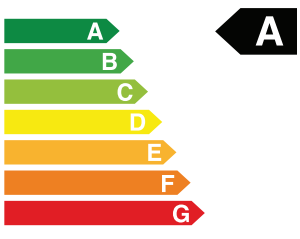
> GEYSER

Reversible heat pump

> GEYSER /ST

Water chiller with storage tank and pumps




BLUE BOX

index

TECHNICAL CHARACTERISTICS

GEYSER

High temperature, high efficiency air/water heat pumps with axial fans.

UNIT FRAME

Galvanised sheet steel painted using RAL 7035 polyester powder at 180 °C, which confers high resistance to atmospheric agents.
The panels can be easily removed to allow total access to internal components.

COMPRESSOR

Vapour injection hermetic scroll compressor, complete with circuit breaker protection included in the electric motor windings, sump heater and rubber anti-vibration supports. The compressor has a connection for the application of the vapour injection in order to reach higher temperatures than standard compressors. Thermodynamically, the injection also allows to reach higher energy efficiency levels.

SOURCE SIDE HEAT EXCHANGER

Made up from a battery with copper pipes and aluminium gills with large exchange surface.
A subcooler is inserted to the base of the battery to ensure complete defrosting; an anti-freeze resistance ensures the runoff of condensate water towards the drain.
A metal grid is present to protect the gill pack.

FANS

Helicoidal fans directly coupled to the 6-pole external rotor electric motors, IP 54 protection level.
Each fan is housed in shaped nozzles and includes the accident-prevention grill in compliance with UNI EN 294.

USER SIDE HEAT EXCHANGER

With braze-welded plate in AISI 316 stainless steel insulated by a cladding in closed cell expansive material.
The heat exchanger has a temperature probe for anti-freeze protection and a mechanical flow switch supplied as standard.

REFRIGERANT CIRCUIT

Includes: charge connection on liquid and suction line, sight glass, dryer filter, thermostatic expansion valves with external pressure equalisation, 4-way reversing valve, liquid receiver, suction line separator (sizes 23 and 29), non-return valves, liquid line solenoid valve, pressure transducer, high and low pressure gauges and safety valve. A refrigerant/refrigerant heat exchanger is also present for the production of vapour in order to cool the compressor.

ELECTRIC CONTROL BOARD

With main isolating device, power and auxiliary circuits protection, compressors remote control. Microprocessor management of the unit with main function display

The electric control board is made up from:

- Main isolating switch and fuse protection of the auxiliary and power circuits);
- Compressor remote control;
- Fan rev. regulator for condensation control;
- Pump relay or motor overload protection and remote control (in ST1P – ST1PS version);
- Main alarm on/off contacts;
- Microprocessor ,for the control of the following functions:
  - Regulation of the water temperature with inlet control;
  - Anti-freeze protection;
  - Compressor timing;
  - High pressure pre-alarm management (to prevent unit block in many cases);
  - Enabling of summer/winter changeover;
  - Automatic defrosting;
  - Alarm signals;
  - Alarms reset;
  - Self-adaptable regulation to allow optimal functioning in the case of low water content in the plant;
  - Digital input for external ON-OFF;
  - Digital input for summer/winter remote changeover.

Display for:

- Outlet water temperature;
- Condensation temperature;
- Set temperature and differentials set;
- Description of the alarms;
- Compressor and pump functioning timer;

230V/1~/50Hz electric power supply for size 12M and 16M, 400V/3N~/50Hz for sizes 12, 16, 23 and 29.

CONTROLS AND SAFETY DEVICES

- Utility water temperature control probe (situated at entry of heat exchanger);
- Anti-freeze probe that activates the anti-freeze alarm (with automatic re-arm at limited intervals);
- High pressure gauge (with manual re-arm);
- Low pressure gauge (with automatic re-arm at limited interventions);
- Mechanical flow switch supplied as standard;
- Condensation pressure control by means of rev. regulator for functioning with low external temperatures.
- High pressure safety valve;
- Compressor internal over-temperature protection.
- Compressor external over-temperature protection

INSPECTION

The units are inspected in the factory and are supplied complete with oil and refrigerant.

VERSIONS

HYDRAULIC MODULE OPTIONS

GEYSER /ST 1P:
Unit with pump
The unit includes a circulator (sizes 12M and 12,16M and16) or a circulation pump (sizes 23 and 29), expansion vessel, air relief valve, hydraulic circuit water discharge valve, safety valve calibrated at 3 bar, which corresponds to the maximum acceptable working pressure

GEYSER /ST 1PS:
Unit with pump and tank
In addition to the components of the /ST 1P version, the unit includes an insulated storage tank.

ATTENTION: if the unit uses the double set point , the tank will increase the time necessary to the achievement of the requested temperature at full capacity

ACCESSORIES

MAIN ACCESSORIES

- Electronic expansion valve
- Automatic filling kit with pressure gauge (only ST version)
- Antifreeze heater
- Additional heaters
- Electronic modulation of the water flow
- Serial interface RS485
- Remote user terminal (in addition to that on the machine)
- Rubber antivibration mounts

REFRIGERANT CIRCUIT ACCESSORIES

- Liquid line cock;
- Electronic thermostatic valve;

HYDRAULIC CIRCUIT ACCESSORIES

- Filling unit with manometer (only ST version).
- Anti-freeze resistance
  Includes:
  Basic version: Electrical resistance in the evaporator;
  ST1P Version: Electrical resistance in the evaporator + heating cableon the pipes
  ST1PS Version: Electrical resistance in the evaporator + heating cable on the pipes + immersion resistance in the tank;
- Additional resistances (for HP/ST 1PS versions);
- Electronic modulation of the water flow

ELECTRIC ACCESSORIES

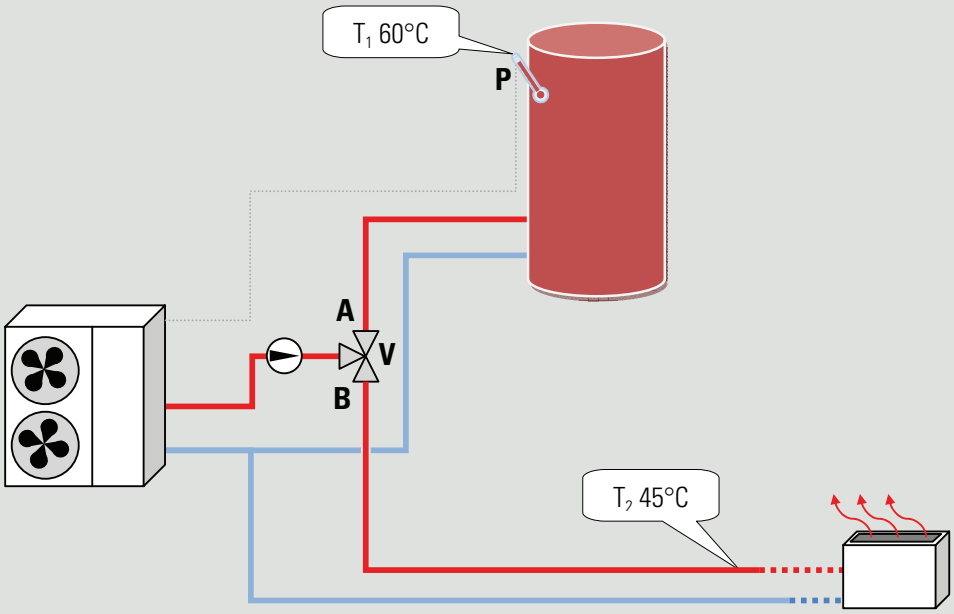
- Power supply 230/1/50 (sizes 12M, 16M)
- Power supply 400/3/50+N (sizes 12,16,23, 29)
- Phase monitor;
- RS485 serial interface;
- Remote user terminal (in addition to that on the machine);
- User interface;
- Compensation of the set point depending on the external air temperature;

VARIOUS ACCESSORIES

- Rubber anti-vibration devices;
- Wooden crate packaging;
- Condensation collection tank (sizes 23 and 29; for sizes from 12M and 12. 16M and 16 the base of the unit also acts as a condensation collection tank);

DOMESTIC HOT WATER MANAGEMENT ACCESSORY

BLOCK DIAGRAM



Let's envisage a system that like represented in the figure and composed of: heat pump, domestic hot water storage tank with temperature probe, a fan-coil system, circulation pump (on request supplied as accessory inside the unit) and a three-way valve (not supplied). The fan-coil system will function in the winter season with water inlet/outlet at 45°/40° C and in the summer with water inlet/outlet at 7°/12° C. Let's also suppose that the domestic hot water storage tank is to be kept at 60°C.
Obviously the fan-coil system can be replaced by radiant or mixed system, consequently adapting the working temperatures. In the same way, the temperature maintained inside the storage tank can be set at any value within the unit's functioning range.
Given the greater frequency of requests for service, the default set-point of the unit is that of the system and the standard position of the three-way valve is B.

WINTER FUNCTIONING LOGIC

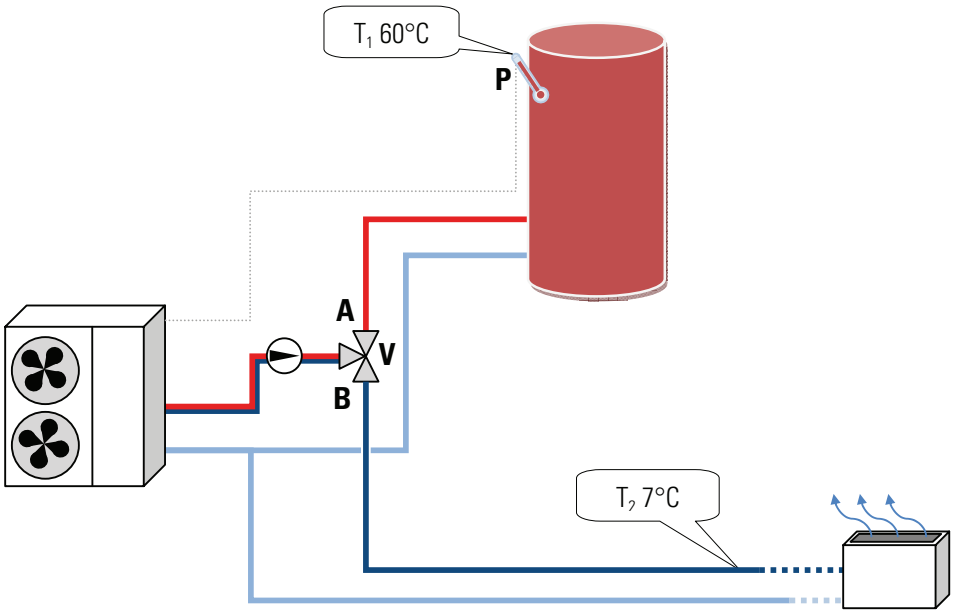
The system described can fundamentally find itself in three situations:

1. **Central heating only request**: the temperature of the unit inlet water, coming from the system, is lower than that expected, therefore the control switches the compressor on and the unit will function until the set-point temperature is reached. The unit stops at that point and only the pump keeps running, which will maintain the water circulating in the system.
   The unit will wait in this state until the water inlet temperature drops again
2. **Production of domestic hot water only**: when the tank temperature drops below the temperature set (e.g. 55°C) the temperature probe P sends a signal to the unit control which, in sequence:
   a. Modifies the set-point taking it from 45° to 60°C
   b. Switches-over the three-way valve V to position A
   c. Starts the pump and unit
   As soon as the water reaches the 60° requested, the probe P or the temperature sensor of the water at unit inlet will stop the compressor and the pump.
   At this point the control will take the set back to the default value and will command the three-way valve to take it back to its standard position.
   The unit is in stand-by for a successive call by the system or the storage tank.
3. **Mixed functioning**: slet's suppose that the unit is functioning for the production of hot water for the central heating system (45°C) and receives a signal from the probe P, positioned in the storage tank, as the domestic hot

water temperature has dropped below the limit set, e.g. 55°C. As domestic hot water has priority over any other heat pump activity, the control will modify the set-point taking it from 45° to 60°C and will switch-over the three-way valve V to position A. The unit therefore raises the storage tank temperature. As soon as the latter reaches the 60°C requested, the control will take the set-point to 45°C and will switch the valve V to position B again.
At this point if the system return water is not hot enough, the unit will continue to work, powering the system. If, however, the return water is hot enough, the pump will continue to function while the compressor stops, in stand-by for a new call

It must be underlined that if defrosting must be performed, in any mode that the unit is operating, valve V will be forced to be switched-over towards the system (position B) in a way to treat the system water and not the domestic hot water.

SUMMER FUNCTIONING LOGIC



Again, instead of the fan-coil system it is possible to have a radiant panel or mixed system, by suitably adapting the temperatures of the water produced.

FUNCTIONING LOGIC

The system described has three situations:

1. **Cooling only**: the temperature of the unit inlet water, coming from the system, is higher than that expected. The control switches the compressor on and the unit will function until the set-point temperature is reached. The unit stops at that point and only the pump will keep running, which will maintain the water circulating in the system.

2. **Production of domestic hot water only**: when the tank temperature drops below the temperature set (e.g. 55°C) the temperature probe P sends a signal to the unit control which, in sequence:
    a. Inverts the unit from chiller functioning mode to heat pump mode, with relative set-point at 60°C
    b. Switches-over the three-way valve V to position A
    c. Start the pump and unit again

    As soon as the water reaches the 60° requested, (the probe P or the temperature sensor of the water at inlet), the control will start the sequence opposite to the previous one and therefore:
    a. Switches the pump and unit off
    b. Will invert the unit from heat pump functioning mode to chiller mode, with relative set-point at 7°C

c. The three-way valve V will switch-over to position B

The unit has therefore gone back to its default state and will remain in stand-by for the successive call by the system or the storage tank.

3. **Mixed functioning**: the unit is functioning to produce cold water (at 7°C) for the cooling system and receives a signal from probe P, positioned in the storage tank, as the temperature of the domestic hot water has dropped below the limit set, e.g. 55°C. As domestic hot water has the priority over any other unit activity, the control will instantaneously start the following sequence of actions:
    a. The pump and unit off will switch-off
    b. Inverts the unit from chiller functioning mode to heat pump mode, with relative set-point at 60°C
    c. Switches-over the three-way valve V to position A
    d. Start the pump and unit again

    As soon as the water reaches the 60° requested, (the probe P or the temperature sensor of the water at inlet), the control will start the sequence opposite to the previous one and therefore:
    a. The pump and unit off will switch-off
    b. Inverts the unit from heat pump functioning mode to chiller mode, with relative set-point at 7°C
    c. Switch-over the three-way valve V to position B
    d. Re-starts the pump

    If the return water from the system is cold enough, the system will remain off, limiting itself to circulating water in the system. On the other hand, the control will start the compressor in order to go back to producing cooled water.

To prevent functioning problems, every time the unit inverts the cycle, before re-starting, it will make the pump "wash" the heat exchanger. In this way excessive heat drops are prevented, which are due to the water treated in the previous cycle triggering unexpected safety device interventions.

WATER FLOW RATE ELECTRONIC MODULATION ACCESSORY

For units subject to long periods of machine standstill, particularly frequent when the machine is slaved to offices and commercial activities, on machine re-start it may occur that the water that reaches the utility heat exchanger is very hot or very cold, depending on the season. If this phenomenon occurs in concomitance with particularly demanding external air conditions, the unit could be forced to make safety devices intervene.
If the unit is equipped with the Water flow rate electronic modulation accessory, by means of pump speed adjustment, the pump will make sure that the water flow rate that reaches the heat exchanger is that suitable to be treated. As the water temperature drops, the water flow rate will increase until it reaches the nominal value, thus preventing false interventions by safety devices.

SET-POINT COMPENSATION DEPENDING ON THE TEMPERATURE OF THE EXTERNAL AIR ACCESSORY

The unit equipped with this accessory will have the set-point which, depending on the temperatures of the external air, will vary in a way to guarantee the correct compromise between comfort and energy saving.

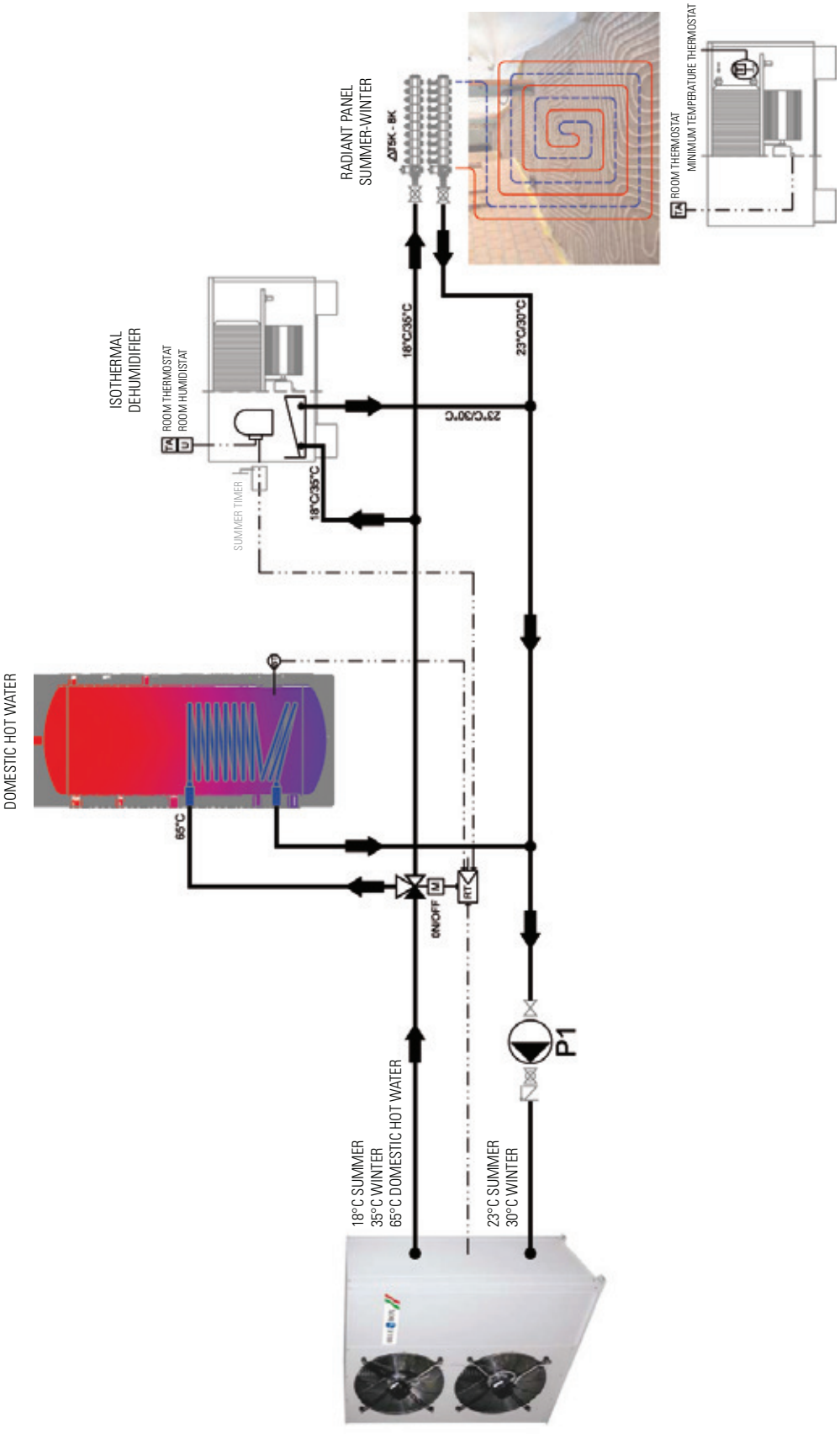
In particular, in winter functioning mode, on decrease of the external air temperature (below 0°C), the unit will decrease the temperature of the outlet water by a maximum of 3°C with respect to the temperature set. On the contrary, in summer functioning mode for temperatures higher than 30°C, the set point will increase by a maximum of 3°C. By doing this, the unit can adapt itself to the external air conditions, thus optimising efficiency and guaranteeing comfort.

ELECTRONIC THERMOSTATIC VALVE ACCESSORY

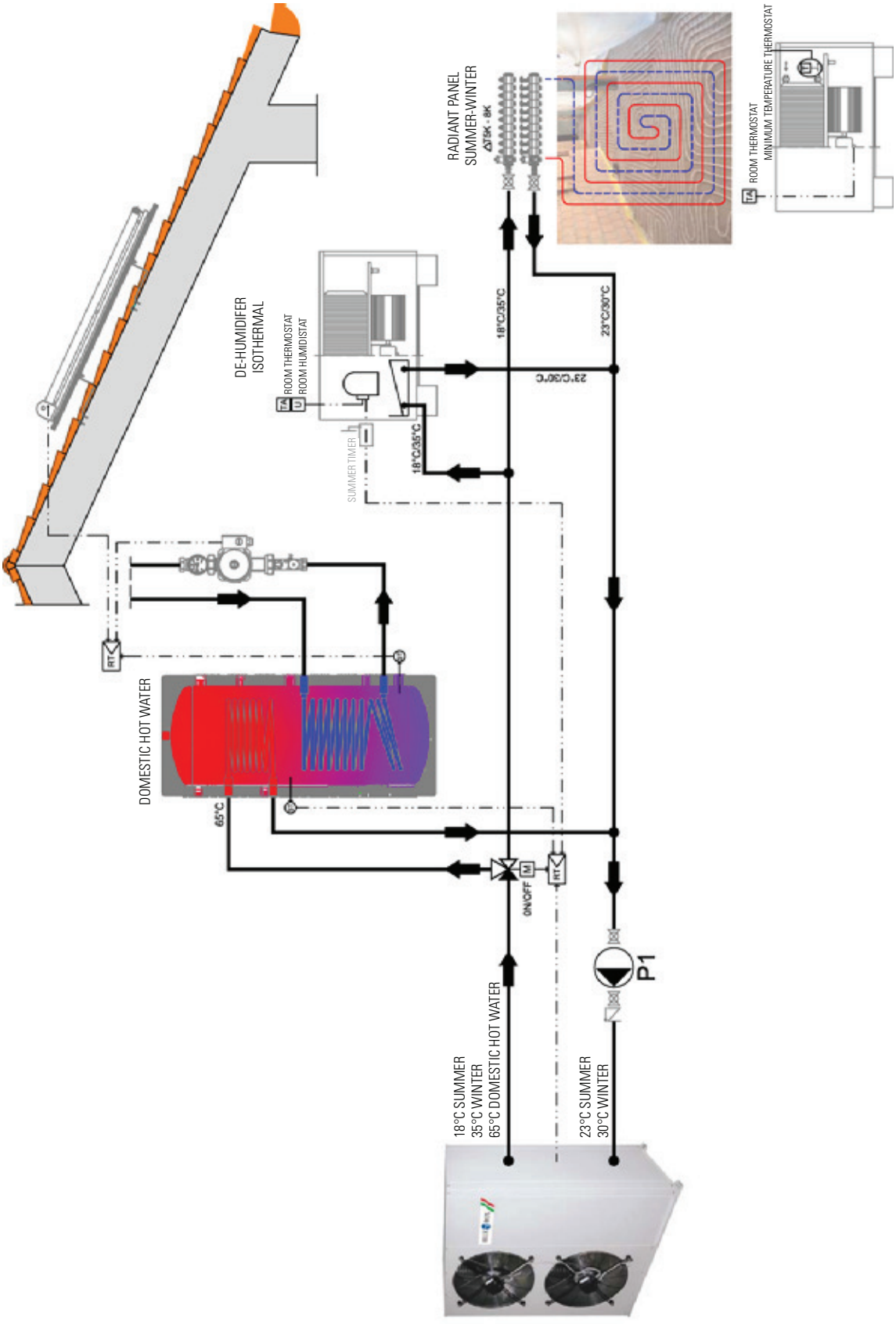
The use of this accessory is particularly indicated for units that operate in very unstable heat load conditions, as in the case of joint management of air conditioning and production of high temperature water. Use of the electronic thermostatic valve in fact allows to:

- maximise the heat exchange at the evaporator
- minimise response times on load variation
- optimise the adjustment of the over-heating
- guarantee maximum energy efficiency

GEYSER


RADIANT PANEL
SUMMER-WINTER
ΔT5K - 8K
ROOM THERMOSTAT
MINIMUM TEMPERATURE THERMOSTAT
ISOTHERMAL
DEHUMIDIFIER
ROOM THERMOSTAT
ROOM HUMIDISTAT
SUMMER TIMER
18°C/35°C
23°C/30°C
DOMESTIC HOT WATER
65°C
ON/OFF
P1
18° C SUMMER
35° C WINTER
65° C DOMESTIC HOT WATER
23° C SUMMER
30° C WINTER

GEYSER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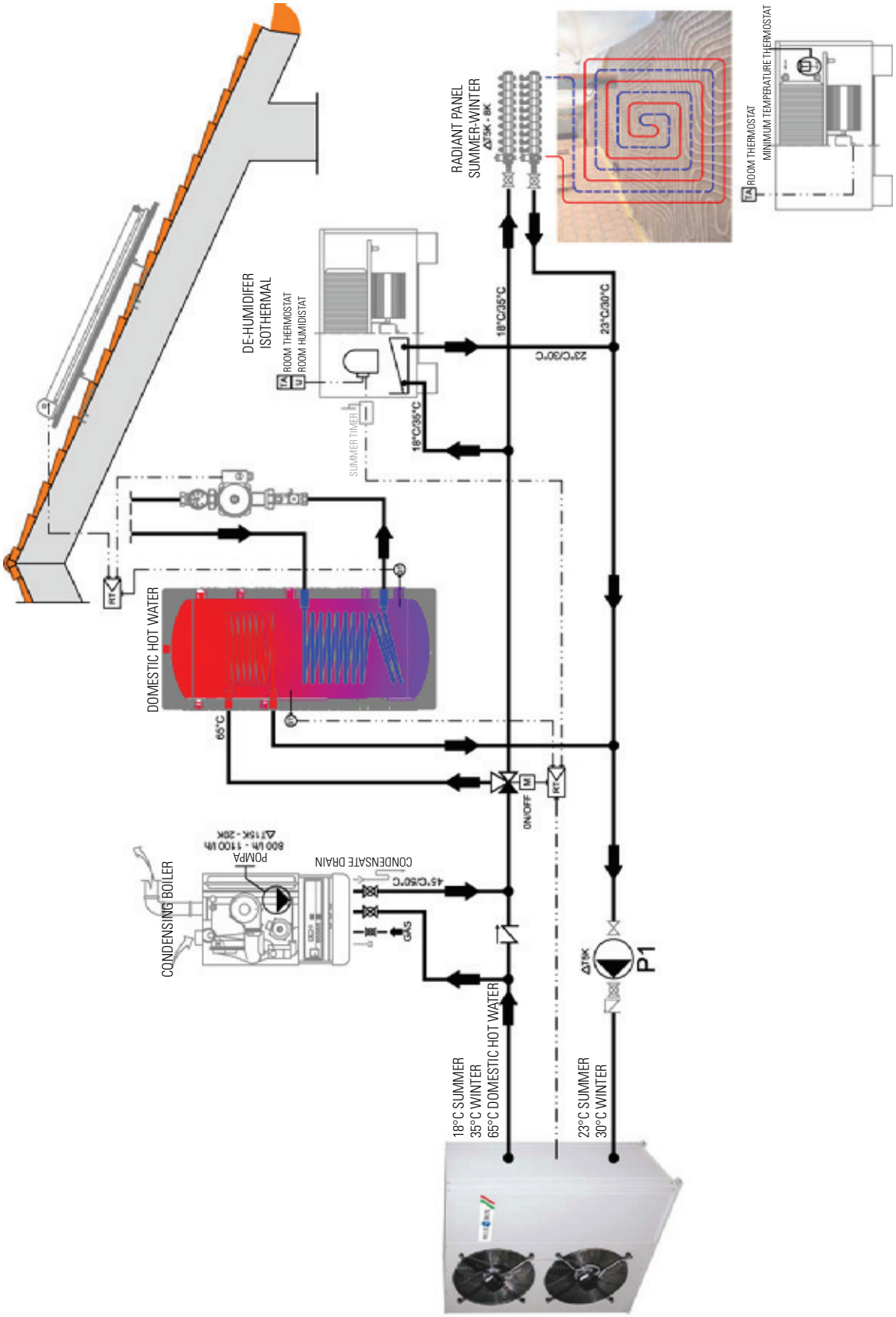
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SUMMER-WINTER
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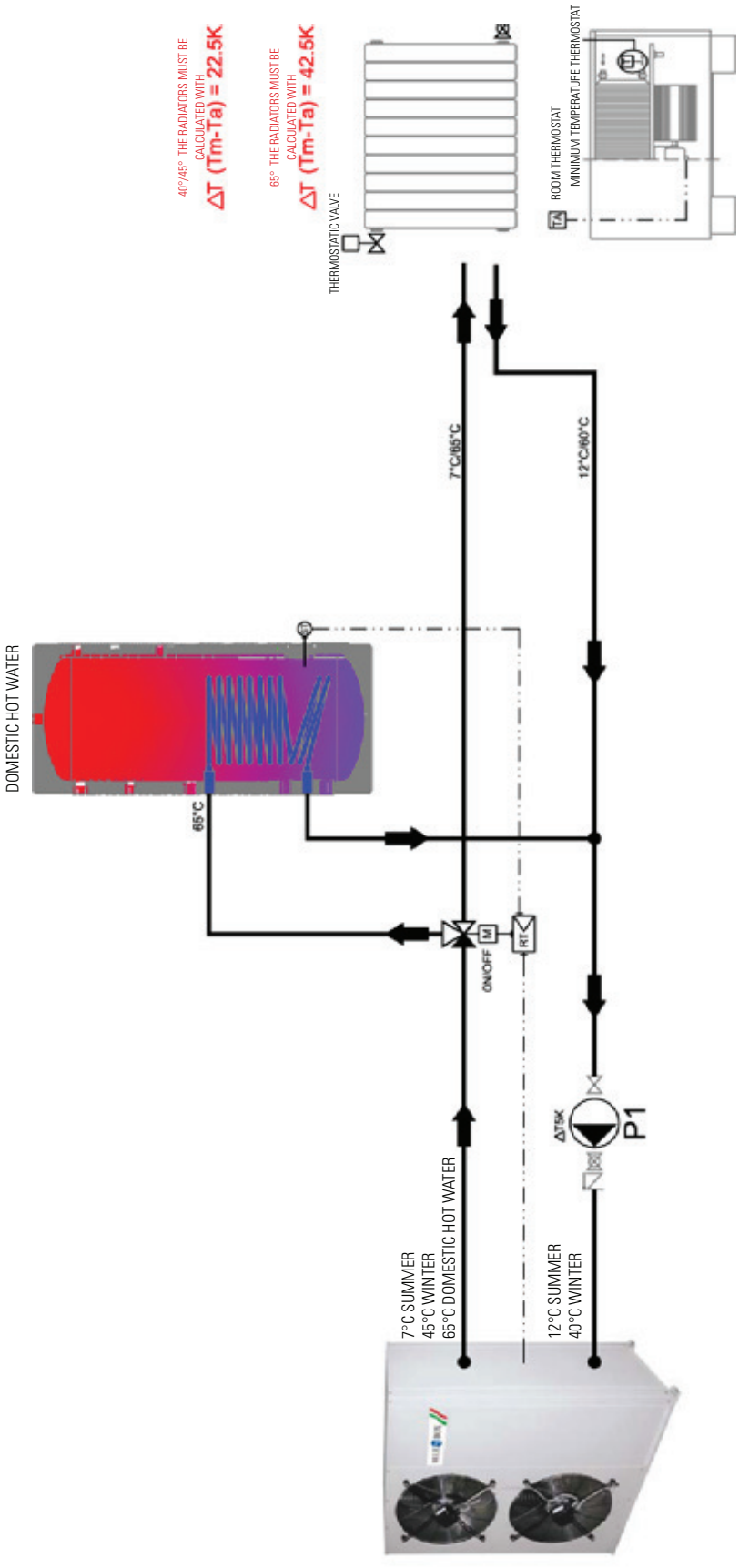
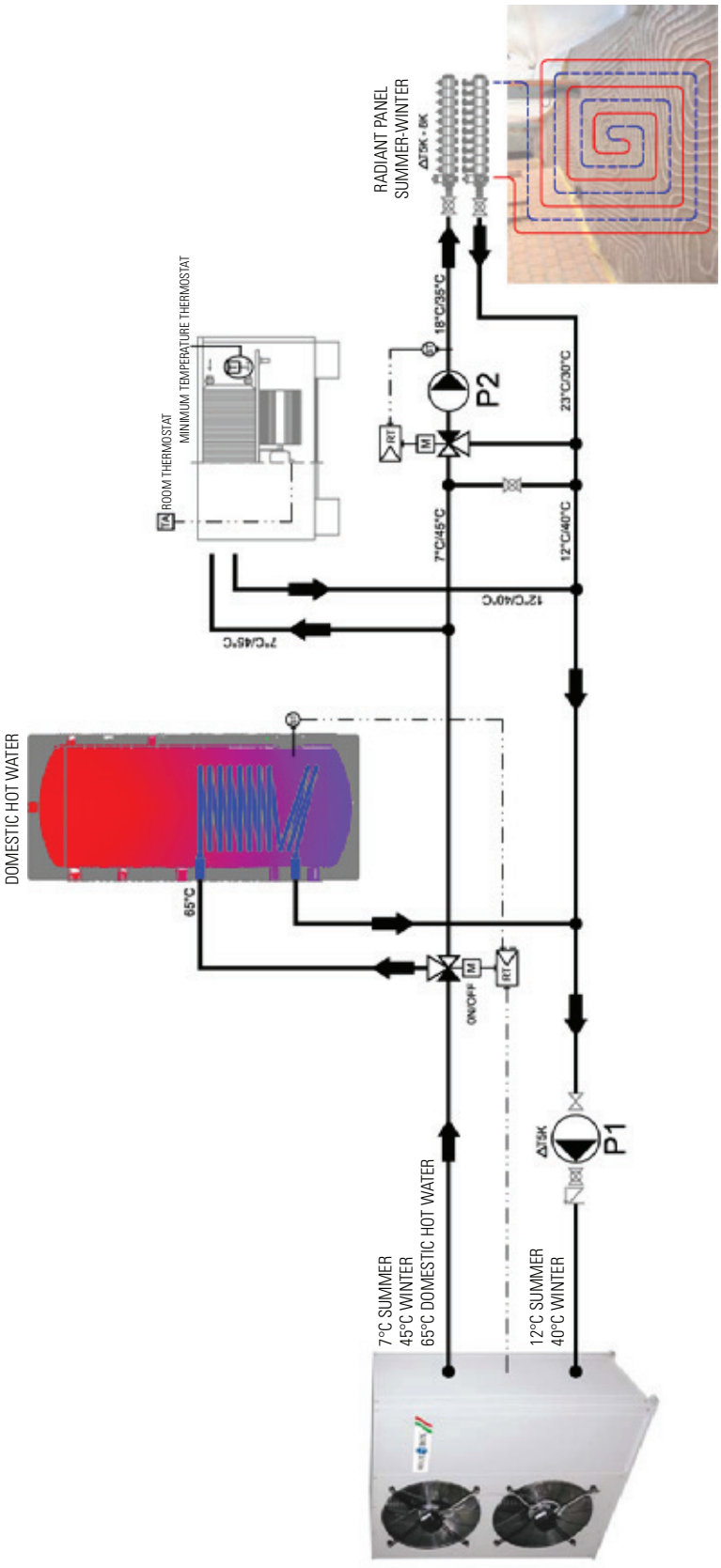
MINIMUM TEMPERATURE THERMOSTAT
DE-HUMIDIFER
ISOTHERMAL
ROOM THERMOSTAT
ROOM HUMIDISTAT
SUMMER TIMER
18°C/35°C
23°C/30°C
DOMESTIC HOT WATER
65°C
ON/OFF
CONDENSING BOILER
POMPA
CONDENSATE DRAIN
45°C/50°C
GAS
P1
18°C SUMMER
35°C WINTER
65°C DOMESTIC HOT WATER
23°C SUMMER
30°C WINTER

GEYSER


40°/45° ITHE RADIATORS MUST BE CALCULATED WITH
ΔT (Tm-Ta) = 22.5K
65° ITHE RADIATORS MUST BE CALCULATED WITH
ΔT (Tm-Ta) = 42.5K
THERMOSTATIC VALVE
ROOM THERMOSTAT
MINIMUM TEMPERATURE THERMOSTAT
7°C/65°C
12°C/60°C
DOMESTIC HOT WATER
65°C
ON/OFF
P1
7°C SUMMER
45°C WINTER
65°C DOMESTIC HOT WATER
12°C SUMMER
40°C WINTER

GEYSER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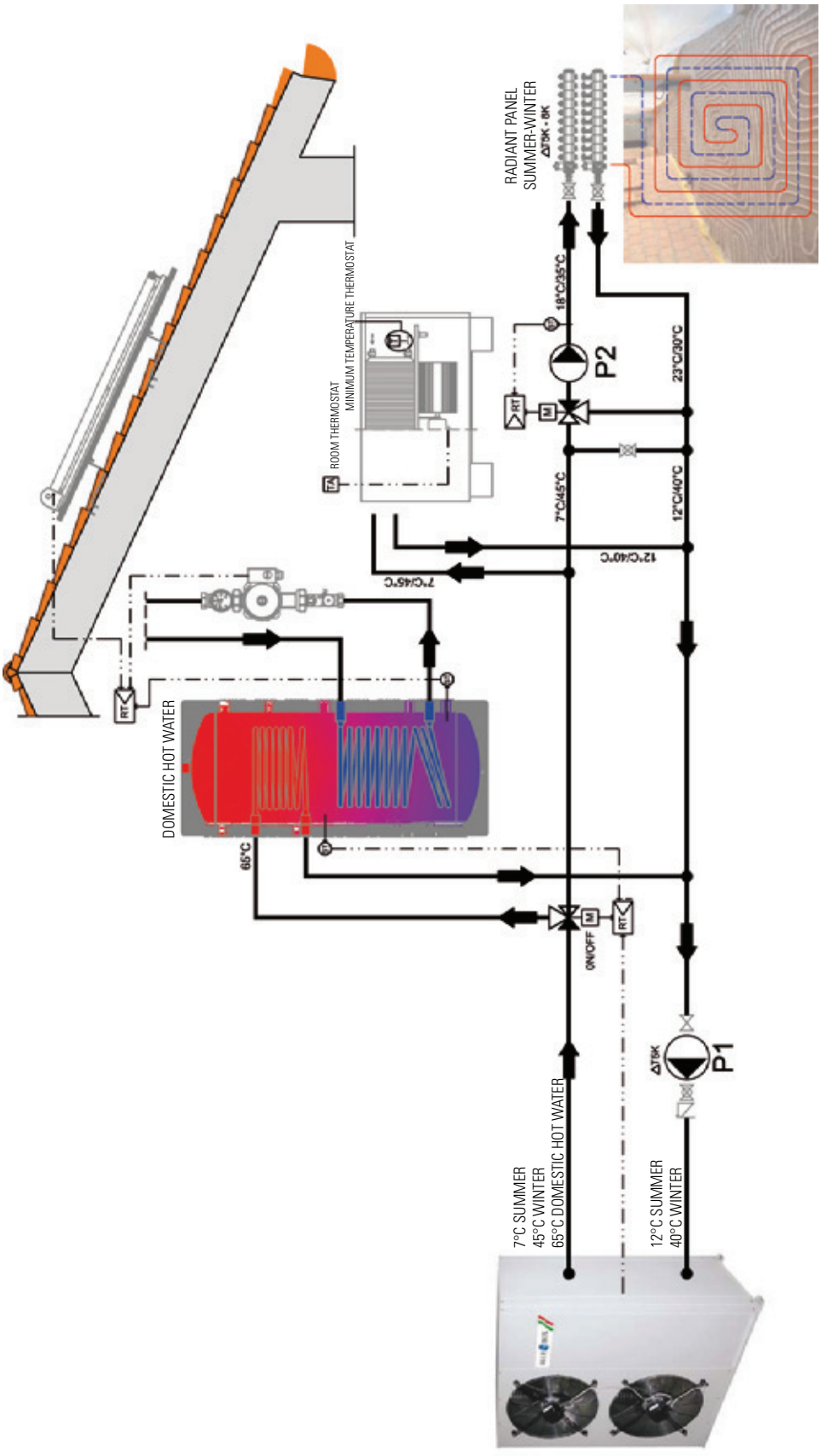
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65°C
ON/OFF
ΔT5K
P1
7°C SUMMER
45°C WINTER
65°C DOMESTIC HOT WATER
12°C SUMMER
40°C WINTER

UNIT SIZE			12M	12	16M	16	23	29
Heating								
Nominal heating capacity	(1)	kW	11,1	10,5	14,4	14,5	20,6	28,1
Heating power	(1), (2)	kW	2,73	2,57	3,55	3,40	5,02	6,82
COP	(1)	kW	4,07	4,09	4,06	4,26	4,10	4,12
Nominal heating capacity	(3)	kW	11,1	10,5	14,6	14,6	20,5	28,5
Heating power	(3), (2)	kW	3,17	2,98	4,20	3,99	5,96	8,11
COP	(3)	kW	3,49	3,51	3,48	3,66	3,44	3,51
Nominal heating capacity	(4)	kW	11,3	10,5	15,4	14,9	19,9	29,6
Heating power	(4), (2)	kW	4,46	4,27	6,16	5,80	8,42	12,2
COP	(4)	kW	2,54	2,45	2,50	2,57	2,36	2,43
Cooling								
Nominal cooling capacity	(5)	kW	12,0	11,3	16,4	16,5	23,1	31,6
Cooling power input	(5), (2)	kW	3,63	3,54	4,76	4,40	6,72	8,49
EER	(5)	kW	3,31	3,18	3,44	3,76	3,43	3,72
Nominal cooling capacity	(6)	kW	8,9	8,6	12,5	12,6	17,5	23,8
Cooling power input	(6), (2)	kW	3,28	3,07	4,36	3,99	6,01	7,48
EER	(6)	kW	2,71	2,79	2,86	3,16	2,92	3,18
Compressors								
Type					Scroll			
Quantity/Refrigerant circuits		n° / n°	1 / 1	1 / 1	1 / 1	1 / 1	1 / 1	1 / 1
Capacity steps		%	100	100	100	100	100	100
Radiant panels								
Cooling power input	(5)	kW	3,23	3,14	4,36	4,00	6,12	7,39
Heating power	(1)	kW	2,33	2,17	3,15	3,00	4,42	5,72
Terminal units								
Cooling power input	(6)	kW	2,88	2,67	3,96	3,59	5,41	6,38
Heating power	(3)	kW	2,77	2,58	3,80	3,59	5,26	7,01
Fans								
Type					Axial			
Quantity		n°	2,00	2,00	2,00	2,00	2,00	2
Air flow		m^3/h	7.800	7.800	7.200	7.200	14.000	15.500
Evaporator								
Type					Plates			
Quantity		n°	1	1	1	1	1	1
Water flow rate		l/h	1.909	1.807	2.476	2.488	3.541	4.831
Pressure drop		kPa	39	35	42	43	42	36
Hydraulic module								
Available pump pressure		kPa	54	58	44	43	118	109
Storage tank capacity		l	70	70	70	70	115	140
Expansion vessel		l	2	2	2	2	2	2
Sound level								
Sound power value	(7)	dB(A)	70	70	70	70	72	73
Sound pressure value	(8)	dB(A)	39	39	39	39	41	41
Dimensions and weight								
Width		mm	925	925	925	925	1.105	1.305
Depth		mm	375	375	375	375	505	505
Height		mm	1.350	1.350	1.350	1.350	1.385	1.585
Operating weight		kg	139	139	170	170	221	397

(1) External air temperature 7°C BS, 6°C BU, Inlet-outlet water 30-35 °C
(2) Total power input is sum of compressors and funs power input
(3) External air temperature 7°C BS, 6°C BU, Inlet-outlet water 40-45 °C.
(4) External air temperature 7°C BS, 6°C BU, Inlet-outlet water 60-65 °C.
(5) External air temperature 35°C, Inlet-outlet water 23-18°C .
(6) External air temperature 35°C, Inlet-outlet water 12-7°C .
(7) Sound power values calculate in compliance with ISO 3744
(8) Sound pressure values measured at 10 meters from the unit in free field conditions and directional factor Q=2