GAIA Maxi

HEAT PUMP SOLUTION FOR RESIDENTIAL COMFORT

- FOR HOUSES WITH HIGH USE OF CAPACITY:
  Ideal for large houses and restructurings without additional works on the envelope in rigid winter climate zones.

- SINGLE UNIT SYSTEM FOR COMBINED ENERGY COMFORT:
  It integrates all system components in a single unit. It guarantees maximum reliability and simple installation and assures comfort and production of domestic hot water, favouring the use of renewable sources.

- COMPLETE SYSTEM MANAGEMENT:
  Controls and manages all system components distributing the necessary energy in the correct amount and only where and when required, guaranteeing maximum comfort, efficiency and reliability.

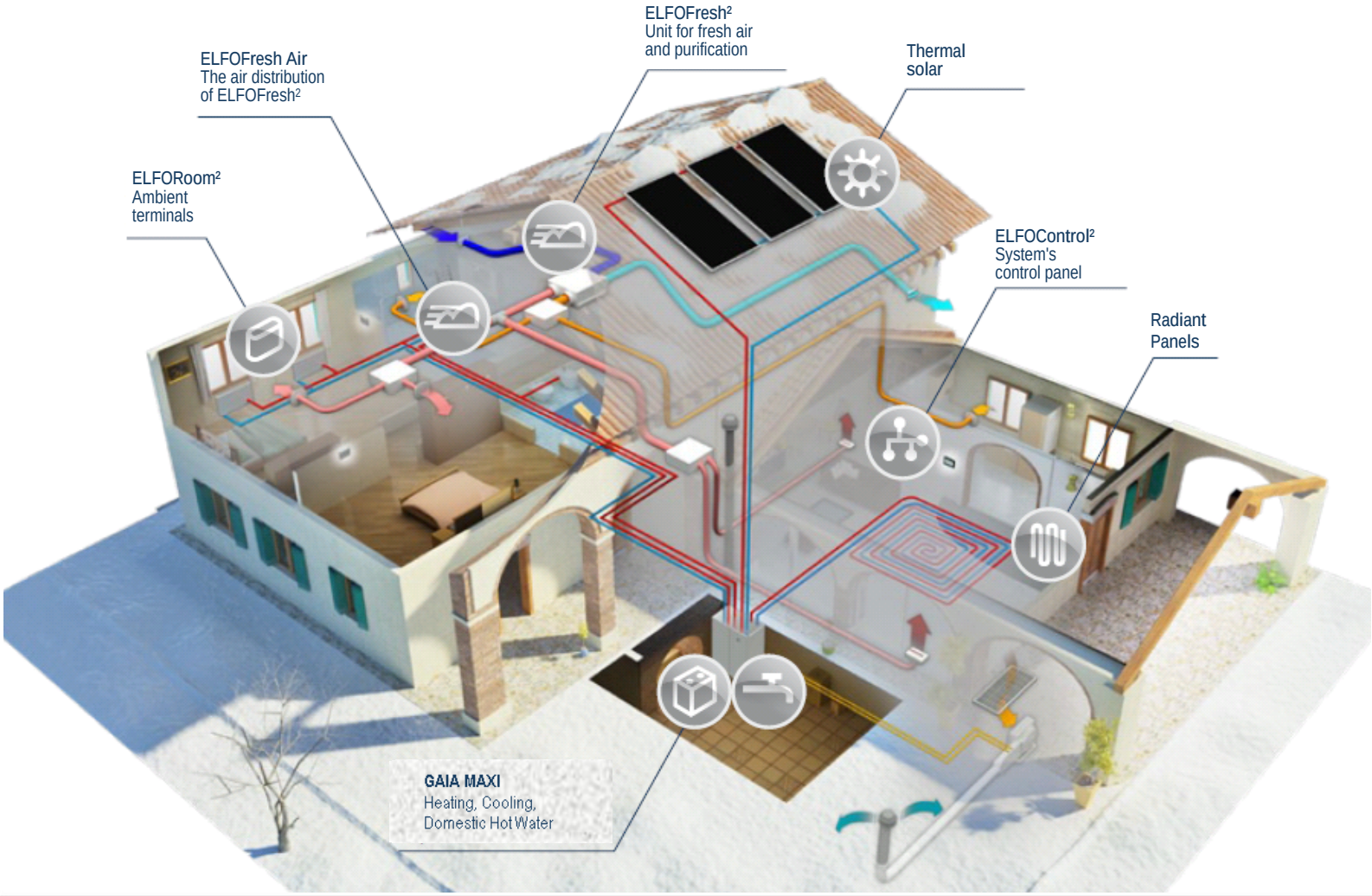
- SOLUTION WITH THE BEST SEASONAL EFFICIENCY PRESENT ON THE MARKET:
  Thermal solar for the production of domestic hot water and system integration, highly efficient heat pump (COP>4.4) with DC Inverter technology applied to compressor, fan, circulators and integration condensing boiler with 108% yield.

- HOT WATER PRODUCTION UP TO 80°C.

* Due to its high efficiency, "GAIA MAXI" may be eligible for heat pump subsidies in Your Country. Please contact Your tax office or utility.

ELFOSystem GAIA Maxi

GAIA Maxi is the heart of the ELFOSystem full system for homes with high use of capacity and rigid climates.



System that looks to the future

- Favours the use of renewable energies.
- Uses the best sources of energy in a combined manner.
- Substantially contributes in achieving the European targets of 20-20-20 to 2020 (with regard to reduction in emissions of CO_2, primary energy and use of renewable energy).

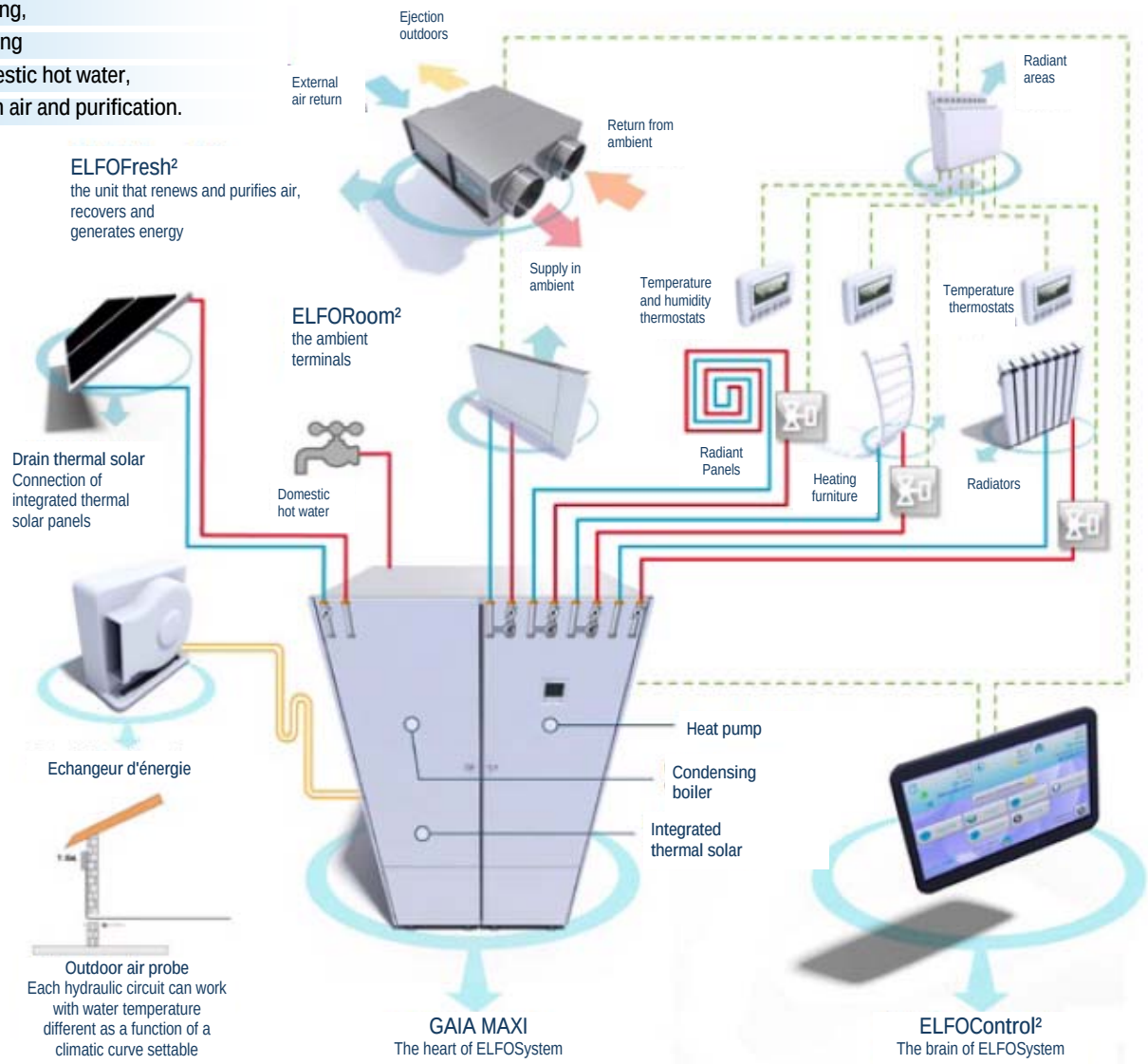
Qualifying proposal

- Specialistic solution with high additional value.
- Single system with yearly cycle for total comfort.
- Increase of at least 2 energy efficiency classes of the building.

ELFOSystem GAIA Maxi

a single intelligent system
with all elements generating comfort all-year-round:

- Heating,
- Cooling
- Domestic hot water,
- Fresh air and purification.



Simple to install

- Industrialised solution enabling quick installation and of quality.
- It excludes installation and adjustment errors.
- Clear and pre-configured wiring and connections.

Financially convenient

- Thanks to the high energy efficiency it increases the property value, with an average return of the investment of 3-4 years.
- Saving of 70% of the heating capacity station space.
- It respects the minimum requisites requested for the existing financial benefits.

ELFOSystem GAIA Maxi

the solution for heating homes
with high heating capacity requirement and rigid climate

Large homes in areas with rigid climates are characterised by a high heat requirements and represent a very demanding test bench for a heating system. The reliability and continuity of service are fundamental requisites in situations where the building requires a heating capacity near that of the design for many days in the year.

In these conditions, to benefit from the high efficiency of the heat pump, single plant solutions are normally used that exploit the electric heaters integrated in the heat pump or bivalent solutions that use a second generator to replace the heat pump when the rigid temperatures reduce its efficiency.

ELFOSystem GAIA Maxi the innovative trivalent solution of CLIVET

- Industrialised and optimised solution
- Integrated centralised adjustment
- Pre-assembled hydraulic connections
- High seasonal efficiency
- Reduced dimensions (below 1 m²)
- Payback convenient

GAIA: a complete range of solutions for residential comfort with yearly cycle

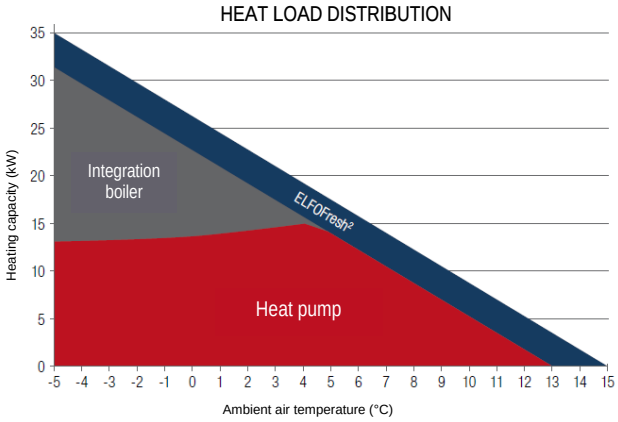
The Full Inverter DC GAIA heat pump technology satisfies the residential sector request: from homes with reduced heat load to large buildings characterised by a high heat requirement.

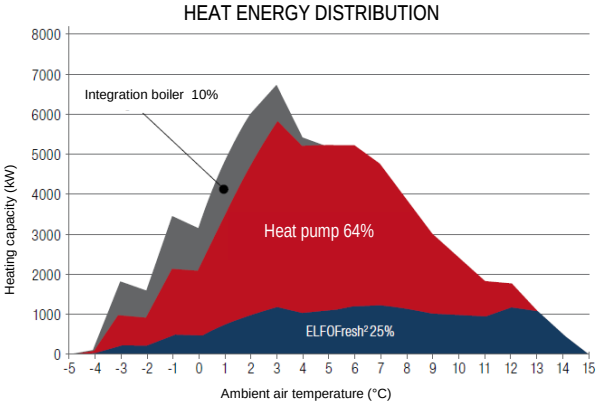
Data concerning the functioning of GAIA in heating in Milan on single-family homes with a heat capacity requirement equal to 8, 15 and 35 kW, compared to a traditional system with Condensing boiler with 98% average seasonal yield.

ELFOSystem GAIA Maxi

new houses and re-qualification of existing buildings:
the numbers certify the efficiency of GAIA Maxi

Home with 35 kW with radiant panel system powered at 35 °C

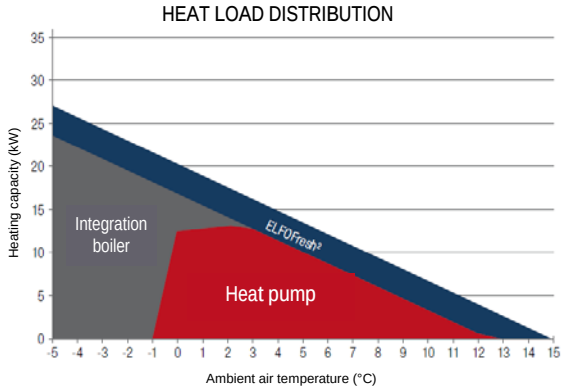


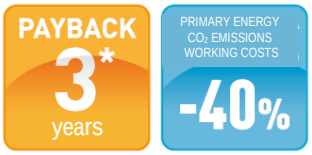


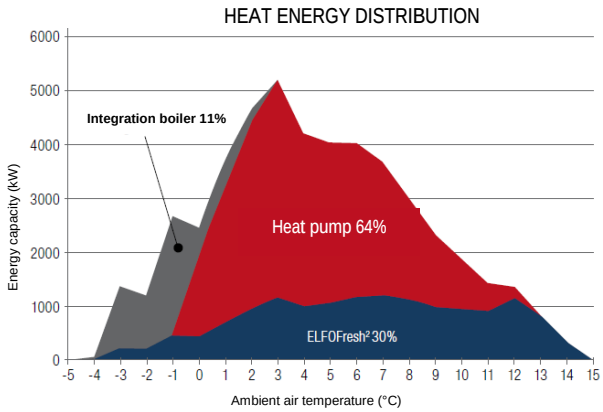
ELFOSystem GAIA Maxi used in a home with low temperature radiant panels heating allows saving up to 45% of primary energy, of CO_2 emissions and working costs compared to a traditional solution with boiler and multisplit conditioner.

Data concerning a home in Milan, climate area E (2404 GG) with 600 m² surface and heating capacity requirement equal to 35 kW with application of RADIANT PANELS.
ELFOSystem GAIA Maxi System: ELFOControl² + GAIA Maxi + ELFOFresh² 500.
System for comparison: Boiler with 98% average seasonal yield + Multisplit conditioner + Recovery unit FI 70%.
Cost of methane 0.08 €/kWh, Cost of electric energy with meter dedicated to the heat pumps 0.18 €/kWh.

Home with 27 kW with radiant panel system powered at 65 °C







When used in the energy re-qualification of a building in replacing the pre-existing generator with radiator system with high temperature, ELFOSystem GAIA Maxi assures a saving of 40% in using primary energy, of CO_2 emissions and in working costs.

Data concerning a home in Milan, climate area E (2404 GG) with 400 m² surface and heating capacity requirement equal to 27 kW with application of RADIANT PANELS.
ELFOSystem GAIA Maxi System: ELFOControl² + GAIA Maxi + ELFOFresh² 500+ ELFORoom².
System for comparison: Boiler with 80% average seasonal yield + Multisplit conditioner + Recovery unit FI 70%.
Cost of methane 0.08 €/kWh, Cost of electric energy with meter dedicated to the heat pumps 0.18 €/kWh.

*If we consider a system in heating only the payback of the solution ELFOSystem GAIA Maxi is 5 years.

ELFOSystem GAIA Maxi
is based on the following components:

Production
GAIA Maxi

Combined energy packaged unit system for heating, cooling and the production of domestic hot water

- Full Inverter DC heat pump
- Integrated drain thermal solar
- Integrated condensing boiler
- Multi-zone hydraulic distribution
- 180-litre System Storage
- 280-litre Domestic Hot Water Storage

Pre-assembled system

Enclosing all the elements necessary for the correct distribution to the air-conditioning system and for the production of domestic hot water, GAIA Maxi:

- **drastically reduces the time of installation,** just connect the unit to the hydraulic piping;
- **it eliminates unnecessary dimensions:** reduction of 70% of the space used compared to a traditional solution;
- **it assures full reliability,** thanks to the use of industrially assembled components and tested by Clivet.

ELFOSystem GAIA Maxi

is based on the following components:

- Complete system management
- Intelligent consumption
- Customisation of the levels of comfort
- Many easy to use functions
- Android platform

Control ELFOControl²

Advanced control system for managing the functioning of the whole system

- It optimises heating and Cooling with GAIA Maxi
- It uses the thermal solar contribution for heating and production of DHW
- It guarantees availability of domestic hot water
- It renews and purifies air with ELFOFresh²
- It communicates with the thermostats of the various rooms for temperature and humidity control
- It manages the radiant panels
- It manages the room terminals
- It manages radiators and heating furniture

Complete comfort management

ELFOControl² is the brain of your system communicating with all installed components. It checks the work conditions of each individual device and allows adjusting the functioning of the entire system of a single control centre, from which the setting of all wanted parameters for the best comfort depend.

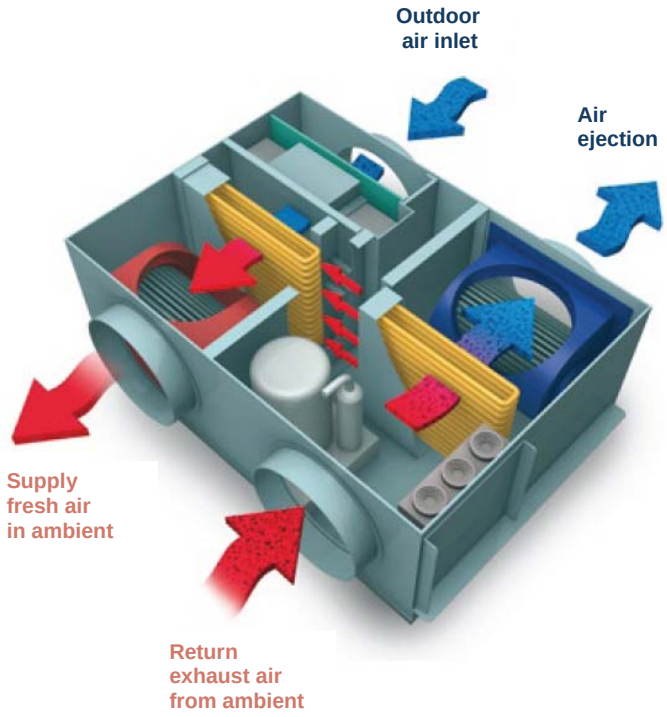
ELFOControl² adjusts the temperature, room by room, checks humidity, assures the quality of the air and the production of domestic hot water, verifies and checks every aspect of the system to guarantee the perfect comfort for every requirement.

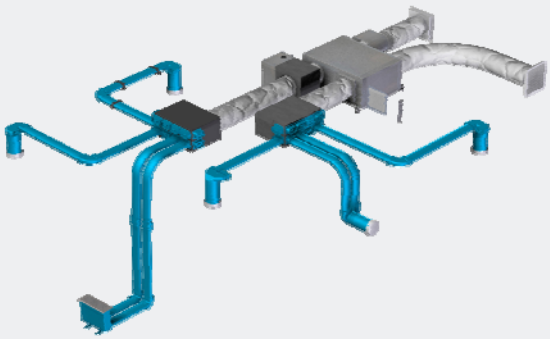
ELFOSystem GAIA Maxi
is based on the following components:

Fresh air
ELFOFresh²

Ventilating and purifying system of the environments and energy recovery

- Summer and winter active thermodynamic recovery
  Thanks to the heat pump technology, it multiplies the energy contained in the exhaust air all-year-round and eliminates high pressure drops of the traditional systems.
- Up to 80% satisfaction of the heat requirement of the building
  It reduces the power requested from the integrating air-conditioning system and increases its seasonal efficiency.
- Electronic filtration
  For an effective protection also against the most insidious polluting agents (PM10, bacteria, pollen).
- Summer dehumidification
  Ideal for combination with Radiant cooling.
- FREE COOLING
  It allows the drawing of fresh air from outside and supply it in the rooms, at no cost, just by operating the fans.





Air Distribution
ELFOFresh Air

The exclusive air distribution system of ELFOFresh²

- Flexible in installation
  Thanks to the use of flexible and usable ducts.
- Simple
  In selecting the components and in the installation.
- Air quality
  Assured by the use of antistatic and antibacterial ducts.
- Guaranteed result

ELFOSystem GAIA Maxi
is based on the following components:

Distribution
ELFORoom²

Water terminal for cased or uncased
vertical and horizontal installation

- **Always homogenous temperature**
  It eliminates the stratification of the air temperature thanks to the continuous modulating of the fan speed.
- **Reduced consumptions**
  The exclusive motor allows significant consumption reductions.
- **Maximum silent operation**
  The continuous functioning of the fan allows the appliance to always work at very reduced speeds, therefore, the noise it produces is imperceptible.
- **It cleans the air while air-conditioning**
  The continuous movement of the air allows a constant filtration improving the quality of the environment air.
- **It satisfies all installations**
  Available in the cased and uncased version, both vertical and horizontal.

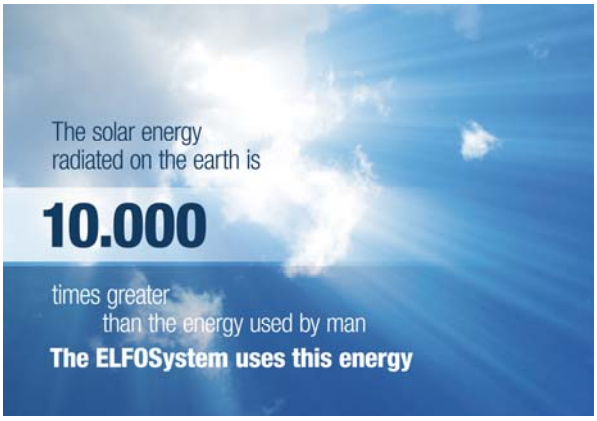
Distribution
ELFODistribution

Heat diffusion systems
with "room by room" temperature adjustment

- **Comfort guaranteed always**
  The use of room by room humidity and temperature thermostats guarantees the excellent comfort conditions for each single room.
- **Radiant systems management**
  From the heads control to the dew temperature control, every aspect of the system is continuously monitored and controlled.
- **Systems with radiators management**

ELFOSystem GAIA Maxi

the advantages:



Renewable Energy

The future of our planet depends on how we will be able to reduce the use of fossil energy resources by switching to renewable ones.

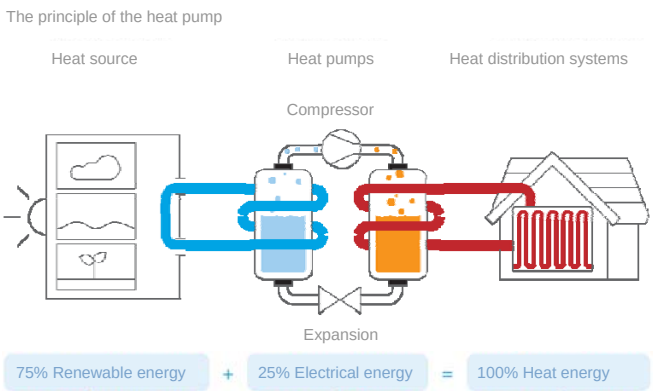
With Directive 2009/28/EC of 23 April 2009 on promoting the use of energy from renewable sources, known as RES Directive, the European Commission has defined the "environmental heat" contained in the Air, Water and Earth as renewable source.

By exploiting the principle of the Heat Pump, ELFOSystem uses the environmental heat to generate all-year-round comfort within buildings.

The Heat Pump

More than 75% of the energy used by the Heat Pump is free and unlimited as it comes from the sun, stored by air, water and earth. With only 25% of electric energy this is increased to an excellent level, for summer and winter comfort.

A single system for heating and cooling. During winter the heat pump takes the energy from outside and transfers it inside the building. During summer the heat pump can invert its functioning and transfer the heat from the building towards the outside, cooling the environments.



Comfort 365 days a year

With ELFOSystem the ideal climate lasts all-year-round, as if time in the house stopped for relaxation that is not dependant on external factors.

ELFOSystem GAIA Edition is a single intelligent system with all the elements generating comfort all-year-round:

- heating
- cooling
- domestic hot water
- fresh air and purification.

Fresh and clean air

There is no real comfort without air exchange as odours and toxic elements accumulate in the home. The current trend to increase heat insulation in homes requires a controlled mechanical exchange of the environment air. The supply of external air is not always health and entails high energy costs.

ELFOSystem expels the air inside the building and supplies external air freshened using a recovery system, exploiting the principle of the heat pump.

ELFOSystem GAIA Maxi

the advantages:

Added value to your property

With Directive 2002/91/EC, the European Union foresees the obligation of a certificate certifying the energy efficiency of the buildings considering the primary energy, the value of a property also depends from this.

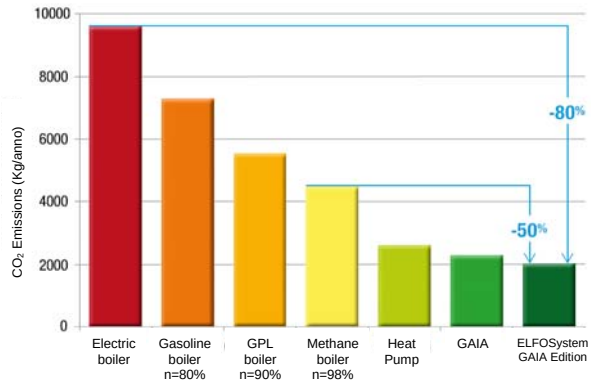
With primary energy consumptions below 50% compared to traditional solutions with boiler, with the same building, ELFOSystem allows higher energy classes.

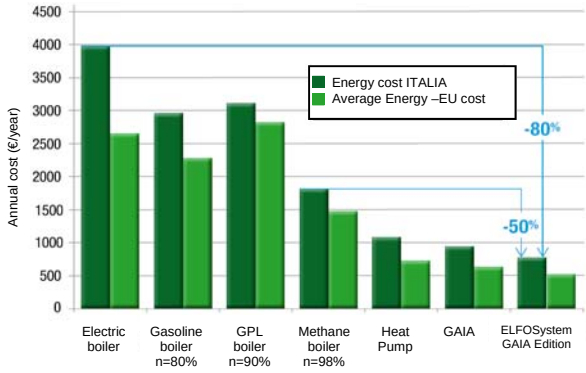
ELFOSystem contributes to the energy efficiency and, therefore, to the value of the property, with an average return of the investment of 3-4 years.

Reduction of the CO_2 emissions

The heat pump systems do not use fossil resources which Natural Gas or Gas oil, therefore, they do not produce CO_2 direct on the place of installation.

Even considering equivalent CO_2, generated by the producer of electric energy, the indirect emissions of CO_2 are on average lower by 50% compared to combustion systems and by 80% compared to electric heating.





Costo elettricità: Italia 0.18 €/kWh, media-EU 0.12 €/kWh
Prezzi Gasolio GPL, Metano tratti da www.energy.eu.

Saving on costs up to 80%

The average seasonal COP of the modern heat pumps can also reach 4, if considering the most efficient air-water units.
As the average yield of the Italian electric system is equal to 0.46, it is understood that the yield of a heat pump, referred to primary energy, is equal to 180%, therefore higher than any traditional combustion or electric generator, meaning a saving from 50% to 80% on working costs.

Reliability

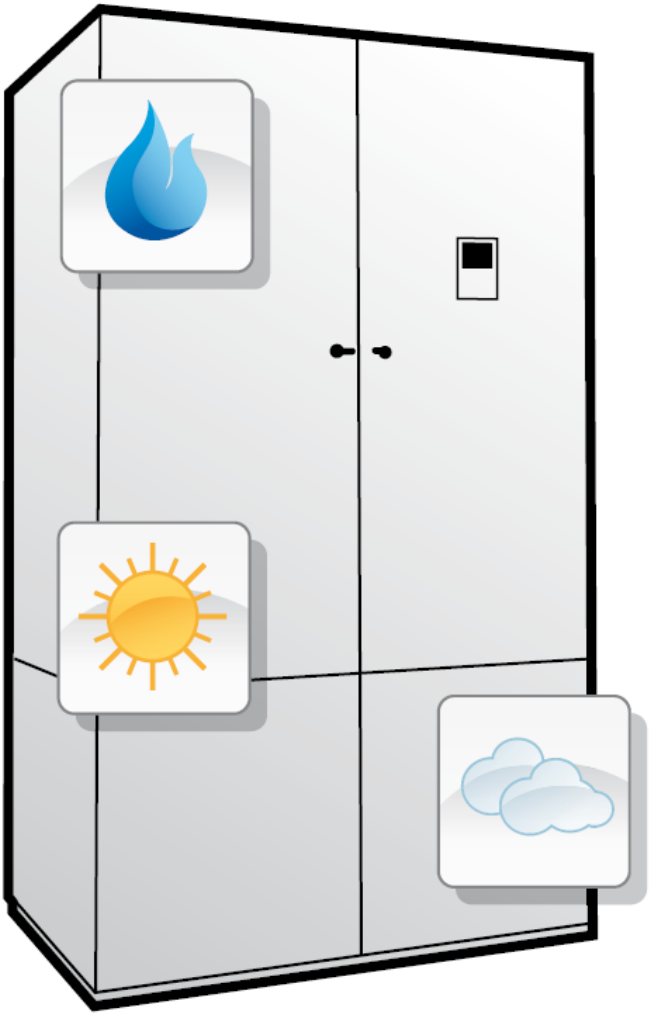
ELFOSystem is the complete system for air-conditioning buildings developed by Clivet in all its components from the thermostat to the heat pump that intelligently "communicate between them" through a simple telephone pair.

The centralised system management optimises efficiency and assures the correct functioning of the system as well as eliminate all adjustment and interaction problems of the traditional installations where different elements must be placed in communication between them.

The components designed and tested by Clivet allows realising quality systems that guarantee the pre-set levels of comfort and energy saving with the guarantee of a perfect functioning.

ELFOSystem GAIA Maxi

packaged unit system for Combined Energy comfort



GAIA Maxi Integrates all system elements in a single unit, it guarantees maximum reliability and simple installation and assures comfort and the production of domestic hot water, favouring the use of renewable sources. Thermal solar for the production of domestic hot water and system integration, highly efficient heat pump (COP>4.4) with DC Inverter Technology applied to compressor, fan, circulators and integration condensing boiler with 108% yield make GAIA Maxi the solution with the best seasonal efficiency present on the market.

GAIA the Full Inverter DC heat pump

The heart of GAIA Maxi is GAIA, the heat pump for heating, cooling and producing domestic hot water that applies the DC Inverter Technology to compressor, fan, circulators to supply the exact capacity requested with the highest efficiency possible.

Drain thermal solar

The GAIA Maxi integrated “Drain Back” drain solar system, exploits the solar contribution for the production of DHW and integration on the heating system eliminating stagnation and freezing problems, typical of the forced circulation systems.

Condensing boiler

When the heating capacity given by the heat pump is insufficient or energetically disadvantageous, GAIA Maxi uses the condensing boiler for the production of hot water for heating and for domestic use.

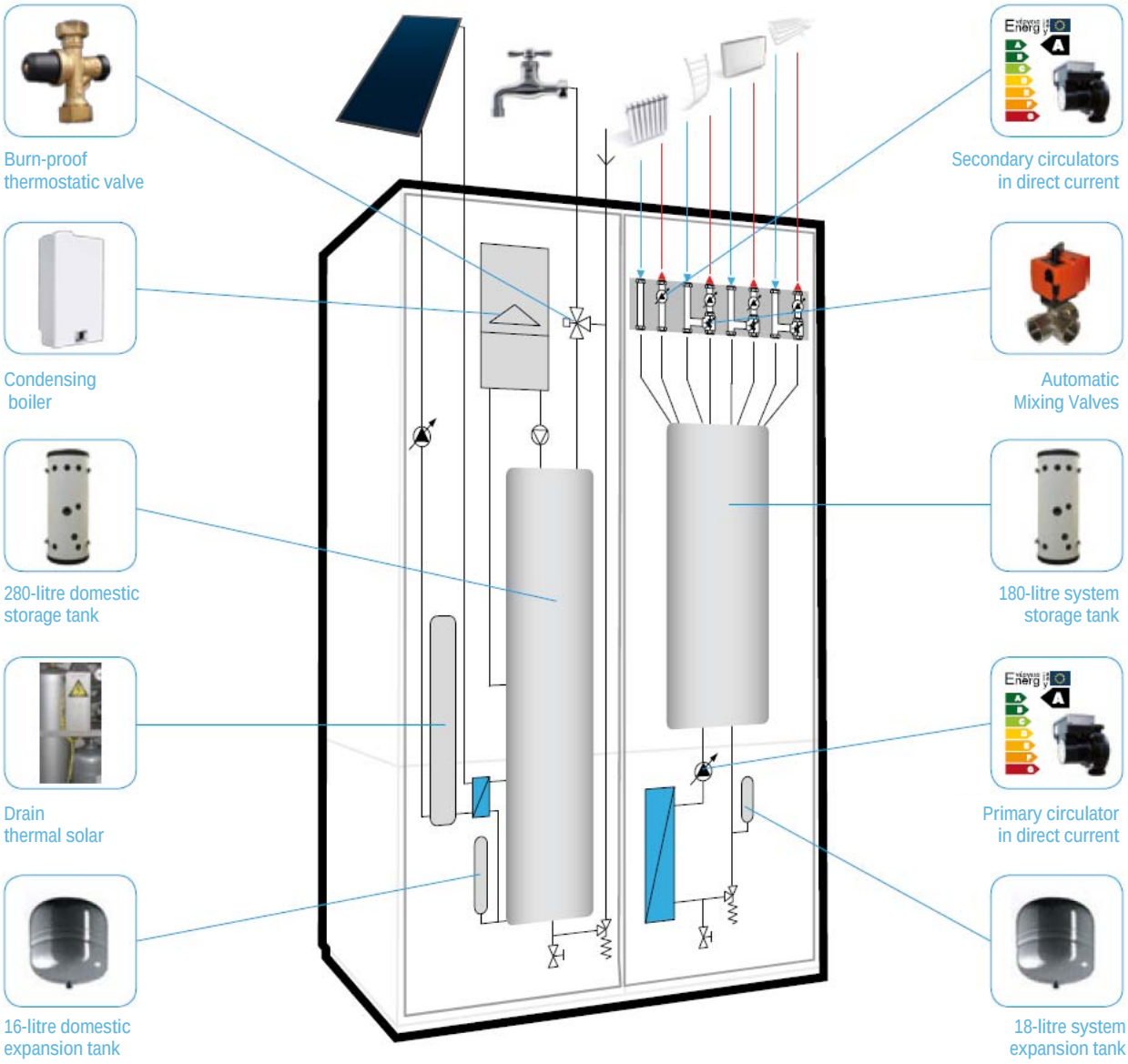
The efficiency of renewable sources

In every moment the control of GAIA Maxi analyses and chooses the best resources to be used for air-conditioning and producing domestic hot water. During the summer season and mid-seasons, the thermal solar is able to satisfy the domestic hot water requirement on its own, whereas the heat pump is used for air-conditioning.
During the winter season the condensing boiler integrates the heat pump to guarantee comfort even during the coldest days, when only the contribution of the heat pump is insufficient to cover the full capacity requirement of the building.

The secret of the extraordinary efficiency of GAIA Maxi is to always favour the use of the most efficient energy source to minimise the working costs, maintaining maximum comfort in the environment.

ELFOSystem GAIA Maxi

integrated domestic hot water and hydraulic distribution



Intelligent management of resources

GAIA Maxi manages up to four different areas with systems at different temperatures:

- **circulators in direct current** at low consumption;
- **automatic modulating of the water flow** in relation to heat differential;
- eventual **mixing valve** to obtain different water temperatures depending on the type of terminal;
- **variable water temperature** for every circuit depending on the external air temperature.

The control assures the production of domestic hot water with the best possible energy efficiency favouring, when possible, the direct solar energy captured through the thermal solar panels, or using the indirect energy contained in the air through the heat pump or using the condensing boiler, when it is the only available source.

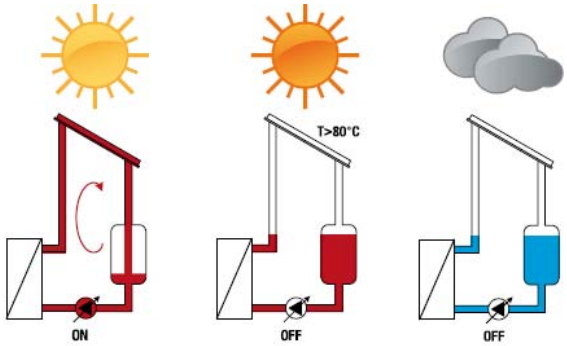
ELFOSystem GAIA Maxi

solar energy recovery integrated system

GAIA Maxi has been designed for connection to the **thermal solar panels** to further increase the use of renewable sources in the free production of domestic hot water and for the heating system.
The exclusive **drain system** integrated in GAIA Maxi assures excellent performances, at the same time eliminating the stagnation and freezing problems that can irreparably damage the solar panels.

Integrated Solar Drain Back

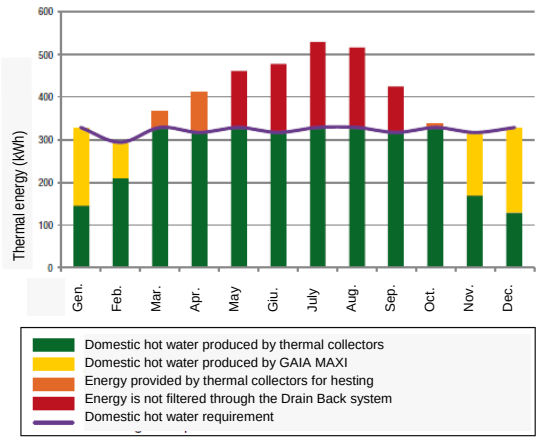
The GAIA Maxi integrated "Drain Back" drain system, differentiates from the traditional forced circulation systems in the managing of the inactive phases during which the solar circular can be drained to offer the necessary protection against risk of over-temperatures or freezing.
When the temperature of the water in the solar panels is too high, the GAIA Maxi control stops the solar pump to drain the circuit and protect the panels from the stagnation phenomena. Draining also happens in case of low temperatures, in this way protecting the solar panel against the risk of its vector fluid freezing.



ACTIVE SOLAR INACTIVE SOLAR

The use of a drain system also entails the following advantages:

- **greater efficiency of the heat exchange** in view of using non-glycol water in the solar circuit;
- **elimination of the solar expansion tank** as the always present air inside the circuit naturally compensates the water volume variations;
- **simplifies installation** and reduces maintenance interventions, **thanks to the integration of the control and of the direct current solar pump in GAIA Maxi.**



Maximum exchange efficiency

The use of a plate exchanger dedicated to connection for the thermal solar panels allows maximising the efficiency of the heat exchange for the production of hot water, makes maintenance easier and does not influence the real storage volume.

It satisfies over 70% of the requirement

Coverage of the heat energy requirement for the domestic hot water, captured through the thermal solar panels, is equal to 75%, the remainder only necessary during the winter months, is assured through the heat pump.

Geographical area north of Italy
- 5 users
- 3 flat solar panels (position 30° - South)

Thermal solar integrated to system

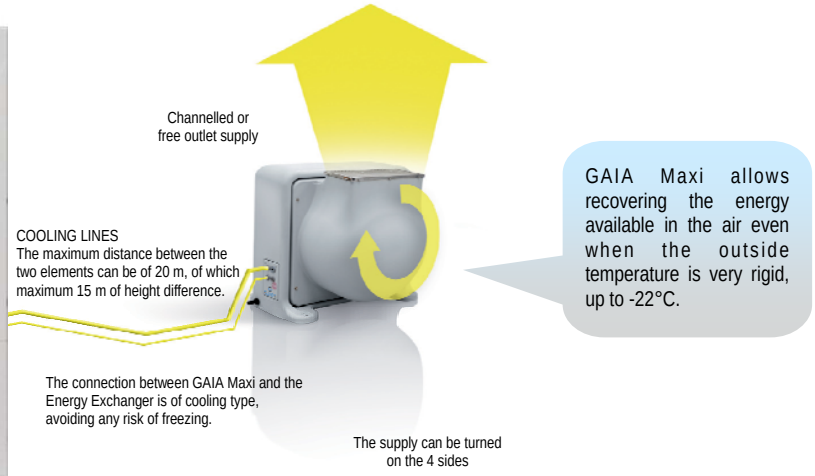
During the heating season, when the request for domestic hot water is satisfied, GAIA Maxi is able to use the heat energy captured by the solar panels and stored in the domestic storage tank to satisfy the system's request.
Through a specific plate exchanger the water of the inertial 180-litre storage tank is taken to a sufficient temperature for use on the system, without having to use the heat pump to guarantee comfort in environment.
Should the temperature of the domestic storage tank reach that of the system and a residue requirement of the system remains, the control will automatically activate the heat pump to satisfy the system's request.

ELFOSystem GAIA Maxi

flexible installation

GAIA Maxi

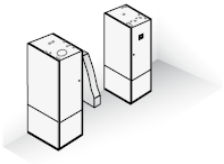
ENERGY EXCHANGER



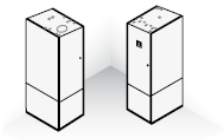
- GAIA Maxi uses a remote ENERGY EXCHANGER for recovering energy from the air.
- The connection between GAIA Maxi and the energy exchanger is of cooling type, avoiding any risk of freezing.
- The energy exchanger can be installed up to 20 m away and at a height different of maximum 15 m, allowing it to be positioned in the most suitable place.
- The direct current inverter radial fan can be calibrated depending on the real load losses and thanks to the constant modulating of its speed, it assures extreme silence.

GAIA Maxi is made of two separable modules for adapting to every installation requirement.

Heat pump module and domestic hot water module installed separately along the same wall



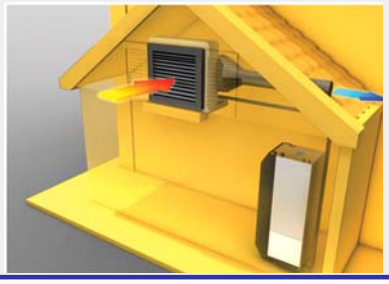
Heat pump module and domestic hot water module installed separately along different walls.



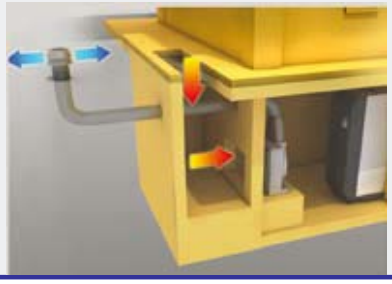
The energy exchanger is very flexible as it allows installation in all engineering situations, inside and outside the building.

Energy exchanger installed outside against the external wall with ejection of the lateral air.

Energy exchanger installed outside, with channelling of the air supply and ejection away from the home.



Energy exchanger installed indoor, in the attic, with outdoor air inlet from a window and lateral ejection in cover.



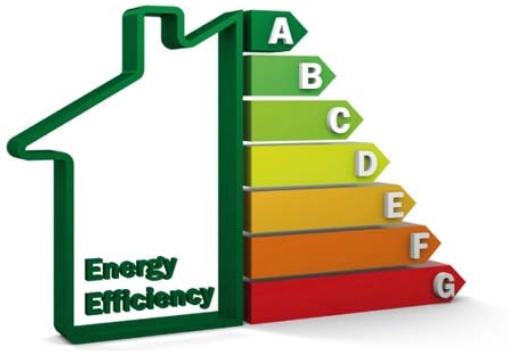
Energy exchanger installed in the basement, with outdoor air inlet through the hopper window and ejection, through an underground channelling, away from the home.

ELFOControl²

the entire system constantly monitored

Complete system management

ELFOControl² is the brain of the system communicating with all system components to guarantee the best comfort, energy saving and functioning reliability.
An "intelligent" control system must also be easy and simple to use.
ELFOControl² thanks to its 7.2 " touch screen panels perfectly integrates in any architectural context and can be easily installed in every room, even in the living room for the constant monitoring of the situation.
The intuitive interface makes navigation simple and immediate even for the less experienced users, to give all the possibility of defining the ideal comfort.



Intelligent Consumption

ELFOControl² intelligently and efficiently manages the system elements to always guarantee the best comfort at the lowest possible cost.
It coordinates all system components optimising the performances and functioning of the unit, generating the necessary energy in the correct amount, only where and when required.
ELFOControl² goes beyond the common concept of area thermoregulation.
The exclusive climate areas management guarantees the best efficiency and maximum customisation of the system settings.
Only a complete and reliable system like ELFOSystem is able to optimise the functioning of every element and assure a result over expectations.

Android platform

ELFOControl² adopts Android, the most diffused technological platform in the Mobile field that arranges it for future connectivity:

- with Mobile devices (which Smartphone and Tablet);
- with WiFi devices;
- with remote assistance and monitoring systems;
- with integration to home automation systems.

With Android, ELFOControl² is today ready for future applications.

ELFOControl²

the comfort simple for all:

Many easy to use functions

The user interface is simple, fast and intuitive and guarantees modification of the settings with easy operations.
With ELFOControl² a few touches on the screen are sufficient to check every single ELFOSystem element.

Every climate area at hand

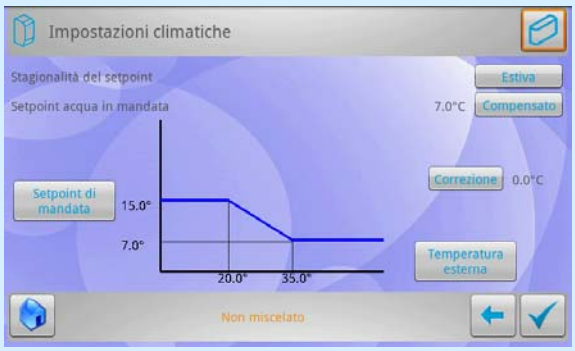
ELFOControl² manages up to 40 elements simultaneously leaving the user with the freedom of defining the wanted temperature for each individual area.

With a few touches from the main screen it is possible:

- to define and manage up to 12 different climate areas;
- program the comfort of the individual areas;
- set the temperatures directly from touch screen or from the thermostat;
- set different temperatures inside the same climate area.

Flexible and Programmable

The customising of the times and temperatures, room by room allows obtaining the perfect comfort for every requirement.
ELFOControl² allows defining up to 10 customised timed programming. A different program can be associated to every day of the week, for optimising the functioning and efficiency of the entire system.



Customisation of the comfort levels

Each of us differently perceives well-being, for this reason it is not easy to define comfort.

ELFOControl² allows the user to adjust all system settings and adjustments, even the most advanced, to its own requirements, to guarantee everyone with the ideal comfort.

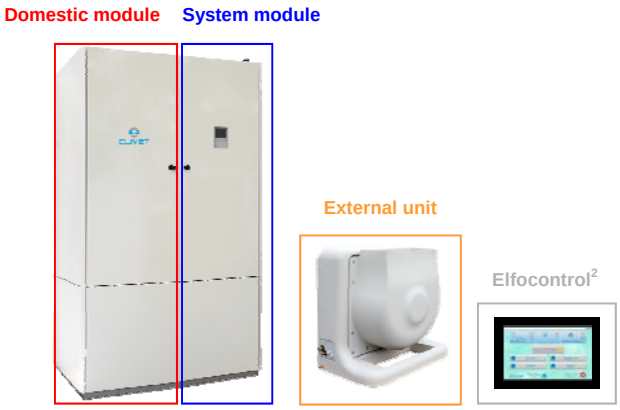
ELFOSystem GAIA Maxi

AIR COOLED BIVALENT HEAT PUMP IN TWO SECTIONS

Index of technical section:

STANDARD UNIT TECHNICAL FEATURES

The supply of the GAIA Maxi includes 4 components delivered in 4 separate packages:
- system module with compressor, boosters and system storage
- domestic module with domestic hot water storage, gas boiler and drain solar (optional)
- external unit with exchanger and radial fan in direct current
- Elfocontrol^2 supervising system



INSTALLATION
The Heat pump module and the Domestic hot water Module are units for indoor installation. Installation in technical rooms is recommended. The Heat exchanger can be installed outdoor or indoor, paying attention to respecting the indications reported in this technical leaflet.

HEAT PUMP MODULE
COMPRESSOR
Scroll hermetic compressor controlled by inverter, equipped with motor protection device for over-temperatures, over-currents and excessive temperatures of the supply gas. It is installed on anti-vibration mounts and it is equipped with oil charge. The compressor is wrapped by a sound-absorbing hood, that reduces its sound emissions. An automatic oil heater prevents the oil from being diluted by the refrigerant upon stop of the compressor.
STRUCTURE Supporting structure realised in "aluzink" sheet metal able to supply excellent mechanical features and long resistance against corrosion.
PANELLING
Pre-painted RAL 9001 sheet metal unit external panelling covered on the inside with heat insulating and sound-absorbing material.
Every panel is easily removable for full access to the internal components.
INTERNAL EXCHANGER
direct expansion exchanger of STAINLESS STEEL 316 brazed plate type with high exchange surface and complete with external anti-condensation heat insulation.
COOLING CIRCUIT
Cooling circuit complete with:
- electronic expansion valve
- check valves
- 4-way cycle inversion valve
- dehydrator filter
- coolant load
- gas and liquid line shut-off valves with service connection
- liquid receiver
- liquid separator in extraction
- high and low pressure transducers
- safety against overpressures
- solenoid valve for liquid line

ELECTRIC CONTROL BOARD
The power section consists of:
- main isolator
- heaters fuses
- inverter for compressor control
- fans fuses
- auxiliary circuit fuse
- compressor protection fuse
- primary and secondary circulators fuses
- recirculation pump fuse

The control section consists of:
- Elfocontrol^2 system
- clean contacts for booster management.
- microprocessor adjustment
- device for variable speed outdoor Low Temperatures functioning of fans
- defrosting automatic control
- setpoint compensation with external air probe
- setpoint compensation with external signal 4-20 mA or 0-10V
- high refrigerant gas pressure pre-alarm function that often avoids shut-down of the unit
- compressor timing and protection
- serial RS485
- thermal solar management for domestic water production
- domestic hot water management
- boiler managed in integration with heat pump

CONTROL STATION ELFOControl^2
Coloured 7.2" Display touch screen for controlling the ELFOSystem system:
- manage up to 12 climate areas
- manage up to 32 elements
- coordinates and optimises the system's energy management

SERVICE KEYBOARD ON BOARD THE UNIT
Command and control keyboard including:
- 5 keys for ON/OFF, mode change, parameters and commands setting
- timer thermostat function
- wide coloured display with set, state, air and water temperatures display

HYDRAULIC CIRCUIT
- primary and secondary circulators in direct current
- drain cock
- 180-litre hydraulic cut-out tank
- water side differential pressure-switch
- system minimum load pressure-switch
- 18-litre system side membrane expansion tank
- 3 bar system water side safety valve
- motorised valves for managing solar and system water with domestic.
- water charging unit with gauge

DOMESTIC HOT WATER MODULE
DOMESTIC HOT WATER CIRCUIT
- system minimum load pressure-switch
- plate exchanger for the production of domestic hot water.
- solar/domestic water plate exchanger
- storage tank for 280-litre domestic water, with vitrified inside and with polyurethane external insulation (40 mm thick) covered in PVC
- electronic anode
- 16-litre membrane expansion tank
- domestic water recirculation circulator
- domestic hot water system recirculation circulator
- recirculation circuit check valve
- domestic water side, automatic air vent valve
- 6 bar domestic water side safety valve
- burn proof thermostatic valve
- separately provided steel mesh water filter

INTEGRATION CONDENSING BOILER
- integration for system and domestic hot water
- anti-legionellosis cycles
- modulating condensing boiler
- LPG and Methane supply
- AISI 316L stainless steel body
- total pre-mixing cylindrical burner

INTEGRATION THERMAL SOLAR (OPTIONAL)
- DHW integration and system
- integrated drain circuit
- direct current circulator
- 3Bar safety valve
- 35-litre tank
- solar temperature probe with 30 m cable

ENERGY EXCHANGER MODULE
The energy exchanger can be installed outdoors and indoors, with the possibility of being channelled. It is provided with a direct current radial fan and heater on the condensate collection tray.
STRUCTURE
The structure of the external unit is made of a single body moulded in polyethylene.
Two aluminium feet are inserted in the lower part, to which it is possible to fix standard supplied rubber antivibrating dampers.
ENERGY EXCHANGER FAN
Plug-fan type fan without reversed blade screw, optimised to reduce sound emissions to a minimum and simultaneously increase energy efficiency, despite maintaining the static pressure necessary for channelling the unit.
ACCESSORY SUPPLIED SEPARATELY:
- Connection flange with underground air ejection channel (FDCCX)
- Non-mixed high temperature booster kit (KIRHX)
- Mixed low temperature booster kit (KIRLX)
- Second, third and fourth booster management board (SRILX)
- Panelling kit for installing separate modules (KPSEPX)

NOTES:
in case of request of second and third boosters supplied separately (KIRHX or KIRLX) only one additional SRLIX board is required; if fourth booster is also requested, therefore managing 4 zones, a further SRLIX board is required.

ELFOControl²

- **Coloured touch screen display** Dimensions: 7.2" resolution 800x480 pixel, Type: colour TFT, resistive type touch screen.
- **Black aesthetical frame** in self-extinguishing plastic material.
- **Control capacity** 12 climate areas; total 40 manageable elements.
- **Network features** ELFOControl² provides the connection of all elements in a BUS system where each element is connected to **just one communication cable.**

ELFOControl² communicates with the system devices through an Ethernet/485 converter (provided). Connection between ELFOControl² and the converter through a category 5 **cable** (5 m cable provided). .

- The RS485 serial line connecting the system elements must always be made with BUS topology (in/out). Only cables for RS485 serial lines must be used. Star, ring or any other type are not admissible.
- The serial line must be installed separately from other cables, powered at different voltages and away from cables or devices that can cause electromagnetic interference.

Display dimensions	inches	7,2”
Display type		Colour TFT
Power supply voltage	V	12Vdc
Power	VA	24VA
Protection degree		IP 20
Weight	Kg	0.5

ELFOControl² is supplied complete with:

- 12Vdc AL12X power supply unit
- Ethernet/485 converter
- cat. 5 Ethernet UTP cable (5 m long)

NOTES: The maximum distance between Ethernet/485 converter and ELFOControl² is of 90 m.

Attention: the cabling from the outside power supply to ELFOControl² must follow low-voltage cabling requirements.

FUNCTIONING LIMITS

Operational temperature	from 0 to 45°C
Stocking temperature	from –10°C to +50°C
Relative humidity	from 10 to 90% without condensation
Installation	The display must not be exposed to direct sunlight or other intense light sources

SYSTEM ACCESSORY SUPPLIED SEPARATELY

1. **AL12X:** 220Vac-12Vdc power supply unit for Modbus thermostats
2. **CIECX:** ELFOControl² Built-in pre-installation box
3. **CBSX:** Shielded cable for RS485 bus
4. **KGPRX:** Mixing unit control module
5. **BMZRX:** Radiant zone module with RS485 communication port for MODBUS thermostats
6. **CMRSX:** Single area module with RS485 communication port
7. **MIOX:** Input/output module with RS485 communication port
8. **HIDT2X:** HID-T2 local electronic room control device (temperature only)
9. **HID-T3X:** HID-T3 local electronic room control device (temperature + humidity)
10. **HID-Ti2X:** HID-Ti2 local electronic room control device (built-in, temperature only)
11. **HIDTi4NX:** Black HID-Ti4 local electronic room control device (built-in, temperature only, requires BMZRX)
12. **HIDTi4BX:** White HID-Ti4 local electronic room control device (built-in, temperature only, requires BMZRX)
13. **HIDURNX:** Black HID-UR local relative humidity sensor (built-in, only combinable with HID-Ti4, requires BMZRX)
14. **HIDURBX:** White HID-UR local relative humidity sensor (built-in, only combinable with HID-Ti4, requires BMZRX)

UNIT MANAGEABLE FROM ELFOControl²

ELFOFresh²: air renewal unit

- ELFOFresh²
- ELFOFresh Large

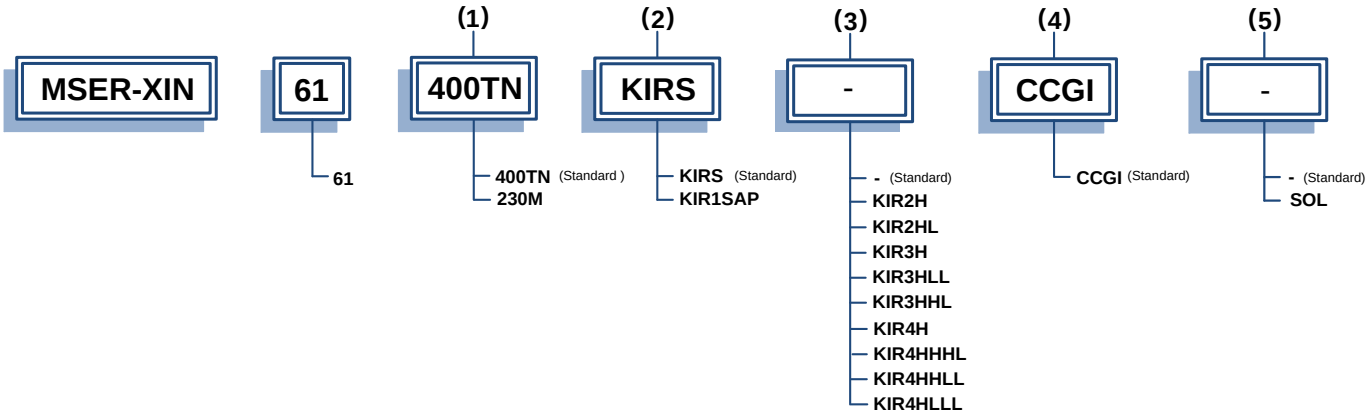
Ambient terminals

- ELFORoom²
- ELFOSpace IN-V and IN-H 3 - 31
- ELFOSpace OUT-V and OUT-H 3 - 31
- ELFOSpace BOX2 7 - 41
- ELFODuct CF 25 - 242
- ELFODuct CFD 7 - 41
- ELFODuct CFI 25 - 71
- ELFODuct CF-V 31 - 242

Mixing unit control and radiant areas module

- Radiant areas module: the panel heads of the different areas can be intercepted depending on the ambient temperature detected by the HID-T2, HID-Ti2 , HID-T3, HID-Ti4 and HID-UR thermostats.
- Mixing unit control module: this module is used to manage the supply temperature of the radiant panels. The temperature and humidity of the rooms are detected by the HID-T2 and HID-Ti2 (temperature only) or HID-T3 (temperature and humidity) room control devices.

UNIT CONFIGURATION



(1) POWER SUPPLY VOLTAGE
Power supply voltage 400/3/50+N (400TN) standard
Power supply voltage 230/1/50 (230M)

(2) BASIC HYDRAULIC KIT
1 area (KIRS) standard
1 high static pressure area (KIR1SAP)

(3) BOOSTER HYDRAULIC KIT
Not requested (-)standard
2 areas: high temperature only (KIR2H)
2 areas: one high temperature + one low temperature (KIR2HL)
3 areas: high temperature only (KIR3H)
3 areas: two high temperature + one low temperature (KIR3HHL)
3 areas: one high temperature + two low temperature (KIR3HLL)
4 areas: high temperature only (KIR4H)
4 areas: three high temperature + one low temperature (KIR4HHHL)
4 areas: two high temperature + two low temperature (KIR4HHLL)
4 areas: one high temperature + three low temperature (KIR4HLLL)

(4) GAS INTEGRATION BOILER
Integration gas boiler (CCGI) standard

(5) DRAIN SOLAR KIT
Not requested (-) standard
Drain solar (SOL)

MAIN TECHNICAL DATA AT NOMINAL FUNCTIONING CONDITIONS

SIZE			61		
APPLICATION			**Radiant Panels**	**Therminal Units**	**Radiators**
HEATING			**A7 / W35**	**A7 / W45**	**A7 / W55**
Total heat capacity with boiler and heat pump	1	kW	41,3	40,2	39,5
Heat pump nominal heat capacity	2	kW	16,3	15,2	14,5
Total absorbed power	3	kW	3,63	4,52	5,35
COP Eurovent	4		4,49	3,36	2,72
COP (EN 14511:2008)	5		4,41	3,30	2,70
Water flow rate (Internal Exchanger)	6	l/s	0,78	0,72	0,35
Standard booster useful pump pressure	6	kPa	28	34	62
HEAT PUMP HEATING			**A2 / W35**	**A2 / W45**	**A2 / W55**
Nominal heat capacity	2	kW	12,5	11,7	11,1
Total absorbed power	3	kW	3,32	4,14	4,90
COP (EN 14511:2008)			3,67	2,75	2,16
INTEGRATION BOILER HEATING					
Nominal heat capacity	10	kW	25,0		
Minimum heat capacity	10	kW	3,3		
Nominal heat capacity 80°/60°	10	kW	24,5		
Minimum heat capacity 80°/60°	10	kW	2,9		
Nominal heat capacity 50°/30°	10	kW	27		
Minimum heat capacity 50°/30°	10	kW	3,6		
Useful nominal heat yield 80°/60°	10	%	98		
Useful nominal heat yield 50°/30°	10	%	108		
Partial load heat yield 30%	10	%	108		
COOLING			**A35 / W18**	**A35 / W7**	-
Nominal cooling capacity	2	kW	17,7	13,3	-
Total absorbed power	3	kW	4,93	4,61	-
EER Eurovent	7		3,60	2,89	-
EER (EN 14511:2008)	8		3,65	2,92	-
ESEER Eurovent	9		7,42	5,41	-

The performances refer to the energy exchanger placed at 3 m from the internal unit.

(1) The heat power refers to the sum of the nominal power of the integration gas boiler (Pam 1013.25 mbar, Amb.T.=15°C) and the nominal power of the heat pump at the conditions of note (2).

(2) Data referring to the following conditions:
A7 / W35 water to internal exchan. 30/35°C, External air temp.: 7°C D.B./ 6°C W.B.
A7 / W45 water to internal exchan. 40/45°C, External air temp.: 7°C D.B./ 6°C W.B.
A7 / W55 water to internal exchan. 45/55°C, External air temp.: 7°C D.B./ 6°C W.B.
A2 / W35 water to internal exchan. 30/35°C, External air temp.: 2°C D.B./ 1°C W.B.
A2 / W45 water to internal exchan. 40/45°C, External air temp.: 2°C D.B./ 1°C W.B.
A2 / W55 water to internal exchan. 45/55°C, External air temp.: 2°C D.B./ 1°C W.B.
A35 / W18 water to internal exchan. = 23/18°C, External air temp.: 35°C
A35 / W7 water to internal exchan. = 12/7°C, External air temp.: 35°C
The nominal heating and cooling capacities refer to 75% of maximum compressor speed.

The power modulating is between 30% and 100%.
Modulation from 75% to 100% only happens below temperature 0°C.

(3) The total absorbed power is obtained by summing the compressors absorbed power + the fans absorbed power - the fan absorbed power to supply the residue useful pressure to the system + the power absorbed by the auxiliary circuit

(4) COP Eurovent: ratio between the delivered power and the total absorbed power.

(5) The total absorbed power is obtained by summing the compressors absorbed power + the power absorbed by the fans - the fan absorbed power to supply the residue useful pressure to the system + the power absorbed by the auxiliary circuit.

(6) COP (EN 14511:2008) ratio between the delivered power and the total absorbed power calculated in compliance with that provided by Standard EN 14511:2008, where the total absorbed power, is obtained by summing the compressors absorbed power + the power absorbed by the fans - the fan absorbed power to supply the residue useful pressure to the system + the power absorbed by the primary circulator - the power absorbed by the circulator to supply the residue useful pressure to the system + the power absorbed by the auxiliary electric circuit

(7) The values refer to performances in heating mode

(8) EER calculated as ratio between the cooling capacity and the total absorbed power.

(9) EER calculated in compliance with that provided by Standard EN 14511:2008, where the total absorbed power, is obtained by summing the compressors absorbed power + the fans absorbed power - the power absorbed by the fan to supply the residue useful pressure to the system + the power absorbed by the primary circulator - the power absorbed by the circulator to supply the residue useful pressure to the system + the power absorbed by the auxiliary circuit.

(10) ESEER calculated according to Eurovent, for water produced at 18°C the partial load condition as defined by EUROVENT for water produced at 7°C has been considered calculated according to external conditions Pam= 1013.25 mbar, Ambient t. = 15°C)

MECHANICAL FEATURES

GRANDEZZA			61
COMPRESSOR			
Type of compressors	1		1 x SCROLL INVERTER DC
Coolant load (C1)	2	Kg	7.5
Cooling circuits		Nr	1
INTERNAL EXCHANGER			
Internal exchanger type	3		PHE
N. internal exchangers		Nr	1
COOLING CONNECTIONS			
External diameter of gas piping	4		3/4” (19.05 mm thickness 1 mm)
External diameter of liquid piping	4		5/8” (15.88 mm thickness 1 mm)
HYDRAULIC CIRCUIT			
Domestic/system safety valve calibration		kPa	300 / 600
System expansion tank capacity		l	18
System storage tank capacity		l	180
ENERGY EXCHANGER FAN			
Type of fans	5		RAD DC
Standard air flow		l/s	1750
Max external static pressure		Pa	90
POWER SUPPLY			
Standard power supply		V	400/3/50+N
DOMESTIC HOT WATER			
Storage tank capacity		l	280
Expansion tank capacity for domestic system	6	l	16
INTEGRATION THERMAL SOLAR			
Capacity of solar exchanger		W/K	3186
Capacity of drain solar tank		l	35
ELFOControl²			
Display dimensions		inches	7,2”
Display type			Colour TFT
Power supply nominal voltage		V	12Vdc
Power		VA	25VA
Protection degree			IP 20
Body dimensions (l x h x d)		mm	205x130x40
Frame dimensions (l x h x d)		mm	222x168x4
Weight		Kg	0.5
DIMENSIONS			
Energy exchanger/DHW Module/System Module Length	7	mm	610 / 570 / 1250
Energy exchanger/DHW Module/System Module Depth	7	mm	800 / 800 / 790
Energy exchanger/DHW Module/System Module Height	7	mm	2040 / 2065 / 1304
STANDARD UNIT WEIGHTS			
Energy exchanger/DHW Module/System Module shipment weight	7	kg	280 / 210/ 110
Energy exchanger/DHW Module/System Module functioning weight	7	kg	480 / 510 / 105

(1) Inverter Compressor
(2) The coolant load refers to the internal unit only.
The energy exchanger is shipped charged with nitrogen.
(3) PHE = plates
(4) Provided with the unit are brass fittings for housing the piping indicated in the table.
(5) RAD DC = direct current radial fan
In the COP and EER calculation, according to the standard EN14511:2008, has been considered the circulator on the primary circuit.
(6) In the event of drain solar option, the 16-litre domestic water side expansion tank is replaced by two standard tanks, respectively 4 and 12-litre, for insertion of the 35-litre solar storage tank.
(7) When the drain solar option is also selected the installer must also add a 24-litre expansion tank on the domestic water side, to compensate the greater volume variations of the liquid due to the higher temperature this reaches with the solar panels.
(8) The dimensions and weights refer to the system module of the external unit/DHW module/internal unit

POWER SUPPLY VOLTAGE : 230/1/50

ELECTRIC DATA

SIZES			61
F.L.A. ABSORBED CURRENT AT MAXIMUM ADMITTED CONDITIONS			
F.L.A. - Total		A	43,5
F.L.I. ABSORBED POWER AT FULL LOAD (AT MAXIMUM ADMITTED CONDITIONS)			
F.L.I. - Auxiliary Circuit		kW	0,1
F.L.I. - Total		kW	7,0

Power supply 230/1/50
Voltage unbalancing: max 2 %

The circulator is also included in calculating the total values.
The units are conform with that prescribed by the European Standards CEI EN 60204 and CEI EN 60335.

This unit is conform with that established by CEI EN 61000-3-12 as long as the short circuit power (Ssc), in the point of connection of the unit to the public distribution line, is greater or equal to the value of 250(Rsce) x Sequ.
The Sequ value (for units powered at 230V/1/50) is given by: Sequ = FLA x 230 (VA)
The installer or user is responsible for ensuring, by contacting the utility provider if necessary, that the minimum short circuit power is at least 250 x Sequ.

The power absorbed by the circulator, necessary for the building's energy certification, must be determined based on the real load losses of the system.
The GAIA Maxi circulator, being direct current inverter, is set during the initial configuration of the unit, so that it has an absorption commensurate with the real load losses of the system.

POWER SUPPLY VOLTAGE: 400/3/50

ELECTRIC DATA

SIZES			61
F.L.A. ABSORBED CURRENT AT MAXIMUM ADMITTED CONDITIONS			
F.L.A. - Total		A	14,5
F.L.I. ABSORBED POWER AT FULL LOAD (AT MAXIMUM ADMITTED CONDITIONS)			
F.L.I. - Auxiliary Circuit		kW	0,1
F.L.I. - Total		kW	7,0

Power supply 400/3/50 (+ NEUTRAL)
Voltage unbalancing: max 2 %

The circulator is also included in calculating the total values
The units are conform with that prescribed by the European Standards CEI EN 60204 and CEI EN 60335.

This unit is conform with that established by CEI EN 61000-3-12 as long as the short circuit power (Ssc), in the point of connection of the unit to the public distribution line, is greater or equal to the value of 250(Rsce) x Sequ.
The Sequ value (for units powered at 400V/3/50) is given by: Sequ = FLA x 400 x 1.73 (VA)
The installer or user is responsible for ensuring, by contacting the utility provider if necessary, that the minimum short circuit power is at least 250 x Sequ.

The power absorbed by the circulator, necessary for the building's energy certification as data attributable to the auxiliary absorption entry, must be determined based on the real load losses of the system.
The GAIA Maxi circulator, being direct current inverter, is set during the initial configuration of the unit, so that it has an absorption commensurate with the real load losses of the system.

MAXIMUM SOUND LEVELS

SIZE	MODULE	Sound Power Level (dB)								Sound Pressure Level (1m)	Sound Power Level
		Octave band (Hz)									
		63	125	250	500	1000	2000	4000	8000	dB(A)	dB(A)
61	HEAT PUMP	46	54	48	52	47	43	45	28	37	53
	ENERGY EXCHANGER	66	69	71	64	61	56	48	45	52	67

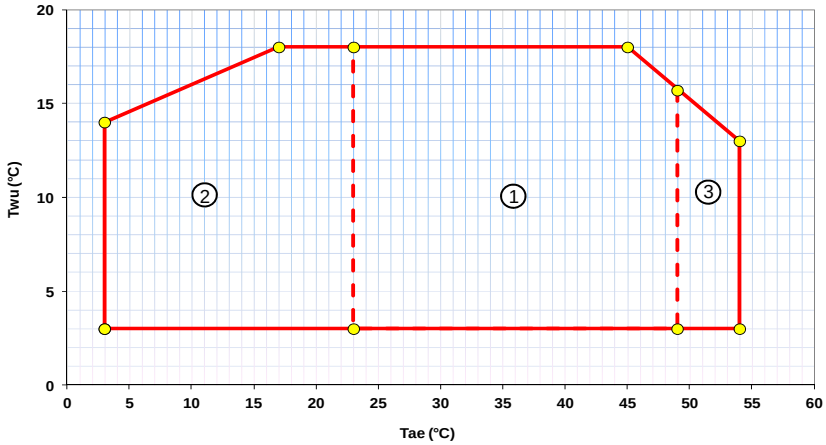
Noise levels are determined using the tensiometric method (UNI EN ISO 9614-2)

Full load unit:
- internal exchanger water 23/18 °C
- ambient temperature = 35 °C

The sound levels of the internal unit refer to unit at full load, in normal test conditions. The sound pressure level refers to a distance of 1 m from the outer surface of the unit operating in an open field.
The sound data of the external unit refer to the energy exchanger channelled to nominal capacity with useful static pressure of 90 Pa.

FUNCTIONING LIMITS

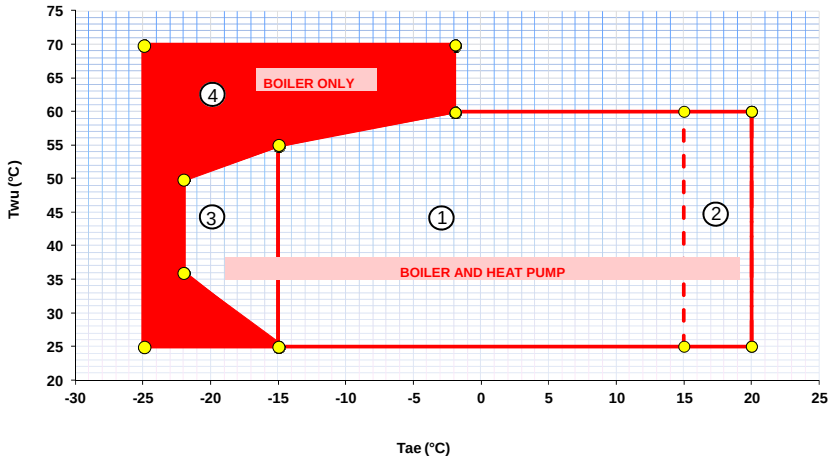
FUNCTIONING LIMITS (COOLING)



Twu [°C] = outlet water temperature from exchanger
Twu [°C] = 3°C antifreeze safety intervention
Tae [°C] = inlet air temperature to the external exchanger

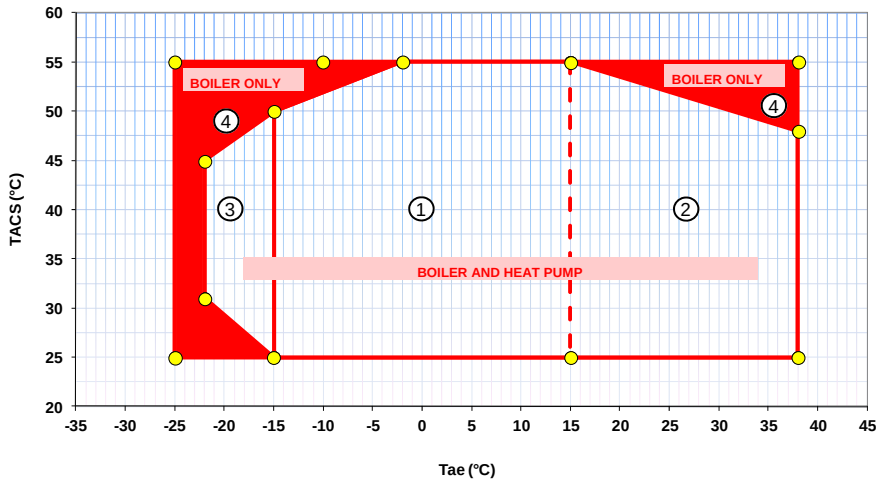
Normal functioning range
Functioning with modulating fans
Functioning with fans at 100%

FUNCTIONING LIMITS (HEATING)



Twu [°C] = outlet water temperature from exchanger
Tae [°C] = external exchanger inlet air temperature
(1) Heat pump normal functioning range with compressor at 75% and boiler when adjustment requires it
(2) Heat pump functioning with modulating fans and boiler when adjustment requires it
(3) Heat pump functioning range for short and temporary periods (max 5000 hours) and boiler when adjustment requires it.
(4) Functioning range extension with the gas boiler only as replacement of the heat pump.

FUNCTIONING LIMITS (DOMESTIC WATER PRODUCTION)

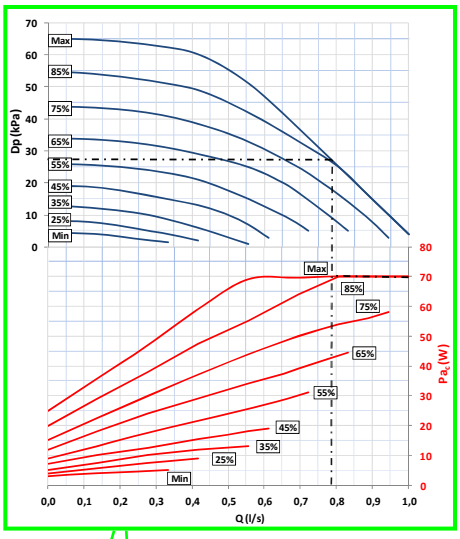


TACS [°C] = domestic water temperature
Tae [°C] = external exchanger inlet air temperature
(1) Heat pump normal functioning range with compressor at 75% and boiler when adjustment requires it
(2) Heat pump functioning with modulating fans and boiler when adjustment requires it
(3) Heat pump functioning range for short and temporary periods (max 5000 hours) and boiler when adjustment requires it
(4) Functioning range extension with the gas boiler only as replacement of the heat pump

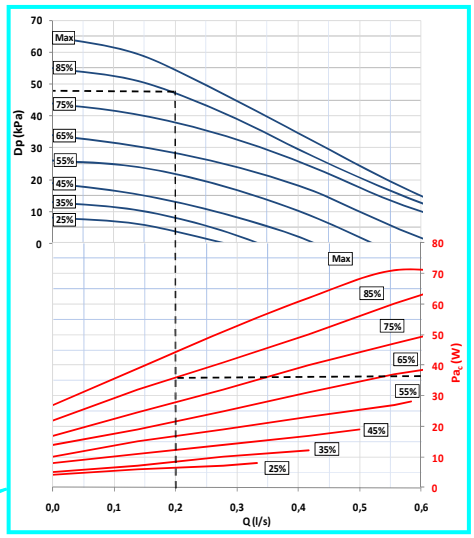
BOOSTER CIRCULATOR ABSORPTION AND STATIC PRESSURE

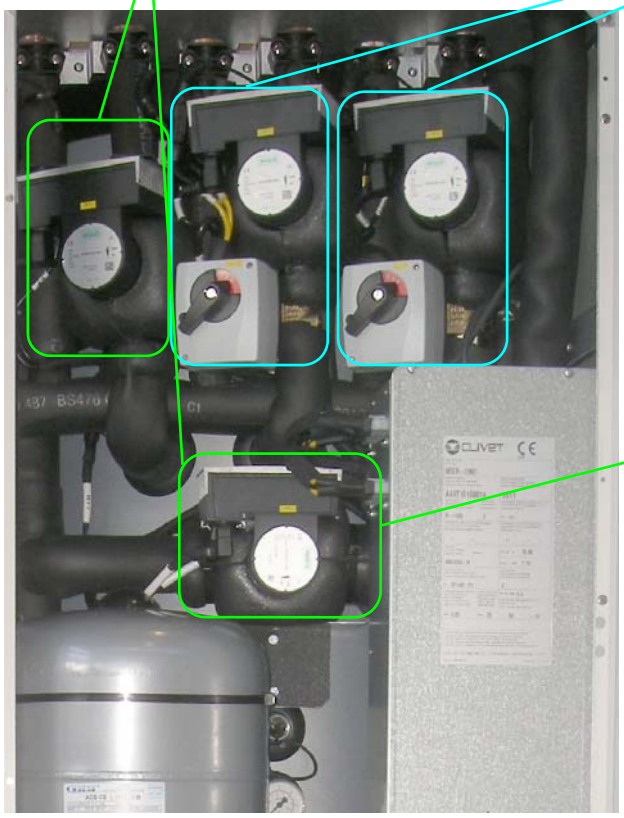
GAIA Maxi can be supplied with a single system side circulator (STANDARD configuration) or up to a maximum of four system side circulators for managing up to 4 areas with different temperatures.
Below is a chart related to the useful static pressure and absorption of every circulator present in the unit.
The power supplied by the unit is distributed on every single booster, it follows that GAIA Maxi is installed with more boosters, the total capacity must correspond to the total power of the unit.

USEFUL STATIC PRESSURE HIGH TEMPERATURE BOOSTER

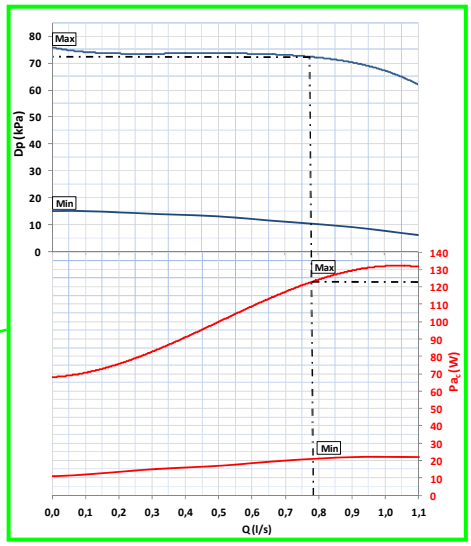


USEFUL STATIC PRESSURE MIXED BOOSTER





USEFUL STATIC PRESSURE HIGH TEMPERATURE FIRST BOOSTER HIGH STATIC PRESSURE (OPTIONAL)



Dp [kPa] = USEFUL STATIC PRESSURE
Pac [W] = SYSTEM CIRCULATOR ABSORBED POWER
Q [l/s] = WATER CAPACITY USEFUL STATIC PRESSURE

The static pressures are available at the unit's connections.
Thanks to GAIA Maxi's adjustments, each pump automatically adapts its water flow to the system's load. However, it is possible to set the maximum static pressure necessary for every single booster by means of a relative parameter, which regulates the 0-10v input signal.
in case of use on radiant systems, it is advised to provide more than one booster to have the correct capacities/static pressures in the circuit.

SIGNAL (V) AND PERCENTAGE CORRESPONDENCE TABLE

Found in the table below is the correspondence between the operating percentage of the circulators and the input control signal.

Signal	1.5 V	2.5 V	3.5 V	4.5 V	5.5 V	6.5 V	7.5 V	8.5 V	10 V
Percentage	Min	25%	35%	45%	55%	65%	75%	85%	Max

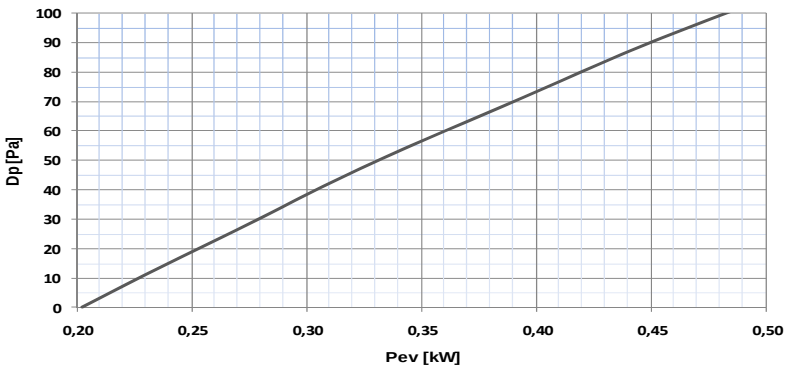
FAN ABSORBED POWER BASED ON THE REQUESTED USEFUL STATIC PRESSURE

In the chart at the side it is possible to identify the fan absorption, based on the useful static pressure towards the channel.

The represented curve refers to the standard flow.

It is possible to vary the static pressure through the relative parameter that manages an 0-10 V signal.

For the setting refer to the use and maintenance manual.



Pev = ELECTRIC POWER ABSORBED BY THE FAN
Dp = FAN USEFUL STATIC PRESSURE

INTEGRATED DRAIN SOLAR SYSTEM (optional)

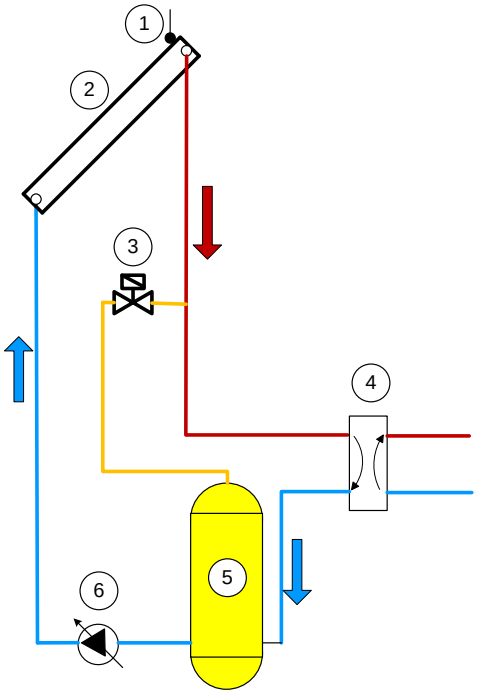
The drain solar system supplied as option in GAIA Maxi works differently from the other systems.
The vector fluid, normally made of mains water, is not pressurised and is made to circulate only during the heat transfer phase.

The drain functioning allows fully draining the solar panel when the fluid temperature is too high (solar T > 80°C) or when the external temperature is low (antifreeze safety).

To enable the draining, the circuit is not fully charged with fluid, but only partially; when the circulation pump stops, the fluid kept in circulation by it, drops by gravity from the panel to the recovery tank, placed in the lowest point of the circuit.
A solenoid valve placed above the storage tank allows bleeding the air from the air towards the solar panels, allowing their charging.

In traditional systems with glycol water during the summer season and under-use of the system, the glycol vector fluid is over-heated (thermal stagnation) with deterioration of its antifreeze properties; to reduce this overheating, it is necessary to maintain circulation active even when heat is not requested, with evident energy waste.

Therefore, the following advantages are had with the drain system: no overheating of the fluid, circulation is not always active, use of main water and greater exchange efficiency admitted from water without glycol.



1. solar temperature probe
2. thermal solar panel
3. solenoid for air outflow from tank during draining
4. exchanger towards DHW and system
5. 35-litre recovery tank
6. solar system circulator

THE ADVANTAGES OF THE SOLAR

The solar radiation is a huge and renewable free energy source and is made by direct radiation and by diffused radiation.

The direct radiation is that supplied directly by the sun without dispersion due to the atmosphere.

The diffused radiation is that supplied directly by the sun also in cloudy days, through dispersion and reflection from the clouds.
As an example, in a day where the sun is covered by the clouds, with a diffused radiation percentage of over 80%, 300 W/m^2 of solar radiation can still be measured, against about 1000W/m^2 available with direct sun.

The power supplied by direct radiation and dispersed strongly depends on the season and local atmospheric conditions.
The calculation of the average annual solar radiation in Italy, bearing in mind the average number of hours of sun in the day and the ratio of power supplied by the sun during the various seasons, varies with the location between 900 kWh and 1800 kWh per m^2 .

To understand what this radiation means in energy terms, 1000 kWh per m²/year correspond to the energy content of 100 litre of petroleum.
As the solar panels are able to captivate on average between 40% and 50% of the solar radiation to ground and that the annual DHW requirement for 4 persons with a consumption of 50l/person per day is of about 3500-4000kWh yearly, using 4m^2 of panels 50% of the total annual requirement of domestic hot water is covered.

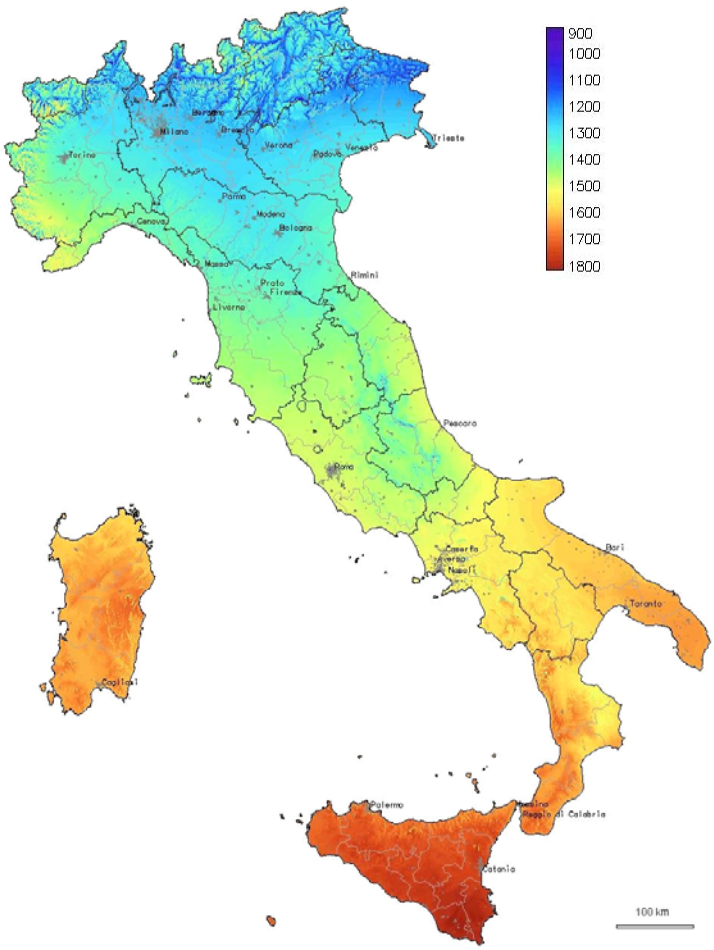
The energy advantages is accompanied by a reduction of the production of CO_2: 100 litres of petroleum produce an emission in atmosphere of 222 kg of CO_2.

In mid-season, the energy captivated by the solar panels manages to satisfy both the domestic hot water requirement and part of the hot water requirement for heating.

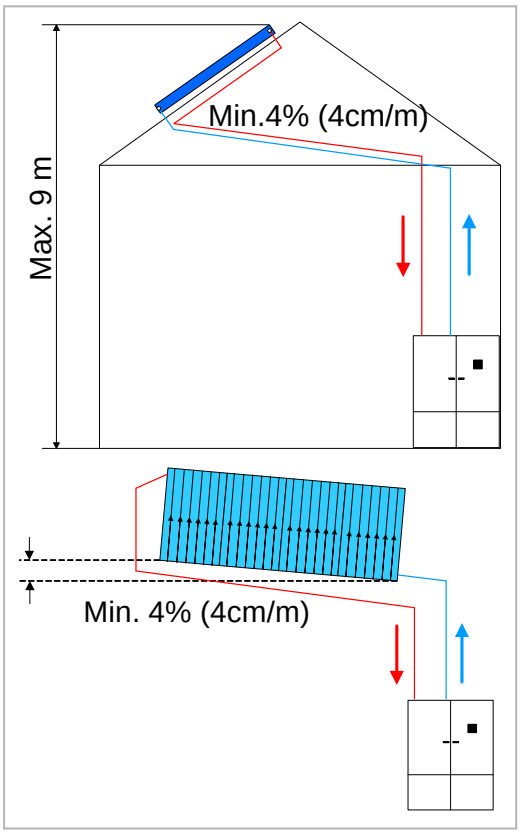
To have the maximum yield in Italy of a solar manifolds system, the latter during the middle months of the year, must be directed south and tilted by 30° compared to the horizontal plan.

In fact, it is easy to move away from these parameters, and therefore, it is possible to increase the surface of the panels to compensate the yield reduction deriving from the inadequate disposition of the same.

MAP OF THE HORIZONTAL RADIATION IN ITALY in kWh/m^2
Data obtained from the European Commission Study Centre.



DRAIN SOLAR FEATURES



The air contained in the circuit acts as expansion tank, not necessary in this system.

When the system heats-up the fluid expands increasing the pressure of the air in the circuit. For this reason vent valves must not be inserted, to avoid bleeding the air necessary for the correct functioning.
The solar circuit must be realised so that there are no siphons in the piping where the liquid can stagnate during draining, the horizontal section to favour outflow, must have a minimum slope of 4% (4 cm/m).

The drain solar does not require glycol to protect the vector fluid against risk of freezing; the only warning is given when choosing installation premises not subject to freezing.

DRAIN SOLAR PIPING TECHNICAL FEATURES	
Recommended supply pipe	In smooth copper with internal diameter of **14 mm** external diameter of **16 mm**
Return pipe **compulsory**	In smooth copper with internal diameter of **10 mm** external diameter of **12 mm**
Maximum static pressure	**9 meters**
Maximum circuit length	Total equivalent length = **40 meters**
Curve equivalent length 90°	**0.6 m**
Curve equivalent length 45°	**0.3 m**

FEATURES OF THE SOLAR PANELS FOR COMBINATION WITH DRAIN SOLAR SYSTEM

Only solar panels suitable for draining must be used, where the water inlet happens in the lower part and the outlet in the upper part without internal siphons, to enable the draining of the circuit.

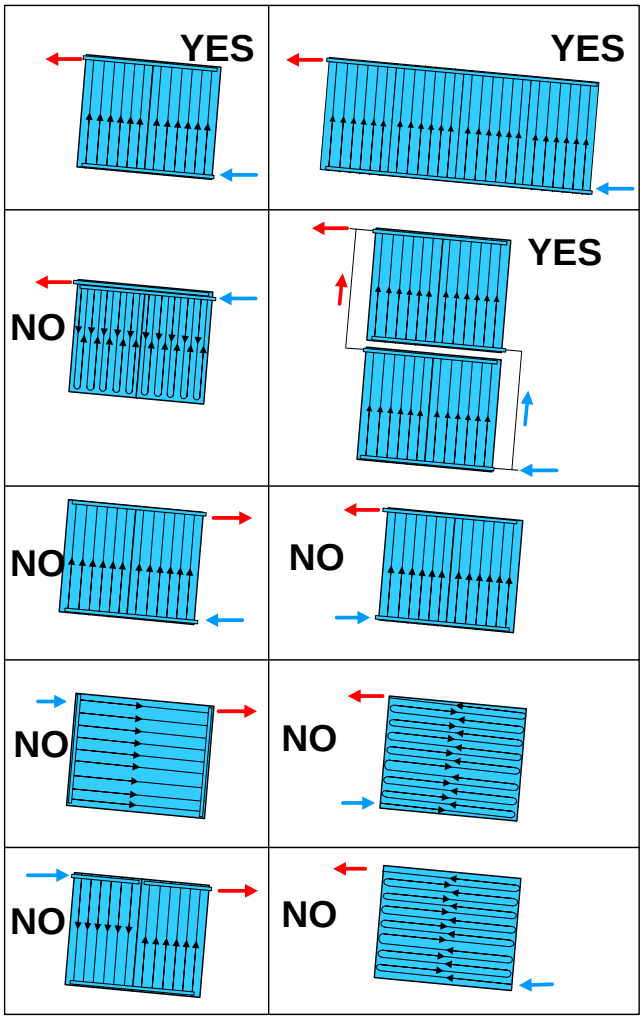
Water inlet and outlet must happen from opposite sides to enable draining of water and bleeding of air when the panel is tilted.

It is not possible to use solar panels with vacuum pipes having fluid inlet and outlet in the top part.

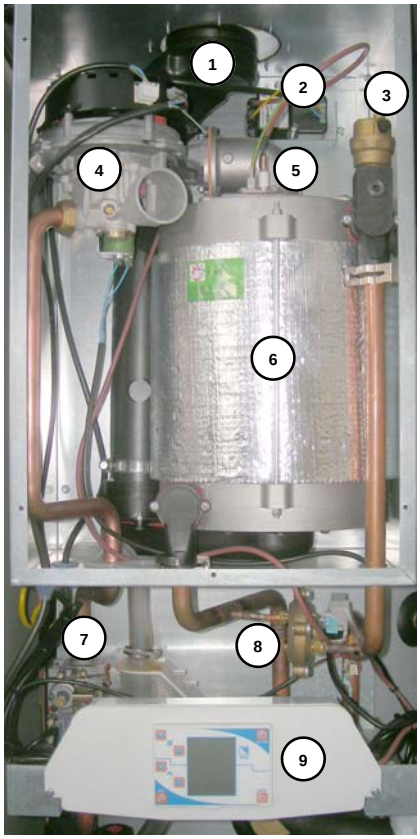
The panels must be installed in parallel, all inlets connected and all outlets connected together.

The maximum surface of the solar panels admitted in combination with GAIA Maxi complete of the drain solar option, is of 10 m^2.

The use of solar panels not satisfying these features is not admitted as GAIA Maxi has been arrange <u>for drain solar only.</u>



GAS CONDENSING BOILER



1. air extraction/fumes discharge flange
2. ignition transformer
3. automatic air vent
4. air-gas mixer
5. ignition electrode
6. condenser/exchanger unit
7. gas valve
8. water flow control differential pressure-switch
9. controls panel

There is a condensing boiler present in the domestic hot water module, optimised for this application.

The core of the boiler is made, in the upper and lower part, in aluminium whereas, the central condensing chamber is in steel; inside this is a smooth steel pipe without welding to enable maximum yield, thermal continuity and avoid corrosion trigger points.

It is provided with an exclusively air-gas mixing system that allows modulation in a wider range, from a minimum of 3 kW up to a maximum to 25 kW, without causing vibrations or annoying noises.

The boiler is supplied with nozzle mounted and calibrated in factory for methane gas (G20). It is possible to use G25 methane using the same nozzle and by only re-calibrating.

The nozzle for LPG supply is provided separately, which use will require re-calibration following the instructions reported in the documentation supplied with the unit.
It is necessary to provide a separate drain for the condense coming from the flue.

The connection, the cleaning and the verifications must always be carried out by qualified personnel and every intervention must be reported in the System schedule as provided by the current laws.

The boiler can function with the following modes:

- domestic hot water production in case of heat pump switch-off for inadequate functioning conditions (low external temperature);
- system heating without DHW request and in case the heat pump is unable to reach the set-point set within the envisioned times;
- Anti-legionellosis cycles in the DHW;

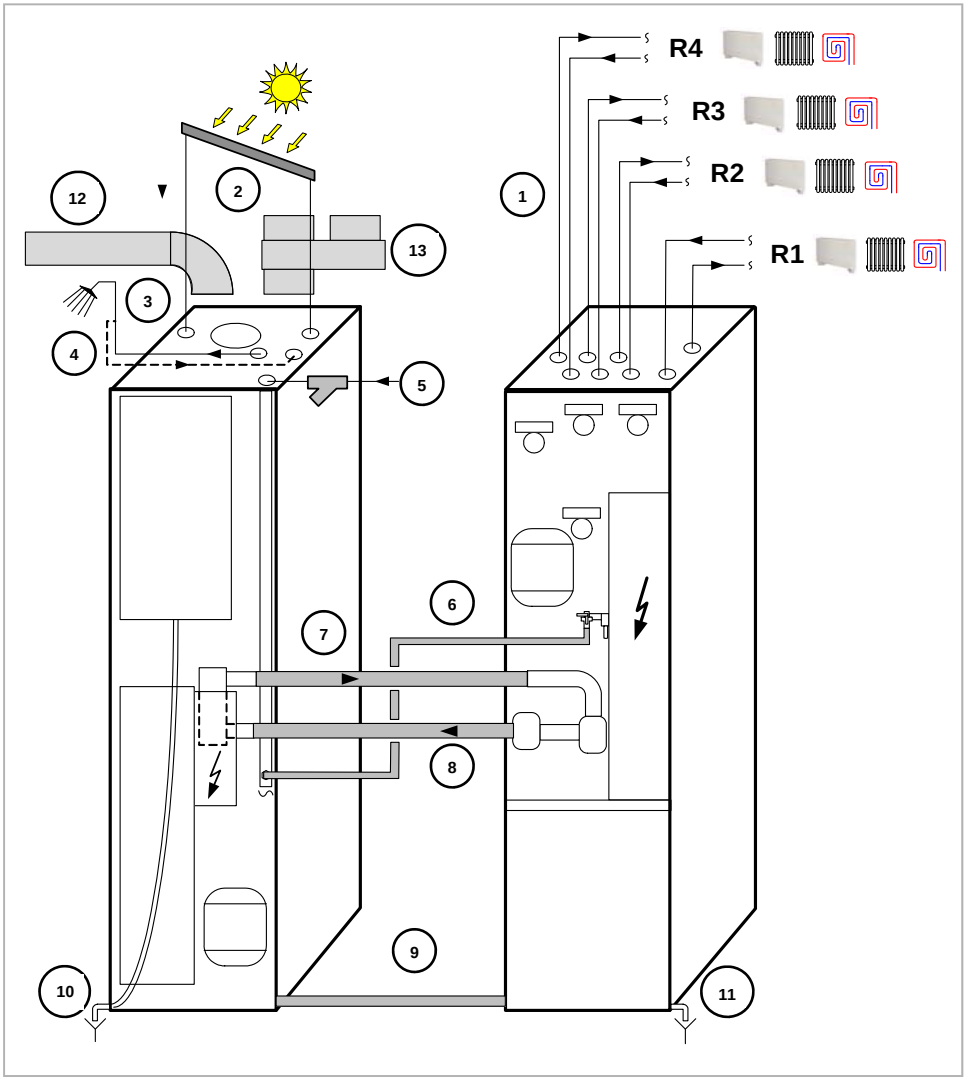
Note : it is not possible to request electric heaters to replace the standard condensing boiler.

BOILER TECHNICAL DATA

BOILER DATA					
Category			II2E+3P - II2H2P - II2E3P - I2HI3PI2L		
Appliance type			C13 - C53		
Gas Type			G20 - G25 -G31		
BOILER COMBUSTION FEATURES	1		**G20**	**G25**	**G31**
Supply pressure		mbar	20	25	37
Fumes capacity to minimum/nominal heat capacity		Kg/h	47/10	47/10	48/10
CO2 to minimum/nominal heat capacity		%	9,4/9,0	9,4/9,0	10,6/10,1
CO at 0% of O2 to minimum/nominal heat capacity		ppm	168/4	167/4	188/3
NOx at 0% of O2 to minimum/nominal heat capacity		ppm	45/17	44/18	49/21
Fumes temperature to maximum/nominal heat capacity		°C	68/66	68/66	70/68
NOx Class					
BOILER CONNECTIONS					
Gas connection diameter		mm	3/4” (19.05 mm)		
Concentric extraction/drain pipe diameter		mm	80/125		
Min-max concentric length		m	0.5 ÷ 10.0 m + 1 Curve at 90°		
Separate extraction/drain pipe diameter mm 80/80		mm	80/80		
Min-max separate pipes length		m	(0,5 ÷ 32) + (0,5 ÷ 32) m + 2 Curve a 90°		

(1) G20: Methane gas 100%, standard nozzle
G25: Methane gas 86%, Nitrogen 14%, standard nozzle
G31: LPG gas, nozzle for lpg supplied separate as standard equipment

DHW MODULE AND HEAT PUMP MODULE CONNECTIONS



1. boosters
2. solar system
3. domestic hot water
4. domestic hot water recirculation
5. supply water
6. system load pipe
7. DHW exchanger water return
8. DHW exchanger water supply
9. drain connection pipe
10. boiler condense drain
11. units drain
12. coaxial drain*
13. split drain*

* = to be chosen as alternative

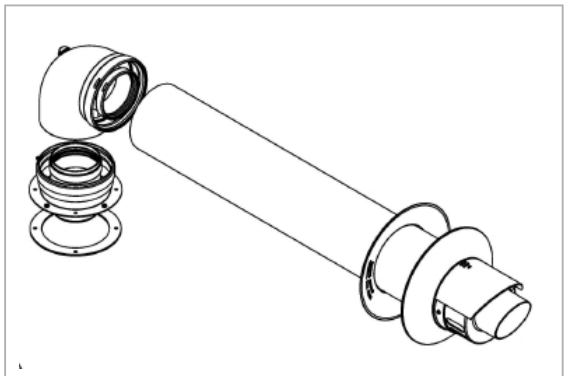
CONDENSE DRAIN AND FUMES CONNECTIONS

The boiler is supplied with flanged connections for extraction/drain that be either coaxial (80/125 mm) or split (80/80 mm).

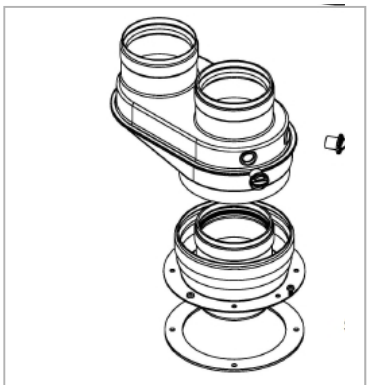
The coaxial drain can be used for a maximum distance of 10 m (with curve at 90°); for greater distances, up to 32 m and with two curves at 90°, it is necessary to use a split extraction/drain.

Piping can be directed in all possible directions, with insertion of curves at 45° or 90°.
It will be necessary to consider that every additional curve entails a reduction of 1 m on the maximum admitted length.
Connection to the flue must be made in compliance with the current technical regulations.

The unit is provided with a dedicated drain for the condense coming from the boiler; this condense with high acidity in residential use can be introduced in the waste water drain of the home (UNI 11071).



Coaxial drain 80/80 mm



Split drain 80/125 mm

GAIA MAXI CONNECTIONS WITH ENERGY EXCHANGER

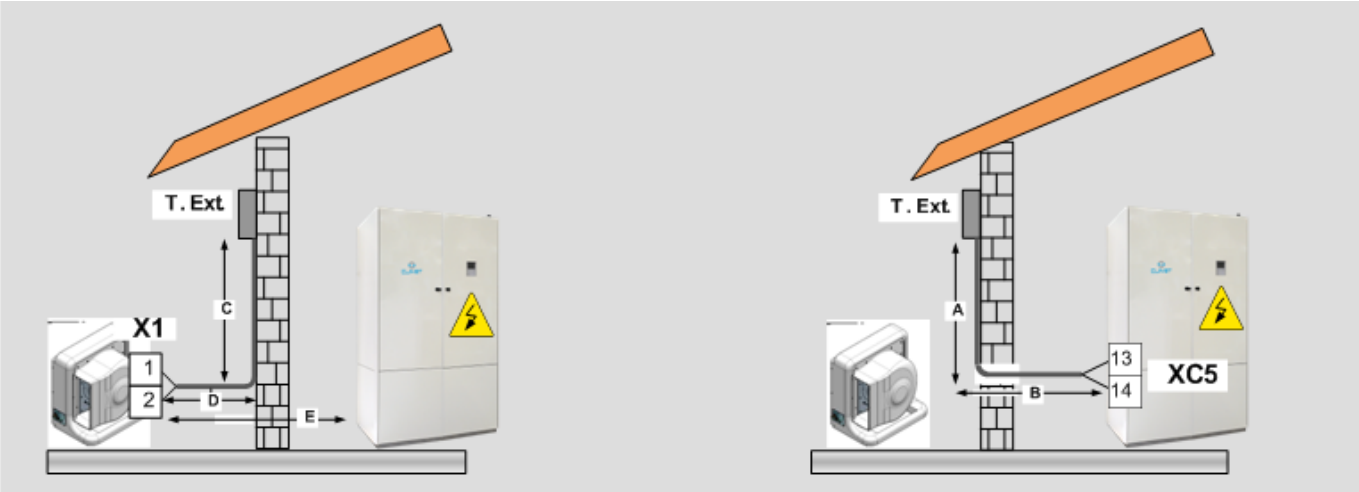
EXTERNAL AIR PROBE

The probe is supplied with the unit.
The client is responsible for installation outside and providing the cable.
The probe can be connected to the energy exchanger or to the Internal unit.

- Cable section: MAXIMUM 2 x 2.5 mm^2, MINIMUM 2 x 1 mm^2
- Maximum length: 20 m (see figures: C+D+E = A+B = 20 m)

The sensor must not be affected by factors which compromise its reading (for example, direct sunlight, air expelled by the fan or other sources, contact with the unit structure or other sources of heat, snow/ice build-up), it must be placed in a covered place (possibly north) e.g. underneath the attic, underneath a terrace and, should it be on a free wall, provide a small shelter.

The probe is necessary to manage defrosting and climate system.

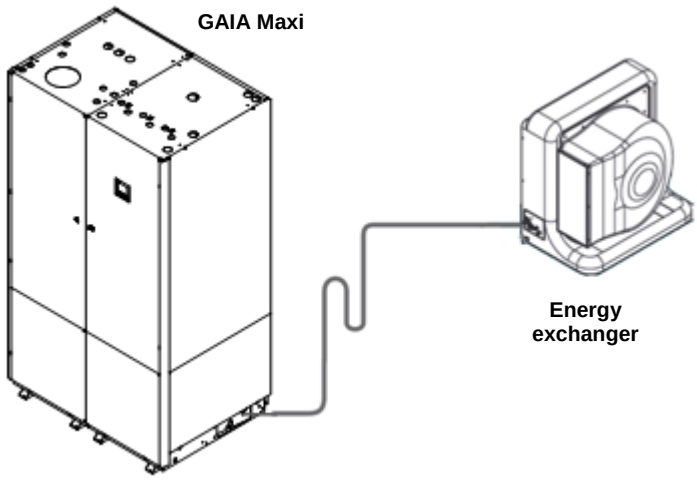


COOLING LINES CONNECTIONS

- Maximum **equivalent length** of the lines 25 m.
- Maximum level difference 15m.

<u>Attention:</u> Provide the relative siphons for every 6 m of level difference.

COOLING LINES EXTERNAL DIAMETERS	GAIA Maxi
Supply line outer diameter	3/4” (19.05 thickness 1 mm)
Line external diameter of the liquid	5/8” (15.88 thickness 1 mm)



Equivalent length of the lines (m) = Effective length (m) + (Q.ty of curves x K)
Consider K = **0.3** m for curves at 90° with wide range;
Consider K = **0.5** m for standard elbow curves at 90°.

<u>Attention</u>: For the correct realisation of the cooling lines, refrigerant gas and oil charge, refer to the GAIA Maxi Manual.

ELECTRIC LINES CONNECTIONS

Indications for the electric connection between the internal unit with the energy exchanger:

- maximum connection cable length: 20 m.
- n. 8 control wires + earth max 2.5 mm^2-AWG 24-13 / min 1.5 mm^2-AWG 24-15
- n. 5 power wires + earth max 2.5 mm^2-AWG 24-13 / min 1.5 mm^2-AWG 24-15.

COOLANT LOAD

COOLANT R-410A LOAD	GAIA Maxi
Indoor unit coolant pre-load	7,5 kg
Energy exchanger load during installation	3,5 kg

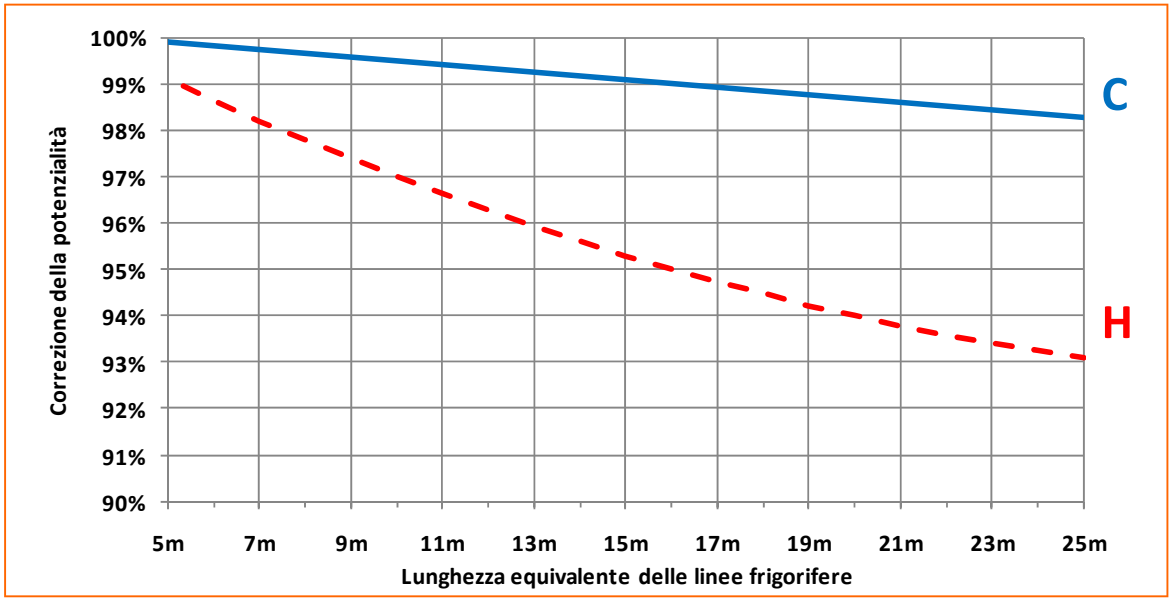
If the distance between the two units is greater of 5 m, a further top-up must be carried out on the liquid line 0.01 Kg/m.

The excellent coolant load must be determined with the unit blocked at 50% in heat pump functioning.
It is irrelevant whether the unit is in domestic water production or system, but it is essential that there is sufficient load for the unit to work for sufficient time to verify the overheating and undercooling.

The under-cooling must be measured by measuring the pressure on the supply and the temperature detected before the liquid receiver: The value must be between: 1.3 ÷ 2.5 °K. (see the unit maintenance manual for the procedure).

DETERMINATION OF THE HEAT AND COOLING YIELD LOSS

The equivalent length of the cooling lines entails a worsening of the cooling and heat capacity supplied to the system and to the domestic water.
The chart enables determining the entity of this yield decrease.



C = Yield curve of the cooling capacity
H = Yield curve of the heat capacity

COMPLETE SYSTEM MANAGEMENT: ELFOSystem GAIA Maxi

To make the best use of the GAIA Maxi capacity, combined with the unit Clivet supplies ELFOControl^2, the developed control system of ELFOSystem GAIA Maxi which manages the complete system and offers advantages on the overall efficiency of the system, on the optimisation of functioning of all elements present in the system, all to benefit an improved performance and reliability of the heat pump, on the elimination of installation errors, wiring and redundancy deriving from the use of external adjustments that can never complete respond to the requirements.
ELFOSystem GAIA Maxi therefore, allows realising a quality system, assuring a better environmental comfort.

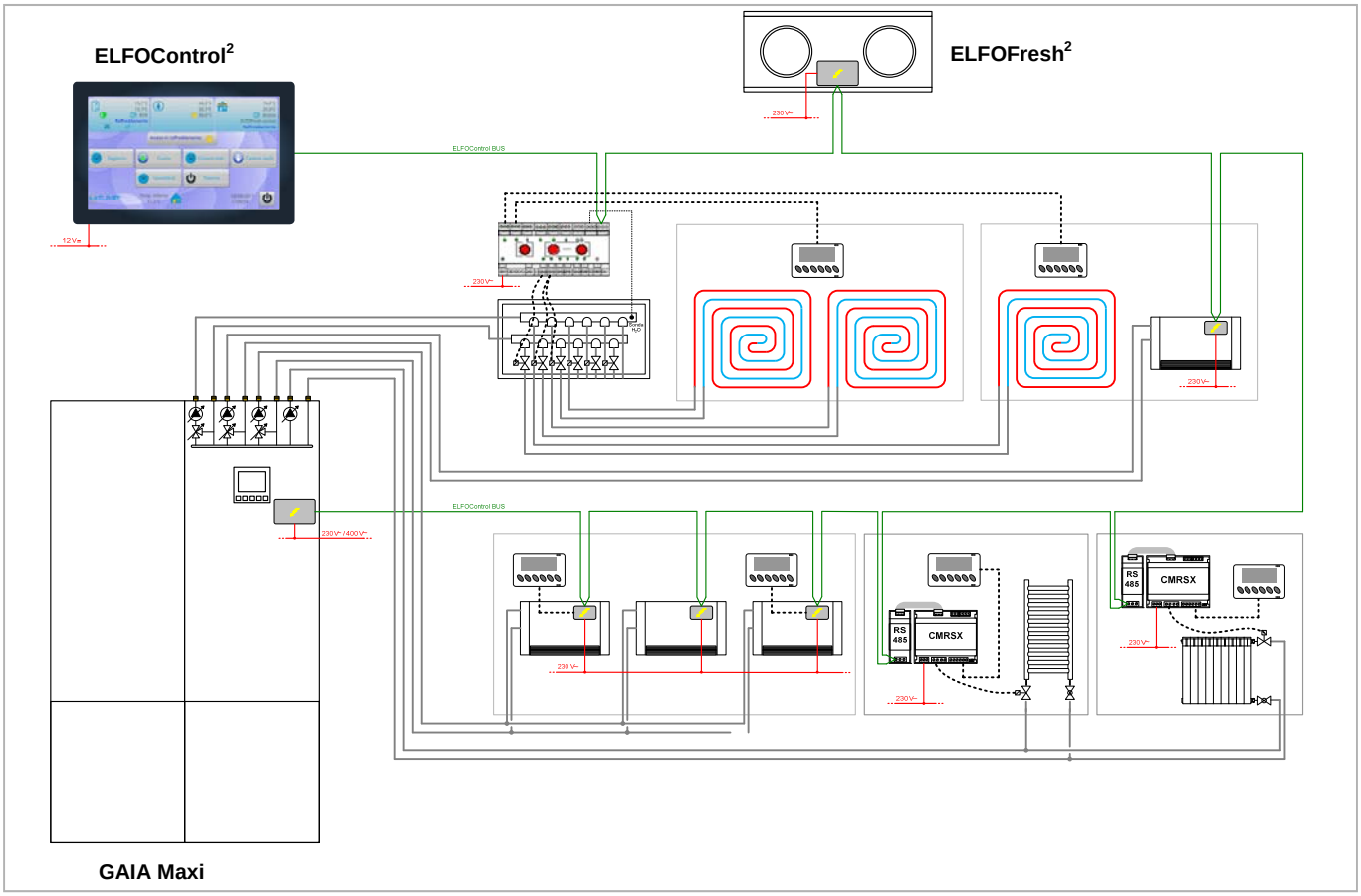
The shown diagram is an example of ELFOSystem GAIA Maxi system where the ELFOControl^2 control coordinates all system elements so that the need for comfort is respected for every area or room that the user will have defined based on a time schedule for every day of the week.

The shut-off valves of the relative hydraulic circuits will be controlled through the relative modules to which the temperature thermostats are connected (HID-T2X, HID-Ti2X, HID-Ti4) and, eventually, the humidity thermostats (HID-T3 or HID-UR), based on reaching the wanted temperature and the GAIA Maxi pumps will activate or not.
Based on the requests, ELFOControl^2 will be able to define the requested power and activate the resources present in the system that, in those conditions, will be energetically more convenient based on the load and environmental conditions.
GAIA Maxi will not be activated during the mid-seasons as the requested load, even if moderate, can be satisfied by

ELFOFresh^2 thanks to its peculiarities, benefitting of a better comfort and an even higher energy efficiency.
The moment the requested power is greater, GAIA Maxi will be activated which, thanks to the inverter compressor in direct current and modulating condensing boiler, will only produce the requested energy and distribute it only where necessary.
In the event of a radiant system also used for cooling, the humidity control happens through ELFOFresh^2, whereas the supply temperature of the water produced by GAIA Maxi is defined based on the external climate and corrected based on the dew point, through detection of the humidity on thermostats HID-T3X or HID-UR.

In the case of the shown diagram, in cooling, the circuit to which the radiators are connected (e.g. of the heating furniture installed in the bathrooms) it will not be activated and GAIA Maxi will produce the water at the correct temperature for the water terminals ELFORoom^2, completely opening the mixer, whereas the supply water to the radiant system will be obtained through the mixer valve.
If the areas of the water terminals ELFORoom^2 is also satisfied, GAIA Maxi will produce supply water to the radiant panels at the correct temperature by completely opening the mixer valve and obtaining an increase in energy efficiency.
The elements present in the system communicate with ELFOControl^2 through a simple serial connection.

ELFOSystem GAIA Maxi therefore appears an industrialised solution enabling quick and quality installation proving to be an advantage for reliability, comfort and energy efficiency.



ELFOControl²: THE BRAIN OF ELFOSystem

The “brain” of ELFOSystem is ELFOControl² the intuitive and simple to use “touch screen” control panel for efficiency and effectively managing **all elements of ELFOSystem** and always achieve the best energy efficiency based on the requested comfort.

ELFOControl² manages :

- the **PRODUCTION** of water for heating, cooling and domestic use with the GAIA Maxi and ELFOEnergy units;
- the **VENTILATION** and purifying of the air in the rooms with the ELFOFresh² units;
- the **DISTRIBUTION** of the cooling/heat energy in all rooms in the home; ;

And also:

- it performs diagnosis on all connected Clivet devices;
- activates the various devices based on the outside conditions and the comfort conditions set;
- it interacts with the various elements of the system through a wired BUS network and allows defining the own comfort from a single position. .

PRODUCTION OF HEAT AND COOLING ENERGY

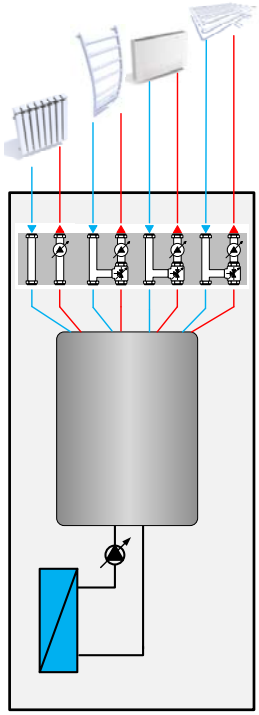
Number of managed elements: 1

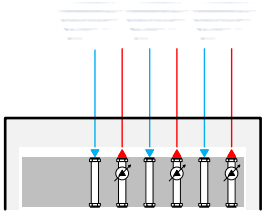
The heat pump produces the necessary energy for satisfying the heating and cooling requirements.
The main functions managed are: :

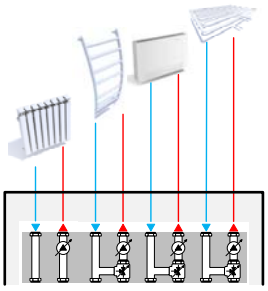
- activation on the effective request of the system;
- domestic hot water production (except ELFOEnergy Medium);
- management of the multi-zone distribution (GAIA Maxi only);
- variation of the water temperature produced based on the External air temperature;
- time schedule;
- special functions (only DHW, DHW only from thermal solar, etc.)

GAIA Maxi directly manages up to 4 boosters (3 of which mixed) and it is an extremely flexible unit and suitable for every type of installation.

Every booster works with a set-point and a climate curve dedicated to optimising its performances.
The booster pumps automatically vary their capacity by automatically adapting to the effective load of the relative hydraulic circuit, whereas any mixers autonomously work to guarantee the correct working temperature based on the set-point set.







The different configurations of the GAIA Maxi boosters make every engineering realisation possible:

SINGLE-TEMPERATURE System

GAIA can be equipped with more direct boosters that all work at the same temperature to supply the energy to the same type of terminals. In use to replace the existing generator the use of only one booster may be the ideal solution to allow reusing the entire heating system.
In new realisations the use of more booster pumps appears particularly suitable in all cases where choosing an area distribution system, where every booster pump supplies only one hydraulic circuit.

MULTI-TEMPERATURE System

The possibility of regulating the mixer valves makes using GAIA Maxi particularly simple in systems using different distribution systems of the hot and cold. These systems are characterised by dedicated set-point for every circuit, GAIA Maxi always assures the correct temperature for every booster thanks to the automatic adjustment of the mixer valves.

VENTILATION - ELFOFresh²

Maximum number of manageable elements: 2

ELFOFresh² the thermodynamic recovery unit active for the freshening and purifying of air in the rooms represents the "first resource" of the system that, thanks to the use of the heat pump technology, is able to:

- introduce heated and cooled primary air in rooms,
- work as a single generator during the mid-seasons or during hours where the heat loads of the building are low;
- work in FREE COOLING when the external air temperature is below the internal one and the indoor rooms needs cooling, switching off the compressor and forcing the fans to work at maximum speed.

During mid-seasons, when ELFOFresh² is the only available resource, ELFOControl² also allows to act directly on air renewal:

- by temporarily activating the units in heating or cooling for a definable time
- by forcing functioning in ventilation only (FREE COOLING);
- By setting in automatic functioning to activate the unit in heating or cooling depending on the temperature of the external air and the set-point defined in ambient.

The following functions are available throughout the year: :

- functioning time schedule;
- defining of the economic functioning for activating ventilation at reduced setpoints to favour the energy saving;
- activation of the silent mode only in heating;
- in case of using 2 units, associate the relative served climate areas to each unit and define an activation profile dedicated to the individual unit.
- For example, it is possible to use a unit dedicated only to the living area and one to the night area.
- In this situation, it is very comfortable to define two different functioning profiles in relation to the different air freshening requirements of the areas. .

DISTRIBUTION

ELFOControl^2 manages the energy distribution in ambient through fan coils, radiant panels, radiators and heating furniture and manages its functioning to detail through a series of satellite modules, connected on bus network, for the complete engineering management of all system elements.

AMBIENT TERMINALS - ELFORoom^2, ELFOSpace, ELFODuct

Maximum number of manageable elements: the maximum number is 40, including other elements present.

The fan coils control the heat or cooling capacity provided in the room by varying the air flow via the fans or the water flow-rate via the on-off or the modulating valves (if any).
With the divisions in "climate areas", ELFOControl^2 joins the terminal rooms into groups which share the same operation meaning the same reference set-point.
It is possible to connect a thermostat in order to have just one control point for several terminals (master terminal).
In this case ELFOControl^2 coordinates the operation of the groups of terminals managed by the same thermostat.

In particular ELFOControl^2:

- sets the main operating parameters (temperature and humidity set-point, ventilation mode and setup) based on a time schedule, with the economical and off comfort scenarios;
- limits the keyboard/local thermostat functions via the scenario settings;
- it activates the dehumidification of the areas, or the specific area, by acting on the ventilation speed of the interests fan coils.

RADIANT PANELS

Thanks to the high exchange surface, the radiant panels allow the use of low temperature water in heating and high temperature in cooling, this makes them particularly suitable for use in combination with the heat pumps to exploit the greatest efficiency in these use conditions.
ELFOControl^2 manages the control of the supply heads of the panels and control of the dew temperature to assure excellent functioning of the system in every condition.

RADIATORS and HEATING FURNITURE

Even in engineering solutions characterised by use of radiators and heating furniture, ELFOControl^2 assures the correct functioning of the terminals. The control of the area valves to exclude supply of the terminals when the ambient does not request it or during the summer season as well as the production of hot water at the correct temperature for supplying the radiators and heating furniture, are managed by ELFOControl^2.

BMZRX - Radiant zone module with RS485 communication port

Maximum number of manageable modules: 5

The BMZRX module manages:
- Modbus thermostats HID-TI4 and HID-UR
- ClivetBus thermostats HID-T2, HID-TI2 and HID-T3

It is possible to connect up to 6 thermostats to this module to control as many different climate areas.
Through the relay outlets the module opens or closes the heads depending on the defined set-point and room temperature detected by the associated thermostat.
The module is supplied with a temperature probe (BT2) to detect the water temperature.
The probe must be positioned where the temperature of the moving water is measured.
The module is always supplied with a TTL/485 converter necessary for using the built-in Modbus thermostats HID-TI4 and HID-UR.
To use the Modbus thermostats HID-TI4 and HID-UR it is necessary to use a power supply unit AL12X.

Every radiant area module can manage only one type of thermostats: only Modbus thermostats or only ClivetBus thermostats, mixed configurations are not admitted.

Example: if wanting to realise a system with 4 Modbus thermostats and 2 ClivetBus thermostats, it will be necessary to use 2 BMZRX modules: 1 to connect the Modbus thermostats and 1 for the ClivetBus thermostats.

Managing of radiant panels in heating mode
ELFOControl^2 constantly detects the temperatures required by the modules available and varies the water production set-point of the heat pump for low-temperature systems or varies the mixing temperature in the mixing unit for double temperature systems.

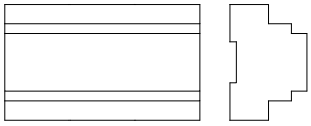
Managing radiant panels in cooling mode
It is necessary to detect the temperature and humidity conditions of the areas served by the outlets of the module by connecting as many HIDT3 thermostats as the parents to be controlled.
The module calculates the dew point using each thermostat and constantly determines the optimal water temperature.
ELFOControl^2 constantly detects the temperatures required by the modules available and varies the water production set-point of the heat pump for low-temperature systems or varies the mixing temperature in the mixing unit for double temperature systems.

Managing heating furniture, heated towel rails and radiators
With this setup the outlet is closed in summer mode by intercepting the relative circuit.
In this case HID-T2 or HID-Ti2 temperature-only thermostat can be used.

Managing double-step radiant panels
This configuration foresees that just one thermostat manages two outlets in double step mode.
When the difference between set set-point and temperature detected by the thermostat is high, both outlets are activated, when the detected temperature differs slightly from the set set-point, only one outlet is activated.
Both outlets are deactivated when the set-point is reached.

Managing triple-step radiant panels
It represents a variation of the previous version, applicable in cases where two concentric radiant circuits show a significant difference in power.
The activation of the circuit follows the principle below: when the detected temperature is very afar from the set-point, both circuits are activated, when the interval between the temperatures reduces, only the circuit with the highest power remains active, for lower temperature differences only the circuit characterised by the lower power is activated.
Both outlets are deactivated when the set-point is reached.
This adjustment allows having a finer modulation of the power yield to ambient.

NOTES: every activation relay of the outlets has a maximum load of 5A (220VAC), it is therefore possible to control more heads simultaneously with every relay, being careful to respect the maximum load.

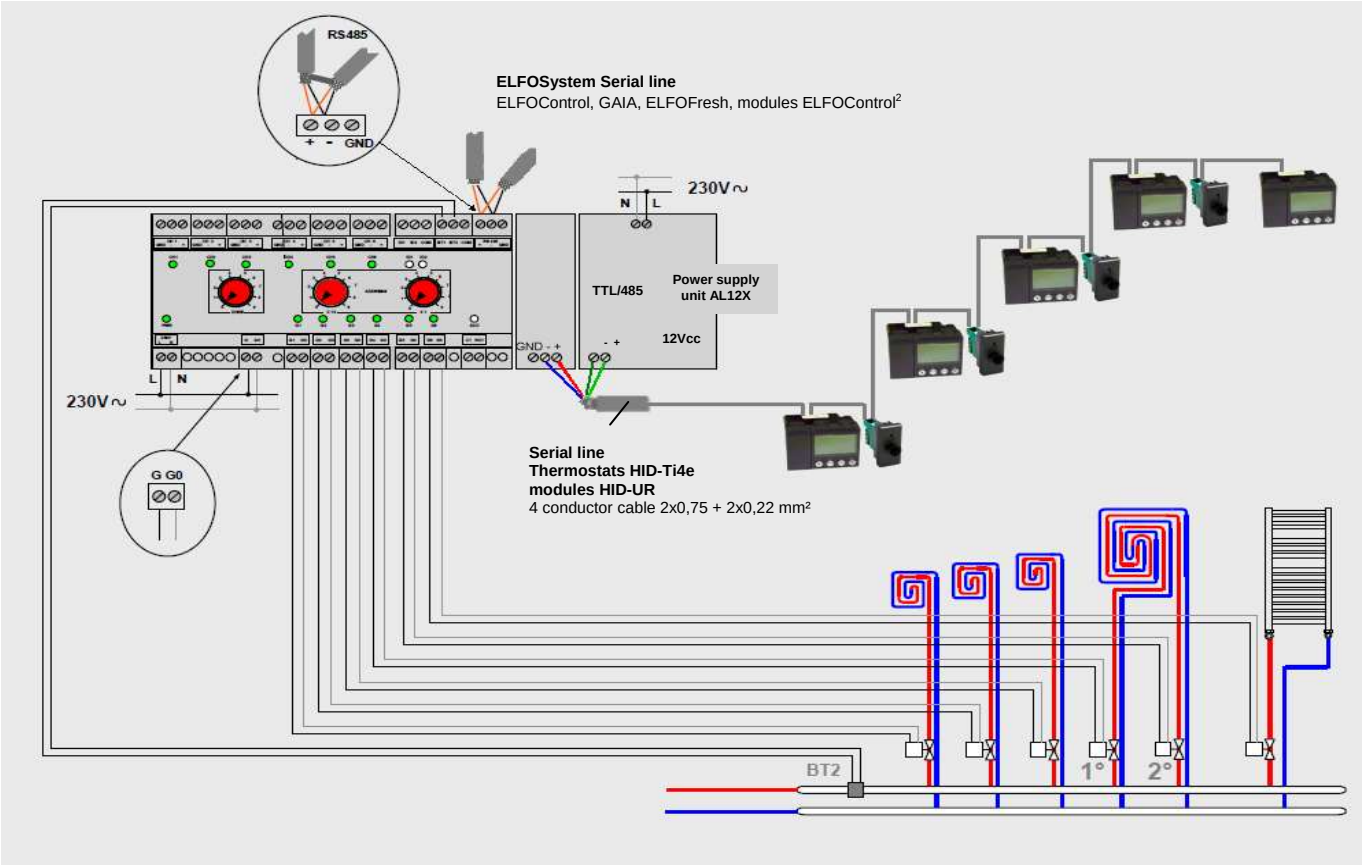


Dimensions and electrical features

Power supply: 220V AC
Absorbed power: 5 W
Maximum capacity of the contacts: 5A with a power supply voltage of 230V
Dimensions (LxHxD):157x90x60 mm
Overall dimensions: 9 DIN + 2 DIN of converter TTL/485

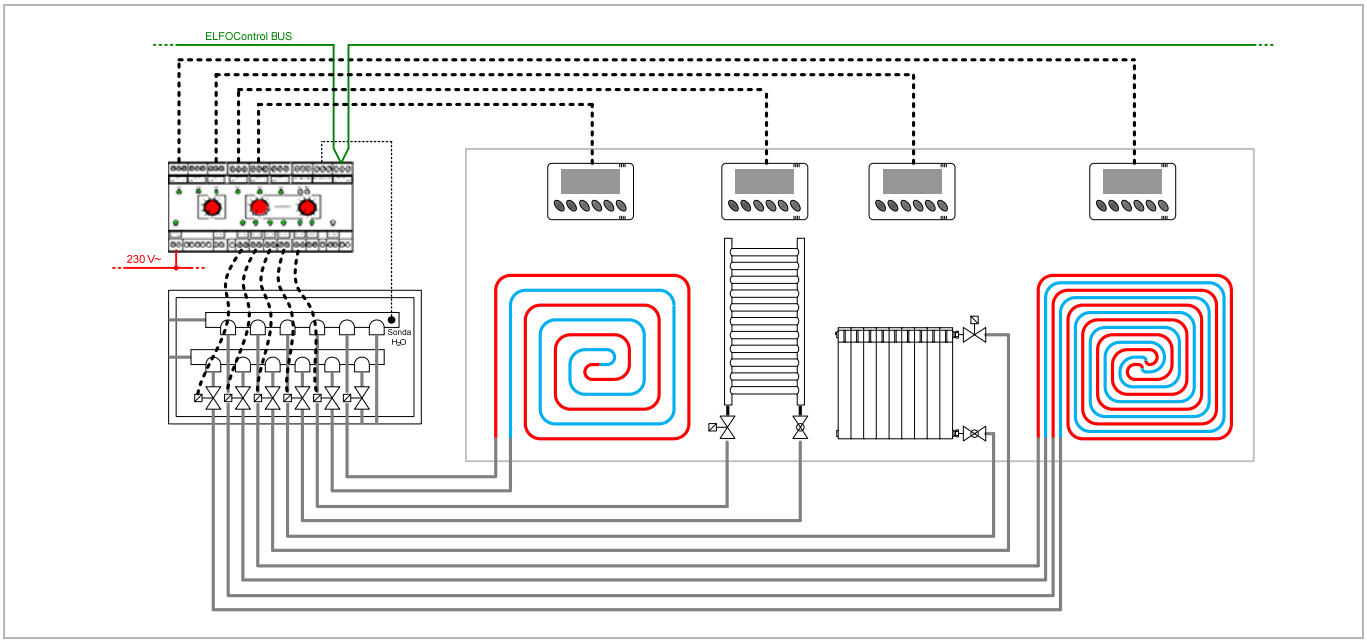
RADIANT AREAS MODULE WITH BUILT-IN MODBUS THERMOSTATS HID-TI4 and HID-UR

Connection of thermostats HID-TI4 and HID-UR must be made in accordance with the type of bus as reported in the connection diagram below and requires the use of power supply unit AL12X for every BMZRX module, to power the various thermostats electrically.
The power supply unit is dimensioned for the maximum number of thermostats manageable by BMZRX (6 HID-Ti4 + 6 HID-UR).



RADIANT AREAS MODULE WITH CLIVETBUS THERMOSTATS HID-T2, HID-Ti2 and HID-T3

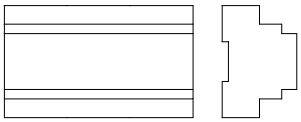
Connection of thermostats HID-T2, HID-Ti2 and HID-T3 must be made directly on the input channels of module BMZRX, these thermostats do not require the use of power supply unit AL12X or converter TTL/485 which is supplied with module BMZRX.



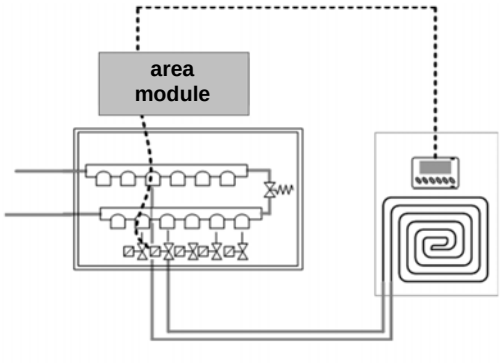
CMRSX - Single area module with RS485 communication port

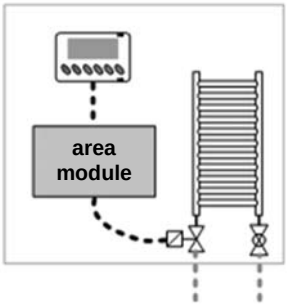
Maximum number of manageable elements: the maximum number is 40, including other elements present

To manage the intercepting head of the power supply circuit of the radiators and/or heating furniture or to manage a single area served by radiant panels, it is necessary to use an area module.
This device is connected to a thermostat of the HID-T2, HID-T3 or HID-Ti2 series used to detect the temperature of the room.
The operation requires the module to open and close the head depending on the temperature detected and the defined set point.
To manage radiators and heating furniture in summer operating mode (cooling), the module closes the head by intercepting the circuit.
This module controls the dew point (if connected to a thermostat with a HID-T3 humidity probe).
As it only has one outlet, it does not allow to manage double-step radiant panels.



Dimensions and electrical features:
Power supply: 220V AC
Absorbed power: 5 W
Dimensions (LxHxD):105x90x60 mm
Overall dimensions: 6 DIN + 2 DIN converter TTL/485





NOTES: to connect area module CMRSX to the Modbus network of ELFOControl² it is necessary to use the serial converter module TTL-RS485 included in the accessory.

KGPRX - Mixing unit control module

Maximum number of manageable modules: 3

The module allows to control a circulator and a mixing valve, with a three-point motor, *of a mixing unit not supplied by Clivet.*
The module is provided with:

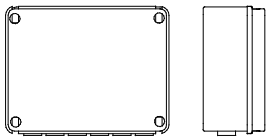
- high temperature thermostat;
- temperature probe for supply water that can be installed via a shaft.

The maximum flows of the contacts of the control module are 5A with a power supply voltage of 230V.

There is an inlet to connect the dew sensor.

GAIA Maxi can directly manage up to three mixed circuits.

With GAIA Maxi the maximum number of mixers that can be managed by ELFOControl² is 3 and includes any mixed boosters managed by GAIA Maxi.



Dimensions and electrical features:

Power supply: 220V AC
Capacity of the relays : 5 A
Dimensions (LxHxD):210x155x80 mm

MIOX - Input / Output module with RS485 communication port

Max number of manageable modules: 2

The use of the Input / Output module allows managing different system elements.
Through ELFOControl^2 it is possible to define the functions associated to every MIOX input and output.

Every module allows to control, via 4 relay outputs in exchange, up to 4 elements and is provided with four buttons allowing to manually activate the outputs.

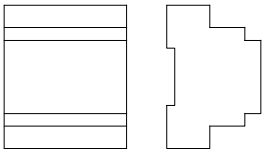
The inputs of the module can assume the following functions: seguenti funzioni:
1) **remote On/Off input** allows remotely activating the ELFOSystem system;
2) **auxiliary heater alarm input** allows acquiring the alarm of the auxiliary heater.

The MIOX outputs can be configured to manage the following functions:
1) **circulator activation**: activates when the hydraulic circuit associated to the circulator is in request ;
2) **area valve control**: activates when the hydraulic circuit associated to the area valve is in request ;
3) **seasonal control**: with the system in heating it closes the contact, when in cooling it opens it. If the system foresees a Chiller combined to a boiler, it can be used to pilot the shut-off valves of the hydraulic circuit ;
4) **auxiliary resource in heating control**: activates when the system is in heating and any area is in request. If use of the boiler only combined with a heat pump is foreseen.

Cold only unit
If foreseen to use the boiler combined with a unit for the production of cooling energy only, the MIOX module will also change the circuits in accordance with the functioning mode of the system in heating or cooling mode.

5) **secondary pump control**: it activates when any area is in request.
The module has a RS485 communication port to connect it directly to the system.

<u>IMPORTANT NOTES</u>: ELFOControl^2 cannot manage circulators installed downstream of mixing units managed by module KGPRX.

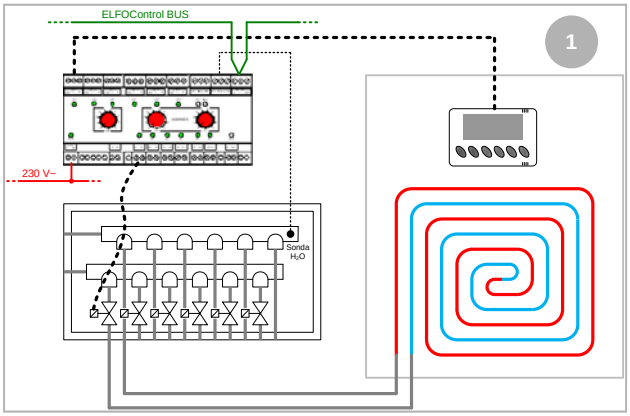


Dimensions and electrical features:

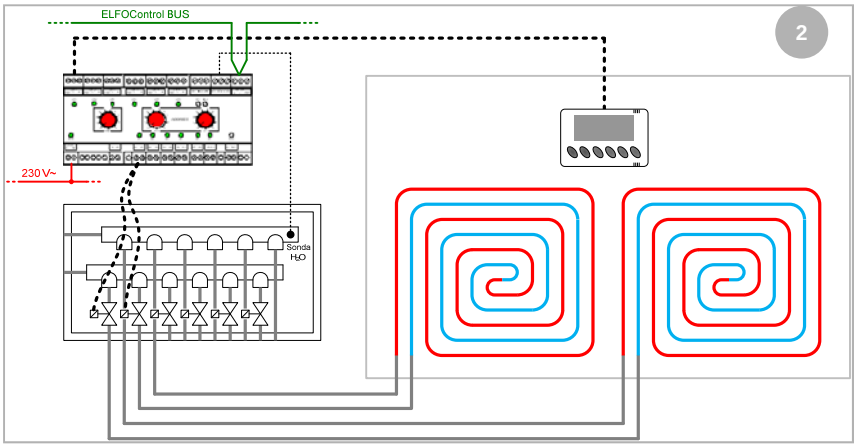
Power supply: 220V AC
Absorbed power: 6 VA max
Dimensions (LxHxD):70x85x65 mm
Overall dimensions: 4 DIN
Outputs : 8(3)A 250 V AC

MANAGE CLIMATE AREAS WITH RADIANT PANELS

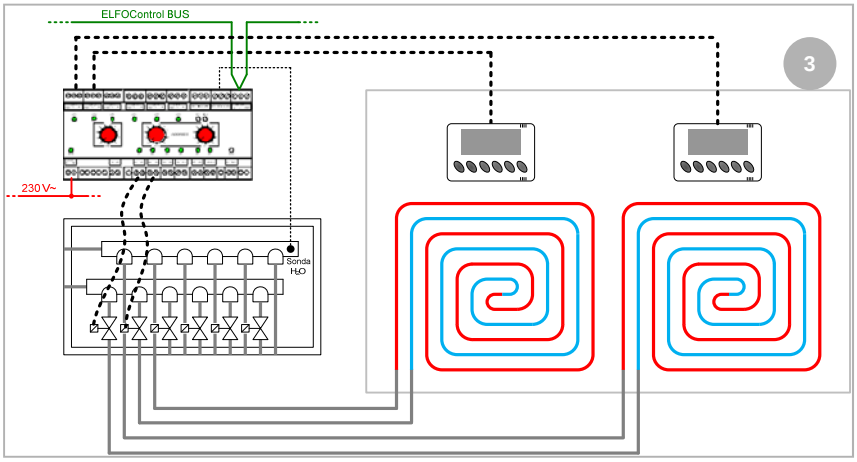
ELFOControl^2, through the radiant areas module that can simultaneously control up to 6 radiant areas, it is able to manage every type of engineering realisation with radiant panel. .



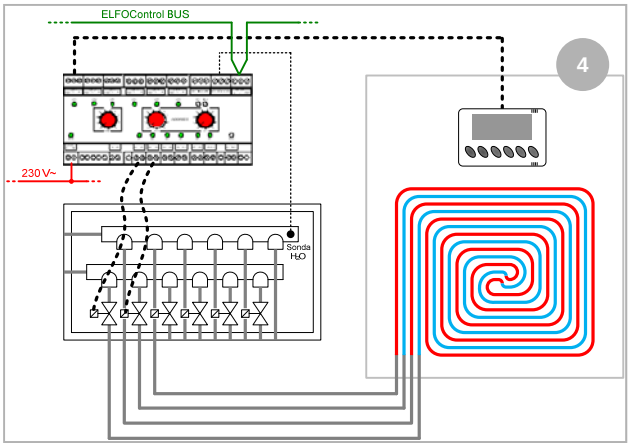
1. Climate area served by only one radiant panel
The area is served by a single radiant circuit.
Thermostat HID-T3 connected to the module determines the opening or not of the head based on the set-point and the temperature detected in ambient.
ELFOControl^2 imposes a reference temperature set point for the area, though it is still possible to correct any set point via the relative thermostat.



2. Climate area served by more radiant panels
The area is served by two radiant circuits managed by a single outlet of the radiant area module that activates/deactivates both circuits simultaneously. One thermostat of the HID-T3 series is connected to the corresponding inlet. The two portions of radiant panel part of the same climate area refer to the same thermostat. In this way ELFOControl^2 imposes a reference temperature set-point to the area but it will be possible to correct any set-point through the relative thermostat .



3. Climate area served by more radiant panels
The area is served by two radiant circuits managed by two outlets of the radiant area module. Two thermostats of the HID-T3 series are connected to the corresponding inlets. Although part of the same climate area, the two portions of radiant panel refer to two individual thermostats. In this way ELFOControl^2 imposes a reference temperature set point to the area, though it is still possible to correct any set point via the relative thermostats.
The operation of the two portions of radiant panel can therefore be varied while maintaining the same time schedule set by ELFOControl^2.
The radiant areas module will intercept the relative head when it reaches the desired temperature set-point.



4. Climate area served by two radiant panels with step management
The area is served by two radiant circuits managed by two outlets of the radiant area module, part of a single thermostat of the HID-T3 series. In this way ELFOControl^2 will impose a reference temperature setpoint to the area but it will be possible to correct any set-point through the relative thermostat. The operation of the two portions of radiant panel can be different while maintaining the same time schedule set by ELFOControl^2.

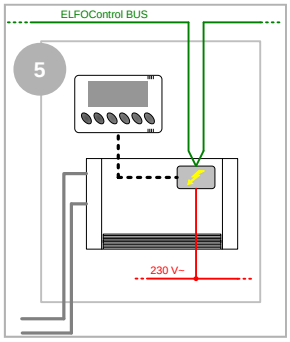
- Two different management are possible:
- two-step when the two radiant circuits have similar powers;
- three-step when the powers of the radiant circuits significantly differ in terms of power.
- This management powers both panels when the distance between ambient temperature and set-point is wide and "modulates" the use of the resources upon reducing of the deltaT to "switch-off" both circuits when the set-point is reached.

MANAGE CLIMATE AREAS WITH FAN COILS

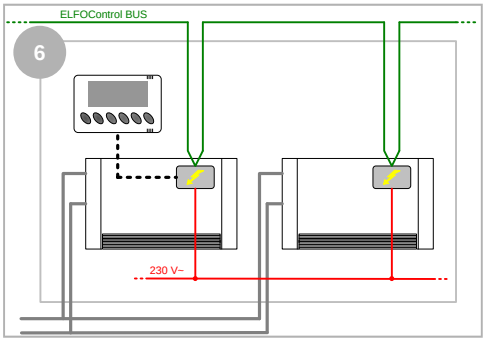
ATTENTION : it is possible to connect thermostats HID-T2, HID-Ti2 and HID-T3 to the ambient terminals

ELFOControl^2 flexibly manages the fan coils allowing the realisation of different adjustment strategies.
It is possible to associate one or more fan coils to every climate area.

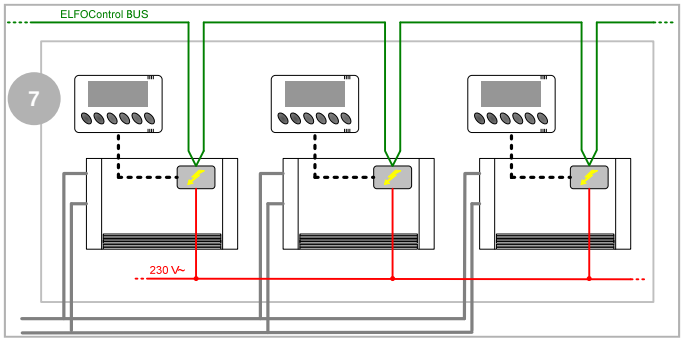
5. Climate area with one fan coil
The area is served by one fan coil fitted with thermostat or on-board keyboard.
The thermostat/keyboard is the reference for detecting the temperature and for the area operation like modifying the setpoint of reference, the ignition, the switch-off, etc.
The temperature value and, eventually, of the relative humidity, detected by the thermostat are sent by ELFOControl² to the other area elements.



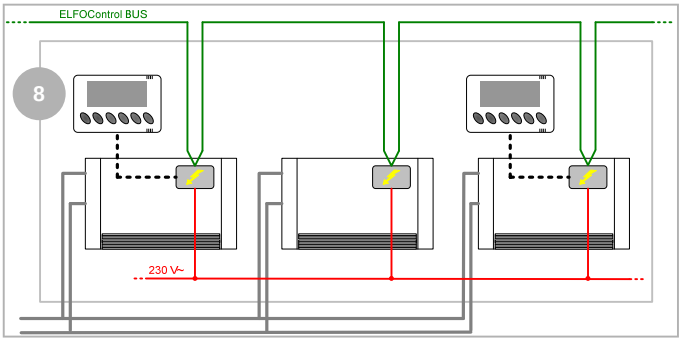
6. Climate area with more fan coils with thermostat of reference
The area is served by fan coils fitted or not with thermostat or on-board keyboard.
The thermostat of reference of the area is connected to a single fan coil (area master) which becomes the reference for detecting the temperature and for the area operation like modifying the set-point of reference, the ignition, the switch-off, etc.
The temperature value and, eventually, of the relative humidity, detected by the thermostat are sent by ELFOControl² to the other area elements.
In this type of setup, the value detected by the temperature probe located on the return of the fan coils is not considered in the temperature adjustment of the individual fan coil and the temperature detected by the area thermostat is used instead.



7. Climate area with more fan coils without thermostat of reference
The area is served only by fan coils fitted with thermostat or on-board keyboard.
There is no reference thermostat for the area and each fan coil adjusts based on the values detected and the settings from the thermostat connected to it.
In this configuration, the ELFOControl^2 function limits to setting the set-points for the fan coils and monitoring of the state of the terminals.

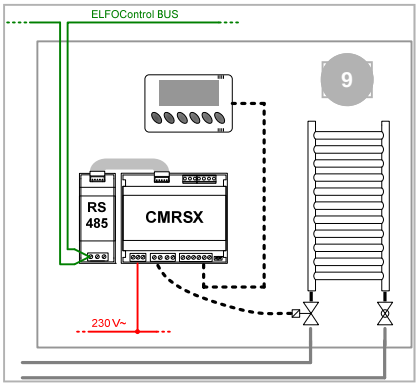


8. Climate area with more fan coils without thermostat of reference (2)
The area is served by fan coils fitted or not with thermostat or on-board keyboard.
There is no thermostat of reference for the area but only thermostats of reference for the individual fan coil or for a group of fan coils managed by a master and every fan coil adjusts based on the values detected and the settings from the thermostat connected to it or to that of the master fan coil.
In this configuration, the ELFOControl^2 function limits to setting the set-points for the fan coils and monitoring of the state of the terminals.

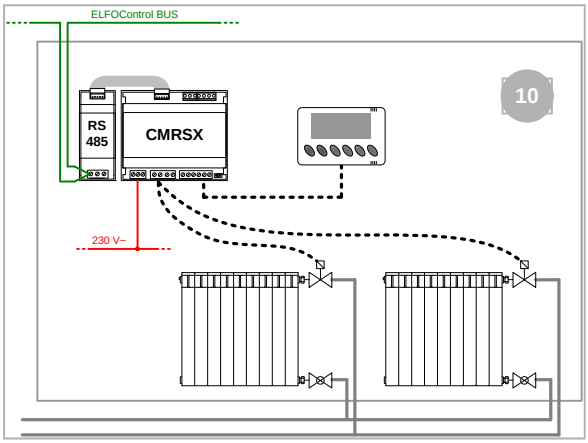


MANAGE CLIMATE AREAS WITH RADIATORS AND HEATING FURNITURE

9. Climate area served by heating furniture
The area uses an area module to manage the intercepting head of the power supply circuit of the heating furniture.
This device is connected to a thermostat of the HID-T2 or HID-Ti2 series used to detect the temperature of the room.
The operation requires the module to open and close the head depending on the temperature detected and the defined set-point.
In summer operating mode (cooling), the module intercepts the circuit by closing the head it controls.
The thermostat must be connected to the module.
In any case the power supply circuit of the heating furniture and the heated towel rails must be intercepted in summer mode (cooling).

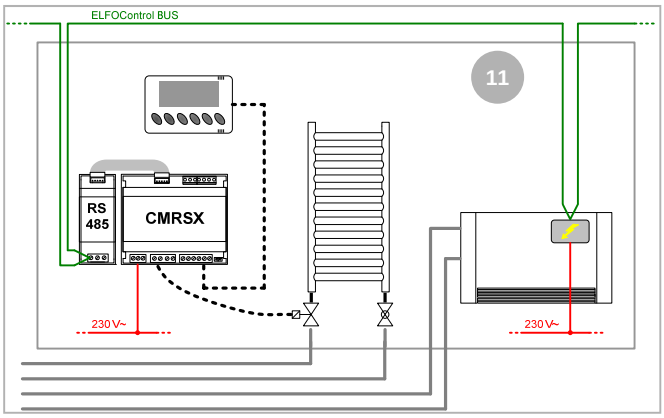


10. Climate area served by radiators
The area is served only by radiators.
The intercepting heads of the radiators are controlled with an area module connected with a temperature only thermostat (HID-T2 or HID-Ti2).
In this case thermostat is the reference for the entire area and the heads of the radiators are connected in parallel so that the area module controls all the radiators of the area.



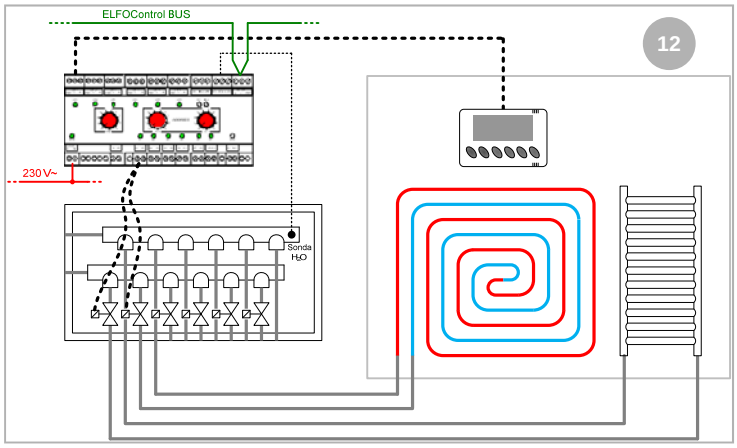
MANAGE MIXED CLIMATE AREAS

In addition to managing climate areas served by a single type of terminals, ELFOControl^2 is able to control mixed climate areas, served by different types of terminals.



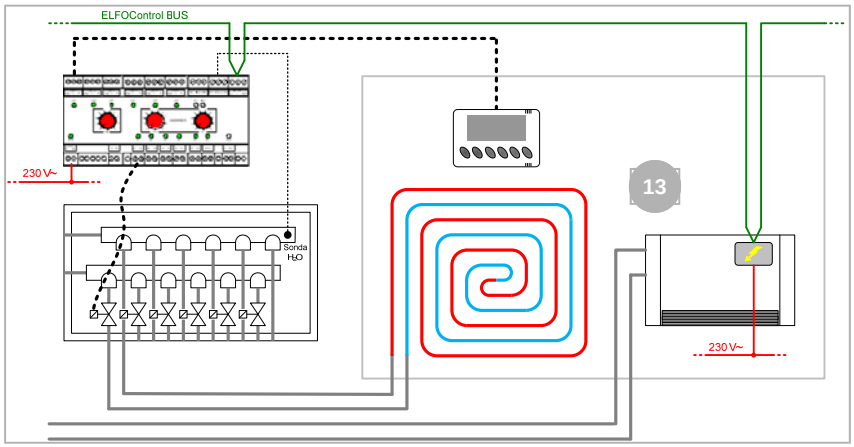
11. Climate area served by heating furniture and fan coils

The area is served only by fan coils and heating furniture.
The intercepting heads of the radiators are controlled by an area module.
In this case the thermostat can be connected to the area module controlling the heating furniture or, alternatively, to the fan coil.
ELFOControl^2 sends the temperature value detected by the room thermostat to the fan coil or to the area module.
In cooling operating mode the area module intercepts the circuit of the heating furniture.



12. Climate area served by radiant panels and low temperature heating furniture

A single output of the radiant area module is used to manage an area served by radiant panels and heating furniture both connected to the low-temperature circuit (bathroom area) as an alternative to the area module.
This is useful if there are three outlets in the radiant area module.
Only one output of the radiant area module is used to intercept both the power supply circuits of the radiant panels and of the heating furniture.
This circuit is intercepted in summer mode and this is why it is not necessary to measure the relative ambient humidity for dehumidification operations.
Therefore a HID-T2 or HID-Ti2 thermostat can be used.



13. Climate area served by radiant panel and fan coils

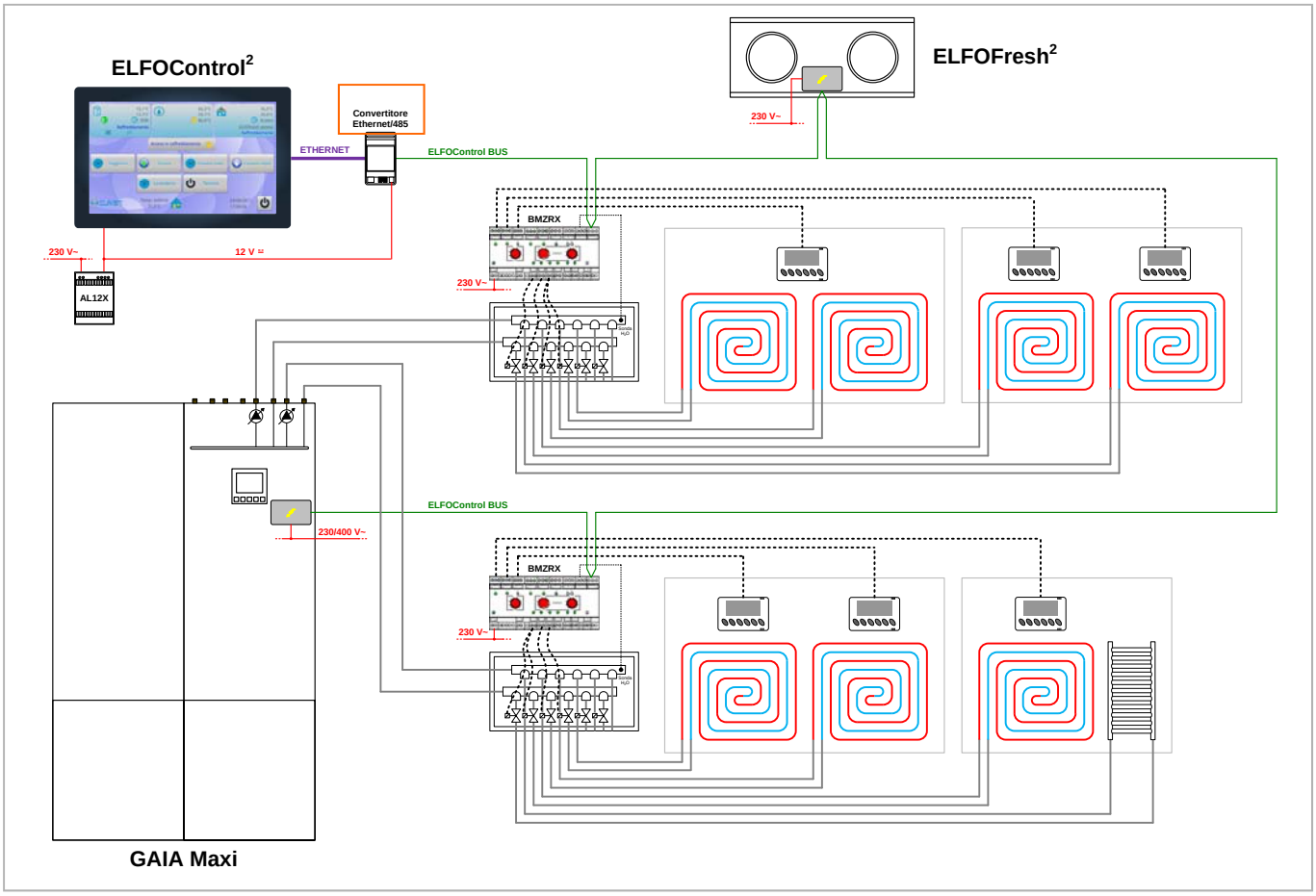
The climate area is served by a radiant circuit managed directly by the radiant areas module and by fan coils connected to the high-temperature circuit.
In this case there should be only one thermostat connected to the radiant areas module ELFOControl^2 sends data to all area elements.
Again, it is necessary to measure the temperature and humidity conditions of the area via a HIDT3 humidity-temperature thermostat.
The anti-dew control function is carried out directly by the area module.
ELFOControl^2 can manage the fan coil using one of the following modes:

- only resource in cooling;
- in integration to radiant panel by acting as second thermoregulation step,
- in integration to radiant panel with dehumidification function (management recommended if system does not foresee ELFOFresh^2).

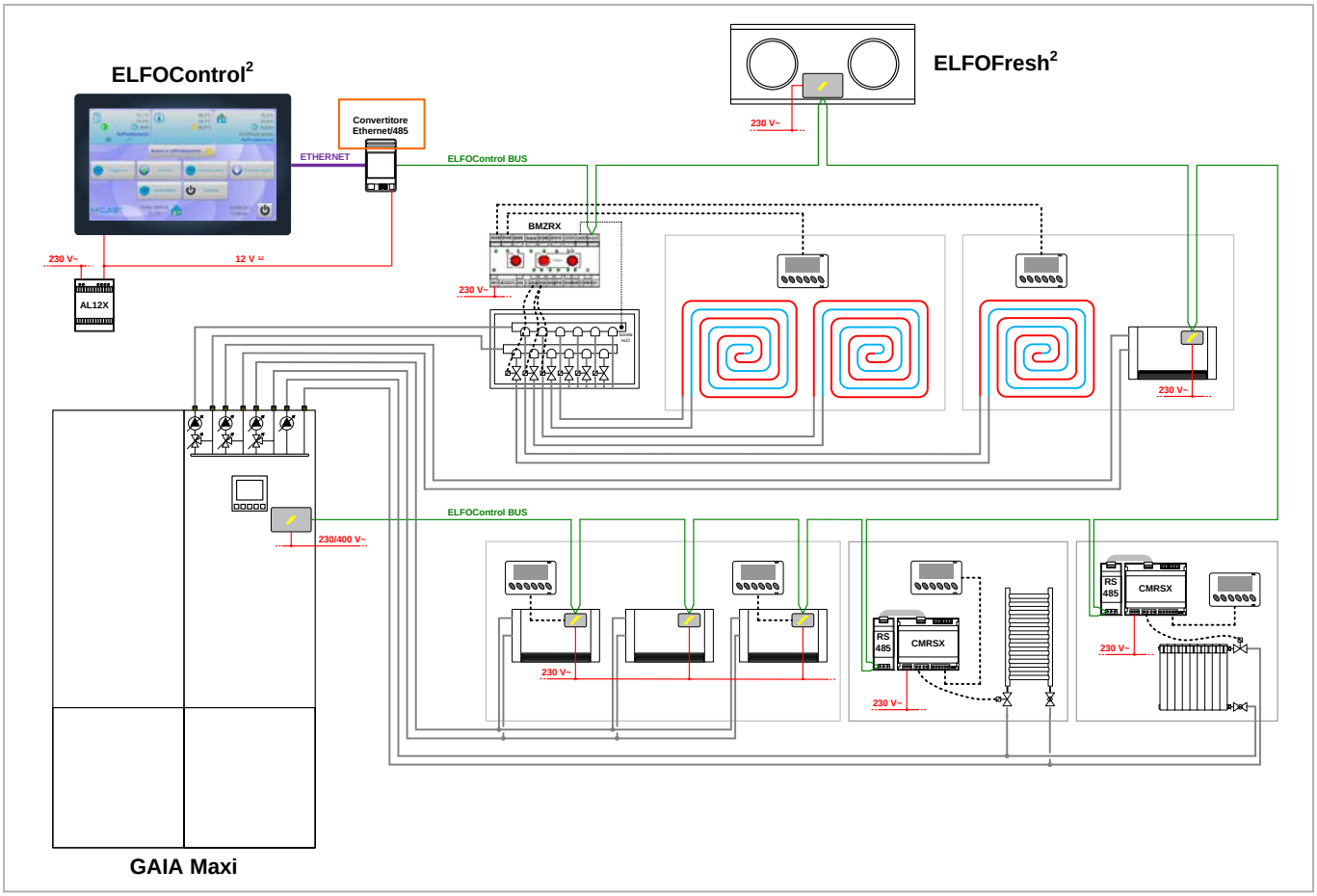
In systems working only in heating mode it is not necessary to check ambient humidity levels and it is therefore possible to use a "temperature-only" thermostat (HID-T2 or HID-Ti2).

TYPICAL SYSTEM DIAGRAMS FOR NEW HOME

SYSTEM WITH RADIANT PANELS AND HEATING FURNITURE

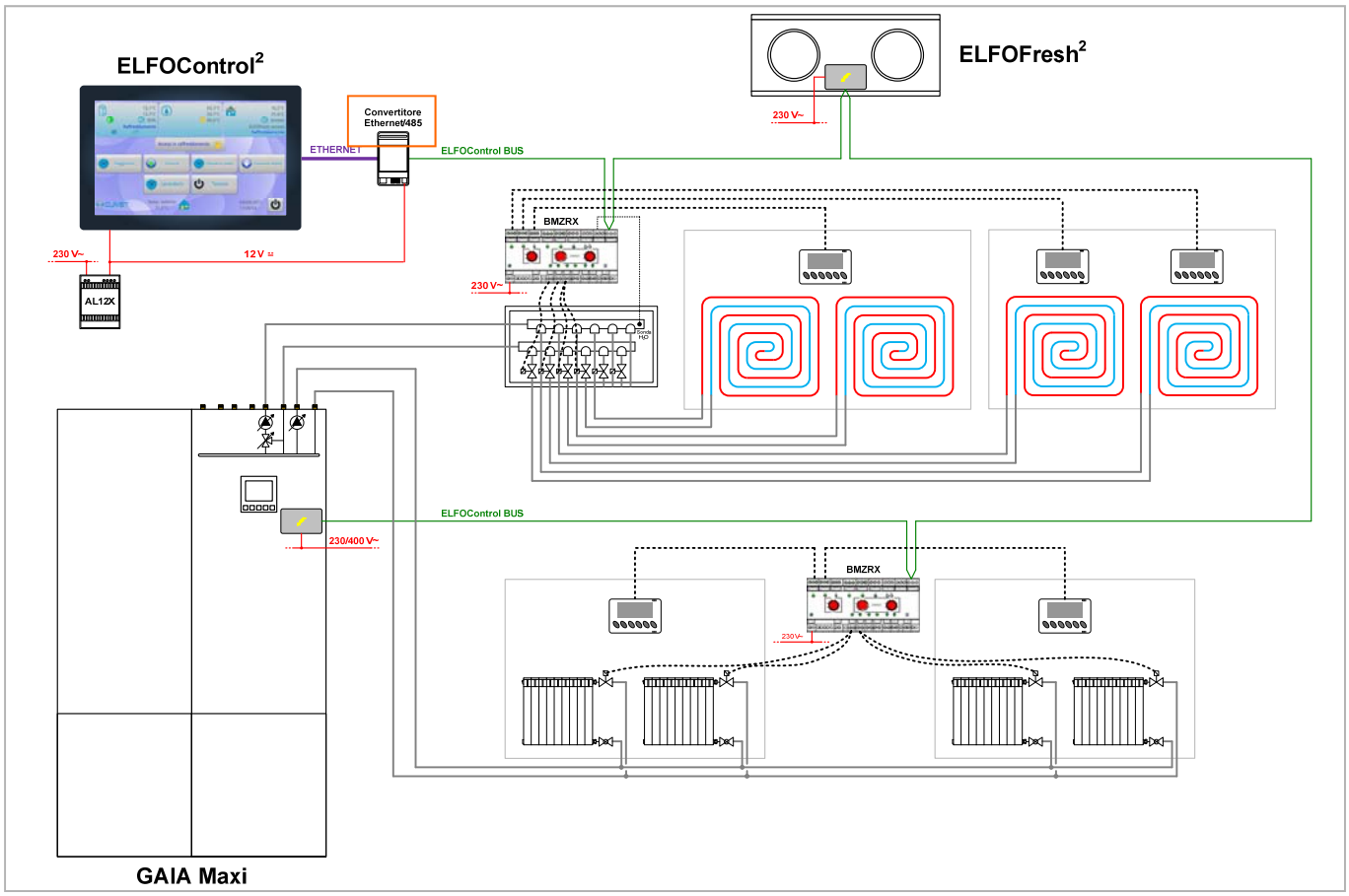


SYSTEM WITH RADIANT PANELS, FAN COILS AND HEATING FURNITURE

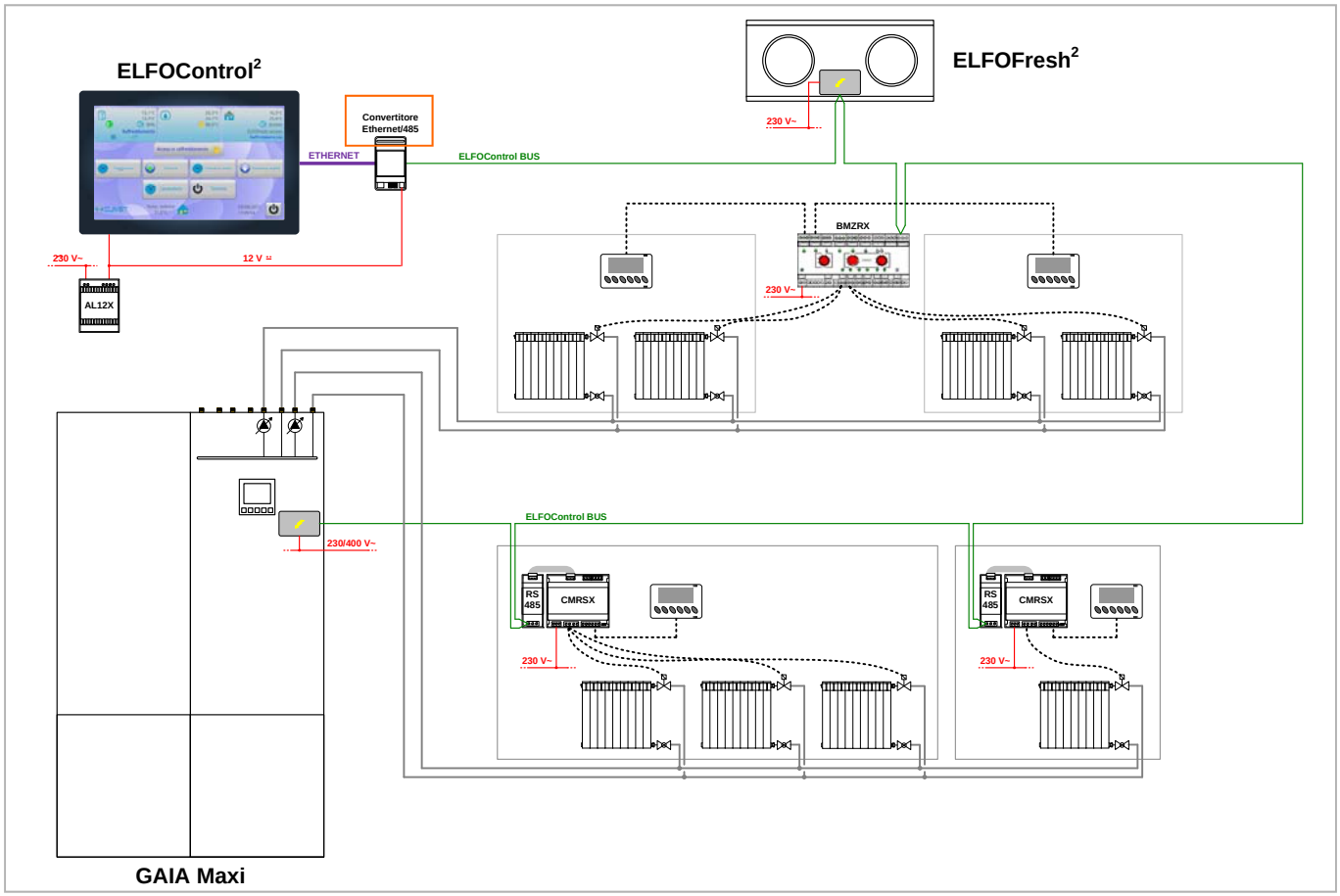


TYPICAL SYSTEM DIAGRAMS FOR EXISTING HOME REQUALIFICATION

SYSTEM WITH RADIANT PANELS AND RADIATORS



SYSTEM WITH RADIATORS



HOW ELFOControl^2 MANAGES THE SYSTEM

The ELFOControl^2 device is configured during system start-up, when defining the type of system, the climate areas in which it will be divided, the number and type of elements present in the system and association of the elements to the relative climate areas.
When the setup has been completed, ELFOControl^2 checks that all the elements of the system defined are actually present: in order to automatically detect any inconsistencies.

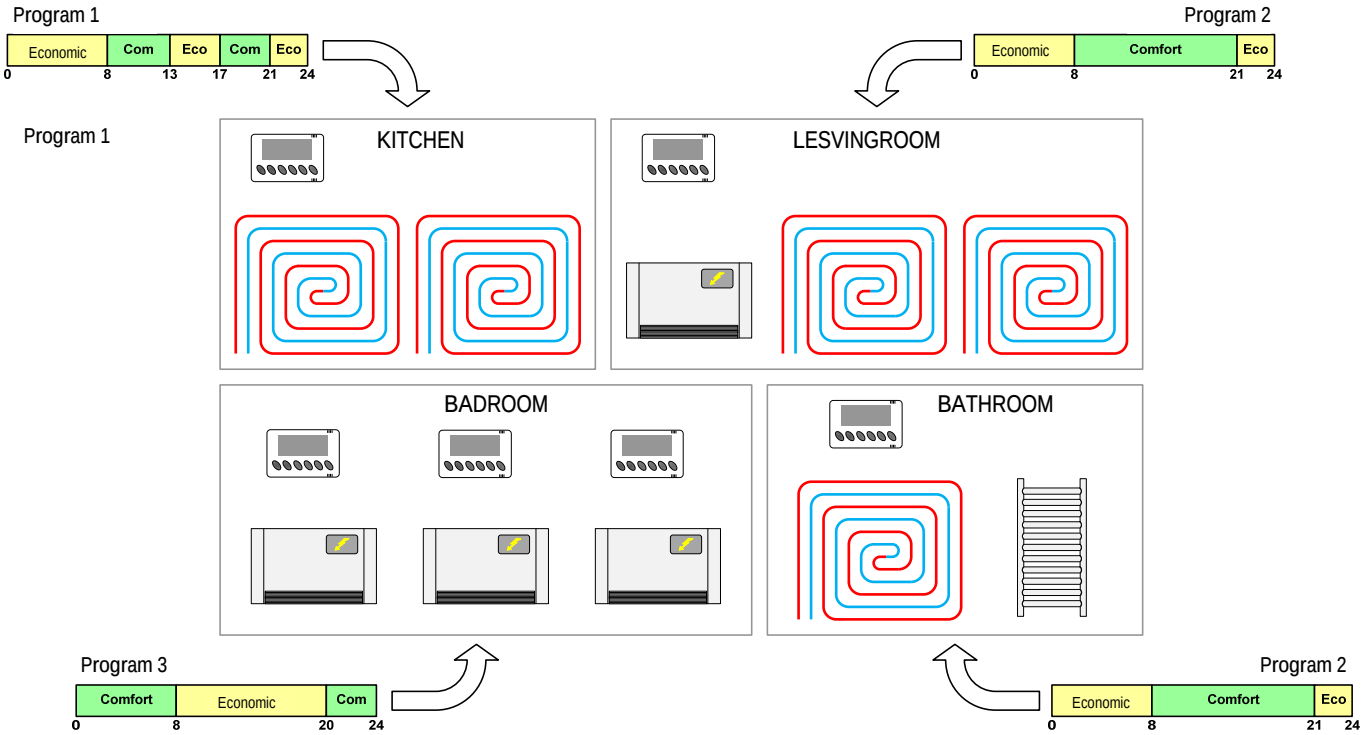
Climate areas

The climate area is the portion of the building (even a single room) to which the same climate profile characterised by 3 three scenarios that can be set is associated: Comfort, Economic or Off.
An area is associated with terminal units (even just one unit) or any outlets of a radiant area module.
Each comfort scenario can be activated more than once during the 24 hours (with half an hour intervals) with time schedules for each area.
For instance it is possible to define the living area where it is possible to set the Comfort profile during occupied periods and the Economical profile during unoccupied periods.

The elements management

Each element is managed based on the comfort parameters set for the relative area it is part of.
For instance the ambient temperature for a certain area may only be set by ELFOControl² or only by a local control device of the terminal unit, or by both. It is also possible to define a range within which it is necessary to set the temperature of the area of the current scenario using the local control device on-board the unit. Each element is managed based on the comfort parameters set for the relative area it is part of.

SYSTEM EXEMPLE DIVIDED IN 4 CLIMATIC AREAS



The Main functions of the system are:

- Time schedule of the comfort profiles for each climate area;
- possibility of defining different energy-saving profiles (maximum savings, normal, maximum comfort);
- prioritisation of the various areas in the activation of the various resources to achieve comfort;
- temporarily force the scenario of an area for a set time;
- possibility of defining the management range of the individual terminal units, using a thermostat for a keyboard, in the various areas based on specific needs (for instance temperature set point with possibility of setting +/- 2 degrees in the comfort profile and defined set-point for the economical profile, etc.);
- switching off the system for a set time;
- possibility of switching on and off the system from a digital input (for instance a telephone dialler);
- diagnostics on all the components of the system for three user levels (user, maintainer, manufacturer) with all the information related to associated elements;
- software update via PC with connection via ETHERNET cable.

AMBIENT CONTROLS

The thermostat can be used:

- connected to a reference fan coil to manage groups of fan coils or as a reference to force the area's settings;
- connected to the area module to manage heating furniture and radiators;
- connected to the mixing module to detect temperature and humidity values of the area served (HID-T3 only);
- connected to the radiant area module to detect temperature and humidity values of the area served (HID-T3 and HID-TI4+HID-UR only).

The thermostat is not connected to the network, but locally to the unit with a dedicated line within 15 metres from it. When a thermostat is used to control several units it can be connected to any unit of the group.

HIDT2X - Electronic room control device HID-T2

The controls of the ELFORoom² can be controlled remotely by the HID-T2 wall-mounted room control device, which contains the probe to measure the ambient temperature.
It can also be used as the only room control device within an area comprising several terminal units.
The HID-T2 room control device can also be used in combination with the area module to manage the bathrooms' heating furniture.

Dimensions: 127x86x27 mm.

HID-T3X - Electronic room control device HID-T3

The HID-T3 room control device has the same features of HID-T2 with the addition of the humidity probe.
If there are any radiant panels, ELFOControl^2 can prevent condensation during operation in cooling mode via the HID-T3 device.

Dimensions: 127x86x27 mm.

HID-TI2X - Electronic room control device HID-Ti2

The HID-Ti2 room control device is available in the built-in version and contains a probe to detect the ambient temperature. It can be matched with the area module.
It is supplied with two interchangeable coloured masks, white and anthracite black.

Dimensions: 65x45x54 mm (installation in 503 built-in box).

HIDTI4NX -HIDTI4BX - Electronic room control device Modbus HID-Ti4

The HID-Ti4 room control device is available in the built-in version and contains a probe to detect the ambient temperature.
It can be matched with HID-UR module for detecting the room humidity.
It is available in the black HIDTI4NX version and in the white HIDTI4BX version
BZMRX radiant area module is compulsory for managing this device.

Installation in 503 built-in box, compatible with line 44 AVE plaques.

HIDURNX -HIDURBX - Electronic room control device Modbus HID-UR

The HID-UR humidity sensor is available in the built-in version for exclusive combination with the HID-Ti4 ambient control.
BZMRX radiant area module is compulsory for managing this device.
It is available in the black HIDURNX version and in the white HIDURBX version.

Installation in 503 built-in box (or 504 if foreseeing installation of the HID-TI4 and HID-UR thermostat in the same box), compatible with line 44 AVE plaques.

AL12X - Power supply unit 230/1/50—12VDC for Modbus thermostats

Isolation transformer 230/1/50 12 Vdc.

Dimensions: 85x 90x65 mm (4 DIN modules).

CIECX - Installation box

The installation of ELFOControl² foresees the fitting of the pre-installation box on the wall. ELFOControl² is then installed in the pre-installation box using the two fixing screws.

Dimensions: 216x168x73 mm.

CBSX - Shielded cable for RS485 bus

Serial cable for RS485 lines (Belden 3105A):

- coil length: 50 m
- no. of conductors: 2
- shielding: Yes
- cable outer diameter: 7.2 mm
- Conductor AWG: 22
- shielding material: Beldfoil (Inner); Tinned Copper (Outer)
- sheath colour: black
- outer sheath material: PVC
- typical impedance: 120 Ohm
- rated voltage: 300 V RMS
- mass conductor: yes

GAIA Maxi ADJUSTMENT

The GAIA Maxi electronic control automatically manages all internal functions for heating and cooling towards the system and for the production of domestic hot water always favouring the more energetically efficient resources to guarantee comfort in ambient. When the thermal solar is energy, it is always favoured for the production of domestic hot water and, should the energy "stored" inside the DHW storage tank also be sufficient for the system heating. Without the solar option or when the resource is not energetically convenient, GAIA Maxi chooses whether to use the heat pump or the condensing boiler to satisfy the comfort requirements.

Functioning in heating

As first resource GAIA Maxi uses, if available, the energy captivated by the solar panels and stored in the domestic hot water storage tank. When the solar is not available the control evaluates, depending on the outdoor air temperature and on the requested water temperature, whether to use the heat pump or the condensing boiler or both, adopting, case by case, the most convenient choice.

In the event of simultaneous heating and domestic water loads, GAIA Maxi uses different strategies based on the resources active at the moment:

- **Heat pump on system:** the heat pump is activated in DHW production and the thermal inertia of the system storage tank is used until the heat pump becomes available for the system again.
- **Boiler on system:** the boiler is activated in DHW production and the thermal inertia of the system storage tank is used until the boiler becomes available for the system again.
- **Heat pump and boiler on system:** the boiler is activated in DHW production and the heat pump serves the system until the boiler becomes available for the system again.

Functioning in cooling

In this case, the only resource available is the heat pump; however, there is the possibility of having the cooling and the domestic hot water loads simultaneously and, therefore, GAIA Maxi will use different strategies:

- **Heat pump on system**: the heat pump is "turned" in DHW production and the thermal inertia of the system storage tank is used until the heat pump becomes available for the system again.

Functioning in domestic hot water production

When GAIA Maxi is used in the production of domestic hot water, GAIA always favours the use of thermal solar, without contribution of the thermal solar, GAIA Maxi uses the heat pump as first resource or, if convenient or in case of temporary unavailability of the heat pump, the boiler. The domestic hot water production is always priority compared to the system. Using the different energy sources, GAIA Maxi is able to manage and satisfy the loads simultaneously:

- **Solar in DHW and request from system:** for request in cooling, GAIA Maxi will activate the heat pump on system while, in case of heating, it will activate the heat pump and/or the boiler to satisfy the system's requirement.
- **Heat pump in DHW and cooling request:** GAIA Maxi will activate the heat pump on system only after having satisfied the DHW setpoint
- **Heat pump or boiler in DHW and heating request:** GAIA Maxi will activate the heat pump or the boiler on system only after having satisfied the DHW set-point.

The water flow of every individual circuit is automatically modulated based on the temperature differential (settable) and therefore, of the thermal load, it is also possible to define the functioning state for every individual circuit, for example circuit 1 only heating, circuit 2 heating and cooling.

ELFOControl^2 is always combined with GAIA Maxi to benefit the maximum of its potentials and to manage the system in its fullness, with more areas and with control of the temperature and humidity, room by room, and benefit of all energy, functional, comfort and reliability advantages deriving from the use of a single controller for the entire system.

Functions :

- Summer, Winter, Domestic Water only functioning mode;
- supply water temperature with climate setting or set-point for every hydraulic circuit present in unit: domestic water from heat pump and/or boiler and from thermal solar temperature;
- Anti-legionellosis cycle;
- domestic recirculation timing;
- functioning parameters with menus dedicated to user and to installer;
- alarms signals;
- maintenance of the correct system water temperature for re-start even if unit is off;
- service keyboard on board unit advanced programming with setting of the daily time slots with ELFOControl^2;
- variation of the supply temperature based on calculation of the dew point for the hydraulic circuits combined to radiant panels managed by ELFOControl^2 in presence of relative humidity or temperature detection thermostats.

Remote controls present in GAIA Maxi electrical control board

- remote Heating/Cooling function
- call from secondary circuit n. 1
- call from secondary circuit n. 2
- call from secondary circuit n. 3
- enable first or second water delivery temperature set-point (secondary circuit n. 1 only)
- vary water delivery temperature set-point (secondary circuit n. 1 only) in relation to an external 4-20mA or 0-10V signal

NOTES: The available digital inputs on the electrical control board are not powered (free contacts).

DESIGNING CRITERIA IN HEATING

Main introduction

GAIA Maxi in heating uses the GAIA inverter heat pump, which energy performances (power delivery, electrical power absorption and efficiency) vary according to three sizes:

- External air temperature;
- system water delivery temperature;
- compressor partialisation.

It also uses a modulating condensing boiler which energy performances (power delivery and efficiency) only vary in view of the water supply temperature.
Shown below is the influence these variables have on the energy performances of GAIA Maxi

HEAT PUMP - EXTERNAL AIR TEMPERATURE

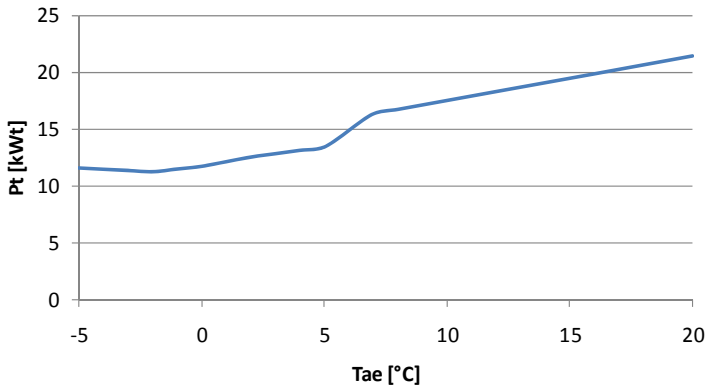
As the heat pump takes heat energy from ambient air to introduce it inside the building, upon increase of the External air temperature, the following also increase:

- the heat pump's heating capacity delivery;
- the efficiency (COP) of the heat pump, i.e. the ratio between heating capacity delivery and electrical power absorption.

Standard EN 14511 defines the test method to be used in calculating the COP and provides that the heating capacity be that delivered by the heat pump condenser, while the electrical power be that absorbed by the compressor, by the fan of the external unit, by the pump to combat pressure drops inside the unit.
Defrosting is also taken into consideration.

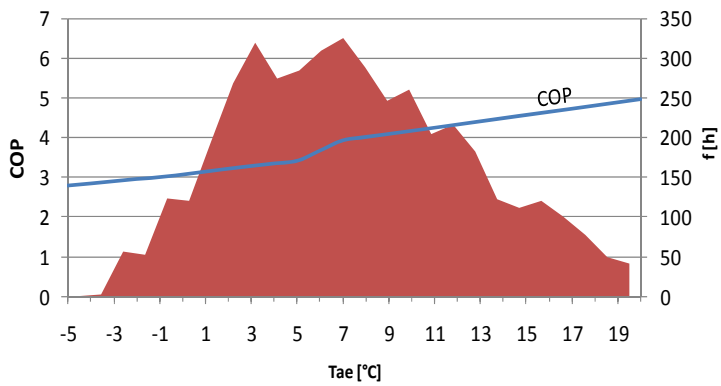
Chart (A) shows an example of the heating capacity delivery and efficiency (COP) flow in view of the External air temperature, for set temperature values of the produced water.

Graphic A



In chart (B), at the COP curve, the curve is overlapped representing the repetition frequency during the winter season of the External air temperature in Milan.
This curve shows the number of hours, during the heating season, where a given value of ambient temperature is shown.
For example, in the examined location, the highest number of hours in the winter season are between a temperature of 2° and 9°C, or interval where the GAIA Maxi heat pump has a COP between 3 and 4.
It can be seen how high value of COP are had in correspondence of most part of the hours of heating; thus it follows a high value of average seasonal efficiency.

Graphic B



KEY :
Tae = External air temperature
Pt = heating capacity supplied by the GAIA Maxi heat pump
COP = heating performance coefficient
f = frequency of the hours of occurrence of the External air temperature

Pt and COP referred to GAIA Maxi with supply temperature set at 35°C.

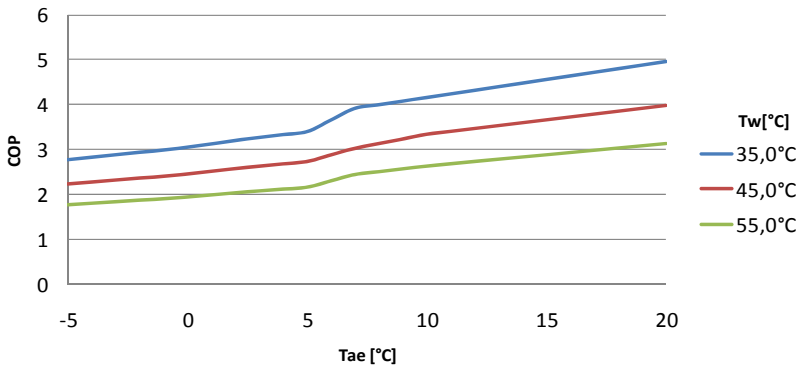
HEAT PUMP - TEMPERATURE OF WATER SUPPLY TO SYSTEM

The efficiency of a heat pump in heating mode, is the greater the more it produces low temperature water.

In the event of using a heat pump, installations with low temperature systems like radiant panels instead of radiators, must be chosen.

The chart shows COP based on External air temperature for three different terminals, each characterised by a pre-set supply water temperature:

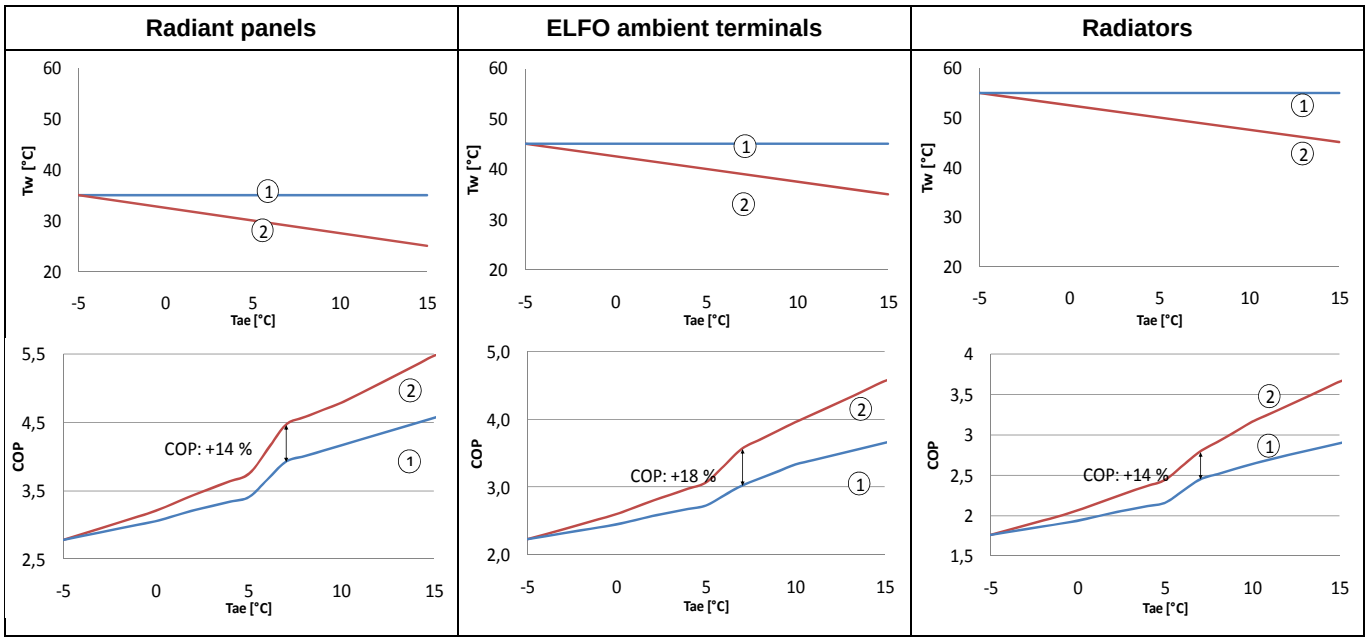
A: Tw=35 °C for radiant panels ;
B: Tw=45 °C for ELFO terminals ;
C: Tw=55 °C for radiators .



KEY:
Tae = External air temperature,
COP = heating performance coefficient referred to GAIA Maxi with supply temperature set with a speed at 75%, corresponding to the declared nominal power,
Tw = supply temperature at 35°C for application with radiant panels, at 45°C for application with ELFORoom² ambient terminals and at 55°C for application with radiators.

HEAT PUMP - SUPPLY TEMPERATURE BASED ON AMBIENT TEMPERATURE (CLIMATE)

The heating capacity requirement of the building decreases upon the increasing of the External air temperature.
It is not necessary to always power the system terminals at the same temperature; for every type of terminal one may want to have a temperature of the running water in line with the External air temperature (that commonly defined as climate adjustment).
In the cases analysed herein, the water temperature has been thought to be variable between the design temperature (typical of a given location) and an ambient temperature of 15°C, with the law reported in the following figure in view of the terminal type.
Highlighted in the chart is the influence the use of climate adjustment has in place of a constant supply temperature adjustment on the production efficiency of the unit.



KEY :
(1) supply at constant temperature,
(2) variable temperature delivery as a function of ambient (climatic) temperatures

Tw = supply water temperature
Tae = External air temperatures

GAIA Maxi data

HEAT PUMP - COMPRESSOR PARTIALISATION

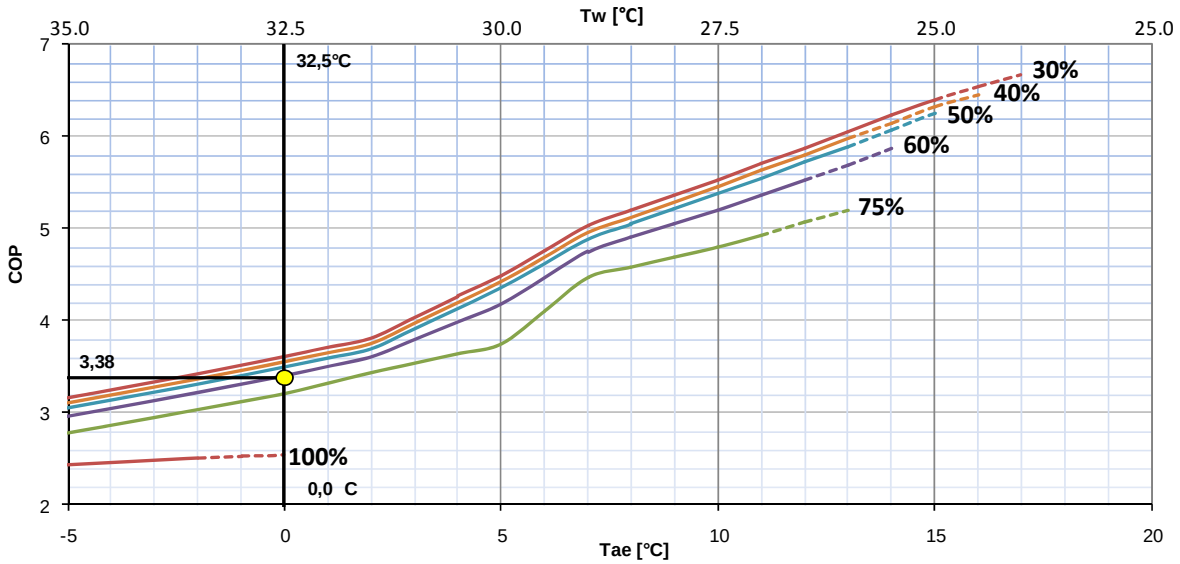
The compressor with inverter can run at variable speed to modulate the heating capacity delivery to the building's actual requirements.

The heat pump's exchange surfaces are specified to obtain a certain efficiency at nominal power.
When the GAIA Maxi, due to reduced system demand, reduces its power delivery, the exchanger surfaces are oversized for the actual power delivery and hence the system's efficiency increases.

The nominal rotation speed of the compressor is define at 75% of the maximum speed.
In the event of particularly hazardous climate conditions, GAIA Maxi is able to satisfy them by producing power higher to the declared nominal power (up to maximum speed of 100%) in order to combat these situations, even without using an integration system of the heat.

The minimum partialisation is 30%, below which the unit operates intermittently.
As an example, the following chart shows the COP according to the External air temperature, to the system water temperature and to the compressor partialisation.

It is evident that the efficiency increases at partial loads.



KEY:
Tw = supply water temperature
Tae = External air temperatures
GAIA Maxi data

CONDENSING BOILER - TEMPERATURE OF WATER SUPPLY TO SYSTEM

The GAIA Maxi condensing boiler offers a high range of modulation of the delivered heating capacity, from a minimum of 3 kW to a maximum of 24 kW, obtainable thanks to the variation of speed of the boiler's fan.

The supply of power depends only on the modulation of speed of the fan that is automatically adjusted by the GAIA Maxi electronics in view of the thermal load to be met.

Differently, the production efficiency shows a correlation with the temperature of the water produced at boiler outlet.

For temperatures below 50°C it maintains stable and equal to 108%, whereas for higher temperature values, it decreases in line with the increasing of the supply temperature, in accordance with that reported in the following table.

Boiler water temperature	**50 °C**	**80 °C**
Boiler efficiency	**108 %**	**98 %**

USE OF PERFORMANCE DATA OF THE HEAT PUMP IN HEATING

The following pages provide charts which can be used to obtain the following information in relation to the previously examined input data (External air temperature, produced water and compressor partialisation):

- heating power delivery
- performance coefficient (COP)
- maximum electrical power absorption.

The charts have been developed according to:

- five different minimum temperatures of the ambient air corresponding to different climate areas**:-15°C;-10°C;-5°C;0°C;5 °C.**
- three different types of terminal: radiant panel, ELFO terminal unit and radiator.

For every type of terminal, a variable temperature of the produced water has been used in view of the ambient temperature (climate) as follows:

RADIANT PANELS:

maximum water temperature equal to 35 °C in correspondence of the design External air temperature and equal to 25 °C for an External air temperature equal to 15 °C, when the load of the building is considered null;

ELFO TERMINAL UNITS:

maximum water temperature equal to 45 °C in correspondence of the design External air temperature and equal to 35 °C for an External air temperature equal to 15 °C, when the load of the building is considered null;

RADIATORS :

with maximum water temperature equal to 55 °C in correspondence of the design External air temperature and equal to 45 °C for an External air temperature equal to 15 °C, when the load of the building is considered null.

DELIVERED HEATING CAPACITY

The chart below shows an example of the heating capacity delivered by the GAIA Maxi heat pump in view of the:

- External air temperature between a minimum value of -5°, taken as value of the design winter temperature of the location examined in the example and a maximum value of 15°C taken as maximum temperature so as to why a building may require heating;
- percentage of the compressor speed compare to a maximum speed (compressor partialisation), between a minimum value of 30% below which the compressor has an ON/OFF function and a maximum value of 100%;
- variable temperature of the produced water based on the External air temperature: equal to 35°C for the minimum temperature of the ambient air of the examined location (-5°C) and equal to 25°C for the External air temperature (15°C) for which the building's request for heat (thermal load) is null.

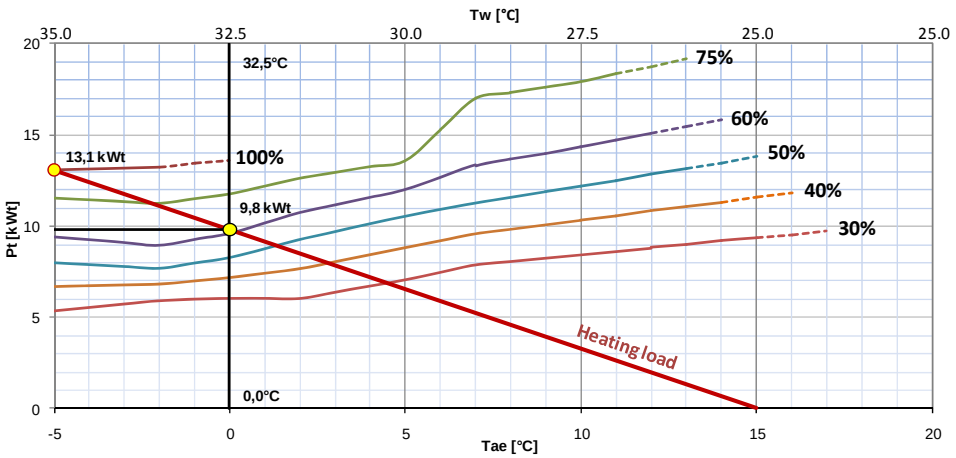
We have considered that the temperature of the produced water varies in view of the ambient air with defined values.

The GAIA Maxi adjustment allows setting adjustable values, in view of ones own designing choices.

The chart shows the thermal load of a building having maximum value in correspondence of the design winter temperature (-5° C) and equal to 13.1 kW and null value in correspondence of an External air temperature of 15°C.

In this way, for every value of External air temperature, known the load, it is possible to determine the compressor partialisation required to obtain, through another chart, the value of COP.

For example, for an External air temperature of 0°C the building is characterised by a thermal load of 9.8 kWt.
This load is satisfied with a supply water temperature to the radiant panels of 32.5°C and the compressor partialisation is equal



Pt = heating power delivery,
Tw = supply water temperature,
Tae = External air temperatures

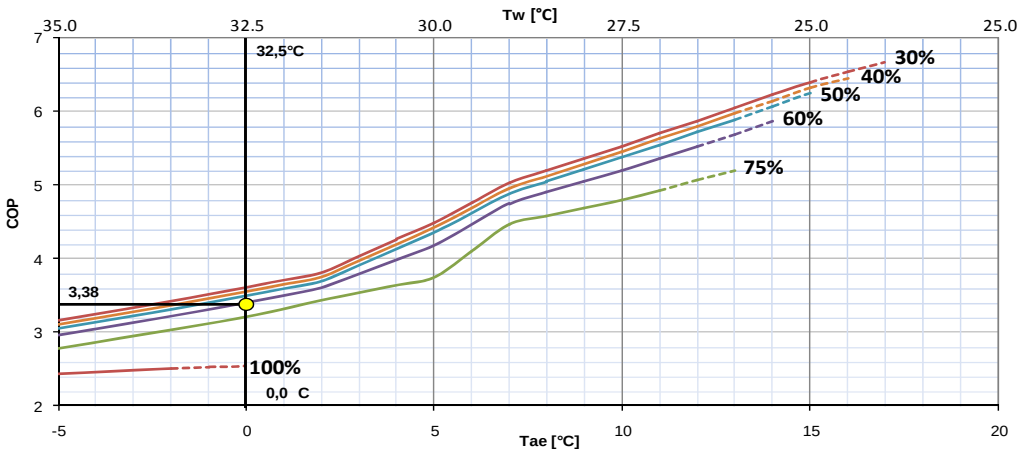
GAIA Maxi data

PERFORMANCE COEFFICIENT (COP)

The following chart shows the performance coefficient of the heat pump (COP) in view of the three same conditions previously illustrated:

- External air temperature
- compressor speed percentage
- produced water temperature.

In the previous example, given the External air temperature (0°C) and consequent water temperature (32.5°C), and using the partialisation given in the preceding chart (60%) we can obtain the heat pump's COP which, in this case, is equal to 3.38.



Tw = supply water temperature
Tae = External air temperatures

GAIA Maxi data

MAXIMUM ABSORBED ELECTRIC POWER

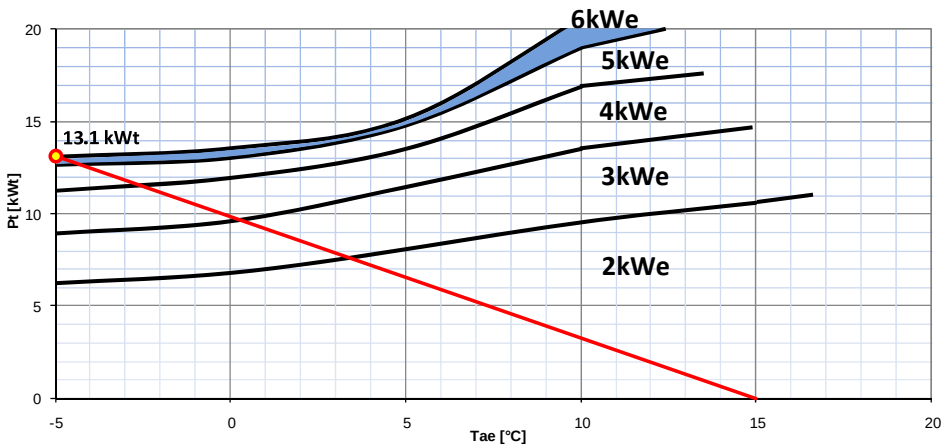
GAIA's controller limits power delivery (and hence power absorption) at start-up as a function of the building's requirements at design conditions.

This function enables us to define the maximum power absorption for the purposes of rating the electrical power meter.
In the following chart, by entering the heat load of the building in question, we can also obtain the maximum electrical absorption of the heat pump in order to specify the meter, to which we must add, if necessary:

- other devices, including supplementary heating elements or active thermodynamic recovery units for the ejected air;
- other loads, for instance, for domestic appliances and services (lights, washing unit, etc.).

GAIA has the power control allowing to set the maximum absorbed power from parameter.
GAIA automatically and continuously controls the electrical absorption of the unit, reducing the maximum compressor partialisation to maintain the absorbed power within a set limit.

In this case, the maximum electrical absorption, 6 kWe, is had in the conditions of minimum External air temperature.
If the unit also provides air conditioning, we must also determine the maximum electrical power absorption when operating in this mode.



Pt= heating capacity requested by the building
Tae = External air temperature

GAIA Maxi data

DIMENSIONING CRITERIA IN HEATING

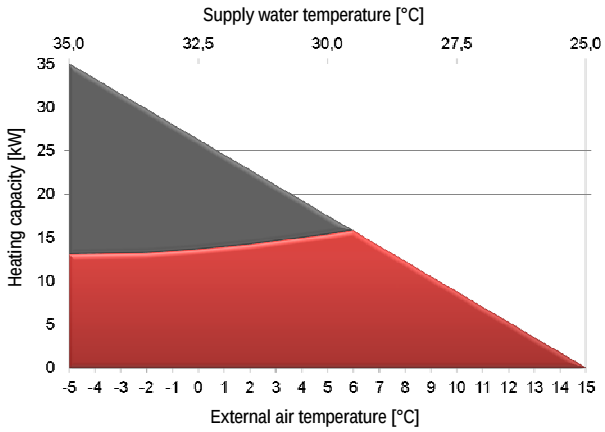
The first step to select the heat pump solution is to determine the design thermal load, meaning the maximum power dispersed by the building during design winter conditions (in correspondence of the design winter
temperature of the examined location by-passing the heat ratio).
Designing foresees the selection of a heat generator that can supply, in design conditions, a higher power, or at least equal, to that dispersed by the building in the same conditions.
In the case of GAIA Maxi using a heat pump and a condensing boiler to meet the thermal requirement of the building, it is necessary to determine the boiler's functioning mode on the system.
There are 2 types of applications

- GAIA Maxi with boiler managed in integration with heat pump;
- GAIA Maxi with boiler in replacement of the heat pump.

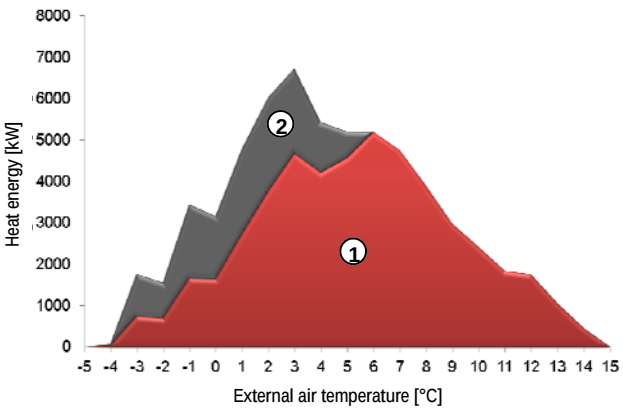
In both cases, if the design thermal load exceeds the heating capacity delivered by GAIA Maxi in the same conditions, the unit can still be installed with additional equipment composed of an **active thermodynamic recuperator**.

GAIA Maxi WITH BOILER IN INTEGRATION WITH HEAT PUMP

If the design work point, determined by the temperature of the water produced at the design winter conditions, falls inside the envelope of the heat pump compressor (areas 1, 2 and 3 of the functioning limits at page 40), GAIA Maxi will use the integration condensing boiler to the heat pump.
In this case the maximum available power to the design temperature of GAIA Maxi coincides with the sum of the maximum power supplied by the heat pump and by of the boiler power.
(Example: at the design temperature -5°C, GAIA Maxi can supply 13.1 with the heat pump and 24 kW with the boiler for a total of 37.1 kW).
When the thermal load of a building is greater than the maximum heating capacity delivered by the heat pump, GAIA Maxi activates the condensing boiler to supply the part of the power necessary to meet the entire load of the building.
The condensing boiler, integrated in the unit, is able to modulate the delivered power up to 24 kW to supply only the necessary power to the system and avoid a high number of ignition-switch-off that, in time, can be cause of breaks and malfunctioning.
The chart in the figure on the side shows the case of a building characterised by a thermal load in design conditions equal to 35 kW with application of radiant panels with design External air temperature equal to -5°C.
As, with water production at 35°C, the GAIA Maxi heat pump is able to supply at the same conditions of ambient air (-5°C) 13.1 kW, the power difference (35 – 13.1 = 21.9 kW) will be supplied by the condensing boiler.
The condensing boiler will work as long as the heating capacity request of the building will not be equal to the maximum power (at 100%) delivered by the unit that, in the example in question, happens in correspondence of an ambient temperature of about 6°C.



Due to the reduced number of hours had in correspondence of low External air temperature values for the examined location, the energy requested from the condensing boiler is lower compared to that delivered by the heat pump. Therefore, the seasonal efficiency of GAIA Maxi is not jeopardised. In the above example, the overall electric energy absorbed by the heat pump + the condensing boiler is equal to 62397 kWhe and the quota relating to the condensing boiler only is of 21%.



(1) = thermal energy produced by the heat pump
(2) = thermal energy produced by the condensing boiler
GAIA Maxi data

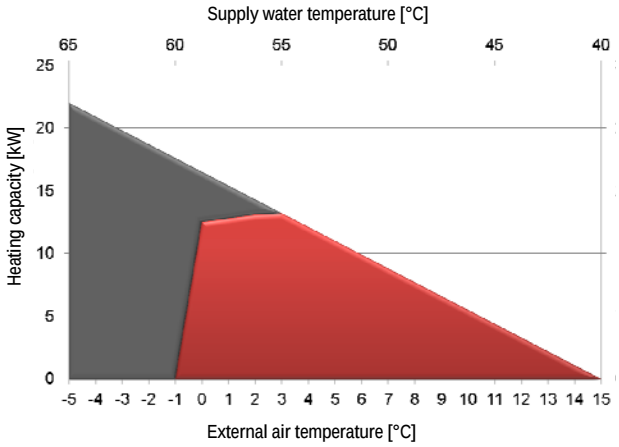
GAIA Maxi WITH BOILER REPLACING THE HEAT PUMP

If the design work point, determined by the temperature of the water produced at the design winter conditions, falls outside the envelope of the heat pump compressor (areas 4 of the functioning limits at page 40), GAIA Maxi will use the condensing boiler to replace the heat pump.

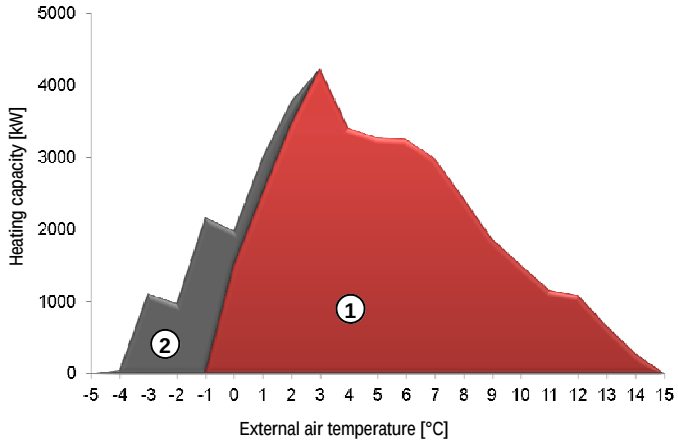
In this case, the maximum power available at the design temperature of GAIA Maxi coincides with the power of the boiler only, that is 24 kW.

When the work point of GAIA Maxi falls within the external area of the compressor envelope, GAIA Maxi deactivates the heat pump and activates the condensing boiler to supply the necessary power to meet the entire load of the building.
The condensing boiler, integrated in the unit, is able to modulate the delivered power up to 24 kW to supply only the necessary power to the system and avoid a high number of ignition-switch-off that, in time, can be cause of breaks and malfunctionings.

The chart in the following figure shows the case of a building characterised by a thermal load in design conditions of 22 kW with application of high temperature radiators (maximum water temperature of 65°C in correspondence of the design External air temperature and equal to 40°C for an External air temperature equal to 15°C) with design External air temperature equal to -5°C.
In this case, the work point of GAIA Maxi falls outside the compressor envelope for external air temperatures below 0°C, therefore, the entire thermal load in this area is satisfied with the sole use of the boiler.
For higher external air temperatures, GAIA Maxi uses the heat pump and activates the integration boiler only when the power delivered by the heat pump is insufficient to meet the full thermal load of the building.



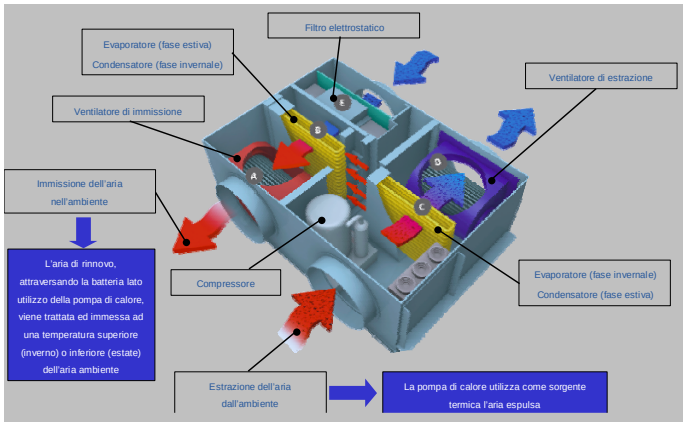
The reduced number of hours had in correspondence of the boiler only functioning, mean the energy requested from the heat pump is higher compared to that delivered by the boiler.
Therefore, the seasonal efficiency of GAIA Maxi is not jeopardised.
In the above example of load, the overall electrical power absorption of the heat pump + the condensing boiler is 39151 kWhe, so that the contribution of the sole condensing boiler is of 15%.



(1) = thermal energy produced by the heat pump
(2) = thermal energy produced by the condensing boiler
GAIA Maxi data

ACTIVE THERMODYNAMIC RECUPERATOR

The current regulatory context increasingly concentrates on energy saving in air-conditioning buildings.
The constructive choices are therefore being addressed towards an increase of the thermal insulation level and a decrease of the heat losses, for example, thanks to the use of increasingly water-resistant fitting to ambient air infiltrations.
At the same time, the satisfying of high quality standard requisites of the air in confined ambients, entails the use of a mechanical system for the air exchange.
However, the use of mechanical ventilation can contribute to significant energy savings should thermal recovery be performed through a heat pump using, as thermal source, the ejected air also known as ACTIVE THERMODYNAMIC RECUPERATOR.
The use of a thermal source at favourable temperature like the ejected air, allows the production of thermal energy with high efficiency.



ELFOFresh²,
thanks to the thermodynamic recovery, allows an efficient recovery both during the summer and the winter.

First step

In addition to the heat recovery from the ejected air, the active recuperator generates a basic amount of energy supplied to the building, both during summer and winter.
Thanks to its high index of energy efficiency, the active recuperator works in low electrical consumption conditions, a lot lower if the same energy is supplied by the main generator.

FREE COOLING

The external climate conditions during the mid-seasons, in particularly at night, can be more pleasant than indoor ones, at least from a temperature point of view.
In fact, homes tend to store heat during the central hours of the day to day disperse it during night-time. In similar conditions, the unit allows to draw fresh air from outside and supply it in the rooms, at no cost, just by operating the fans.

Humidity Control

The active recuperator is the ideal complement of floor, wall or ceiling radiant systems for its extraordinary ability to control the environmental humidity that, in particular during summer, is necessary for the correct yield of the radiant panels.

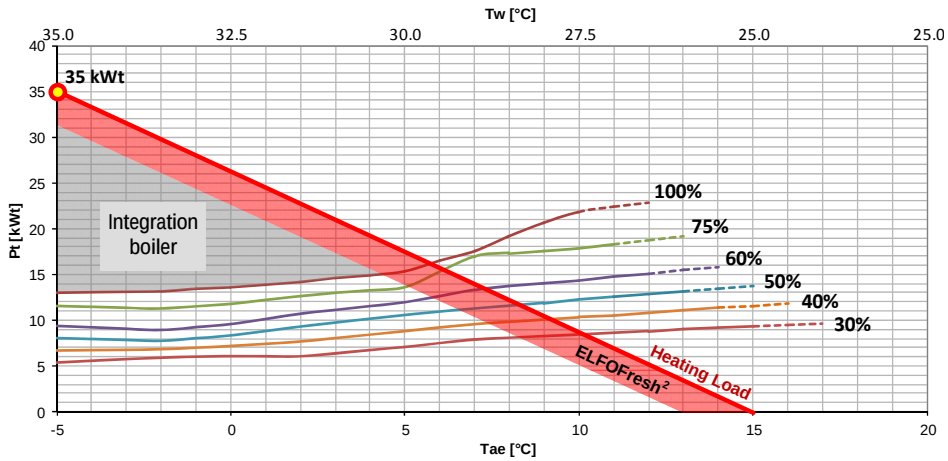
Filtration

An efficient filtration guarantees the elimination of toxic elements and odours present in the ambient air.
The electrostatic filter acts as highly efficient electronic purifier: its ability to reduce pollutants in the air is higher than 95%.
In particular, it is able to eliminate fumes, dust, virus, bacteria and all polluting particles having a diameter between 0.01 and 20 micron.
Associated to this high filtration yield is the reduction of absorbed energy for ventilation, as the load losses are reduced to 20% compared to traditional filters, which standard efficiency further reduces as they wear.

Consider the first analysed building within the dimensioning criteria of GAIA Maxi, characterised by:
- a power dispersion in winter design conditions (ambient temperature -5℃) of 35 kW with a straight line curve up to an ambient temperature of 15°C (continuous line).

In this case the presence of an active thermodynamic recovery unit (ELFOFresh² size 500) enables us to provide a heating capacity to the building which reduces the power draw on the heat pump (dotted line).

Using the ACTIVE THERMODYNAMIC RECUPERATOR, not only refreshes and purifies the air and produces high efficiency thermal energy, but also enables us:
- to install the GAIA Maxi even in buildings with a thermal load higher than the maximum power delivery of the heat pump;
- to run only the active thermodynamic recuperator in more mild ambient temperatures, thus avoiding frequent starts and stops of the GAIA Maxi which would reduce its efficiency.

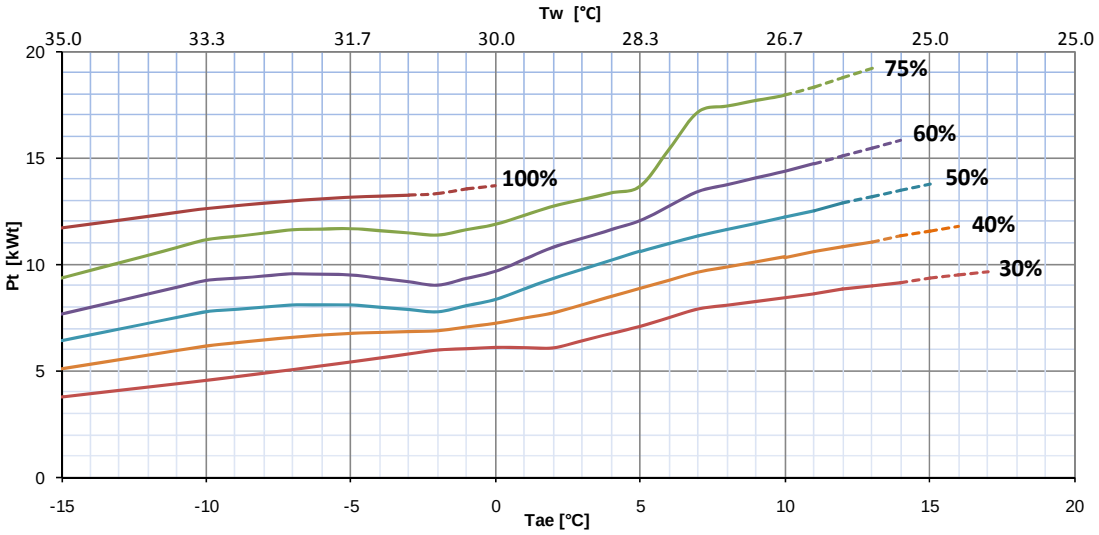


Pt= heating power delivery,
Tw = supply water temperature,
Tae = external air temperatures

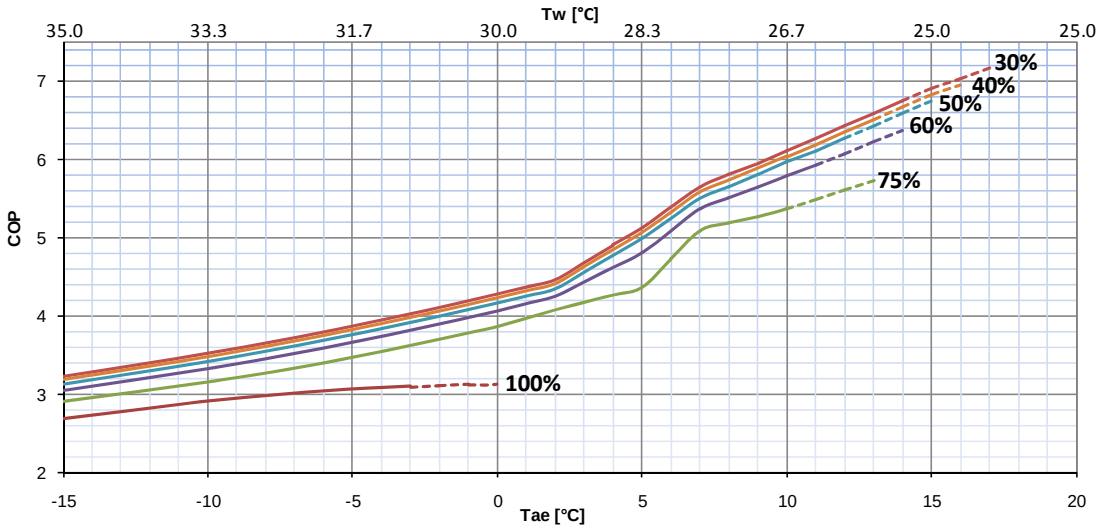
HEATING RADIANT PANELS T_{design} –15°C

Performances in heating for radiant panels application, variable delivery water temperature based on the ambient temperature, design temperature –15°C.

HEATING CAPACITY



COP



ELECTRIC POWER

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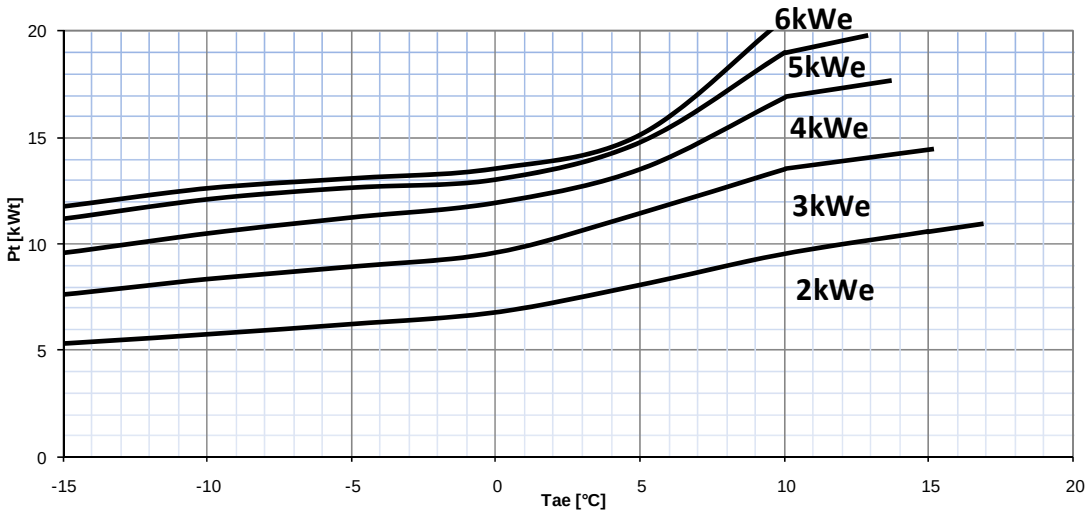


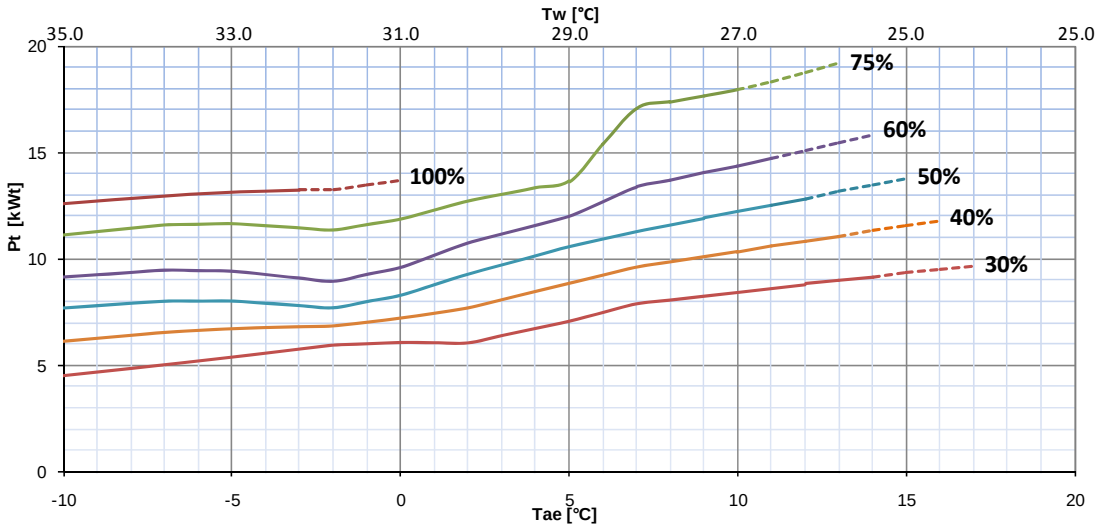
NOTES:
Pt = heat capacity supplied to the system
Tw = Produced water temperature
Tae = External air temperature

The performances refer to DeltaT=5°C
The heating capacity and COP data include defrosting.

HEATING RADIANT PANELS T_{design} –10°C

Performances in heating for radiant panels application, variable delivery water temperature based on the ambient temperature, design temperature –10°C.

HEATING CAPACITY



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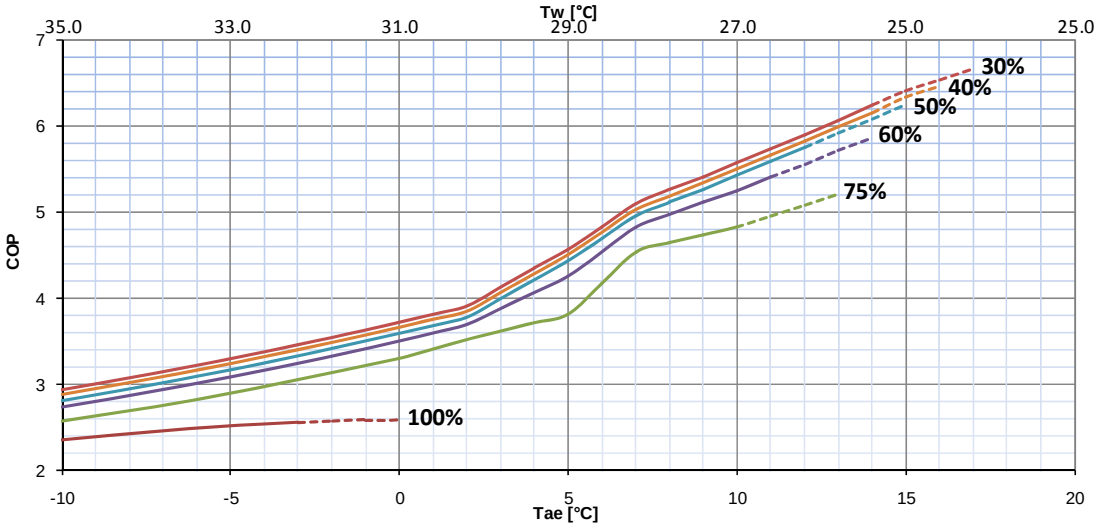

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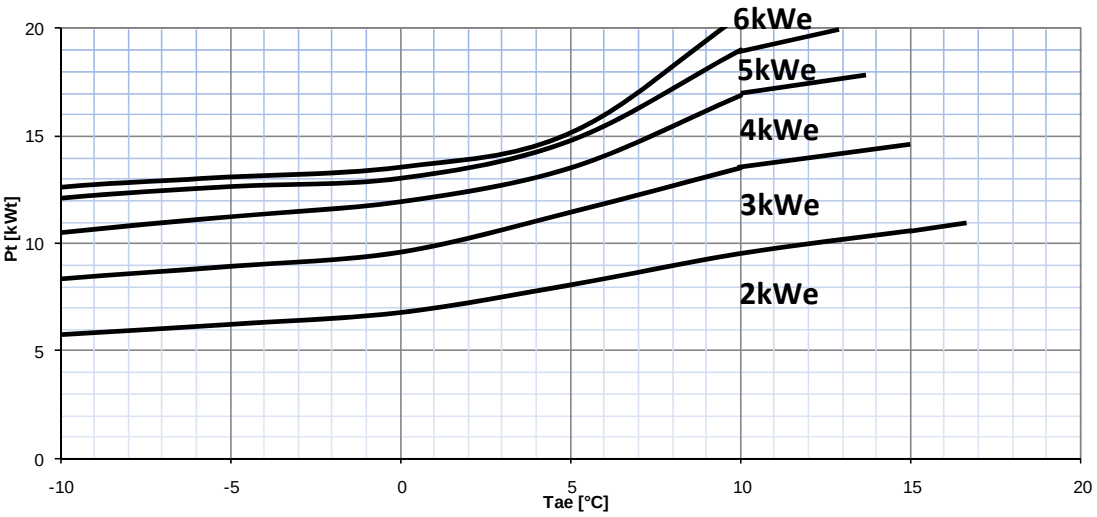


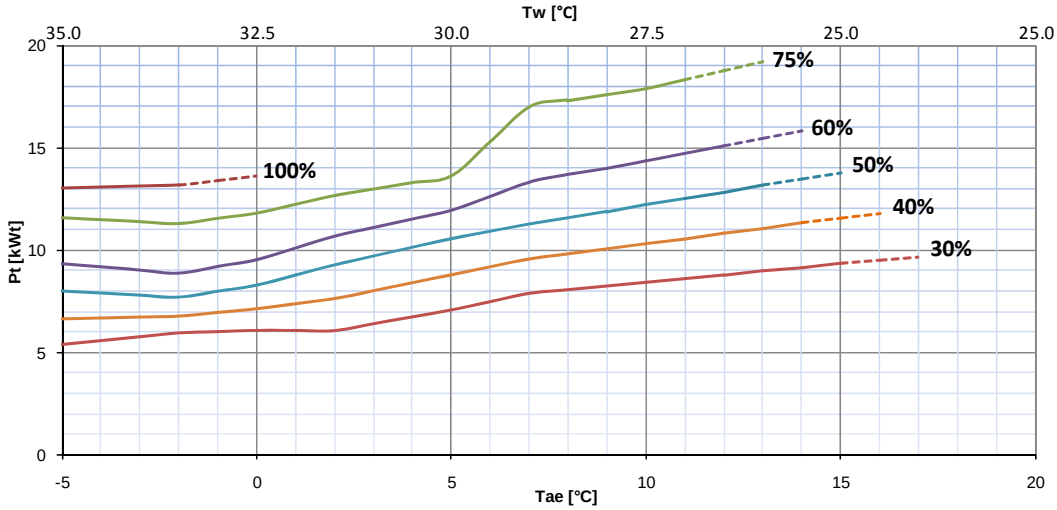
NOTES:
Pt = heat capacity supplied to the system
Tw = Produced water temperature
Tae = External air temperature

The performances refer to DeltaT=5°C
The heating capacity and COP data include defrosting.

HEATING RADIANT PANELS T_{design} –5°C

Performances in heating for radiant panels application, variable delivery water temperature based on the ambient temperature, design temperature –5°C.

HEATING CAPACITY



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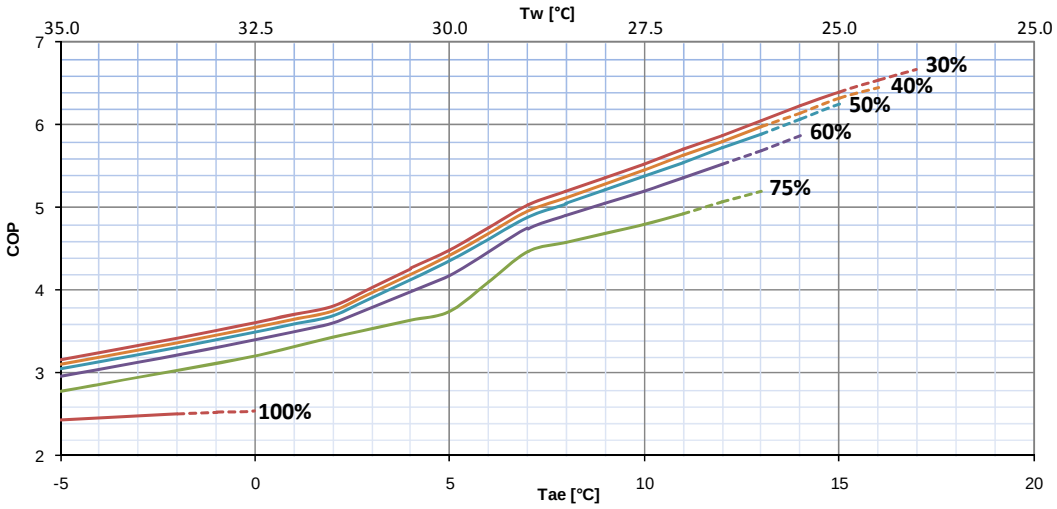

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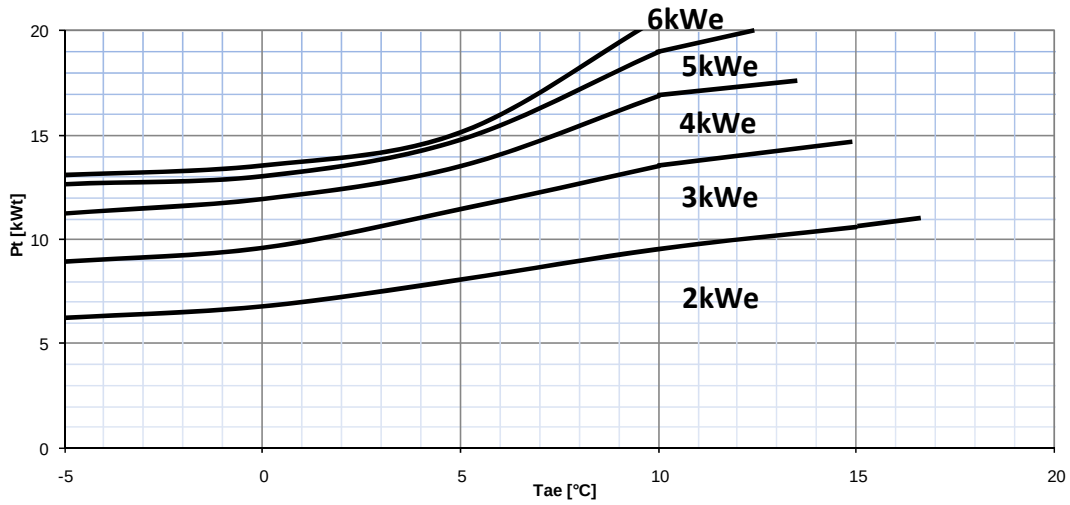

NOTES:
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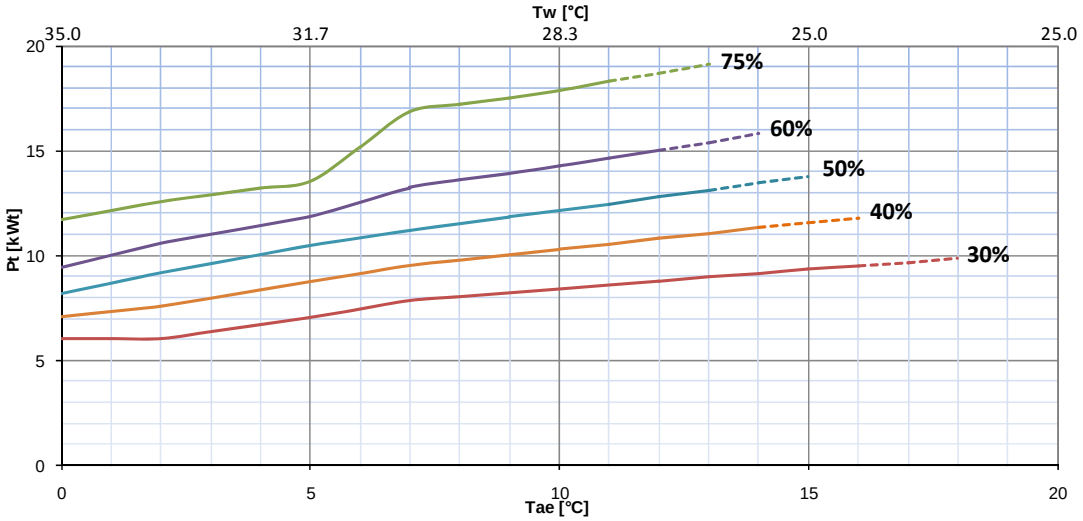
The performances refer to DeltaT=5°C

The heating capacity and COP data include defrosting.

HEATING RADIANT PANELS T_{design} 0°C

Performances in heating for radiant panels application, variable delivery water temperature based on the ambient temperature, design temperature 0°C.

HEATING CAPACITY



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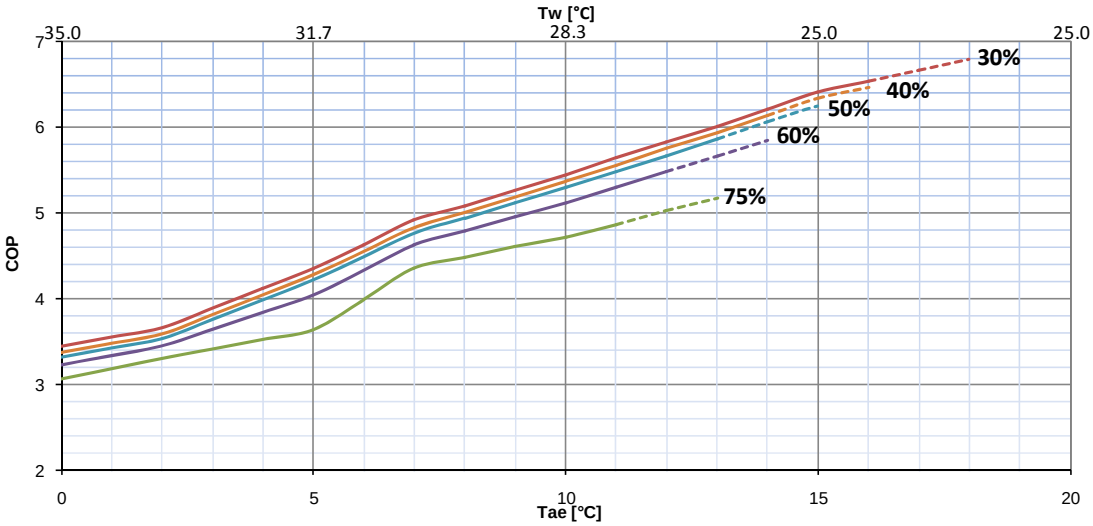

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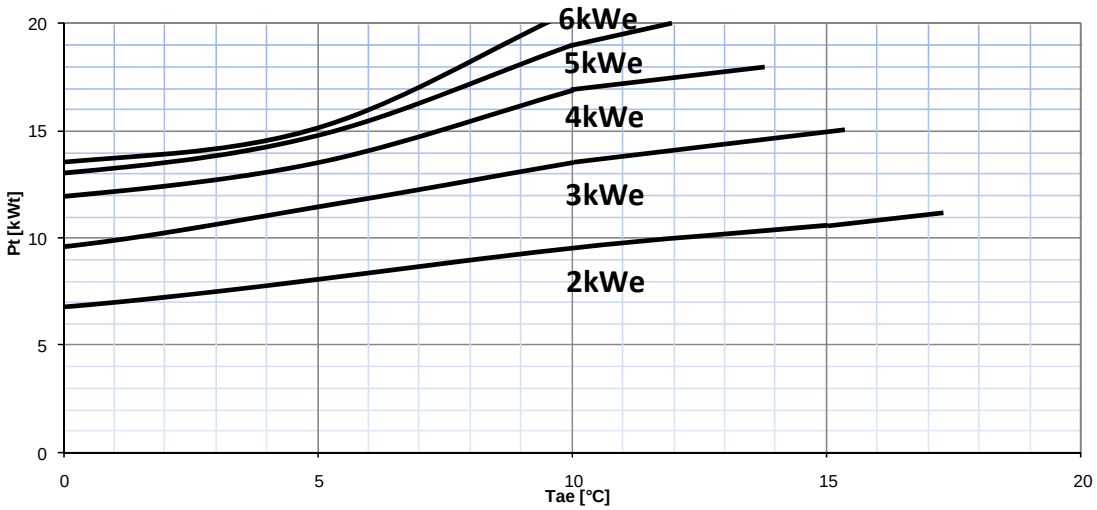

NOTES:
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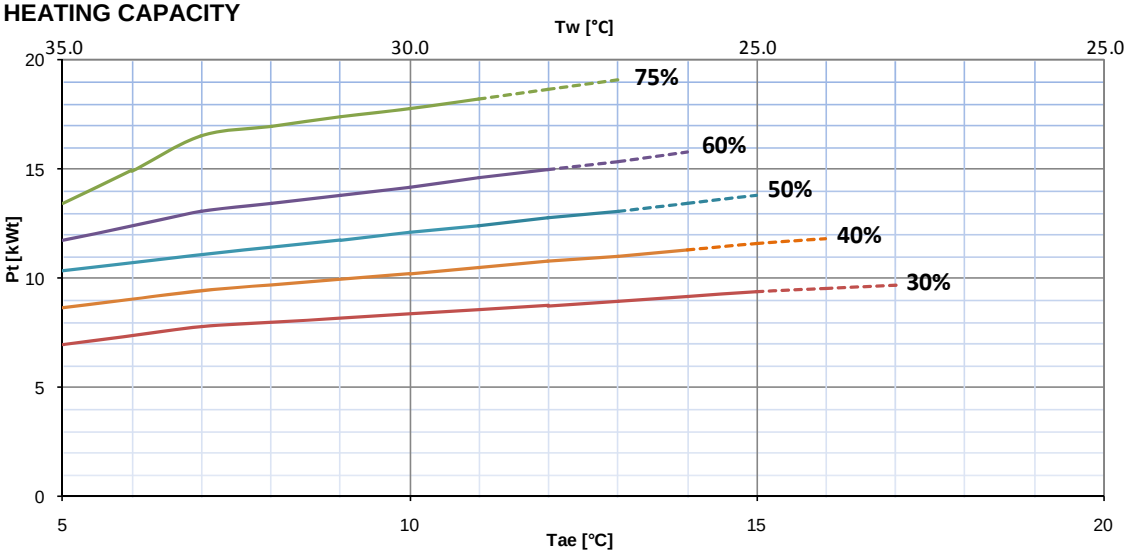
Tw = Produced water temperature
Tae = External air temperature

The performances refer to DeltaT=5°C
The heating capacity and COP data include defrosting.

HEATING RADIANT PANELS T_{design} +5°C

Performances in heating for radiant panels application, variable delivery water temperature based on the ambient temperature, design temperature +5°C.

HEATING CAPACITY



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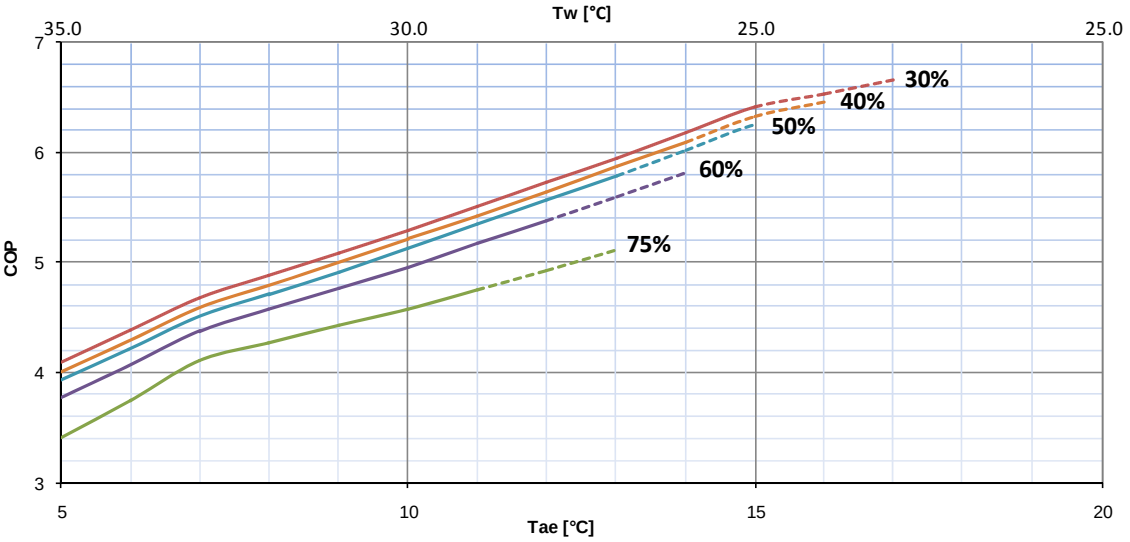

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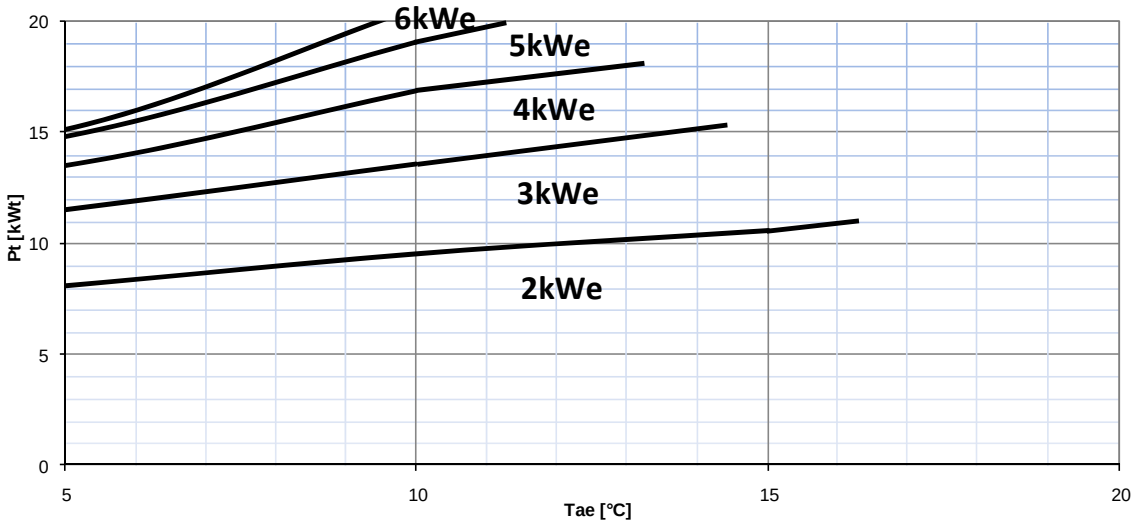

NOTES:
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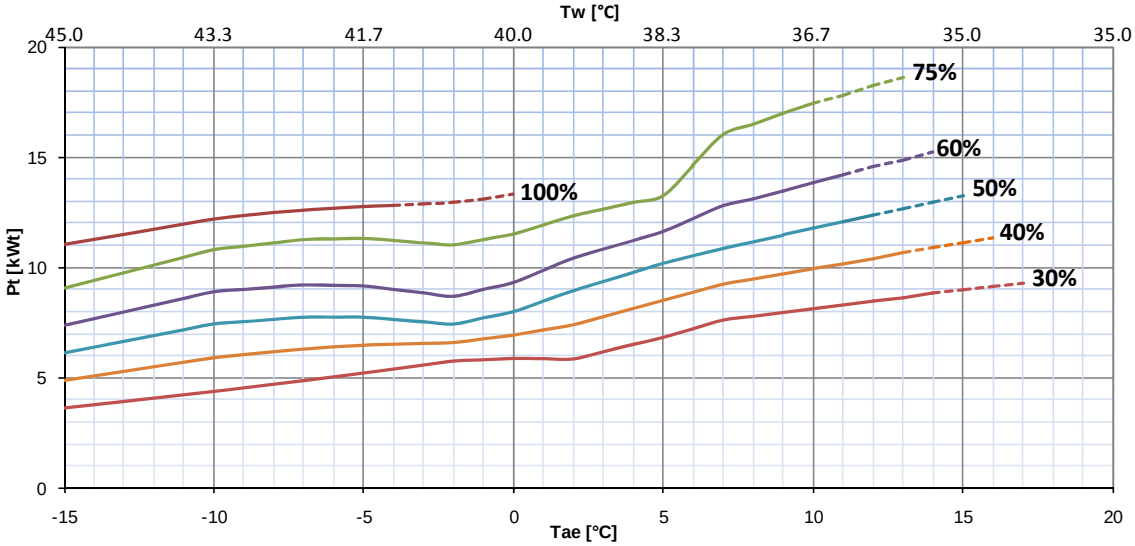
The heating capacity and COP data include defrosting.

HEATING ELFO TERMINAL UNITS T_{design} –15°C

Performances in heating for terminal units application, variable delivery water temperature based on the ambient temperature, design temperature –15°C.

HEATING CAPACITY



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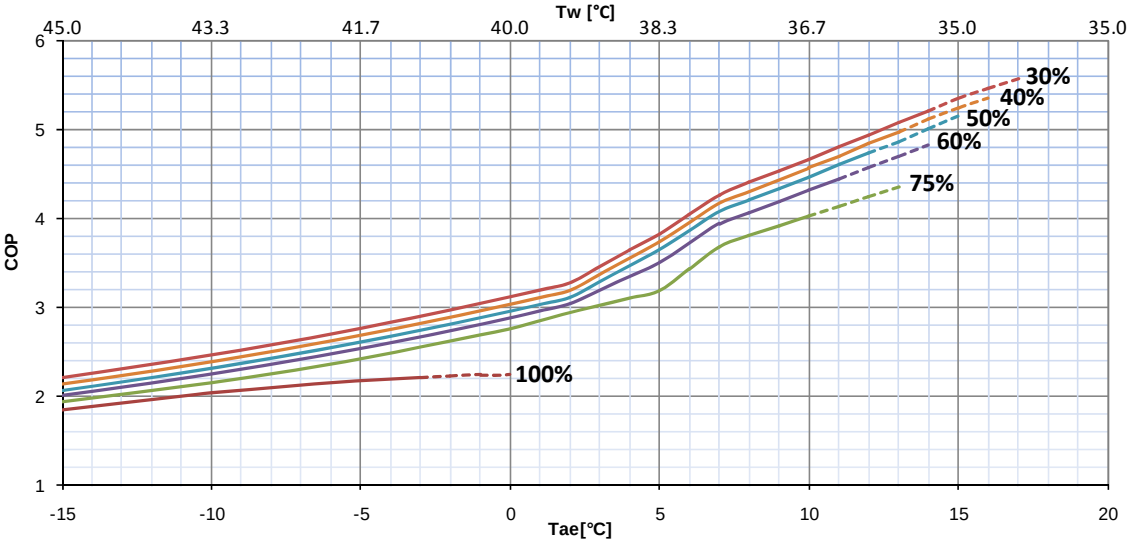

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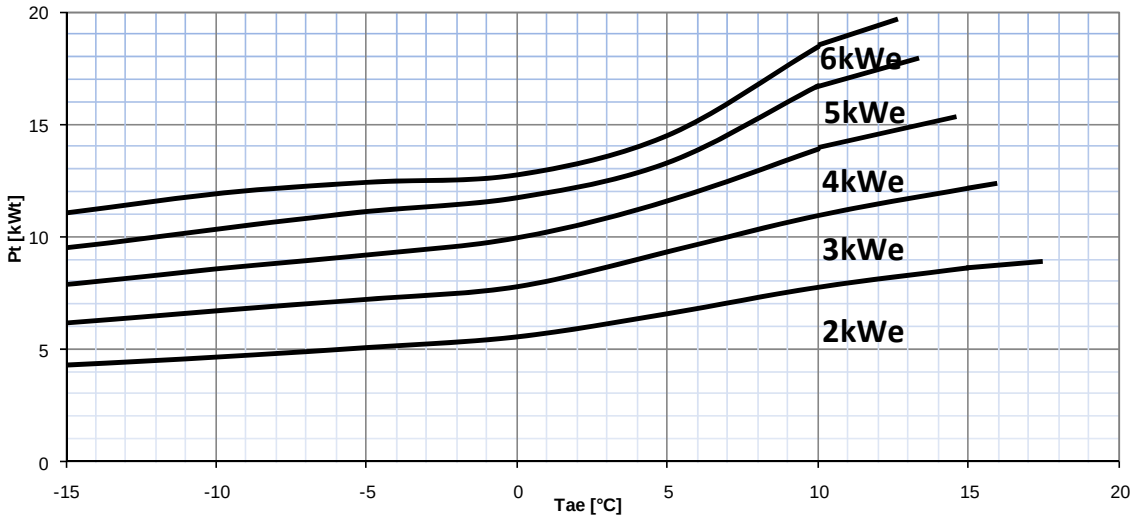

NOTES:
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Tw = Produced water temperature
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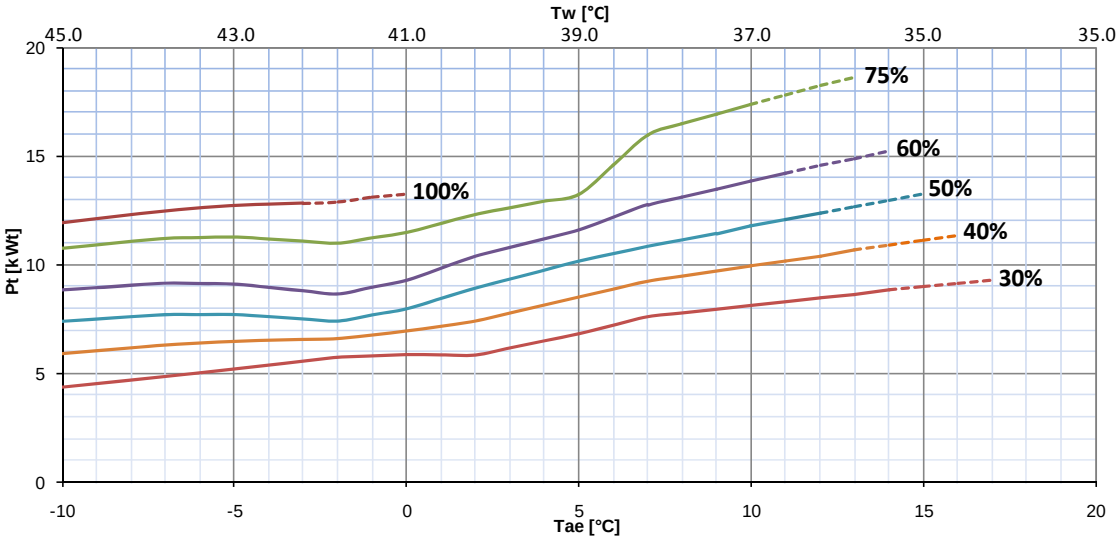
The performances refer to DeltaT=5°C
The heating capacity and COP data include defrosting.

HEATING ELFO TERMINAL UNITS T_{design} –10°C

Performances in heating for terminal units application, variable delivery water temperature based on the ambient temperature, design temperature –10°C.

HEATING CAPACITY



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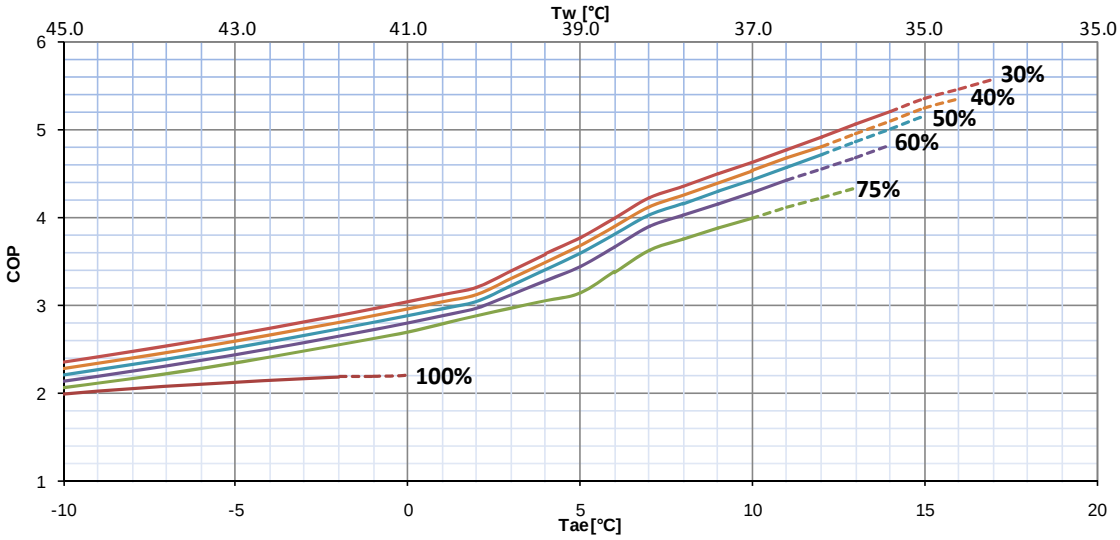

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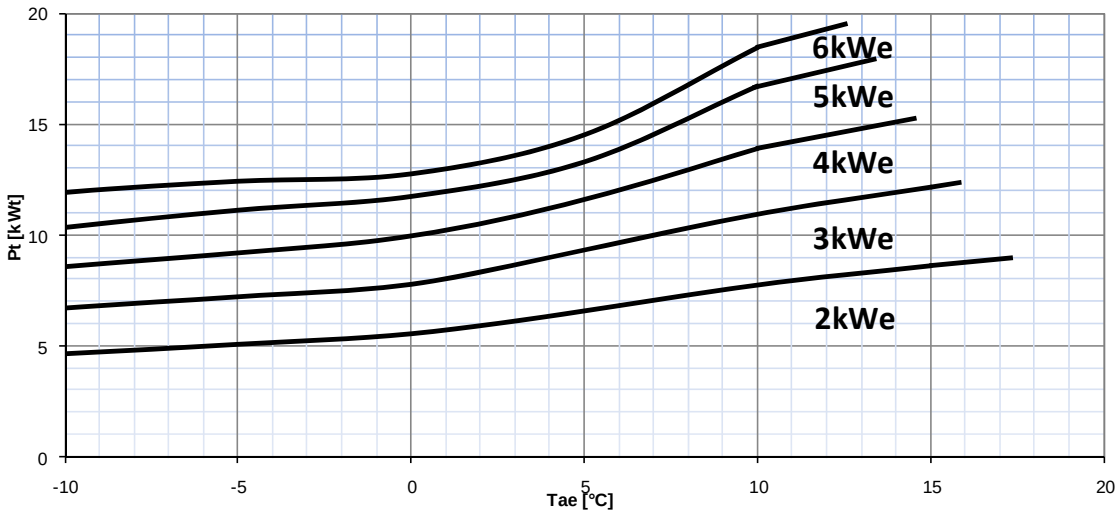

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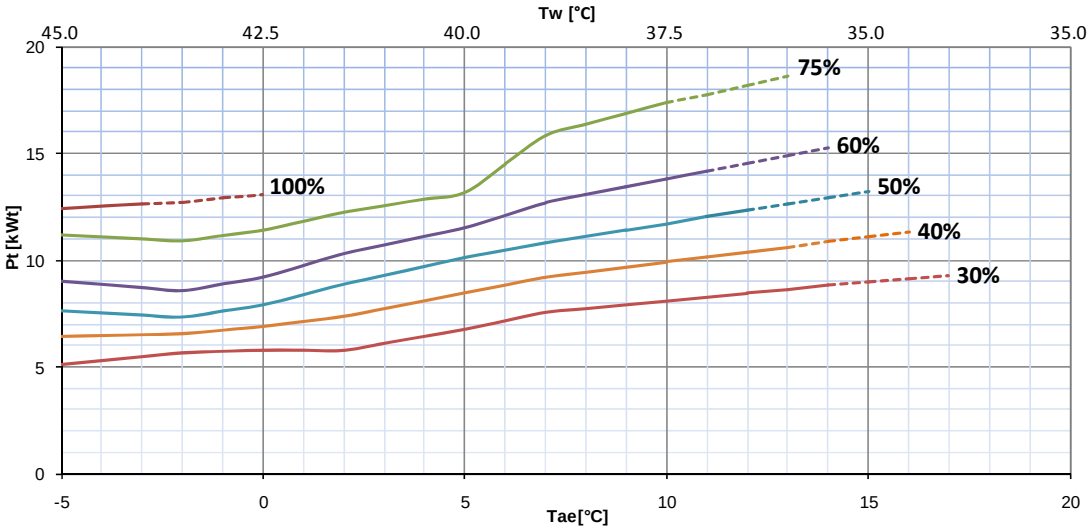
HEATING ELFO TERMINAL UNITS T_{design} –5°C

Performances in heating for terminal units application, variable delivery water temperature based on the ambient temperature, design temperature –5°C.

HEATING CAPACITY



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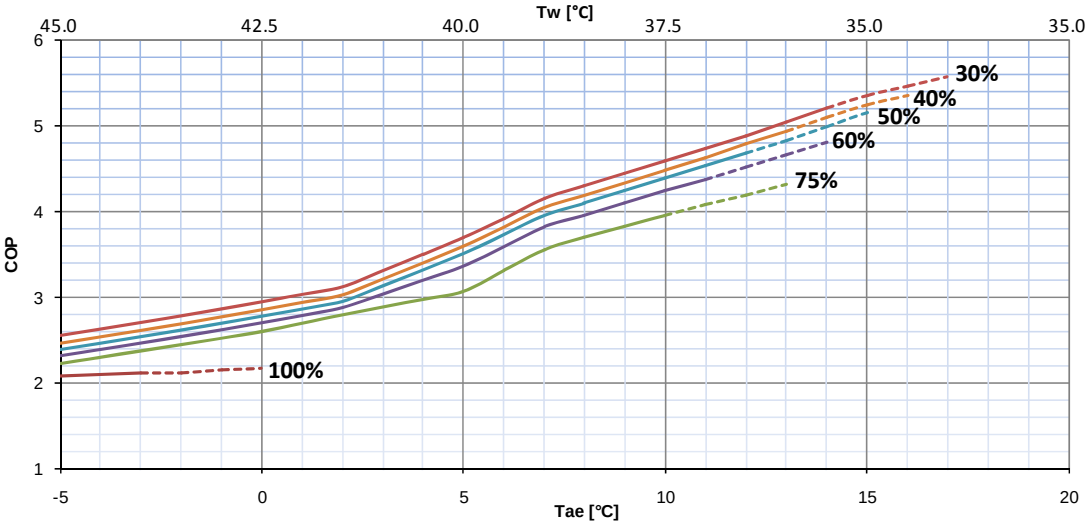

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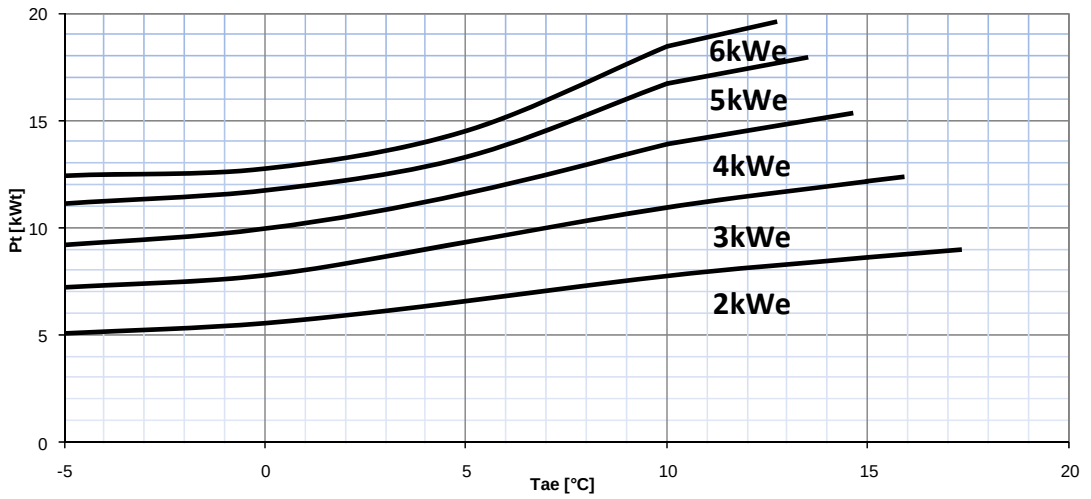

NOTES:
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The performances refer to DeltaT=5°C
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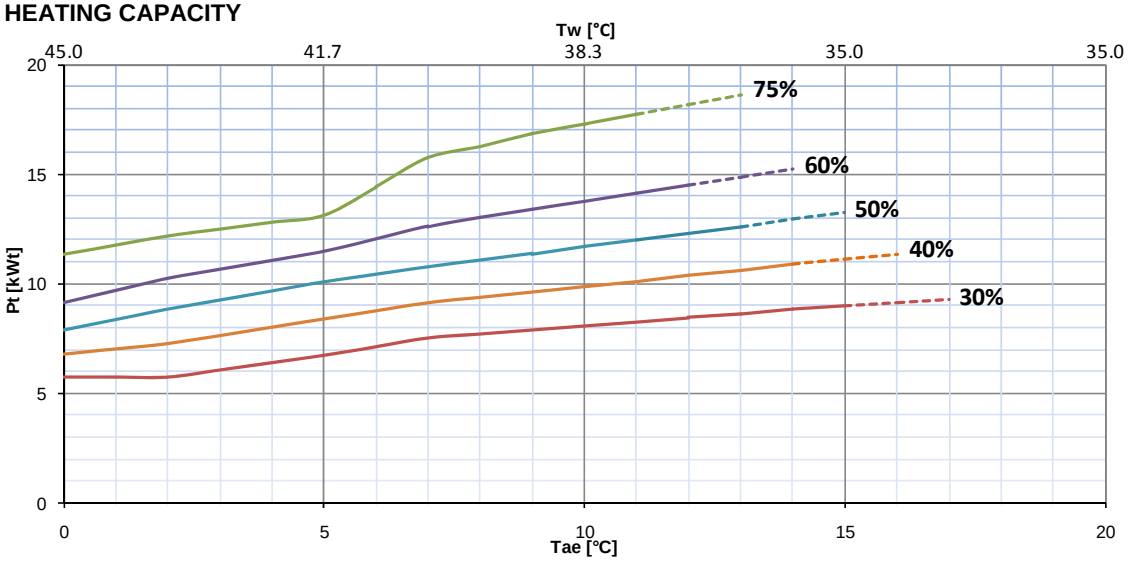
HEATING ELFO TERMINAL UNITS T_{design} 0°C

Performances in heating for terminal units application, variable delivery water temperature based on the ambient temperature, design temperature 0°C.

HEATING CAPACITY



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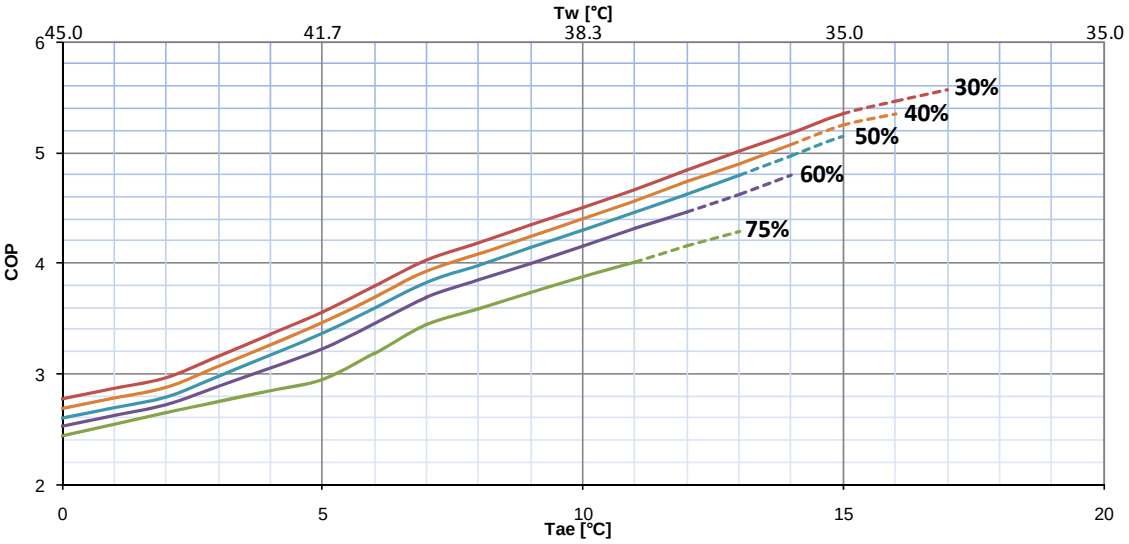

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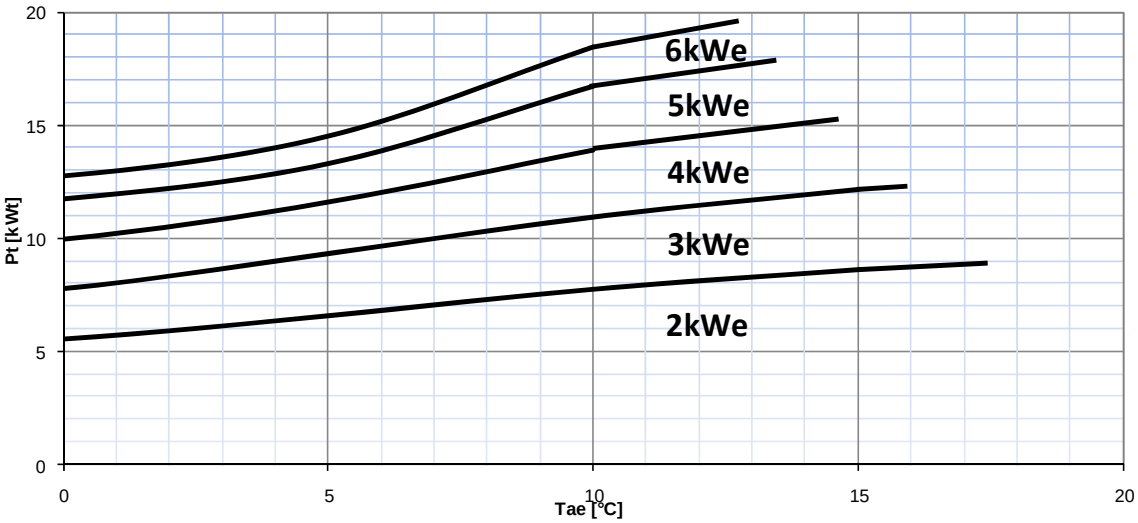

NOTES:
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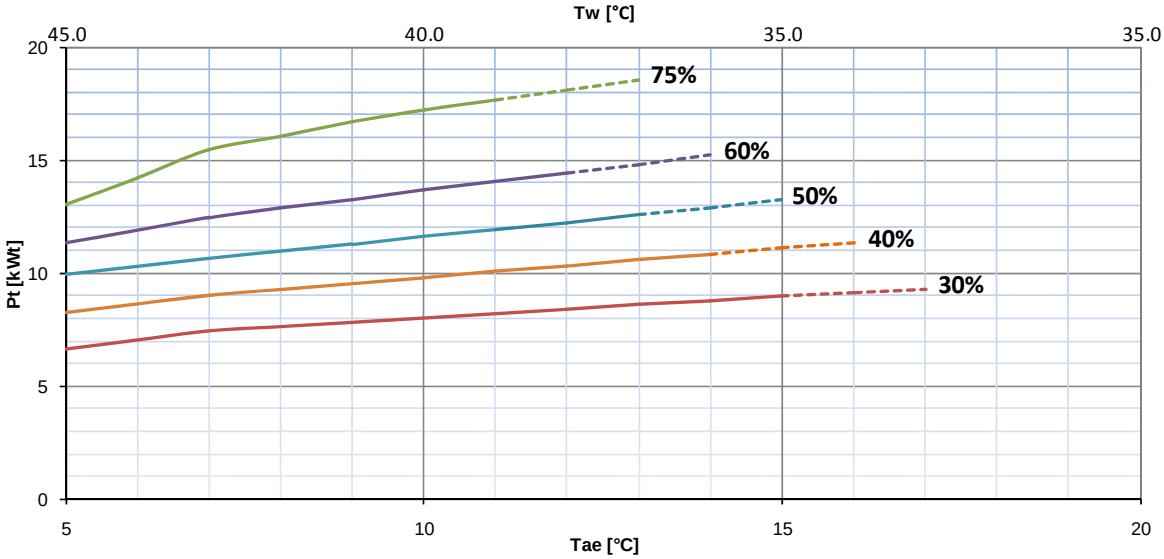
Tae = External air temperature

The performances refer to DeltaT=5°C
The heating capacity and COP data include defrosting.

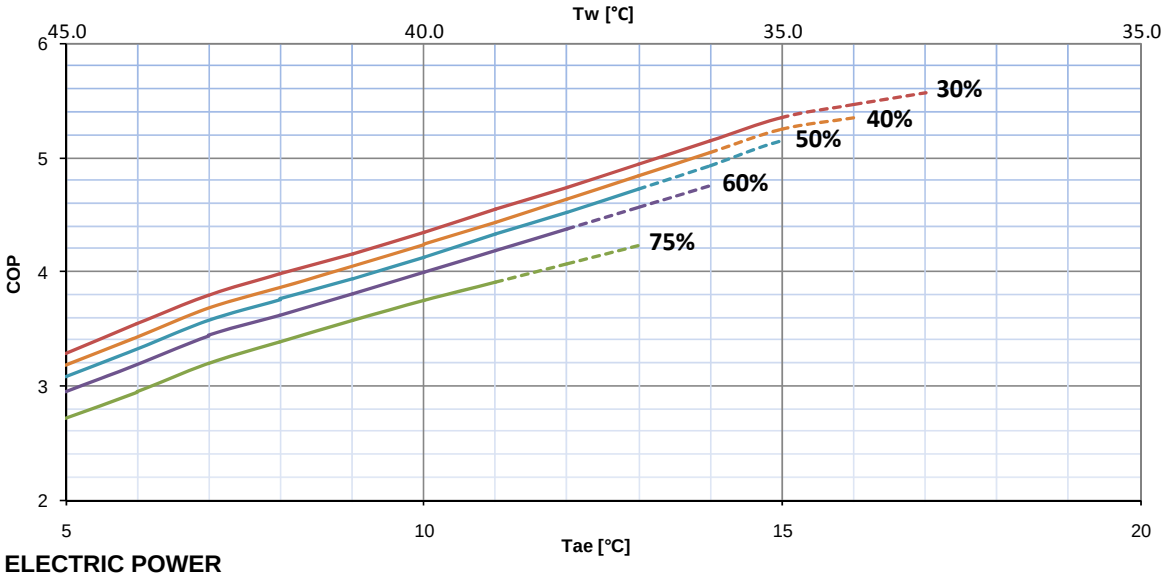
HEATING ELFO TERMINAL UNITS T_{design} +5°C

Performances in heating for terminal units application, variable delivery water temperature based on the ambient temperature, design temperature +5°C.

HEATING CAPACITY



COP



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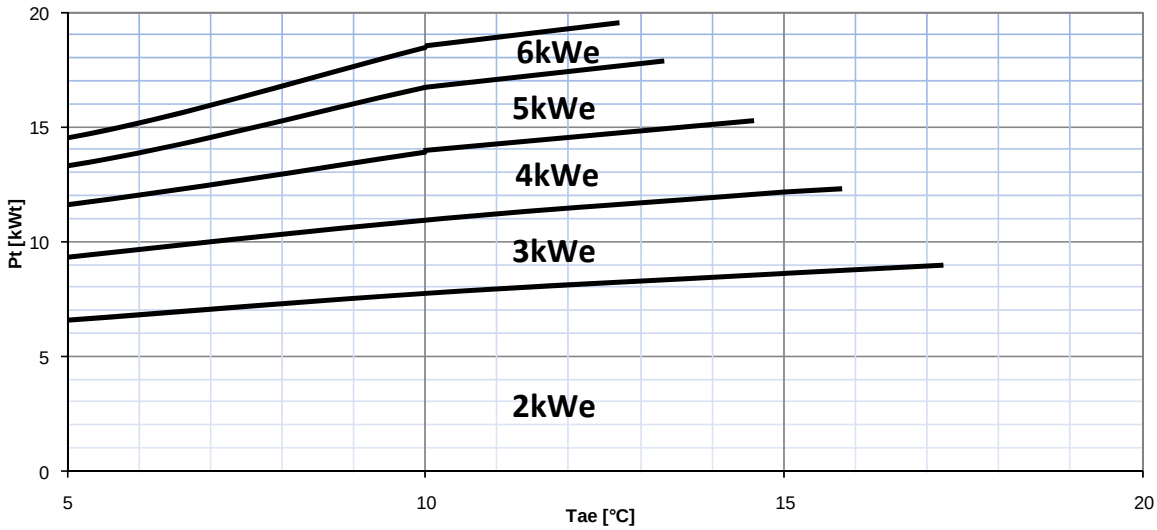

NOTES:
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The performances refer to DeltaT=5°C
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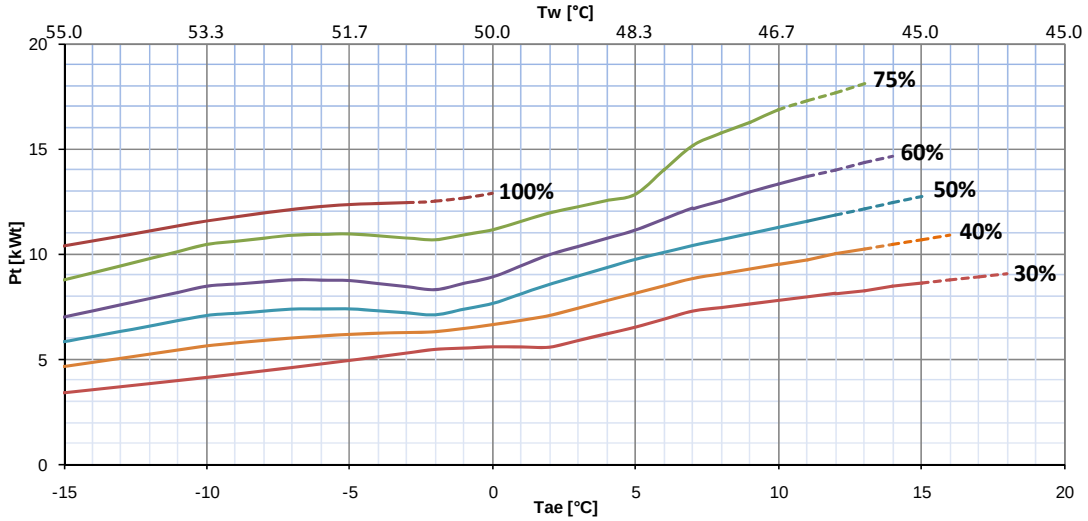
HEATING RADIATORS T_{design} –15°C

Performances in heating for radiators application, variable delivery water temperature based on the ambient temperature, design temperature - –15°C.

HEATING CAPACITY



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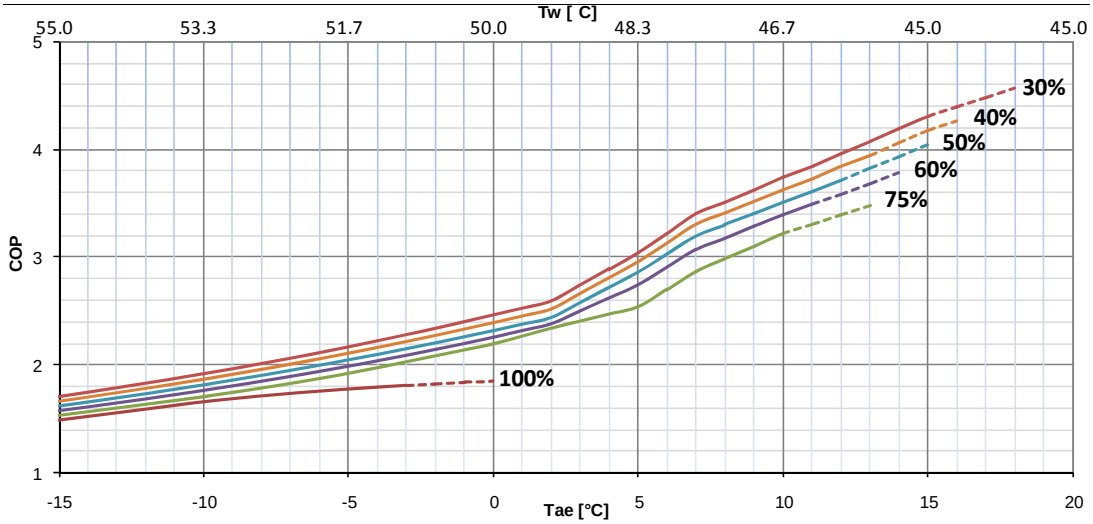

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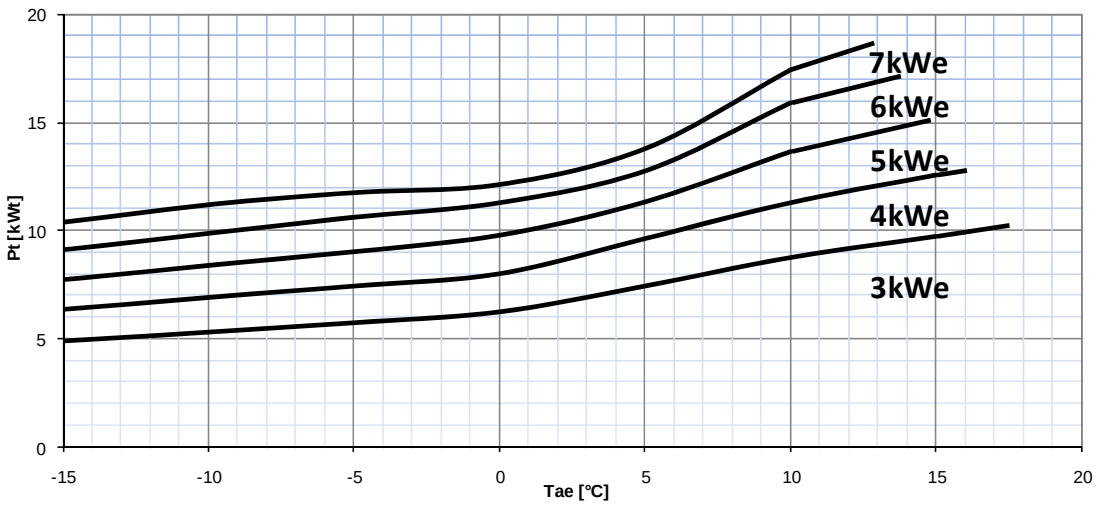

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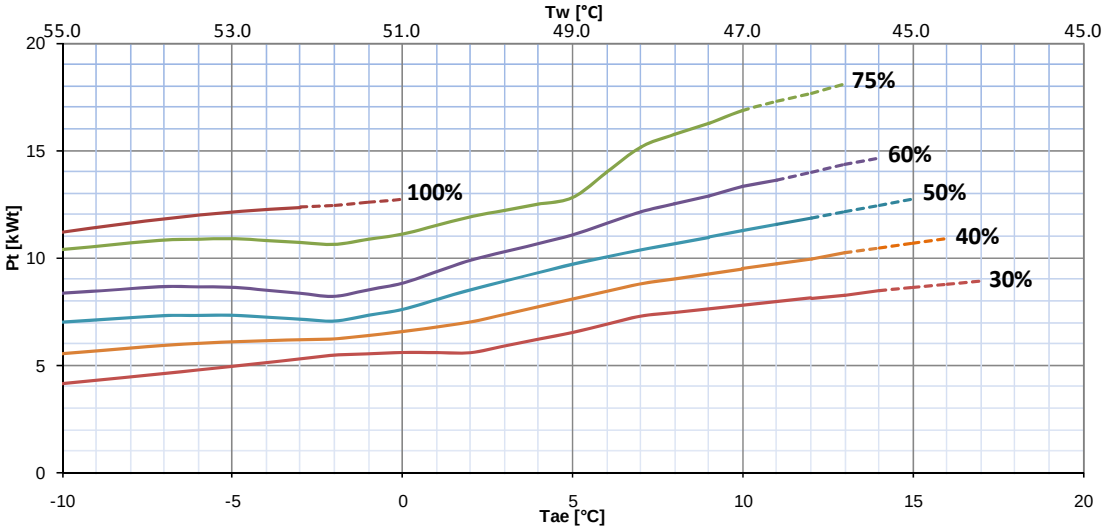
HEATING RADIATORS T_{design} –10°C

Performances in heating for radiators application, variable delivery water temperature based on the ambient temperature, design temperature –10°C.

HEATING CAPACITY



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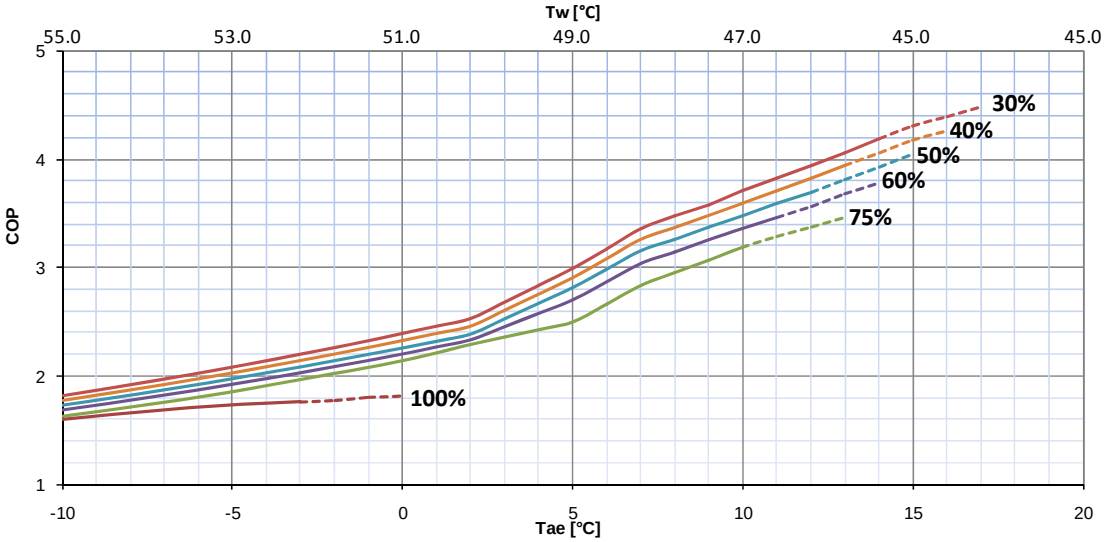

ELECTRIC POWER

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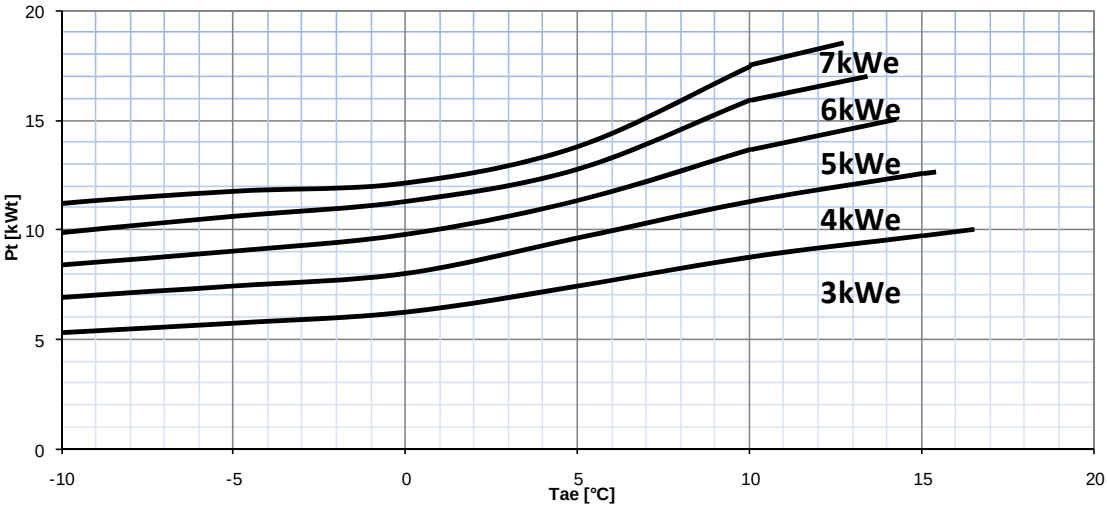

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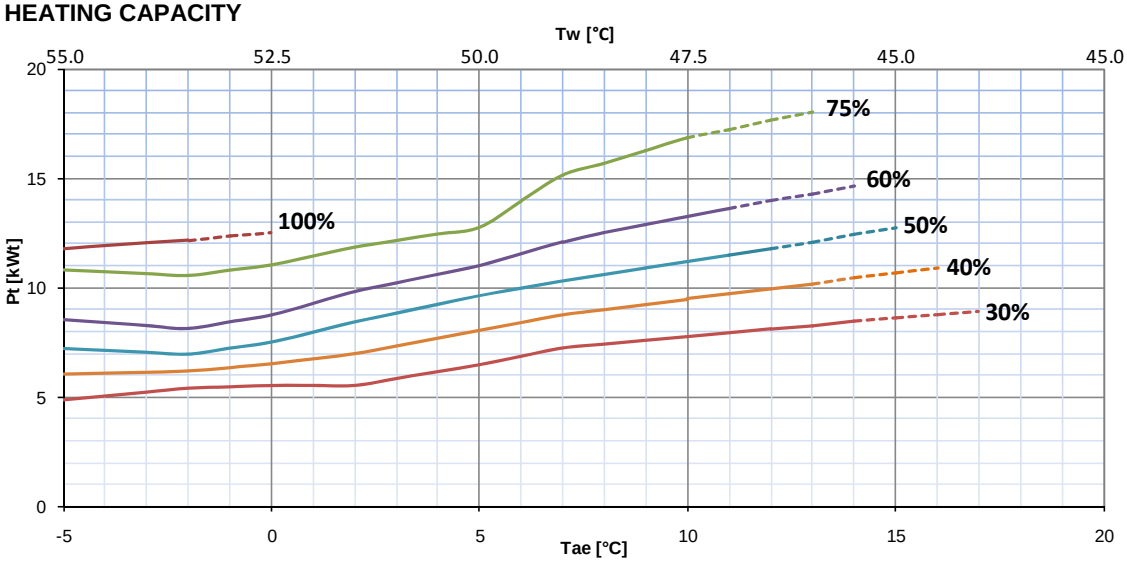
HEATING RADIATORS T_{design} –5°C

Performances in heating for radiators application, variable delivery water temperature based on the ambient temperature, design temperature –5°C.

HEATING CAPACITY



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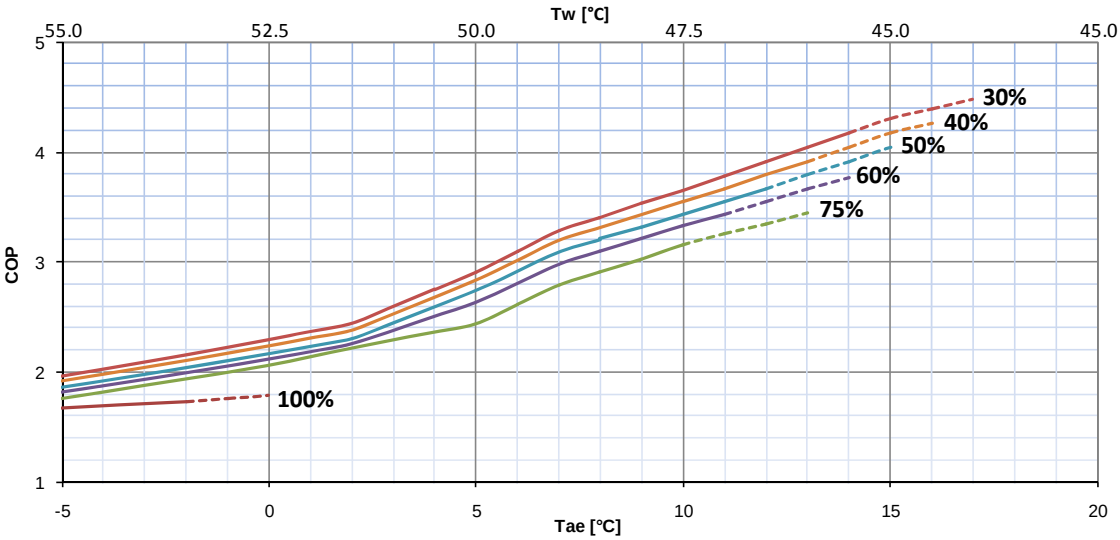
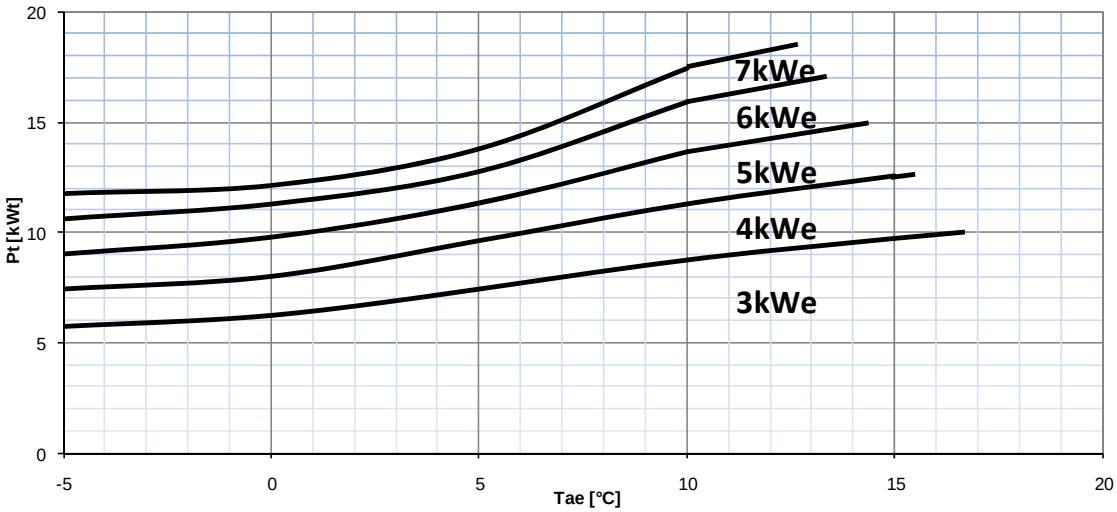


ELECTRIC POWER

Using the following chart, knowing the external air temperature, the requested heat capacity and the system load curve, the maximum electric power is identified that can be absorbed by the heat pump for the dimensioning of the meter.



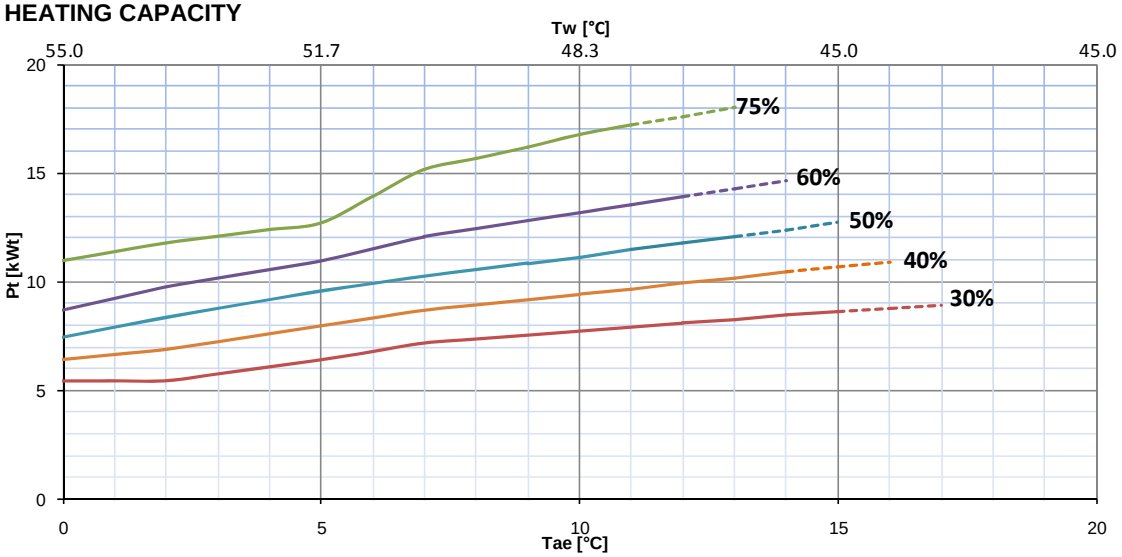
NOTES:
Pt = heat capacity supplied to the system
Tw = Produced water temperature
Tae = External air temperature

The performances refer to DeltaT=5°C
The heating capacity and COP data include defrosting.

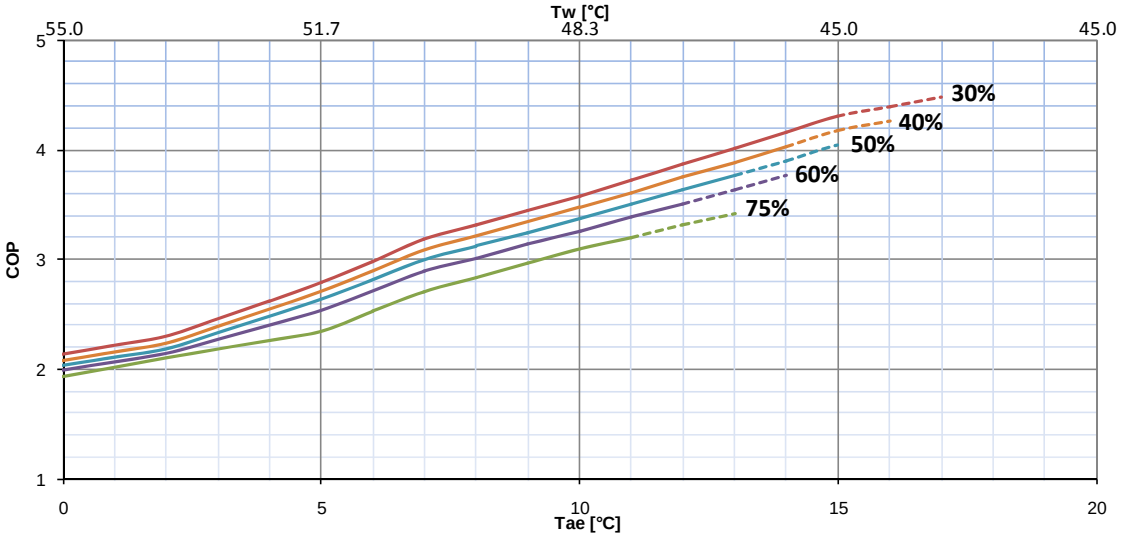
HEATING RADIATORS T_{design} 0°C

Performances in heating for radiators application, variable delivery water temperature based on the ambient temperature, design temperature 0°C.

HEATING CAPACITY

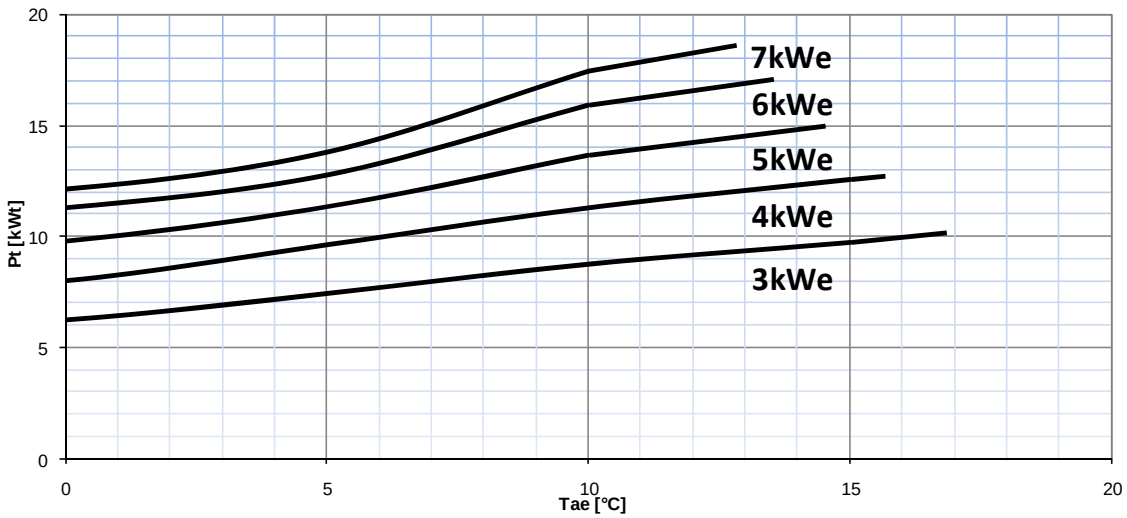


COP



ELECTRIC POWER

Using the following chart, knowing the external air temperature, the requested heat capacity and the system load curve, the maximum electric power is identified that can be absorbed by the heat pump for the dimensioning of the meter.



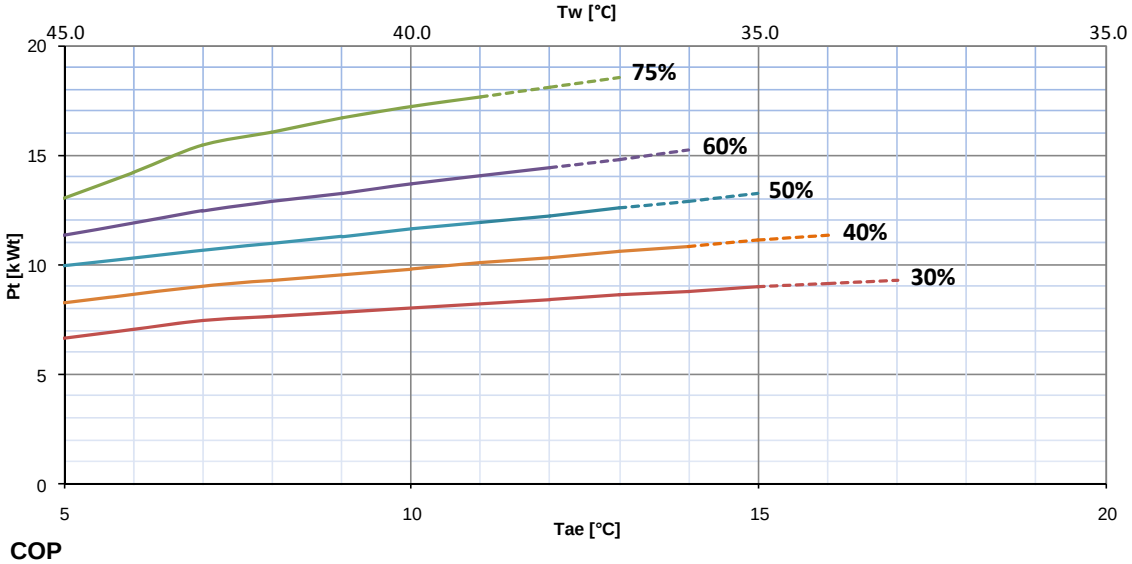
NOTES:
Pt = heat capacity supplied to the system
Tw = Produced water temperature
Tae = External air temperature

The performances refer to DeltaT=5°C
The heating capacity and COP data include defrosting.

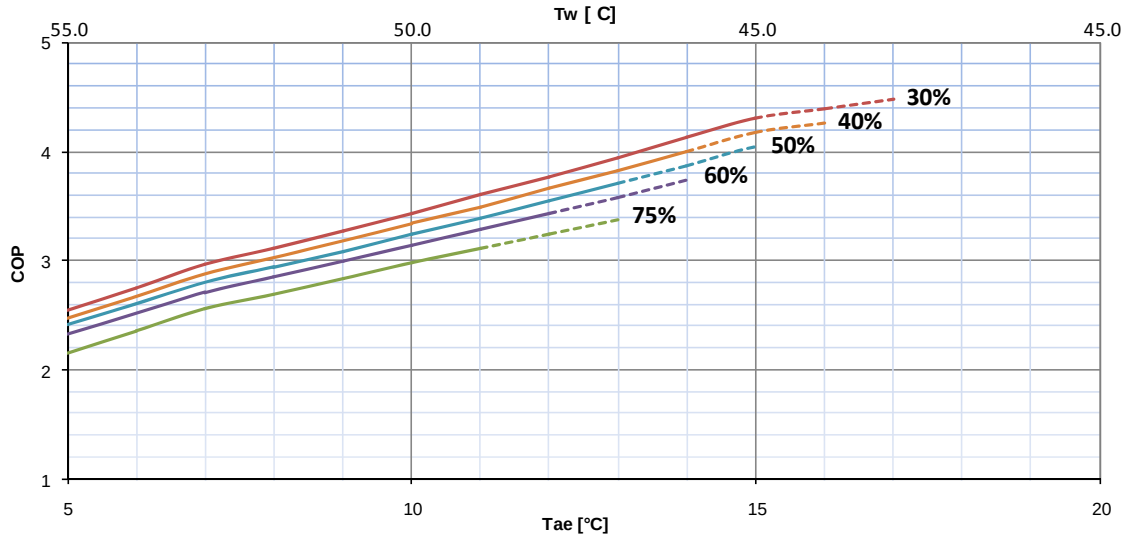
HEATING RADIATORS T_{design} +5°C

Performances in heating for radiators application, variable delivery water temperature based on the ambient temperature, design temperature +5°C.

HEATING CAPACITY

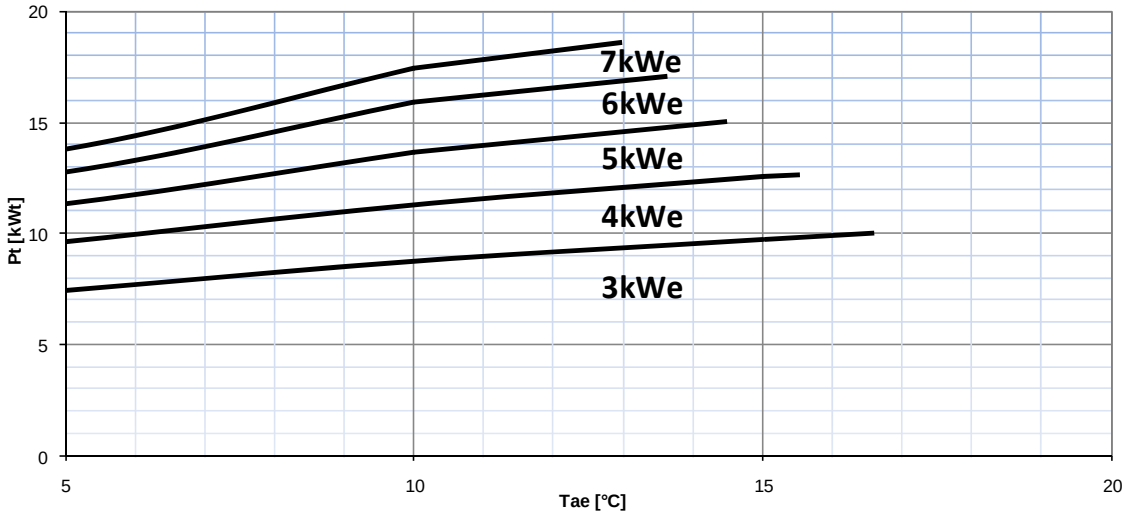


COP



ELECTRIC POWER

Using the following chart, knowing the external air temperature, the requested heat capacity and the system load curve, the maximum electric power is identified that can be absorbed by the heat pump for the dimensioning of the meter.



NOTES:
Pt = heat capacity supplied to the system
Tw = Produced water temperature
Tae = External air temperature

The performances refer to DeltaT=5°C
The heating capacity and COP data include defrosting.

DESIGNING CRITERIA IN COOLING

Input data to determine the GAIA Maxi performances
The energy performances (delivered cooling capacities, absorbed electrical powers and, therefore, efficiency) of GAIA Maxi depend on three sizes:

- external air temperature;
- system water delivery temperature;
- compressor partialisation.

EXTERNAL AIR TEMPERATURE

As the external air temperature drops the following increase:

- the heat pump's cooling capacity;
- the heat pump's efficiency (EER).

SYSTEM WATER DELIVERY TEMPERATURE

The efficiency of a heat pump in cooling mode is higher the higher the temperature of the water it produces.
In contrast to heating mode, the building's cooling load is not strictly dependent on the external air temperature, due to the contribution of internal heat sources and sunlight.
In the following graphs, we have not traced the building's cooling load curve.
It is thus not possible to associate with each external air temperature a system water temperature.
In the following examples, performance is determined in relation to a constant water temperature, depending only on the type of terminal and not the external air temperature (fixed point delivery).
Despite this, the GAIA Maxi's controller can vary the system water temperature to suit the building's actual cooling demand, thus enhancing its efficiency.

CALCULATION OF DELIVERY TEMPERATURE AS A FUNCTION OF DEWPOINT

If GAIA Maxi is used in applications with radiant panels for summer cooling, the water delivery temperature to radiant system is calculated in relation to the temperature and humidity detected by the ambient thermostats (HID-Ti4+HID-UR or HID-T3) managed by ELFOControl^2.

COMPRESSOR PARTIALISATION

IThe compressor with Inverter can run at variable speed to modulate the cooling capacity delivery to the building's actual requirements.
The heat pump's exchange surfaces are specified to optimise efficiency at nominal power.

When the GAIA Maxi, due to reduced system demand, reduces its power delivery, the exchanger surfaces are oversized for the actual power delivery and hence the system's efficiency increases.

The minimum partialisation is 30%; below which the unit operates intermittently.

The maximum compressor partialisation is 100% but this can be reduced when the limit function of the supplied power described at page 32, operates.

Such absorptions result in unjustifiable power draw and hence higher running costs.

Despite this limitation, the cooling capacity is sufficient to meet the building's requirements.

USE OF PERFORMANCE DATA IN COOLING

The following pages provide charts which can be used to obtain the following information in relation to the previously examined input data (external air temperature, produced water and compressor partialisation):

- cooling capacity delivered;
- energy efficiency ratio (EER);
- maximum electrical power absorption.

COOLING CAPACITY DELIVERED

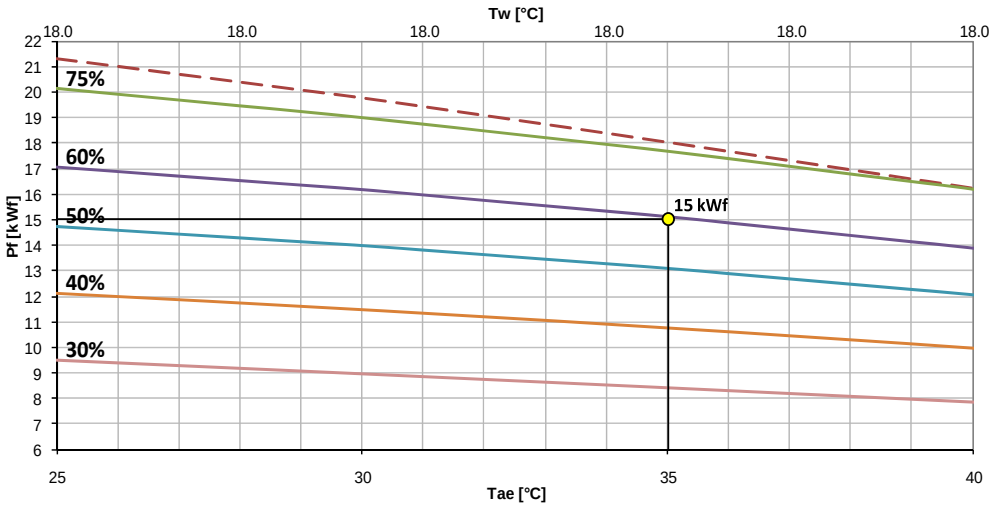
The following chart shows the cooling capacity delivered by the GAIA Maxi's evaporator, in kW, with produced water temperature constant and equal to 18°C, as a function of:

- external air temperature between:
  - **a minimum of 25°C**, taken as the minimum temperature for which a building may require cooling;
  - **a maximum of 40°C** taken as the maximum reachable temperature in location, even with Mediterranean climate.

- compressor speed as percent of maximum speed, between:
  - **a minimum of 30 %**, below which the compressor operates intermittently (ON/OFF);
  - **a variable maximum of 30% to 100%**, depending on the produced water temperature and any absorbed power limit.

Standard EN 14511 provides that the cooling capacity is that of the heat pump's evaporator, while the electrical power is given by the absorption of the compressor, of the external unit's fan and of the pumps.

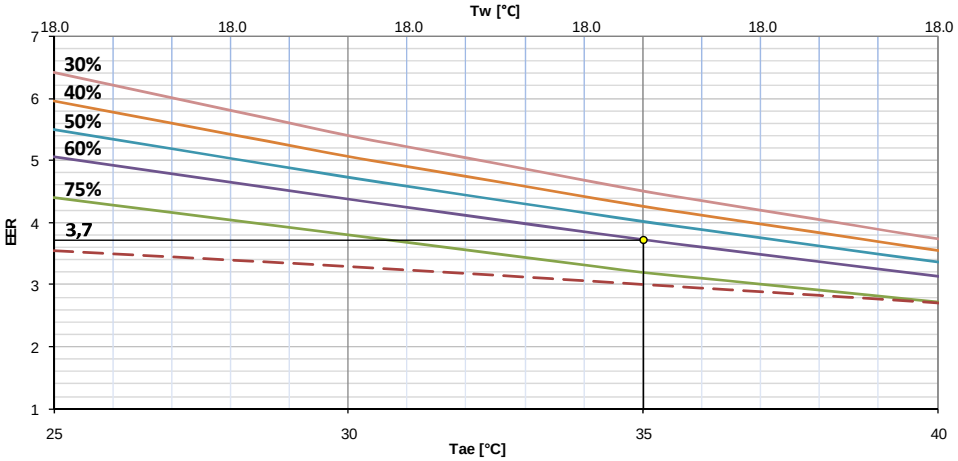
Given the building's cooling requirement, in relation with the external air temperature, we can obtain the compressor speed fraction from the following chart.
As an example, for a cooling load of 8.5 kW and external air temperature of 32 °C, the compressor partialisation is 75%.



Pf = cooling capacity supplied to the system
Tw = produced water temperature
Tae = external air temperatures

ENERGY EFFICIENCY RATIO (EER)

The following chart gives the heat pump's energy efficiency ratio (EER) as a function of the same three conditions examined above (external air temperature, compressor partialisation, produced water temperature).
In the previous example, given the external air temperature (32°C) and using the partialisation given in the preceding chart (75%), we can obtain the heat pump's COP which, in this case, is equal to 3.8.



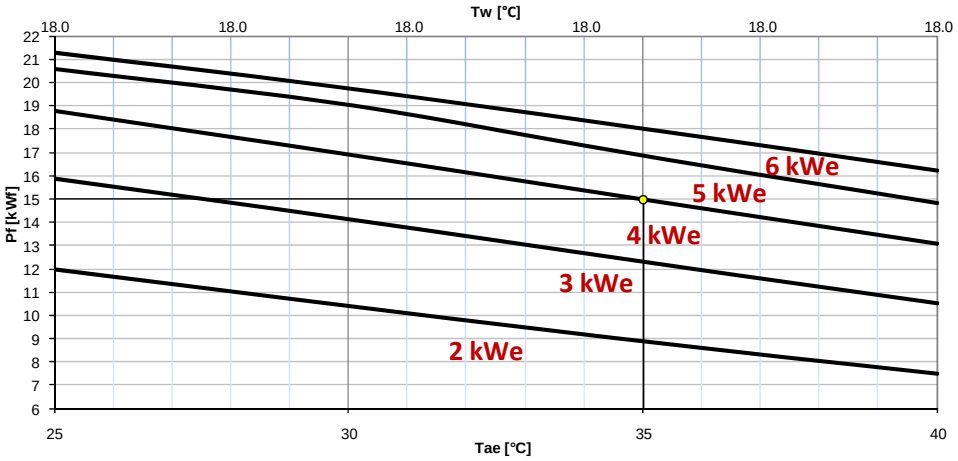
EER = energy efficiency in cold
Tw = produced water temperature,
Tae = external air temperatures

MAXIMUM ABSORBED ELECTRIC POWER

In the following chart, given the building's cooling load, we can also obtain the maximum electrical absorption of the heat pump in order to specify the meter, to which we must add, if necessary:

- other devices, for example, active thermodynamic recovery systems for the ejected air;
- other loads (for instance, for domestic appliances and services).

In the example, for an external air temperature of 35°C and cooling load of 15 kW, the maximum electrical absorption is 4 kWe.



Pf = cooling capacity supplied to the system
Tw = produced water temperatures
Tae = external air temperatures

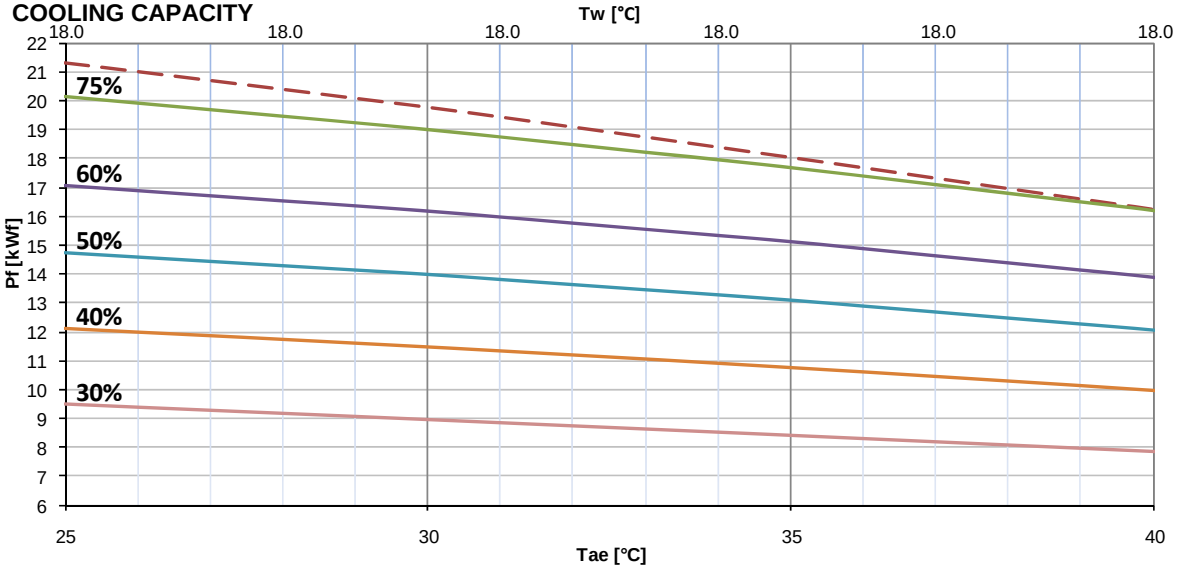
DIMENSIONING CRITERIA OF GAIA-MAXI AIR IN COOLING

After having checked the heat pump's rating in heating mode we must also determine whether in cooling mode, at the various air and water temperatures, the heat pump has a cooling capacity greater than, or at least equal to, the building's requirement.
In the case of the GAIA Maxi, if the design heat load is greater than the heating capacity, in the same conditions, we can still install the unit, with additional equipment.
One possible option is an active thermodynamic recuperator, the principle of which is explained in the heating section.
When operating in cooling mode, furthermore, the recovery unit not only refreshes the air but also dehumidifies it, thus cooling the room with radiant surfaces.

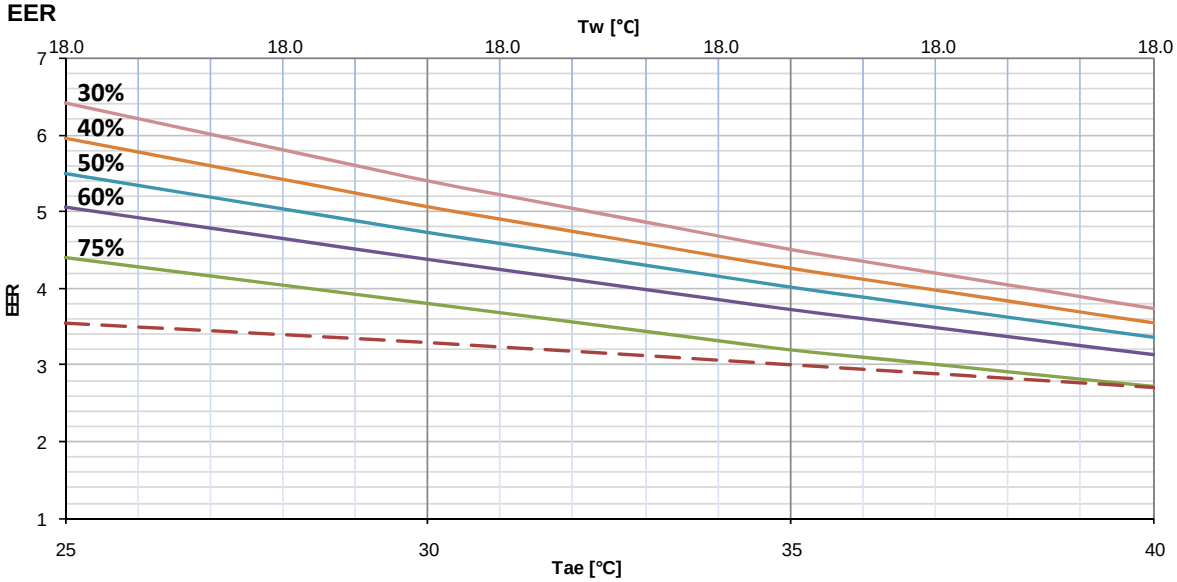
COOLING RADIANT PANELS T_{supply} 18°C

Performances in cooling for radiant panels application, delivery water temperature set at 18°C.

COOLING CAPACITY

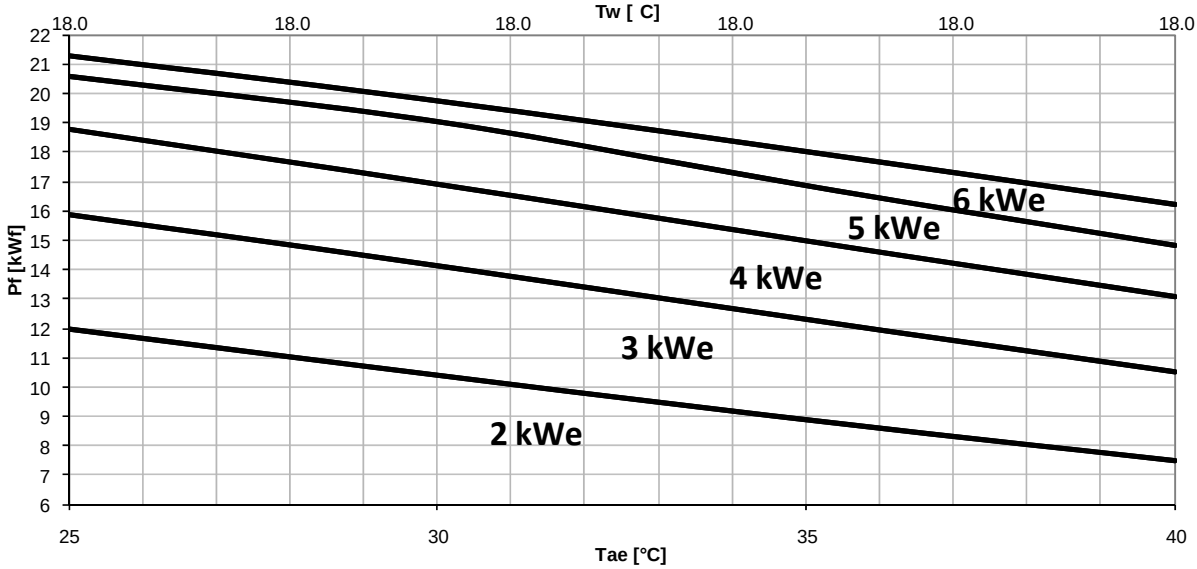


EER



ELECTRIC POWER

Using the following chart, knowing the external air temperature, the requested cooling capacity and the system load curve, the maximum electric power is identified that can be absorbed by the cooling circuit for the dimensioning of the meter.



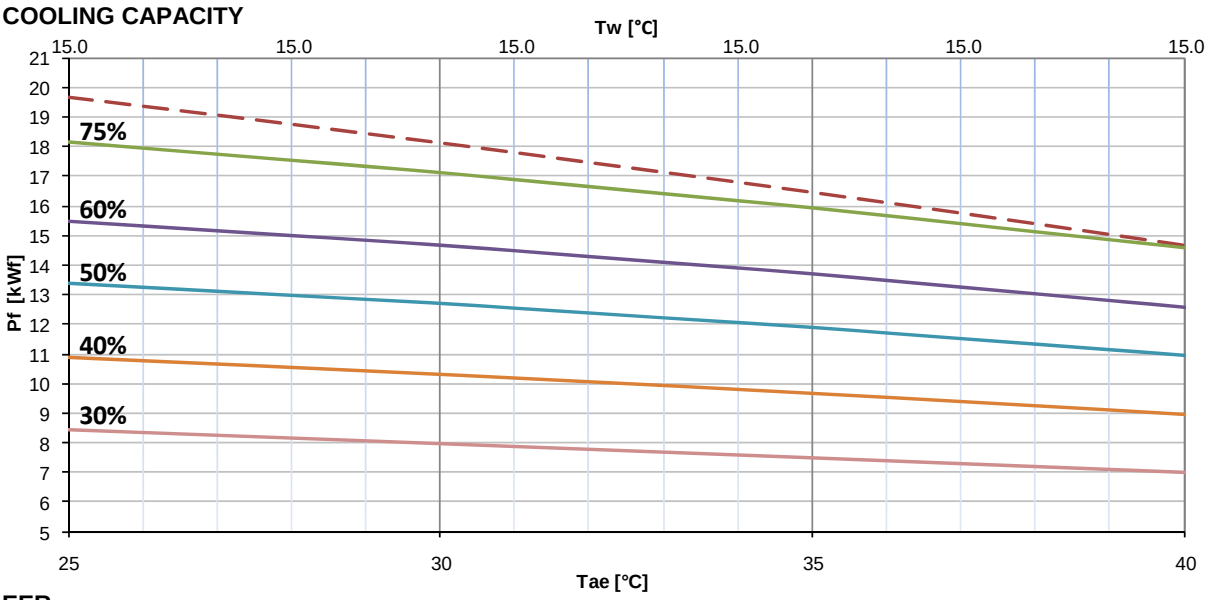
NOTES:
Pf = cooling capacity supplied to the system
Tw = Produced water temperature
Tae = External air temperature

The performances refer to DeltaT=5°C

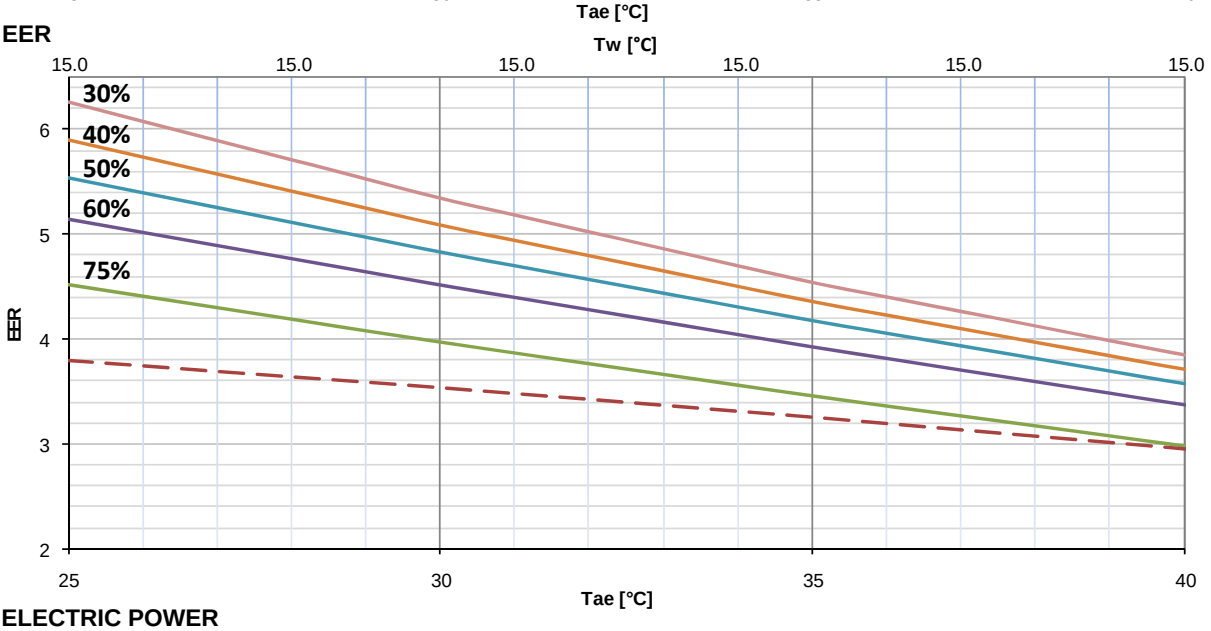
COOLING RADIANT PANELS T_{supply} 15°C

Performances in cooling for radiant panels application, delivery water temperature set at 15°C.

COOLING CAPACITY

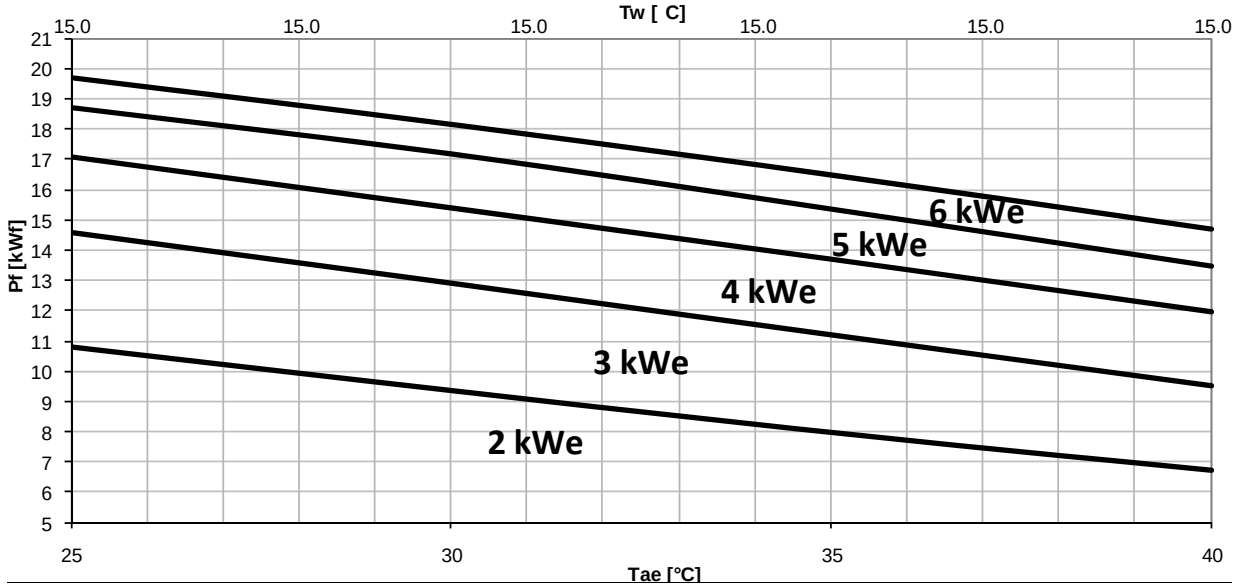


EER



ELECTRIC POWER

Using the following chart, knowing the external air temperature, the requested cooling capacity and the system load curve, the maximum electric power is identified that can be absorbed by the cooling circuit for the dimensioning of the meter.



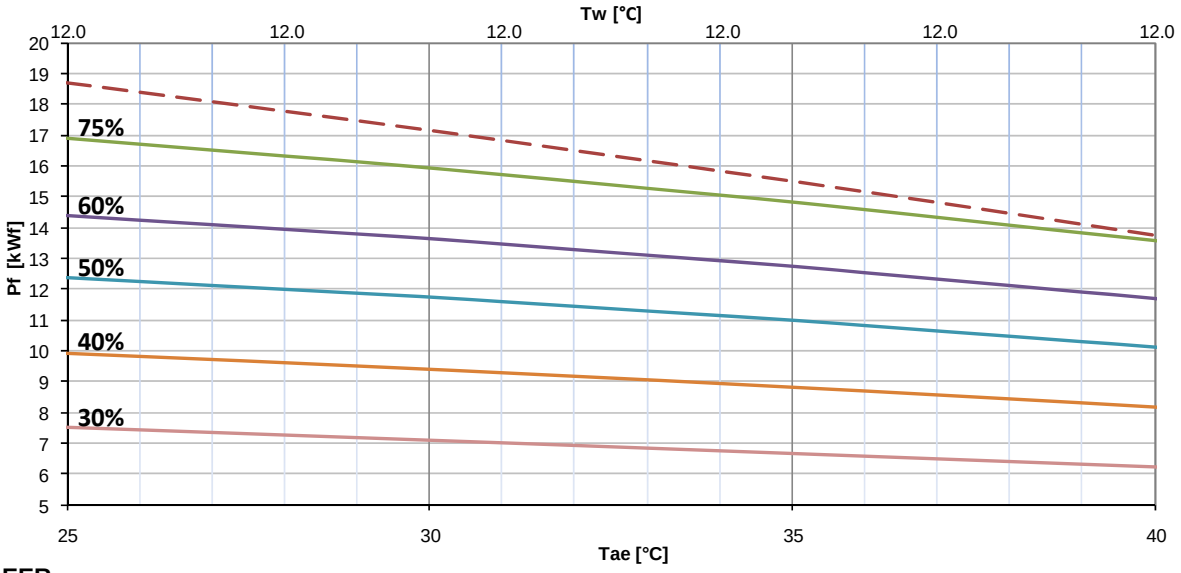
NOTES:
Pf = cooling capacity supplied to the system
Tw = Produced water temperature

Tae = External air temperature
The performances refer to DeltaT=5°C

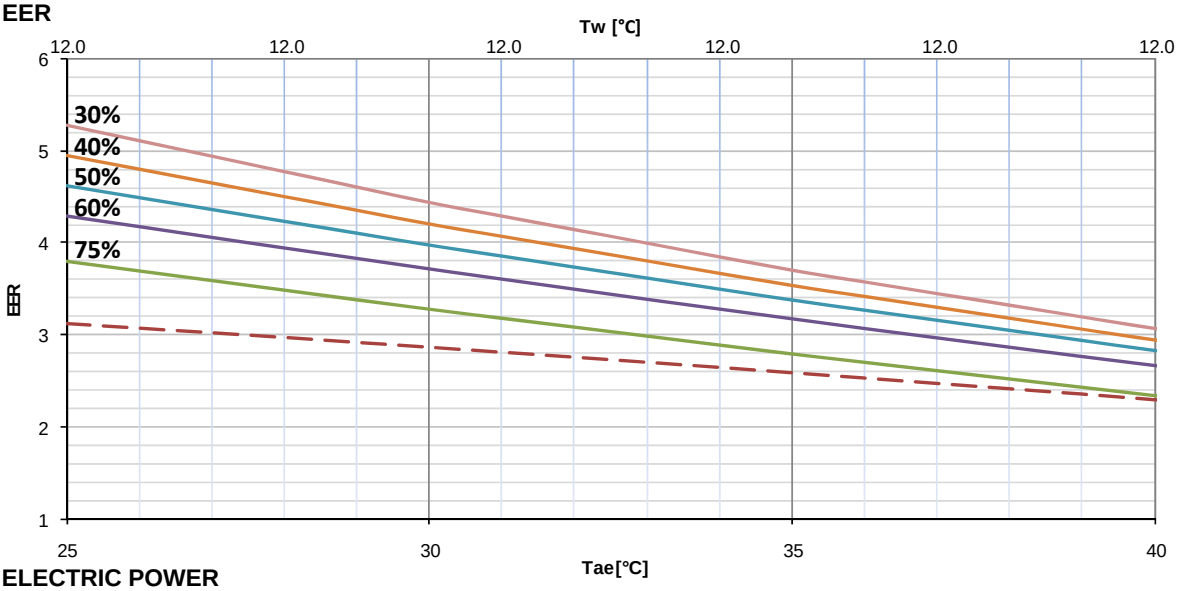
COOLING ELFO TERMINAL UNITS T_{supply} 12°C

Performances in cooling for terminal units application, delivery water temperature set at 12°C.

COOLING CAPACITY

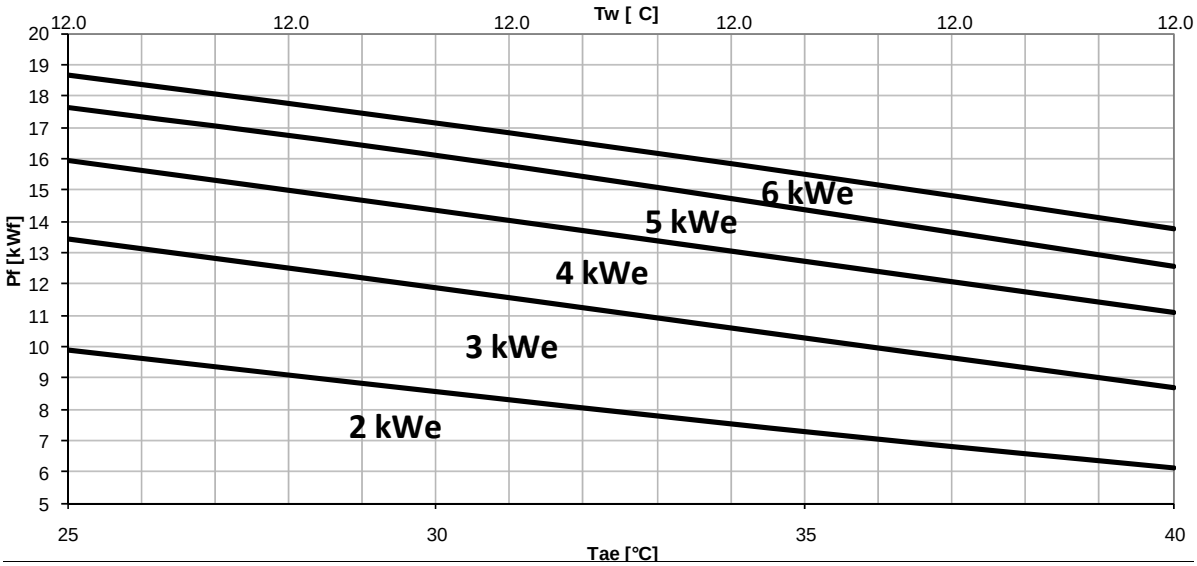


EER



ELECTRIC POWER

Using the following chart, knowing the external air temperature, the requested cooling capacity and the system load curve, the maximum electric power is identified that can be absorbed by the cooling circuit for the dimensioning of the meter.

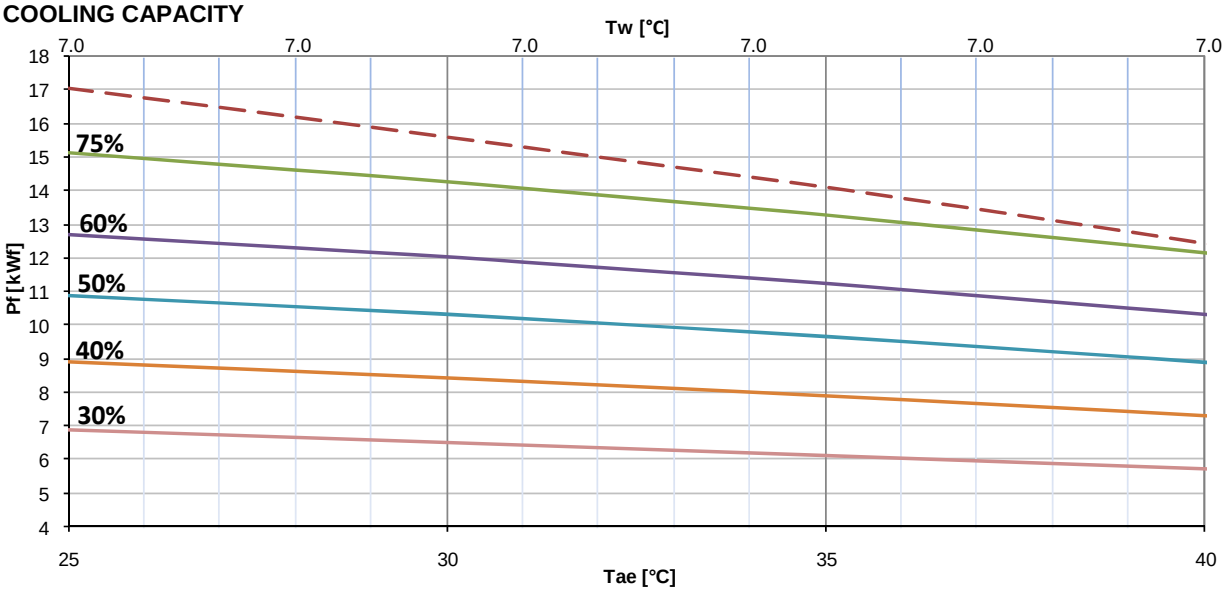


NOTES:
Pf = cooling capacity supplied to the system
Tw = Produced water temperature
Tae = External air temperature
The performances refer to DeltaT=5°C

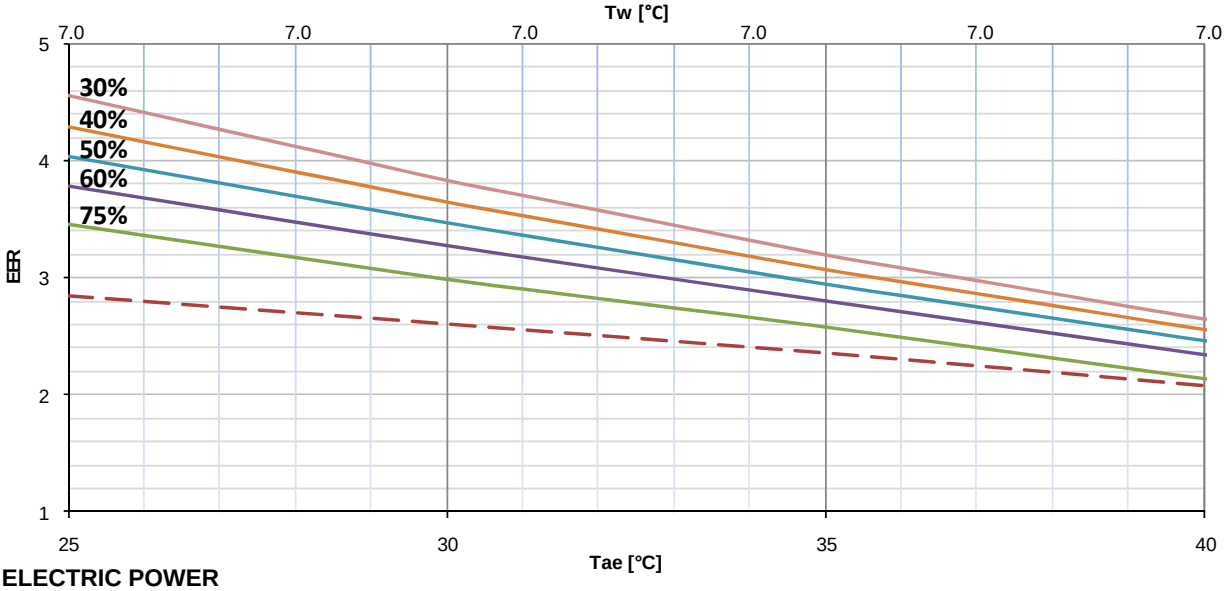
COOLING ELFO TERMINAL UNITS T_{supply} 7°C

Performances in cooling for terminal units application, delivery water temperature set at 7°C.

COOLING CAPACITY

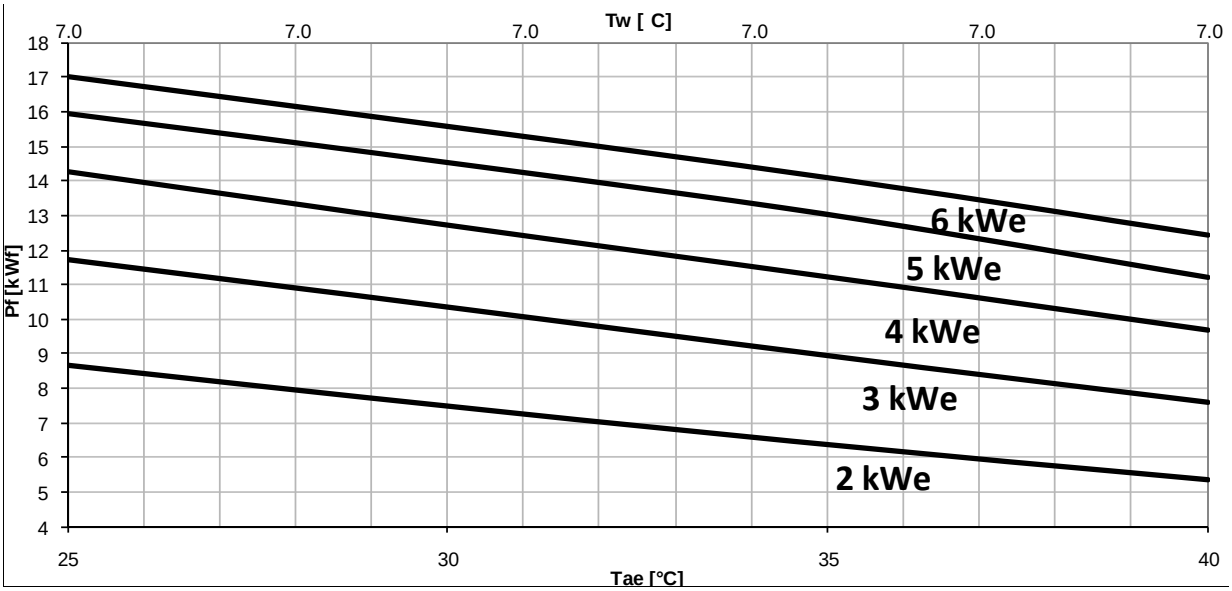


EER



ELECTRIC POWER

Using the following chart, knowing the external air temperature, the requested cooling capacity and the system load curve, the maximum electric power is identified that can be absorbed by the cooling circuit for the dimensioning of the meter.



NOTES:
Pf = cooling capacity supplied to the system
Tw = Produced water temperature
Tae = External air temperature
The performances refer to DeltaT=5°C

DOMESTIC HOT WATER PRODUCTION

THE HYDRAULIC COMPONENTS FOR MANAGING THE DOMESTIC WATER

GAIA Maxi has a 280-litre domestic hot water storage tank that is heated always favouring the heat energy captivated through the thermal solar panels, when present.
If the captivated solar energy is insufficient or there are no solar panels, the domestic hot water is produced through the heat pump.

GAIA Maxi has a connection for the main water that works:

- as manual system load with relative gauge and safety valve
- and as re-integration of the domestic hot water with relative safety valve.

There is a thermostatic valve that can be manually calibrated with burn proof function on the domestic hot water delivery towards the system, again inside the GAIA Maxi.
The burn proof function consists, in case of sudden cold water at inlet loss, in the mixer intervening, immediately closing the hot water passage thus avoiding dangerous scalding.
The domestic water present inside the storage tank is heated and maintained at temperature, through two specific external plate exchangers, easily replaceable and of higher exchange efficiency compared to traditional coil drowned in the storage tank, one dedicated to thermal solar panel and one to heat pump.
Using a special DC circulator, which also recirculates the domestic water, prevents excessive stratification of the storage tank water for increased available power and a larger amount of water available for use.
This gives us an availability of domestic water equivalent to that of a 500 l storage tank with temperature stratification.

THE PRODUCTION OF DOMESTIC WATER WITH PRIORITY ON THERMAL SOLAR

The adjustment logic favours the production of domestic water with solar panels.
Through a temperature sensor complete of cable to be positioned on the solar panel, GAIA Maxi checks whether the water temperature, heated by solar panel, is ideal for heating the domestic water based on the temperature of the lower part of the storage tank.

When the domestic water is heated through the solar panels, it is taken to a settable set-point temperature up to a maximum of 80°C. This set-point is specific for production with solar.
Different is the set-point, settable up to a maximum of 55°C, for the domestic water produced by heat pump or boiler.

This logic allows storing more energy through the solar panels, therefore for free, compared to that stored through heat pump.
Based on the solar panel surface and with the above-said logic, the domestic water production is also totally covered during the summer season.
If solar panels are not present, GAIA Maxi sees to the production of domestic water only through the heat pump, both during winter and summer.
All this happens through reload cycles, at settable times normally at night and, if also requested during the day, favouring the moments in which there is no request of heating capacity for the heating or cooling system.

THE ANTI-LEGIONELLOSIS CYCLE

In the GAIA Maxi's adjustment, the sanitisation cycle can be activated through a complete reload of the storage tank, at the maximum temperature possible.
The final heat shock happens thanks to the integration condensing boiler of GAIA Maxi.
If the heat pump is out of service, the production of domestic hot water is guaranteed through the integration boiler.

USE OF DOMESTIC HOT WATER PRODUCTION PERFORMANCE CURVES

Known the maximum absorbed electric power (the maximum value between that for heating and cooling), use the first chart below to determine, for a given ambient temperature, the heating capacity which can be delivered by the heat pump.
The heating capacity calculated in this way enables us to determine the DHW storage tank recharge time in relation to its volume (280 litres) and the water heat differential.

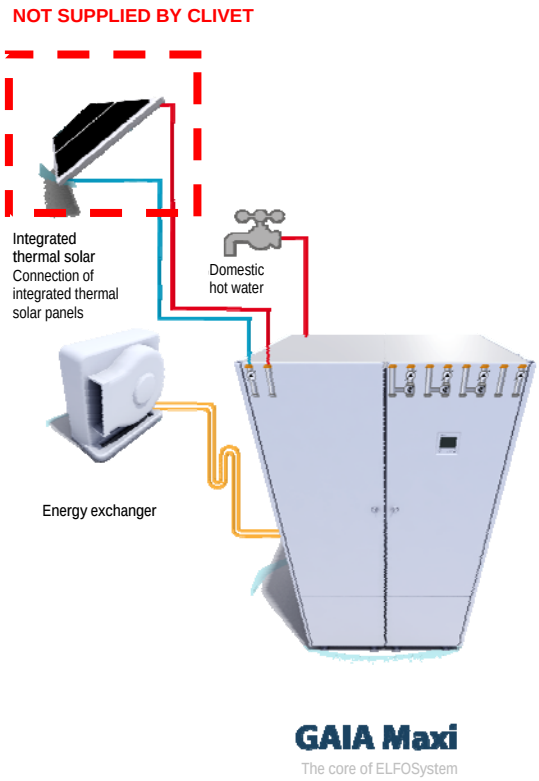
The maximum temperature of the water inside the storage tank can be produced through the heat pump is of 55°C.
To ensure a better production efficiency and so reduce operation costs, it is recommended to set the setpoint of the domestic hot water between 48-50°C.

The following charts give the heating power delivery of the GAIA Maxi's condenser, in kW, as a function of:

- external air temperature between a minimum value of -22°, equal to lower functioning limit of the unit, and a maximum value of 40°C taken as maximum temperature that can be reached in location, even in Mediterranean climate;
- meter power defined as maximum power in heating and cooling mode;
- compressor speed as percent of maximum speed, equal to average power supplied as indication of performance.

GAIA Maxi, when producing domestic hot water, modulates the compressor speed in relation to the storage tank water temperature.
The lower this temperature the higher the power draw on the heat pump and hence compressor speed required to quickly bring the water back up to temperature.

CONNECTION TO DRAIN SOLAR PANELS



The dimensioning of the drain thermal solar manifolds surface for the production of domestic hot water, must happen following the technical standard of sector.

General dimensioning rules that must not replace the design activity, foresee a surface of the flat solar manifolds per person equal to:

- 1.2 m^2/person in areas with reduced solar radiation (e.g. North of Italy);
- 1 m^2/person in areas with medium solar radiation (e.g. Centre of Italy);
- 0.8 m^2/person in areas with high solar radiation (e.g. South of Italy).

Such rules of approximation would allow coverage of about 50% of the annual requirement for primary energy requested for the production of domestic hot water.

With its 280-litre storage tank and a solar panel surface around 6 m², GAIA Maxi is able to cover the domestic hot water requirement for a family of 5 persons with a daily consumption of about 55 l/(day per person).

The use of an additional storage tank is not possible and, however, not necessary: the integration gas boiler supplied in the standard configuration of the unit, allows to continuously draw the domestic hot water at maximum capacity of 15 l per minute (example: with re-integration water at 13°C and ambient temperature of 7°C, GAIA Maxi allows continuously drawing the hot water at a minimum temperature of 38°C).

GAIA Maxi guarantees priority of domestic hot water production to solar panels; should the ratio of the solar not be sufficient to heat the domestic water, it is directly produced by the heat pump.

The capacity of the solar exchanger installed in GAIA is **3186 W/K.**

The maximum domestic water temperature in the storage tank is of 85°C (Controlled by a safety thermostat).

The maximum domestic water temperature that can be obtained with the heat pump is of 55°C (See functioning limits) In case of fault of the cooling circuit or to complete the anti-legionellosis cycle in replacement of compressor, the integration condensing boiler intervenes.

Note: if the unit is equipped with the solar option, a 24-litre expansion tank must be added on the domestic water line.

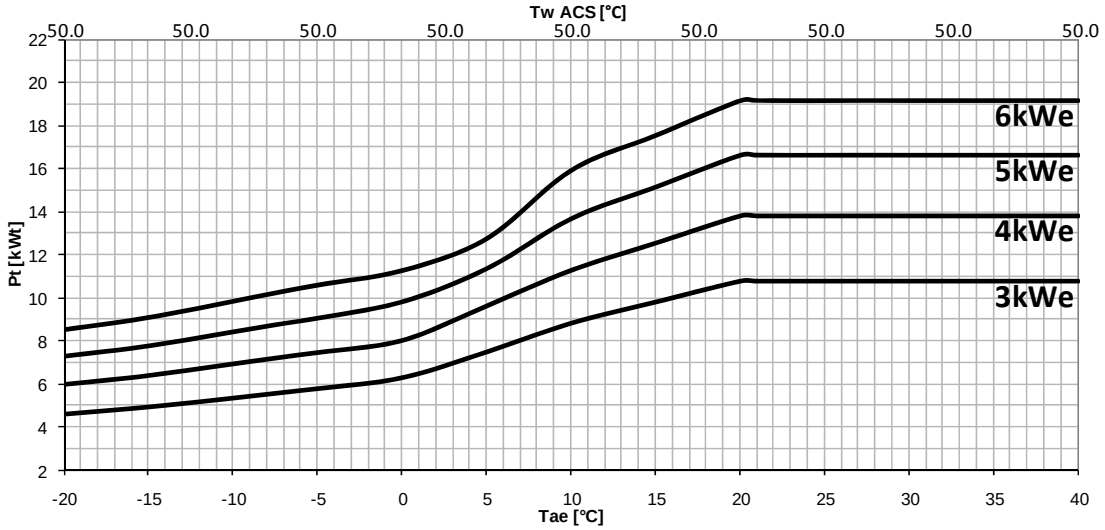
The solar panels system are activated when the storage tank temperature is below that of the water produced by the panels.

The temperature probe of the adjustment control unit of the solar panels must be positioned in the relative shaft of the GAIA storage tank.

DOMESTIC HOT WATER T_{supply} 50°C

Performances in domestic hot water production at 50°C

ELECTRIC POWER



COP

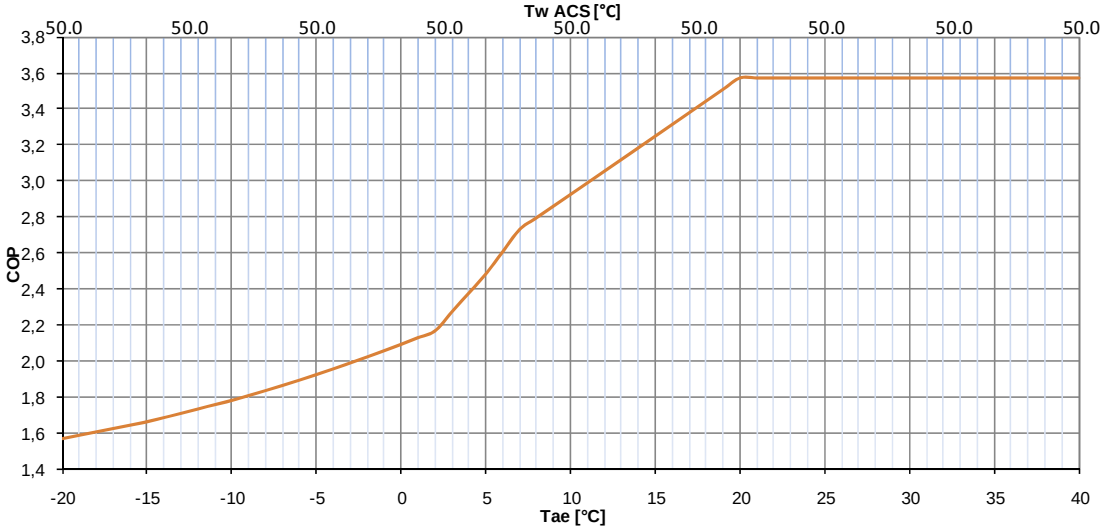
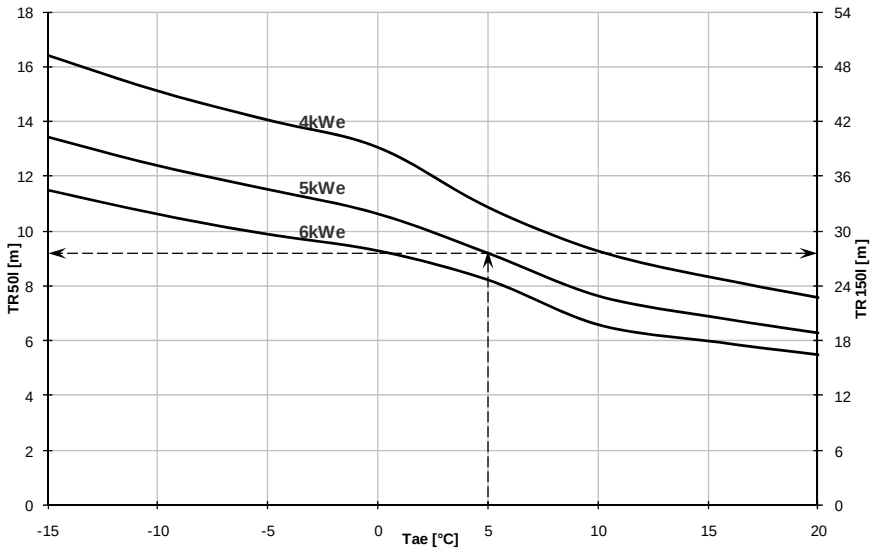


CHART FOR IDENTIFYING THE RE-INTEGRATION TIME OF THE DOMESTIC WATER BASED ON MAXIMUM ELECTRIC POWER AVAILABLE TO THE UNIT



In the chart at the side it is possible to identify the time necessary to re-integrate the domestic water, based on the maximum electrical power available for the unit.

Tmrs50l = Make up time following consumption of 50 litres of domestic water (shower), in minutes .

Tmrs150l = Make up time following consumption of 150 litres of domestic water (bath), in minutes.

Tae = External air temperature °C.

Data referred to:
- Water mains temperature: 10°C.
- DHW temperature: 50°C.
- Drawn water temperature: 40°C

Example:
Let us assume from the previous example that the maximum electrical power is 5kW.
With the external air temperature at 5°C, the re-integration time after a shower (50 l) is just above 9 minutes, whereas in case of a bath (150 l), the re-integration time is of about 27 minutes.

The make up time calculation does NOT consider heat production by solar panels.

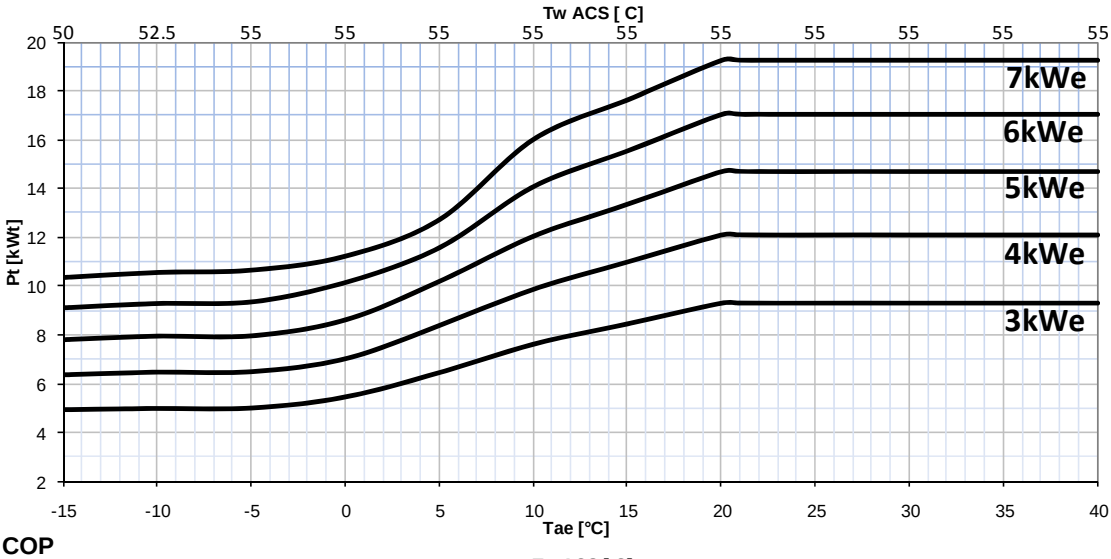
NOTES:
Pt = heat capacity for domestic water
TwACS = Produced domestic water temperature
Tae = External air temperature

Pel = Maximum electrical power necessary
The heating capacity and COP data include defrosting

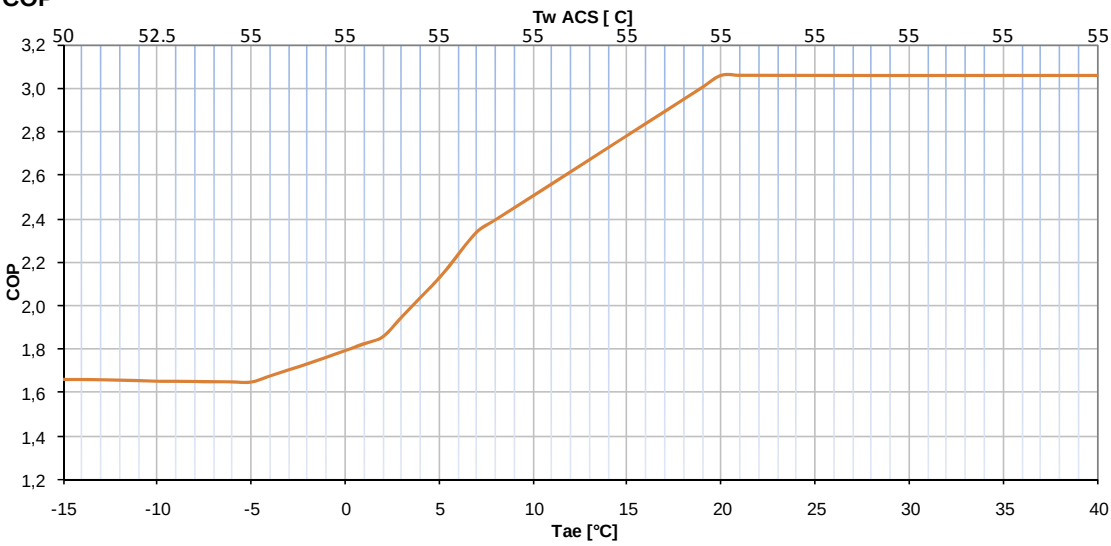
DOMESTIC HOT WATER T_{supply} 55°C

Performances in domestic hot water production at 55°C

ELECTRIC POWER

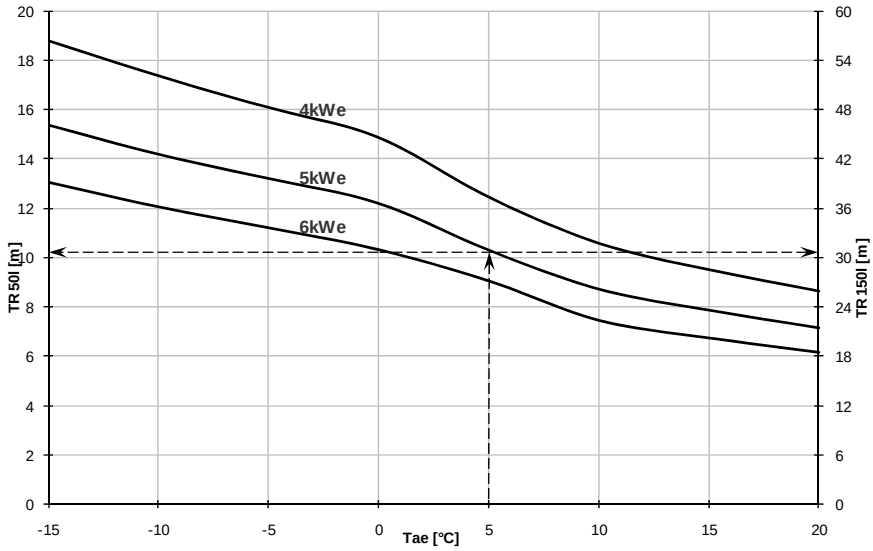


COP



Note: the Electric Power and COP charts show TwACS values below 55°C for external air temperature (Tae) below -5°C as shown at page 19 with regard to GAIA Maxi functioning limits.

CHART FOR IDENTIFYING THE RE-INTEGRATION TIME OF THE DOMESTIC WATER BASED ON MAXIMUM ELECTRIC POWER AVAILABLE TO THE UNIT



In the chart at the side it is possible to identify the time necessary to re-integrate the domestic water, based on the maximum electrical power available for the unit.

Tmrs50l = Make up time following consumption of 50 litres of domestic water (shower), in minutes .

Tmrs150l = Make up time following consumption of 150 litres of domestic water (bath), in minutes.

Tae = External air temperature °C.

Data referred to:
- Water mains temperature: 10℃.
- DHW temperature: 55℃.
- Drawn water temperature: 40°C

Example:
Let us assume from the previous example that the maximum electrical power is 5kW.
With the external air temperature at 5°C, the re-integration time after a shower (50 l) is just above 9 minutes, whereas in case of a bath (150 l), the re-integration time is of about 27 minutes.

The make up time calculation does NOT consider heat production by solar panels.

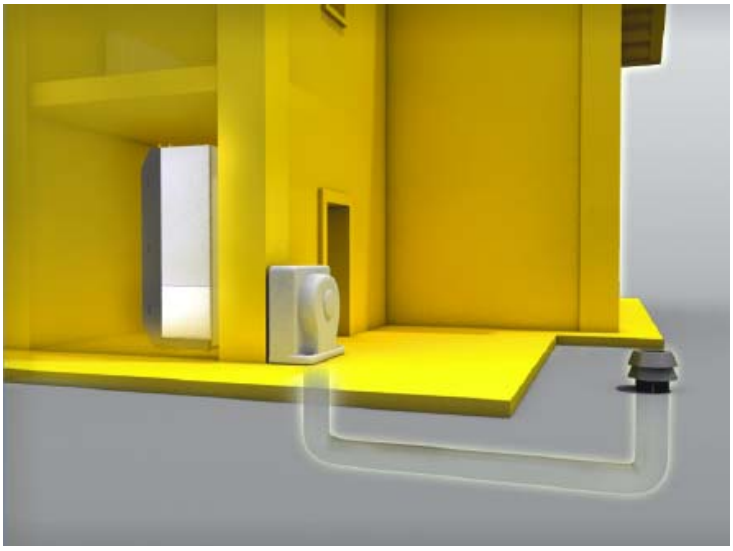
NOTES:
Pt = heat capacity for domestic water
TwACS = Produced domestic water temperature
Tae = External air temperature

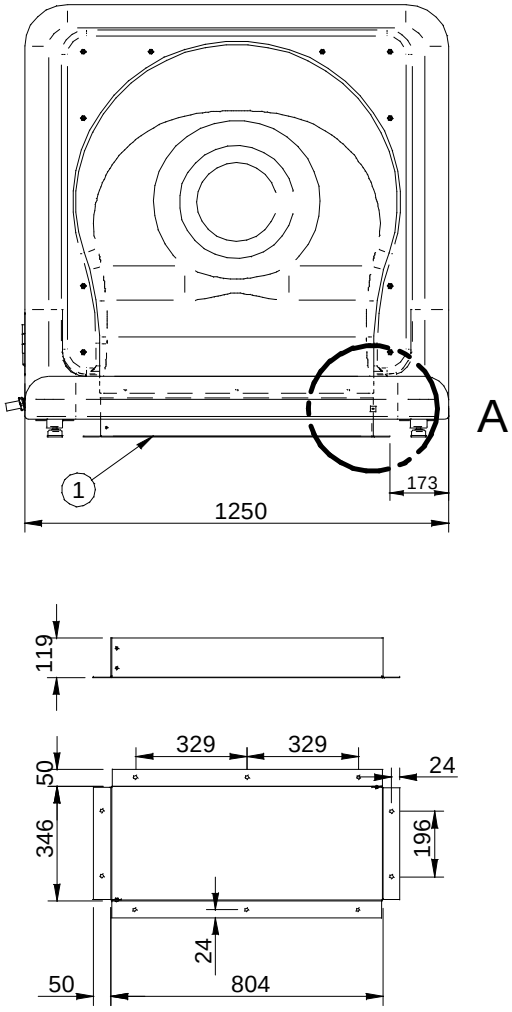
Pel = Maximum electrical power necessary
The heating capacity and COP data include defrosting

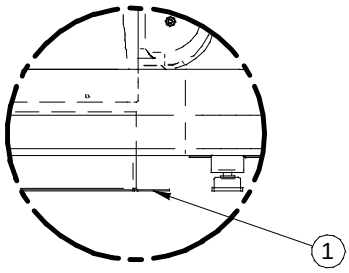
ACCESSORIES

FDCCX - Connection flange with underground air ejection channel

This accessory allows connecting the air ejection of the energy exchanger, to an underground channel by simply turning the casing of the unit downwards. The flange must be directly fixed on the underground channel, whereas mounted on the opposite edge is the gasket supplied with the accessory, as shown in the diagram below.

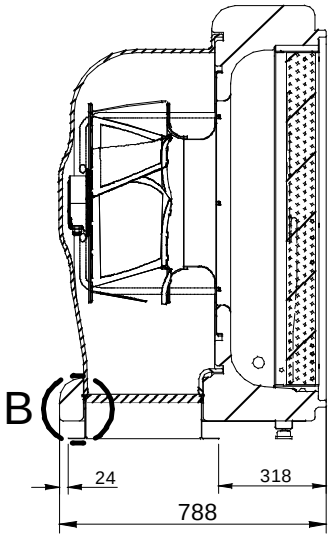


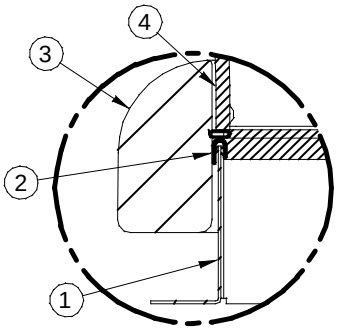




DETT. A

(1) CONNECTION FLANGE WITH UNDERGROUND CHANNEL
(2) SEAL GASKET BETWEEN FLANGE
(3) UNIT SUPPORTING STRUCTURE
(4) ADJUSTABLE AIR EJECTION HOOD





DETT. B

accessory supplied separately

(KIR..X) Booster kits supplied separately

In the standard configuration, GAIA Maxi provides a DC pump towards the system, and it has been designed to incorporate, as an option, up to four hydraulic circuits with their own DC pump and mixer valve to control up to four different zones, even at different temperatures.

The following configurations are possible:

KIRS = 1 zone : the standard configuration with 1 pump. The delivery water temperature is that produced directly by the GAIA unit.

KIR1SAP = 1 zone : it is the configuration with high static pressure pump, in replacement of the KIRS standard pump, at high temperature for the first zone. The delivery water temperature is that produced directly by the GAIA unit.

KIR2H = 2 zones : the 2 pump configuration. The delivery water temperature, for both circuits, is that produced directly by the GAIA unit.

KIR2HL = 2 zones (one of which is mixed): the configuration with 2 pumps and 1 mixer on the 2nd circuit. The delivery water temperature, for the 1st circuit, is that produced directly by the GAIA unit. The supply water temperature of the second circuit, is always equal to or lower than that of the first circuit in heating and cooling, through action of the mixer valve.

KIR3H = 3 zones : the 3 pump configuration. The delivery water temperature, for all circuits, is that produced directly by the GAIA unit.

KIR3HLL = 3 zones (two of which are mixed): the configuration with 3 pumps and 2 mixers on the 2nd and 3rd circuits. The delivery water temperature, for the 1st circuit, is that produced directly by the GAIA unit. The delivery temperatures of the 2nd and 3rd circuits, are always equal to or lower than that of the 1st circuit in heating or equal to or higher than that of the 1st circuit in cooling, due to the action of the mixer valve.

KIR3HHL = 3 zones (one of which is mixed): the configuration with 3 pumps and 1 mixer on the 3rd circuit. The delivery water temperature, for the first and second circuit, is that produced directly by the GAIA unit. The delivery temperature of the third circuit, is always equal to or lower than that of the 1st circuit in heating or equal to or higher than that of the 1st circuit in cooling, due to the action of the mixer valve.

KIR4H = 4 zones: the 4 pump configuration. The delivery water temperature, for all circuits, is that produced directly by the GAIA Maxi unit.

KIR4HHHL = 4 zones (one of which is mixed): the configuration 4 pumps and 1 mixer on the 4th circuit. The delivery water temperature, for the first, second and third circuit, is that produced directly by the GAIA unit. The delivery temperature of the fourth circuit, is always equal to or lower than that of the 1st circuit in heating or equal to or higher than that of the 1st circuit in cooling, due to the action of the mixer valve.

KIR4HHLL = 4 zones (two of which are mixed): the configuration with 4 pumps and 2 mixers on the 3rd and 4th circuits. The delivery water temperature, for the first and second circuit, is that produced directly by the GAIA unit. The delivery temperature of the third and fourth circuit, is always equal to or lower than that of the 1st circuit in heating or equal to or higher than that of the 1st circuit in cooling, due to the action of the mixer valves.

KIR4HLLL = 4 zones (three of which are mixed): the configuration with 4 pumps and 3 mixers on the 2nd, 3rd and 4th circuits. The delivery water temperature, for the 1st circuit, is that produced directly by the GAIA unit. The delivery temperature of the second, third and fourth circuit, is always equal to or lower than that of the 1st circuit in heating or equal to or higher than that of the 1st circuit in cooling, due to the action of the mixer valves.

Configuration detail

(KIR..X) Booster kits supplied separately

If the unit is ordered only with standard booster (KIR1), it is possible to request additional boosters, even supplied separately. The necessary accessories are:

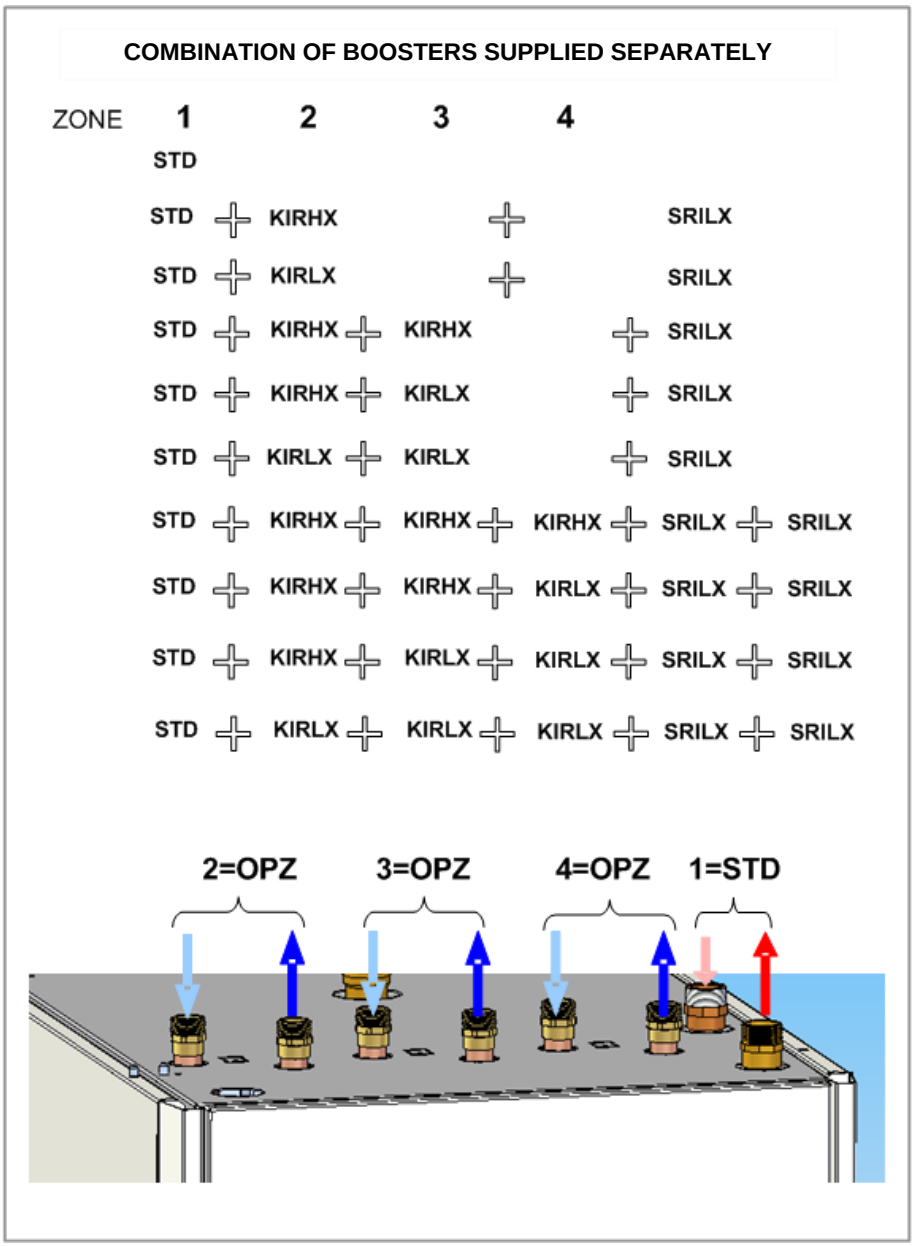
Single booster not mixed (KIRHX)
Composed by DC circulator and relative supply and return probes.

Single booster mixed (KIRLX)
Composed by DC circulator, three-point mixer valve and relative supply and return probes.

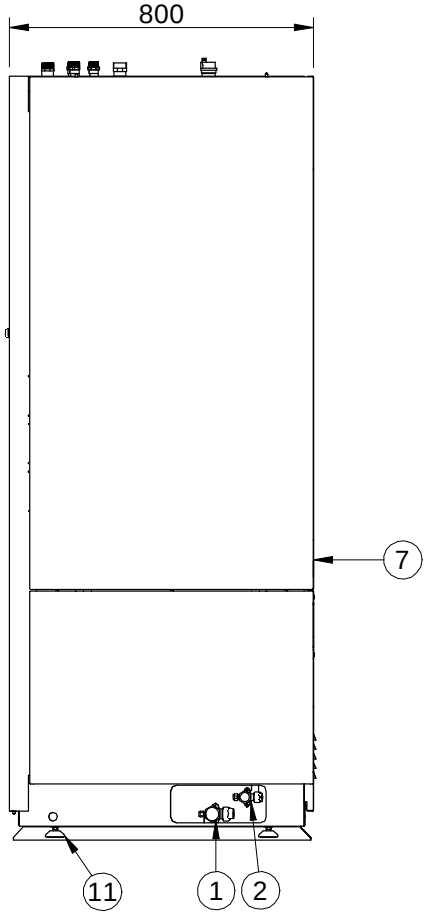
Second, third and fourth booster management board (SRILX)
This board is essential for managing one, two and three additional boosters.

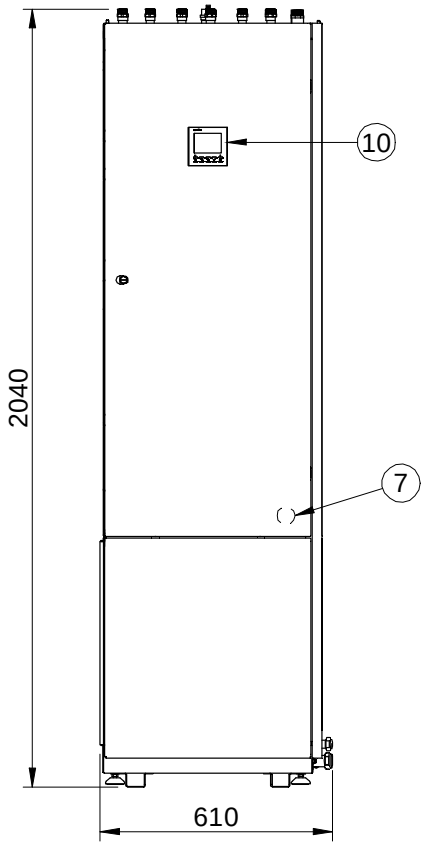
Note: in case of request of second and third boosters supplied separately (KIRHX or KIRLX) only one additional SRLIX board is required; if fourth booster is also requested, therefore managing 4 zones, a further SRLIX board is required

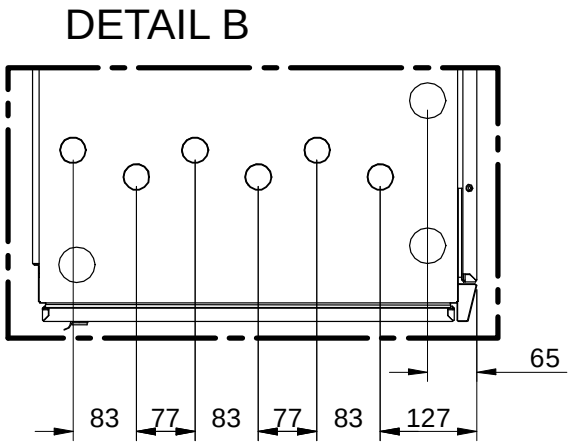
The following image represents the possible uses of the above-described accessories. STD indicates the first circuit that is always supplied with the unit.

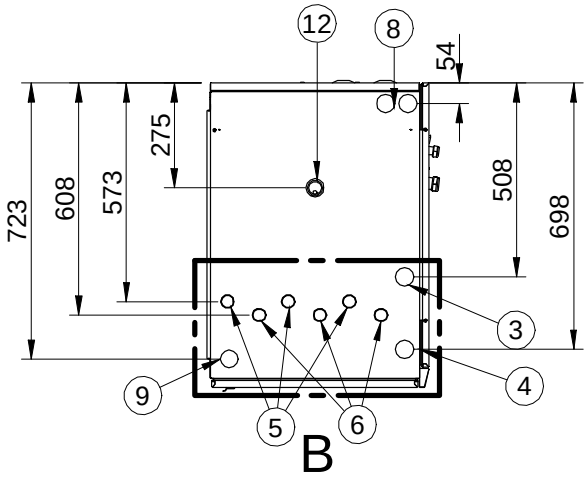


DIMENSIONAL DRAWING





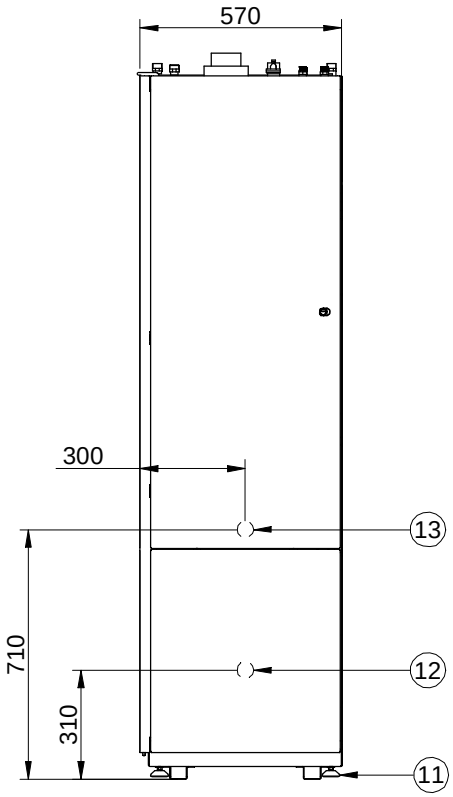


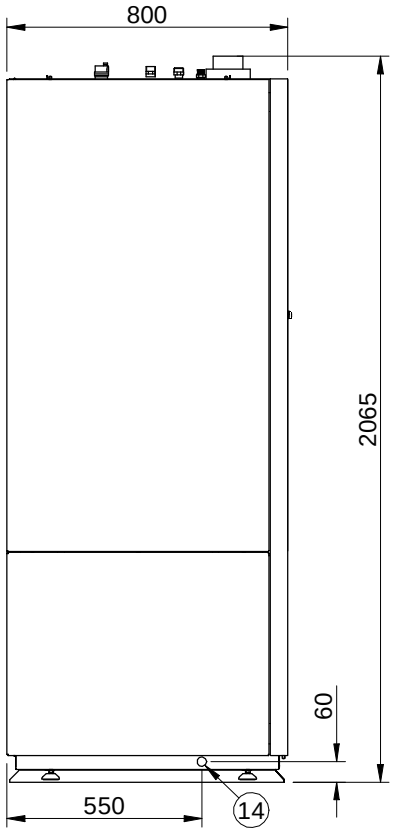


1) EXTRACTION 3/4”
2) LIQUID 5/8”
3) INLET FROM SYSTEM USE G1”M
4) OUTLET TO SYSTEM USE G1”M
5) INLET FROM SYSTEM USE 2ND, 3RD AND 4TH BOOSTER G3/4”
6) OUTLET TO SYSTEM USE 2ND, 3RD AND 4TH BOOSTER G3/4”
7) ENERGY EXCHANGER CABLES OUTLET
8) ELECTRIC LINE INPUT
9) DHW MODULE CABLES OUTLET
10) MULTIPURPOSE KEYBOARD
11) ADJUSTABLE IN HEIGHT SUPPORT FOOT
12) AUTOMATIC VENT VALVE

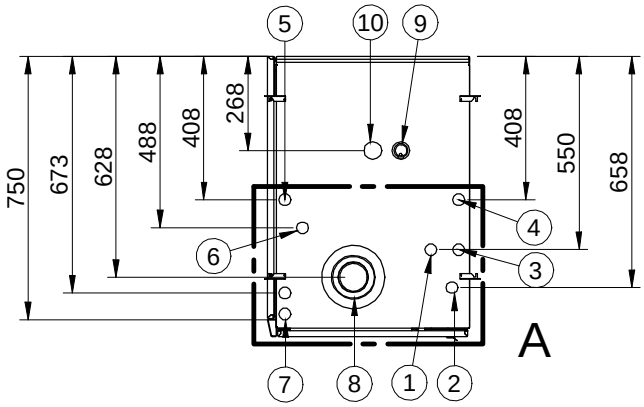
SIZES			61
Length		mm	610
Depth		mm	800
Height		mm	2040
Functioning weight		kg	480
Shipment weight		kg	280

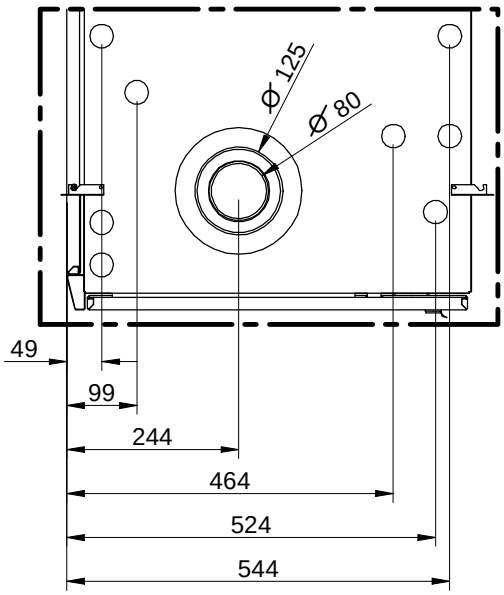
DIMENSIONAL DRAWING





DETAIL A



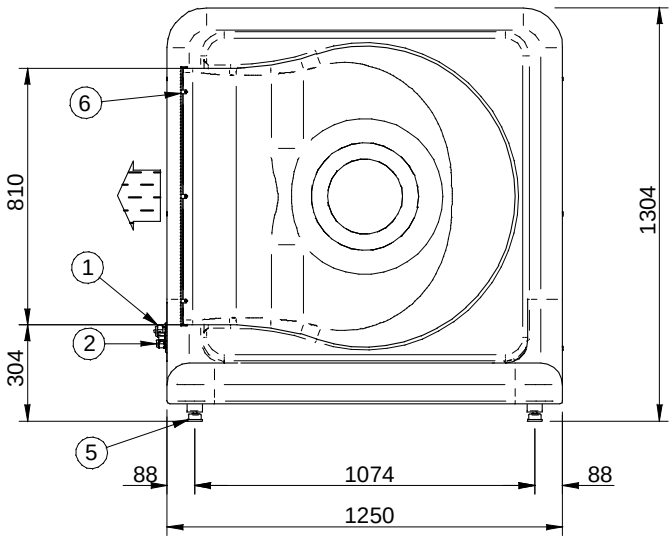


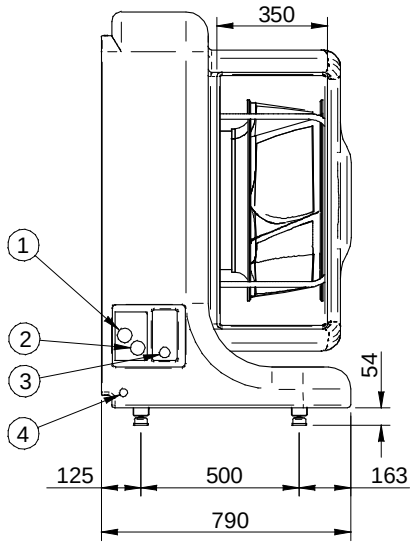
1) DOMESTIC HOT WATER OUTLET G1/2”M
2) WATER MAIN INLET G1/2”M
3) RECIRCULATION CIRCUIT INLET G3/8” F
4) OUTLET AT SOLAR PANEL G3/4” M
5) INLET FROM SOLAR PANEL G3/4” M
6) GAS INLET G3/4” M FLAT SEAT
7) ELECTRIC LINE INPUT
8) FUMES DISCHARGE CONNECTION
9) AUTOMATIC VENT VALVE
10) STANDARD TANK CONNECTION COUPLING G3/4” M
11) ADJUSTABLE IN HEIGHT SUPPORT FOOT
12) AUXILIARY DHW PREPARATION OUTLET G3/4” F
13) AUXILIARY DHW PREPARATION INLET G3/4” F
14) CONDENSING BOILER CONDENSE DRAIN

SIZES			61
Length		mm	570
Depth		mm	800
Height		mm	2065
Functioning weight		kg	520
Shipment weight		kg	220

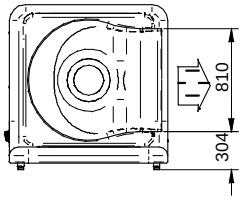
DIMENSIONAL DRAWING

A

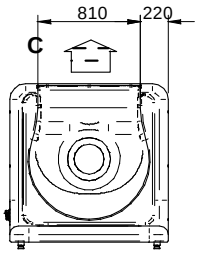




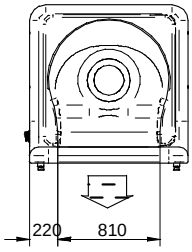
B



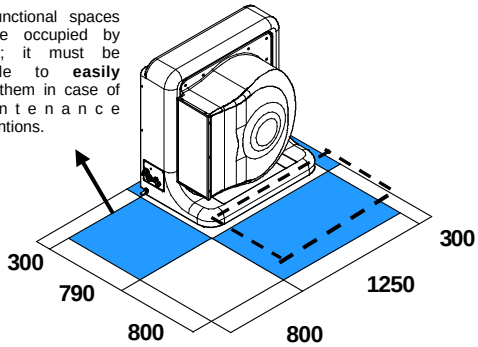
C

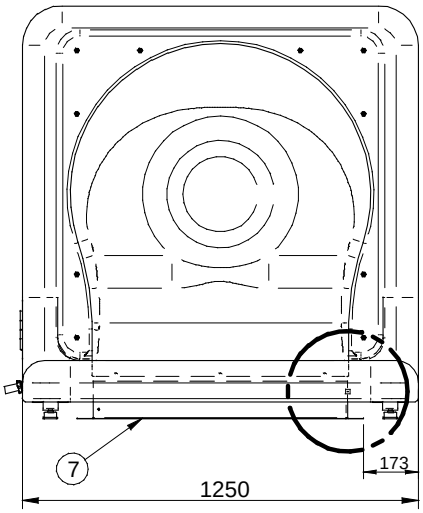


D

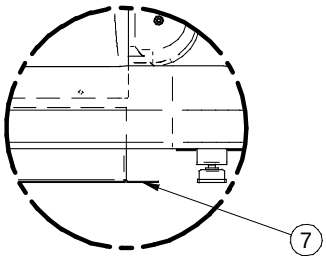


The functional spaces can be occupied by objects; it must be possible to **easily move** them in case of maintenance interventions.





A



DETAIL A

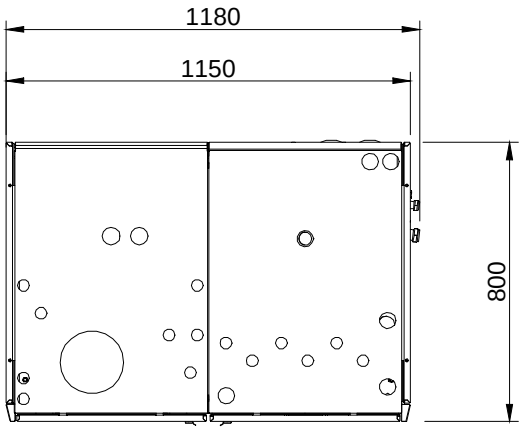
1) FLARE GAS COUPLING FOR PIPING 3/4”
   (External diameter 19.05 mm, thickness 1 mm)
2) FLARE GAS COUPLING FOR PIPING 5/8”
   (External diameter 15.88 mm, thickness 1 mm)
3) ELECTRIC LINE INPUT
4) CONDENSE DRAIN 12.5 mm
5) ANTI-VIBRATION SUPPORT
6) AIR SUPPLY PROTECTIVE GRID
7) CONNECTION FLANGE WITH UNDERGROUND CHANNEL (OPTIONAL)

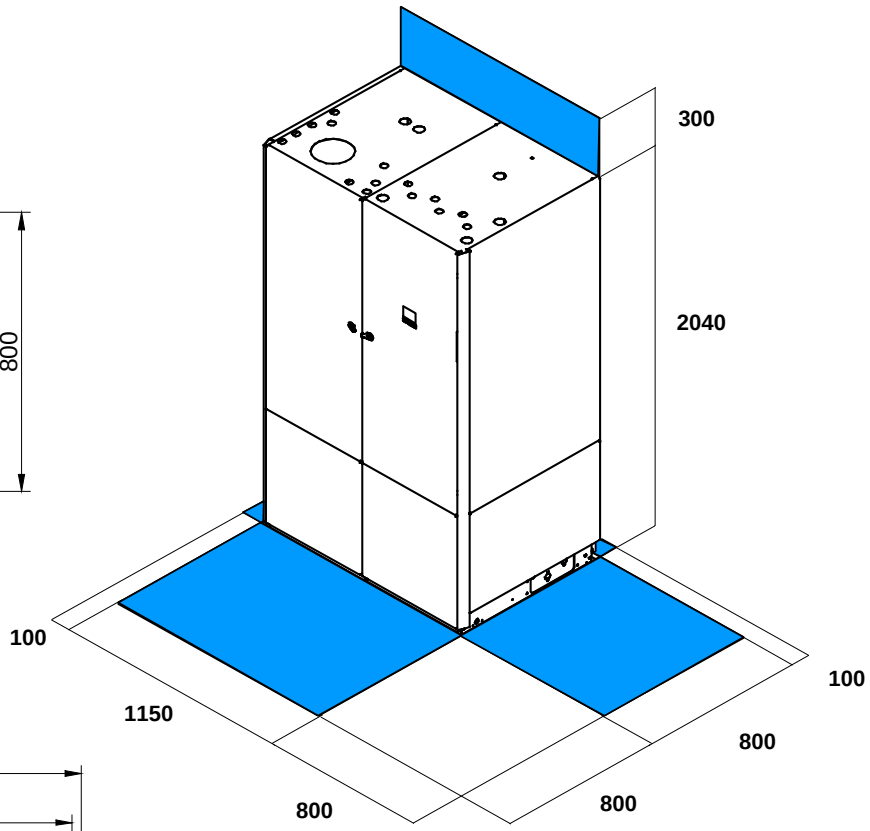
(A,B,C,D) FAN SUPPLY CONFIGURATIONS

SIZES			61
Length		mm	1250
Depth		mm	790
Height		mm	1304
Functioning weight		kg	105
Shipment weight		kg	110

GAIA MAXI DIMENSIONAL DRAWING AND FANCTIONAL CLEARANCE

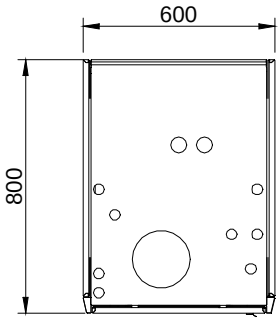
JOINT DHW AND SYSTEM MODULES

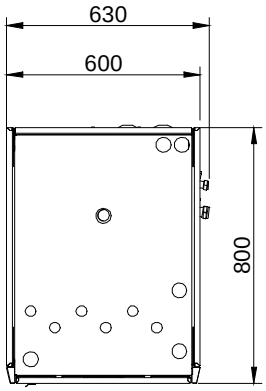


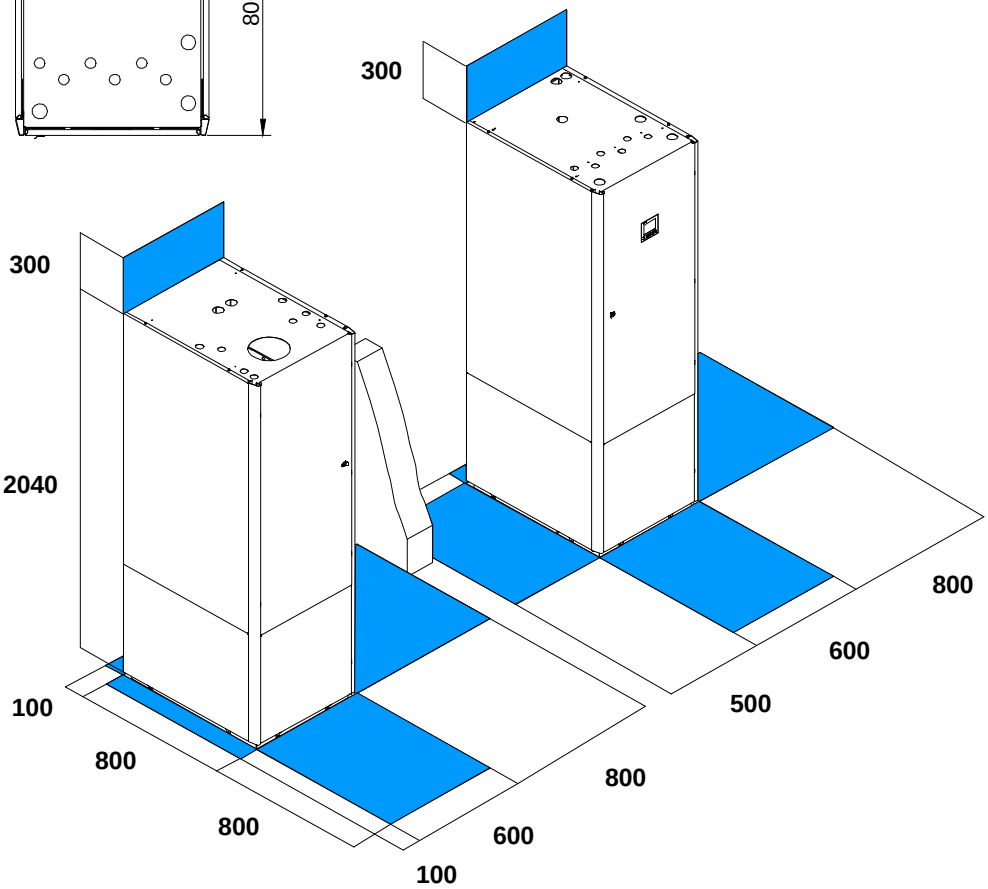


SEPARATE DHW AND SYSTEM MODULES

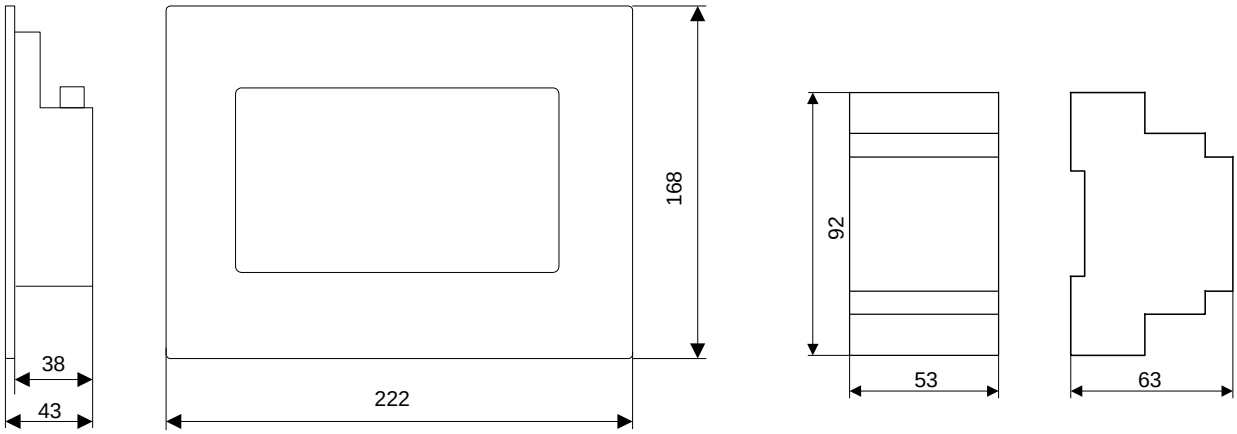
The maximum distance between system module and DHW one is of 3 m with 1" smooth copper piping.







ELFOControl² DIMENSIONS AND COMBINED MODBUS CONVERTER



Ethernet maximum distance between converter and display: 90 m.

DESCRIPTION FOR GAIA MAXI SPECIFICATION

Water/air heat pump in three sections made by a moto-evaporating system module and by a domestic hot water module for installation inside more than one remote condenser/evaporator unit for outdoor installation.
The moto-evaporating system module is composed of a cooling circuit with DC inverter compressor, R410a coolant, electronic expansion valve, brazed plate main exchanger, drier filter, liquid receiver, liquid separator, 4-way reverse cycle valve, pressure transducer liquid line solenoid valve, high and low pressure transducers, fluid and gas check valves, water side differential pressure switch, main plates, system side 18 l membrane expansion tank, system side 3bar safety valve, 180 l system side integrated storage tank, motorised valves for managing system and solar water with domestic.
The domestic module is composed of an hydraulic circuit with 280 l domestic water storage tank and electronic anode, modulating condensing boiler for integration and 25 kW anti-legionellosis cycles, domestic side 16 l membrane expansion tank, domestic side automatic air vent valve, system load minimum pressure switch, domestic side 6 bar safety valve, brazed plates heat pump exchanger, domestic water supply thermostatic valve with burn proof function, circulator with domestic water recirculation function on system, recirculation circuit check valve. .

....based on the unit configuration: :

SOL Option*:*
Circulator for DC solar system with variable capacity adjustment based on load losses, integrated drain circuit, solenoid valve for air outflow from solar storage tank, 3 bar safety valve, 35 l solar liquid storage tank, brazed plates solar exchanger.

Standard KIRS
Primary circuit circulator, heat pump side, in DC insisting on a 180 l integrated system storage tank.
Secondary circuit circulator, system side, in DC with variable capacity adjustment based on load losses.

KIR1SAP Option
Primary circuit circulator, heat pump side, in DC insisting on a 180 l integrated system storage tank.
High static pressure secondary circuit circulator, system side, in DC with variable capacity adjustment based on load losses.

KIR2H Option
Primary circuit circulator, heat pump side, in DC insisting on a 180 l integrated system storage tank.
Two secondary circuit circulators, system side, in DC with variable capacity adjustment based on load losses.

KIR2H Option
Primary circuit circulator, heat pump side, in DC insisting on a 180 l integrated system storage tank.
Two secondary circuit circulators, system side, in DC with variable capacity adjustment based on load losses.
One of the two circuits, system side, in addition to circulator it has a mixer valve.

KIR3H Option
Primary circuit circulator, heat pump side, in DC insisting on a 180 l integrated system storage tank.
Three secondary circuit circulators, system side, in DC with variable capacity adjustment based on load losses.

KIR3HHL Option
Primary circuit circulator, heat pump side, in DC insisting on a 180 l integrated system storage tank.
Three secondary circuit circulators, system side, in DC with variable capacity adjustment based on load losses.
One of the three circuits, system side, in addition to circulator it has a mixer valve.

KIR3HLL Option
Primary circuit circulator, heat pump side, in DC insisting on a 180 l integrated system storage tank.
Three secondary circuit circulators, system side, in DC with variable capacity adjustment based on load losses.
Two of the three circuits, system side, in addition to circulator are equipped, respectively, with a mixer valve.

KIR4H Option
Primary circuit circulator, heat pump side, in DC insisting on a 180 l integrated system storage tank.
Four secondary circuit circulators, system side, in DC with variable capacity adjustment based on load losses.

KIR4HHHL Option
Primary circuit circulator, heat pump side, in DC insisting on a 180 l integrated system storage tank.
Four secondary circuit circulators, system side, in DC with variable capacity adjustment based on load losses.
One of the four circuits, system side, in addition to circulator it has a mixer valve.

KIR4HHLL Option
Primary circuit circulator, heat pump side, in DC insisting on a 180 l integrated system storage tank.
Four secondary circuit circulators, system side, in DC with variable capacity adjustment based on load losses.
Two of the four circuits, system side, in addition to circulator are equipped with a mixer valve.

KIR4HLLL Option
Primary circuit circulator, heat pump side, in DC insisting on a 180 l integrated system storage tank.
Four secondary circuit circulators, system side, in DC with variable capacity adjustment based on load losses
Three of the four circuits, system side, in addition to circulator are equipped with a mixer valve.

Electrical power and control board with protections on compressor, circulators and fan, manage domestic water production with solar - heat pump priority and anti-legionellosis cycles, system load self-adjusting function and set-point compensation based on the external air temperature, service keyboard with touch screen display for running the unit, functioning parameters setting and daily/weekly timer thermostat function.
Remote evaporating/condensing unit with finned heater and plug fan type fan with DC, 90 Pa useful static pressure, polyethylene structure with incorporated condense collection tray and air flow adjustable on 4 sides.

GAIA Maxi TECHNICAL DATA

- Integration gas boiler nominal heating capacity: 25.0 kW
- Heating capacity under nominal conditions (A7/W35) 16.3 kW, efficiency factor COP=4.41
- Cooling capacity under nominal conditions (A35/W18) 17.7 kW, efficiency factor EER=3.65
- Power supply 400/3/50+N (2301/1/50 optional)
- The COP and EER are calculated per EN14511:2008

Model Clivet MSER-XIN 61.

DESCRIPTION FOR THE ELFOControl^2 SPECIFICATION

Control unit for ELFOSystem systems of autonomous residential type for indoor installation composed of:
- 7.2" resistive touch screen display with 800X480 colour TFT type pixel resolution;
- ETHERNET port for connection to MODBUS TCP/MODBUS RTU converter;
- MODBUS TCP/MODBUS RTU converter;
- 230/1/50 - 12VDC power supply unit
- connection to the ELFOSystem elements on a rs485 serial line via a AWG22 shielded bifilar cable with a typical impedance of 120 Ohm and a rated voltage of 300 V RMS. .

Display power supply voltage 12Vdc.
Ethernet/485 converter power supply voltage: 12/24 Vdc 12Vac.
Clivet Model: ELFOControl²

Integrated functions:

Integrated functions:
- control up to 12 independent climate areas and 40 ELFOSystem elements;
- management of 1 ELFOEnergy or GAIA heat pump;
- management of up to 2 ELFOFresh² air renewal units;
- management of ELFORoom², ELFOSpace, ELFODuct terminals;
- control of room temperature;
- control of room's humidity levels;
- summer and winter climate adjustment;
- daily and weekly time schedule for individual zones;
- anti-dew function to manage the radiant panels;
- control and programming of air renewal and purification;
- control and programming of the production of domestic hot water;
- programming of the function against Legionella bacteria;
- set points that can be customised by the user;
- management of customised user profiles.

… coordination of ELFOSystem's elements depending on the unit's setup:

AL12X - Power supply unit 230/1/50 - 12VDC
Power supply unit for main body and for HID-Ti4 +HID-UR Modbus thermostats network.
Power supply 230 Vac.

KGPRX - Mixing unit control module
Clivet KGPRX 6 DIN mixing module for 3-point mixing valve to adjust the temperature of water fed to the radiant panels, complete with 2 temperature probes and a safety thermostat. Power supply 230 Vac.
Max elements managed 3.

BMZRX - Radiant zone module with RS485 communication port
Clivet CMZRX 9 DIN radiant area module plus RS485 2 DIN serial module for 1-6 water intercepting heads, can be connected to 1-6 MODBUS room thermostats to control the individual heads, summer and winter operation with anti-frost and anti-dew functions, complete with water temperature probe. Power supply 230 Vac.
Max elements managed 5.

CMRSX - Single area module with RS485 communication port
Clivet CMRSX 6 DIN single area module for 1 water intercepting head, can be connected to 1 room thermostat to control the individual heads, summer and winter operation with anti-frost and anti-dew functions, complete with water temperature probe.
Power supply 230 Vac.

MIOX - Input/output module with RS485 communication port
Clivet MIOX 4 DIN Input /Output module to active 1-4 booster pumps and/or area valves and manage remote consent.
Power supply 230 Vac.
Maximum elements managed 2.

HID-Ti2X - HID-Ti2 electronic room control device (built-in, temperature only)
Clivet HID-TI2 Local Electronic Room Control Device with 4 keys with Clivet Bus interface for built-in installation to control the room temperature. Power supply via Clivet Bus

HIDT2X - HID-T2 electronic room control device (temperature only)
Clivet HID-T2 Local Electronic Room Control Device with 6 keys with Clivet Bus interface for wall installation to control the room temperature. Power supply via Clivet Bus.

HID-T3X - Electronic room control device HID-T3 (temperature + humidity)
Clivet HID-T3 Local Electronic Room Control Device with 6 keys with Clivet Bus interface for wall installation to control the room temperature and humidity levels. Power supply via Clivet Bus.

HIDTI4NX— HIDTI4BX Modbus HID-Ti4 electronic room control device (built-in, temperature only)
HID-Ti4 Clivet Local Electronic Room Control Device with 4 keys with MODBUS interface for built-in installation to control the room temperature. 12Vdc power supply unit.
Available in the black HIDTI4NX version and in the white HIDTI4BX version. It can be matched to HIDURNX and HIDURBX modules for detecting the room humidity. The BMZRX module is compulsory.

HIDURNX— HIDURBX Modbus HID-UR relative humidity sensor (built-in, relative humidity only)
Relative humidity sensor can only be matched with HID-Ti4 built-in thermostat for detecting the room humidity. 12Vdc power supply unit.
Available in the black HIDURNX version and in the white HIDURBX version. The BMZRX module is compulsory.

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