals. 	<ol style="list-style-type: none"> 1. If using the remote ON-OFF control, close the selector connected to the corresponding digital input or check the programmer clock settings. 2. If not using the remote ON-OFF control, insert a jumper between the terminals of the corresponding digital input. <p>Remember to check the electrical connections at the remote ON-OFF control input terminals. A faulty or loose connection, even if seeming correct, can trigger the alarm.</p>
<p>E01</p> <p>High pressure circuit 1</p> <p>Compressor thermal cut-out circuit 1</p> <p>External fans thermal cut-out circuit 1</p> <p>E21</p> <p>High pressure circuit 2</p> <p>Compressor thermal cut-out circuit 2</p> <p>External fans thermal cut-out circuit 2</p>	<ol style="list-style-type: none"> 1. Pressure switch fault or not correctly set. 2. Presence of non-condensable substances in the refrigerant circuit. The symptoms are : <ul style="list-style-type: none"> - poor refrigerating capacity - excessive difference between the air temperature and the dew point (over 20°C) - high evaporation pressure - high subcooling - presence of bubbles on the fluid indicator 3. Excessive refrigerant charge. The symptoms are: <ul style="list-style-type: none"> - high evaporation pressure - high subcooling - high condensation pressure 4. Finned coils clogged or dirty. 5. Operating temperature outside the operating limits provided for. 6. Treated air flow excessive (in cooling) or insufficient (in heating). 7. Unit not correctly installed. 8. External fans faulty. 9. External fan speed adjustment system inefficient. 	<ol style="list-style-type: none"> 1. With a pressure gauge on the pressure point provided on the compressor delivery piping, check the pressure switch intervention setting value and the reset value. 2. Carry out refrigerant recovery, vacuum and charge. 3. Reduce the refrigerant charge 4. Remove the dirt and any obstructions covering the pipes and fins of the coils and that prevent correct heat exchange. 5. Make sure the temperatures of the outside air and the treated air are within the unit's operating limits. 6. Make sure the treated air flow is between the max. and min. values provided for. Make sure the inlet and outlet ducts are open and free of obstructions. Check the state of the filters for the treated air. Check the setting of the internal fan transmission and belt tension. 7. Make sure the unit is installed respecting the minimum required operating spaces. Make sure the external coil is not exposed to direct sunlight, no hot air is directed towards the coil, and that there is no recirculation of air expelled by the fans. 8. Check for any obstructions on the fan blades. Check the electrical windings and replace any damaged fans. 9. Check the ventilation control PCBs and replace them if necessary. Check the positioning of the fluid probes and their integrity. Check the ventilation parameters. <p>A quick test for checking the presence of incondensables in the refrigerant circuit consists of comparing the saturated dew point (measured with a pressure gauge on the high pressure point) with the ambient temperature, with the unit stopped and after the temperature of the refrigerant fluid has had time to balance itself with the temperature of the air surrounding the condenser. If the temperature indicated by the pressure gauge exceeds the measured ambient temperature by 2°C this means there are traces of incondensables in the circuit. The greater the difference in temperature, the greater the quantity of incondensables present.</p>
<p>E02</p> <p>Low pressure circuit 1</p> <p>Sequence meter</p> <p>E22</p> <p>Low pressure circuit 2</p>	<ol style="list-style-type: none"> 1. Pressure switch faulty or not correctly set. 2. Dehydrator filter on the fluid line clogged. 3. Low refrigerant charge. The symptoms are: <ul style="list-style-type: none"> - low evaporation pressure - high overheating - low or no subcooling - presence of bubbles on the fluid indicator 4. Finned coils obstructed or dirty. 5. Operating temperature outside the operating limits provided for. 6. Treated air flow excessive (in heating) or insufficient (in cooling). 7. Unit not correctly installed. 8. External fans faulty (in heating). 9. External fan speed adjustment system inefficient (in heating). 10. Phase sequence at supply terminals incorrect. 	<ol style="list-style-type: none"> 1. With a pressure gauge on the pressure point provided on the compressor inlet piping, check the pressure switch intervention setting value and the reset value. Carry out the check for both low pressure switches during operation in cooling. 2. Replace the dehydrator filter. 3. Increase the refrigerant charge. 4. Remove the dirt and any obstructions covering the pipes and fins of the coils and that prevent correct heat exchange. 5. Make sure the temperatures of the outside air and the treated air are within the unit's operating limits. 6. Make sure the treated air flow is between the max. and min. values provided for. Make sure the inlet and outlet ducts are open and free of obstructions. Check the state of the filters for the treated air. Check the setting of the internal fan transmission and belt tension. 7. Make sure the unit is installed respecting the minimum required operating spaces. Make sure the external coil is not exposed to flows of cold air or recirculation of air expelled by the fans. 8. Check for any obstructions on the fan blades. Check the electrical windings and replace any damaged fans. 9. Check the ventilation control PCBs and replace them if necessary. Check the positioning of the fluid probes and their integrity. Check the ventilation parameters. 10. Invert two phases at the unit's supply terminals. <p>The lack of refrigerant in the system is generally caused by leaks. Therefore the leak points must be identified by pressurising the circuit. Carry out repair, vacuum and reinstate the refrigerant charge necessary</p>

Adjustment and control

ALARM	CAUSE	POSSIBLE ACTION OR CHECK
		for efficient operation of the unit.
E05 Low outlet air temperature	IN COOLING 1. Insufficient treated air flow. IN HEATING 2. Operating temperature outside the operating limits provided for. 3. Excessive opening of outside air shutter. 4. Excessive percentage of renewal air.	1. Make sure the treated air flow is between the max. and min. values provided for. Make sure the inlet and outlet ducts are open and free of obstructions. Check the state of the filters for the treated air. Check the setting of the internal fan transmission and belt tension. 2. Make sure the temperature of the treated air is within the unit's operating limits. 3. Make sure the outside air shutter is not obstructed or blocked. Check the operation of the relevant servomotor. 4. Check the shutter minimum opening value (Par L07) and reduce it if necessary.
E06 Outlet air temperature probe fault	1. Probe shorted or disconnected. 2. Temperature outside the probe limits (-30°C ÷ 90°C). 3. Probe electrical connection faulty or loose.	1. Check the probe as described in the section "Probe characteristics" and replace it if necessary. 2. With a thermometer check if the temperature is outside the probe limits. 3. Check the probe electrical connections. If the operating temperature is correct the probe is not faulty and the alarm remains; the electronic controller could be damaged.
E07 Fluid probe fault circuit 1	1. Probe shorted or disconnected. 2. Temperature outside the probe limits (-30°C ÷ 90°C). 3. Probe electrical connection faulty or loose.	1. Check the probe as described in the section "Probe characteristics" and replace it if necessary. 2. With a thermometer check if the temperature is outside the probe limits. 3. Check the probe electrical connections. If the operating temperature is correct the probe is not faulty and the alarm remains; the electronic controller could be damaged.
E26 CO ₂ probe fault	1. Sensor damaged. 2. Electrical connection faulty or loose.	1. Check the instrument and replace it if necessary. 2. Check the probe electrical connections (power supply and output signal).
E27 Fluid probe fault circuit 2	1. Probe shorted or disconnected. 2. Temperature outside the probe limits (-30°C ÷ 90°C). 3. Probe electrical connection faulty or loose.	1. Check the probe as described in the section "Probe characteristics" and replace it if necessary. 2. With a thermometer check if the temperature is outside the probe limits. 3. Check the probe electrical connections. If the operating temperature is correct the probe is not faulty and the alarm remains; the electronic controller could be damaged.
E40 Inlet air temperature probe fault	1. Probe shorted or disconnected. 2. Temperature outside the probe limits (-30°C ÷ 90°C). 3. Probe electrical connection faulty or loose.	1. Check the probe as described in the section "Probe characteristics" and replace it if necessary. 2. With a thermometer check if the temperature is outside the probe limits. 3. Check the probe electrical connections. If the operating temperature is correct the probe is not faulty and the alarm remains; the electronic controller could be damaged.
E41 Filters differential pressure switch	1. Dirty filters. 2. Insufficient treated air flow. 3. Electrical connection faulty or loose. 4. Incorrect intervention limit setting. 5. Faulty pressure switch.	1. Check the state of the filters and clean or change them if necessary. 2. Make sure the treated air flow is between the max. and min. values provided for. Make sure the inlet and outlet ducts are open and free of obstructions. Check the setting of the internal fan transmission and belt tension. 3. Check the pressure switch electrical connections. 4. Check the pressure switch setting and make sure the set value is compatible with the type of filters fitted. 5. Replace the pressure switch.
E42 Outside air temperature probe fault	1. Probe shorted or disconnected. 2. Temperature outside the probe limits (-30°C ÷ 90°C). 3. Probe electrical connection faulty or loose.	1. Check the probe as described in the section "Probe characteristics" and replace it if necessary. 2. With a thermometer check if the temperature is outside the probe limits. 3. Check the probe electrical connections. If the operating temperature is correct the probe is not faulty and the alarm remains; the electronic controller could be damaged.
E43	1. Electrical connections faulty or loose. 2. Electric motor damaged. 3. Transmission damaged or not correctly adjusted.	1. Check the electrical connections inside the electrical panel and in the electric motor box. Check the electrical panel fuses 2. Check the continuity of the electric motor winding. 3. Check the setting of the fan transmission and belt tension.

Adjustment and control

ALARM	CAUSE	POSSIBLE ACTION OR CHECK
Internal fan thermal cut-out Inlet fan thermal cut-out	4. Fan blocked or damaged. 5. Excessive treated air flow.	4. Make sure the fan blades are not obstructed and that the shaft is free to turn. 5. Make sure the treated air flow is between the max. and min. values provided for.
E46 Inlet air high temperature	Active only in COOLING. 1. Operating temperature outside the operating limits provided for. 2. Incorrect positioning of inlet air temperature probe. 3. Incorrect reading of inlet air temperature probe.	1. Make sure the temperature of the treated air is within the unit's operating limits. 2. Make sure the inlet air temperature probe is placed in the special seat. 3. Check the probe as described in the section "Probe characteristics" and replace it if necessary.
E48 Inlet air humidity probe fault	1. Sensor damaged. 2. Electrical connection faulty or loose.	1. Check the instrument and replace it if necessary. 2. Check the probe electrical connections (power supply and output signal).
E49 Outside air humidity probe fault	1. Sensor damaged. 2. Electrical connection faulty or loose.	1. Check the instrument and replace it if necessary. 2. Check the probe electrical connections (power supply and output signal).
E63 Heaters thermal cut-out Gas-fired heating module alarm	1. Insufficient treated air flow. 2. Gas-fired heating module shut-down.	1. Make sure the treated air flow is between the max. and min. values provided for. Make sure the inlet and outlet ducts are open and free of obstructions. Check the setting of the internal fan transmission and belt tension. 2. Consult the specific documentation of the gas-fired heating module for complete diagnostics.

Functions available for the user

Set point

The set point value in COOLING and in HEATING can be set. These values must come within a predetermined max. and min. value. The task of the controller is to keep the inlet air temperature as close as possible to the set value by activating the available compressors according to an on-off logic.

Operating mode selection

Operating mode (cooling or heating) selection can occur in two ways :

- selection from keyboard (Pa H49 = 0)
- selection from digital input (Pa H49 = 1)

Serial communication

The device is configured to be able to communicate on a serial line using the MODBUS protocol. When connecting the device it must be given an address univocally identifying it among all the devices connected to the same serial line ("Modbus individual address"). This address must be between 1 and 247 and is configurable by means of the parameters Pa H67 and Pa H68 (see the section on serial communication).

Operation with heat pump

The parameter Pa H10 enables operation with heat pump when it assumes value 1. This parameter must assume value 0 for all cooling-only units. It is possible to set an outside air temperature value (Pa r13) below which operation with heat pump is blocked (the heaters, hot water coil or the gas-fired heating module remain active in any case, if present).

Heaters

Antifreeze

The heating elements are activated according to a specific set point, differentiated for heating (Pa r07) and cooling (Pa r08) mode. These values must come within a predetermined max. and min. value. Adjustment occurs on the inlet air temperature.

Integration

The parameter Pa r15 enables operation of the heating elements to integrate the heat pump when it assumes value 1.

Free cooling

To enable the free cooling function the parameter Pa L01 must assume value 1.

Shutter minimum opening

The minimum opening of the outside air shutter can be set by means of the parameter Pa L07 (between 0 and 100%) according to the required percentage of renewal air and the characteristics of the inlet duct. For the shutter to open, free cooling must be enabled (Pa L01 = 1).

Dehumidification

In cooling mode the dehumidification function can be managed if an inlet air humidity probe is provided for (or if the enthalpic free cooling option was selected). The humidity set point can be set between 0 and 100% by means of the parameter Pa L19.

If the heaters or hot water coil are present it can be enabled during dehumidification (to obtain after-heating) by setting the parameter Pa r16 to 1.

Night purging

This function enables an inside air change to be carried out and can only be activated by means of the remote thermostat (EKF400 RT type keyboard). If the outside air temperature is higher than the night purging set point (Pa L24) the outside air shutter is opened 100% and the internal fan is activated for a time indicated by the parameter Pa L23. The function is not available if any other type of temperature control is in progress.

Air quality control (CO₂)

This function controls opening of the outside air shutter according to the quantity of CO₂ measured in the inlet air. The set point can be set by means of the parameter Pa L26, between 0 (corresponding to 0 ppm) and 100 (corresponding to 1000 ppm).

Ventilation mode

This function enables activation of the internal fan, deactivating all the adjustment logics except for free cooling (if enabled : Pa L01 = 1). It can only be activated by means of the remote thermostat (EKF400 RT type keyboard).

Economy mode

This function allows the set point in cooling and in heating to be modified by adding or subtracting a delta (Pa L25) to guarantee more efficient operation of the unit. It can be activated by means of the digital input ID8 or the remote thermostat (EKF400 RT type keyboard). Economy mode remains activated while the digital input is active (contact open).

Shutter forced opening

This function enables forced opening (100%) of the outside air shutter, irrespective of the other active adjustment logics (this function also has priority over the alarms). The digital input used is ID9. If the input is active (contact open) the shutter is completely open.

Remote ON - OFF

This function allows the machine to be switched on or off at a distance. The digital input used is ID10. If the input is active (contact open) the controller switches off all loads and the display shows "E00".

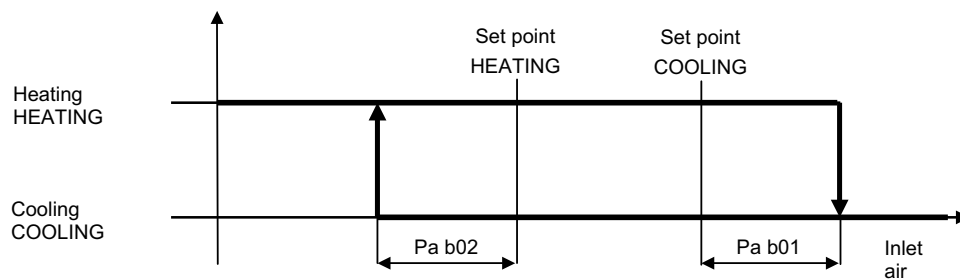
The unit remains OFF while the input is active and cannot be controlled from keyboard.

Remote Cooling - Heating

This function allows remote switching of the machine operating mode and is enabled only if Pa H49 = 1. The digital input used is ID11. If the input is active (contact open) the selected operating mode is Heating.

Automatic mode

This function enables automatic switching between the cooling and heating modes according to the inlet air temperature and set points. It can be activated by means of the remote thermostat (EKF400 RT type keyboard) or setting the parameter Pa H49 to 2.



Recording hours of operation

The controller can record in the non-volatile memory the hours of operation of :

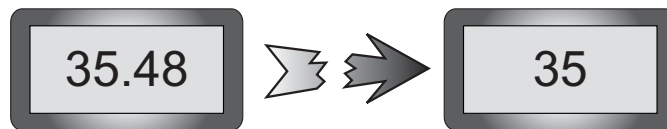
- compressors
- internal fan

The internal resolution is in minutes. The values are visible in the special menu with label $\square hr$ (see menu structure).The whole value is displayed for values below 999 hours; for higher values the hours/100 are displayed and the decimal point lights up.

Example. 1234 hours are indicated as follows :

12.3

The hours are reset by pressing the set button for 2 seconds, while the hours of operation are displayed. In case of a power failure the last hour fraction recorded is set to 0, therefore the hour count is rounded off to the lowest figure.



Power failure

In case of a power failure, when the power is restored the control goes to the status existing prior to the failure. If a defrost is in progress the procedure is cancelled. All timings in progress are cancelled and reinitialised.

Adjustment and control

Probe characteristics

NTC10K-25°C type temperature probes are used.

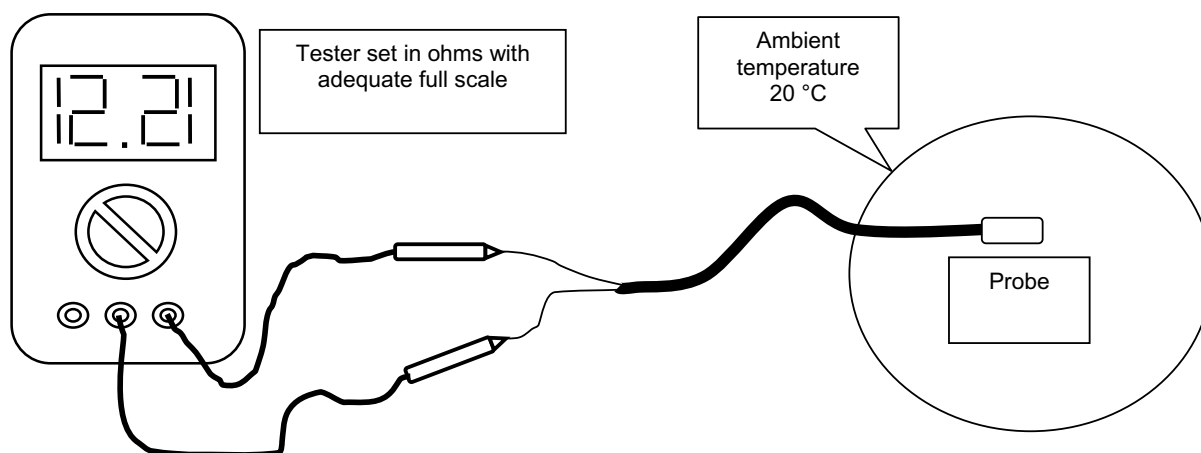
When the probe bulb is at the temperature of 25°C the electrical resistance at the probe ends measurable with a multimeter is approx. 10 kΩ. The thermistor of these probes is at a negative temperature: the electrical resistance value decreases with the increase in temperature.

To verify if a probe is faulty or disconnected, check the agreement between the resistance value in kΩ and the temperature of the bulb in °C according to the following table.

Temperature [°C]	Resistance [kΩ]	Temperature [°C]	Resistance [kΩ]	Temperature [°C]	Resistance [kΩ]
0	25.7950	20	12.2110	40	5.7805
1	24.8483	21	11.7628	41	5.5683
2	23.9363	22	11.3311	42	5.3640
3	23.0578	23	10.9152	43	5.1671
4	22.2115	24	10.5146	44	4.9774
5	21.3963	25	10.1287	45	4.7948
6	20.6110	26	9.7569	46	4.6188
7	19.8546	27	9.3988	47	4.4493
8	19.1259	28	9.0539	48	4.2860
9	18.4239	29	8.7216	49	4.1287
10	17.7477	30	8.4015	50	3.9771
11	17.0963	31	8.0931	51	3.8312
12	16.4689	32	7.7961	52	3.6906
13	15.8644	33	7.5100	53	3.5551
14	15.2822	34	7.2343	54	3.4246
15	14.7213	35	6.9688	55	3.2989
16	14.1810	36	6.7131	56	3.1779
17	13.6605	37	6.4667	57	3.0612
18	13.1592	38	6.2293	58	2.9489
19	12.6762	39	6.0007	59	2.8406

For a reliable check is not essential to control every single value but just several sample values. If the instrument indicates infinite resistance it means that the probe is disconnected.

Example. With a temperature of 20°C on the probe, the ohmmeter display will indicate approx. 12.21 kΩ



SERIAL COMMUNICATION

The unit can communicate on a serial line using the Modbus communication protocol with RTU coding.

With the "Modbus Kit", supplied as an accessory, the unit can be connected to an RS485 network and meet the requirements of any master device connected to the network

Serial line settings

The serial line must be set in the following way :

- baud rate : 9600
- data bits : 8
- stop bits : 1
- parity : even

All the devices connected to the same serial line MUST use the same settings.

Device address

To communicate correctly, each device connected to the serial network must have a univocal address ("Modbus individual address") between 1 and 247. This address can be set by modifying the following parameters :

- family serial address H67
- device serial address H68

These parameters can assume a value between 0 and 14 and together define the address of the device :

$$\text{Device address} = \text{H67} \times 16 + \text{H68}$$

Example.

H67 = 1 Hex 01
 H68 = 12 Hex 0C
 Device address = 28 Hex 1C

Modbus commands

The Modbus commands implemented by the controller are :

- read parameters 3 (Hex 03 : Read Holding Registers)
- write parameters 16 (Hex 10 : Write Multiple Registers)

Table of addresses

All the available resources are stored in the controller as a WORD (2 bytes) and therefore require the reading or writing of an entire Modbus register. According to the Modbus protocol, to identify a register of address X the address X-1 must appear in the message.

Some messages contain more than one piece of information : in this case the bits representing the value of the resource are identified by the number of bits used ("Bit number") and the least significant bit ("Lsb"). In writing such registers it is necessary to read the current register value, modify the bits representing the relevant resource and rewrite the entire register.

Example.

Bit number = 4
 Lsb = 7
 Resource value = 3

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	0	1	1	0	1	0	0	1	1	1	0	1	1	0	1	0

Some resources can only be read (R) whereas other can also be written (RW).

To interpret the value written in the register it is necessary to consider the value of CPL, EXP and UM :

CPL : if the register represents a number with sign (CPL = Y) carry out the following conversion :

0 = register value < 32767 : resource value = register value
 32768 = register value < 65535 : resource value = register value - 65536

EXP : indicates the exponent of the power of 10 to multiply by the register value to obtain the resource value.

EXP	Multiplier	
-2	10^{-2}	0.01
-1	10^{-1}	0.1
0	10^0	1
1	10^1	10
2	10^2	100

MU : indicates the unit of measure of the resource

IMPORTANT. DO NOT modify any parameter not indicated in the tables provided or indicated as a read-only parameter (R), otherwise the warranty will be invalidated.

Serial communication

Label	Description	RW	Register address		Bit number	Lsb	CPL	EXP	UM
			Dec	Hex					
-	Cooling set point	RW	2049	0801	16	0	Y	-1	°C
-	Heating set point	RW	2050	0802	16	0	Y	-1	°C
H10	Enable heat pump	RW	2060	080C	16	0	N	0	-
H49	Operating mode selection configuration	RW	2099	0833	16	0	N	0	-
H67	Family serial address	RW	2117	0845	16	0	N	0	-
H68	Device serial address	RW	2118	0846	16	0	N	0	-
b01	Automatic operating mode hysteresis in cooling	RW	2168	0878	16	0	N	-1	°C
b02	Automatic operating mode hysteresis in heating	RW	2169	0879	16	0	N	-1	°C
r07	Antifreeze heaters set point in heating	RW	2210	08A2	16	0	Y	0	°C
r08	Antifreeze heaters set point in cooling	RW	2211	08A3	16	0	Y	0	°C
r13	Heat pump shut-down set point	RW	2216	08A8	16	0	Y	0	°C
r15	Enable heaters in heating	RW	2218	08AA	16	0	N	0	-
r16	Enable heaters in dehumidification	RW	2219	08AB	16	0	N	0	-
L01	Enable free cooling	RW	2252	08CC	16	0	N	0	-
L07	Shutter min. opening	RW	2258	08D2	16	0	N	0	%
L19	Dehumidification set point	RW	2270	08DE	16	0	N	0	%
L23	"Night purging" duration	RW	2274	08E2	16	0	N	1	min.
L24	"Night purging" set point	RW	2275	08E3	16	0	Y	0	°C
L25	"Economy" mode differential	RW	2276	08E4	16	0	Y	-1	°C
L26	Shutter min. opening CO2 set point	RW	2277	08E5	16	0	N	0	%
t01	Inlet air temperature probe (STR)	R	4097	1001	16	0	Y	-1	°C
t02	Outlet air temperature probe (STM)	R	4098	1002	16	0	Y	-1	°C
t03	Fluid probe circuit 1 (SL1)	R	4099	1003	16	0	Y	-1	°C
t04	Outside air temperature probe (STE)	R	4100	1004	16	0	Y	-1	°C
t05	CO2 probe (CO2)	R	4101	1005	16	0	Y	1	ppm
t06	Fluid probe circuit 2 (SL2)	R	4102	1006	16	0	Y	-1	°C
t07	Inlet air humidity probe (SUR)	R	4103	1007	16	0	Y	0	%
t08	Outside air humidity probe (SUE)	R	4104	1008	16	0	Y	0	%
-	Shutter opening	R	14339	3803	16	0	N	0	%
-	COOLING mode activated *	RW	16525	408D	1	8	N	0	-
-	HEATING mode activated *	RW	16525	408D	1	9	N	0	-
-	Unit status (1 = ON ; 0 = OFF)	RW	16525	408D	1	15	N	0	-
-	Alarm E00	R	17089	42C1	1	8	N	0	-
-	Alarm E02	R	17089	42C1	1	10	N	0	-
-	Alarm E05	R	17089	42C1	1	13	N	0	-
-	Alarm E06	R	17089	42C1	1	14	N	0	-
-	Alarm E07	R	17089	42C1	1	15	N	0	-
-	Alarm E22	R	17089	42C1	1	2	N	0	-
-	Alarm E26	R	17089	42C1	1	5	N	0	-
-	Alarm E27	R	17089	42C1	1	6	N	0	-
-	Alarm E40	R	17091	42C3	1	8	N	0	-
-	Alarm E42	R	17091	42C3	1	10	N	0	-
-	Alarm E46	R	17091	42C3	1	12	N	0	-
-	Alarm E48	R	17091	42C3	1	13	N	0	-
-	Alarm E49	R	17091	42C3	1	14	N	0	-
-	Alarm E01 - manual reset	R	17093	42C5	1	9	N	0	-
-	Alarm E02 - manual reset	R	17093	42C5	1	10	N	0	-
-	Alarm E05 - manual reset	R	17093	42C5	1	13	N	0	-
-	Alarm E21 - manual reset	R	17093	42C5	1	1	N	0	-
-	Alarm E22 - manual reset	R	17093	42C5	1	2	N	0	-
-	Alarm E41 - manual reset	R	17095	42C7	1	9	N	0	-
-	Alarm E43 - manual reset	R	17095	42C7	1	6	N	0	-
-	Alarm E63 - manual reset	R	17095	42C7	1	2	N	0	-

* If both operating modes are enabled by mistake the unit switches to OFF status.

MAINTENANCE

IMPORTANT. BEFORE CARRYING OUT ANY CLEANING OR MAINTENANCE OPERATIONS ON THE UNIT MAKE SURE THE POWER IS DISCONNECTED. ANY ROUTINE OR EXTRAORDINARY MAINTENANCE OPERATIONS GIVEN BELOW MUST BE CARRIED OUT BY SPECIALISED AND AUTHORISED PERSONNEL IN ORDER TO ENSURE COMPLIANCE WITH THE CURRENT SAFETY REGULATIONS.

This section is extremely important for lasting efficiency of the unit. Just a few operations performed periodically can prevent having to resort to interventions by specialised personnel. The operations to be carried out do not require particular technical knowledge and consist of simple checks of the unit's components.

Heat exchangers

Accidental contact with the exchanger fins can cause small cuts. Use special gloves to carry out the operations described below. The exchangers must be able to ensure maximum heat exchange, therefore their surfaces must always be free of dirt or dust which could form on them due to the action of the fans. Use a brush to remove all the impurities deposited on the surface of the exchanger. Use a compressed air jet to clean the aluminium surface of the exchanger, making sure to keep the jet parallel to the direction of the fins so as to avoid possible damage. If the aluminium fins have been bent, "comb" the exchanger with a special tool to eliminate any damage.

External fans

Before every seasonal start-up, check the fixing of the fans and respective grilles to the vibration-damping mounts and that these are properly secured to the structure of the unit. Insofar as possible, check any unbalance in the electric axial fan indicated by anomalous vibrations and noise.

Structure

To prevent possible anomalous vibrations and noise, make sure the various steel parts are secured and that the various inspection panels are properly fixed to the unit by means of the special $\frac{1}{4}$ turn closures. In case oxidation, treat the relevant parts of the unit with paints suitable for eliminating or reducing the problem. Periodical cleaning of all the internal metal surfaces in contact with the treated air is also advisable to limit the risk of Legionella.

Electrical part

Make sure there are no cuts, cracks or alternations on the power cable connecting the unit to the distribution board, that could compromise its insulation. Contact an authorised assistance centre if maintenance is necessary. Carefully check the tightness of all the electrical connections after an initial period of operation from first start-up and at every seasonal start-up or stop.

Air ducts

Make sure the fixing screws of the air ducts and the relevant structures are not loose. Loose screws are the source of vibrations and therefore noise. Check any vibration-damping systems installed on the air ducts to prevent the transmission of vibrations.

Internal exchanger condensate discharges

It is advisable to periodically check the state of the condensate drain tray and connections of the direct expansion coil and the collection tray and union present with the optional drip separator or the water coil. Dirt or deposits could give rise to dangerous clogging. Periodical cleaning of all these components in contact with the treated air is also advisable.

External exchanger condensate discharges

In winter operation, defrosting of the external exchanger through reversing the refrigerating cycle occurs periodically. During this phase make sure the water dripping from the finned pack can flow down regularly under the level of the machine and in particular that the drain union, fitted standard on all units, is not blocked. If the downflow is not correct, with particularly rigid temperatures a layer of ice could form over the base and compromise operation of the entire system.

Water coil (optional)

In the winter period always empty the water present in the finned-pack exchanger, when not used, by means of the special drain valves located at the bottom of the manifold and the exchanger itself. This operation prevents ice forming with consequent breakage in case of particularly low outside temperatures.

Air filters

Checking the filters is considered routine maintenance to be carried out according to the place where the unit is installed. It is advisable to carry out this operation weekly in particularly dusty places. All the units are fitted standard with pleated filter cells (G4 filtering class according to EN 779) having standard dimensions in order to be available from any manufacturer or dealer. For greater safety it is advisable to install, as an accessory, the differential pressure switch for indicating dirty filters. The filter section in the unit differs for its position in the respective construction configurations.

- In the standard configuration (VB) the filter section is located on the outside of the unit, suitably inserted in a special frame applied on the inlet. To clean the filters, proceed according to the instructions given below.
 1. Remove the prefilter frame closing side panel by loosening the special knurled wheels.
 2. Remove the filters positioned on special guides.
 3. Wash the filtering mat in lukewarm water and a normal detergent.
 4. Rinse thoroughly under running water.
 5. Dry the filtering baffles thoroughly and refit them in the special seats.
 6. Use a screwdriver to loosen the self-tapping screws joining the upper filtering cell to the lower, if replacement is necessary.
- In the other construction configurations available the filter section is located inside the unit, in the air mixing chamber of the additional module. For access and normal cleaning, remove the relevant foam panel.
 1. Remove the filter inspection foam panel by undoing the closures a ¼ turn with the special triangular wrench provided.
 2. Remove the standard filters positioned on special guides. Make sure to periodically check the state of the G4 pleated cells and carry out cleaning as described above or replacement when necessary. These operations are all-important also for better filtering efficiency of any rigid pocket filters present, and to increase the time intervals between replacing.
 3. Check the state of any rigid pocket filters present and replace whenever necessary, using a screwdriver to loosen the self-tapping screws joining the upper filtering cell to the lower with special restraint guides.
 4. Fit the filter inspection panel in its seat before starting the unit.

Transmission

To meet most installation needs the double suction centrifugal fans fitted on the unit are coupled to electric motors with a transmission system consisting of a belt, electric motor, fixed fan pulley and expanding motor pulley. All the components, sized for reliability and low maintenance, in any case require periodical checking in order to avoid possible extraordinary maintenance.

Belts

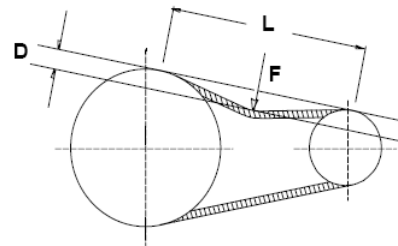
Check the alignment of the belts with the motor and fan pulleys. For the expanding pulleys always refer to the centre of the grooves and not the edge of the pulleys. Loosen the bolts fixing the motor feet and move them along the slots in the slide until obtaining correct alignment. If the ends of the slots are reached, also shift the slide along the fixing supports. Make sure the belt has not lifted and that it does not touch the bottom of the pulley grooves and, whenever two are provided for, that their lengths are equal. Check correct belt tension. Insufficient tension causes slipping, with consequent overheating and a significant shortening of its useful life. On the other hand, excessive tension subjects the belt to greater stresses than those permissible, with consequent reduction in its life, excessive strain on the supports and a reduction in bearing operation hours.

Belt tension can be varied by means of the worm screw of the slide, on which the electric motor is positioned, using a socket wrench or spanner. If specific instruments are not available for measuring the tension of the belts, the following approximate method can be used.

Measure the free section L, for each belt.

Using a torque wrench, apply a perpendicular force F in the middle of L able to cause a deflection D of 1.5 mm for every 100 mm of length L.

Make sure the applied force F is approx. 35-40 N.



- L = pulley centre distance [mm]
 - F = force [N]
 - D = elastic deviation [mm]
- $D = L \times 0.015$

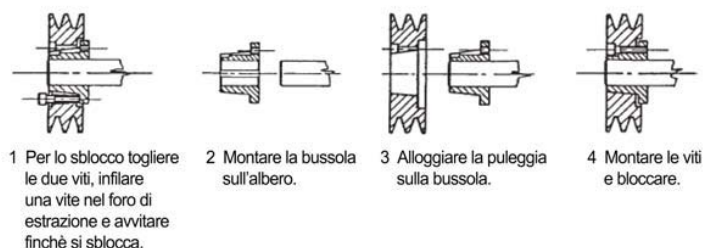
Pulleys

Avoid the conditions listed below, which could cause early wear of the pulleys (fixed or expanding).

- lack of alignment, lack of parallelism, breakage, high wear and lack of eccentricity
- dust, grease, dirt and also a high level of humidity which would cause the formation of condensate. These substances depositing between the surfaces of the belt and those of the pulley can cause the system to work in anomalous conditions.

Before adjusting the pulley, measure the actual work rolling pitch diameter and determine the required diameter, then remove the belt. For single-groove pulleys, loosen the locking screw of the movable disk and turn it on the threaded hub, checking the obtaining of the required rolling pitch diameter with the belt. Lightly oil the thread in case of sliding difficulty. Tighten the screws evenly, checking the alignment of the transmission, refit the belt and correctly tighten it. For pulleys with two grooves, proceed in the same way, carefully checking (measuring the opening with a gauge and measuring the work diameter of the belt) that the grooves are equally adjusted.

Periodically check groove wear. The working life of the pulleys mainly depends on correct performance of the belt tensioning and transmission alignment operations. After a certain period of operation the wear will in any case alter the geometric characteristics of the grooves (generally more pronounced in pulleys of smaller diameter) along with reduced life of the belts. In this case it is necessary to replace the most altered pulley or the entire transmission. For pulleys with taper-lock bushing, replacement is carried out as indicated in the following figure.



The shaft and taper fit must be cleaned but not greased. Oil the screws and tighten them evenly and alternately. To remove the pulleys without bushing, it is necessary to remove the fixing, consisting of :

- Grub screw on threaded hole in the hub, for the pulleys installed on fans.
- Screw and washer or cap, on threaded hole in the shaft, for the pulleys installed on motors.

Carefully clean the shaft before fitting the new pulley.

If the new pulleys are not supplied by us, make sure they are statically and dynamically balanced.

Electric motor

Regular cleaning of the electric motor ensures a longer life, since it increases the ability of the housing to dissipate the heat generated. The cooling air slots must always be kept free.

Inspection and maintenance intervals depend on operating and environmental conditions.

Bearings in good condition indicate low friction values and thus electrical absorption kept within the necessary minimum values, to the advantage of motor life. The basic theoretical fatigue life L_{10h} (in conformity with standard ISO 281/1 for bearings without additional axial radial loads) is over 50,000 hours. Those supplied are prelubricated double-shielded type.

A periodical check for any noise or possible whirring can reduce the need for maintenance operations. When ordering replacement parts, specify the code and type of motor indicated on the plate. The standardised components are available at all specialised dealers.

Internal fan

Regular general fan cleaning will ensure an optimum passage of air and therefore high efficiency. Bearings in good condition indicate low friction values, thus contributing to limiting electrical absorption, to the advantage of the electric motor, while also reducing the possibility of excessive wear of the drive belt.

The bearings of all the fans are chosen according to type and size to guarantee a life $L_{10h} = 40,000$ hours of work with reference to standard ISO 281/1. This value was calculated in the most unfavourable load conditions for the bearing, i.e. considering the max. permissible radial load. In the operating conditions in which the fans are generally used, the average life is much longer.

Seasonally, before starting the unit, check the fixing of the fans to the unit's structure.

Also make sure the fan wheel is perfectly straight and that it has not undergone dangerous unbalancing causing anomalous vibrations and noise.

REFRIGERANT SAFETY CARD

1 SUPPLIER COMPANY AND PRODUCT IDENTIFICATION

Card No.	FRIG 8
Product	R-410A
Supplier company identification	RIVOIRA SpA

2 COMPOSITION / INFORMATION ON INGREDIENTS

Substance / Preparation	Preparation
Components / Impurities	Contains the following components :
	Difluoromethane (R32) 50 % in weight
	Pentafluoroethane (R125) 50 % in weight
EEC No.	Non-applicable for mixtures
Trade-name	/

3 IDENTIFICATION OF HAZARDS

Identification of hazards	Liquefied gas. The vapours are heavier than air and can cause suffocation, reducing the oxygen available for breathing. Rapid evaporation of the fluid can cause freezing. Can cause cardiac arrhythmia.
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4 FIRST-AID MEASURES

Inhalation	Do not administer anything if the person has fainted. Take the person outdoors. Use oxygen or artificial respiration if necessary. Do not administer adrenaline or similar substances.
Contact with eyes	Rinse thoroughly with plenty of water for at least 15 minutes and see a doctor.
Contact with skin	Wash immediately with plenty of water. Immediately remove all contaminated garments.
Swallowing	Risk unlikely.

5 FIRE-PREVENTION MEASURES

Specific hazards	Increase in pressure.
Dangerous fumes	Halogen acids, traces of carbonyl halides.
Fire-extinguishing means usable	All the known fire-extinguishing means can be used.
Specific methods	Cool the containers/tanks with water sprays.
Special protection equipment	Use self-contained breathing apparatus in confined spaces.

6 MEASURES AGAINST ACCIDENTAL SPILLING OF THE PRODUCT

Personal protection	Evacuate personnel to safe areas. Provide for adequate ventilation. Use personal protection equipment
Protection for the environment	It evaporates.
Product removal methods	It evaporates.

7 HANDLING AND STORAGE

Handling and storage	Ensure an adequate air change and/or extraction in the workplaces. Only use well-ventilated rooms. Do not breathe vapours or aerosols. Carefully close the containers and keep them in a cool, dry and well-ventilated place. Keep in the original containers.
Incompatible products	Explosives, flammable materials, organic peroxides.

8 CONTROL OF EXPOSURE / PERSONAL PROTECTION

Personal protection	Ensure adequate ventilation, especially in closed areas.
Control parameters	Difluoromethane (R32): Recommended exposure limits: AEL (8h and 12h TWA) = 1000 ml/m ³ Pentafluoroethane (R125): Recommended exposure limits: AEL (8h and 12h TWA) = 1000 ml/m ³
Respiratory tract protection	For rescue and for maintenance works in tanks, use self-contained breathing apparatus. The vapours are heavier than air and can cause suffocation, reducing the oxygen available for breathing.
Eye protection	Total protection glasses.
Hand protection	Rubber gloves.
Hygiene measures	Do not smoke.

9 CHEMICAL-PHYSICAL PROPERTIES

Relative density, gas (air=1)	Heavier than air.
Solubility in water (mg/l)	Not known, but deemed very low.
Appearance	Colourless liquefied gas.
Odour	Similar to ether.
Fire point	Does not ignite.

10 STABILITY AND REACTIVITY

Stability and reactivity	No decomposition if used according to the special instructions.
Materials to be avoided	Alkali metals, alkali-earth metals, granulated metal salts, Al, Zn, Be, etc. in powder.
Hazardous products of decomposition	Halogen acids, traces of carbonyl halides.

11 TOXICOLOGICAL INFORMATION

Local effects	Concentrations substantially above the value TLV (1000 ppm) can cause narcotic effects. Inhalation of highly concentrated products of decomposition can cause respiratory insufficiency (pulmonary oedema).
Long-term toxicity	No carcinogenic, teratogenic or mutagenic effects have been recorded in experiments on animals.
Specific effects	Rapid evaporation of the fluid can cause freezing. Can cause cardiac arrhythmia.

12 ECOLOGICAL INFORMATION

Effects linked to ecotoxicity	Pentafluoroethane (R125) Potential global warming with halocarbitides; HGWP (R-11 = 1) = 0.84 Potential impoverishment of the ozone; ODP (R-11 = 1) = 0
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13 CONSIDERATIONS ON DISPOSAL

General	Do not dispose of where accumulation can be hazardous. Usable with reconditioning. The depressurised containers must be returned to the supplier. Contact the supplier if instructions for use are deemed necessary.
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Refrigerant safety card

14 INFORMATION FOR TRANSPORT

Designation for transport	LIQUEFIED GAS N.A.S. (DIFLUOROMETHANE, PENTAFLUOROETHANE)
UN No.	3163
Class/Div	2.2
ADR /RID No.	2, 2nd A
ADR/RID hazard no.	20
ADR label	Label 2 : non-toxic non-flammable gas.
CEPIC Groupcard	20g39 - A
Other information for transport	Avoid transport on vehicles where the loading zone is not separate from the cab. Make sure the driver is informed about the potential risk of the load and knows what to do in case of accident or emergency. Before starting transport, make sure the load is properly secured and : make sure the valve of the container is closed and does not leak; make sure the blind cap of the valve (when provided) is correctly fitted; make sure the cap (when provided) is correctly fitted and that there is an adequate ventilation passage; ensure compliance with the current provisions.

15 INFORMATION ON REGULATIONS

The product must not be labelled according to Directive 1999/45/EC.

Comply with the regulations given below, and the relevant applicable updates and amendments.

Circulars no. 46/79 and 61/81 of the Ministry of Labour : Risks related to the use of products containing aromatic amines

Leg. Decree no. 133/92 : Regulations on the discharge of hazardous substances in waters

Leg. Decree no. 277/91 : Protection of workers against noise, lead and asbestos

Law 256/74, Decree 28/1/92, Leg. Decree no. 52 dated 3/2/97, Decree dated 28/4/97 as amended : Classification, packing and labelling of hazardous substances and preparations

Decree no. 175/88, as amended : Activities with significant accident risks (Seveso Law)

Decree no. 203/88 : Emissions into the atmosphere

Decree no. 303/56 : Work hygiene

Decree no. 547/55 : Regulations on accident prevention

Leg. Decree no.152 dated 11/5/99 : Protection of waters

16 OTHER INFORMATION

Recommended uses Refrigerant

Can cause suffocation in high concentration.

Keep in a well-ventilated place.

Do not breathe the gas.

The risk of suffocation is often underestimated and must be clearly explained during the training of operators.

Ensure compliance with all the national and regional regulations.

Before using this product in any new process or trial, an in-depth study on safety and compatibility of the product with the materials must be carried out.

The above information is based on our current know-how and describes the product according to the safety requirements. It does not however represent a guarantee and assurance of the qualities in a legal sense. Each person responds personally for compliance with such regulations.

The information contained in this document is to be deemed valid at the time of printing. The company declines any liability for damage caused by use of the product in incorrect applications and/or conditions different from those provided for.



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FERROLI**

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