HiWarm
TOTAL HEAT RECOVERY MULTI-PURPOSE AIR - WATER UNIT
MODULATING HEAT PUMP FOR HEATING
DOMESTIC WATER AND RESIDENTIAL COMFORT

12 kW - 22 kW - 33 kW
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UNIT IDENTIFICATION
The unit data are reported on the rating label on this page.
The label shows the following data:
- Series and size of the unit
- Main technical data
- Manufacturer
- The label is applied on the unit, usually on the enclosing panels beside the condenser coil.

IMPORTANT: NEVER REMOVE THE LABEL
- Serial number of the unit
- The serial number permits to identify the technical characteristics and the components installed
- Without this datum it will be impossible to identify the unit correctly

TRANSLATION OF ORIGINAL INSTRUCTIONS
- For any further information, contact the manufacturer: info@galletti.it
- To get the weight of the unit, refer to the User Manual, Rated technical data table.
The technical and dimensional data provided herein may undergo changes in connection with product improvements.
1 DESCRIPTION OF THE PRODUCT

1.1 THE HIWARM SERIES

HiWarm is a total heat recovery multi-purpose air-water heat pump which absorbs cold or heat from outdoor air and, without any type of combustion or flame, can heat or cool an entire home and produce domestic hot water in a totally autonomous manner, according to priority or total recovery function in cooling mode.

HiWarm is a split heat pump featuring:

- Compressor installed in the indoor unit so as both to reduce outdoor noise emissions and allow the construction of a lightweight outdoor unit that can be positioned above the ground with simple brackets.
- Outdoor unit configured as a compact ductable indoor unit with backward curved fans driven by permanent magnets electric synchronous motor (EC), intended for installation in attics.

The product is available in three sizes, classified based on their cooling capacity under nominal conditions, that is, for water produced at 12 - 7°C with an outdoor air temperature of 35°C.

The fundamental constructive feature that distinguishes a HiWarm from other solutions present in the market is the presence of a dual hydraulic circuit:

- Air conditioning circuit with reversibility on the cooling circuit side and set-point adjustable between min/max with a voltage-free contact or between min/max with a 0-10V or 4-20mA signal.
- ACS circuit with total recovery (in the event of simultaneous cooling) or in any case with recovery as a priority. This circuit is separate and unlike in other similar products on the market it does not require long heating/cooling phases for inertial storage which impair energy efficiency, above all in summertime.

The pluses of HiWarm, which make it a top-of-the-range unit in the realm of multifunctional heat pumps with total recovery, are:

- Brushless scroll or twin-rotary compressors
- AISI 316 High efficiency exchangers with braze-welded plates.
- Highly efficiency fans.
- Throttle valve: EEV (electronically controlled electric thermal expansion valve) to take advantage from the possibility of generating thermodynamic cycles under reduced pressure let-downs, resulting in clear benefits in terms of COP.
- By introducing a 4-way valve in the user water circuit (inside the unit) it is possible to reverse the direction of flow of the water over the exchangers at the same time the flow of refrigerant is reversed, thus maintaining the countercurrent in the cooling and heating mode.
- Advanced electronic control, which makes it possible to respond in a suitable manner to requirements under part load conditions.

These critical components ensure optimal part-load operation, something that is increasingly taken into consideration and a discriminating element in the technical choices of thermal engineers.
1 DESCRIPTION OF THE PRODUCT

1.1 THE HIWARM SERIES

The structure of the HiWARM units features:

- indoor unit: galvanised steel perimeter enclosure panels with an epoxy polyester powder coating, oven cured at 180°C, and front cover which also incorporates the LCD display. The unit is completely enclosed but may be accessed on 3 sides thanks to easy-to-remove panels that greatly simplify maintenance and/or inspection. All routine maintenance operations are carried out from the front side of the unit.

- outdoor unit: galvanised steel perimeter enclosure panels with an epoxy polyester powder coating, oven cured at 180°C. The unit is completely enclosed with panels and available in RAL9002 (Grey White). 6 pole axial fans with blades ensuring broad coverage, associated with external rotor asynchronous motors (or synchronous permanent magnets) and fan continuous speed modulation.

- remote unit for indoor installation (attic): galvanised sheet steel panelling, coated with epoxy polyester powder paint oven cured at 180°C. The unit is completely enclosed with panels and available in RAL9002 (Grey White). It includes radial fans with brushless motors assuring continuous and efficient modulation Maximum available head available at 200 Pa.

The distribution of components is such as to guarantee easy accessibility and the layout ensures an optimal distribution of weight on the base of the unit.

**MAIN COMPONENTS - INDOOR UNIT**

- FINNED PACK HEAT EXCHANGERS
- DISPLAY
- INVERTER
- CYCLE INVERSION VALVE
- WATER SIDE
- SOLENOID VALVES
- LIQUID RECEIVER
- PUMPS
- COMPRESSOR
- LIQUID SEPARATOR
- STANDARD USER INTERFACE
# DESCRIPTION OF THE PRODUCT

## 1.2 CONFIGURABILITY

### PRODUCT CONFIGURATION

#### LIST OF OPTIONS

<table>
<thead>
<tr>
<th>VERSION CMP1</th>
<th>MUL TIFUNCTIONAL HEAT PUMP FOR 2-PIPE SYSTEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>REMOTE UNIT:</td>
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<tr>
<td>EXTERNAL REMOTE UNIT WITH HORIZONTAL AIR FLOW</td>
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<td>EXTERNAL REMOTE UNIT WITH VERTICAL AIR FLOW</td>
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<td>INTERNAL REMOTE UNIT WITH DUCTED AIR FLOW</td>
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<tr>
<td>1 - POWER SUPPLY</td>
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<tr>
<td>230/1.50 + INVERTER + THERMAL MAGNETIC CIRCUIT BREAKERS (SIZE 012 ONLY)</td>
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<tr>
<td>400/3.50 + N + INVERTER + THERMAL MAGNETIC CIRCUIT BREAKERS (SIZES 022 AND 033 ONLY)</td>
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<td>2 - WATER PUMP ON USER SIDE</td>
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<td>MODULATING SINGLE PUMP</td>
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<td>3 - WATER PUMP ON RECOVERY SIDE</td>
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<td>4 - REMOTE COMMUNICATION</td>
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<td>ABSENT</td>
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<td>RS485 SERIAL CARD (CAREL OR MODBUS PROTOCOL)</td>
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<td>LONWORKS SERIAL CARD</td>
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<td>GSM MODEM KIT</td>
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<td>PCOWEB ETHERNET CARD (SNMP OR BACNET PROTOCOL)</td>
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<td>PCOWEB ETHERNET CARD + SUPERVISION SOFTWARE</td>
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<td>5 - AIR FLOW MODULATION OF REMOTE UNIT</td>
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<td>CONDENSATION CONTROL WITH FANS ADJUSTED BY POTENTIOMETER</td>
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<td>CONDENSATION CONTROL, “EC BRUSHLESS” ELECTRONICALLY CONTROLLED FANS</td>
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<td>6 - REMOTE CONTROL</td>
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<td>ABSENT</td>
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<td>REMOTE DISPLAY FOR PCO</td>
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<td>7 - PACKING</td>
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<td>STANDARD</td>
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<td>WOODEN CRATE</td>
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<td>WOODEN CASE</td>
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<td>8 - EXTERIOR COLOUR</td>
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<td>WHITE - RAL 9016 POLISH</td>
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<td>SILVER GREY - RAL 9006 METALLISED</td>
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<td>DARK GREY - RAL 7016 METALLISED</td>
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<td>BLUE - RAL 7031 POLISH</td>
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<td>BORDEAUX - RAL 3003 POLISH</td>
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<td>9 - SPECIAL HEAT EXCHANGER CONFIGURATION ON REQUEST</td>
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<td>COPPER / COPPER COILS</td>
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<td>FINS PRE-COATED WITH EPOXY PAINT</td>
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<td>LIST OF ACCESSORIES</td>
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<td></td>
<td>HEAT EXCHANGER PROTECTION NET FOR OUTDOOR UNIT (NO SIZE 033)</td>
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<td>FOUR FEMALE WATER PIPE FITTINGS</td>
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<td>NORMATIVE REFERENCE OTHER THAN “97/23/CE - PED”</td>
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### LIST OF STANDARD FEATURES

- REFRIGERANT R410A
- BLDC COMPRESSORS
- PAINTED GALVANIZED SHEET STEEL STRUCTURE
- INCORPORATED FLOW SWITCH
- STAINLESS STEEL BRAZED PLATE EXCHANGERS
- SOUND-INSULATING COVER FOR THE COMPRESSOR
- 4-WAY FLOW REVERSE VALVE ON USER SIDE INSTALLED ON BOARD
- ELECTRONIC EXPANSION VALVE
- PCO ADVANCED PROGRAMMABLE CONTROL
- SERVICE KIT (KIT OF SENSORS FOR QUICK DIAGNOSIS)
- CLOCK CARD
- SENSOR FOR TRAP ON USER TANK SUPPLIED AS STANDARD
- SENSOR FOR TRAP ON DHW TANK SUPPLIED AS STANDARD
- RUBBER VIBRATION DAMPERS AT THE BASE OF THE UNIT
- RUBBER VIBRATION DAMPERS AT THE BASE OF THE OUTDOOR UNIT
- HYDROPHILIC COIL
- HIGH EFFICIENCY MODULATING WATER PUMPS
- SECOND SET POINT ACTIVATED BY EXTERNAL INPUT

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1 DESCRIPTION OF THE PRODUCT

1.3 OPERATION MODE

HiWARM is a total heat recovery multi-purpose heat pump for the production of DHW and for simultaneous heating, cooling and dehumidification purposes in residential applications.

Starting from the generic overall operating diagram below, in the next pages a description will be provided of the four operating modes of the unit.
1 DESCRIPTION OF THE PRODUCT

1.3 OPERATION MODE

During wintertime and falltime periods, HiWarm enables room to be heated and produces DHW. The system inertia, increased by the buffer tank, which we recommend associating with the machine also in the heating system, enables rapid defrost cycles and priority production of domestic hot water without any discomfort. The picture below illustrates the operation of the unit when producing heat on the system side.

The next page instead illustrates the operation of the unit during the production of domestic hot water.
1 DESCRIPTION OF THE PRODUCT

1.3 OPERATION MODE

During wintertime operation, if the unit is producing heat on the system side, and in the meantime a demand arrives for domestic hot water, HiWarm will give priority to production of the latter.

During in-between seasons, where there is no need for heating or cooling, HiWarm can produce only domestic hot water.
1 DESCRIPTION OF THE PRODUCT

1.3 OPERATION MODE
During summertime periods HiWarm cools and dehumidifies with humidity control and at the same time produces hot water at zero cost. The cooling function is not interrupted during the production of domestic hot water, thus ensuring optimal comfort even in the event of a high value of enthalpy in the rooms. The picture below illustrates operation during the production of cooling only on the system side. The next page illustrates operation during the production of cooling on the system side and the simultaneous production of domestic hot water (thus with total heat recovery).

COOLING AND DEHUMIDIFICATION
1 DESCRIPTION OF THE PRODUCT

1.3 OPERATION MODE

Cooling and simultaneous production of DHW (total recovery)
1 DESCRIPTION OF THE PRODUCT

1.4 COMPONENTS

R410A SCROLL OR TWIN ROTARY COMPRESSOR

The optimization of manufacturing procedures, combined with a careful choice of the built-in volume ratio of the compressors, enables a decided improvement in the isentropic efficiency of compression and a consequent reduction in energy losses during process. The use of scroll and twin rotary compressors makes it possible to use low-viscosity oils which, compared to solutions with oil at a high viscosity level, considerably reduce thermal resistance at the evaporator with increases in the evaporation temperature of over 1.5°C (more than a 5.5% gain in terms of EER) compared to alternative solutions. Hermetic spinning scroll compressors (HiWarm22, HiWarm33) or Twin-Rotary compressors (HiWarm12) come complete with motor protection against overtemperatures, overcurrents and excessive discharge gas temperatures. Mounted on rubber vibration dampers, complete with oil charge and housed in a compartment that is soundproofed with sound absorbing material. They are also supplied complete with an oil heater that switches on automatically to prevent the oil from being diluted by the refrigerant when the compressor stops.

The brushless permanent magnet compressor synchronous motor is controlled by a trapezoidal wave driver within a speed range between 30 (20) and 120 Hz (BLDC “Brushless Direct Current” technology).

INVERTER

It is a static converter of electricity, more precisely a rectifier and AC-DC-AC rectifier. When it is actuated, the inverter controls the motor power supply. In the most general case, in fact, inverters serve to vary the amplitude and/ or frequency of the motor supply voltage. In the case of Brushless (BLDC) permanent magnets synchronous motors, it is necessary to ensure the operation of the motor.

The inverter compressor is controlled using proportional or proportional + integral control of the setpoint in any operating mode.

In the event of simultaneous user demands for interior cooling and domestic hot water for the system, the speed set-point is by default defined by the lower of the two speeds; after the initial start phase, the inverter modulates the motor’s performance in real time based on application needs, delivering only the actual power required. As a result, the frequency varies from a minimum state of 20 (30) [Hz] to a maximum of 120 [Hz] according to the user’s needs. The maximum acceleration is defined by both the torque limits, and above all by the need to minimize the amount of oil driven at transients. This parameter cannot be changed.

R410A THERMAL CARRIER FLUID

HFC R410A, despite having a higher GWP (Global Warming Potential; GWP = 1975 kg CO2) than other refrigerants, is characterised by very favourable heat conductivity in liquid form and a near absence of glide, which allows a decided improvement to be achieved in terms of both evaporation performance and condenser performance. Higher operating pressures and a favourable pressure-temperature curve enable the use of more compact heat exchange geometries, which means that the same exchange surface is associated with a smaller internal volume and hence a smaller refrigerant charge is required: these factors combine to reduce the overall GWP of the unit in comparison to other types of ecological refrigerants belonging to the HFC family.

The GWP of R410A is 1975 kg CO2 against 1177 of R407C and against 1410 of R134a. This disadvantage is counterbalanced by a higher EER and still more by a better ESEER. GWP is therefore higher than other HFC fluids, though TEWI (total equivalent warming impact) is much lower, thanks to the high efficiency and the reduced refrigerant charge.

With 8% average increase of the surface, the internal volume of the exchangers is 23% lower, the average density is in turn lower and therefore the charge of R410A is approximately 27% less than that of the R407C units of the same size.

TEWI: Total Equivalent Warming Impact expresses the mass of CO2 that produces the same overall effect of the chiller during its operational life. The main characteristic of this parameter is that it considers not only the effects of using a refrigerant gas which derive from its accidental or non-accidental release into the atmosphere, but also the effect on global warming generated by the carbon dioxide emitted in producing the energy used for the refrigeration system in question. The TEWI is expressed by a relation whose addends represent the component due to indirect effect and that due to the direct effect:

\[
\text{TEWI} = \alpha_{cog} \cdot E + \text{GWP} \cdot m_{\text{ref}}
\]

- \( E \) = energy consumed by the cooling system during its operational life.
- \( \alpha_{cog} \) = amount of carbon dioxide emitted to produce one kWh of power, depending on the manner in which it is generated;
- \( m_{\text{ref}} \) = charging with refrigerant.

For the evaluation of TEWI it is therefore necessary to estimate...
1 DESCRIPTION OF THE PRODUCT

1.4 COMPONENTS

The efficiency of cooling systems, on which depends the amount of energy consumed, their life, the type of energy source which is drawn and the mass of refrigerant contained.

With this type of approach, attention is focused not only on controlling atmospheric emissions and choosing environmentally friendly refrigerants, but also on improving the overall efficiency of the refrigeration system which, depending on the application, can play an important role in determining the actual impact that adopting a given fluid will have on the global warming of our planet.

HEAT EXCHANGERS WITH AISI 316 S/S PLATES

A careful study of the internal corrugation maximizes the turbulence (thermal exchange coefficient) minimizing the possibility of dirtying. Compatibly with the powers involved, it is always preferable to choose the maximum thermal length in order to draw the maximum possible benefits deriving from countercurrent flows.

ELECTRONICALLY CONTROLLED ELECTRIC VALVE (EEV)

Supplied as standard on all HiWarm units. If correctly parameterized by the software, this device has the capacity to render the operation of the cooling circuit very efficient, the final result being to reduce the power absorbed by the system. The rod in the central part of the valve can slide vertically with a wide range of movement to allow the orifice through which the fluid passes to be opened by varying degrees. Using this valve makes it possible to decrease the energy consumption of the compressor when the surrounding conditions make it possible to reduce \( \Delta p \Rightarrow (p_{\text{cond}} - p_\text{v}) < 5 \) bars, to values at which the usual expansion valves do not assure the same performance.

4-WAY CYCLE REVERSING VALVE

From the laws of thermodynamics we know that a heat exchange will be more efficient, when it takes place through countercurrent rather than concurrent flow, thanks to a higher logarithmic mean temperature difference.

The majority of reversible units available on the market, have a concurrent flow configuration after being switched from the cooling to the heating mode, resulting in a decrease in thermodynamic performance.

By introducing a 4-way valve in the user water circuit (inside the unit) it is possible to reverse the direction of flow of the water over the exchangers at the same time the flow of refrigerant is reversed, thus maintaining the countercurrent. The direction of the water flow toward / from the system obviously does not change.

The plumbing connections on the user side maintain the same IN/OUT configuration without the user being aware of any change.

NB: the above selection always considers a heat exchange under counter-flow conditions.

PUMPS

Wet-rotor circulation pumps with EC motors, maintenance free, high efficiency (class A) and electronically controlled have been used. The pump casing is made of grey cast iron with a cataphoretic KTL coating, which provides optimal protection against corrosion. The thermal insulation is polypropylene, the shaft is stainless steel, the bearings are made of metal-impregnated carbon and the rotor, with a three-dimensional spiral is made of a synthetic material with a hermetic insulating coating of composite carbon fibre material.
1 DESCRIPTION OF THE PRODUCT

1.4 COMPONENTS

SOLENOID VALVES

Solenoid valves are widely used to control the flow of hot/cold liquids with on/off-type users. The operating principle consists in applying an electric current to a coil which creates a magnetic field. This is transformed into mechanical energy which opens or closes the valve. The principle of operation is very reliable, inexpensive and widely used for every kind of application with ON / OFF utilities.

LIQUID RECEIVER

The unit can be modulated with variable flow rates and various possible operating conditions. The optimal refrigerant charge, which depends not only on the volume of the exchangers but also on the points mentioned, can thus vary a great deal under different operating conditions and the presence of the liquid receiver is fundamental for re-establishing an equilibrium, especially in the case of transients.

LIQUID SEPARATOR

The liquid separator is placed on the compressor inlet line and has the function of containing the excess unevaporated refrigerant and preventing its return to a liquid state at the compressor and the possible damage that might result from this.

SYNCHRONOUS MOTORS

Our compressors and our hydraulic pumps are equipped with BLDC (Brushless Direct Current) synchronous electric motors. The synchronous motors are characterised by a constant rotation speed, independent of load (or stall torque) but linked to the frequency defined by the inverter.

The synchronous motor is Brushless, since current is not delivered directly to the rotor but only to the stator and therefore there is no need to introduce sliding electrical contacts. Besides the 20 Hz frequency, the on-board mP controls a feedback signal (BEMF Back Electromotive Force) which certifies whether or not the rotation of the rotor is synchronous with the magnetic field and makes torque corrections accordingly so as to re-establish/maintain the synchronism and thus maximum efficiency.

- BLDC motors are “brushless” because they do not require induction in the stator windings (a permanent magnet is located in the motor) therefore they are not subject to the associated losses.
- BLDC motor has no rotor currents (caused by stator induction in asynchronous motors) => no rotor losses.
- BLDC motor has no “sliding contacts” => no maintenance needed.

The rotor’s position is determined by measuring the BEFM (Back Electromotive Force) induced by the rotor in the “unexcited phase” (when one of the three phases is on zero): there are no Hall effect sensors in the motor given their unreliability at high speeds and temperatures, and for this reason the motor is also called “sensorless”.

‡ BLDC motors are “brushless” because they do not require induction in the stator windings (a permanent magnet is located in the motor) therefore they are not subject to the associated losses.

‡ BLDC motor has no rotor currents (caused by stator induction in asynchronous motors) => no rotor losses.

‡ BLDC motor has no “sliding contacts” => no maintenance needed.

‡ BLDC motor has no “sliding contacts” => no maintenance needed.
1 DESCRIPTION OF THE PRODUCT

1.4 COMPONENTS

MAIN COMPONENTS - OUTDOOR UNIT

The outdoor unit has the same components for all three sizes: the dimensions of the finned coil vary, as does the number of fans, depending on size (two fans for 012, three for 022 and four for 033).

FINNED BLOCK HEAT EXCHANGER:

The finned block heat exchangers allow to obtain the maximum front surface in relation to the footprint of the unit. The ample front surfaces reduce the risk of dirt build-up and, thanks to the reduced flow-through speed, serve to reduce pressure drops on the air side, thus enhancing the airflow capacity (efficiency) and decreasing the sound power emitted by the fans. They are designed to bring about a heat exchange between refrigerant and air via a series of copper tubes with a diameter of 8 mm, geometry 25 x 21.65 mm, expanded with a controlled automatic process into 0.10 mm thick aluminium fins. Expansion is a critical process, as it determines the tube/fin contact resistance and is a key factor for achieving high heat exchange efficiencies, though often ignored.

FANS:

The remote outdoor unit is equipped with 6 pole fans (3 pole pairs) with plastic blades ensuring broad coverage (450 mm), associated with single phase asynchronous motors or EC permanent magnets synchronous motors (option). As regards the remote unit for indoor installation, in order to obtain more quiet operation use is made of backward curved centrifugal fans with reaction impellers combined with EC brushless motors to ensure continuous efficient modulation: the air flow rate, and thus the power input and noise emitted, are always adapted to the real conditions of use according to the channel pressure drops and part-load conditions of the unit.
1 DESCRIPTION OF THE PRODUCT

1.4 COMPONENTS

OPTIONAL BUFFER TANKS

INERTIAL BUFFER TANK - SYSTEM SIDE

It is necessary to provide an adequate volume of water on the heating / cooling system in order to:
- reduce temperature oscillations to indoor units.
- maintain the temperature delivered to the indoor units in the event that heating/cooling is interrupted due to the priority assigned to the demand for DHW.
- ensure optimal control of the air/water heat pump defrost function during the wintertime. The “negative” effect of defrosting can be attenuated by using indoor units with high thermal inertia, but this might not be sufficient (for example, in the case of a defrost cycle that occurs when all the zone valves of a radiant system are closed).

If the volume of water contained in the pipes on the system side is not sufficient to ensure the above, it will be necessary to install a buffer tank. This can be the two-connection type installed in series with the heat pump, or even better one with four connections, and thus with a “hydraulic separator” function: in this manner you can have complete independence between the working capacity of the heat pump and that of the distribution system. In such a case, great attention should be paid to exergetic losses due to the mixing of outlet and return flows.

Buffer tanks for sanitary hot water production

HiWarm should be combined with an external tank for the storage of thermal energy for the production of DHW. The buffer tank serves to meet user needs in periods of peak demand without having to rely on excessively high thermal capacities. The result is a steadier and more continuous operation of the system, and thus a better thermal yield. The indoor unit produces hot water for the subsequent preparation of domestic hot water, which is then accumulated in the boiler, with temperatures that increase from the bottom layer to the top layer. This makes it possible to obtain an efficient heat exchange with the supplemental and user circuit coils, with a thermal approach equivalent to a countercurrent flow and without exergetic losses caused by undesirable mixing.

The buffer tanks for storing DHW can be selected separately by the installer; Galletti offers high-efficiency solutions based on the principle of accumulating technical water, which show a number of advantages compared to traditional buffer tanks.
## 2 TECHNICAL DATA

### 2.1 THERMODYNAMICAL PERFORMANCE AND TECHNICAL DATA OF THE HIWARM SERIES

Thermodynamic performances of HiWarm units equipped with pumps (standard) and electronic control fans (optional) have been reported in accordance with standard EN14511-2004. ESEER values have been calculated in accordance with Eurovent standards. Performances have been calculated for a maximum length of 10 m for the gas lines connecting the internal unit to the remote one. Air temperature indicated refer to dry bulb conditions.

<table>
<thead>
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<th>Compressor speed</th>
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<tr>
<td>[Hz]</td>
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<tr>
<td>30</td>
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<tr>
<td>Cooling capacity [kW]</td>
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<tr>
<td>Compressor input power [kW]</td>
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<td>Compressor input current [A]</td>
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<td>Fan input power [kW]</td>
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<tr>
<td>Fan input current [A]</td>
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<tr>
<td>EER [-]</td>
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<tr>
<td>ESEER Eurovent - radiant panels (user @ 23-18°C) *</td>
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<tr>
<td>ESEER Eurovent - fan-coils (user @ 12-7°C)</td>
</tr>
</tbody>
</table>

| Comp | HiWarm 012 | HiWarm 022 | HiWarm 033 |
|--------------|
| Compressor speed | 
| [Hz] | 
| Cooling capacity [kW] | 4.2 | 15.7 | 8.5 | 28.1 | 8.6 | 44.0 |
| Compressor input power [kW] | 0.6 | 3.2 | 1.3 | 7.5 | 1.2 | 11.8 |
| Compressor input current [A] | 6.9 | 8.6 | 10.9 | 13.2 | 3.2 | 20.4 |
| Fan input power [kW] | 0.08 | 0.30 | 0.06 | 0.45 | 0.05 | 0.60 |
| Fan input current [A] | 0.40 | 1.40 | 0.10 | 0.80 | 0.10 | 1.10 |
| EER [-] | 6.27 | 4.41 | 6.34 | 3.46 | 6.80 | 3.47 |
| USER water flow rate [kg/h] | 3500 | 7000 | 5250 | 10500 | 7000 | 14000 |
| USER water pressure drops [kPa] | 2.0 | 19.0 | 3.0 | 26.0 | 3.0 | 23.0 |

### Heating @ 35 °C air-23-18°C water

| Comp | HiWarm 012 | HiWarm 022 | HiWarm 033 |
|--------------|
| Compressor speed | 
| [Hz] | 
| Cooling capacity [kW] | 3.3 | 16.6 | 7.6 | 32.3 | 11.8 | 51.7 |
| Compressor input power [kW] | 0.9 | 4.3 | 2.1 | 9.5 | 3.2 | 14.2 |
| Compressor input current [A] | 12.8 | 18.4 | 15.2 | 23.7 | 20.2 | 25.9 |
| Fan input power [kW] | 0.08 | 0.30 | 0.06 | 0.45 | 0.05 | 0.60 |
| Fan input current [A] | 0.40 | 1.40 | 0.10 | 0.80 | 0.10 | 1.10 |
| COP [-] | 3.46 | 3.54 | 3.58 | 3.14 | 3.63 | 3.37 |
| DHW water flow [kg/h] | 1047 | 2480 | 1307 | 5563 | 2169 | 8885 |
| DHW pressure drops [kPa] | 3.0 | 41.0 | 4.0 | 64.0 | 4.0 | 61.0 |
| DISSIPATION air flow rate [m³/h] | 3500 | 7000 | 5250 | 10500 | 7000 | 14000 |

### DHW @ @ 50/55°C and 30°C outdoor air

| Comp | HiWarm 012 | HiWarm 022 | HiWarm 033 |
|--------------|
| Compressor speed | 
| [Hz] | 
| Cooling capacity [kW] | 2.4 | 9.2 | 4.7 | 17.1 | 7.9 | 28.1 |
| Compressor input power [kW] | 0.9 | 4.1 | 1.8 | 8.9 | 2.9 | 13.4 |
| Compressor input current [A] | 10.6 | 11.0 | 14.8 | 15.3 | 22.7 | 23.7 |
| Fan input power [kW] | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Fan input current [A] | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| COP [-] | 3.55 | 3.16 | 3.49 | 2.86 | 3.68 | 3.03 |
| Total COP (including recovery) [-] | 6.21 | 5.38 | 6.05 | 4.78 | 6.42 | 5.11 |
| USER water flow rate [kg/h] | 3500 | 7000 | 5250 | 10500 | 7000 | 14000 |
| USER water pressure drops [kPa] | 2.0 | 26.0 | 4.0 | 40.0 | 4.0 | 38.0 |

* Value calculated following the ESEER mode Eurovent Fan-coils (user @ 12-7°C).
## TECHNICAL DATA

### 2.1 THERMODYNAMICAL PERFORMANCE AND TECHNICAL DATA OF THE HIWARM SERIES

<table>
<thead>
<tr>
<th>Compressor speed [Hz]</th>
<th>HiWarm 012</th>
<th>HiWarm 022</th>
<th>HiWarm 033</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>110</td>
<td>30</td>
<td>120</td>
</tr>
<tr>
<td>ESEER Eurovent - radian panels (user @ 23-18°C) *</td>
<td>8.61</td>
<td>6.69</td>
<td>6.52</td>
</tr>
<tr>
<td>ESEER Eurovent - fan-coils (user @ 12-7°C)</td>
<td>5.65</td>
<td>5.30</td>
<td>5.24</td>
</tr>
</tbody>
</table>

#### BT heating @ 40/45°C and 7°C outdoor air

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>BT Heating @ 40/45°C and 7°C outdoor air</td>
<td>2.9</td>
<td>0.7</td>
<td>8.6</td>
<td>0.30</td>
<td>1.40</td>
<td>2.64</td>
<td>489</td>
<td>2.0</td>
</tr>
<tr>
<td>BT Heating @ 30-35°C and 7°C outdoor air</td>
<td>3.1</td>
<td>0.6</td>
<td>7.2</td>
<td>0.30</td>
<td>1.40</td>
<td>3.48</td>
<td>527</td>
<td>2.0</td>
</tr>
</tbody>
</table>

#### Noise emissions

<table>
<thead>
<tr>
<th>Indoor unit</th>
<th>Lw sound power level - indoor unit [dBA]</th>
<th>Lp sound power level (10 m Q=2) indoor unit [dBA]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indoor unit</td>
<td>54</td>
<td>26</td>
</tr>
<tr>
<td>Outdoor unit</td>
<td>65</td>
<td>37</td>
</tr>
</tbody>
</table>

#### Compressor

<table>
<thead>
<tr>
<th>Compressor Types</th>
<th>Electric Motor Types</th>
<th>Oil charge for compressor [kg]</th>
<th>No. of refrigerating circuits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Twin Rotary</td>
<td>BLDC</td>
<td>1.7</td>
<td>1</td>
</tr>
<tr>
<td>Scroll</td>
<td>BLDC</td>
<td>2.1</td>
<td>1</td>
</tr>
<tr>
<td>Scroll</td>
<td>BLDC</td>
<td>2.3</td>
<td>1</td>
</tr>
</tbody>
</table>

#### Dimensions, weights and connections

<table>
<thead>
<tr>
<th>Dimensions - indoor module (L x H x D) [mm]</th>
<th>Dimensions - outdoor module (L x H x D) [mm]</th>
<th>Weight of Indoor Unit [kg]</th>
<th>Weight of Outdoor Unit [kg]</th>
<th>Dimensions of water connectors [mm]</th>
<th>Cooling connections</th>
</tr>
</thead>
<tbody>
<tr>
<td>803x1120x501.5</td>
<td>1120x1230x450</td>
<td>190</td>
<td>803x1247x606</td>
<td>1410x1280x450</td>
<td>2000x1512x550</td>
</tr>
<tr>
<td>Rotolock type</td>
<td>Rotolock type</td>
<td>260</td>
<td>Rotolock type</td>
<td>35</td>
<td>Rotolock type</td>
</tr>
<tr>
<td>Rotolock type</td>
<td>Rotolock type</td>
<td>270</td>
<td>Rotolock type</td>
<td>35</td>
<td>Rotolock type</td>
</tr>
<tr>
<td>Rotolock type</td>
<td>Rotolock type</td>
<td>270</td>
<td>Rotolock type</td>
<td>35</td>
<td>Rotolock type</td>
</tr>
</tbody>
</table>

* Value calculated following the ESEER mode Eurovent Fan-coils (user@ 12-7°C).
2  TECHNICAL DATA

2.2  RATINGS OF HIWARM UNITS

To calculate the nominal performance data of HiWarm units, read the output thermal capacity and input electrical power for specific operating conditions (including the inverter) from the ordinates in the diagrams below. The unit’s efficiency is measured by the ratio between these two values. For nominal operating conditions, including between the curves, linearly interpolate to obtain the new values; for nominal operating conditions outside the curves, contact Galletti S.p.A.

HEATING CHARACTERISTICS

HiWarm 12 - heating capacity produced with outdoor temperature variations:

---

**Diagram 1:**

- Heating capacity production with outdoor temperature variations for HiWarm 12.
- Graph showing electrical input in the heating mode with outdoor temperature variations.
- Curves for different temperature conditions: 30/35°C, 40/45°C, 50/55°C.

---

**Diagram 2:**

- Electrical input in the heating mode with outdoor temperature variations for HiWarm 12.
- Graph showing outdoor air temperature variations from -11°C to 21°C.
- Curves for different condensation temperatures: 30/35°C, 40/45°C, 50/55°C.
2 TECHNICAL DATA

2.2 RATINGS OF HIWARM UNITS

HiWarm 22 - heating capacity produced with outdoor temperature variations:

HEATING CHARACTERISTICS

OUTCONDENSATIONTEMPERATURE °C

<table>
<thead>
<tr>
<th>OUTCONDENSATIONTEMPERATURE °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outdoor air T °C</td>
</tr>
</tbody>
</table>

HIWARM 22 - electrical input in the heating mode with outdoor temperature variations:
2  TECHNICAL DATA

2.2  RATINGS OF HIWARM UNITS

HiWarm 33 - heating capacity produced with outdoor temperature variations:

**HEATING CHARACTERISTICS**
2 TECHNICAL DATA

2.2 RATINGS OF HIWARM UNITS

COOLING CHARACTERISTICS

HiWarm 12 - cooling capacity produced with outdoor temperature variations:

HIWARM 12 – electrical input in the cooling mode with outdoor temperature variations:
2 TECHNICAL DATA

2.2 RATINGS OF HIWARM UNITS

COOLING CHARACTERISTICS

HiWarm 22 - cooling capacity produced with outdoor temperature variations:

HIWARM 22 – electrical input in the cooling mode with outdoor temperature variations:
2 TECHNICAL DATA

2.2 RATINGS OF HIWARM UNITS

COOLING CHARACTERISTICS

HiWarm 33 - cooling capacity produced with outdoor temperature variations:

HIWARM 33 - electrical input in the cooling mode with outdoor temperature variations:
2 TECHNICAL DATA

2.3 PERFORMANCE OF THE HIWARM UNITS UNDER POWER MODULATION CONDITIONS

To calculate the performance data of HiWarm units under part-load conditions, apply the coefficients shown in the diagrams below to the previously listed performance data at the maximum compressor rotation frequency. The curves present in each diagram describe the relative variation in capacity and efficiency under extreme operating modes of the unit: any other operating modes will fall within that interval (in any case never greater than 5%, so overly rough approximations are avoided).

HiWarm 12 —corrective coefficient for heating capacity with frequency variations:

HiWarm 12 —corrective coefficient for power input with frequency variations:

HiWarm 12 —corrective coefficient for cooling capacity with frequency variations:

HiWarm 22 —corrective coefficient for heating capacity with frequency variations:

HiWarm 22 —corrective coefficient for power input with frequency variations:

HiWarm 22 —corrective coefficient for cooling capacity with frequency variations:
2 TECHNICAL DATA

2.3 PERFORMANCE OF THE HIWARM UNITS UNDER POWER MODULATION CONDITIONS

HiWarm 33 – corrective coefficient for heating capacity with frequency variations:

HiWarm 33 – corrective coefficient for power input with frequency variations:

HiWarm 33 – corrective coefficient for cooling capacity with frequency variations:
2 TECHNICAL DATA

2.4 OPERATING LIMITS

HiWarm 12 operating limits in terms of water produced and outdoor air temperature (dry bulb):

HiWarm 22 operating limits in terms of water produced and outdoor air temperature (dry bulb):
2 TECHNICAL DATA

2.4 OPERATING LIMITS

HiWarm 33 operating limits in terms of water produced and outdoor air temperature (dry bulb):

Operating limits of HiWarm in total recovery mode for water produced on the cold water user side and recovery:
2 TECHNICAL DATA

2.4 OPERATING LIMITS

The temperatures indicated in the diagrams represent a broader working range than is typical of air conditioning applications, attesting to the fact that the operating regime of these applications can be implemented in a continuous manner.

- Thermal carrier fluid: water or water and antifreeze mixtures, max glycol 30%
- Maximum pressure, water side = 5 bars
- Maximum pressure high pressure side = 41.5 bars
- Maximum room T of indoor unit = 42 °C
- Minimum room T of indoor unit = -10 °C
- Maximum pressure, low pressure side = 29 bar (**)
- Supply voltage: = +/- 10% of rating plate voltage
- Maximum storing T of indoor unit= + 42 °C
- Minimum storing T = -20 °C (limit imposed by the built-in electronic components)

(**) this value can be reached only during storage and determines the refrigerant saturation pressure of 30 bar-r on the low pressure side of the circuit, a value that in fact defines the limits.

EVAPORATOR WATER FLOW RATE

The nominal flow rate is based on a thermal differential of 5 °C between inlet and outlet water, in relation to the cooling capacity provided at the nominal water temperatures (12-7 °C). The maximum allowed flow rate is associated with a temperature differential of 3 °C: higher flow rate values cause too big pressure drops. The minimum allowed flow rate is associated with a thermal differential of 8 °C. Lower flow rates could cause excessively low evaporation temperatures, which would trigger the safety devices and cause the unit to stop or poor distribution and risk of thermal exchange under non turbulent or non fully turbulent operating conditions.
Nominal available head of hydraulic pumps under conditions of cooling water to 7-12°C and outdoor air at 35°C. The pumps actuated by inverters can work at any point within the range whose upper limit is determined by the pump characteristics.

**2.5 TECHNICAL DATA OF WATER PUMPS**

Electrical input 0.1 [kW] Input power 0.6 [A]

Electrical input 0.3 [kW] Input power 1.3 [A]
2 TECHNICAL DATA

2.5 TECHNICAL DATA OF WATER PUMPS

3 MANAGEMENT AND CONTROL

The management and optimization software of the cooling cycle and the electronic and electromechanical components is implemented and developed in-house by highly specialized staff.
3 MANAGEMENT AND CONTROL

- CONNECtIONS FOR THE USER AVAILABLE ON THE HIWARM ELECTRIC CONTROL BOARD:

81-82 user request
91-92 on DHW request
11-14 remote on-off
51-52 summer/winter selection
61-62 secondary setpoint or external alarm selection
31-32-33 unit general alarm signal
70-73 user tank sensor
70-74 DHW tank sensor
70-75 Outdoor temperature probe

3.1 USER INTERFACE

The user interface adopted, PGD1, comprises an LCD display (8 rows x 22 columns) and 6 keys. From here the user can carry out all program-related operations, view the status of the unit at all times and edit parameters.

- DESCRIPTION OF KEYPAD

The 6 keys and their respective functions are described in the table below.

<table>
<thead>
<tr>
<th>KEY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALARM</td>
<td>PRESS THE ALARM KEY TO RESET ALARMS. WHEN AN ALARM IS PRESENT, THE BUTTON LIGHTS UP RED.</td>
</tr>
<tr>
<td>PROGRAM</td>
<td>PRESS PRG TO ACCESS THE MAIN MENU.</td>
</tr>
<tr>
<td>ESC</td>
<td>PRESS ESC TO MOVE UP TO A HIGHER LEVEL IN THE MENU.</td>
</tr>
<tr>
<td>UP</td>
<td>PRESS UP TO GO TO THE NEXT SCREEN OR INCREASE THE VALUE OF A PARAMETER.</td>
</tr>
<tr>
<td>ENTER</td>
<td>PRESS ENTER TO GO INTO THE FIELDS OF PARAMETERS TO BE EDITED AND TO CONFIRM CHANGES.</td>
</tr>
<tr>
<td>DOWN</td>
<td>PRESS DOWN TO GO TO THE PREVIOUS SCREEN OR DECREASE THE VALUE OF A PARAMETER.</td>
</tr>
</tbody>
</table>

- MAIN SCREEN

When the heat pump is switched on the control logic will check the operating mode and show this information on the main screen.
3 MANAGEMENT AND CONTROL

3.1 USER INTERFACE

MAIN SCREEN

Besides the user temperatures (summer or winter air conditioning) and the domestic hot water temperature, the following information is given via icons:

<table>
<thead>
<tr>
<th>ICON</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="User Pump Icon" /></td>
<td>The user pump is enabled. When the user tank is present and the user probe is enabled, it also indicates that a demand for winter or summertime air conditioning is active. If a user tank is not present, the user pump will always be on, provided that a user enabling request does not arrive via a digital input.</td>
</tr>
<tr>
<td><img src="image" alt="DHW Pump Icon" /></td>
<td>The DHW pump is enabled. When the DHW tank is present and the DHW probe is enabled, it also indicates that a demand for domestic hot water is active. If a DHW tank is not present, the user pump will always be on, provided that a DHW enabling request does not arrive via a digital input.</td>
</tr>
<tr>
<td><img src="image" alt="Fans Icon" /></td>
<td>Fans are on.</td>
</tr>
<tr>
<td><img src="image" alt="Compressor Start-Up Icon" /></td>
<td>Compressor start-up to satisfy the demand for air conditioning (user) or DHW.</td>
</tr>
<tr>
<td><img src="image" alt="4-Way Water Valve Positioning Icon" /></td>
<td>The 4-way water valve on user side is in the positioning mode. Positioning takes place each time the unit is powered and then when the user operating mode is changed (winter or summer).</td>
</tr>
</tbody>
</table>

Selecting operating mode

From the User menu → LAN and Supervision → J1 it is possible to define how the on/off switching of the unit will be controlled. To do this:

- Press PRG to access the main menu.
- Using the UP and DOWN keys scroll the menu and select USER;
- Press ENTER and enter the password (default 100) using UP and DOWN keys;
- Press ENTER to confirm the password and access the user menu;
- Using the UP and DOWN select “Lan and Supervision”;
- Press ENTER to access the screen (J1):

---

**UNIT ON/OFF**

**ENABLE ON/OFF FROM:**

- KEYPAD: NO
- REMOTE CONTACT: NO
- SUPERVISION: NO
- SLOTS: NO

---

In this screen enable one or more unit starting options.

The options are:

- by means of the display key (local or remote independently)
- by means of external contacts (no voltage)
- through the remote supervision system
- via time slots

If several options are enabled, consent will have to be given via all of them in order for the unit to work. The main screen shows the unit’s status specifying, in the event that the unit is OFF, the condition that imposes this status.

---

The indication shown may be:

- **ON:** unit on (all On/Off logics of the unit enable operation).
- **OFF Alarm:** unit off because an alarm has occurred. Irrespective of the status of the enabled On/Off logics, some alarms will cause the unit to shut down.
- **OFF Superv.:** unit switched off via supervisor.
- **OFF Time slots:** unit off according to scheduled time slots.
- **OFF Remote:** unit switched off by remote digital contact.
- **OFF Keypad:** unit switched off from the keypad. If this option is disabled, it will no longer be possible to change the unit’s status from the keypad. NB: If the unit has been switched off from the keypad and then this control mode is disabled, it will no longer be possible to switch on the unit.

From screen J1 and with cursor in the top left-hand position, press DOWN to access the following screen (J2):

---

**UNIT CONTROL**

**USER ENABLING:** NO

**DHW ENABLING:** NO

---

It is possible to select the type of enabling for the unit operating modes, and namely:

- by means of the display keys
- by means of the external contacts connected to the terminal board of the unit
- through a supervision system it is possible to remotely enable/disable the DHW operation or the user function (summer/winter air conditioning)
3 MANAGEMENT AND CONTROL

3.1 USER INTERFACE

ON-OFF VIA Keypad

To start the unit keep the ENTER key pressed until the following screen appears:

```
+----------------------+
|                      |
| UNIT STARTING        |
| -> COOLING           |
| PRG : CONFIRM        |
| ESC : CANCEL         |
|                      |
|                      |
+----------------------+
```

press UP or DOWN to select the operating mode of the user (cooling/heating) then press PRG to confirm. Press ESC to exit without starting the unit.

N.B.: the unit starting will enable also the DHW production. Whether the compressor and pumps actually start running will depend on whether there is a user and/or DHW request as determined by the programmed setpoint and the temperatures.

To stop the unit keep the ENTER key pressed until the following screen appears:

```
+----------------------+
|                      |
| STOP UNIT?           |
| PRG : CONFIRM        |
| ESC : CANCEL         |
|                      |
|                      |
+----------------------+
```

press PRG to confirm the unit stop, press ESC to exit, keeping the unit running.

ON-OFF CONTROL BY MEANS OF EXTERNAL CONTACTS

Before this mode can be used, specialized personnel must make an electrical connection between the external contacts and the terminals located inside the electrical enclosure of the unit.

With reference to the unit wiring diagram the terminals and their functions are available as follows:

X3:11-14 > ON/Off of the unit
X3:24-81 > user enabling (winter air conditioning according to the mode selection)
X3:24-82 > enabling DHW production
X3:51-52 > selection of user mode

Whether the compressor and pumps actually start running will depend on the programmed temperatures and setpoints.

ON-OFF CONTROL VIA SUPERVISOR

Use of a supervisory controller requires the installation of a specific communication card (pCWeb or RS485) which serves as an interface between the main controller of the units and the supervision system. From the User menu → Lan and Supervision → J6 it is possible to set the main configuration parameters of the communication and the type of protocol.

```
+----------------------+
| SUPERVISION J6       |
| SYSTEM               |
| COMMUNIC. SPEED:     |
| 1200 BPS            |
| IDENTIF NO.: 000     |
| PROTOCOL : CAREL     |
|                      |
|                      |
+----------------------+
```

With the supervision system, in addition to all the previous commands (on-off, user enabling and DHW) it is possible to read the status of all alarms, reset alarms, adjust the operating setpoints and read all operating parameters.

For the complete list of supervision variables and further details, refer to the software user manual.

ON-OFF CONTROL VIA TIME SLOTS

Through the clock card it will be possible to schedule the unit On/Off times according to time slots.

Enabling requirements

- CLOCK CARD INSTALLED
- THE ON-OFF VIA TIME SLOT OPTION MUST BE ENABLED (USER MENU → LAN AND SUPERVISION → J1)

```
+----------------------+
| UNIT ON/OFF J1      |
| ENABLE ON/OFF FROM: |
| - KEYPAD : NO       |
| - REMOTE CONTACT: NO|
| - SUPERVISION : NO  |
| - SLOTS : YES       |
|                      |
|                      |
+----------------------+
```

SETTING ON-OFF TIME SLOTS

FOUR DIFFERENT TIME SLOTS ARE PRESENT ((USER MENU → CLOCK → L2); TWO ARE CONFIGURABLE AND CAN BE USED TO DEFINE THE LOGIC OF THE DIFFERENT DAYS OF THE WEEK.

- Slot 1 (F1) : It defines 2 unit on/off intervals over a 24 hour period
3 MANAGEMENT AND CONTROL

3.1 USER INTERFACE

ON-OFF CONTROL VIA TIME SLOTS

Slot 2 (F2) : It defines one unit on/off interval over a 24 hour period

- Slot 3 (F3) : Unit always on
- Slot 4 (F4) : Unit always off

Weekly programming

Once the On/Off time slots have been defined, they must be used to define
the logic to be adopted on different days of the week (User menu → Clock → L3).

N.B.: The On/Off by time zones option is only a means of enabling or
disabling operation; this means that the unit will switch on only if all the
active On/Off options (User menu → LAN and Supervision) similarly enable
operation.

N.B.: In the Setpoint menu it is only necessary to define the user operating
setpoints for the different times of the day; the DHW setpoint is fixed (see
next paragraph).

SETPOINT SELECTION

User Setpoint enabled
(Setpoint menu → F0)

Active DHW Setpoint
(Setpoint menu → F1)

Main Setpoint
(Setpoint menu → F2)

N.B.: The On/Off by time zones option is only a means of enabling or
disabling operation; this means that the unit will switch on only if all the
active On/Off options (User menu → LAN and Supervision) similarly enable
operation.

N.B.: In the Setpoint menu it is only necessary to define the user operating
setpoints for the different times of the day; the DHW setpoint is fixed (see
next paragraph).

SETPOINT SELECTION

User Setpoint enabled
(Setpoint menu → F0)

Active DHW Setpoint
(Setpoint menu → F1)

Main Setpoint
(Setpoint menu → F2)

At the same time you must set the summer and winter setpoints to be used
during or outside the time slots (Setpoint menu → F5-F6).

Setpoints for programmed time slots, user only

From the SETPOINT menu you can set time slots for every day of the week
to control the setpoint changes during the periods of the day when the unit
is ON (Setpoint menu → F7).
3 MANAGEMENT AND CONTROL

3.1 USER INTERFACE

SETPOINT SELECTION

To control the time slots the following procedure is necessary:
- selection of automatic setpoint adjustment “by time slots” (User menu → Setpoints and parameters → H4).

Secondary Setpoint Via Digital input (setpoint menu → F3).
From the SETPOINT menu you can establish the secondary summertime and wintertime setpoints controlled by the digital input ID14 accessible from the terminals X3:61-62. When the digital input is open, the main setpoint will be used; when the digital input is closed the secondary setpoint will be used.

ALARMS
- When an anomaly occurs or the unit stops because a protection device has been tripped, the red LED of the ALARM key will light up.
- By pressing the ALARM key once, it is possible to access the active alarm list and using the UP/DOWN keys it is possible to scroll the list to display all active alarms where present. Each alarm is identified by a code and a brief description; refer to the software manual for a complete list.
- Pressing the ALARM key a second time will reset the alarms, provided that the cause which generated them has been removed.
- If the specific function is enabled, all alarms except the high and low pressure ones will be automatically reset after a preset time interval.
- The information that at least one alarm is active can be communicated externally by means of a voltage free relay contact on terminals X3:31-32-33 (see Wiring diagram). With a supervision system, it is also possible to read the status of each single alarm as well as the general alarm, reset the alarms and optionally set up a data logger (pCOWeb).
- The information of alarm presence from 31-32-33 terminals may be used to remote signalling (by means of a pilot lamp for example).
- switch on an auxiliary backup device for the production of DHW (for example, a heating element installed inside the tank and controlled by a mechanical thermostat).

OPERATING MODE
The possible methods for selecting the unit’s operating mode (cooling/heating) are shown below, in order of priority:
1. via Digital input
2. from the Keypad or via the Supervisor

When the unit is switched on the control logic will check the operating mode and show this information on the main screen (the correspondence between the symbol used on the display and the mode can be configured from the User menu → Setpoints and parameters → Hh).
3 MANAGEMENT AND CONTROL

3.2 SUPERVISION SOFTWARE FUNCTIONS

Ethernet with supervision software is integrated into the HiWARM unit.

The supervision software allows a connection to be made between the onboard controller of the unit and the 10 Mbps Ethernet RJ45 network. The operating system used is Linux 2.4.21.

Installation takes place directly on the serial port of the advanced controller and a static or dynamic IP address with DHCP function is used.

The supervision software permits the following:

- display of unit status
- display of current alarms and alarm history
- recording of data with 10 settable variables
- downloading of all data records via a web browser or FTP
- possibility of editing the main parameters

With supervision software it is also possible to perform supervisory monitoring using the following protocols:

- with SNMP v1 & v2c protocol
- with BACnet Ethernet or BACnet/IP protocol

The parameters related to management of the SNMP and BACnet protocol are set from the Administrator configuration pages, such as the one shown in the figure:

The logic controlling the defrost cycle waits for a repeated and prolonged lowering of pressure to the evaporator, a sign that the heat exchange with the outside has been obstructed. To carry out a defrost cycle, the unit has to reverse the cycle and heat the finned exchanger at maximum power in order to minimize the period of inactivity as far as heating the home is concerned. The diagram below shows the compressor frequency during defrosting. Before and after a defrost cycle, the compressor slows to minimum speed so as to best enable the reversal of the thermodynamic cycle.

The temperatures at which the phenomenon occurs most frequently are just below 0°C.

3.3 DEFROST MANAGEMENT FUNCTION

In the winter the finned exchanger becomes covered with ice as it absorbs heat from the environment and maintains a temperature lower than the ambient temperature. Air humidity slowly condenses and freezes between the fins, thus interrupting thermal exchange.
# 4 Gas and Plumbing Connections

## 4.1 Gas Tubing Design Criteria

All copper tubing is made to our specifications, our aim being to completely control the process of their manufacture and thereby improve the quality of our products. All tubing meets the requirements imposed by Directive 97/23/EC (PED) and is verified by means of the FEM calculation code in the point most stressed by bending at 180° and at the maximum pressure allowed by the safety devices, considering suitable safety coefficients.

The HiWarm unit comes pre-charged with refrigerant and oil; installation requires evacuating the line (see operation and maintenance manual) and allowing the pre-charge contained in the unit to flow into the line. Refer to the table to see the maximum length of line covered by the pre-charge; beyond this value, add refrigerant and oil as necessary according to the indications provided.

References for the design of copper tubing under pressure:
The table below provides indications concerning the tubing and refrigerant and oil charges for the different sizes of HiWarm and different lengths of the line:

### References for the Design of Copper Tubing Under Pressure:

<table>
<thead>
<tr>
<th>Refrigerant</th>
<th>R410A</th>
<th>R410A</th>
<th>R410A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Refrigerant Charge [KG]</td>
<td>6.5</td>
<td>10.5</td>
<td>15</td>
</tr>
<tr>
<td>Limit Refrigerant Charge [KG]</td>
<td>11</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>Base Oil Charge [KG]</td>
<td>0.7</td>
<td>2.1</td>
<td>2.3</td>
</tr>
<tr>
<td>Oil Type</td>
<td>DAPHNE HERMETIC OIL FV50S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Addition of Oil Upon Exceeding the Maximum Refrigerant Charge (for each extra KG of Refrigerant) [G/KG]</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Length of Line Covered by the Base Charge [M]</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

### Gas Intake Grille

| Gas Intake Grille [IN(MM)] | 5/8 (15.9) | 3/4 (19) | 7/8 (22.2) |
| Liquid Line [IN(MM)] | 3/8 (9.5) | 1/2 (12.7) | 5/8 (15.9) |
| Addition of Refrigerant Per Metre of Line Beyond the Length Covered by the Pre-Charge [KG] | 0.05 | 0.11 | 0.17 |
| Addition of Oil Per Individual Siphon [G] | 20 | 34 | 54 |

### Gas Intake Grille

| Gas Intake Grille [IN(MM)] | 3/4 (19) | 7/8 (22.2) | 1 1/8 (28.6) |
| Liquid Line [IN(MM)] | 3/8 (9.5) | 1/2 (12.7) | 5/8 (15.9) |
| Addition of Refrigerant Per Metre of Line Beyond the Length Covered by the Pre-Charge [KG] | 0.05 | 0.11 | 0.18 |
| Addition of Oil Per Individual Siphon [G] | 34 | 54 | 115 |

### Gas Intake Grille

| Gas Intake Grille [IN(MM)] | 3/4 (19) | 7/8 (22.2) | 1 1/8 (28.6) |
| Liquid Line [IN(MM)] | 3/8 (9.5) | 1/2 (12.7) | 5/8 (15.9) |
| Addition of Refrigerant Per Metre of Line Beyond the Length Covered by the Pre-Charge [KG] | 0.05 | 0.11 | 0.18 |
| Addition of Oil Per Individual Siphon [G] | 34 | 54 | 115 |
4 GAS AND PLUMBING CONNECTIONS

4.1 GAS TUBING DESIGN CRITERIA

Installation of gas line with remote unit placed higher than the indoor unit

- Line slope of 1° - 3° to facilitate return of oil
- Siphons for height adjustment along long horizontal piping sections.
- Siphons h = 200 mm, Radius = 2D before entering the unit

It is recommended to set on each line a siphon every 5 m in height. If the difference in height between indoor and remote unit exceeds 10 m, please contact the technical dept. for a correct selection of the components. If the line length exceeds 25 m, please contact the technical dept.

Installation of gas line with remote unit placed lower than the indoor unit

- Siphon h = 200 mm, R = 2D every 5 m of height
- Line slope of 1° - 3° to facilitate return of oil
- Siphons for height adjustment along long horizontal piping sections.
4 GAS AND PLUMBING CONNECTIONS

4.1 GAS TUBING DESIGN CRITERIA

Flowchart for defining the amounts of refrigerant and oil the system needs to be charged with:

- **SI**: Contact the Technical Department
- **NO**: Set 1 siphon every 5m of difference in height following the instructions
- **SI**: Distance in height between main and remote units > 10m or line length > 25 m
- **NO**: Distance in height between main and remote units > 5m
- **SI**: Length of line > 15m
- **NO**: Charging with refrigerant > limit charge
- **SI**: Addition of refrigerant per metre of line beyond the length covered by the pre-charge
- **NO**: Addition of refrigerant per kg of refrigerant beyond the limit charge, according to previous table

Example

Unit: HWM033
Line length 25m (including 10m of vertical distance) - If the line exceeds 25m in length or a difference in height of 10m, the technical department should have been contacted.

- Diameter of gas line (outlet): 28.6 mm – 1 1/8"
- Diameter of liquid line: 15.9 mm – 5/8"
- Base refrigerant charge: 15 kg
- Addition of refrigerant per metre of line: 0.18 g/m
- Addition of oil per individual siphon: 115 g
- Limit refrigerant charge for the compressor: 15 kg
4 GAS AND PLUMBING CONNECTIONS

4.1 GAS TUBING DESIGN CRITERIA

REFERENCES FOR THE DESIGN OF COPPER TUBING UNDER PRESSURE:

**CHARGING WITH REFRIGERANT**

- Refrigerant to be added due to the length of line
  
  \[(25 \text{ m} - 15 \text{ m}) \times 0.18 \text{ g/m} = 1.8 \text{ kg}\]

<table>
<thead>
<tr>
<th>Metres of line</th>
<th>Addition of refrigerant per metre of line</th>
</tr>
</thead>
</table>

Total refrigerant charge

\[1.8 \text{ kg} + 15 \text{ kg} = 16.8 \text{ kg}\]

| Charge due to the length of line | Base refrigerant charge |

**ADDING OIL**

- Vertical line 10m => 2 siphons

Addition of oil due to siphons

\[115 \text{ g} \times 2 = 230 \text{ g}\]

| Addition of oil per single siphon | No. of siphons |

Refrigerant charge beyond limit

\[16.8 \text{ kg} - 15 \text{ kg} = 1.8 \text{ kg}\]

| Total refrigerant charge | Limit refrigerant charge for compressor |

Addition of oil upon exceeding the maximum refrigerant charge

\[1.8 \text{ kg} \times 50 \text{ g/kg} = 90 \text{ g}\]

| Refrigerant charge beyond limit | Adding oil per kg of refrigerant |

Total addition of oil

\[90 \text{ g} + 230 \text{ g} = 320 \text{ g}\]

| Total addition of oil | Addition of oil due to siphons |

Addition of oil upon exceeding the maximum refrigerant charge
4 GAS AND PLUMBING CONNECTIONS

4.1 GAS TUBING DESIGN CRITERIA

References for the design of copper tubing under pressure:

<table>
<thead>
<tr>
<th>DIAMETER (MM)</th>
<th>THICKNESS (MM)</th>
<th>MINIMUM RADIUS OF CURVATURE (MM)</th>
<th>DESIGN PRESSURE (BAR)</th>
<th>CATEGORY PED</th>
<th>␀S MAXIMUM COPPER (N/MM²)</th>
<th>␀S ACTUAL COPPER (N/MM²)</th>
<th>SAFETY COEFFICIENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>1</td>
<td>36</td>
<td>42</td>
<td>A3 P3</td>
<td>227</td>
<td>16.8</td>
<td>13.5</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>36</td>
<td>42</td>
<td>A3 P3</td>
<td>227</td>
<td>21.0</td>
<td>10.8</td>
</tr>
<tr>
<td>16</td>
<td>1</td>
<td>46</td>
<td>42</td>
<td>A3 P3</td>
<td>227</td>
<td>29.4</td>
<td>7.7</td>
</tr>
<tr>
<td>18</td>
<td>1</td>
<td>56</td>
<td>42</td>
<td>A3 P3</td>
<td>227</td>
<td>33.6</td>
<td>6.8</td>
</tr>
<tr>
<td>22</td>
<td>1.5</td>
<td>67</td>
<td>42</td>
<td>A3 P3</td>
<td>227</td>
<td>28.6</td>
<td>8.5</td>
</tr>
<tr>
<td>28</td>
<td>1.5</td>
<td>96</td>
<td>42</td>
<td>A3 P3</td>
<td>227</td>
<td>35.0</td>
<td>6.5</td>
</tr>
<tr>
<td>35</td>
<td>1.5</td>
<td>70</td>
<td>42</td>
<td>A3 P3</td>
<td>227</td>
<td>44.8</td>
<td>5.0</td>
</tr>
<tr>
<td>42</td>
<td>1.5</td>
<td>84</td>
<td>42</td>
<td>A3 P3</td>
<td>227</td>
<td>54.6</td>
<td>4.2</td>
</tr>
<tr>
<td>54</td>
<td>2.0</td>
<td>108</td>
<td>42</td>
<td>A3 P3</td>
<td>227</td>
<td>52.5</td>
<td>4.3</td>
</tr>
</tbody>
</table>

Domestic hot water must be heated by means of a stainless steel coil fitted inside the tank or an external plate exchanger, in such a way you avoid having to store domestic hot water and it is not necessary to provide for an anti-Legionella cycle.

4.2 GENERAL GUIDELINES FOR HEATING SYSTEMS SERVED BY HIWARM

Multi-purpose units (both on/off and modulating) are not suitable for use as "rapid" heaters; therefore an accumulation of heat must always (necessarily) be provided for the production of DHW. Analogously, heat pumps that use outdoor air as the thermal source require defrost cycles which introduce large quantities of cold water into the building’s heating circuit, albeit not for more than 8 minutes. For this reason there needs to be a minimum amount of water in the system to prevent the thermal energy removed (which we can consider approximately equal to the nominal cooling capacity produced for 300 s) from causing the heating system to fall below a certain comfortable room temperature. For example, in the case of radiant floor heating panels, this minimum amount of water must be determined based on the minimum volume of water obtainable by closing all zones of the system. As a rule, also in the case of radiant panels, use of a tank is recommended.

Domestic hot water must be heated by means of a stainless steel coil fitted inside the tank or an external plate exchanger, in such a way you avoid having to store domestic hot water and it is not necessary to provide for an anti-Legionella cycle.

If the engineer opts in any case for DHW storage-the buffer tank must be suitable for storing drinking water and fitted with a surface coil (on which the multifunctional unit will work) such as to enable a heat exchange commensurate with the unit’s power, considering the working temperatures of the unit and the temperature at which the DHW is stored inside the tank. In such a case, moreover, an anti-Legionella cycle must be provided for generally by exploiting a supplemental heater (e.g. a heating element). It should be said that this will result in general in a certain expenditure of energy, which could be avoided by storing technical water.
4 GAS AND PLUMBING CONNECTIONS

4.2 GENERAL GUIDELINES FOR HEATING SYSTEMS SERVED BY HIWARM

Please note that DHW system should in no case be in contact with the water circuit of the units. In all systems which provide for capacity control of users (for example two-way valves on the exchangers or similar devices), the content of water in the system can vary considerably under the various operating conditions. This aspect should be taken into account when sizing the storage tanks.

The use of a tank with the function of hydraulic separator ensures maximum flexibility in the system, but requires accurate sizing (which takes into account the decoupled flows) to avoid exergetic losses due to the mixing of flows at different temperatures.

This problem is solved by ensuring good stratification both in the wintertime and summertime; in this respect, installing two cycle reversing valves (even manually actuated ones) will ensure proper stratification in both operating modes.

Other documentation, made available by the manufacturer, should be referred to for comprehensive guidelines to be followed to ensure a correct design of thermal systems for multifunctional heat pumps.

4.3 GENERAL GUIDELINES FOR PLUMBING CONNECTIONS

When you are getting ready to set up the water circuit you should follow the directions below and in any case make sure to comply with national or local regulations (use the diagrams included in this manual as your reference).

- Connect the pipes to the chiller using flexible couplings to prevent the transmission of vibrations and to compensate for thermal expansions.

- The water circuit must be set up in such a way as to guarantee that the nominal flow rate of the water supplied to the evaporator remains constant (+/- 15%) in all operating conditions.

- Attention should be paid to ensure that the pressure on the pump intake side, where the expansion tank is positioned, will always be greater than 0.5 bars while the pump is running: this also helps to reduce the risks of pump cavitation.

PUMPING SYSTEMS

Two pumps are used in the HiWarm unit: one serving users – heating or cooling – and one for domestic hot water. One pump or the other is enabled according to the request.

The pumps installed are of the high-efficiency type with an inverter-powered synchronous motor; they fall into energy class A.

Common pumps with an asynchronous motor have a characteristic curve that changes based on the pressure drops they are dealing with.

The operating mode and thus the capacity are imposed by the system. In the figure you can observe the operating diagram of asynchronous motor-driven pumps, with their characteristic curve (first diagram) based on pressure drops (second diagram):

Asynchronous motor-driven pumps have a characteristic curve controlled by the microprocessor controller of the unit. The operating logic can be based on a constant flow rate, a constant head or a constant temperature difference in the heat exchanger. The latter mode is illustrated in the diagram below.

The pump system performance details are shown paragraph “Technical data”.

Pump Flow rate %

Pump operating range with compressor speed adjustments
4 GAS AND PLUMBING CONNECTIONS

4.3 GENERAL GUIDELINES FOR PLUMBING CONNECTIONS

Cooling circuit diagram

Here below the present fooling diagram of HiWARM is shown, which however may be subject to change:

Refer to the legend on the following page:
5 DIMENSIONAL DRAWINGS

Dimensions of HiWARM 012 indoor unit

<table>
<thead>
<tr>
<th>REF.</th>
<th>CONNECTIONS</th>
<th>TYPE</th>
<th>HWM012</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>WATER OUTLET - AIR CONDITIONING SYSTEM</td>
<td>COPPER PIPE</td>
<td>028 M</td>
</tr>
<tr>
<td>B</td>
<td>WATER INLET - AIR CONDITIONING SYSTEM</td>
<td>COPPER PIPE</td>
<td>028 M</td>
</tr>
<tr>
<td>C</td>
<td>WATER OUTLET - DHW SYSTEM</td>
<td>COPPER PIPE</td>
<td>028 M</td>
</tr>
<tr>
<td>D</td>
<td>WATER INLET - DHW SYSTEM</td>
<td>COPPER PIPE</td>
<td>028 M</td>
</tr>
<tr>
<td>E</td>
<td>LIQUID LINE - OUTDOOR UNIT</td>
<td>ROTALOCK</td>
<td>012 F</td>
</tr>
<tr>
<td>F</td>
<td>GAS LINE - OUTDOOR UNIT</td>
<td>ROTALOCK</td>
<td>016 F</td>
</tr>
</tbody>
</table>
Dimensions of HiWARM 012 outdoor unit

PLUMBING CONNECTIONS

<table>
<thead>
<tr>
<th>REF</th>
<th>CONNECTIONS</th>
<th>TYPE</th>
<th>HW/M012</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>GAS LINE FOR INDOOR UNIT</td>
<td>ROTALOCK</td>
<td>Ø16 F</td>
</tr>
<tr>
<td>B</td>
<td>LIQUID LINE FOR INDOOR UNIT</td>
<td>ROTALOCK</td>
<td>Ø12 F</td>
</tr>
</tbody>
</table>
5 DIMENSIONAL DRAWINGS

Dimensions of HiWARM 022 and HiWarm 033 indoor units

<table>
<thead>
<tr>
<th>REF.</th>
<th>CONNECTIONS</th>
<th>TYPE</th>
<th>HWM022</th>
<th>HWM033</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>WATER OUTLET - AIR CONDITIONING SYSTEM</td>
<td>COPPER PIPE</td>
<td>Ø35 M</td>
<td>Ø35 M</td>
</tr>
<tr>
<td>B</td>
<td>WATER INLET - AIR CONDITIONING SYSTEM</td>
<td>COPPER PIPE</td>
<td>Ø35 M</td>
<td>Ø35 M</td>
</tr>
<tr>
<td>C</td>
<td>WATER OUTLET - DHW SYSTEM</td>
<td>COPPER PIPE</td>
<td>Ø35 M</td>
<td>Ø35 M</td>
</tr>
<tr>
<td>D</td>
<td>WATER INLET - DHW SYSTEM</td>
<td>COPPER PIPE</td>
<td>Ø35 M</td>
<td>Ø35 M</td>
</tr>
<tr>
<td>E</td>
<td>LIQUID LINE - OUTDOOR UNIT</td>
<td>ROTALOCK</td>
<td>Ø12 F</td>
<td>Ø16 F</td>
</tr>
<tr>
<td>F</td>
<td>GAS LINE - OUTDOOR UNIT</td>
<td>ROTALOCK</td>
<td>Ø22 F</td>
<td>Ø22 F</td>
</tr>
</tbody>
</table>

PLUMBING CONNECTIONS

CENTRE OF GRAVITY
5 DIMENSIONAL DRAWINGS

Dimensions of HiWARM 022 outdoor unit

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### PLUMBING CONNECTIONS

<table>
<thead>
<tr>
<th>REF.</th>
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</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>GAS LINE FOR INDOOR UNIT</td>
<td>ROTALOCK</td>
<td>Ø22 F</td>
</tr>
<tr>
<td>B</td>
<td>LIQUID LINE FOR INDOOR UNIT</td>
<td>ROTALOCK</td>
<td>Ø12 F</td>
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</table>
Dimensions of HiWARM 033 outdoor unit

<table>
<thead>
<tr>
<th>REF.</th>
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</thead>
<tbody>
<tr>
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<td>GAS LINE FOR INDOOR UNIT</td>
<td>ROTA LOCK</td>
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</tr>
<tr>
<td>B</td>
<td>LIQUID LINE FOR INDOOR UNIT</td>
<td>ROTA LOCK</td>
<td>016 F</td>
</tr>
</tbody>
</table>
HiWarm: total condensation heat recovery multi-purpose air-water heat pump. It permits to heat or cool an entire home and produce domestic hot water in a totally autonomous manner through a dedicated water circuit, according to priority or total recovery function in cooling mode. The heat pumps of the HiWarm series cover a range of heating capacities from 7 to 51 kW, and a range up to 37 kW in the cooling mode.

The product is available in three sizes, classified based on their cooling capacity under nominal conditions, that is, for water produced at 12 - 7°C with an outdoor air temperature of 35°C. The common characteristics of the unit can be summed up as follows:

- Split unit with compressor installed in the indoor unit so as to both reduce outdoor noise emissions and allow the construction of a lightweight outdoor unit that can be positioned on the ground with simple brackets.
- Outdoor unit configured as a compact ductable indoor unit with back-erad curved fins driven by permanent magnet synchronous motor (EC), intended for installation in attics.
- Expansion valve: ETV (electronically controlled electronic thermal expansion valve), to take a damage from the possibility of generating thermodynamic cycles under reduced pressure let-downs, resulting in clear benefits in terms of COP.
- Integrated control of pumps on the system side and DHW side: both pumps can be directly controlled by the unit.
- Cycle relay on variable speed with RAL 9016 polish on the blades for a better fluid-dynamic distribution.
- Electronically controlled electronic thermal expansion valve.
- Advanced electronic control, which makes it possible to respond in a suitable way exchange places under counter-current flow conditions.
- Double water circuit:
  - Air conditioning circuit with reusability on the cooling circuit side and a setpoint a = 10°C with minimum/min with a 0-40°C or 0-10°C signal.
  - DHW circuit with total recovery (in the event of simultaneous cooling) or in any case with recovery as a priority.

This circuit is separate and does not require long heating/cooling phases for inertia storage which impair energy efficiency, especially in summertime.

The basic choice underlying the development of the HiWarm series regards the use of:

- Scroll or twin rotary compressors
- Exchanges with brazed-welded AISI 316 stainless steel plates
- High-efficiency axial fans with winglet tips on the blades for a better fluid-dynamic distribution
- Electronically controlled electronic thermal expansion valve
- Advanced electronic control, which makes it possible to respond in a suitable manner to requirements under partial load conditions.
- Cooling circuit a according to EEC Directive 97/23 PED
- Electric control panel a according to EN 60204-1
- Thermal magnetic protectors for safeguarding gas inox or currents

**Versions:**
- Indoor unit + Remote outdoor unit → "E"
- Indoor unit + Remote unit configured as ductable indoor unit → "T"

The structure of the HiWarm units features:

- Indoor unit: galvanized steel perimeter enclosure panels with an epoxy polyester powder coating, oven cured at 180°C, and front cover which also incorporates the display, on two levels, basic (LCD) and 10 inch Windows CE based Graphic Touch Screen. The unit is completely enclosed but may be accessed on 3 sides thanks to easy-to-remove panels that greatly simplify maintenance and/or inspection. All routine maintenance operations are carried out from the front side of the unit.
- Remote unit for outdoor installation (attic): galvanized sheet steel panelling, coated with epoxy polyester powder paint oven cured at 180°C. The unit is completely enclosed with panels and available in RAL9002 (Grey White). 6 pole axial fans with blades ensuring broad coverage, associated with permanent magnet synchronous motors (optional) ensuring continuous modulation of rotation speed.
- Remote unit for indoor installation (attic): galvanized sheet steel panelling, coated with epoxy polyester powder paint oven cured at 180°C. The unit is completely enclosed with panels and available in RAL9002 (Grey White). It includes axial fans with brushless motors assuring continuous and efficient modulation maximum available head of available ±200 Pa.

**Description of the Base Unit including:**

- Twin Rotary or Scroll-type compressors designed to work with R410A. They are equipped with motor protection a gas inox or entrappers, overcurrents and excessive discharge gas temperatures. The brushless permanent magnet synchronous motor is controlled by a two phase inverter (BLDC “Brushless Direct Current” technology) supplied with ac.
- Inverter
- Heat exchanger AISI316 S/S plates:
- Electronically controlled electronic valve (EEV)
- Cycle reversing 3-way valve on the heating/cooling water circuit
- ON/OFF solenoid valves
- Liquid receiver for re-establishing an equilibrium, especially in the case of transients, of the optimal refrigeration charge, which vary under the different operating regimes.
- Wet rotor circulation pumps with synchronous EC motors, high efficiency (class A) and electronically controlled have been used. The pump casing is made of grey cast iron with a certificated KTL coating, which provides optimal protection against corrosion.
- Liquid separator placed on the compressor inlet line: it has the function of containing the excess unvaporated refrigerant at mid-pressing its return to a liquid state at the compressor and the possible damage that might result from this.
- Advanced pCO microprocessor + PGD graphic keypad which enables the control of the unit and of the main circuits parameters.

**Options:**
- Refrigerant – Compressor - power supply
  - R410A – inverter → 300/150 (std thermal magnetic circuit breakers) → only for WM012
  - R410A – inverter → 300/150 + N (std Thermal magnetic circuit breakers)
- Options: remote communication
  - R485 Serial Card
  - Lonworks serial card
  - GSM modem kit
  - GWEB Hardware: Ethernet card
  - GWEB Software + Ethernet card for Web interface

**Options:**
- Control options + remote controller
  - Wall mounted remote display
  - Clock card
  - Wall mounted remote display + clock card

**Options:**
- Cooling accessories
  - Service kit (temperature probes for quick diagnosis)

**Options:**
- Condensation control
  - Fan speed modulation by potentiometer with a adjustment of air flow rate
  - “EC” electronically controlled fan speed modulation - (brushless)

**Options:**
- Insulation
  - Base rubber vibration dampers
  - Base spring vibration dampers

**Options:**
- Colour
  - White - RAL 9016 polish
  - Silver grey - RAL 9006 metallic
  - Dark grey - RAL 7016 metallic
  - Blue - RAL 7031 polish
  - Bordeaux - RAL 7031 polish

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R666008551- Rev.D0