AERMEC

la prima per il clima

R410A

Roof-Top- Technical Installation manual

- UNIT FOR EXTERNAL INSTALLATION
- FOR HIGH CROWDING APPLICATIONS
- THERMODYNAMIC HEAT RECOVERY

RTY 01-10

EN

AERMEC
COMPANY QUALITY SYSTEM
ICIM
ISO 9001:2008 - Cert. n° 0128
CISQ IQNet
AERMEC S.P.A.

CE

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English

Index

Application of roof-tops

The units are intended for **applications in highly crowded** places ***such as cinemas, meeting rooms, restaurants, bars, discos, being intended*** for **operation with 80% outside** and expelled air ***(version MB3).***

The functions of the autonomous conditioning units of **the ROOF-TOP type, of high efficiency** ***are:***
1) air treatment;
2) filtering;
3) renewal (MB3);
4) heat recovery of exhaust air (MB3).

The units are distinguished by their **extraordinary compact** ***size and the*** simplicity with which they can be installed ***; in addition to this, the units include inside all the functions that in other traditional systems are delegated to multiple machines with*** **positive effects on the efficiency of the wholesystem.**
The new built-in functions provide temperature and humidity conditions that are as comfortable as possible so that the occupants are at ease, thereby improving the quality of life.

Some examples of application:

Cinema

Restaurant

Disco

Advantages of roof-tops in relation to the application

The system solutions available on the market, for the applications mentioned in the previous paragraph, can be quite varied. They range for example from split or multi-split systems (which, however have limitations in the treatment of primary air:
- restrictions on the possible contamination with coolant in the areas served by the pipework;
- energy efficiency not fully exploited due to the lack of the free-cooling function), to hydronic systems that ensure optimum air treatment, although at the expense of simplicity of installation and costs which are generally high.
Roof-top **units are plug&play** units designed in such a way as to minimize installation and maintenance. In fact, the sizing of the components, the hydraulic and electrical connections and testing are carried out by the manufacturer. The same units take full advantage of all the best technologies to **reduce the consumption** of the cooling or heating capacity and to reduce the ventilation consumption.

The **compactness of the unit** allows to reduce installation spaces while maintaining the possibility to accessorize the unit at any time for other needs of the customer.
Finally, another advantage of using rooftops is the **increase of the value of the property** on which they are installed; in fact, **the reduction of the global need for primary energy**, compared to traditional solutions, improves the energy performance of the building and therefore its market value, thus placing it at the top of the green building list provided for by the recent legislative framework.

Legal-legislative framework

The European Commission, with Directive 2009/28/EC of 23rd April 2009 on the promotion of energy from renewable sources, known as RES Directive, claimed that the "ambient heat" contained in Air, Water and Soil is a renewable source.

On 18th June 2010 the new Directive 2010/31/EC on energy performance of buildings was published in the Official Journal of the European Union.
The Directive promotes "the improvement of the energy performance of buildings within the European Union, taking into account local conditions and outdoor climate, as well as the requirements relating to indoor environment and effectiveness in terms of costs."
For this reason, no later than 31st December 2020 it is expected that all new buildings are "NEARLY ZERO ENERGY BUILDINGS."

This expression identifies high-energy performance buildings, the energy needs of which should be covered to a large extent by energy from renewable sources.

In this context, the RTY rooftop units are proposed as solutions that are energy efficient and qualifying for the plant, also contributing substantially to the respect of LEED credits.

The LEED certification recognizes, in a building, the method oriented to performance sustainability: the energy and water savings, the reduced CO2 emissions, the improvement the ecological quality of the interiors, the materials used.

LEED characteristics

At an international level, the LEED protocol of environmental sustainability is recognized for the definition and evaluation of the environmental sustainability of buildings.
It assesses the environmental performance of buildings during their total life cycle starting from their design to their construction and use.
The protocol can be applied for the evaluation of any type of building, commercial, institutional, residential: it can also be applied both for the construction of new buildings and the renovation of existing buildings.

The rating system is recognized by the international scientific community, and it is based on a classification in seven environmental categories:

1) Sustainability of the Site (1 prerequisite , max 26 points);
2) Water Management (1 prerequisite, max 10 points);
3) Energy and Environment (3 prerequisites, max 20 points);
4) Materials and Resources (1 prerequisite, max 14 points);
5) Indoor Environmental Quality (2 prerequisites, max 15 points);
6) Innovation in the Design and Regional Priority Processes (6 points max).

The sum of points or credits obtained can lead to 4 levels of certification of the building:

- Basic Certification: 40 -49 points
- Silver: 50 -59 points
- Gold: 60 -79 points
- Platinum: 80 points and over

• Prerequisite 2 of the Chapter ENERGY and ENVIRONMENT

The units comply with the provisions contained in ASHRAE Standard 90.1 - 2007; they specifically fulfil the values in Table 6.8.1 A / B of the American standard of reference for minimum energy efficiency.

• Prerequisite 3 of the Chapter ENERGY and ENVIRONMENT

In order to meet most of the national laws issued in the world in terms of refrigerant that does not belong to the categories CFC or HCFC, the units use the environmentally friendly refrigerant R410A.

• Credit 1 of the Chapter INDOOR ENVIRONMENTAL QUALITY

As an accessory, the unit can be equipped with a CO2/VOC sensor to keep under control the indoor air quality requirements and optimal ventilation.
In addition, the unit can also be equipped with the control of the air flow into the room (optional).
These two options can allow the building to obtain the credit for "monitoring the flow of fresh air" with the achievement of one point.

• Credit 2 of the Chapter INDOOR ENVIRONMENTAL QUALITY

Thanks to the ability to perform free-cooling/heating in temperature and/or enthalpy and the recovery of thermodynamic heat, the units achieve one point.

• Credit 5 of the Chapter INDOOR ENVIRONMENTAL QUALITY

Another point can be given to the building for the use of filter systems of high capacity. The roof-top units have the ability to use rigid bag filters F7, F9, or even electrostatic filters (comparable in efficiency to HEPA filters H10); in this way the occupants are guaranteed to be in an environment free of chemical pollutants and particulates.

• Credit 7 of the Chapter INDOOR ENVIRONMENTAL QUALITY

Thanks to the advanced temperature control technology, the use of roof-top units is rewarded with another point for the ability to create a thermally favourable environment; the use of humidifiers and post-heating coils ensure the management of the variables of interest ensuring maximum comfort.

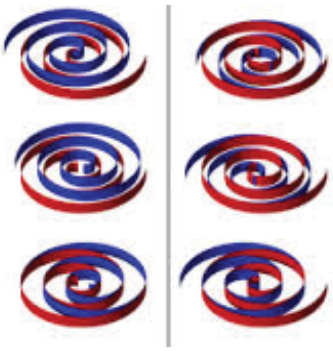
Efficiency of the refrigerant circuit

Scroll compressors

To improve the efficiency linked to the cooling circuit SCROLL compressors in "uneven" tandem configurations were adopted (except size 08).

This type of combination (compressors of different sizes) offers the possibility to have available the potential of each compressor depending on the real requirements of the machine. It appears, in fact, that the units are used at their full potential, both in the summer and during winter, only for short periods of the year.
For most of the operating time the units will be used to achieve the settings of SET-POINT thanks to the partialization of the compressors and to the functions of the control system, thus allowing greater flexibility to changes in climatic conditions and increasing the energy efficiency of partial loads.
The units achieve two objectives simultaneously:

- they provide maximum environmental comfort at any time;
- they achieve a high energy efficiency.



Electronic thermostatic valve

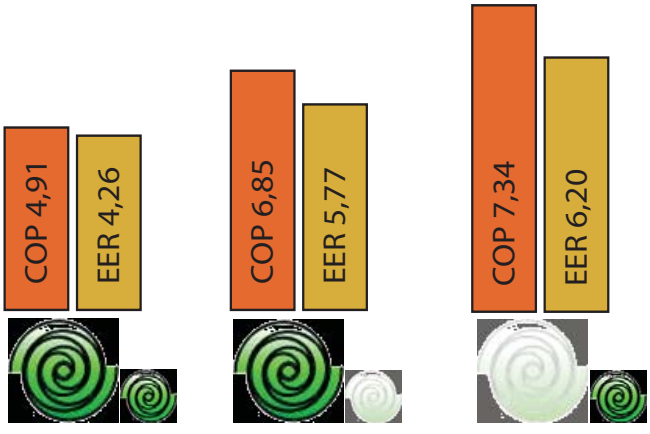
The use of this type of valve is particularly suitable and recommended on units that have to operate in conditions of very variable loads.
The use of the electronic thermostatic valve in fact allows you to:
- maximize the heat transfer to the evaporator;
- minimize the response time to changes in the load as much as possible while maintaining the use of the compressors stable and reliable;
- optimize superheat control for maximum energy efficiency.

By equipping the cooling system of an electronic thermostatic valve, the pressure oscillations decrease strongly and the reaction time is shortened, that is reduced to a few seconds. The advantages are greater the lower the percentage of required power is.

R410A Refrigerant gas

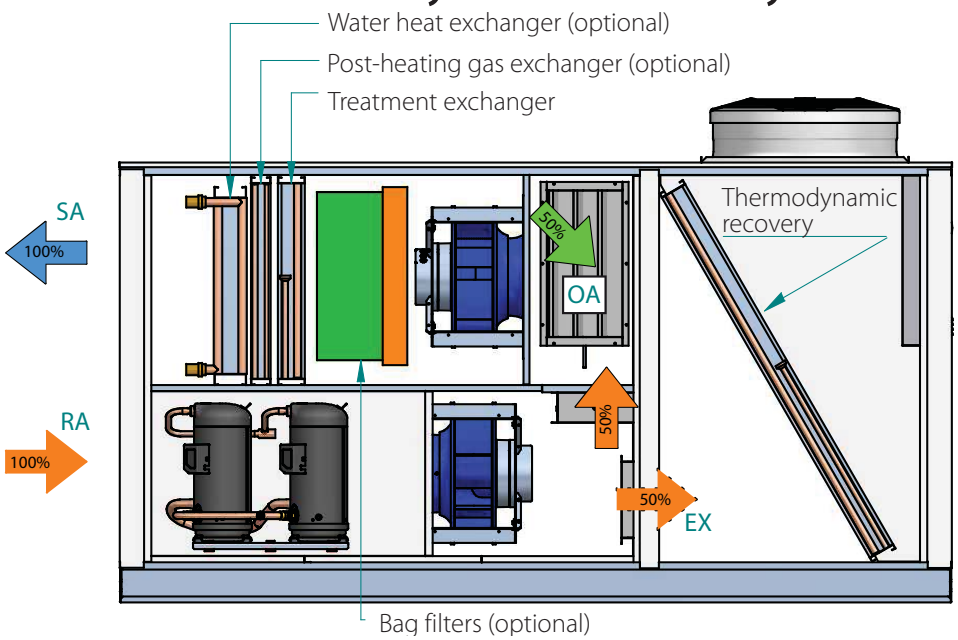
The 1995 Montreal Protocol banned various refrigerants, stating that they are dangerous to the integrity of the ozone layer of the Earth; the use of eco-friendly refrigerant gas is therefore the necessary change in this regard. The units use R410A refrigerant.

Effect of the sequential deactivation of the compressors



Example referred to the model RTY 13. COP and EER referred to the standard conditions given in the technical data.

Thermodynamic recovery - MB3



SA air flow;
OA outside air;
RA extracted air;
EX exhaust air.

Recovery of thermodynamic heat

The thermodynamic recovery in the AERMEC roof-top units, linked to the presence of the recovery ventilation, is characterized by a controlled ejection of the ambient air on the outdoor condenser coil, which leads to a positive impact on the efficiency of the unit as the following are achieved:
- the average temperature on the outdoor battery is more favourable and therefore there are lower energy absorptions of the compressors;
- the extension of the operating limits.

Also, thermodynamic recovery, compared to other recovery systems, allows for:
- a reduction in energy expenditure for ventilation and therefore a better overall energy efficiency;
- high efficiency in all seasons.

Optimized batteries

Particular attention has been paid to the study of heat exchangers; besides the size, they have been designed after a specific study on circuits.
The use of micro finned copper tubes and the possibility to use fins of different materials (aluminium, pre-varnished aluminium, copper and tin-plated copper) is the demonstration of the particular attention paid to the different possibilities in critical conditions.

Condensation control

One of the main factors in order to improve the system in terms of energy savings is the control of the condensing temperature: thanks to the lowering of the condensation temperature there is an increase in the cooling capacity while the power absorbed is reduced.
All this means a better adaptation to changing climate conditions, a significant reduction of noise due to the decrease of the number of revolutions of axial fans (optional), and the extension of the operating limits at high temperatures in winter and at low temperatures in summer.

Heat recovery from refrigeration units

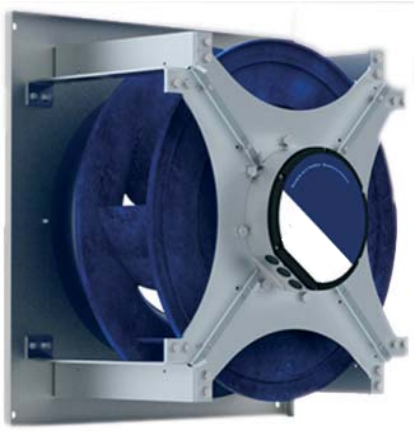
There is the possibility to manage the heat recovery by means of the water powered battery resulting from condensation of the refrigeration units (only with post-heating functions).

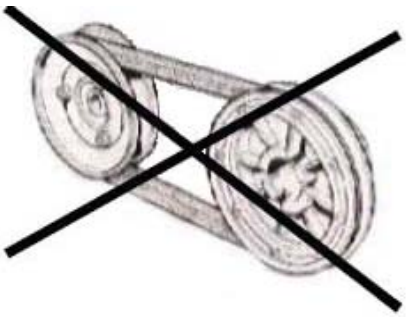
Regenerative heat exchanger

To increase the refrigerating effect of the circuit and to preserve the compressor from dangerous aspirations of liquid, a specific circuit has been studied to allow the coolant to pass through the liquid separator.
This lowers the temperature of the liquid inside the coil, increasing the refrigerating effect of the circuit itself: at the same time the gas inside the separator is heated thus ensuring that there are no traces of liquid in the aspiration of the compressor.

Efficiency of the ventilation

A significant part of the management costs of air exchange systems is attributable to energy consumption for ventilation. To this we must also add the cost for the study of the conditions for the correct operation of the system, and for the long and precise calibrations required on site.





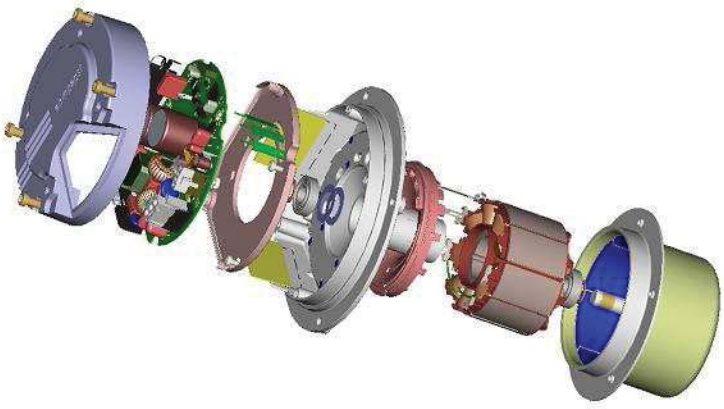
The units use directly coupled fans (PLUG-FAN with EC motors): the rotation of the motor is transmitted directly to the impeller, without the use of transmissions (belts and pulleys); in this way, transmission inefficiencies and the wear and maintenance of the belt are eliminated.
This ventilation system is therefore very versatile and efficient; the result is a lower energy consumption compared to a ventilation system of equal capacity used on traditional units available on the market.
By keeping the fan speed under control, the air flow can be adjusted and the static pressure can be adjusted to the pressure drop of the system, making system start-up particularly simple.
The adjustment or modification of the transmission is no longer required because the ventilation system will adapt to the constant changes.

EC motors

The EC motor is mainly composed of a permanent magnet that, together with the current in the stator winding, generates a torque force on the rotor without generating energy dissipation: consequently, this increases the efficiency of the motor.

Thestrengths of an EC motor compared to a motor with a frequency controller (INVERTER) are:

- EC electronics less bulky than INVERTER electronics (extra space);
- Improved efficiency;
- No power dissipation;
- Reliability.



Features of the casing

1) Good thermal transmittance values

The use of "sandwich" panels with a thickness 50 mm reduces the thermal bridge that is created between the treated air and the external environment and consequently reduces the energy requirements necessary;

2) Cleanability of internal surfaces

The shape of the edge of the panel and of the frame ensures that the internal surface of the unit is completely smooth, with a reduction of the accumulation of dust from the inside and easier cleaning and maintenance of the same.

The inspection doors are supported by nylon hinges loaded with glass fibre, a steel pin, and blocked by several handles, depending on the height, made of the same material.

3) Reaction to fire

Thanks to the particular formulation of the polyurethane foam, the casing appears to be in reaction to fire class M1 according to the French standard NFP 92-51

4) Eco-friendly proprieties

The polyurethane foam has been developed with precise specifications to obtain the exceptional value = 0 GWP (Global Warming Potential) not contributing to the greenhouse effect.

Advanced electronic management

The unit controller, to which expansions can be applied, ensures the management of all the accessories and the various configurations of the roof-top.
As a basic setting, the electronic control of the unit is designed in such a way that the fans operate with the **function of constant air flow;** this function acts on the analog outputs of the fans, **keeping the air flow constant, both in supply and return.**
With a view to reducing energy consumption, the supply and return air flow may vary depending on the number of active compressors (Optional).
Thermoregulation, both during summer and winter, is performed using a temperature sensor for the return air from the environment, the control, depending on the Set Points set, enables (or disables) the connected devices (fans, compressors, resistors/ generator, valves and dampers).
Below are the possible applications that can be configured.

- 2 summer Set Points and 2 winter Set Points depending on energy saving (Standard)

  Using a temperature sensor placed on the flow of return air you can set two Set Points for summer and two Set Points for winter; the latter, through control, activate (or deactivate) the connected devices (fans, compressors, resistors/generator, valves and dampers) depending on external conditions and energy saving.

- Dynamic Set Point / Set point Compensation (Optional)

  When the external conditions are particularly severe for the system, the dynamic SET POINT/ compensation Set Point activates a compensation that brings the SET POINT data close to the actual outdoor temperature: this allows to reduce the gap of the indoor-outdoor temperature and thus leads to significant energy saving.

- Water powered battery (optional)

  The operation of the valve that regulates the flow of water to the battery, if present, is different depending on whether the unit is in summer or winter mode. In fact, it can work in:
  1) Winter Mode - hot water powered battery - Hot Thermoregulation;
  2) Summer Mode - hot water powered battery - Post-heating in dehumidification;

- Electric battery (optional)

  Even the electric battery, when present, has different uses depending on the mode of operation of the unit:
  1) Winter mode - Hot Thermoregulation;
  2) Summer mode - Post-heating in dehumidification.

- Humidification ON-OFF or modulating (Optional)

  With this option, during HUMIDIFICATION, the controller manages a humidifier (OUTDOOR-Optional) via an ON-OFF signal or a modulating signal.

- Dynamic Defrost (standard in the versions in heat pump)

  There is the possibility to manage the supply fan in a dynamic way during defrosting, making it operate at a reduced speed or modulating the speed itself.
  During the defrost phase, the four-way valve that reverses the refrigeration cycle is activated; at the same time the supply fan can operate in three different ways:
  1) Off;
  2) On with a speed set by control;
  3) It turns on and modulates in function of the evaporation pressure.

• Supply and return fan management: integrated-separated (standard) operation

The supply and return fans are managed separately. There is a 0-10 V analog output for the supply fan and a 0-10 V analog output for the return fan; these can be set to manage the supply and return fans in order to create the correct pressure balance in the areas served.
Some examples of application may be:
1) a smoking room requires a certain value of depression to prevent the smoke from exiting the room;
2) A hospital needs a certain amount of pressure to prevent untreated outside air from entering the rooms.

• "Washing" and "recirculation" modes (Optional)

It is possible to manage the air exchange function by forcing the opening of the external damper (if present): by activating the ventilation appropriately, the air is renewed completely.
Dually to washing there may be the recirculation function in which there is no flow of external air but only the recirculation of internal air.

• Activation (Optional)

This function is used to enable the achievement of the set-point temperature of the environment as quickly as possible during start-up of the unit.
The controller manages the start-up of the unit by keeping the external dampers closed up to a certain SET value. In this way, the time needed to reach the SET value is reduced and this increases energy saving.
Once the SET level has been reached, the external dampers are activated for the normal use of the unit.

• Dehumidification (Optional)

In the case in which the return humidity is grater than the SET value, dehumidification, if configured, is activated.
During this phase, in addition to the activation of the compressors, the air flow rate is reduced to increase the effect of dehumidification.

• Remote panel (Optional)

The units can be equipped with a remote panel with graphical management through icons.

• Communication protocols (Optional)

The following communication protocols can be present:
- BMS RS 485 serial card;
- Ethernet-pCOweb interface card;
- BACnet MS/TP pCOnet interface card;
- LonWorks® interface card;
- Konnex® interface card;
- CAN-bus serial card.

Also, some user interfaces can be managed as digital inputs:
- ON/OFF remote;
- Summer/Winter;
- Smoke/fire alarm;
- Double Set Point;

or even digital outputs can be managed:
- Unit status (On/Off);
- Unit mode (Summer/Winter);
- General alarm.

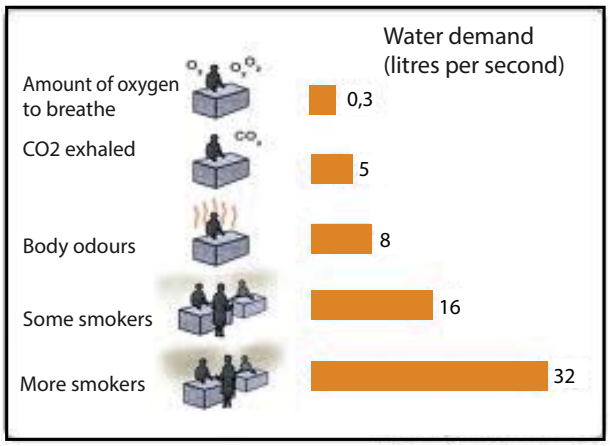
• CO_2 - VOC sensor (Optional)

If the CO_2 - VOC (Volatile Organic Compound) sensors are configured and present, the controller will manage the opening of the external damper when it verifies that the percentage of pollutants will be higher than the SET value.
The sensors can be mounted separately or together. In this case, the adjustment favours the one with the larger request.

Air quality

Changes in legislation in the industry (EN 13779)

The air we breathe , theoretically a mixture of oxygen and nitrogen plus some noble gases, actually contains also components which are much less noble, almost all of which are the result of technological progress related directly or indirectly to the work of man, or, more simply to his presence. To check the quality of air means to keep under control the largest number of these less noble gases as possible, since they are harmful to human health.



Mechanical ventilation and treatments that can be operated on air may allow the control of the concentrations of contaminants both of indoor and outdoor origin, ensuring the level of air quality required.
In the field of ventilation and air quality (for non-residential buildings, but the principles have general validity), the European standard EN 13779 is the most powerful and complete tool available to the design engineer to identify the most appropriate engineering solutions.
The objective of the standard is to ensure a healthy and comfortable indoor air quality through purification systems at low investment and management costs.

The functions integrated in the roof-top units are:

- pressure sensor for a constant flow rate management

The units are equipped with sensors, the pressure valves of which are placed before and after the fan, that continuously detect the flow variations of the unit: the higher the Δ (delta) the more electronics intervene on the speed of the fan in order to bring the Δ (delta) equal to zero.
Δ (delta) equal to zero is equivalent to having a constant flow.

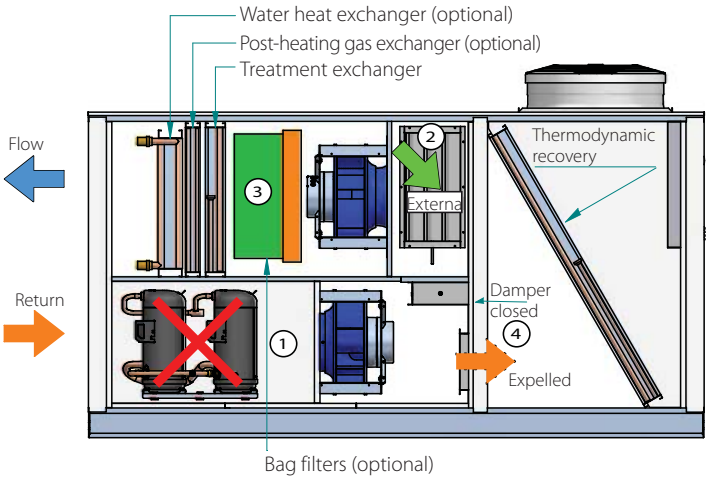
- CO2 , VOC (Volatile Organic Compound) sensor

The probes are used to increase comfort and to optimize energy consumption by means of the control of the ventilation demand.
The sensors detect:
- concentrations of CO_2
- the concentration of VOCs (volatile organic compound) as an indicator of environmental odours such as tobacco smoke, body odour, or irritating materials.

Controlling contaminants allows energy savings as it manages the opening of the outside air only when necessary.

- thermal free-cooling

When the external conditions are close to the SET-POINT values, the unit is able to automatically activate the free-cooling mode; by activating this mode, **the compressors are turned off** (1) **andsuitably filtered external air** (2) is drawn through the opening of the dampers(3) (bag filters optional); this allows to have fresh air in the **rooms and to expel return air** (4).
The use of this method allows, especially in spring and/or autumn, a substantial reduction in energy consumption in general and of the compressors in particular.



- enthalpic free-cooling

It allows to increase the seasonal efficiency of the unit through a more extensive and optimized use of free cooling, obtained by considering the enthalpy of the outside air and return air instead of the sole temperatures. The measurement of relative humidity (outdoor air and return air), necessary for the calculation of the enthalpy, is made by two capacitive humidity sensors.

- management of smoke detector

A smoke detector can be installed as an accessory in the units featuring the following principle:
- The contact of the smoke detector component goes to the digital input "Smoke Fire Alarm" of the roof-top, and in this case there can be the contact of another smoke/fire alarm, such as supervision or a fire protection system; it must be connected in series to the contact of the smoke detector.
Note: In all RTY units there will be:

- filtration:

The European standard EN 13779 was issued with the aim of making sure that the air inside the environments is as healthy as possible.
A poor IAQ causes health problems to the people who live in the building.

The standard classifies outdoor air, ODA, into 5 classes according to the concentrations of dust pollutants: ODA 1 identifies pure air with the possible presence of natural pollutants (pollen) whereas ODA 5 identifies air with high concentrations of dust and/or gas.

Outdoor Air Quality Classes (ODA)	Indoor Air Quality Category (IDA)			
	IDA 1 high quality	IDA 2 average quality	IDA 3 medium quality	IDA 4 low quality
ODA 1 (pure air with possible temporary presence of natural pollutants, e.g. pollen)	F8	F8	F7	F6
ODA 2 (air with high concentrations of dust)	F7 / F9	F6/ F8	F6 / F8	G4 / F6
ODA 3 (air with high concentrations of gas pollutants: CO_2, CO, NO_2, SO_2, etc.)	F7 / F9	F8	F7	F6
ODA 4 (air with high concentrations of dust and gas)	F7 / F9	F6 / F8	F6 / F7	G4 / F6
ODA 5 (air with extremely high concentrations of dust and gas)	F6 / F9	F6 / F9	F6 / F7	G4 / F6

Definition of filtering classes according to standard EN 779

The same standard classifies indoor air IDA into 4 classes: IDA 1 identifies an excellent indoor air quality whereas IDA 4 identifies a very low indoor air quality.

By cross-referencing the ODA and IDA data appropriately, the standard suggests the level of filtration needed.

Air filtration is therefore a mandatory function to maintain proper hygiene and wellness conditions in the environments; the units are equipped with low pressure drop filter cells with a level of efficiency G4 (EN 779) on the flow of extracted air and, if present, on the flow of outdoor air.

In addition to this filter class it is also possible to use high efficiency filters F7-F9 (EN 779): these have a large filter surface thus ensuring high efficiency air filtration and a remarkable ability to accumulate dust.
The bag filters are hermetically sealed onto a special support frame to prevent any by-pass of untreated air, and their extractability is ensured by a special inspection door upstream of the cells which is of an appropriate size for access for maintenance.

To monitor the fouling of the filters, there are (optional) manostats with pressure valves downstream and upstream of the filter panel which give a simple and rapid indication of the fouling of the filters.

- ELECTROSTATIC FILTERS (OPTIONAL)

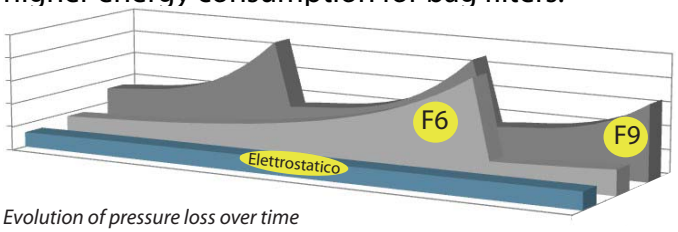
To drastically reduce the operating costs of the filtration function, as an option, one of the most effective types of filters is suggested: electrostatic filters. Their technology is refined and basically allows to separate, literally, air from any other foreign substance in its natural conformation (dust, mites, pollen, etc.). This is because they feature a complex structure where the air initially passes through a membrane or pre-filter capable of ionizing it (electric charge), then it proceeds through aluminium elements that retain all foreign substances. When the filter is saturated it is sufficient to wash it with soap and water to remove dirt and regenerate the filter. If the washing is done with care, the filter can last for many years.

The efficiency of electronic filters on RTYs is equivalent to the H10 classification used with conventional filters, compared to the category "absolute filter". Their effectiveness also applies against smoke, fine dust, particulate PM10, PM2, 5, PM1, bacteria, germs and viruses thanks to the filtering power of 0.3 to 0.4 µ.

In the electrostatic filter, the initial pressure loss increases just slightly during the fouling of the filter itself. This characteristic, combined with a high capacity of accumulation of pollutants, allows the filter to have a long life. In a traditional rigid pocket filter the initial pressure loss is higher compared to an electrostatic filter and it increases significantly during its fouling. The bag filter has to be replaced when it reaches the maximum recommended pressure of 450 Pa.

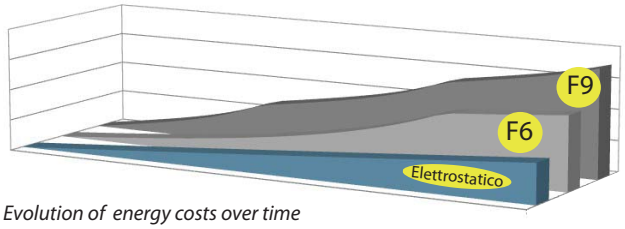
Comparing the electrostatic filter with two other different filter systems placed in the same environmental conditions of pollution and at the same air flow rate, it can be noticed that the pressure loss of the electrostatic filter grows very slowly, while an F6 filter reaches the maximum pressure of 450 long before. This leads to the need to intervene to replace the F6 filter. Even more obvious is the duration of an F9 filter that needs to be replaced almost three times during the period of operation of an electrostatic filter.

The greater resistance to the passage of air means higher energy consumption for bag filters.



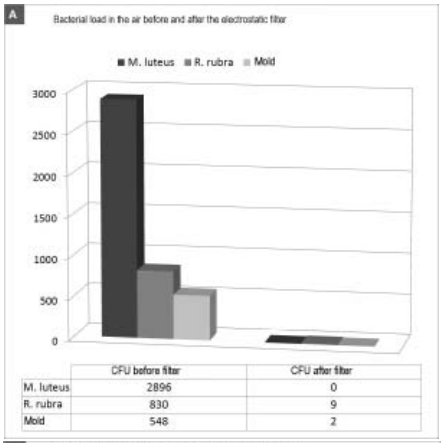
Evolution of pressure loss over time

Compared to an electrostatic filter, the energy consumption of an F6 filter is double and it is triple for an F9 filter.

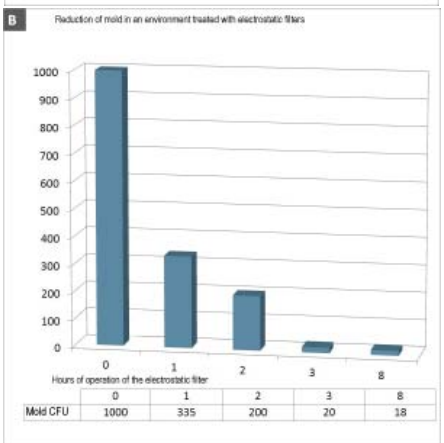


Evolution of energy costs over time

The electrostatic filter has a high antibacterial power due to its high efficiency on submicron particles and to the action of the electric field. In test **A** the concentration of some common bacteria present in the environment before and after the electrostatic filter was measured. The efficiency is between 98 and 99.9%. In test **B** it was possible to see how the concentration of mould in the air in an environment with a filtered air system with electrostatic filters decreased.



	CFU before filter	CFU after filter
M. luteus	2896	0
R. rubra	830	9
Mold	548	2



	0	1	2	3	8
Mold CFU	1000	335	200	20	18

General rules

Standards and Directives respected on designing and constructing the unit:

Safety:
Machinery Directive
2006/42/CE

Low Voltage Directive
LVD 2006/95/CE

Electromagnetic compatibility
Directive
EMC 2004/108/CE

Pressure Equipment Directive
PED 97/23/EC EN 378,
UNI EN 14276

Electric part:
CEI EN 60335-2-40, CEI EN 61000-6-1/2/3/4

Protection rating
IP 24

Acoustic part:
SOUND POWER
(EN ISO 9614-2)
SOUND PRESSURE
(EN ISO 3744)

Refrigerant GAS:
This unit contains fluoride gases with greenhouse effect covered by the Kyoto Protocol. Maintenance and disposal must only be performed by qualified staff.

AERMEC RTY units are constructed according to the acknowledged technical standards and safety regulations. They have been designed for air conditioning production and must be used compatibility with their technical features. The company is exempt from any contractual and non-contractual liability for any damage caused to persons, animals or property resulting from errors in installation, adjustment and maintenance or from improper use. All uses not expressly indicated in this manual are not permitted.

Preservation of the documentation

The instructions and all related documentation must be given to the user of the system, who is responsible for preserving the same so that they are always on hand when required.
Read this file carefully; the execution of all jobs must be performed by qualified staff, according to the Standards in force on this subject in the different countries.
The appliance must be installed in such a way as to enable maintenance and/or repairs to be carried out.
The appliance warranty does not cover the costs for ladders, scaffolding, or other elevation systems that may become necessary for carrying out servicing under warranty.
Do not modify or tamper with the appliance as dangerous situations can be created and the manufacturer will not be liable for any damage caused. The validity of the warranty shall be null and void where the above-mentioned instructions are not complied with.

SAFETY PRECAUTIONS AND REGULATIONS FOR INSTALLATION

– The system must be installed by an experienced and qualified technician and in compliance with the national legislation in force in the country of destination. AERMEC S.P.A. will not assume any liability for damage if these instructions are not respected.

– Before commencing any work READ THE INSTRUCTIONS CAREFULLY AND PERFORM THE RELATED SAFETY CHECKS TO AVOID ANY POSSIBILITY OF DANGER. All the staff involved must have thorough knowledge of the operations and any dangers that may arise at the moment in which the installation operations are carried out.

Product identification

The RTY units can be identified through:
- TECHNICAL PLATE
that shows the identification data of the product and its technical information.

NOTE
Tampering, removal, lack of the identification plate or other does not allow the safe identification of the product and will make any installation or maintenance operation to be performed difficult.

All units are tested and delivered complete with refrigerant and oil, (on site it will be necessary to provide for the hydraulic and electrical connections, by the installer)

Description of the unit

The "ROOF-TOP" units, for highly crowded environments, are the ideal solution for the climate control of average sized areas in residential, commercial and industrial buildings that require very versatile and compact systems, and of course more and more energy efficient. The sizes from 1 to 10 go from a nominal refrigerating capacity of 30 to 135 kW. The standard equipment (MB3) includes the mixing chamber with 3 dampers with renewed air max 80% of the total capacity.
The unit is equipped with an electrical panel and and electronic controller. The controller, to which expansions can be applied, ensures the management of all the accessories and the various configurations of the roof-top.
As a basic setting, the electronic control of the unit is designed in such a way that the fans operate with the function of constant air flow; this function acts on the analog outputs of the fans, keeping the air flow constant, both in supply and return.
The range is available in the cooling+heating version with heat pump operation, RTY H.
It is MB3 configured, where there is, as standard, a mixing chamber with 3 dampers with return fan and thermodynamic recovery of the heat of the exhaust air.

These units, generally placed on rooftops, or in any case out in the open, primarily offer the following advantages:
- Thanks to their installation on rooftops, they do not take away any operating space,
- They offer maximum versatility, and therefore allow for differential treatment in different volumes with different destination. (Cinemas, restaurants, discos, etc...),
- They offer high levels of environmental comfort by controlling not only the temperature but also the renewal, filtering and humidification or dehumidification of the air,
- The ambient noise level is kept low for the accurate silencing of the machine and the meticulous choice of components of motion (on all: compressors and fans).

The RTY rooftop units are supplied complete with:
- Corrugated synthetic filter class G4 (EN779) on the flow of outdoor air, available also on the intake (standard);
- Supply and return fans are of the plug-fan type with permanent magnet synchronous motor with electronic control.
  The impellers are oriented so as to ensure optimum airflow through the internal components, with minimum noise;
- Carel series “Pco5” controller;
- Electrical panel;

CAUTION : Pay particular attention to the conditions of installation, location, hydraulic and electrical connections, power supply voltage.

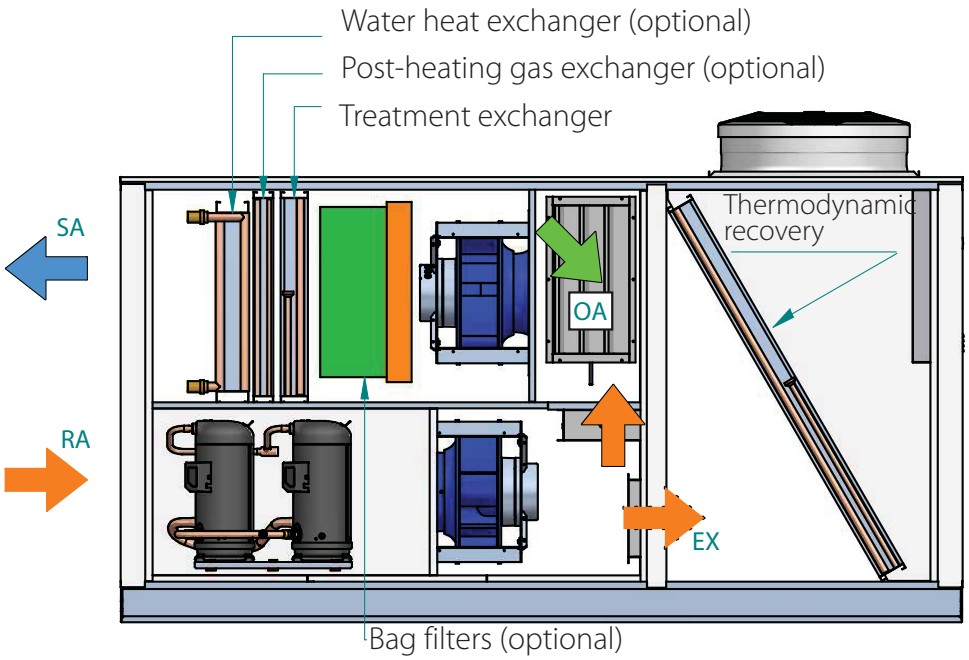
CAUTION: Before the use (or after a prolonged period of suspension), it is of extreme importance that the oil in the compressor sump is previously heated for at least 24 hours using the relevant electrical resistances.

Available versions
The RTY series units are available in 10 sizes, 1 version and 1 configuration :
RTY H = cooling + heating version with heat pump operation; Free-cooling in temperature as standard.
By appropriately combining the various options available, it is possible to configure each model in such a way so as to meet the most specific system requirements.
For further information, refer to the selection program.

Configurations andequipment
The units of the RTY series can also count on the configuration:
MB3 recovery of heat from the exhaust air (with exhaust fan).

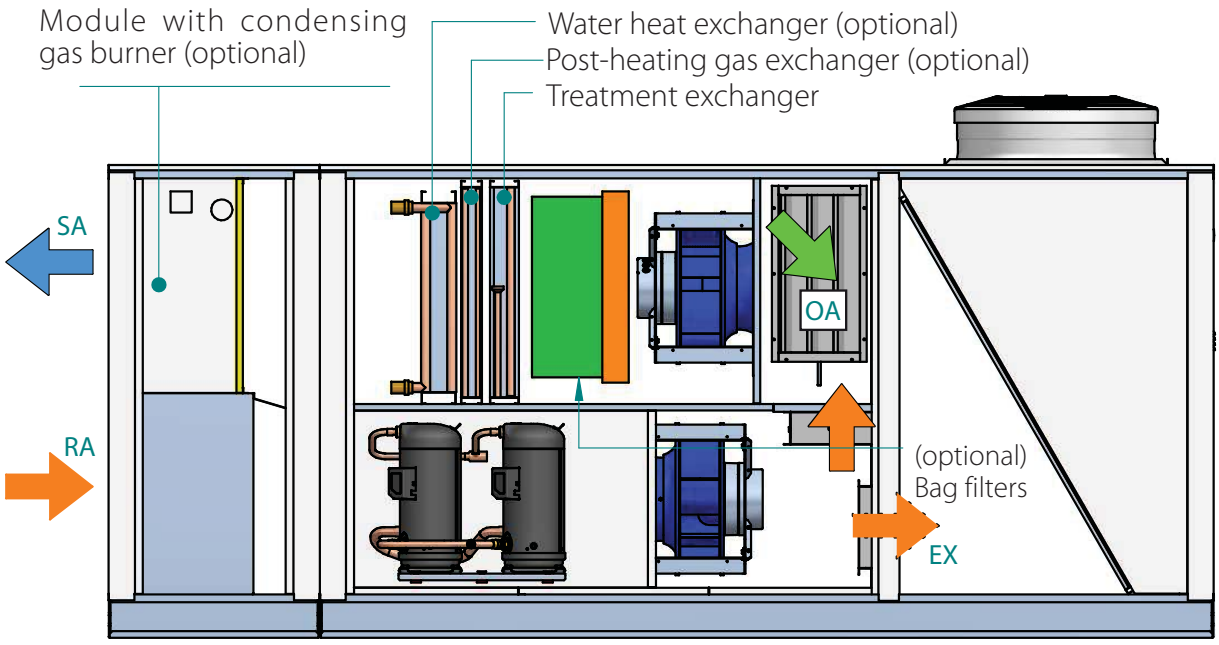
Configurations

Configuration with thermodynamic recovery MB3

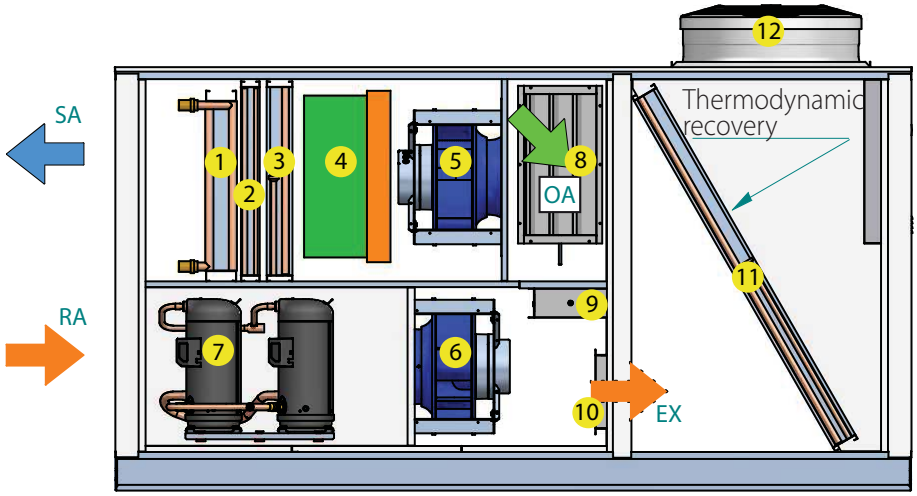


SA air flow;
OA outside air;
RA extracted air;
EX exhaust air.

Configuration with thermodynamic recovery MB3 + Gx model gas condensing heat generator module



MAIN COMPONENTS



Key
1 Water powered battery (optional)
2 Direct expansion coil for post-heating (optional)
3 Treatment battery
4 Bag filters (optional)
5 Supply fan
6 Return fan (only on version MB3)
7 Scroll tandem uneven compressors
8 Outdoor air input damper
9 Recirculation damper
10 Expulsion damper (only MB3)
11 External battery
12 Axial fans

SA air flow; **OA** outdoor air; **RA** extracted air; **EX** exhaust air.

DESCRIPTION OF COMPONENTS

COMPRESSOR

Scroll type compressors in tandem "uneven" configuration (except for sizes 09 and 14) equipped, as standard, with the electrical resistor on the casing. The sump resistance is powered automatically when the unit stops as long as the unit is live.
The compression chamber is composed of two pockets between a fixed spiral and an involute one: the evolution of the movable spiral continuously reduces the volume available for the refrigerant, thus allowing compression.

OUTDOOR AND INDOOR EXCHANGER

It is made with finned copper tubes and aluminium fins, pre-painted aluminium, copper or tinned copper, locked by the mechanical expansion of the tubes. It is highly efficient; internally ribbed tube and corrugated fins.

FANS

Supply and return fans (if present) are of the plug-fan type with permanent magnet synchronous motor with electronic control (EC). The impellers are oriented so as to ensure optimum airflow through the internal components, with minimum noise. A differential pressure switch is installed on the supply fan, as standard, and it has the function of signalling a possible shut-down of the fan.

FANS (AXIAL)

The axial fans, located in the condensing section of the machine, are of the helical type, statically and dynamically balanced and protected electrically by fuses and mechanically by grilles. The electronic control of condensation in the F versions and of condensation and evaporation during winter operation in the H versions is optional. The fans are also available with an electronic control (EC) permanent magnet synchronous motor.

SUPPORT STRUCTURE

The structure is made from a galvanized steel base, a frame of powder coated galvanized steel in RAL9002 (self-supporting structure), insulated panels made of pre-painted metal sheets (exterior only) with polyurethane 45kg/mc thickness 50 mm reaction to fire class M1 according to the standard NFP92-512:1986 (n. test LNE PV P115893 - DE/1).
The casing is designed to ensure access to the internal components for ordinary and extraordinary maintenance.

FILTRATION

For the RTY units, different types of filters with different degrees of filtration are available:

- Flat filters G4 (standard in both supply and return)
- Bag filters F7 - F9 (optional, only in supply)
- Electrostatic filters H10 (optional, only in supply).

In this way it is possible to meet any filtering need and to guarantee, at the same time, compliance with the regulations in force regarding air quality in environments.
A differential pressure switch for the fouling of the filters is also provided (optional).
For further information please contact the AERMEC Sales Department .

HOT GAS COIL (optional)

During the summer the air that enters the room may contain a high level of humidity, well above the desired value.
For it to enter the environment under the desired conditions, firstly the air flow is cooled in the evaporator coil where the condensation is separated, then it is post-heated in order to maintain the desired conditions of comfort in the environment.
The hot gas post-heating coil is placed after the treatment coil and is activated by drawing a flow of hot gas downstream of the compressors.
This also lowers the condensation temperature, significantly reducing the power absorbed by the compressors and at the same time it increases the cooling power with greater efficiency (EER).

ELECTRONIC THERMOSTATIC VALVE

The use of the electronic thermostatic valve allows you to:
- maximize the heat transfer to the evaporator;
- minimize the response time to changes in the load as much as possible while maintaining the use of the compressors stable and reliable;
- optimize superheat control for maximum energy efficiency.

LIQUID SEPARATORWITH REGENERATIVE EXCHANGER

The liquid separator installed on the refrigeration assembly of the RTY series is installed on the liquid line after the condenser: it is equipped with a dip tube that allows the liquid only to pass through.
Its surface is treated with a special process and subjected to an epoxy powder coating which allows for resistance against corrosion in salt spray for more than 500 hours.
It is used and installed to:
- store the liquid refrigerant in function of the heat load of the evaporator;
- cool the liquid refrigerant before expansion;
- if necessary, recover the refrigerant, without draining the system.

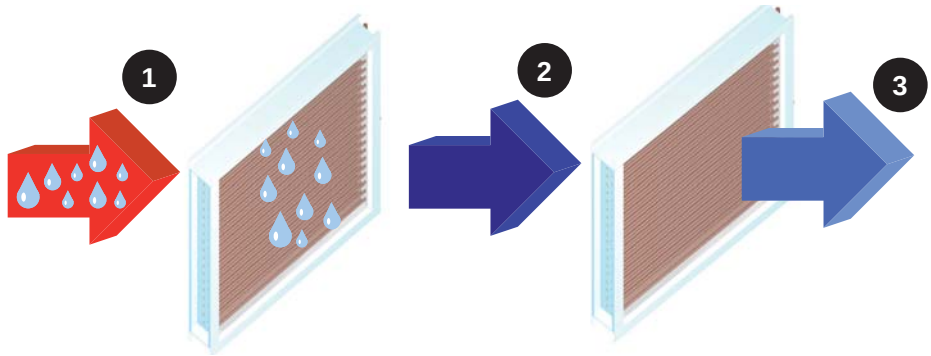
DEHYDRATING FILTER WITH REMOVABLE CARTRIDGE

The refrigerant circuit is equipped with filtration through a dehydrating filter with removable cartridge; the function of this filter is to dehumidify and deacidify the refrigerant and in some cases even eliminate solid particles present in the circuit.
The filter must be able to remove the acids that may form in the liquid at any temperature; the elimination of moisture prevents the formation of hydrochloric acid or hydrofluoric acid and ice on the valves, the activated alumina neutralizes acids while the molecular sieve performs the task of absorbing moisture. The elimination of moisture in refrigeration systems with compressor is essential for the life of the system itself; in the case of important interventions on the refrigerant circuit, it is recommended to replace the filter cartridge after isolating it by means of the valves placed upstream and downstream.

CYCLE REVERSING VALVE

The refrigeration cycle reversing valve is a device by means of which the evaporator and the condenser reverse their operation; the heat pump starts to operate as a cooler and vice versa.

Indicative diagram of post-heating battery operation



1 Input air on the internal exchanger (evaporator) full of moisture;

2 Air cooled and dehumidified;

3 Air treated by the post-heating exchanger and available at ideal conditions

Accessories

BW Hot water powered heating coil with 2 rows.

BEx Electric heating coil in two stages.

BEMx Modulating electric heating coil.

Gx Heat generator; heating module with condensing gas burner (34 kW, 45 kW, 65 kW, 80 kW, 105 kW, 150 kW).

FTx Bag filters (FT7 - FT9) ; efficiency F7 -F9 on the supply air flow.

H10 Electrostatic filters on the supply flow comparable, as for efficiency, to absolute filters.

FCH3 Enthalpic freecooling can be combined with:

- the accessory **DP** (dehumidification and post-heating management kit) only in the presence of mixing chamber with three dampers and water powered or electric battery.
- the accessory **CUR** (Humidification contact) only with mixing chamber with three dampers.

PSTEP Constant flow rate adjustment depending on the thermal load of STEP rate.

AXEC EC permanent magnet axial fans which can adjust the rotations in function of the condensation and evaporation pressure.

SCO2 - SVOC Air quality sensors CO_2 / VOC

BPGC Hot gas post-heating battery.

STA Ambient temperature sensor.

SUA Ambient humidity sensor.

PSF-PSF2 Filter pressure switch; differential pressure switch for the control of the fouling of the return and renewal filters or of the return, renewal and supply filters.

EPV (CuAl-Pv) External battery.

ECU (CuCu) External battery.

ESN (CuCu-Sn) External battery.

IPV (CuAl-Pv) Internal battery.

ICU (CuCu) Internal battery.

ISN (CuCu-Sn) Internal battery.

A1 (standard) rear recirculation air intake, renewed air intake - head of return fan if present 150 Pa.

A2 lower recirculation air intake, renewed air intake - head of return fan if present 150 Pa.

A3 rear recirculation air intake, renewed air intake - head of return fan if present 250 Pa (only for rear supply).

A4 lower recirculation air intake, renewed air intake - head of return fan if present 250 Pa (only for rear supply).

M1 (standard): Rear air supply, head of supply fan up to 300 Pa (only for lower recirculation air intake).

M2 Lower air supply, head of supply fan up to 300 Pa (only for lower recirculation air intake).

M3 Rear air supply, head of supply fan up to 400 Pa.

M4 Lower air supply, head of supply fan up to 400 Pa (only for lower recirculation air intake).

Ux Steam humidification

UPx Immersed electrode producer with + Ux

CUR Humidification control configuration; ON/OFF contact (usually open) for humidification consent. In this case, the unit comes complete with a humidity sensor placed on the environment return air. It is also equipped with a humidity sensor to be placed downstream of he humidification section.

PR1 Remote panel; Allows you to control the rooftop at a distance.

RIF Rephaser (power factor > 0,9).

MM Multimeter.

MAG Electric protection of fans with thermal magnets.

DP Dehumidification and post-heating management (if present); Kit for the management of dehumidification and post-heating. It can be combined with the accessory CUR (Humidification contact).

SCMRM Modulating servoswith spring return.

MAN High and low pressure gauges.

GP Protection grid of condenser coils; protects the external battery from blows and prevent access to the underlying area where the compressors and the cooling circuit are housed.

MSSM - MSSR Supply and return silencers module.

CA Rainproof cover on outdoor air intake.

VTx Rubber anti-vibration supports. Select the VT model from the compatibility table.

CF Exhaust pipe for heat generator (only with version with condensing gas burner module).

RC Roof-curb.

RF Smoke detector with free contact.

RFC Smoke detector and recirculation damper and external air intake closing management.

RS Serial card BMS RS485 with MODBUS protocol

LW LON WORKS interface board

BIP Interface card Ethernet-pCOweb (BACnet IP).

BAC Interface card BACnet MS/TP pCOnet.

SSV Unit supervision system.

For the configuration of the unit and all its accessories, please refer to the selection program

Technical data of MB3 configuration

			01	02	03	04	05	06	07	08	09	10
(1)	Total cooling capacity	kW	30.0	39.2	48.2	64.2	73.6	82.3	88.7	110.7	122.4	134.8
(1)	Sensible cooling capacity	kW	21.2	26.9	32.3	42.1	47.6	53.6	59.0	75.1	81.5	88.5
(1)	Power absorbed by the compressors	kW	5.4	8.5	9.8	13.2	15.2	17.6	18.5	24.0	27.1	32.0
(4)(1)	E.E.R.		5.6	4.6	4.9	4.9	4.8	4.7	4.8	4.6	4.5	4.2
(2)	Total cooling capacity	kW	31.7	41.6	51.0	68.0	78.0	87.2	93.8	116.5	129.1	142.0
(2)	Sensible cooling capacity	kW	18.9	24.1	29.2	38.1	43.3	48.5	53.1	67.2	73.2	79.9
(2)	Power absorbed by the compressors	kW	5.4	8.6	10.0	13.3	15.4	17.8	18.8	24.4	27.7	32.6
(4)(2)	E.E.R.		5.9	4.8	5.1	5.1	5.1	4.9	5.0	4.8	4.7	4.4
(3)	Heating capacity	kW	29.1	39.4	48.0	65.9	70.0	84.6	90.0	114.2	126.8	142.2
(3)	Power absorbed by the compressors	kW	4.6	7.2	8.7	13.1	13.4	16.7	16.5	19.8	22.9	26.8
(4)(3)	COP		6.4	5.4	5.5	5.0	5.2	5.1	5.5	5.8	5.5	5.3
	Max. nominal air flow of indoor fan	m^3/h	3,500	4,500	5,500	7,000	8,000	9,500	11,500	14,000	15,000	16,500
	Min. nominal air flow of indoor fan	m^3/h	2,450	3,150	3,850	4,900	5,600	6,650	8,050	9,800	10,500	11,550
	Compressors	Q.ty	2	2	2	2	2	2	2	2	2	2
	Compressors	type	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll
	Refrigerating circuits	Q.ty	1	1	1	1	1	1	1	1	1	1
(5)	Capacity steps	Q.ty	3	3	3	3	3	3	3	2	3	3
	External fans	Q.ty	1	1	2	2	2	2	2	2	2	2
	External fans	type	Axial AC	Axial AC	Axial AC	Axial AC	Axial AC	Axial AC	Axial AC	Axial AC	Axial AC	Axial AC
	Indoor supply fans	Q.ty	1	1	1	1	1	1	1	1	1	2
	Indoor supply fans	type	Rad EC	Rad EC	Rad EC	Rad EC	Rad EC	Rad EC	Rad EC	Rad EC	Rad EC	Rad EC
	Indoor return fans	Q.ty	1	1	1	1	1	1	1	2	2	2
	Indoor return fans	type	Rad EC	Rad EC	Rad EC	Rad EC	Rad EC	Rad EC	Rad EC	Rad EC	Rad EC	Rad EC
	Diameter of indoor supply fans	mm	400	450	450	450	450	450	500	560	630	450
	Diameter of indoor return fans	mm	350	400	400	450	450	500	500	450	450	450
(6)	Max. static pressure available in supply	Pa	1396	834	656	489	702	674	558	648	482	777
(6)	Max. static pressure available in return	Pa	279	281	283	282	283	286	291	298	301	306
	Electrical power supply V/Ph/Hz		400 / 3 / 50									

MB3 configuration dimensions

Length	mm	3,400	3,400	3,400	3,400	3,400	3,400	3,400	3,400	3,400	3,400
Width	mm	1,900	1,900	1,900	2,100	2,100	2,100	2,100	2,100	2,100	2,100
Height	mm	1,800	1,800	1,800	2,100	2,100	2,100	2,100	2,100	2,100	2,100
Total height	mm	2,061	2,061	2,061	2,373	2,373	2,373	2,373	2,373	2,373	2,373
MB3 configuration weight	Kg	1361	1389	1389	1650	1654	1679	1684	1727	1794	1852

(1) Cooling capacity Tin 27°C - 19°C w.b. / Text 35°C - 24°C w.b. (EN14511) RH 40%; operation with 80% outside and exhaust air.
(2) Cooling capacity Tin 27°C - 19°C w.b. / Text 35°C - 26°C w.b. RH 50%; operation with 80% outside and exhaust air.
(3) Thermal power Tin 20°C - 15°C w.b. / Text 7°C - 6°C w.b. (EN14511) operation with 80% outside and exhaust air.
(4) Referred to compressors.
(5) Size 08, not "UNEVEN".
(6) At max. nominal capacity, new clean G4 filter.

RTY MB3			01	02	03	04	05	06	07	08	09	10
F.L.A.:	*Full load amps in max. admissible conditions*											
	Compressor 1	A	10.0	11.4	13.6	18.7	23.2	23.2	23.2	34.0	40.0	48.1
	Compressor 2	A	7.0	9.3	11.4	14.5	14.5	18.7	22.3	34.0	34.0	34.0
	Single external fan	A	1.75	1.75	1.75	3.6	3.6	3.6	3.6	3.6	3.6	3.6
	Single supply fan	A	3.9	3.3	3.3	3.3	4.8	5.8	5.6	7.9	7.2	5.8
	Single return fan		3.9	3.3	3.3	3.3	3.3	5.6	5.6	3.3	3.3	3.3
F.L.I.:	*Full load input in max. admissible conditions*											
	Compressor 1	kW	4.8	6.4	7.5	11.2	13.3	13.3	13.3	15.5	20.1	24.8
	Compressor 2	kW	3.3	5.2	6.4	8.4	8.4	11.2	12.3	15.5	15.5	15.5
	Single external fan	kW	0.94	0.94	0.94	1.67	1.67	1.67	1.67	1.67	1.67	1.67
	Single supply fan	kW	2.4	2	2	2	2.9	3.6	3.5	4.9	4.5	3.6
	Single return fan		2.4	2	2	2	2	3.5	3.5	2	2	2
L.R.A.:	*Locked rotor amps*											
	Compressor 1	A	51.1	73.0	87.0	96.1	120.0	120.0	120.0	174.0	225.0	272.0
	Compressor 2	A	46.0	73.0	73.0	96.1	96.1	96.1	96.1	174.0	174.0	174.0
	M.I.C.		63.84	87.24	104.28	117.94	142.74	149.14	152.64	220.24	270.84	320.54

Functioning limits

Here are some parameters that were taken into account to calculate the limits of operation in cooling mode (SUMMER):

- general and non-specific values;
- standard air flow;
- proper use of the unit and non-critical positioning;
- full load operation.

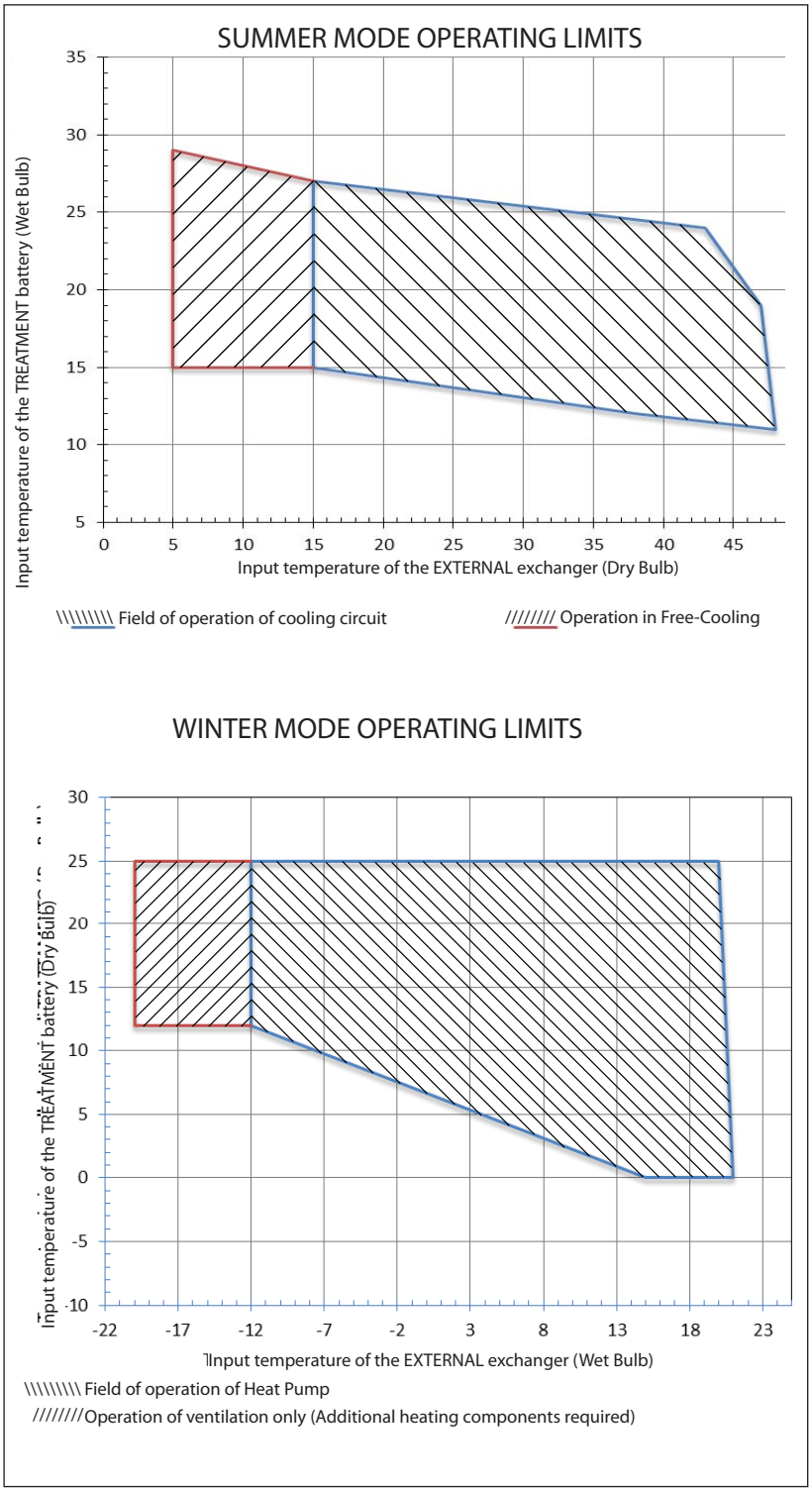
By configuring the unit in external air intake mode, the temperatures of the mixtures that are generated at the entrance of the heat exchanges are calculated; in this way, you can know the limits;

For operation in heating mode (WINTER), the following parameters were taken into account:

- general and non-specific values;
- standard air flow;
- proper use of the unit and non-critical positioning;
- full load operation.

By configuring the unit in external air intake mode, the temperatures of the mixtures that are generated at the entrance of the heat exchanges are calculated; in this way, you can know the limits;

After prolonged operation in heat pump mode, depending on the low temperatures and percentage of external humidity, the unit is programmed to perform some defrosting cycles with reverse cycle to eliminate the ice formed on the walls of the external heat exchanger.
It is therefore very important to favour the elimination of the water produced by the continuous defrosting to avoid that it accumulates in proximity of the base; it may, in this case, lead to the formation of ice blocks.



NOTE: If the machine is to be made to operate outside the limits indicated in the diagram, please contact the AERMEC technical sales dept.
If the machine is placed in particularly windy areas, it is necessary to provide windbreaks to prevent unstable operation of the DCPR device.

Sound data

The data refers to units operating under the conditions described below.

The sound power level refers to:
- Total sound power level of the supply fan measured at nominal flow (filter A).
- Total sound power level of the return fan measured at nominal flow (filter A).

	Nominal capacity [m³/h]	Frequency [Hz]	63	125	250	500	1000	2000	4000	8000	Global [dB (A)]
RTY01	3,500	Lw [dB (A)] supply channel	33	51	58	62	63	57	59	46	68
RTY02	4,500	Lw [dB (A)] supply channel	42	57	62	65	63	58	59	49	69
RTY03	5,500	Lw [dB (A)] supply channel	46	59	66	69	67	62	63	57	73
RTY04	7,000	Lw [dB (A)] supply channel	51	61	73	75	73	67	67	67	79
RTY05	8,000	Lw [dB (A)] supply channel	54	64	78	79	78	71	70	70	84
RTY06	9,500	Lw [dB (A)] supply channel	28	49	73	79	81	76	76	74	85
RTY07	11,500	Lw [dB (A)] supply channel	28	51	72	79	80	74	75	70	84
RTY08	14,000	Lw [dB (A)] supply channel	29	54	72	80	79	74	77	72	85
RTY09	15,000	Lw [dB (A)] supply channel	28	57	70	79	77	72	73	64	82
RTY10	16,500	Lw [dB (A)] supply channel	25	46	72	77	78	74	73	69	83

SOUND POWER OF RETURN FANS											
	Nominal capacity [m³/h]	Frequency [Hz]	63	125	250	500	1000	2000	4000	8000	Global [dB (A)]
RTY01	3,500	Lw [dB (A)] return channel	33	48	51	56	54	53	54	38	61
RTY02	4,500	Lw [dB (A)] return channel	42	53	56	59	55	55	55	38	64
RTY03	5,500	Lw [dB (A)] return channel	45	56	61	63	60	59	61	51	68
RTY04	7,000	Lw [dB (A)] return channel	49	61	68	70	66	64	63	65	75
RTY05	8,000	Lw [dB (A)] return channel	51	62	72	74	70	68	64	71	79
RTY06	9,500	Lw [dB (A)] return channel	22	48	61	66	69	68	65	61	74
RTY07	11,500	Lw [dB (A)] return channel	24	49	65	72	74	73	69	68	79
RTY08	14,000	Lw [dB (A)] return channel	23	45	60	66	66	66	64	64	73
RTY09	15,000	Lw [dB (A)] return channel	25	50	64	73	78	74	70	69	81
RTY10	16,500	Lw [dB (A)] return channel	26	48	64	71	71	70	66	70	77

GLOBAL SOUND POWER/PRESSURE OF THE UNIT										
	RTY01	RTY02	RTY03	RTY04	RTY05	RTY06	RTY07	RTY08	RTY09	RTY10
Global sound power of the unit [dB (A)]	72	72	76	79	80	82	82	83	85	82
Global sound pressure [dB (A)] (1m, Q =2)	64	64	68	71	72	74	74	75	77	74

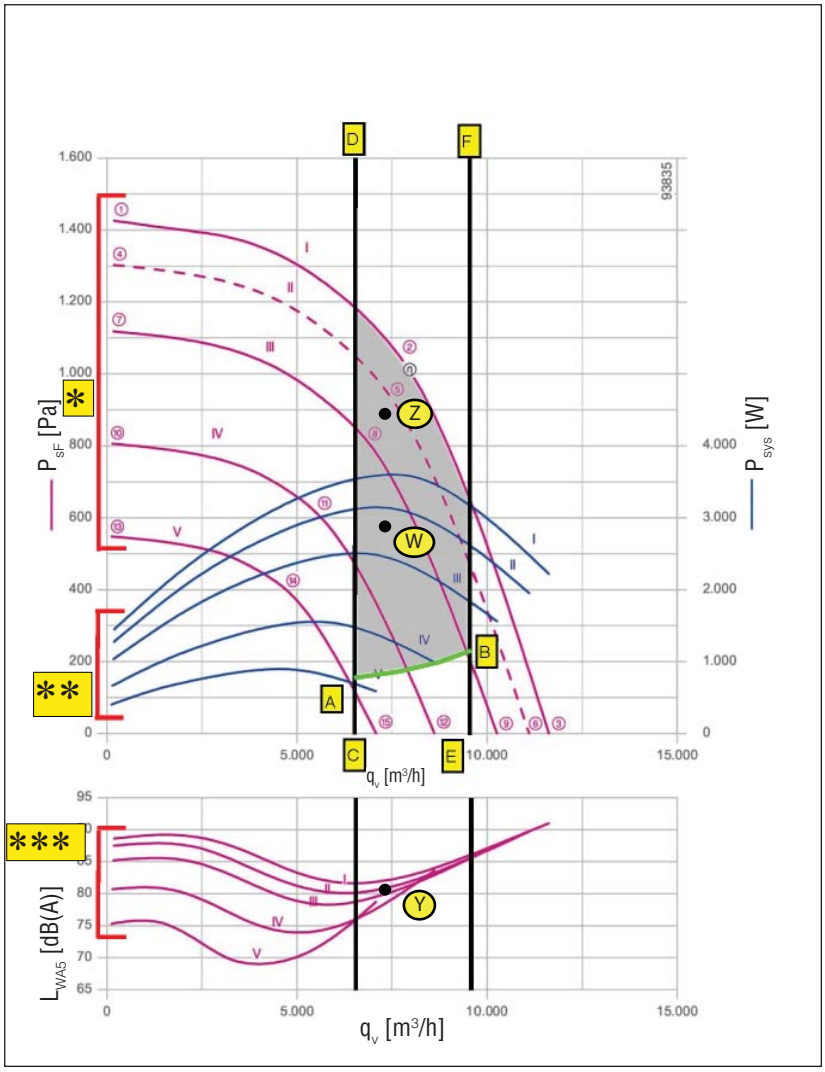
Characteristic curves of fans

The graphs show the curves of the fans installed in the RTY series.

* - curves of the total head at different speeds.
The curve I is related to the number of rotations.
It should be noted that the fans vary their speed continuously.
At a given flow rate, the available head of the unit, without accessories, is obtained by subtracting from the value of the total head the pressure drops (basic machine) of the filter + battery in relation to a fouling of the same in average life (curve AB)
The curves are shown for easy reading.

** - curves of the electrical power consumption.
By way of example, the value of the electric power input of the operating point "Z", between the curves II and III, will be read in the axis of the ordinates on the right and it will be between the curves II and III (point W) of the electrical power consumption.

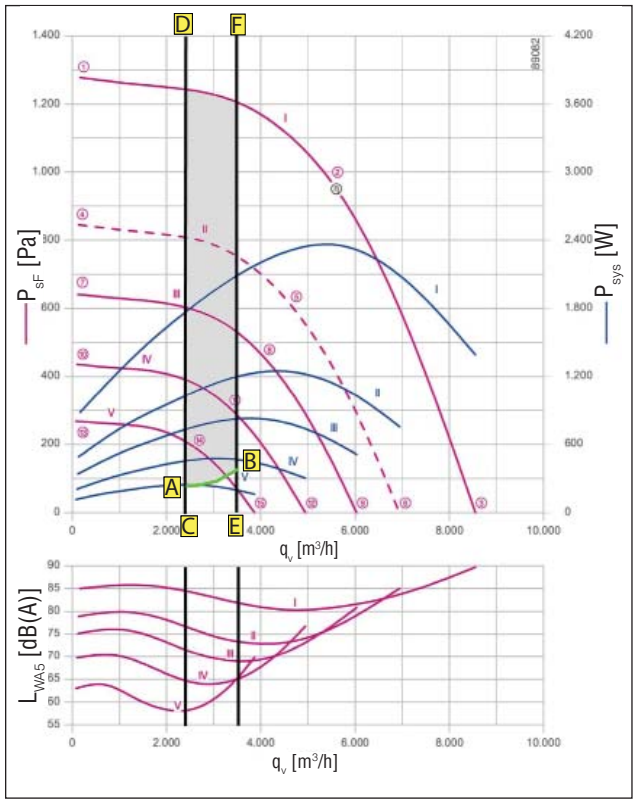
*** - curves of the sound power level in weighted suction A.
By way of example, the value of the sound power from the point of operation "Z" will be between the curves II and III (point Y).



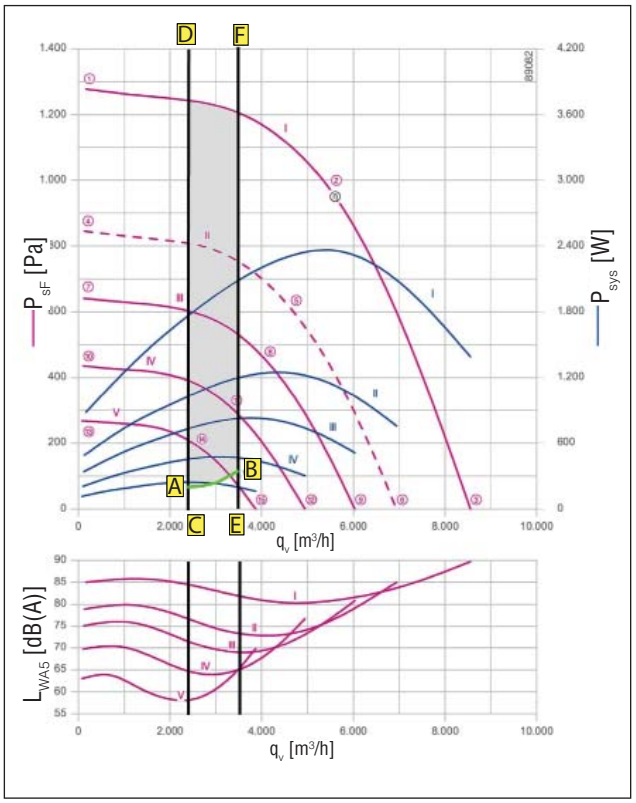
KEY	
P_{sF}	Fan head [Pa]
P_{sys}	Electrical power consumption [W]
q_v	Capacity [m³/h]
L_{WA5}	Level of sound power in weighted suction A [dB(A)]
CD	Limit of minimum capacity
EF	Limit of maximum capacity

Conditions of reference:
- air density 1,2 kg/m³;
- unit without accessories;
- G4 filters fouling average life

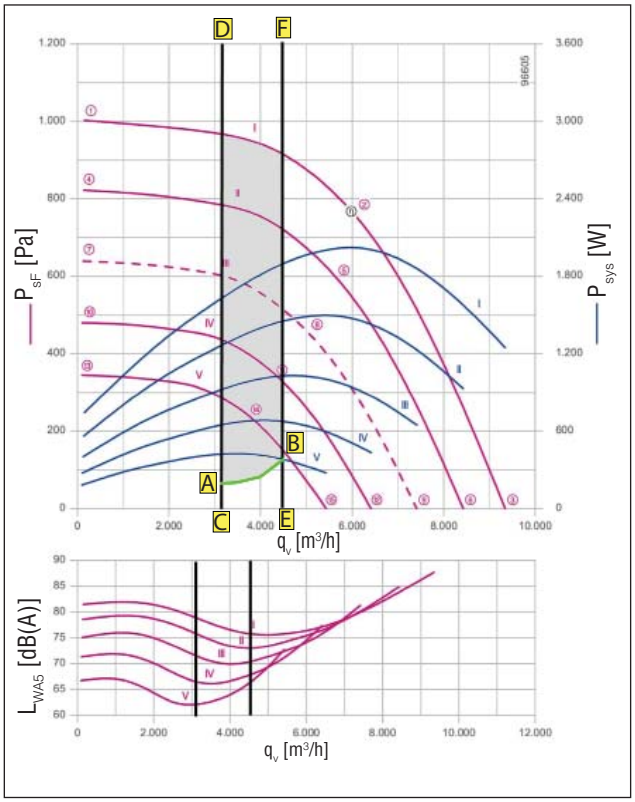
TAB1 relative to RTY 01 supply



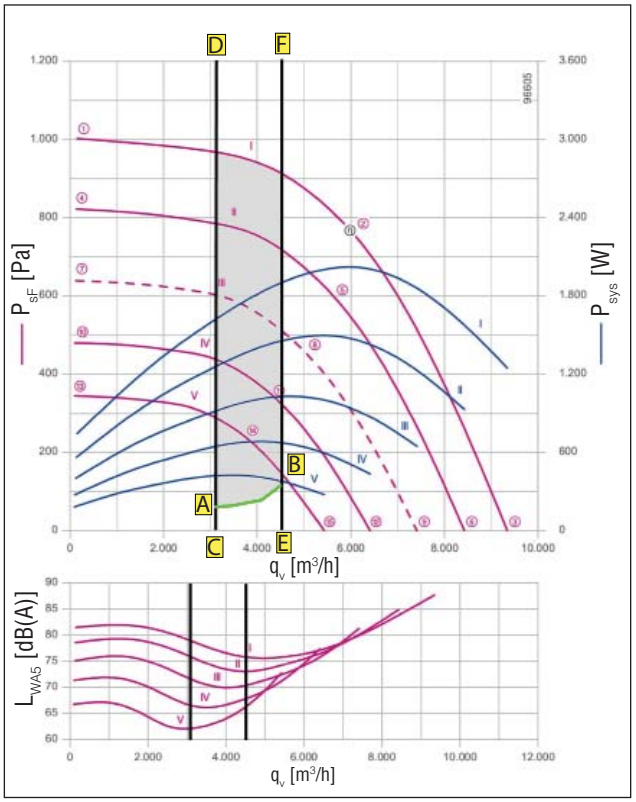
TAB2 relative to RTY 01 return



TAB3 relative to RTY 02 supply



TAB4 relative to RTY 02 return



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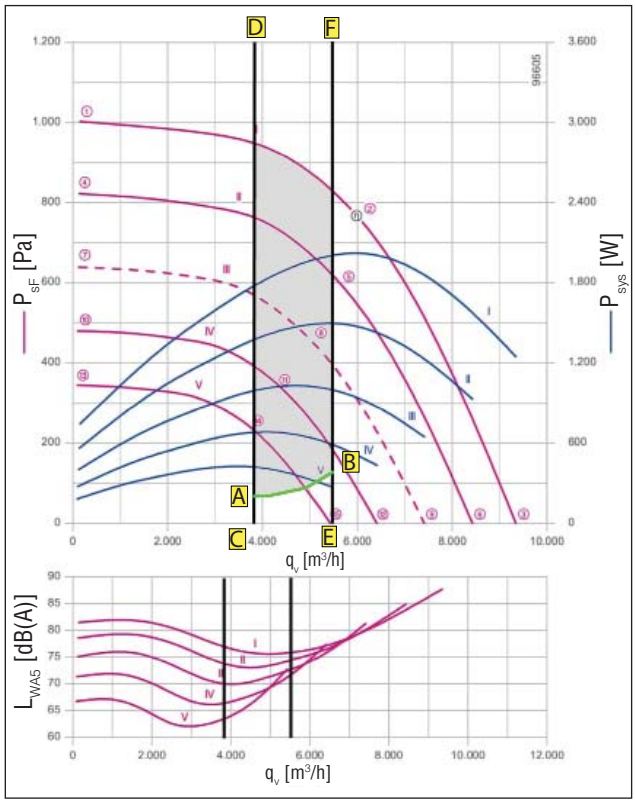
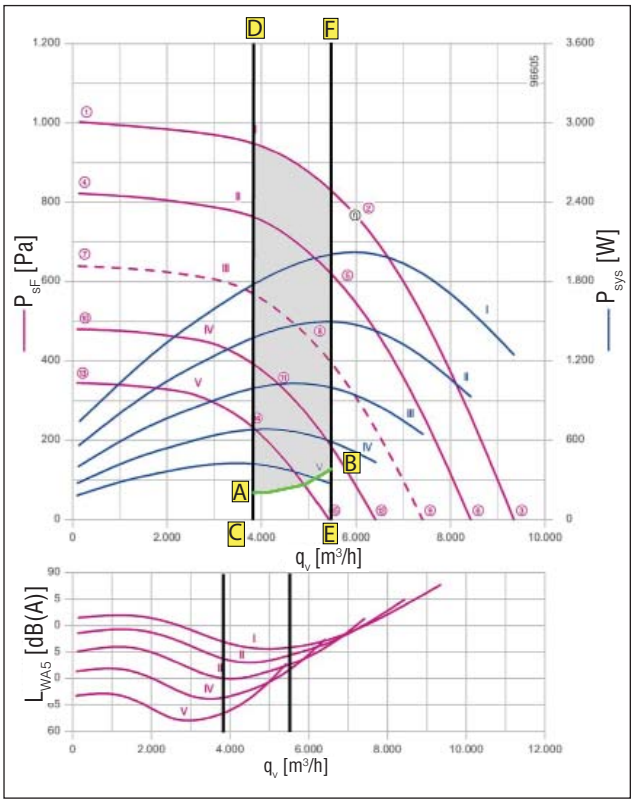
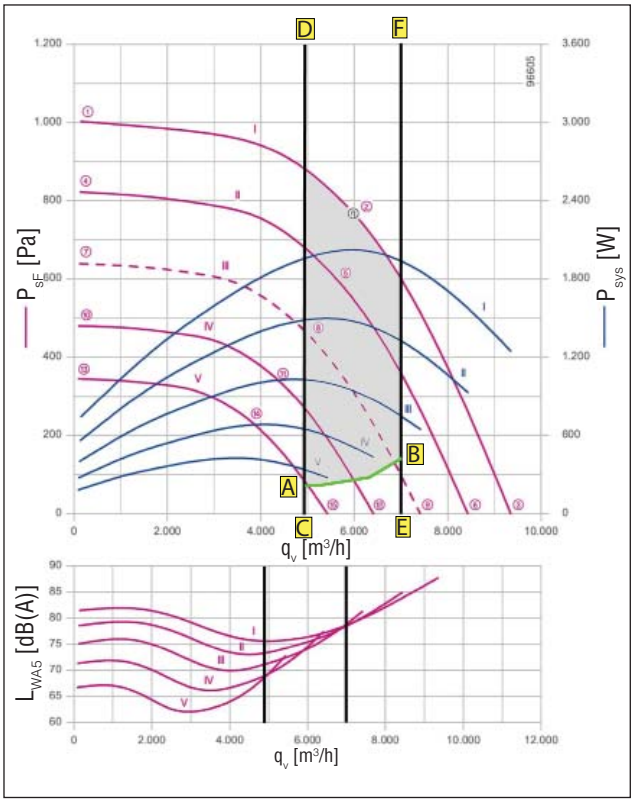
TAB5 relative to RTY 03 supply



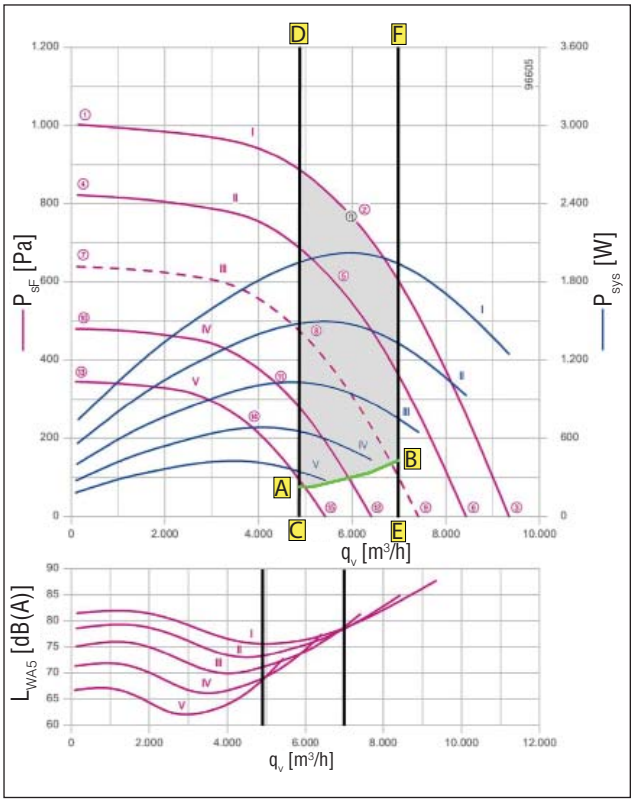
TAB6 relative to RTY 03 return



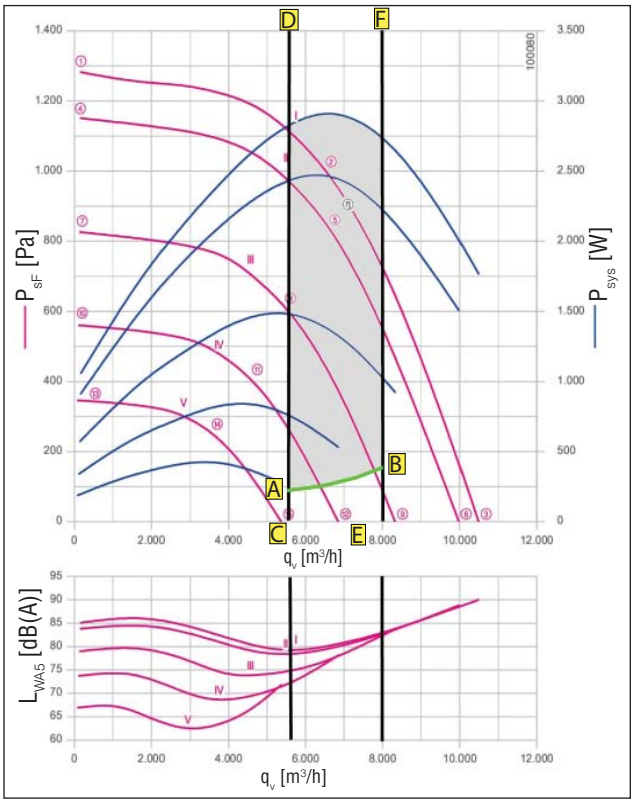
TAB7 relative to RTY 04 supply



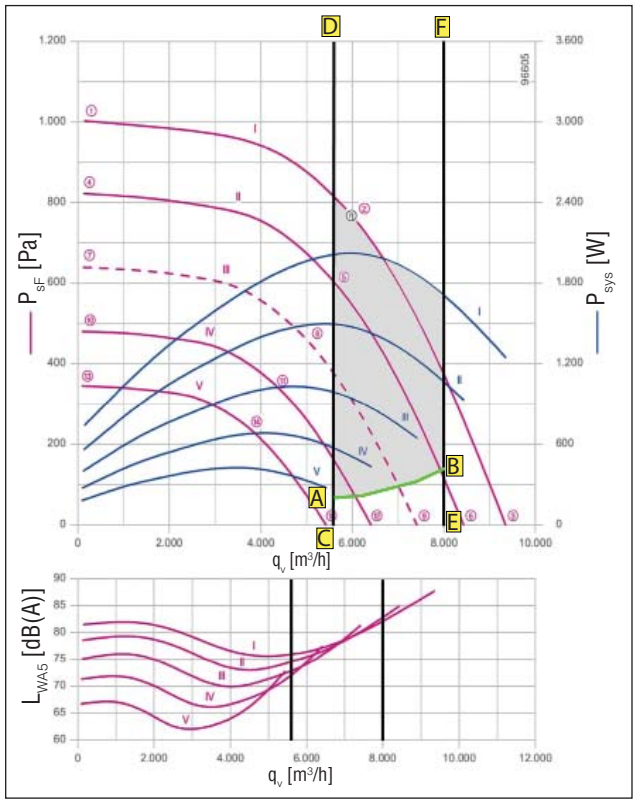
TAB8 relative to RTY 04 supply



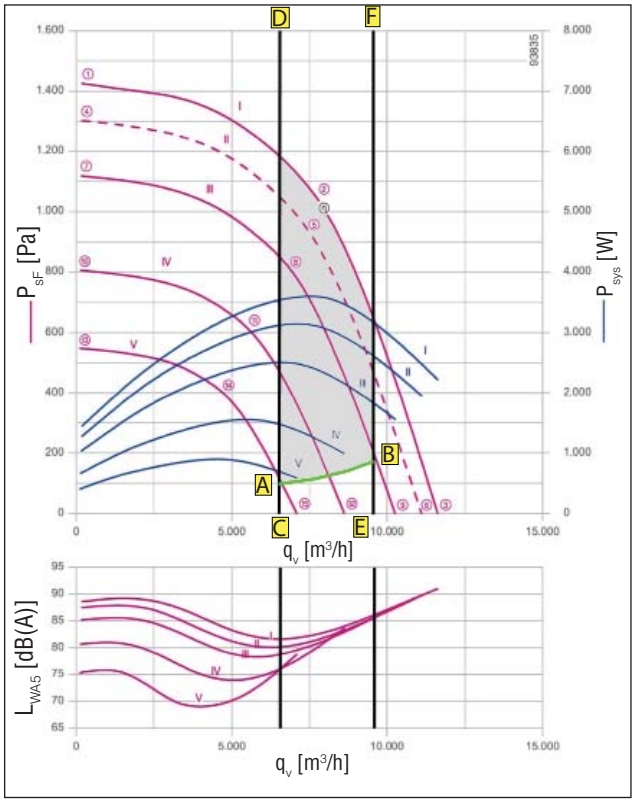
TAB9 relative to RTY 05 supply



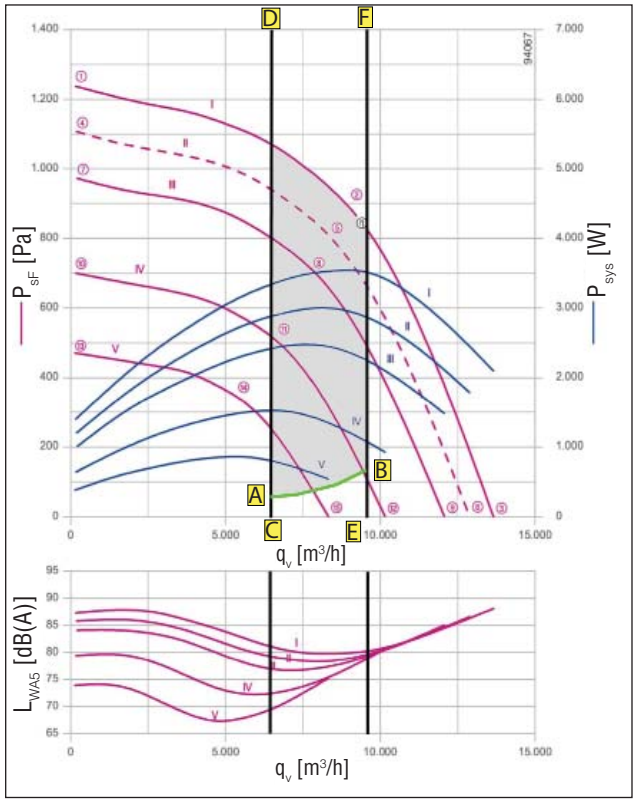
TAB10 relative to RTY 05 supply



TAB11 relative to RTY 06 supply



TAB12 relative to RTY 06 supply



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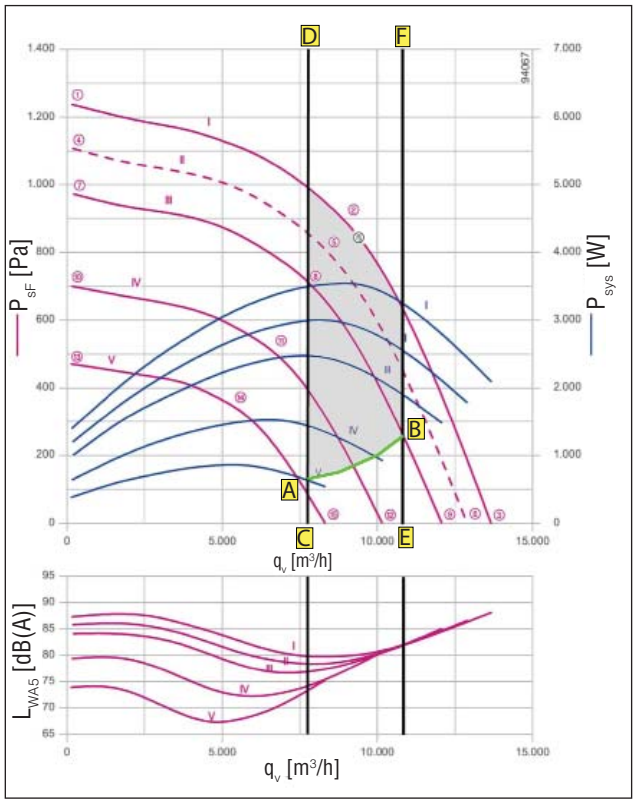
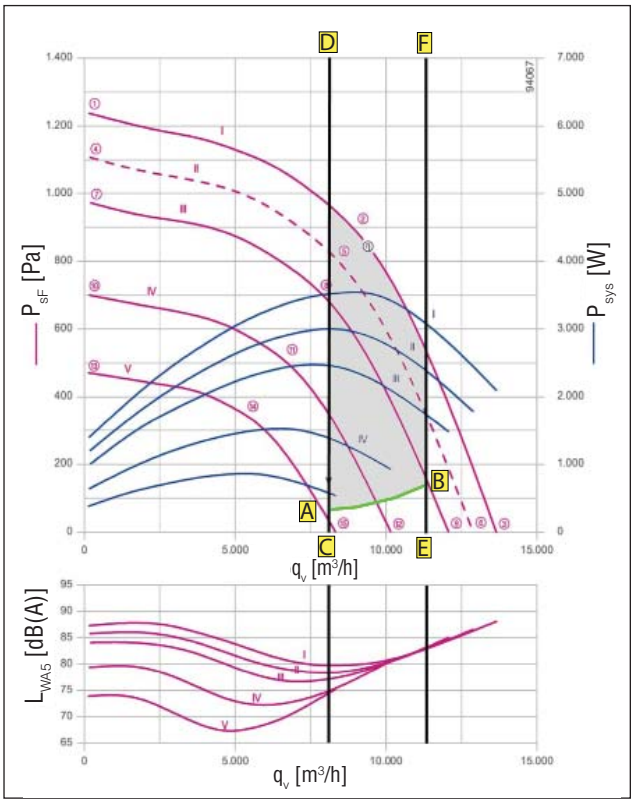
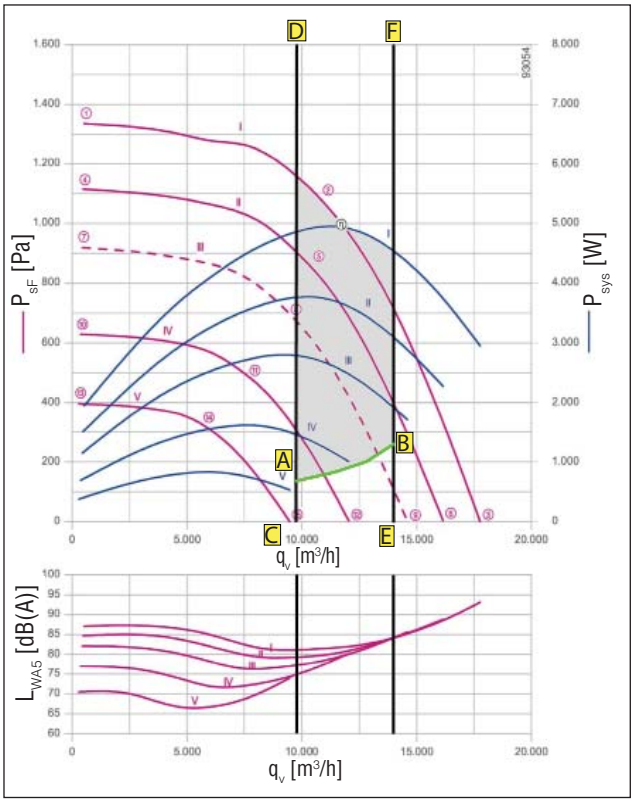
TAB13 relative to RTY 07 supply



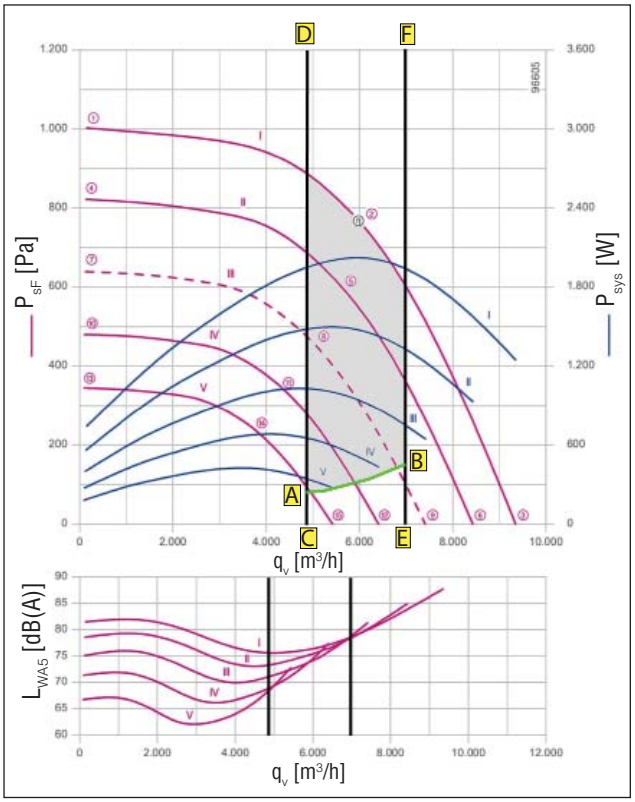
TAB14 relative to RTY 07 supply



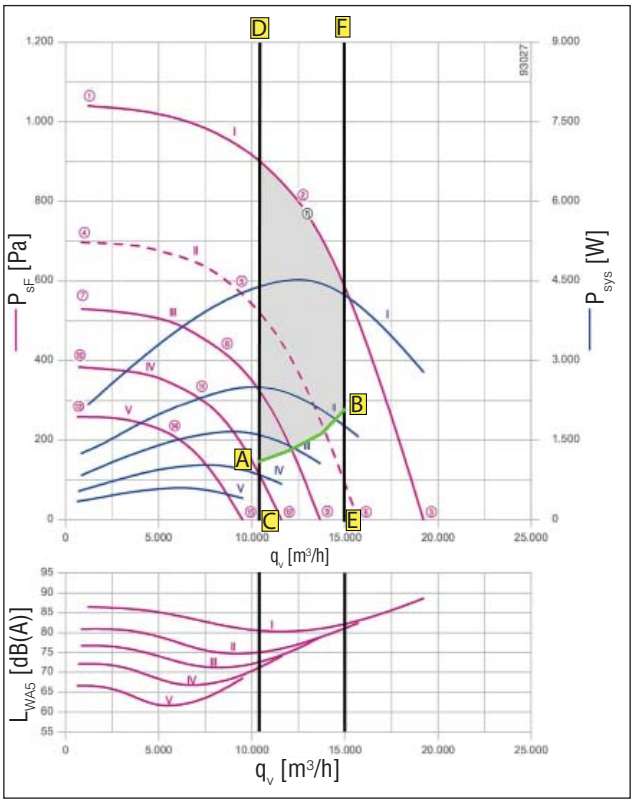
TAB15 relative to RTY 08 supply



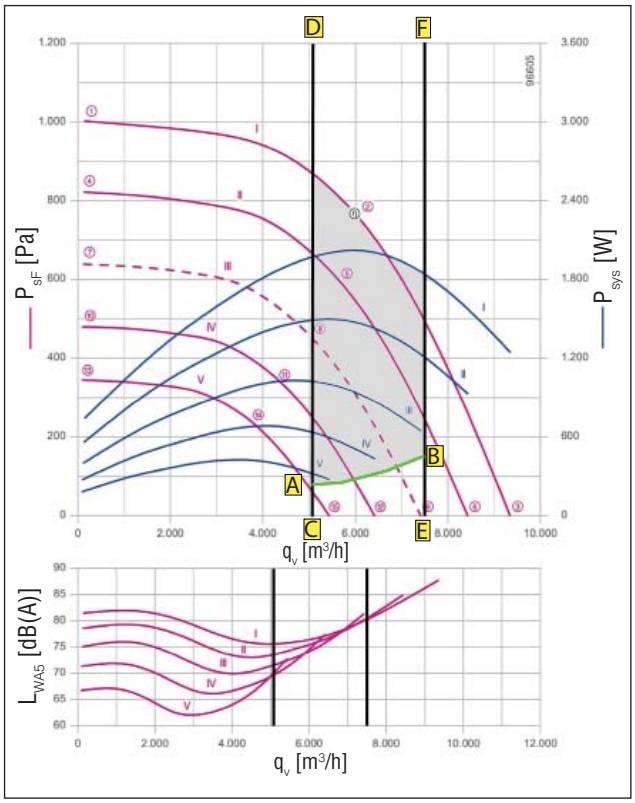
TAB16 relative to RTY 08 supply



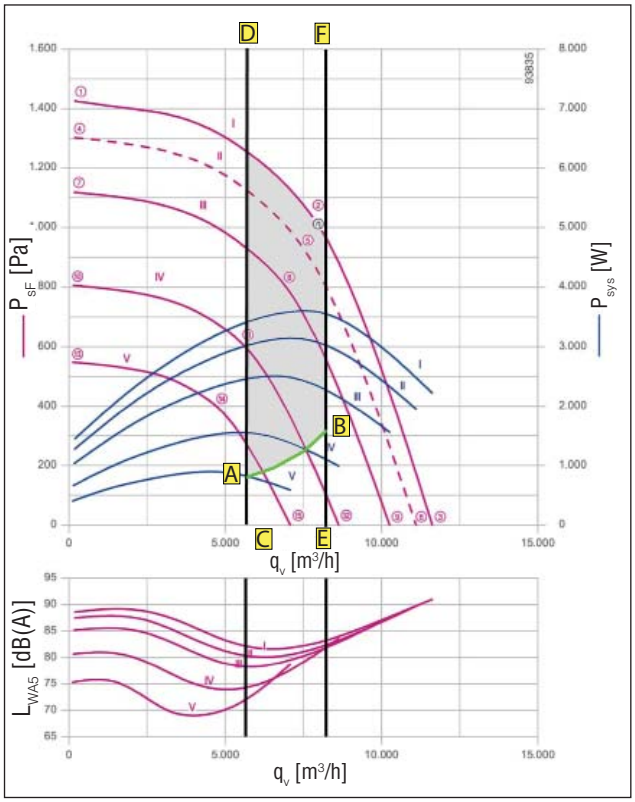
TAB9 relative to RTY 09 supply



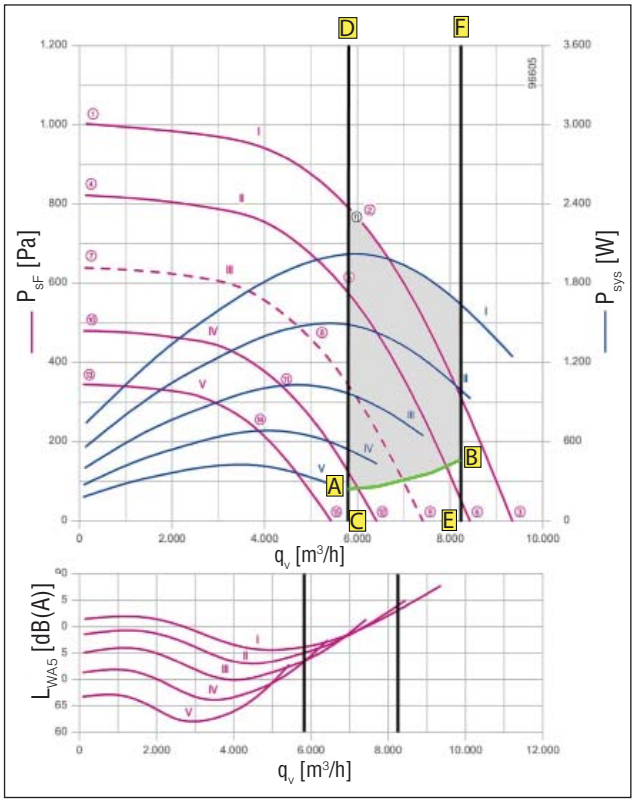
TAB10 relative to RTY 09 supply



TAB11 relative to RTY 10 supply



TAB12 relative to RTY 10 supply



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Performance data of water powered batteries (2 rows)																	
RTY 01			Minimum air flow rate 2,450 m³/h														
			Heating 80/60			Heating 70/50			Heating 80/65			Heating 70/60			Heating 60/40		
	Tm (°C): air input temperature		Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]
		10	33.31	1463.4	2.2	27.42	1197.7	1.6	34.73	2037.3	3.9	30.38	2661.0	6.6	21.42	930.7	1.0
		15	30.20	1326.5	1.8	24.36	1063.7	1.3	31.61	1854.3	3.3	27.32	2392.7	5.4	18.37	798.2	0.8
		18	28.36	1245.7	1.6	22.54	984.3	1.1	29.77	1746.5	3.0	25.51	2234.7	4.8	16.55	719.3	0.7
		20	27.14	1192.4	1.5	21.34	931.8	1.0	28.56	1675.5	2.7	24.32	2130.3	4.4	15.34	666.8	0.6
RTY 01			Nominal/maximum air flow rate 3,500 m³/h														
			Heating 80/60			Heating 70/50			Heating 80/65			Heating 70/60			Heating 60/40		
	Tm (°C): air input temperature		Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]
		10	42.58	1870.5	3.4	34.86	1522.2	2.4	44.69	2621.9	6.2	39.26	3438.2	10.5	27.00	1173.3	1.6
		15	38.58	1694.9	2.8	30.91	1350.0	2.0	40.68	2386.8	5.2	35.30	3092.0	8.6	23.08	1003.2	1.2
		18	36.21	1590.8	2.5	28.57	1247.8	1.7	38.32	2247.9	4.7	32.97	2887.6	7.6	20.75	901.7	1.0
		20	34.65	1522.1	2.3	27.02	1180.1	1.5	36.75	2156.2	4.3	31.43	2752.5	7.0	19.20	834.2	0.9

Performance data of water powered batteries (2 rows)																	
RTY 02			Minimum air flow rate 3,150 m³/h														
			Heating 80/60			Heating 70/50			Heating 80/65			Heating 70/60			Heating 60/40		
	Tm (°C): air input temperature		Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]
		10	39.70	1744.0	3.0	32.55	1421.5	2.1	41.59	2440.0	5.4	36.49	3195.8	9.2	25.27	1098.2	1.4
		15	35.97	1580.4	2.5	28.88	1261.1	1.7	37.86	2220.9	4.6	32.81	2873.5	7.5	21.63	939.8	1.1
		18	33.77	1483.6	2.2	26.70	1166.1	1.5	35.65	2091.7	4.1	30.64	2683.7	6.7	19.45	845.3	0.9
		20	32.32	1419.6	2.1	25.26	1103.1	1.4	34.20	2006.4	3.8	29.21	2558.5	6.1	18.01	782.5	0.8
RTY 02			Nominal/maximum air flow rate 4,500 m³/h														
			Heating 80/60			Heating 70/50			Heating 80/65			Heating 70/60			Heating 60/40		
	Tm (°C): air input temperature		Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]
		10	49.92	2192.9	4.5	40.72	1778.1	3.2	52.62	3087.1	8.3	46.33	4058.0	14.1	31.38	1363.5	2.1
		15	45.22	1986.5	3.8	36.08	1575.6	2.6	47.91	2810.6	7.0	41.68	3650.2	11.7	26.78	1163.6	1.6
		18	42.44	1864.1	3.4	33.33	1455.4	2.2	45.12	2647.1	6.3	38.92	3409.1	10.3	24.03	1044.3	1.3
		20	40.59	1783.2	3.1	31.50	1375.7	2.0	43.28	2539.1	5.8	37.10	3249.7	9.4	22.20	964.9	1.1

Performance data of water powered batteries (2 rows)

RTY 03

Minimum air flow rate 3,850 m³/h

Tm (°C): air input temperature	Heating 80/60			Heating 70/50			Heating 80/65			Heating 70/60			Heating 60/40		
	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]
10	45.29	1989.5	3.8	37.02	1616.6	2.7	47.62	2793.4	7.0	41.86	3666.4	11.8	28.62	1243.6	1.8
15	41.03	1802.4	3.2	32.82	1433.2	2.2	43.35	2543.0	5.9	37.65	3297.5	9.7	24.45	1062.5	1.3
18	38.51	1691.6	2.8	30.33	1324.4	1.9	40.82	2395.0	5.3	35.16	3079.6	8.6	21.96	954.5	1.1
20	36.84	1618.4	2.6	28.68	1252.4	1.7	39.16	2297.2	4.9	33.52	2935.7	7.8	20.31	882.6	0.9

RTY 03

Nominal/maximum air flow rate 5,500 m³/h

Tm (°C): air input temperature	Heating 80/60			Heating 70/50			Heating 80/65			Heating 70/60			Heating 60/40		
	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]
10	56.23	2470.3	5.6	45.75	1997.7	4.0	59.46	3488.4	10.4	52.45	4593.3	17.7	35.12	1526.1	2.6
15	50.93	2237.4	4.7	40.51	1769.2	3.2	54.15	3176.5	8.8	47.19	4132.6	14.6	29.93	1300.6	1.9
18	47.79	2099.2	4.2	37.40	1633.4	2.8	51.00	2991.7	7.9	44.07	3859.8	12.9	26.83	1166.0	1.6
20	45.71	2007.8	3.9	35.34	1543.4	2.5	48.91	2869.3	7.3	42.01	3679.4	11.8	24.77	1076.3	1.4

Performance data of water powered batteries (2 rows)

RTY 04

Minimum air flow rate 4,900 m³/h

Tm (°C): air input temperature	Heating 80/60			Heating 70/50			Heating 80/65			Heating 70/60			Heating 60/40		
	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]
10	59.15	2598.6	4.6	48.46	2116.1	3.3	62.08	3641.7	8.4	54.53	4776.1	14.2	37.59	1633.4	2.2
15	53.62	2355.4	3.8	42.99	1877.7	2.7	56.53	3316.2	7.1	49.06	4296.7	11.7	32.17	1397.8	1.6
18	50.34	2211.3	3.4	39.75	1736.1	2.3	53.25	3123.8	6.4	45.82	4013.5	10.3	28.93	1257.3	1.3
20	48.17	2116.1	3.2	37.61	1642.4	2.1	51.08	2996.7	5.9	43.69	3826.5	9.5	26.78	1163.8	1.2

RTY 04

Nominal/maximum air flow rate 7,000 m³/h

Tm (°C): air input temperature	Heating 80/60			Heating 70/50			Heating 80/65			Heating 70/60			Heating 60/40		
	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]
10	73.57	3231.6	6.8	59.98	2619.4	4.9	77.65	4555.1	12.6	68.43	5993.0	21.4	46.21	2008.3	3.1
15	66.67	2928.6	5.7	53.17	2321.9	3.9	70.72	4149.1	10.7	61.59	5394.0	17.7	39.45	1714.4	2.4
18	62.57	2748.9	5.1	49.12	2145.0	3.4	66.62	3908.5	9.6	57.53	5039.0	15.6	35.41	1538.9	1.9
20	59.86	2629.7	4.7	46.43	2027.7	3.1	63.91	3749.4	8.9	54.85	4804.2	14.3	32.73	1422.1	1.7

Performance data of water powered batteries (2 rows)

RTY 05

Minimum air flow rate 5,600 m³/h

Tm (°C): air input temperature	Heating 80/60			Heating 70/50			Heating 80/65			Heating 70/60			Heating 60/40		
	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]
10	64.35	2826.9	5.4	52.62	2297.9	3.8	67.68	3970.6	9.8	59.53	5214.1	16.6	40.71	1769.0	2.5
15	58.32	2562.1	4.5	46.67	2038.1	3.1	61.64	3616.0	8.3	53.57	4691.4	13.7	34.80	1512.4	1.9
18	54.75	2405.3	4.0	43.14	1883.8	2.7	58.06	3406.3	7.4	50.04	4382.3	12.1	31.28	1359.3	1.6
20	52.39	2301.3	3.7	40.80	1781.6	2.4	55.70	3267.6	6.9	47.70	4178.1	11.1	28.93	1257.4	1.3

RTY 05

Nominal/maximum air flow rate 8,000 m³/h

Tm (°C): air input temperature	Heating 80/60			Heating 70/50			Heating 80/65			Heating 70/60			Heating 60/40		
	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]
10	79.39	3487.3	7.8	64.62	2822.3	5.6	83.95	4924.7	14.6	74.06	6486.9	24.7	49.68	2158.8	3.6
15	71.94	3160.0	6.6	57.26	2500.8	4.5	76.47	4486.2	12.3	66.66	5838.9	20.4	42.37	1841.4	2.7
18	67.51	2965.8	5.8	52.89	2309.5	3.9	72.04	4226.2	11.0	62.28	5454.8	18.1	38.01	1651.8	2.2
20	64.58	2837.1	5.4	49.98	2182.8	3.5	69.11	4054.2	10.2	59.38	5200.7	16.6	35.11	1525.5	1.9

Performance data of water powered batteries (2 rows)

RTY 06

Minimum air flow rate 6,650 m³/h

Tm (°C): air input temperature	Heating 80/60			Heating 70/50			Heating 80/65			Heating 70/60			Heating 60/40		
	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]
10	71.39	3136.1	6.5	58.25	2543.6	4.6	75.29	4417.1	11.9	66.33	5808.9	20.2	44.92	1951.9	3.0
15	64.70	2842.1	5.4	51.63	2255.0	3.7	68.58	4023.1	10.1	59.69	5227.5	16.7	38.36	1666.8	2.2
18	60.73	2667.7	4.8	47.71	2083.4	3.2	64.60	3789.8	9.0	55.76	4883.3	14.8	34.44	1496.6	1.8
20	58.10	2552.2	4.4	45.10	1969.7	2.9	61.97	3635.5	8.4	53.16	4655.8	13.5	31.83	1383.3	1.6

RTY 06

Nominal/maximum air flow rate 9,500 m³/h

Tm (°C): air input temperature	Heating 80/60			Heating 70/50			Heating 80/65			Heating 70/60			Heating 60/40		
	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]
10	87.20	3830.2	9.3	70.85	3093.9	6.6	92.41	5421.3	17.3	81.64	7150.2	29.5	54.31	2360.2	4.2
15	79.01	3470.5	7.8	62.75	2740.5	5.3	84.20	4939.4	14.6	73.50	6437.3	24.4	46.28	2011.1	3.1
18	74.14	3256.9	6.9	57.94	2530.1	4.6	79.32	4653.3	13.1	68.67	6014.3	21.6	41.48	1802.6	2.6
20	70.92	3115.5	6.4	54.74	2390.5	4.1	76.09	4463.9	12.2	65.47	5734.2	19.8	38.28	1663.7	2.2

Performance data of water powered batteries (2 rows)

RTY 07

Minimum air flow rate 8,050 m³/h

Tm (°C): air input temperature	Heating 80/60			Heating 70/50			Heating 80/65			Heating 70/60			Heating 60/40		
	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]
10	79.66	3499.4	7.9	64.85	2831.9	5.6	84.25	4942.3	14.7	74.33	6510.4	24.9	49.84	2165.9	3.6
15	72.19	3171.0	6.6	57.46	2509.3	4.5	76.75	4502.3	12.4	66.91	5860.1	20.6	42.51	1847.4	2.7
18	67.75	2976.1	5.9	53.06	2317.4	3.9	72.30	4241.4	11.1	62.51	5474.6	18.2	38.13	1657.1	2.2
20	64.81	2847.0	5.4	50.15	2190.1	3.5	69.35	4068.7	10.3	59.59	5219.6	16.7	35.22	1530.5	1.9

RTY 07

Nominal/maximum air flow rate 11,500 m³/h

Tm (°C): air input temperature	Heating 80/60			Heating 70/50			Heating 80/65			Heating 70/60			Heating 60/40		
	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]
10	96.29	4229.6	11.1	78.08	3409.7	7.8	102.28	6000.0	20.9	90.47	7924.0	35.6	59.69	2593.8	5.0
15	87.24	3832.3	9.3	69.14	3019.2	6.3	93.20	5467.6	17.6	81.47	7135.4	29.4	50.81	2208.1	3.7
18	81.86	3595.9	8.3	63.81	2786.5	5.4	87.81	5151.3	15.8	76.12	6667.1	26.0	45.50	1977.4	3.1
20	78.29	3439.2	7.7	60.27	2632.0	4.9	84.24	4941.6	14.6	72.58	6356.8	23.9	41.97	1823.8	2.6

Performance data of water powered batteries (2 rows)

RTY 08

Minimum air flow rate 9,800 m³/h

Tm (°C): air input temperature	Heating 80/60			Heating 70/50			Heating 80/65			Heating 70/60			Heating 60/40		
	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]
10	88.65	3894.0	9.6	72.00	3144.1	6.8	93.99	5513.6	17.9	83.05	7273.6	30.5	55.17	2397.5	4.3
15	80.32	3528.2	8.0	63.77	2785.0	5.4	85.63	5023.6	15.1	74.77	6548.6	25.2	47.00	2042.6	3.2
18	75.37	3311.0	7.1	58.87	2571.0	4.7	80.68	4732.7	13.5	69.86	6118.3	22.2	42.12	1830.5	2.7
20	72.09	3166.9	6.6	55.62	2429.1	4.2	77.39	4540.1	12.6	66.60	5833.5	20.4	38.87	1689.3	2.3

RTY 08

Nominal/maximum air flow rate 14,000 m³/h

Tm (°C): air input temperature	Heating 80/60			Heating 70/50			Heating 80/65			Heating 70/60			Heating 60/40		
	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]
10	106.08	4659.7	13.3	85.87	3749.6	9.3	112.92	6624.7	25.0	100.01	8758.9	42.7	65.47	2845.0	5.9
15	96.11	4221.8	11.1	76.00	3318.9	7.5	102.92	6038.0	21.1	90.08	7889.0	35.3	55.68	2419.5	4.4
18	90.18	3961.2	9.9	70.12	3062.3	6.5	96.97	5689.0	18.9	84.17	7371.8	31.2	49.82	2165.1	3.6
20	86.24	3788.2	9.1	66.22	2891.8	5.8	93.03	5457.6	17.6	80.26	7029.0	28.6	45.92	1995.5	3.1

Performance data of water powered batteries (2 rows)

RTY 09

Minimum air flow rate 10,500 m³/h

Tm (°C): air input temperature	Heating 80/60			Heating 70/50			Heating 80/65			Heating 70/60			Heating 60/40		
	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]
10	91.91	4037.2	10.2	74.59	3257.4	7.2	97.52	5721.0	19.1	86.21	7550.9	32.6	57.10	2481.3	4.6
15	83.27	3658.0	8.6	66.06	2884.9	5.8	88.86	5212.9	16.1	77.63	6798.8	27.0	48.63	2113.2	3.4
18	78.14	3432.4	7.6	60.98	2663.1	5.0	83.72	4911.2	14.5	72.53	6352.3	23.8	43.57	1893.2	2.8
20	74.74	3283.0	7.0	57.60	2515.6	4.5	80.31	4711.3	13.4	69.15	6056.6	21.8	40.20	1746.7	2.4

RTY 09

Nominal/maximum air flow rate 15,000 m³/h

Tm (°C): air input temperature	Heating 80/60			Heating 70/50			Heating 80/65			Heating 70/60			Heating 60/40		
	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]
10	109.61	4815.0	14.1	88.68	3872.3	9.9	116.77	6850.3	26.5	103.45	9060.7	45.5	67.55	2935.5	6.2
15	99.31	4362.5	11.8	78.48	3427.1	7.9	106.43	6244.0	22.4	93.19	8161.5	37.6	57.43	2495.7	4.7
18	93.18	4093.1	10.5	72.40	3161.6	6.8	100.28	5883.2	20.1	87.08	7626.6	33.2	51.38	2232.7	3.8
20	89.11	3914.2	9.7	68.36	2985.4	6.2	96.21	5643.9	18.7	83.03	7272.0	30.5	47.35	2057.4	3.3

Performance data of water powered batteries (2 rows)

RTY 10

Minimum air flow rate 11,550 m³/h

Tm (°C): air input temperature	Heating 80/60			Heating 70/50			Heating 80/65			Heating 70/60			Heating 60/40		
	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]
10	96.50	4238.9	11.2	78.25	3417.0	7.9	102.51	6013.5	20.9	90.68	7942.0	35.8	59.81	2599.3	5.0
15	87.43	3840.7	9.4	69.28	3025.7	6.3	93.41	5479.9	17.7	81.66	7151.7	29.6	50.92	2212.6	3.7
18	82.04	3603.8	8.3	63.94	2792.5	5.5	88.01	5162.9	15.9	76.30	6682.3	26.1	45.60	1981.5	3.1
20	78.46	3446.8	7.7	60.40	2637.6	4.9	84.43	4952.8	14.7	72.75	6371.3	24.0	42.05	1827.5	2.6

RTY 10

Nominal/maximum air flow rate 16,500 m³/h

Tm (°C): air input temperature	Heating 80/60			Heating 70/50			Heating 80/65			Heating 70/60			Heating 60/40		
	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]	Qtot [kW]	Port H_2O [l/h]	ΔpW [kPa]
10	114.59	5033.3	15.3	92.63	4044.9	10.7	122.18	7167.6	28.8	108.30	9485.3	49.4	70.48	3062.5	6.7
15	103.82	4560.3	12.8	81.96	3579.1	8.6	111.37	6533.7	24.4	97.56	8544.7	40.9	59.89	2602.7	5.0
18	97.40	4278.5	11.4	75.60	3301.4	7.4	104.94	6156.4	21.9	91.17	7985.1	36.1	53.56	2327.6	4.1
20	93.14	4091.4	10.5	71.38	3116.9	6.7	100.67	5906.0	20.3	86.94	7613.9	33.1	49.34	2144.2	3.5

Electric heating coils

The use of this accessory is typically suitable for cold climates; it is available in different sizes and also allows for the heating of the environment. The electric coils are managed by the thermoregulator.
They are made of a galvanized steel frame with armoured elements, equipped with safety thermostats with automatic and manual reset, calibrated to intervene in the event of failure or poor ventilation.
During defrosting, with the supply fan operating, it can be activated to heat the return air. In this way, the operating limits of the unit itself can be extended.
Also, with this use, the electric coils can be used as an integration of the yield capacity of the heat pump; the thermoregulator is able to manage and activate the integration function.

NOTE:
- The inclusion of the "electric heating coil" as an accessory implies the variation of the main electrical data of the unit;
- The accessory "electric heating coil" cannot be assembled at the same time as the accessory "hot water coil";
- he accessory "electric heating coil" cannot be assembled if the "heating module with GXXX condensing gas burner" is present.

Abbreviation	Description	Size 01	Size 02	Size 03	Size 04	Size 05	Size 06	Size 07	Size 08	Size 09	Size 10
BE09	2-stage 9 kW electric heating coil	O	O	O	-	-	-	-	-	-	-
BE12	2-stage 12 kW electric heating coil	O	O	O	O	O	O	O	-	-	-
BE18	2-stage 18 kW electric heating coil	-	-	-	-	O	O	O	O	O	O
BE24	2-stage 24 kW electric heating coil	-	-	-	-	O	O	O	O	O	O
BE36	2-stage 36 kW electric heating coil	-	-	-	-	-	-	-	O	O	O
BEM06	2-stage 6 kW modulating electric heating coil	O	O	O	O	-	-	-	-	-	-
BEM09	2-stage 9 kW modulating electric heating coil	O	O	O	O	-	-	-	-	-	
BEM12	2-stage 12 kW modulating electric heating coil	O	O	O	O	O	O	O	-	-	-
BEM18	2-stage 18 kW modulating electric heating coil	-	-	-	-	O	O	O	O	O	O
BEM24	2-stage 24 kW modulating electric heating coil	-	-	-	-	O	O	O	O	O	O
BEM36	2-stage 36 kW modulating electric heating coil	-	-	-	-	-	-	-	O	O	O

Heating module with condensing gas burner

The application of the heating module is suitable for very cold climates. It is available with different potentials and allows you to heat the environment.
In the case that bad weather conditions make the use of a heat pump not very ideal or convenient, the gas module may be useful; for this reason, bearing in mind that its use must be equalized to that of the heat pump, during design or selection an equal potential must be identified.
Thanks to highly efficient condensation technology with premix and modulation (up to 105% depending on the lower calorific value), the energy savings are up to 50%: in fact, the use of an electronic card with the continuous modulation of power controlled by a microprocessor allows for extremely low power consumption which are reduced even more when operating in partial load mode.
The premixed burner, in combination with the air/gas valve, allows for a "clean" combustion with very low emissions of polluting elements.
The heating module includes a condensing hot air generator with modulating control, fuelled with natural gas or liquefied petroleum gas (the kit for conversion to LPG is also provided), and it can be completed by the exhaust pipe kit (CF), in steel, and all the adjusting and safety devices (the chimney will have to be studied each time depending on the system requirements). In the case of supply (optional), the chimney kit comes unassembled, to be assembled and installed by the installer.
The use of a sophisticated technique of air/gas mixture makes the generator absolutely safe, since the gas valve supplies the fuel in relation to the air flow, according to a default setting defined by the company.
In the absence of combustion air, the valve does not supply gas; in the case of a decrease of combustion air, the valve automatically reduces the gas flow, keeping the combustion parameters at optimal levels.

The combustion chamber is made of steel AISI 430 while the exchanger tubes and the fume collection box is made of stainless steel with low carbon content.
NOTE:

- The accessory "Heating module with condensing gas burner" **cannot** be present at the same time as the accessory "Electric heating coil";
- The inclusion of the "Heating module with condensing gas burner" determines a reduction of the head available to the air side;
- The accessory requires a supply of natural gas/LPG (the configuration for the connection is performed by the customer), also please note that if there is a chimney for the fumes (accessory provided unassembled), **you must comply with all the regulations regarding the unit.**

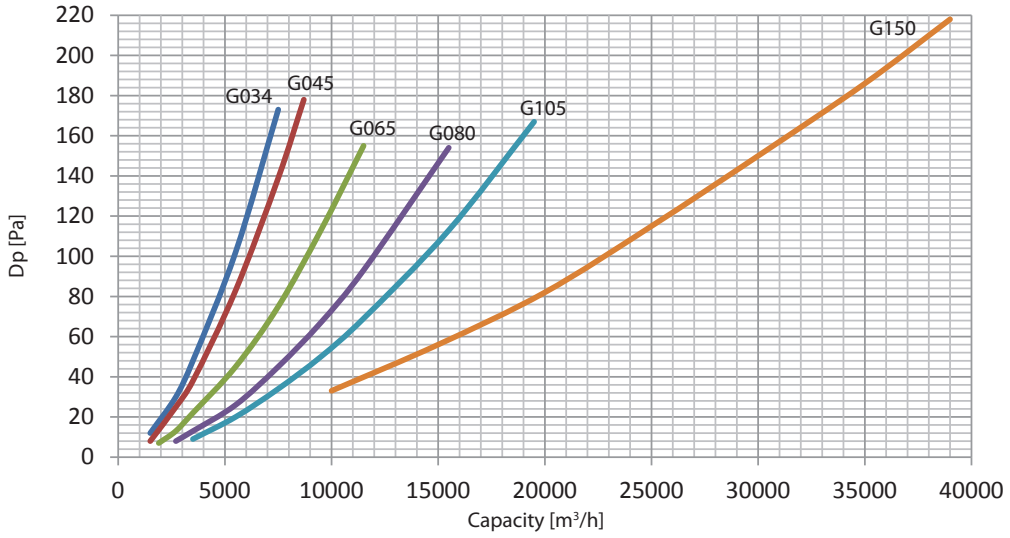
Abbre-viation	Description	Size 01	Size 02	Size 03	Size 04	Size 05	Size 06	Size 07	Size 08	Size 09	Size 10
G034	Heating module with 34 kW* gas burner	O	O	O	O	-	-	-	-	-	-
G045	Heating module with 45 kW* gas burner	O	O	O	O	O	O	O	-	-	-
G065	Heating module with 65 kW* gas burner	-	-	-	O	O	O	O	-	-	-
G080	Heating module with 80 kW* gas burner	-	-	-	O	O	O	O	O	-	-
G105	Heating module with 105 kW* gas burner	-	-	-	-	-	-	-	O	O	O
G150	Heating module with 150 kW* gas burner	-	-	-	-	-	-	-	O	O	O

* = As standard, the unit is set for natural gas; it is supplied with the kit for LPG conversion, consisting of:
- orifice plate;
- pilot flame nozzle;
- adhesive label "unit converted..."

Model		G034		G045		G065		G080		G105		G150	
	U.M.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Heating capacity	kW	7.6	34.9	8.5	44	12.4	65	16.4	82	18	100	44	155
Nominal heating capacity	kW	8.1	33.6	9	42.8	13.4	62.9	17.8	80	19.6	97.2	46.3	145
Yield	%	106.9	96.3	105.5	96.4	108.1	96.8	108.3	97.6	109.1	97.2	105.2	93.5
Max amount of condensation[1]	l/h	0.9		1.1		2.1		3.3		2.7		3.87	
Pressure available to the fireplace	Pa	90		100		120		120		120		100	
Electrical power consumption	W	11	74	24	82	15	97	40	123	20	130	400	
Operating temperature	°C	from -15°C to + 40°C - for lower temperatures, the burner compartment heating kit is needed											
Ø gas connection	GAS	UNI/ISO 7/1-3/4"		UNI/ISO 7/1-3/4"		UNI/ISO 7/1-3/4"		UNI/ISO 7/1-1"		UNI/ISO 7/1-1"		UNI/ISO 7/1-1"	
Ø suction/drainage pipes	mm	80/80		80/80		80/80		80/80		80/80		130/130	
Minimum air flow rate[2]	m³/h	2100		2600		3100		4200		5400		8500	

(1) Max value of produced condensation obtained from test at 30% Qn;
(2) The minimum air flow rate has been calculated for a Δt of 50°C, suitable for process plants or special plants.

The graph on the left shows the evolution of the air flow / pressure drop ratio in function of the different sizes of the heating modules with gas burner.



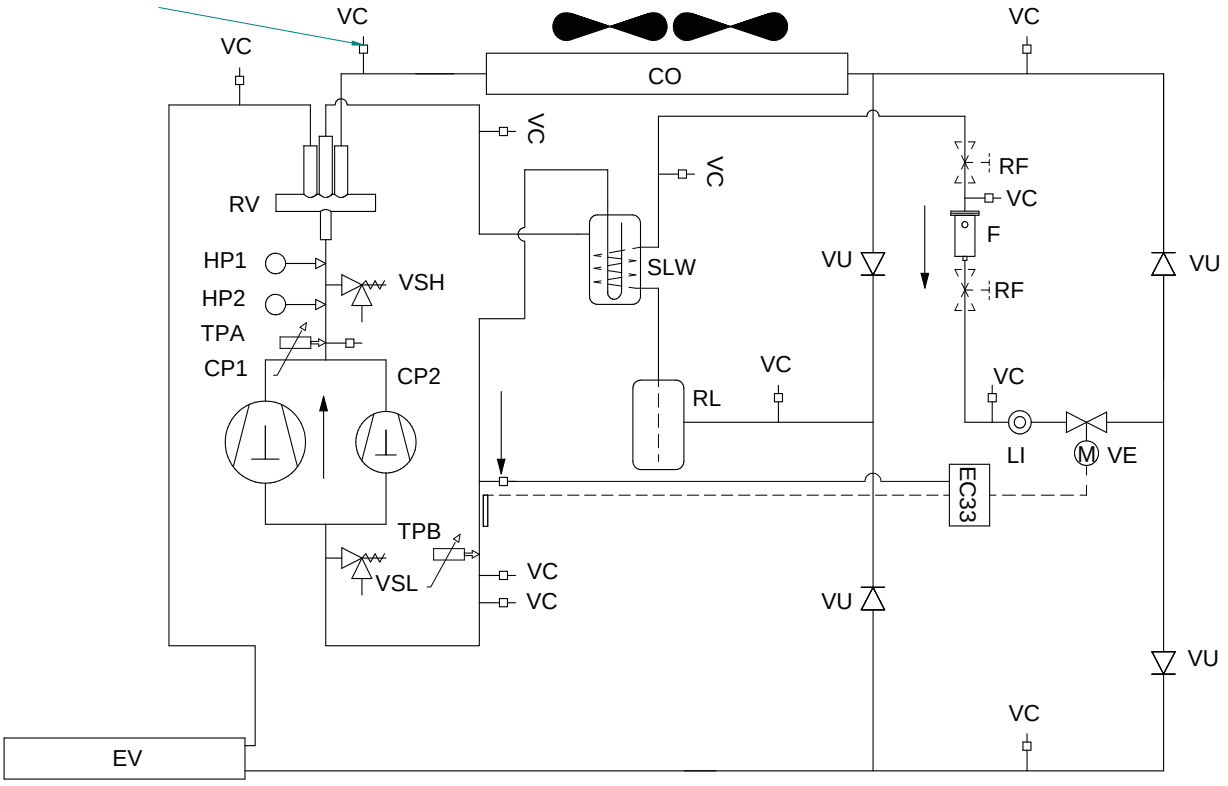
List of pressure equipment - directive PED 97/23 EC

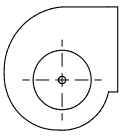
The table on the side shows a list of the pressure equipment and the relative module mounted on RTY rooftops,in accordance with Directive PED 97/23 CE module A1.

COMPONENT	MODULE
Compressor	D1
Finned coil exchanger	A
Cycle reversing valve	excluded (art. 3.3)
Liquid receiver	D1
High pressure switch	B+D
High pressure side safety valve	B+D
Low pressure side safety valve	B+D

Refrigerating diagrams

In the case of a pressure switch speed adjustment accessory, it must be connected with the "T" joint cod. 6790603

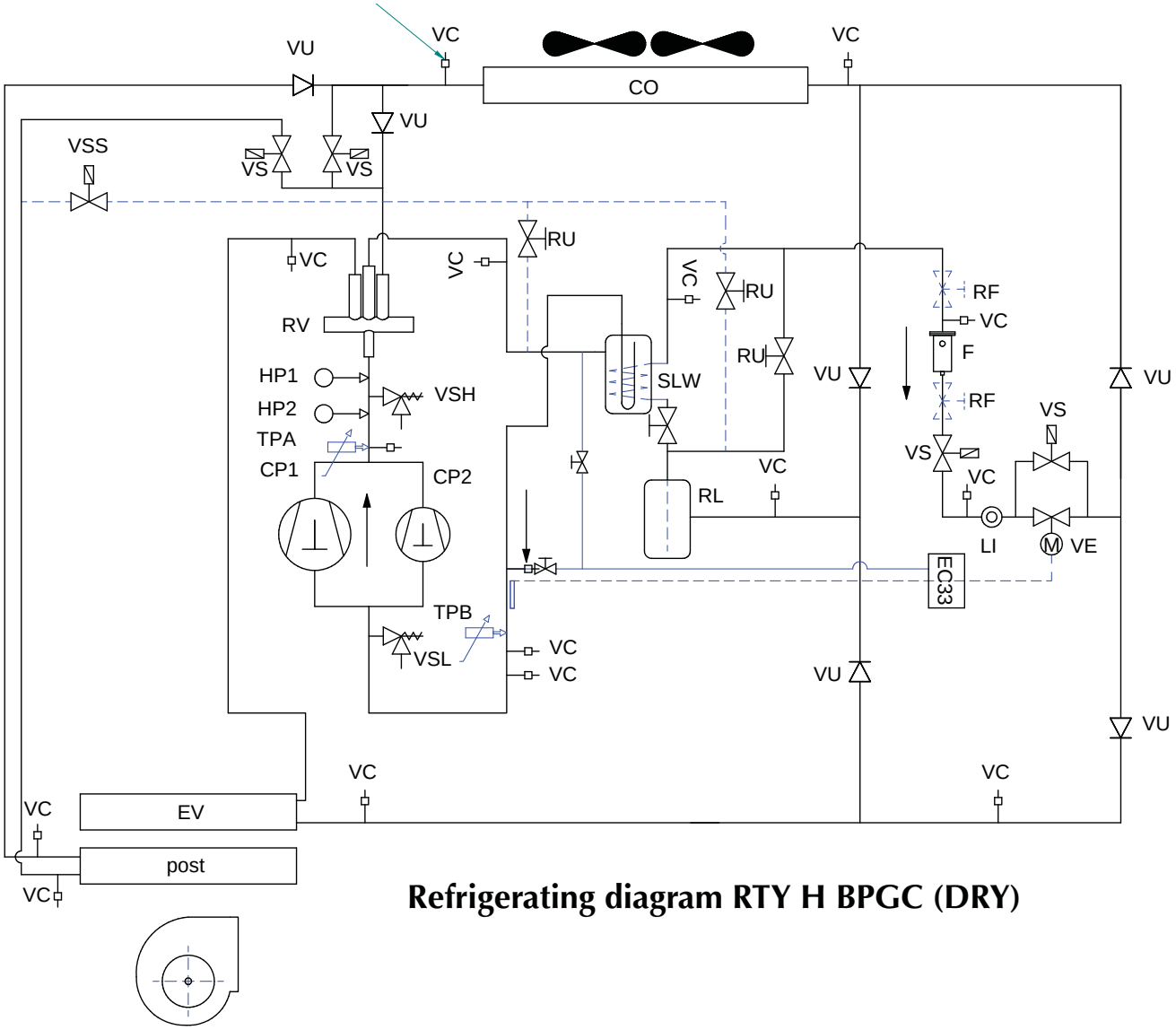




Refrigerating diagram RTY H

CO	Capacitor	RV	Cycle reversing valve
CP1	SCROLL compressor 1	TPA	High pressure transducer
CP2	SCROLL compressor 2	TPB	Low pressure transducer
EV	Evaporator	VC	Service valve
F	Dehydrator filter	VE	Thermostatic expansion valve
HP1	Manual reset high pressure switch	VS	Solenoid Valve
HP2	Manual reset high pressure switch	VSH	High pressure safety valve
LI	Liquid indicator	VSL	Low pressure safety valve
RF	Filter valve (only with interchangeable cartridge)	VU	One-way valve
RL	Liquid receiver	SLW	Liquid separator with exchanger

In the case of a pressure switch speed adjustment accessory, it must be connected with the "T" joint cod. 6790603



Refrigerating diagram RTY H BPGC (DRY)

CO	Capacitor	RV	Cycle reversing valve
CP1	SCROLL compressor 1	TPA	High pressure transducer
CP2	SCROLL compressor 2	TPB	Low pressure transducer
EV	Evaporator	VC	Service valve
F	Dehydrator filter	VE	Thermostatic expansion valve
HP1	Manual reset high pressure switch	VS	Solenoid Valve
HP2	Manual reset high pressure switch	VSH	High pressure safety valve
LI	Liquid indicator	VSL	Low pressure safety valve
POST	Warm gas post-heating coil	VSS	Discharging solenoid valve
RF	Filter valve (only with interchangeable cartridge)	VU	One-way valve
RL	Liquid receiver	SLW	Liquid separator with exchanger

Plate information

The RTY units are equipped with an adhesive label that summarizes the main technical data such as model, nominal cooling and heating capacity, nominal capacity of air intake and electrical data.
For future reference and for all communication with AERMEC S.p.A. you must indicate the serial number.
Also, each piece is accompanied by a label with the weight and other information useful for traceability.
The technical data plate and the main component weight label are located on the the rooftop, on the side of the electrical panel near its inspection panel.
The weight label of each additional part is located on the inspection panel, or on the package.

AERMEC CE 1115

ARTICOLO - ARTICULO *ITEM - EINZEITEIL-ARTICLE*	XXXXX.YY
Descrizione	RTX 10 MB1
MODELLO - MODELO *MODEL - MODELL*	RTX 10
MATRICOLA - MATRICULA UNIDAD *SERIAL NUMBER - SERIENUMMER*	XXXXXXXXXXXXXXXX
PS / PmaxLP /TS	42bar / 25bar / 135°
Pmin / Tmin	2bar / -25°C
REFRIGERANTE - GAS REFRIGERANT *REFRIGERANT - KÄLTEMITTEL*	R410A
REFRIGERANTE kg- GAS REFRIGERANT kg *REFRIGERANT kg- KÄLTEMITTEL kg*	18
A. MAX	47,7
TENSIONE DI ALIMENTAZIONE - FUENTE DE ALIMENTACION *POWER SUPPLY - STROMVERSORGUNG*	400/3/50

BARCODE MATRICOLA | BARCODE ARTICOLO

AERMEC CE 1115

MODELLO

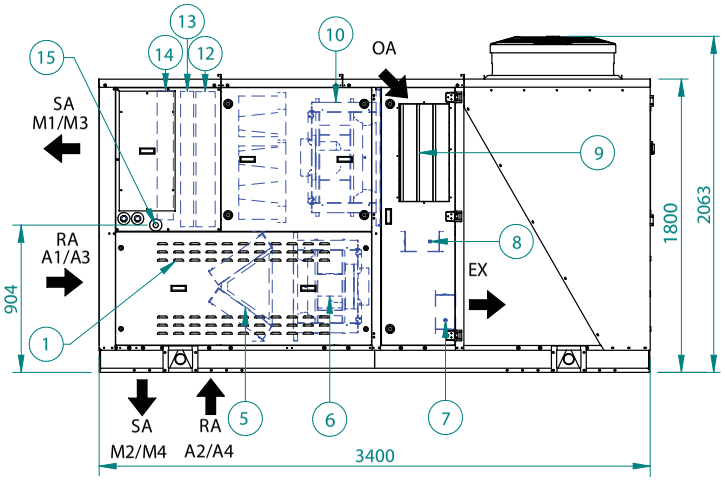
RTX 10

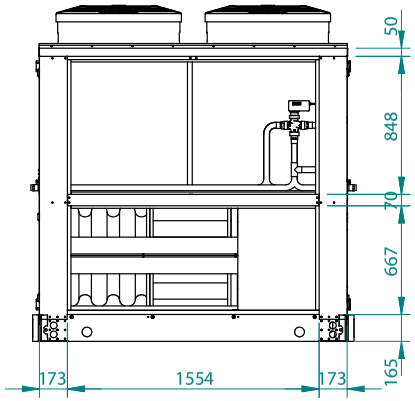
VERSIONE / COMMESSA **COMM. XXXXXX**	*KG* *PESO LORDO - GROSS WEIGHT* *POIDS BRUT - BRUTTOGEWICHT* **1417**
ACCESSORI e/o TRASFORMAZIONI **XXXXXX**	*Collo - Package* **1 / 1** **XXXXXX**

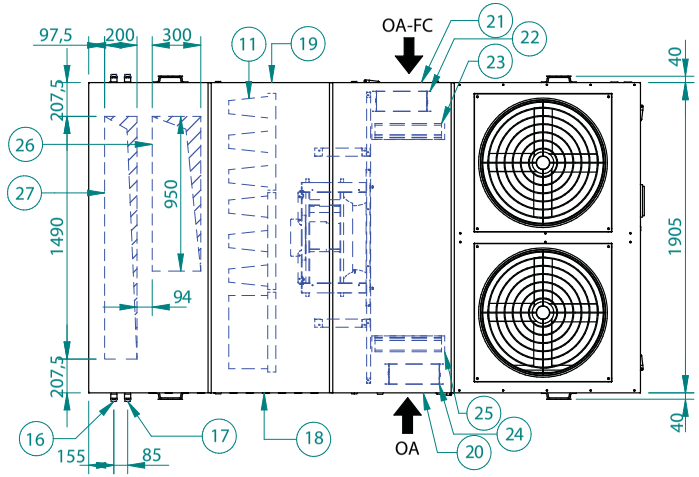
MATRICOLA

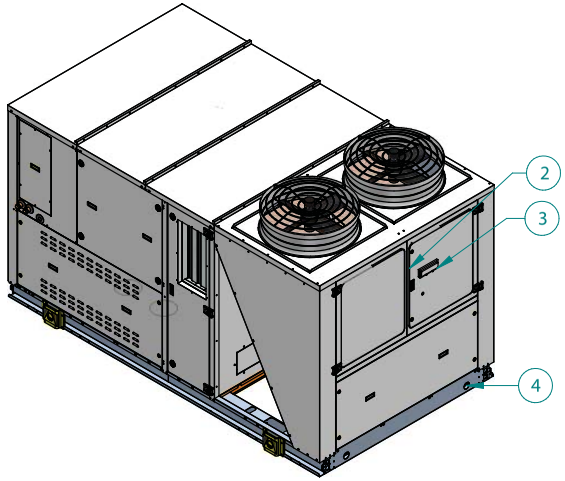
XXXXXXXXXXXXXXXX

BARCODE MATRICOLA









N°	DESCRIPTION	ACC.
1	Compressor compartment inspection panel	STD
2	Electrical panel	STD
3	Microprocessor control keyboard	STD
4	Electrical line input	STD
5	G4 air return filters	STD
6	Return fan	STD
7	Exhaust damper	STD
8	Recirculation damper	STD
9	External air damper	STD
10	Supply fan	STD
11	Rigid bag filters F7/F9 - limp F7 - electrostatic	OPT
12	Treatment coil	STD
13	Warm gas post-heating coil	OPT
14	Water-powered/electric integration coil	OPT
15	Tank Condensation discharge	STD
16	Integration coil water input Ø 1" GAS	OPT
17	Integration coil water output Ø 1" GAS	OPT
18	Access for inspection of fan and supply filters	STD
19	Access for inspection of fan and return filters	STD
20	Access for inspection and replacement of filters and damper servo-motors	STD
21	Access for inspection and replacement of filters if present FCT3/FCH3	OPT
22	External air freecooling damper, if present FCT3/FCH3	OPT
23	External air freecooling filters, if present FCT3/FCH3	OPT
24	External air damper	STD
25	G4 external air filters	STD
26	Air return opening A2/A4	OPT
27	Air supply opening M2/M4	OPT
SA	Supply air	STD
RA	Extracted air	STD
OA	External air	STD
OA-FC	External air freecooling, if present FCT3/FCH3	STD
EX	Exhaust air only for version MB3	STD

Size
SRA 01 - 02 - 03

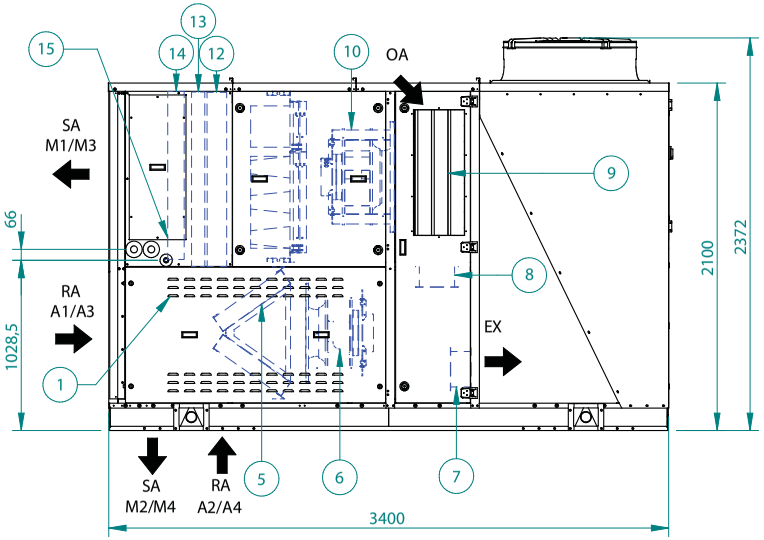
AVAILABLE CONFIGURATIONS		
	M1 / M3	M2 / M4
A1 / A3	•	°
A2 / A4	•	•

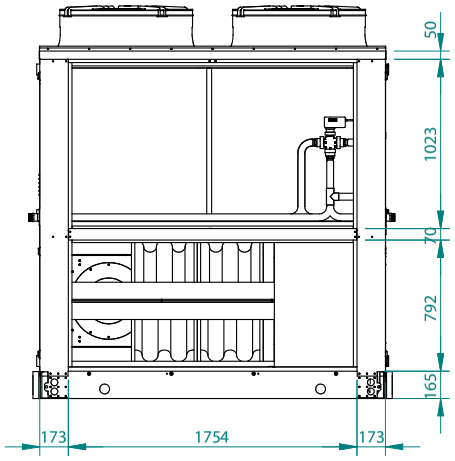
• configuration available

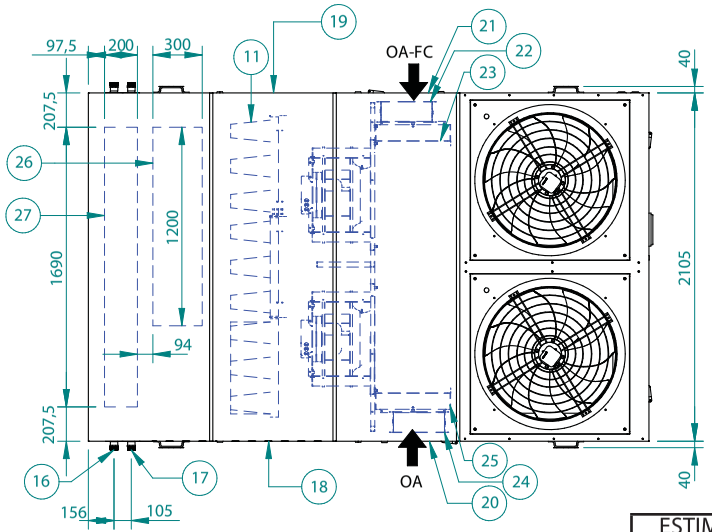
° configuration not available

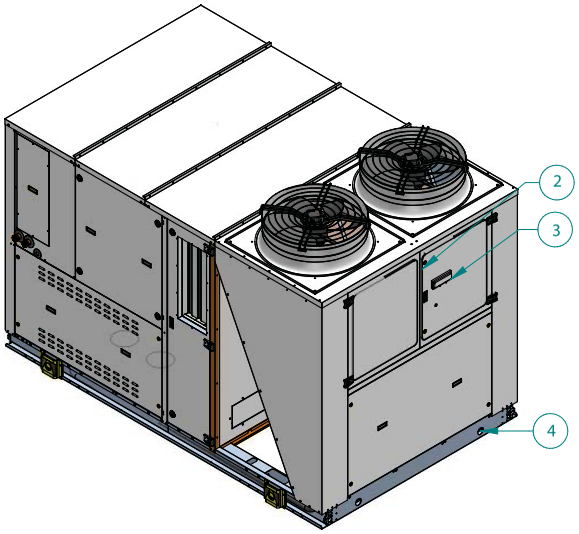
ESTIMATED WEIGHT OF UNIT	
SIZE	MB1 / 2 [kg]
01	1333
02	1360
03	1360

* Provide for a minimum space of 1500 mm around the unit and 3000 mm above.









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OA	External air	STD
OA-FC	External air freecooling, if present FCT3/FCH3	STD
EX	Exhaust air only for version MB3	STD

Size
RTY 04 - 10

AVAILABLE CONFIGURATIONS		
	M1 / M3	M2 / M4
A1 / A3	•	o
A2 / A4	•	•

● configuration available

o configuration not available

ESTIMATED WEIGHT OF UNIT		ESTIMATED WEIGHT OF UNIT	
SIZE	MB1 / 2 [kg]	SIZE	MB1 / 2 [kg]
04	1650	08	1727
05	1654	09	1794
06	1679	10	1852
07	1684		

* for the accessory FCT3/FCH3 the external air intake takes place on both sides (OA + OA-FC);
** For sizes 06-07-08-09-10 the air intake takes place on both takes;
*** Provide for a minimum space of 1500 mm around the unit and 3000 mm above.

INSTALLATION AND USE OF THE UNIT

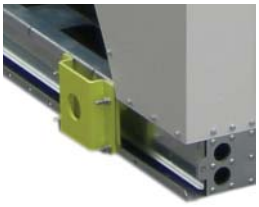
PACKAGING

The units of the RTY series are usually supplied without packaging, except for high efficiency filtering cells and the assembling accessories provided suitably packaged and to be installed by the installer. On request, the units can be supplied wrapped in polyethylene film, on a pallet+polyethylene film, in a cage or crate.

HANDLING

Before handling the unit, make sure that it has not been damaged during transport and check that the equipment to be used for lifting and positioning are suitable in capacity (see table of weights or the label on the part) and that they comply with safety standards in force.
Particular attention should be paid to all the operations of loading, unloading and lifting in order to avoid danger to persons and damage to the structural and functional organs of the machine.

To lift the unit, there are some holes on the base highlighted by special yellow metal omegas through which steel poles will be inserted: the poles, of a suitable size, must protrude from the base for such a length that the lifting straps can be stretched upward without inteRTYrence.



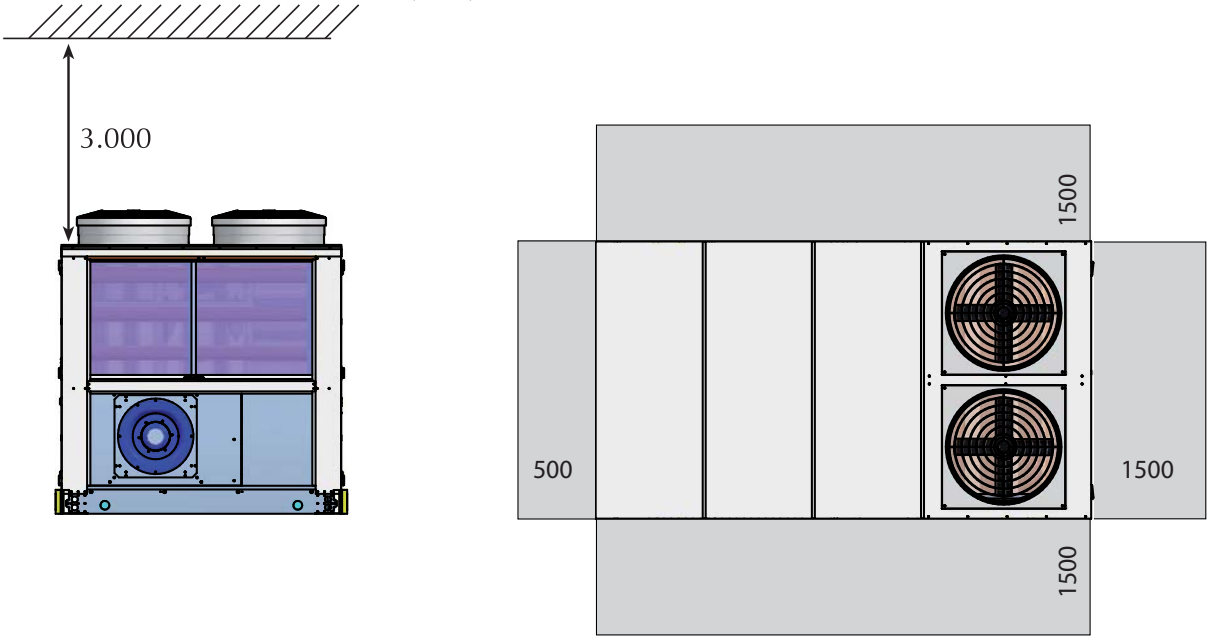
Make sure that the straps are approved to withstand the weight of the unit, make sure they are securely AERMECened to the upper frame and to the lifting poles, the safety latches must guarantee that the straps do not come out of their place.
The lifting frame must have its attachment point on the vertical of the barycentre.
The positioning can be done by using two pallet jacks, one for each side of the section, preferably acting on the longer sides.
Alternatively, the positioning can be done by sliding the rooftop on tubes acting as rollers.
During lifting, it is recommended you assemble the anti-vibration supports VTx, AERMECening them to the holes ø 40 mm on the base, according to the installation diagram supplied with the accessories VTx.
It is absolutely forbidden to stand under the unit.

POSITIONING

The machines of the RTY series canbe installed outside, in an appropriate area, providing the technical spaces necessary. This is essential both to allow ordinary and extraordinary maintenance operations and for the correct operation of the unit, since it has to collect air from outside along the perimeter and expel it upwards. For the correct operation of the unit, it must be installed on a peRTYctly horizontal surface. Make sure that the surface is able to support the weight of the machine.

If the machine is placed in particularly windy areas, it is necessary to provide windbreaks to prevent unstable operation of the DCPR device.

MINIMUM TECHNICAL SPACES (mm)



BEFORE START-UP

Before start-up, we recommend you check that:

- the electric and hydraulic connections have been made correctly;
- the line voltage is within tolerance (±10% of the nominal value);

WARNING: At least 24 hours before start-up of the unit (or after it has been off for a long time), the unit must be powered in order to allow the heating elements of the crankcase of the compressors to cause any refrigerant that may be present in the oil to evaporate. Failure to do so may cause serious damage to the compressor and will void the warranty.

ATTENTION !
If, when starting for the first time, the compressors should not start, the cause may be attributed to the incorrect wiring of the sequence of L1-L2-L3 phases or the interruption of one of them resulting in the intervention of the phase sequence relay.

START-UP OF THE UNIT

The start of operation must be scheduled in advance agreed on the basis of the time frame regarding the realisation of the system.
Prior to the work to be carried out by the AERMEC service personnel, all other works (electrical and hydraulic hook-ups, priming and bleeding of air from the system) must have been completed.
To set all the operating parameters and for detailed information regarding the operation of the machine and the control board, please refer to the user manual.

LOADING/UNLOADING THE UNIT

During winter, only if the water-powered battery is present, if the unit is stopped, the water in the exchanger may freeze, causing irreparable damage to the exchanger itself, the complete discharge of the refrigerant circuits and, sometimes, to the compressors.
There are two solutions possible for the prevention of freezing:

1) Complete draining of water from the exchanger at the end of the season and filling at the beginning of the next season.
2) Operation with glycoled water, with a percentage of glycol selected on the basis of the minimum external temperature envisioned. In this case it is necessary to take due account of the different yields and absorptions of the refrigerator, size of the pumps and yields of the terminals.

HOW TO USE GAS R140A

The water Rooftops, operating with R410A refrigerant gas, require special attention during installation and maintenance in order to avoid malfunctions.
It is therefore necessary to:

- Avoid topping up with oil that is different from that specified and that is already preloaded in the compressor.
- If there are gas leaks that make the rooftop even partially drained, do not add coolant, but drain the machine completely and after running an empty cycle, reload it with the amount provided for.
- If any part of the refrigerant circuit is replaced, do not leave the circuit open for more than 15 minuted.
- In particular, in case of replacement of the compressor, complete the installation within the time specified above, after removing the rubber plugs.
- When unloaded, do not power the compressor, do not compress air inside the compressor.
- Using R410A gas cylinders, it is recommended that you pay attention to the maximum number of withdrawals allowed in order to guarantee the correct ratio of the components of the R410A gas mixture.

CHECKS WHEN STARTING FOR THE FIRST TIME

To protect some delicate components during transport there may be particular clamping elements highlighted by a special marking . It is essential to remove them before starting the unit.
Before starting the unit and during the first start-up, it is very important to check the following:

FANS

a- tightening of the screws of the fan motor assembly;
b- free rotation of the fan motor;
c- direction of rotation: the fan impeller must turn in the direction indicated by the arrow on the feeding screw of the fan; if the direction of rotation is incorrect, reverse two phases on the terminal board of the motor;
d- power consumption: calibrate the thermal protections according to the values indicated on the plate of the motor and, with an ammeter, check that the power consumption does not exceed this value. If the consumption is excessive, it is likely that the pressure drops of the air distribution system have been overestimated and that the flow is superabundant: in this case, it is necessary to add another resistor with a calibration damper.

Hydraulic connections

Condense discharge
The condensate collection tank features a 1/2" G UNI 338 threaded outlet.
An exhaust system must feature a suitable siphon to:

• allow the free drainage of condensation;
• prevent the unwanted entry of air in the depressurized system;
• prevent the unwanted release of air in the pressurized systems;
• prevent the infiltration of odours or insects.

Below are the rules to follow to have the correct size and operation of the siphons in the case of a pressurized and depressurized tank.

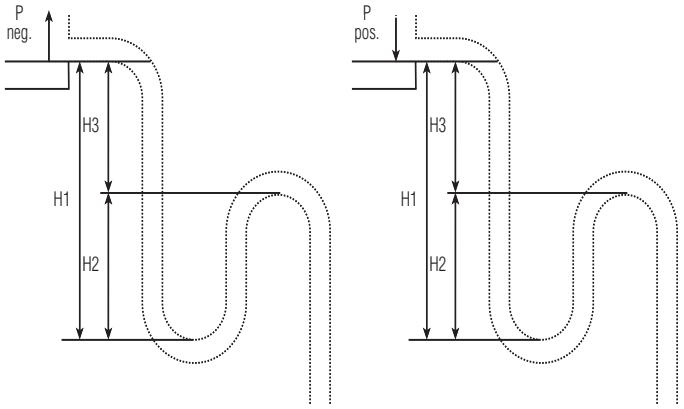
Negative pressure:

H1 = 2P
H2= H1 / 2

Positive pressure:

H1 = 2P
H2= H1 / 2

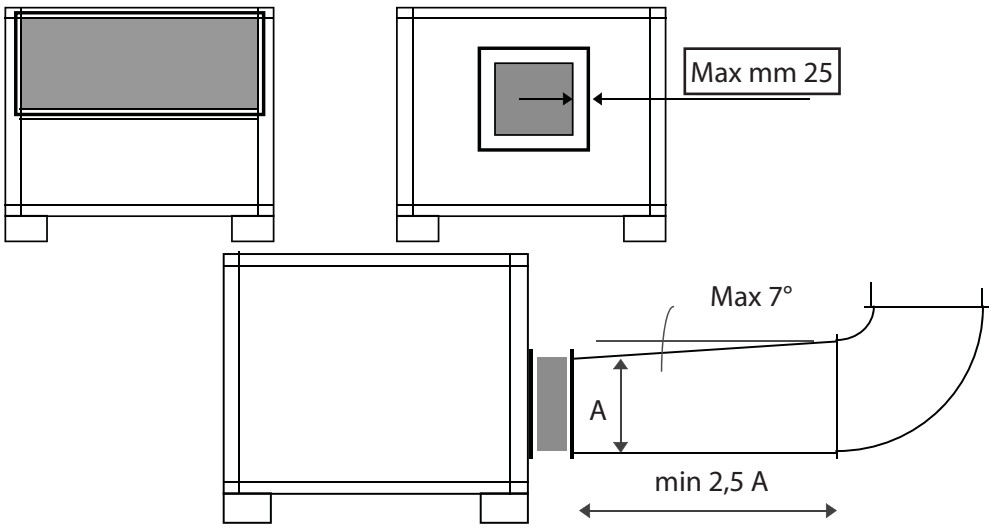
where P is the pressure in millimetres of water column (approximately 1 mm = 9.81 Pa)



The siphon must be equipped with a cap to allow the cleaning of the lower part, or it must at least allow AERMEC disassembly for cleaning

Aeraulic connections

For the installation of the ducts we recommend you:
• prepare appropriate brackets to support the ducts in order to prevent their weight from resting on the unit;
• connect the supply and return vents to the ducts with the interposition of an anti-vibration joint (by the installer). The anti-vibration joint is connected to the unit by screwing it onto the flange or the damper when present. If the flange or the damper are not present, the anti-vibration joint must be screwed onto the frame of the unit with self-tapping screws;
• prepare an earth wire that connects the anti-vibration joint in order to ensure equipotential bonding between the channel and the unit;
• prepare, before bends, ramifications, etc., the supply channel with a straight section that is at least 2.5 times longer than the shorter side of the channel to avoid problems in the performance of the fan;
• make sure that the ducts do not feature inclinations of the diverging sections above 7°C.



Electric connections

The unit is completely wired at the factory and for start-up it requires a power supply as shown on the technical plate of the unit, fitted with adequate in line protections.

It is the responsibility of the installer to suitably size the power line depending on the length, the type of cable, the consumption of the unit and its physical location.
All electrical connections must comply with the regulations in force at the time of installation.

N.B: Check the tightening of all power wire clamps on commissioning and after 30 days from start-up. Then, check the tightness of all the power terminals every six months. Loose terminals can cause the cables and components to overheat.

Safety Symbols


Danger: *Power*


Danger: *Temperature*


Danger: *Moving bodies*


Danger: *Disconnect*


Danger !!!

IMPORTANT SAFETY INFORMATION

The machine must not exceed the limits of pressure and temperature indicated in the table in paragraph "Operating limits".

The correct operation of the machine is not guaranteed after a fire; before restarting the machine, contact an authorized service centre.

The machine is equipped with safety valves that, in case of excessive pressure, can discharge the high temperature gas into the atmosphere.

Wind, earthquakes and other natural phenomena of exceptional intensity have not been considered.

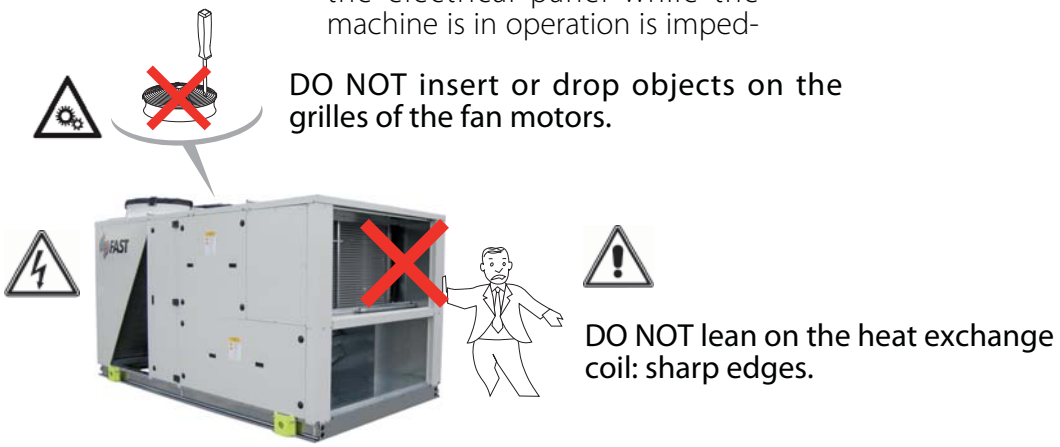
If the unit is used in an aggressive atmosphere or with aggressive water, consult the manufacturer.

After extraordinary maintenance interventions on the refrigeration circuit with the replacement of components, before restarting the machine, carry out the following operations:

1. Pay attention when restoring the refrigerant indicated on the technical plate of the machine.
2. Open all the valves present in the refrigerant circuit.
3. Correctly connect the power supply and the grounding system.
4. Check the hydraulic connections
5. Check that the condenser coils are not dirty or blocked
6. Check the correct rotation of the fan assembly

Improper use

The appliance has been designed and built to guarantee maximum safety in its immediate vicinity, as well as to resist against atmospheric agents.
The fans are protected from accidental contact by protective guards.
The accidental opening of the electrical panel while the machine is in operation is impeded by the door lock.
Avoid laying tools or heavy objects directly on the heat exchange coils, so as not to damage the fins.



DO NOT insert or drop objects on the grilles of the fan motors.

DO NOT lean on the heat exchange coil: sharp edges.

Diagnosing and troubleshooting

The following are some possible solutions to the main problems that can occur during the operation of the unit.
You must take into account that other causes of malfunction may depend on the plant in which the unit operates and on the regulation system.

Problem	Possible cause	Possible solution
Air flow not sufficient	- Filters blocked; - Formation of frost on the components; - Fouling of the heat exchanger coils; - Underestimated pressure drop of the distribution system;	- Clean the components
Air flow excessive	- Incorrect calibration of dampers; - Underestimated pressure drop of the distribution system; - Inspection doors open; - Filters not assembled after maintenance;	- Calibrate the dampers - Make sure the doors are closed - Assemble the filters
Noise not normal	- Bearings of the motor or of the fan worn or faulty - Foreign bodies on the impeller of the fans	- Replace the bearings - Clean the impeller
Water dragging	- Siphon clogged - Siphon missing or not assembled correctly	- Clean the siphon - Provide an excellent siphon
Desired temperatures not reached	- Input temperatures not provided - Presence of air in the water-powered batteries - Water flow insufficient - Water temperature insufficient - Failure of the control system	- Bleed the coils - Increase the water flow Check the water temperature Check the control system

Disposal and recycling

All operations regarding the putting out of service of the machine must be carried out by qualified personnel in compliance with the national legislation in force in the country of destination.
The components of the unit referred to in this manual have been designed to guarantee continuous operation: the duration of some of these also depends on the maintenance to which they were subjected.
At the end of their life cycle, the units must be treated at a facility specialized in reuse, recycling and recovery of materials in compliance with the legislation in force; in this case, this operation must be performed only by qualified and skilled personnel.

The main types of material that can be used to compose the units in their various types are:
- Galvanized and/or prepainted steel sheet (panels, fans, condensate collection tanks, bulkheads, carpentry of internal and external structure, safety nets);
- Aluminium or aluminium alloy sheet (coil fins, grilles and/or dampers, electric motor casing;
- copper (tubes/battery fins, electric motor windings, cooling system tubes);
- polyurethane foam (insulation of the sandwich panels);
- electrical and/or electronic material (electrical panels, controllers);

Before disconnecting the unit the following must be retrieved, if present:

- the refrigerant gas (if it is not possible to isolate the circuits): the extraction of the refrigerant gas must take place by means of suction devices operating in a closed circuit in order to ensure that there is no release of compounds into the atmosphere.

- the antifreeze present in the hydraulic circuits: when removing make sure there are no leaks or spills into the environment. The antifreeze should be stored in appropriate containers.

For all recovery operations of the substances present in the unit you must adopt all the measures which may prevent both damage to property and people and the pollution of the surrounding area.
While waiting for the unit to be dismantled and disposed of, it can be stored outdoors since the changes of weather and temperature do not cause harmful effects to the environment, provided that the electrical, refrigeration and hydraulic circuits of the unit are intact and closed.

DISMANTLING AND DISPOSAL

WARNING: FOR DISMANTLING AND DISPOSAL, THE UNIT MUST ALWAYS BE DELIVERED TO AUTHORIZED CENTRES.
While dismantling, the fans, the motor andthe batteries, if in working conditions, may be recovered by the authorized centres for reuse.

All the materials must be recovered or disposed of in accordance with national regulations in force.

The unit must be treated at a facility specialized in reuse, recycling and recovery of materials.

The correct disposal of the product will help prevent possible negative consequences for the environment and for human health.

For further information please contact the installer or local authorities.

WEEE Directive (only for EU)

- The WEEE Directive provides that the disposal and recycling of electrical and electronic equipment must be managed through a special collection, in appropriate centres, separate from that used for the disposal of mixed municipal waste.
- The user has the obligation not to dispose of the equipment, at the end of its useful life, as municipal waste, but to assign it to a special collection centre.
- For further information please contact the manufacturer.

Notes

Notes

AERMEC S.p.A.
37040 Bevilacqua (VR) Italia–Via Roma, 996
Tel. (+39) 0442 633111
Telefax 0442 93730–(+39) 0442 93566
www.aermec.com - info@aermec.com