

valu-technik



Floor cooling system

UNI EN 1264 Certificate



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aquatechnik®

aquatechnik, leading company in the hydro-thermo-sanitary industry, has long been working in the industry of pipe extrusion and moulding of plastic-material fittings.

At present, it can boast thousands of projects and successes, with a well-established experience that makes it one of the most significant companies in Europe. Also concerning the industry of floor-panel radiant systems, **aquatechnik** is characterised by thirty years of experience: the constant use of high-quality components, certified to the UNI EN 1264 standard, as well as the continuous development of new products, allowed the company to supply the market with complete, innovatory and proven floor-panel radiant systems.

When temperatures increase, it is extremely important to choose the type of climate control, the search for a perfect combination of system features, such as performance, energy output and obtained comfort.

The floor-panel radiant system, besides being considered the best heating system in winter, proves to be an excellent solution for summer cooling, as well. A single, invisible and low-consumption system to control climate in the room all year long; it is healthy and comfortable in its summer version, too. **aquatechnik** offers its decades-long experience and its competence to supply a winning system, innovatory and high-performance materials, as well as technical support during all steps, from design to installation.

IDEAL COMFORT

Recent studies have demonstrated that comfort conditions are better when the body can dispose of its own heat according to precise proportions among various heat exchange methods:

- 40%-45% by radiation: according to the temperatures of the surrounding surfaces;
- 15%-20% by convection: mainly according to the temperature and the speed of the air;
- 2%-5% by conduction: according to the temperatures of the surfaces we are physically in contact with;
- 30%-35% by evaporation: according to the physical activity and the general surrounding conditions.



In summer, the sun warms house structures through the south-facing walls, which can reach 50°C temperatures; the latter transfer heat to the other surfaces by contact and warm them, balancing one to the other. As a consequence, also the air inside the structure will warm up and often exceeds 30°C.

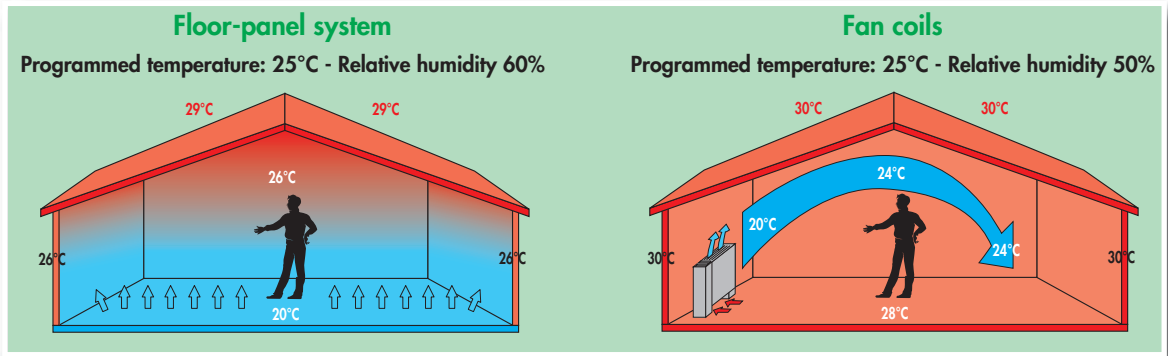
When entering a non-cooled room whose walls are warmer than the body temperature, the organism cannot transfer heat, thus causing an increase in the perspiration level, which leads to the subsequent increase in the perceived discomfort.

The use of forced-draught air-conditioning systems allows lowering the body temperature by conduction and convection, but air currents and thermal shocks often have contraindications for our health.

To obtain an excellent physiological comfort level, you need to transfer heat by radiation, and it is possible only by means of a radiant cooling system. The system

with radiant panels allows a homogeneous distribution of temperatures and its advantage is to lower the average temperature of the surfaces that surround the person (floor, walls, ceiling). The concomitant operation of the combined dehumidifiers reduces the air humidity level, thus assuring an unequalled wellbeing sensation. Differently from traditional air-conditioning systems that create artificial wellbeing conditions with turbulence effect and high noise level, the radiant cooling system allows obtaining uniform temperatures and correct proportions of heat exchanges between the body and the environment.





The floor-panel heating and cooling system is still the most comfortable climate-control system, which can offer an invaluable habitat and body wellness level.

OPERATION

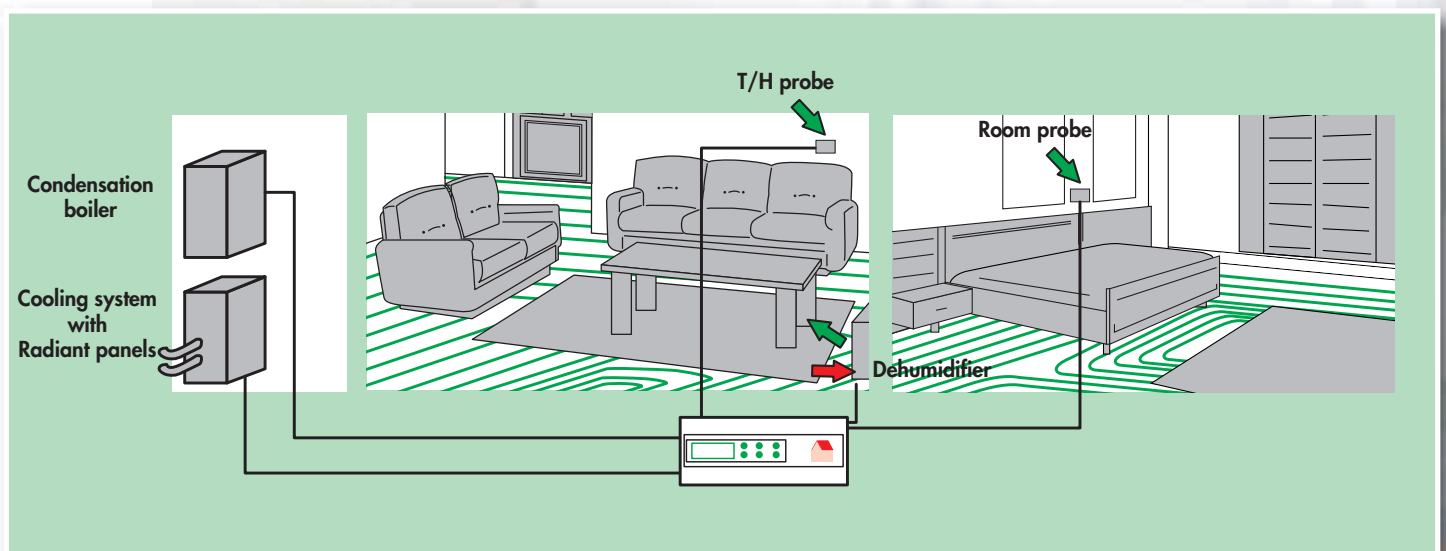
The same system with radiant panels that is used in winter for heating purposes, after specific design checks, can cool the rooms in summer, as well.

The low-temperature water (on average about $+15^{\circ}\text{C}$) flows within the same pipes forming the floor-panel circuits that carry hot water in winter; this way, the thermal energy in the air and in the structure will be absorbed and disposed of by the radiant effect of the cooled floor.

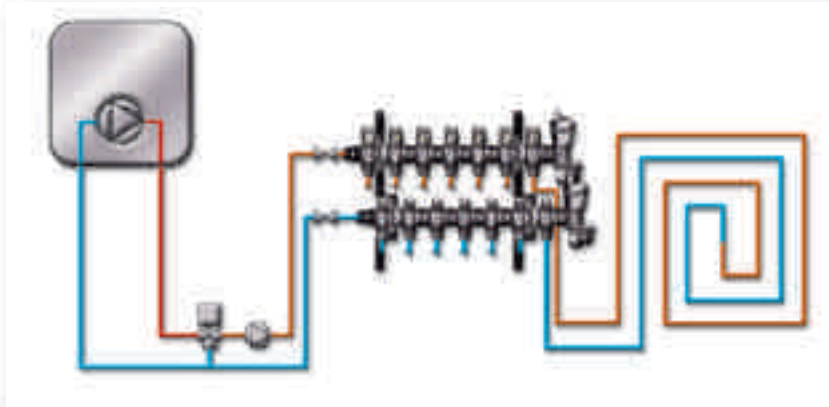
As for the cooling system with radiant panels, the quantity of relative humidity within the rooms becomes really important. The installation of specific probes in the houses (able to simultaneously detect the relative humidity and the room temperature) allows adjusting the control units to control the switching ON and OFF of the dehumidifiers, besides establishing the lowest fluid delivery temperature as possible inside the pipes, thus assuring the absence of condensation on the floors (temperature limit called "dew point").

Therefore, the control units will increase the delivery temperature when the percentage of detected relative humidity increases and, vice-versa, they will lower the delivery temperature when the percentage of relative humidity decreases.

aquatechnik offers a wide and complete range of components that allow creating systems and meeting the most varied system needs.



HEAT-REGULATION SYSTEMS



Intel and Brain climate control units are the most advanced solutions offered by **aquatechnik** to manage cooling systems with radiant panels. They are climate control units designed to assure wellbeing in the rooms. They streamline energy consumption by controlling the water temperature within the delivery pipes of the system, and are suitable for all climatic regions. In particular, as for the summer cooling function, Intel and Brain control units include delivery probes, humidity and temperature room probes, mixer valves, pumps, servomotors, electrical heads, activation consents for cold water generator and dehumidifiers, with the double function of regulating temperature and

room humidity, a combination that assures the best room comfort and wellness. It is possible because **aquatechnik's** climate control units operate according to a psychrometric diagram whose purpose is to identify the so-called saturation line that divides the mist zone from the zone with unsaturated air (where the system includes a mixture of air and water vapour).

This way, the control units relate the fluid delivery temperature to the percentage of humidity detected in the rooms by the specific probes. This allows the cooling system to operate with the lowest possible delivery fluid temperature, thus improving the performance of the system and, at the same time, it removes the possibility of condensation formation on the floor (dew point).

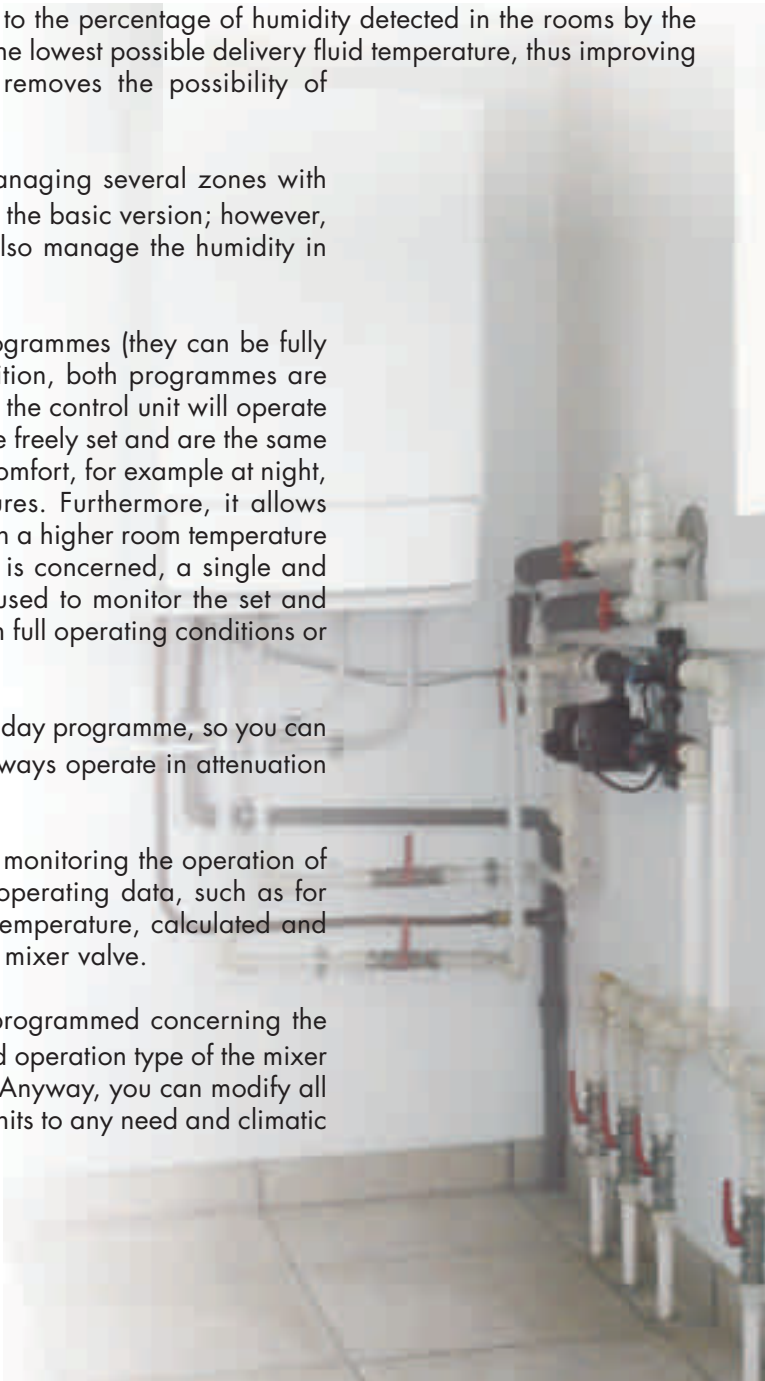
aquatechnik's climate control units allow simultaneously managing several zones with different temperatures, as well as a "pilot" zone for humidity in the basic version; however, with the support of the specific expansion module, you can also manage the humidity in several zones and possible system supplements.

All zones are provided with working and not-working day programmes (they can be fully customized to make up for any operating need) and, in addition, both programmes are equipped with management by time bands (attenuation) where the control unit will operate to reach a higher room temperature (attenuation degrees can be freely set and are the same in all zones and all time bands). It allows obtaining increased comfort, for example at night, when it is advisable to have slightly higher room temperatures. Furthermore, it allows additional energy saving by making the system operate to obtain a higher room temperature when, for example, the house is empty. As far as every zone is concerned, a single and simple screen (you can customize its name, as well) can be used to monitor the set and detected temperatures, the system efficiency conditions, if it is in full operating conditions or in attenuation mode.

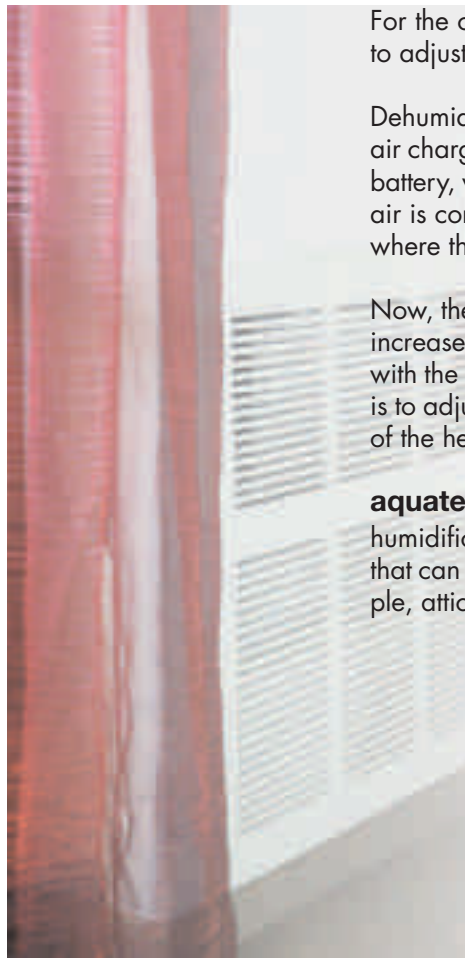
aquatechnik climate control units are also provided with a holiday programme, so you can set a starting date and a final date in which the system will always operate in attenuation mode.

Intel and Brain are also provided with an interface that allows monitoring the operation of the system, so it is possible to control, in real time, its main operating data, such as for example humidity and maximum room temperature, external temperature, calculated and detected delivery temperatures, as well as the operation of the mixer valve.

aquatechnik climate control units are supplied as already programmed concerning the main operating data (attenuation temperature, opening time and operation type of the mixer valve, etc.) and are usually compatible with all climatic zones. Anyway, you can modify all operating values in order to adapt the efficiency of the control units to any need and climatic condition.



DEHUMIDIFICATION SYSTEMS



For the correct operation of the radiant system in the cooling mode, it is absolutely necessary to adjust the system for the dehumidification function.

Dehumidifiers have the function of removing the humidity from the environment: they suck the air charged with humidity within the premises. After that, the air passes through the pre-cooling battery, where the air is cooled at a temperature that is close to saturation. Then, the pre-treated air is conveyed to the evaporator, which further lowers its temperature beyond the dew point, where the water vapour condenses and the produced water will be drained.

Now, the dehumidified air with a very low temperature is introduced into the condenser, which increases its temperature. After that, the air passes through the post-cooling battery (supplied with the same water conveyed into the pipes of the system with radiant panels), whose function is to adjust the air at a neutral temperature (similar to the initially sucked air) besides disposing of the heat produced by the condenser and the connected compressor.

aquatechnik offers a wide range of dehumidifiers to better meet all needs, with different dehumidification ranges. In addition, a series is available having a patented integration system that can introduce cold air into the premises: it is useful in particularly adverse rooms (for example, attic or rooms exposed to the sun with large glass surfaces).



Technical features	DRY 200 P	DRY 400 P	DRY 400 PI	DRY 400 S	DRY 400 SI
Input voltage	230 V - 50 Hz	230 V - 50 Hz	230 V - 50 Hz	230 V - 50 Hz	230 V - 50 Hz
Average rated power demand (at 20°C, 60% R.H.)	250 W	390 W	390 W	400 W	400 W
Maximum power demand (at 32°C, 95% R.H.)	320 W	450 W	450 W	460 W	460 W
Max. current demand (at 32°C, 95% R.H.) F.L.A.	1.9 A	3.0 A	3.0 A	3.0 A	3.0 A
Breakaway starting current F.L.A.	14.0 A	20.0 A	20.0 A	20.0 A	20.0 A
Air flow (with clean filter)	260 mc/h	320 mc/h	320 mc/h	320 mc/h	320 mc/h
Sound pressure level SPL (at 3m in free field)	34 db(A)	34 db(A)	34 db(A)	38 db(A)	38 db(A)
Coolant R134a	190 g	360 g	360 g	360 g	450 g
Standard defrosting control	electrical	electrical	electrical	electrical	electrical
Operating range (temperature)	8 - 32 °C	10 - 32 °C	10 - 32 °C	10 - 32 °C	10 - 32 °C
Operating range (relative humidity)	40 - 98 %	45 - 98 %	45 - 98 %	45 - 98 %	45 - 98 %
Rated condensation capacity (30°C - 80% R.H.)	14 l/g	34 l/g	34 l/g	34 l/g	34 l/g
Weight with formwork excluding the grating	26 Kg	36 Kg	36 Kg	34 Kg	39 Kg
Cooling water flow-rate (input temp. 15°C)	80 l/h	180 l/h	260 l/h	180 l/h	260 l/h
Cooling water pressure drop	2,3 kPa	12,0 kPa	25,0 kPa	12,0 kPa	25,0 kPa
"Cooling" funct. capacity (room t. 25°C-65%, water 16°C/18°C)	-	-	1600 W	-	1600 W
"Cooling" funct. sensitive capacity (room t. 25°C-65%, water 16°C/18°C)	-	-	960 W	-	960 W



CONTROL UNITS (art. 98002-98010-98020)

Designed and manufactured to manage radiant climate control systems.

- MONOCLIMA (single-climate): single-zone, programmable control unit
- INTEL: programmable control unit up to 7 zones
- BRAIN: programmable control unit up to 24 zones

T/M AND ROOM PROBES (art. 98030-98032)

They are available in temperature and T/H versions to detect room-humidity temperatures. Reduced overall dimensions and modern design to favour the relevant integration into the furniture.



EXTERNAL PROBE (art. 98036)

It was designed and manufactured to detect the external temperature.

PROBE (art. 98034)

Immersion probe to detect the temperature of the delivery water.



EXPANSION MODULE (art. 98040)

It allows installing several T/H probes and the subsequent detection of the humidity level in different zones.

DRY P DEHUMIDIFIERS (art. 98198-98200-98206)

For wall-mount applications. They were designed and manufactured to streamline the humidity level and to prevent the condensation effect in floor-mounted radiant systems in the cooling function; they are provided with a post-cooling battery. Dehumidification capacity: 14 l/24h for the P200 model ; 34 l/24h for the P400 model. The latter is also available with a 1600W supplement. They are arranged for vertical underpin installation within the areas identified by the designer.



DRY S DEHUMIDIFIERS (art. 98245-98250)

For ceiling-mount applications. They were designed and manufactured to streamline the humidity level and to prevent the condensation effect in floor-panel radiant systems in the cooling function; they are provided with double battery (pre- and post-cooling). Dehumidification capacity: 34 l/24h. They are also available with a 1600W supplement. They are arranged for horizontal underwall installation and in compartments or lowered areas within the ceiling, within the zones identified by the thermohydraulic designer.

REMOTE INTERFACE (art. 98280-98285)

It is a device that allows managing and displaying the data concerning the climate control units; it has a modern and up-to-date design.



PRACTICAL RECOMMENDATIONS

TESTING OF THE SYSTEM

- It is extremely important to test the system before casting the screed and leave it under pressure during the relevant formation.
- Test the system at a recommended pressure of 10 bar, and restore the pressure from time to time until it has stabilised.
- During testing operations, it is advisable to perform some pressure charging and discharging cycles in the system before stabilising the pressure at the pre-established value. The aforesaid cycles allow identifying possible weaknesses in the pipes and in gasket seals between manifold couplings, etc.
- In case of freezing hazard, use the specific antifreeze solutions after checking their compatibility with the pipes, or completely drain the system, in case of water testing, after casting the screed.
- If there is no freezing hazard and you want to prepare the system to be switched ON, fill it by means of the specific charging/discharging units that are installed in the manifolds, as it is described in the following chapter.
- The absence of leakages and the testing pressure must be specified in a testing report.

SWITCHING ON AND BALANCING OF THE SYSTEM

- Load the system by using the specific charging/discharging units installed in the manifolds. Fill loop by loop, and drain the air from a rubber pipe that is connected to the charging/discharging unit and use manual and automatic drain valves. The operation must be carried out by starting to fill, with all valves and holders being closed, except for the ones for a loop. After draining the first loop, act in the same way for the other loops and close valve and holders of the completed loops. The aforesaid procedure assures a correct charging of the system and, as a consequence, a better output also preventing the malfunction of the circulating unit.
- While filling the system it is important to drain all the air that is present. System charging and venting operations are carried out as follows:
 - 1) close all holders and all valves in delivery and return manifolds.
 - 2) close the shut-off valves installed in the supply lines of delivery and return manifolds.
 - 3) connect a transparent rubber pipe to the draining cock of the return manifold (on the top).
 - 4) fill the water through the delivery manifold (low) by means of a pipe connected with the charging/

discharging cock or through the \varnothing 1" opening of the shut-off valve.

- 5) open the valve and the holder in the first circuit loading the water until fully removing the air; check the continuous exit of water by using the transparent rubber draining pipe previously connected with the return manifold.
 - 6) close both the valve and the holder in the previously loaded circuit.
 - 7) repeat the last two operations for all circuits.
- Before switching ON the system, check that the perimeter insulating strip was cut flush with the final floor, assuring that the screed freely operates (expands) against the vertical structures.
 - Wait at least three screed-drying weeks before activating the system.
 - Switch ON the system with an initial delivery temperature of 25°C to be kept for 3 days. After that, increase it until reaching the maximum design temperature (see the drawing), which has to be kept for at least 4 days.
 - The system start-up process must be documented.
 - In case of quick drying, self-levelling or synthetic casting screeds, activate the system after a period that complies with the specifications established by the supplier of the screed.
 - While starting up the system, adjust the boiler thermostat at 50°C. The aforesaid precaution prevents water from circulating at a too high temperature within the panel system in case of adjustment malfunctions.
 - Calibrate the circuits of the system by adjusting manifold holders and position the relevant opening according to design tables (see the drawing).
 - As far as the boiler is concerned, you have always to provide for a safety probe to be installed in the delivery side of the panel system, which is independent from the control unit, and directly connected with the heat generator that will switch it OFF in case of overtemperatures.

DESIGN ACTIVITY

- To prevent physiological discomfort conditions, the surface temperature of the floor must be lower than the values established by the reference standards (UNI/CEN 130 and UNI EN 1264-2), max. 29°C in residential living areas, max. 35°C in marginal areas with the limit of 1 m depth from external walls. The 35°C max. temperature can also be reached in the so-called transit and/or passage areas (ex. access

areas and corridors) and in toilets.

- To prevent useless heat accumulations and to reduce the already remarkable thermal inertia of this type of systems, during the design step, keep the value of the power supplied by the panel lower than the value provided for in reference standards (UNI/CEN 130 and UNI EN 1264), that is, max. 100 W/m².
- It is preferable to use modulating-type thermoregulations, that is, capable of adapting the system to the external climatic conditions. Indeed, differently from thermostatic thermoregulations, which are also called fixed-point because they always maintain the same water temperature within the system, the thermoregulations with climatic regulator assure the reduction of useless heat accumulations in the screed with the subsequent reduction of the thermal inertia in the same system. In addition, selecting modulating thermoregulation assures considerable energy saving when managing the system

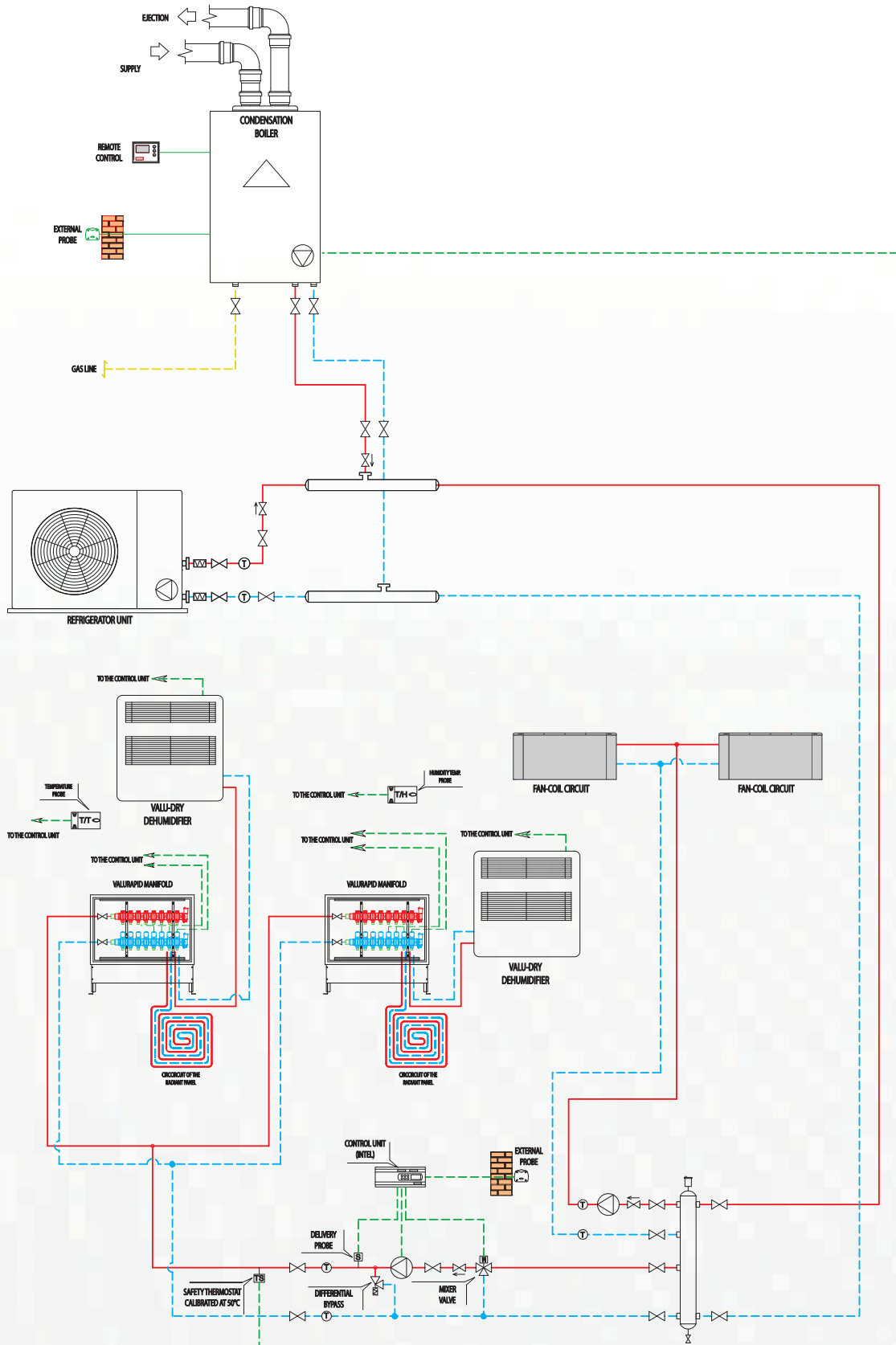
SYSTEM MANAGEMENT

- During the operating period, do not switch OFF the system and reduce system operation slowdowns as much as possible; in that case, do not exceed maximum 2 or 3 degrees of difference (ΔT) between comfort and attenuation temperatures.
- It is advisable to manage the system with modulating thermoregulations.

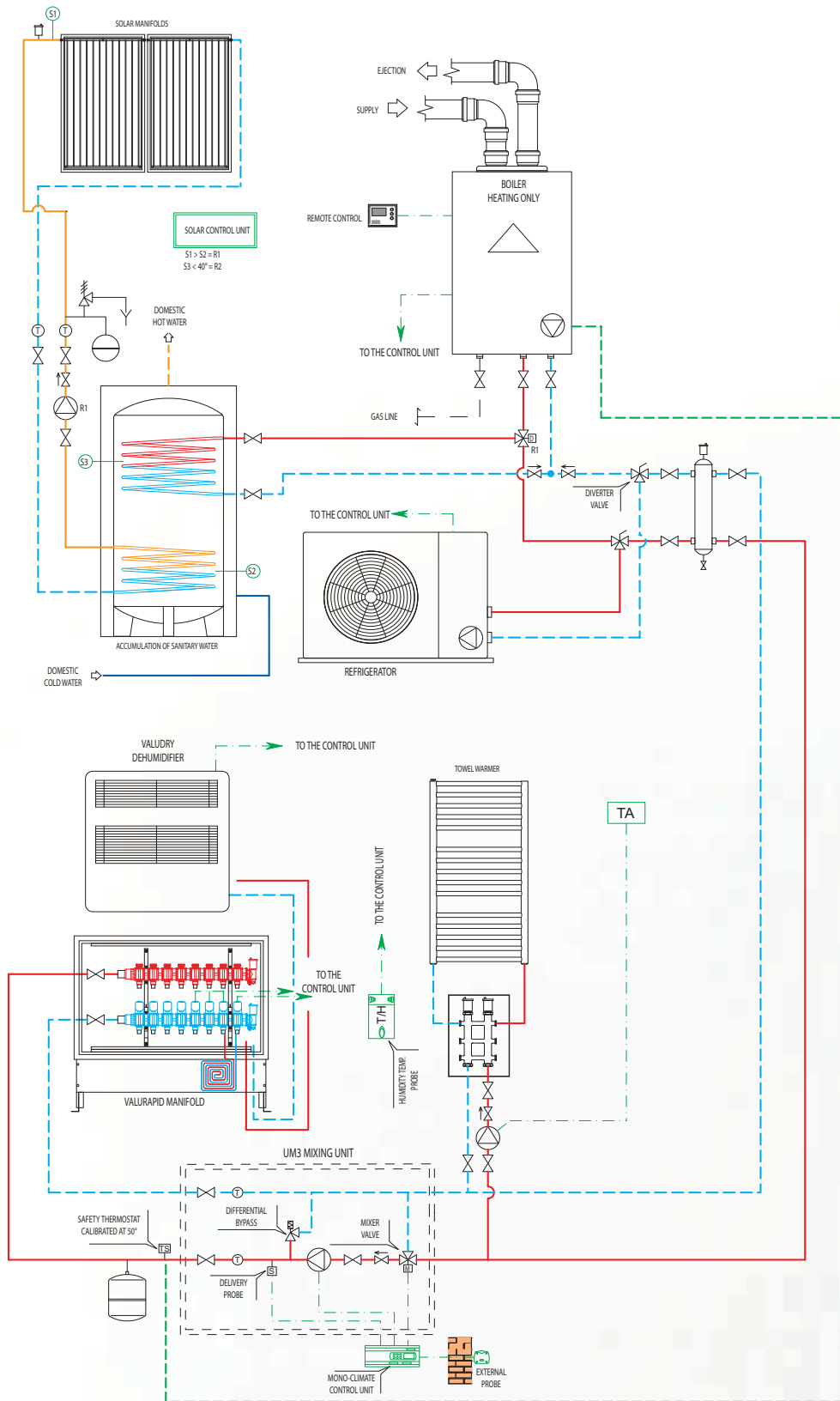


EXAMPLES OF GRAPHIC DIAGRAMS

STANDARD DIAGRAM FOR VALU-TECHNIK FLOOR-PANEL HEATING AND COOLING SYSTEM WITH RADIANT PANELS, HIGH AND LOW TEMPERATURE SYSTEM, MULTI-ZONE WITH UM3-TYPE MIXING UNIT AND ELECTROTHERMAL HEADS

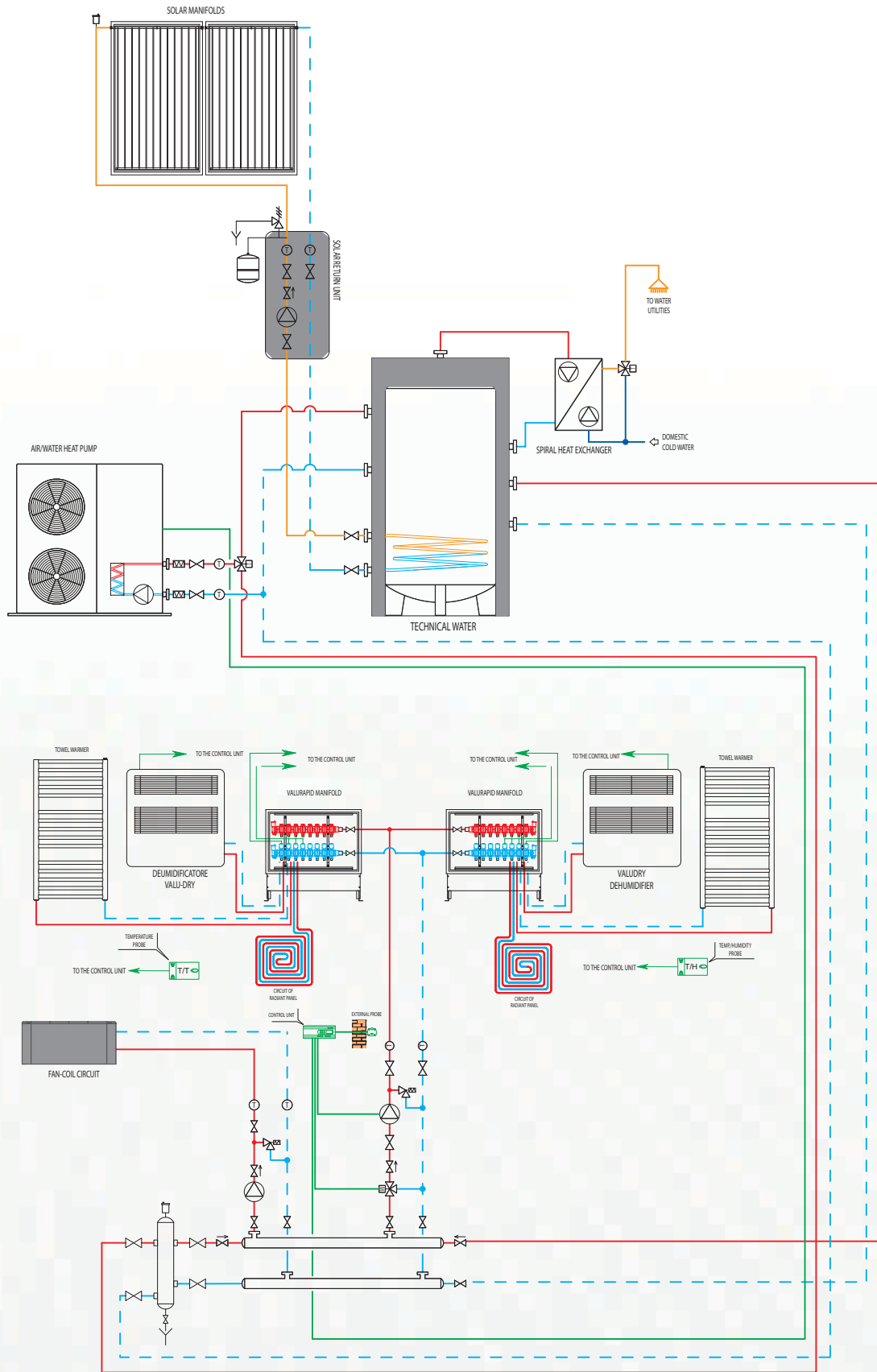


**STANDARD DIAGRAM FOR VALU-TECHNIK FLOOR-PANEL HEATING AND COOLING SYSTEM
WITH RADIANT PANELS, HIGH AND LOW TEMPERATURE SYSTEM
WITH UM3-TYPE MIXING UNIT, ELECTROTHERMAL HEADS AND SOLAR SYSTEM**

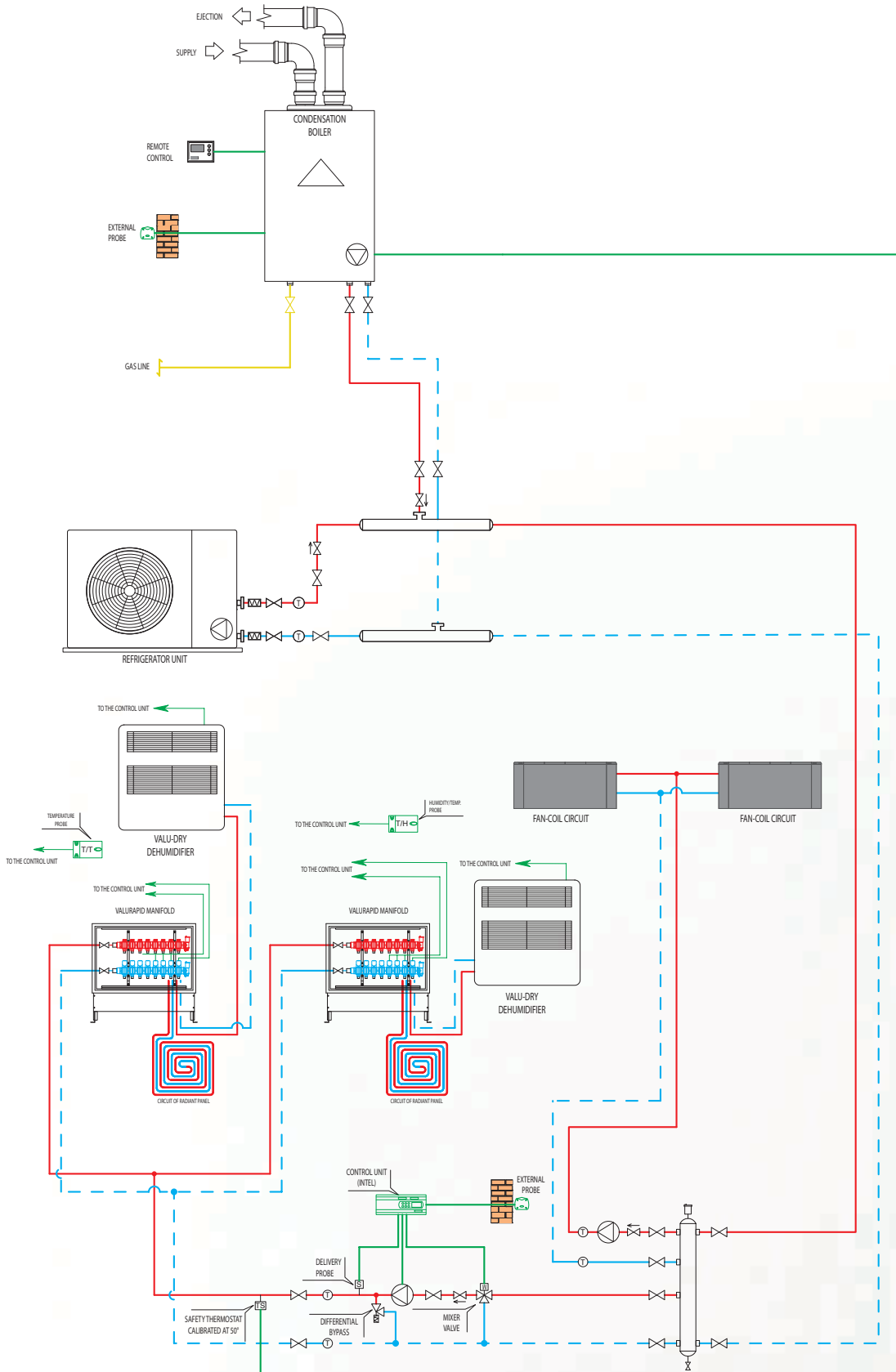


NOTE: CONTROL OF DELIVERY TEMPERATURE BY MEANS OF THE UM3 MIXING UNIT WITH CLIMATIC REGULATOR AND CONTROL UNIT EQUIPPED WITH EXTERNAL PROBE
CONTROL OF ROOM TEMPERATURE BY MEANS OF TWO-WAY ZONE VALVE CONTROLLED BY THE CONTROL UNIT
CONTROL OF THE DEHUMIDIFIERS CONTROLLED BY THE CONTROL UNIT

STANDARD DIAGRAM FOR FLOOR-PANEL VALU-TECHNIK HEATING AND COOLING SYSTEM WITH RADIANT PANELS, SYSTEM WITH HEAT PUMP AND SOLAR MANIFOLDS FOR HIGH AND LOW TEMPERATURE WITH COOLING CONTROL



STANDARD DIAGRAM FOR FLOOR-PANEL VALU-TECHNIK HEATING AND COOLING SYSTEM WITH RADIANT PANELS, HIGH AND LOW TEMPERATURE SYSTEM WITH COOLING CONTROL



REFERENCES







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