RADIANT CEILING SYSTEMS

giacoklima®

Technical manual

PLASTERBOARD

GKC AND GKCS SERIES

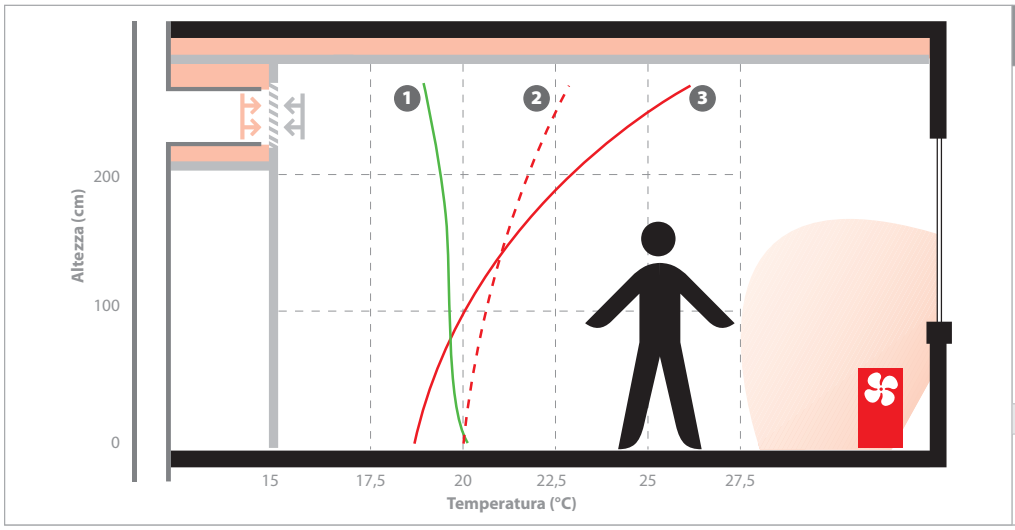
GIACOMINI

Technology in Comfort

SUMMARY

Introduction

The use of a radiant system ensures high comfort conditions, thanks to a more natural thermal exchange system for the human body, that eliminates the unpleasant draughts, dust circulation and the typical noise of the traditional air systems. The radiant systems maintain an homogenous comfort inside the room, minimizing the temperature differences either vertically or horizontally. Moreover, by acting on the surface temperatures, therefore on the working temperature of the room, you can get the same comfort sensation by maintaining the internal air temperatures closer to that one of the external air, compared to the traditional systems: this permits to achieve remarkable energy saving.



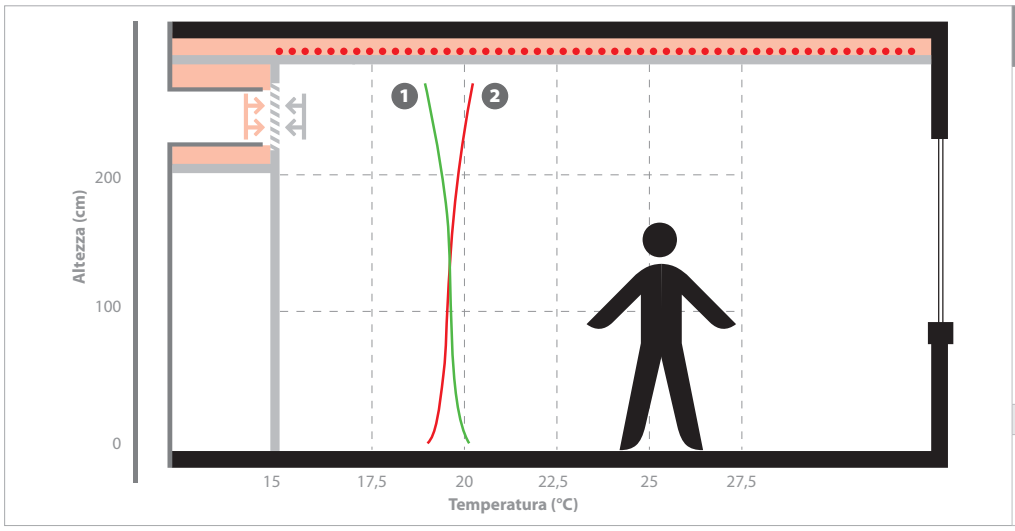
CONVECTION SYSTEMS: High ΔT in vertical

- With a convection system, the re-heated air tends to stratify in the upper part of the room
- The temperature difference in vertical is high enough (1-2 K per meter)
- The thermal exchange between feet and head determines a particularly irritating sensation

LEGEND

1 = Ideal profile
2 = Radiators
3 = Fan coils

With traditional conditioning systems, high air stratification with perceivable gradient



RADIANT SYSTEMS reduced ΔT in vertical

- With a radiation system, there are no remarkable air movements
- No hot air stratification upwards
- The temperature difference in vertical is very contained

LEGEND

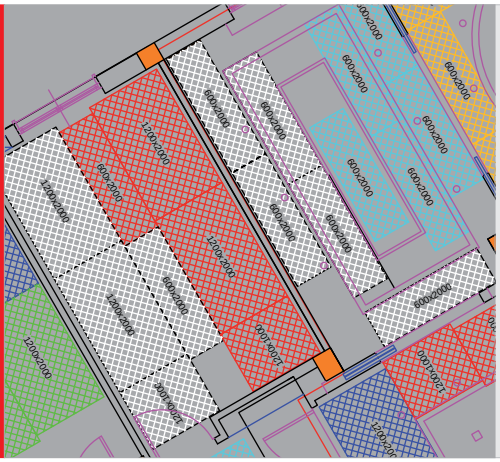
1 = ideal profile
2 = radiant ceiling

With radiant ceiling systems, vertical profile of the ideal temperature with not perceivable gradient

Further saving can be obtained thanks to the possibility of using more efficient energy production systems, as this kind of systems requires delivery temperatures definitely less extreme compared to those ones of traditional conditioning systems. giacoklima system permits also the maximum space exploitation and a large project and architectural freedom in the room interpretation. The radiant ceiling system in cooling shall be always combined with a dehumidification system; if this is used also as mechanical ventilation system to guarantee the hygienic air changes, you will obtain a room into which also a high quality of the internal air is guaranteed, in addition to the thermo-hygrometric comfort.

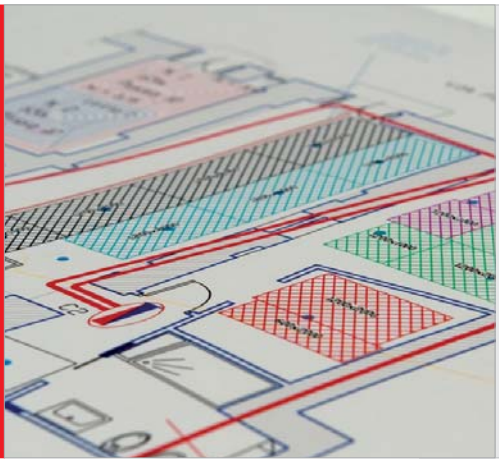
Advantages

Modularity



Thanks to the availability of active panels of various dimensions (1200x2000, 1200x1000 and 600x2000 mm), giacoklima GKC and GKCS series allow the accomplishment of radiant plasterboard false ceilings, even in the rooms having the most complex geometries, and they satisfy excellently the requirements of designers and architects.

Maximum flexibility



From the plant point of view, the division in zones can be personalized according to the specific needs. The hydraulic connections can be carried out with large freedom, by making possible very flexible solutions.

Ease of inspection

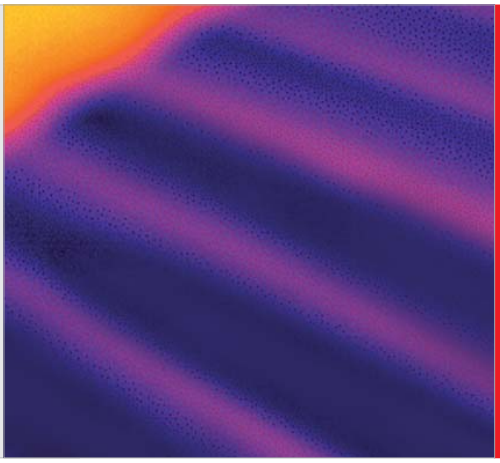
The integration of folding doors to be inspected, at the distribution manifolds, permits the access to the area above the false ceiling to effect easy maintenance and control operations without switching off the system.

Mounting quickness

The components of the carrying structure are the same used for the common plasterboard false ceilings (not radiant) to make the mounting quick and precise. The connections to manifolds or to the distribution lines are carried out by means of push fittings and plastic material pipe, making the operation extremely easy and reliable.

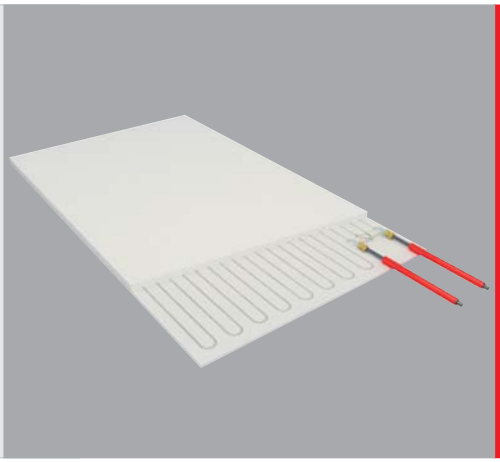
High thermal output

The C100 activation (GKC) provides for thermal diffusers in anodized aluminium glued on the panel with special adhesive and circuits with copper pipes; alternatively (GKCS) the activation with circuits made of PE-X pipe size 8x1 mm with anti-oxygen barrier is available.
In each application, the most appropriate output is therefore guaranteed in cooling and in heating.



Preassembly

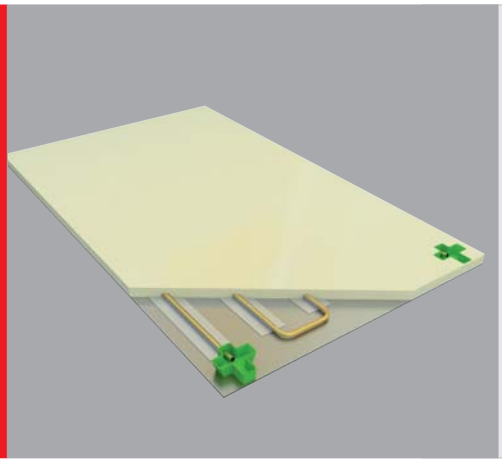
The active panels are preassembled and completed at the factory with the insulation layer, to simplify and reduce the mounting operations and to ensure the correct installation.



Integration with other plants

The plant part related to the renewal air and humidity control can be integrated into the plasterboard. The false ceiling can integrate lights, air diffusers and other plant components such as loudspeakers, smoke/fire detection sensors, presence sensors, etc. with extreme flexibility and without altering the aesthetic and functional aspect.

Thermal and acoustic insulation

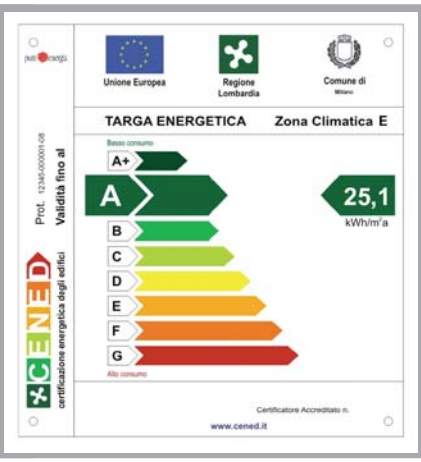


The insulating layer placed on the upper side of the panels, ensures an optimal thermal and acoustic insulation upwards. Depending on the version, the layer can be constituted by expanded polyurethane (CFC free) or EPS (sintered expanded polystyrene).

System offer

The range of Giacomini products includes components and materials to carry out all distribution, shunt and connection versions; in particular manifolds (modular or bar ones) can be used or direct connection from the pipe line can be made.

The clear division of the air conditioning tasks between the primary air, responsible of the air renewal and dehumidification, and the radiant ceiling, in charge of treating the sensible part of the summer thermal loads, allows to adopt more compact canalizations and air machines of lower size compared to an air system. Due to the use of a radiant ceiling system in combination with primary air in place of a whole air system, the energy requirement is very limited and lower than a traditional system.



Energy saving

Choosing giacoklima radiant ceiling means trusting on the long experience matured by Giacomini in the design, production and supply of radiant ceiling systems, that leads to high competence, specialized training opportunities for designers and installers and targeted consulting during the project and executive steps.

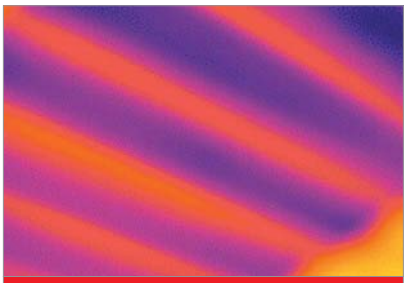
Well-established competence and experience

Reply rapidity

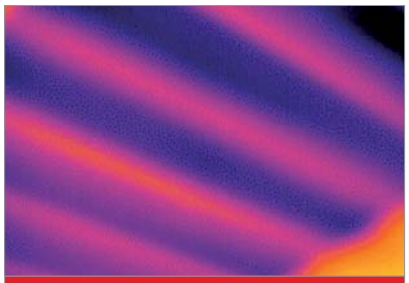
Giacoklima radiant ceiling system exploits the large plasterboard surface of the false ceiling for the transmission of the thermal energy from/towards the room, therefore it reacts very rapidly to the performance variations requested by the thermoregulation system. The images reported as follows have been taken by means of a thermographic camera and show the reaction rapidity of the radiant ceiling in summer operation (cooling) starting from the condition of switched off system.

Supplied by 1 minute

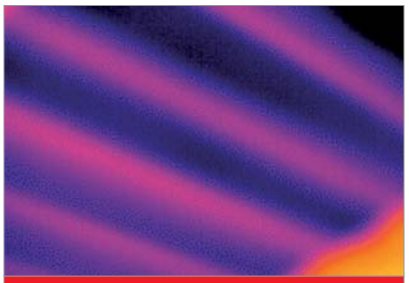
Supplied by 5 minutes



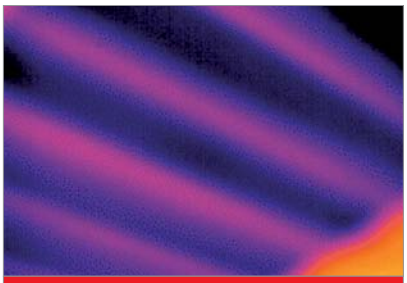
Supplied by 10 minutes



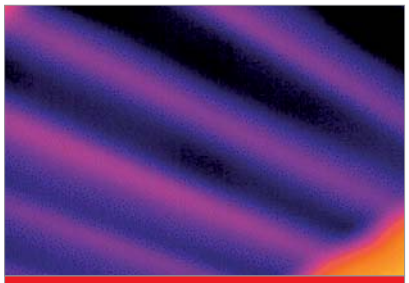
Supplied by 15 minutes



Supplied by 20 minutes

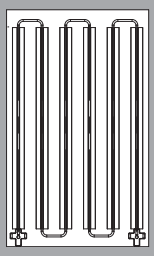


Supplied by 25 minutes

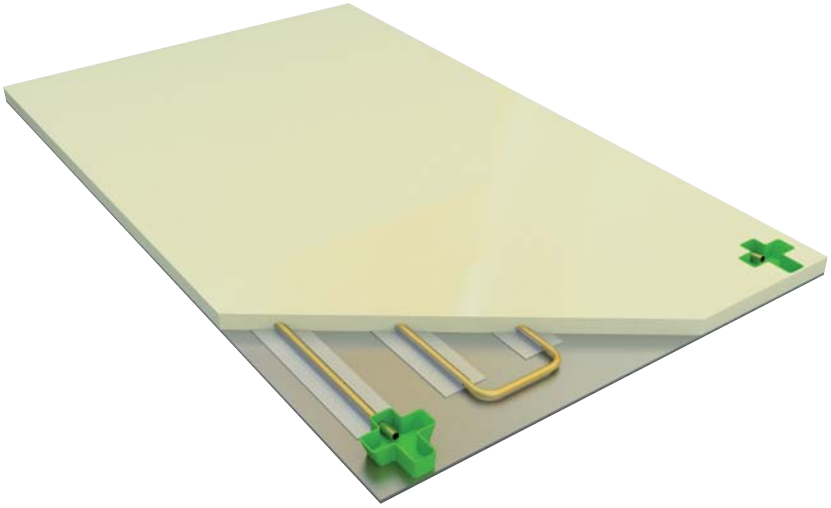


Supplied by 30 minutes

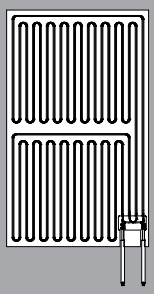
GKC SERIES



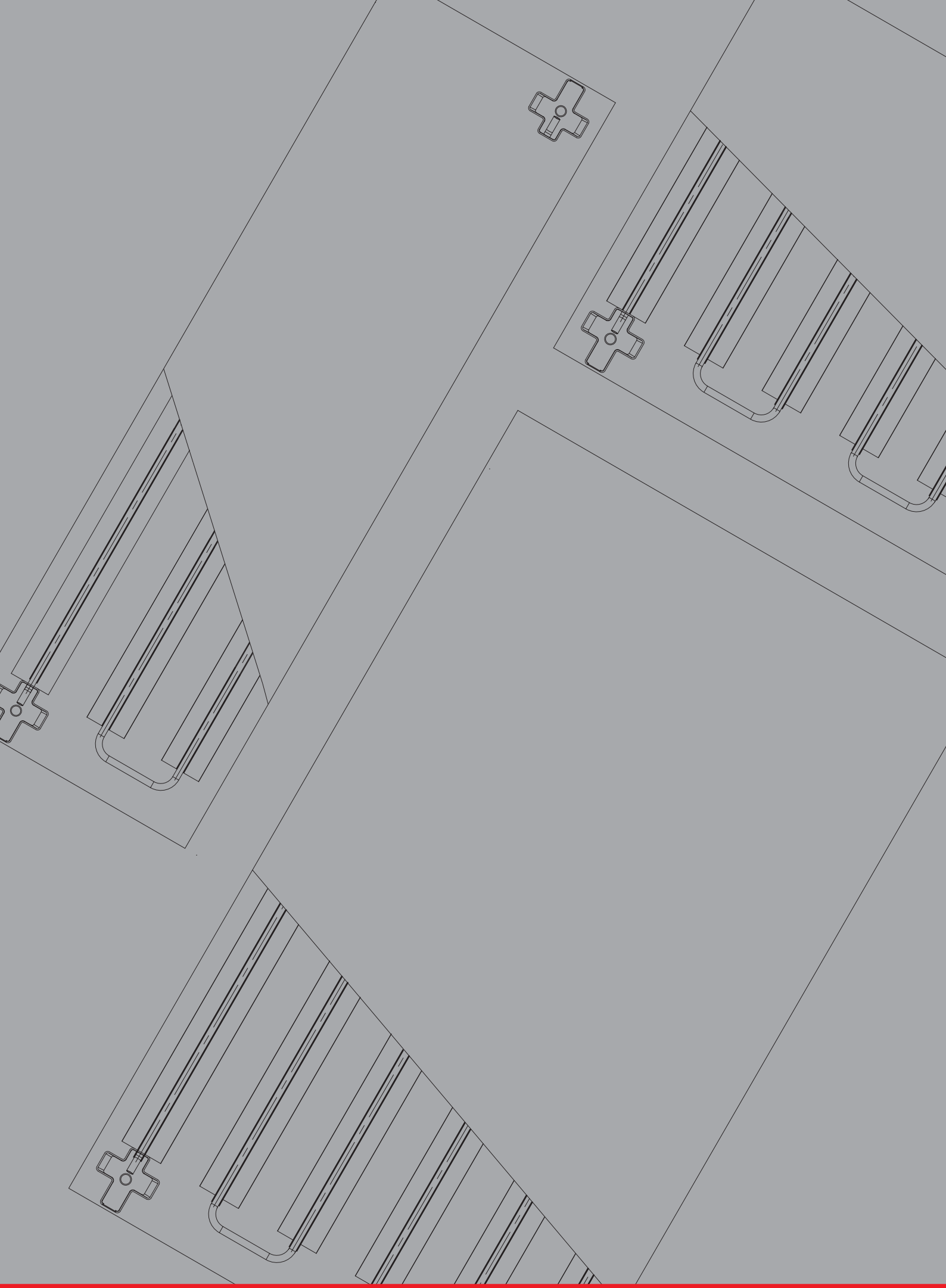
- C100 activation with thermal diffusers in anodized aluminium and copper pipe serpentine size 16x1 mm
- 10 plasterboard thickness
- Aluminium layer size 0,1 mm (for active panels only)
- 40 mm insulation in expanded polyurethane (CFC free)
- 3 panel dimensions (1200X2000, 1200X1000 and 600X2000 mm)
- inactive panel for compensation size 1200x2000 mm
- prearrangement for the connection to the distribution line by means of RC push fittings



GKCS SERIES



- activation with PE-X pipe serpentine size 8x1 mm with anti-oxygen barrier
- 15 mm plasterboard thickness
- 30 mm insulation in sintered expanded polystyrene (EPS)
- 3 panel dimensions (1200x2000, 1200x1000 and 600x2000 mm)
- Inactive panel for compensation size 1200x2000 mm
- Preinsulated and prearranged end pipe section for the connection to the distribution line by means of RC push fittings



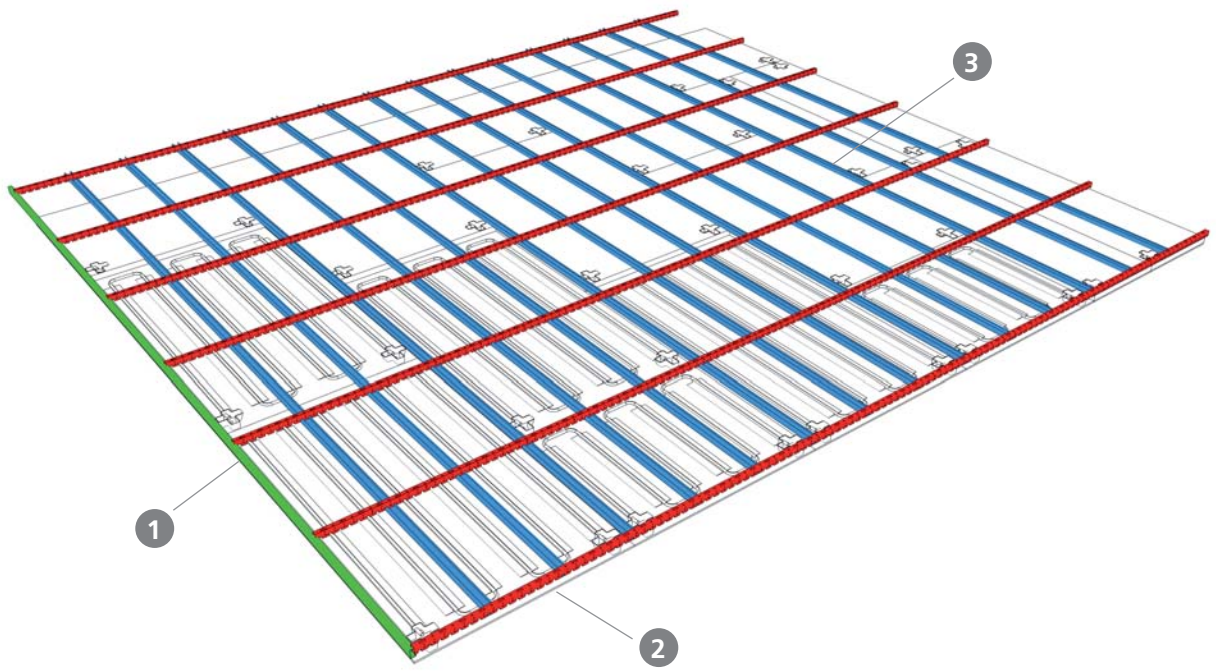
GKC SERIES

Description

GKC giacoklima series allows making radiant false ceilings having plasterboard finish, particularly suitable for heating and cooling of residential buildings, hotels, residences, commercial rooms and in general, buildings where a false ceiling having civil finishes is preferable. The system is constituted by active and inactive panels, by the carrying structure and by hydraulic connection components. The system perfectly fits also the rooms having the most complex geometry, due to the availability of panels of three different modularity:

- 600x2000 mm
- 1200x1000 mm
- 1200x2000 mm

The activation is made of aluminium thermal diffusers and a hydraulic circuit with copper serpentine. The radiant false ceiling can be completed by folding doors to be inspected, to have access to the part of hydraulic zone distribution and make maintenance interventions. The link with walls and with the side compensation can be made by means of the inactive GKC panels.



1. Perimeter profile
2. Primary carrying element
   Laying distance between the axis 900mm
3. Secondary carrying element
   Laying distance between the axis 400mm

KG814Y001 primary carrying element joint
KG814Y001 secondary carrying element joint
Double in KG806Y001
KG804Y001 hanger L=1,5 m

Radiant false ceiling of the GKC series, crossed structure with longitudinal secondary carrying element.

Panel type

GKC panel types are active and inactive. The active panels have radiant capacity, having thermal diffusers in anodized aluminium glued to the panel, while the inactive ones have a completion function and show no thermal diffusers. Both panel types are made of plate of 10 mm plasterboard, and a 40 mm insulation layer; the active panels have also the thermal activation and a barrier to steam, made of an aluminium sheet size 0,1 mm applied on the plasterboard plate

Ease of inspection

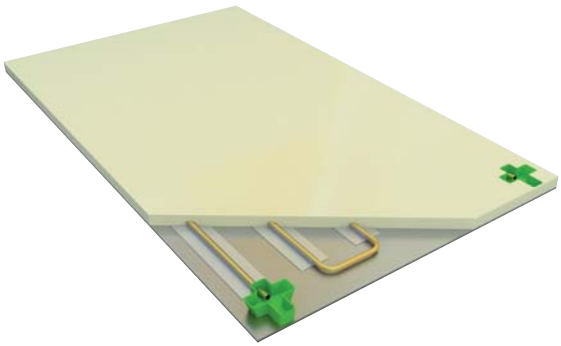
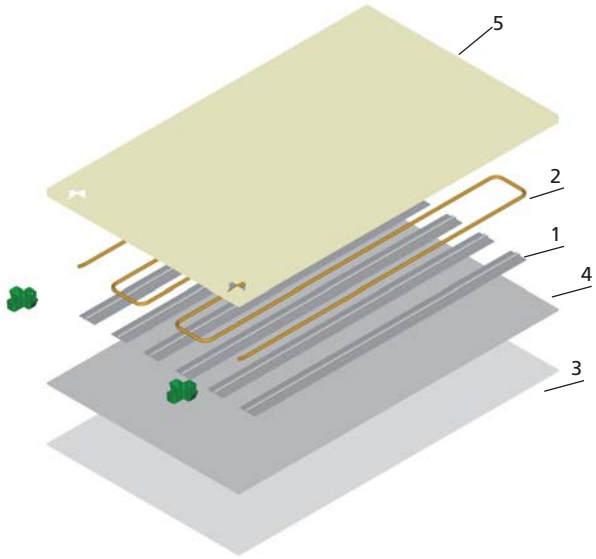
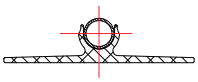
The radiant false ceiling can be completed by folding doors to be inspected, to have access to the hydraulic zone distribution part and make maintenance operations.

Activations

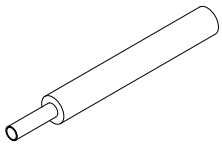
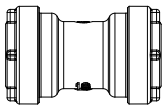
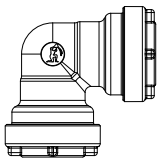
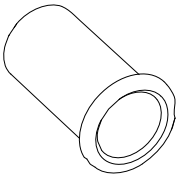
The panels of the GKC series have a C100 type activation; therefore they have thermal diffusers in anodized aluminium of 100mm width, glued on the panels in the factory. The number and the length of the thermal diffusers depend on the panel dimensions:

- KC120X200 has 6 diffusers, 1700 mm length;
- KC120X100 has 6 diffusers, 700 mm length;
- KC60X200 has 3 diffusers, 1700 mm length.

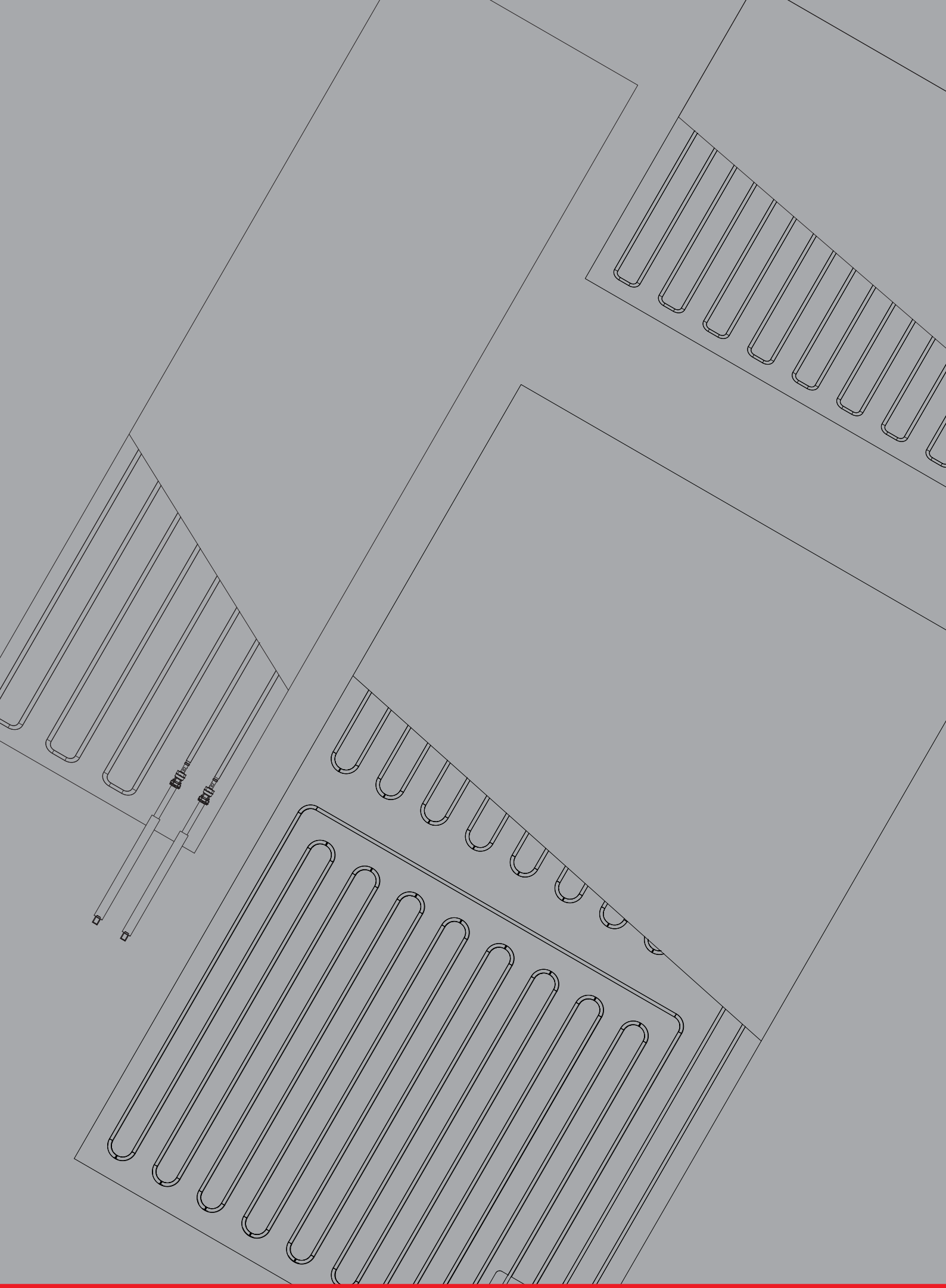
The water circulation occurs through a circuit made by means of a serpentine with copper pipe size 16x1 mm.

C100 TYPE ACTIVATION	
	
DIFFUSER AND PIPE SECTION	LEGEND
	**1**=aluminium thermal diffuser **2**=copper pipe **3**=10 mm plasterboard panel **4**=aluminium sheet **5**=expanded polyurethane insulation

Connection

	
Tubo isolato	RC102
	
RC122	RC900

The connection among adjacent panels or to the distribution manifolds is carried out by means of brass push fittings and pre insulated plastic material pipes size 16x1,5 mm, with anti-oxygen barrier (for possible not preinsulated parts, an appropriate thermal insulation shall be provided for). The insulating layer of the active panel has an opening, that permits the installation of straight RC102 or angle RC122 fitting, for the connection.



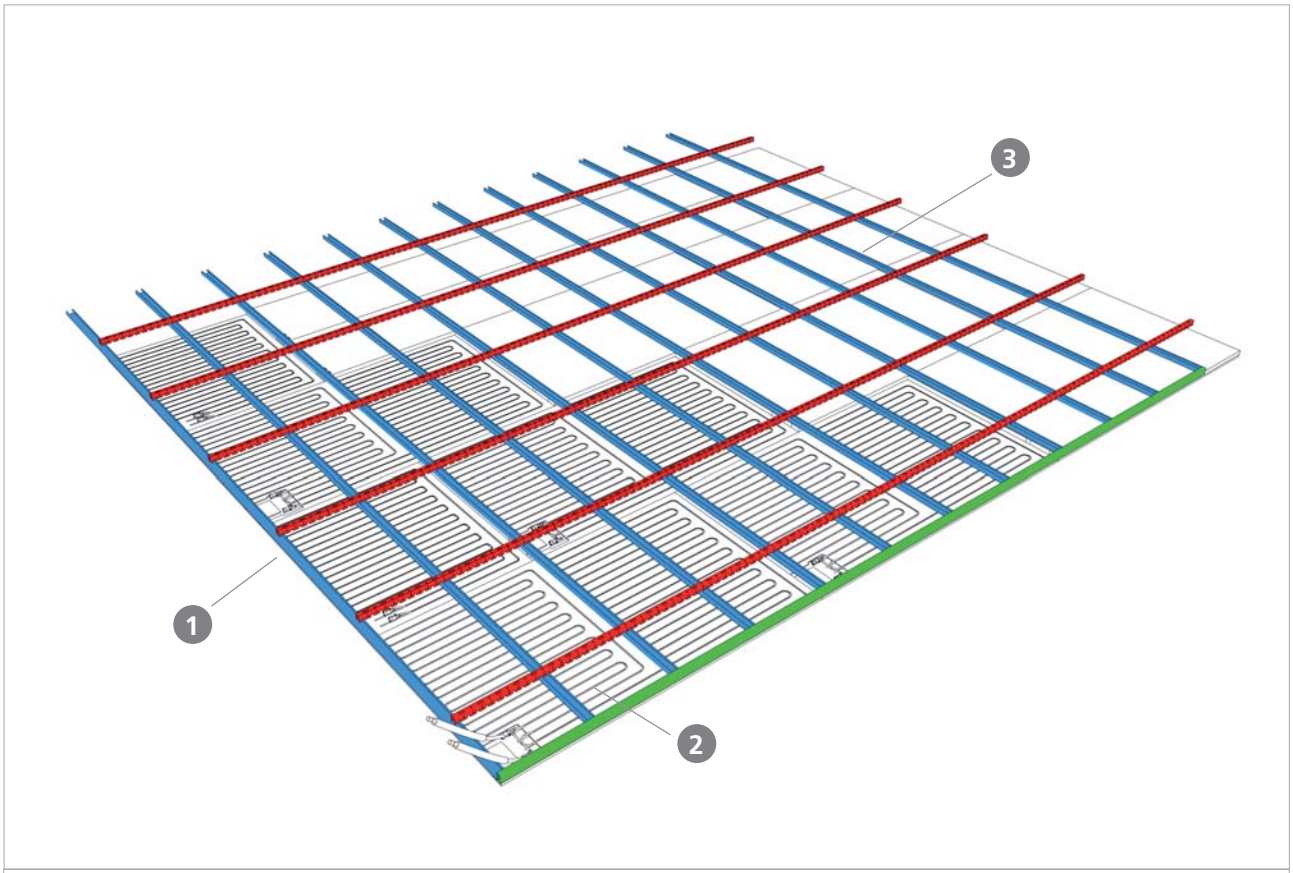
GKCS SERIES

Description

Giacoklima GKCS series allows accomplishing radiant false ceilings with plasterboard finish, particularly suitable for the heating and cooling of residential buildings, accommodation structures such as hotels, residences, commercial rooms and in general buildings, where a false ceiling having civil finishes is preferable. The system fits perfectly active and inactive panels, the carrying structure and the components of the hydraulic connections. The system permits covering adequately also the rooms having complex geometry, due to the availability of panels having three different modularity:

- 600x2000 mm
- 1200x1000 mm
- 1200x2000 mm

The activation is constituted by an hydraulic circuit with anti-oxygen barrier PE-X pipe. The radiant false ceiling can be completed by folding doors to be inspected, to have access to the zone hydraulic distribution part, and make maintenance operations. The connection with the walls and the lateral compensations can be made by using GKCS inactive panel.



1. KG800Y040 perimeter profile L=4 m
2. KG800Y001 primary carrying element L=4 m
   900 mm laying distance between the axis
3. KG800Y020 secondary carrying element L=4 m
   500 mm laying distance between the axis

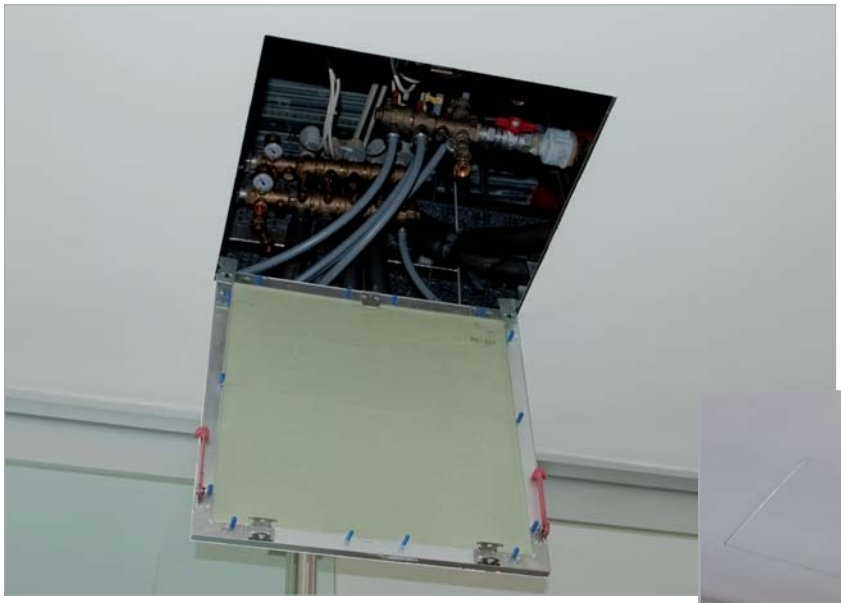
KG814Y001 Primary carrying element joint
KG814Y001 Secondary carrying element joint
double in KG806Y001
KG804Y001 hanger L=1,5 m

Radiant false ceilings of the GKCS series, crossed structure with transverse secondary carrying elements.
The laying with crossed structure having longitudinal secondary carrying elements is possible too (see GKC, page 11)

Panel types

There are two types of GKCS panels: active and inactive. The active panels have radiant power, due to the hydraulic circuit in PE-X pipe laid on the plasterboard plate, while the inactive ones have completion purpose and show no thermal diffusers. Both panel types are made with a 15 mm plasterboard plate, and a 30 mm insulation layer.

Ease of inspection

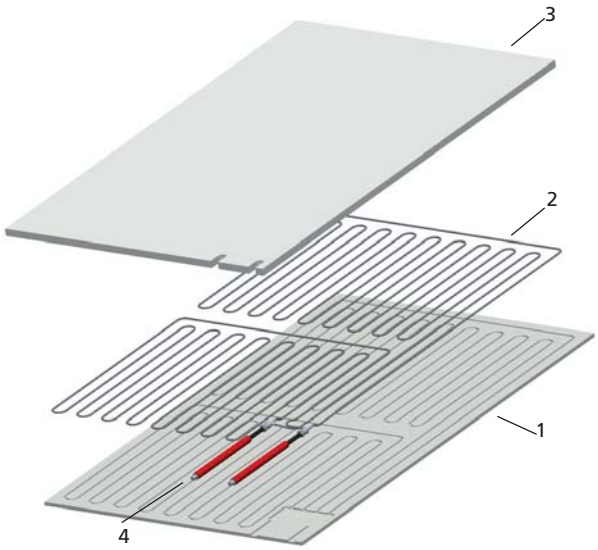


The radiant false ceiling can be completed with folding doors to be inspected, to have access to the zone hydraulic distribution part, and make maintenance operations.

Activations

The panels of the GKCS series have an activation constituted by one or two hydraulic circuits made by means of PE-X pipe size 8x1 mm with anti-oxygen barrier laid in an appropriate housing, drawn on the upper side of the plasterboard plate. The number of hydraulic circuits depends on the panel dimensions:

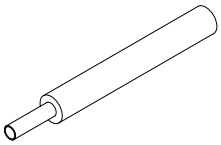
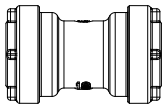
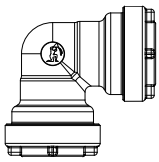
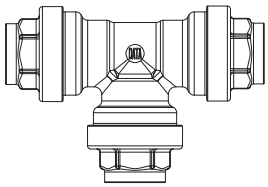
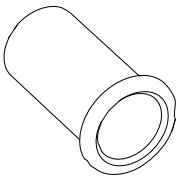
- KS120X200 has 2 circuits
- KS120X100 and KS60X200 have 1 circuit

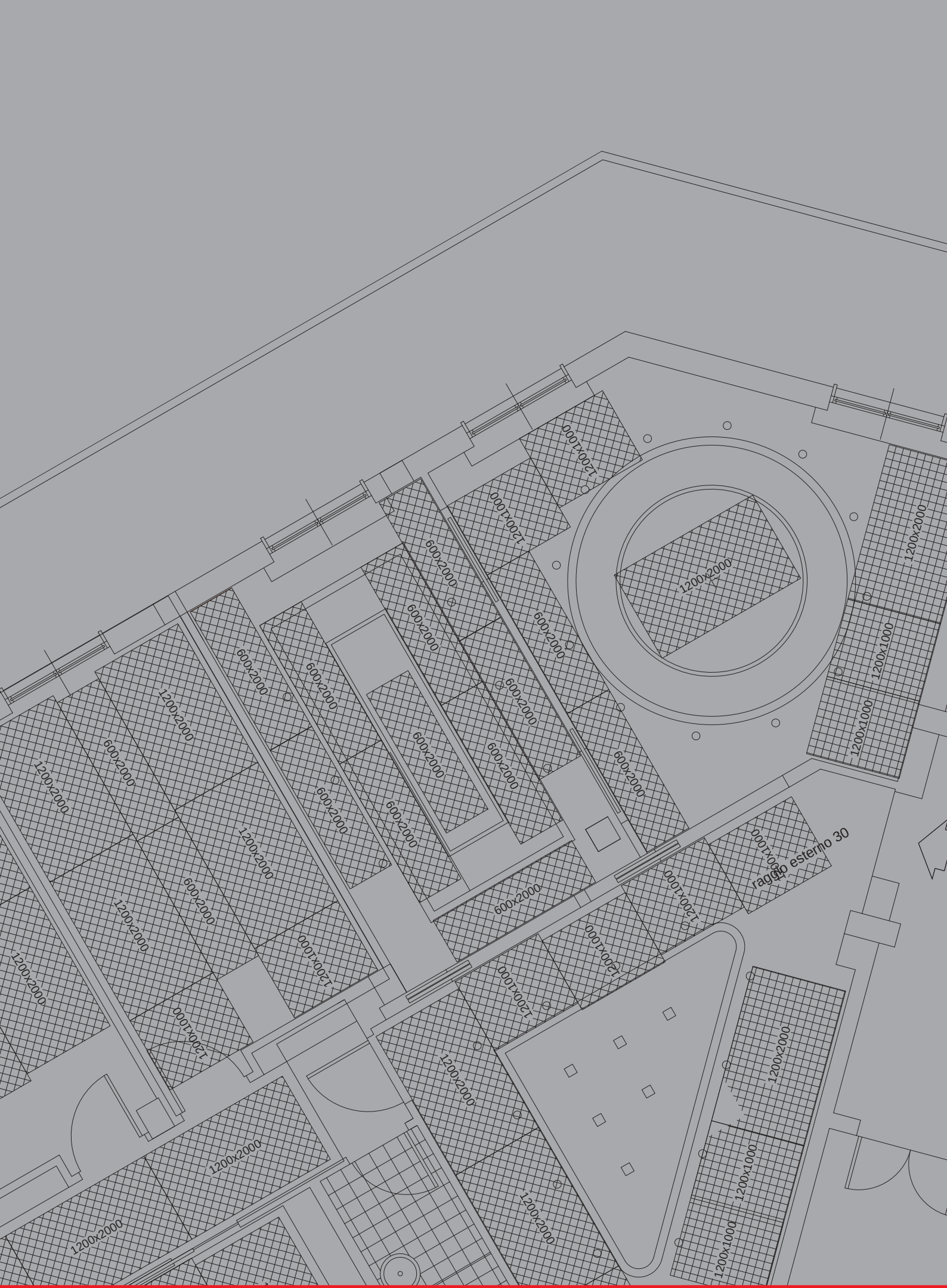
ACTIVATION	
	

LEGENDA

1 = 15 mm plasterboard panel
2 = 8x1 mm PEX pipe serpentine
3 = 30 mm EPS insulation
4 = 16x1,5 mm preinsulated polybutylene pipe

Connection

		
Insulated pipe	RC102	RC122
		The connection of the panels to the manifold is made by means of push fittings, and PB pipes size 16x1,5 mm with intermediate anti-oxygen barrier, subject to introduction of the RC900 support sleeve into the end section of the pipe.
RC150	RC900	

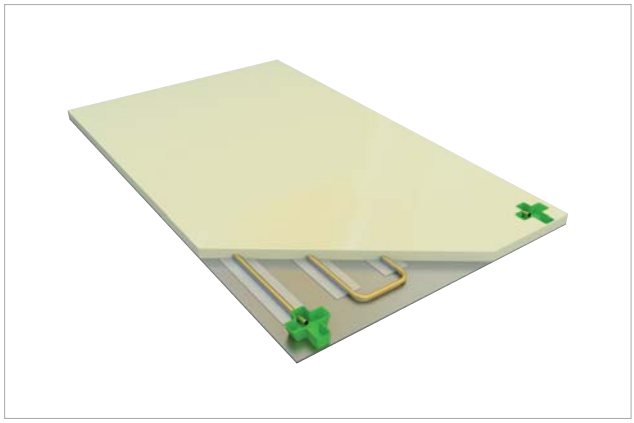


TECHNICAL AND PROJECT DATA

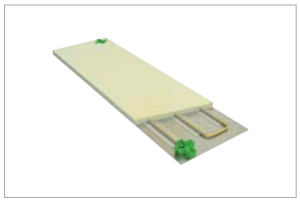
Panel activation types

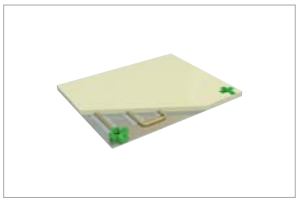
For giacoklima plasterboard radiant ceilings, two activation types are available:

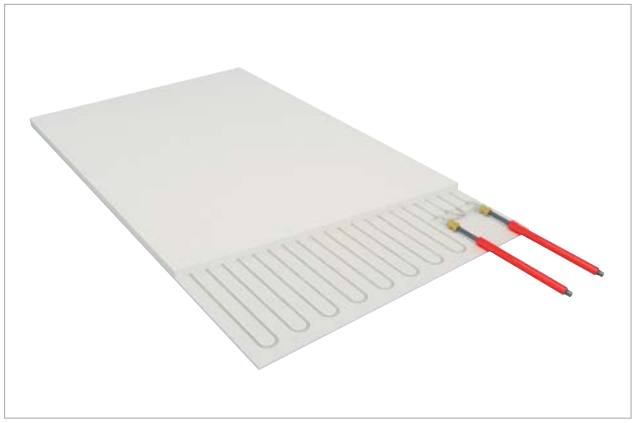
- **C100 activation (GKC series)** constituted by a circuit with copper pipe size 12x1 mm and thermal diffusers in aluminium, 100 mm width;
- **Activation** with plastic material pipe (GKCS series): constituted by one or two circuits with PE-X pipe size 8x1 mm, with anti-oxygen barrier.



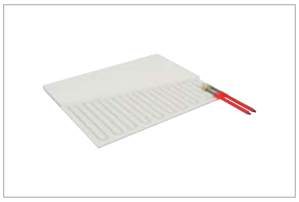
C100 activation







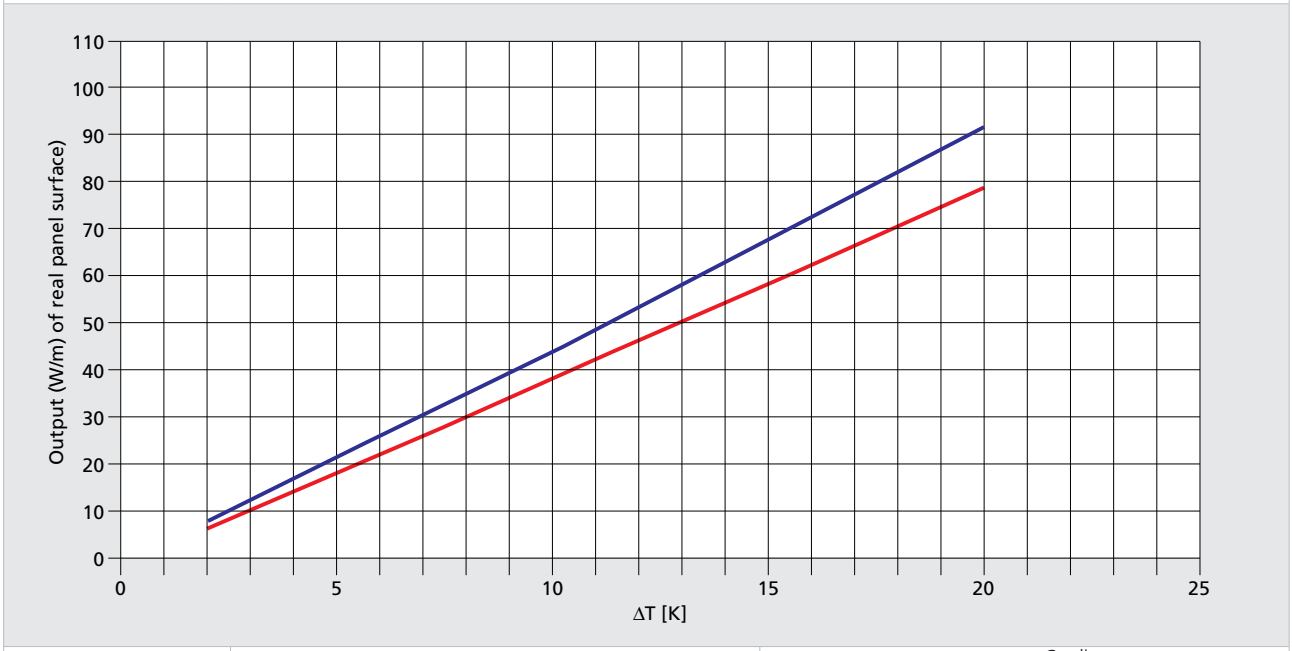
8x1 mm PE-X pipe activation



Thermal outputs

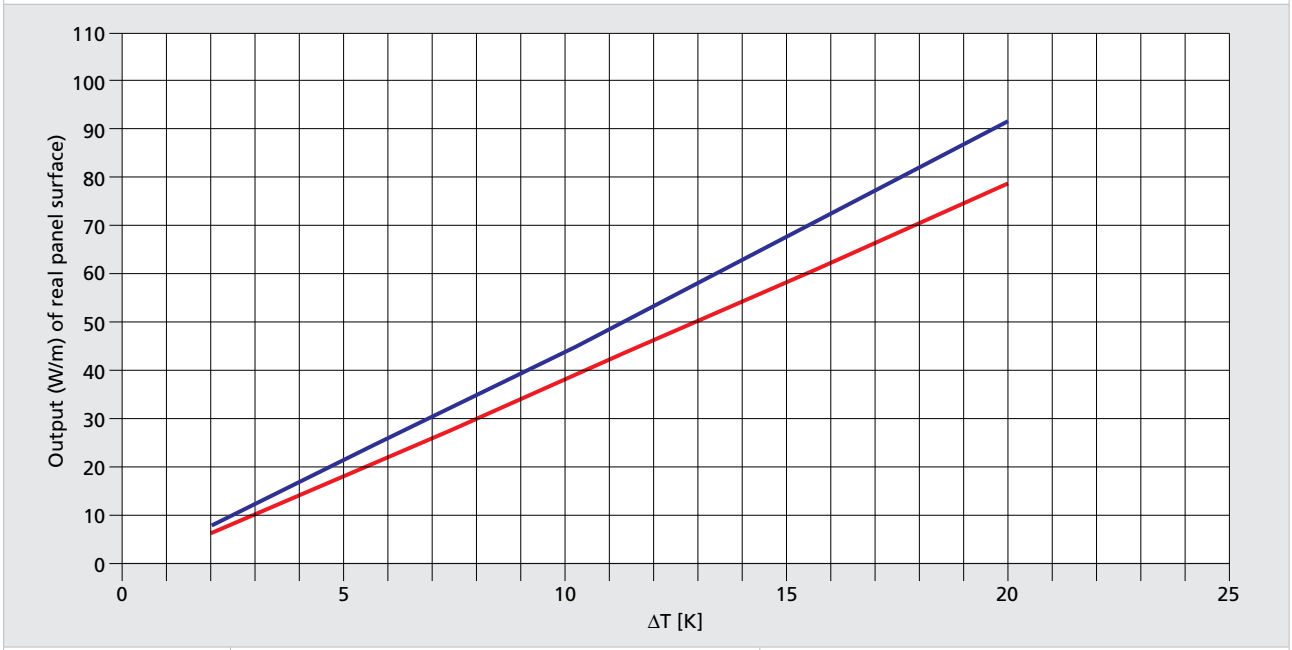
The thermal outputs reported as follows, are certified according to the standards EN 14240 for cooling, and EN 14307 for heating. The output results are different for the various activation types: the following graphs report the outputs in heating and in cooling for the C100 activation type and plastic material pipe one respectively.

GKC PLASTERBOARD GIACOKLIMA SYSTEM – C100 ACTIVATION TYPE



LEGEND	Heating	Cooling

GKCS PLASTERBOARD GIACOKLIMA SYSTEM – 8X1 MM PE-X PIPE ACTIVATION



LEGEND	Heating	Cooling

The characteristic equations to obtain the outputs with analythical method, instead of graphical, are the following:

$Q_H = C_H \bullet \Delta T^{nH}$ [W/m²]) heating output
$Q_C = C_C \bullet \Delta T^{nC}$ [W/m²] cooling output

Where

$$\Delta T = \left| Ta - \frac{T_r + T_m}{2} \right|$$

T_a = room temperature
T_m = delivery temperature
T_r = return temperature

In the following table, the coefficients are reported:

Coefficiente	GKC-C100	GKCS
C_H	3,470	3,315
n_H	1,070	1,057
C_C	4,615	3,775
n_C	1,024	1,064

REMARK: For application simplicity, the outputs gathered either from the graphs, or by the equations, refer to the real panel surface and not to the active area of the same.

Therefore the surfaces to be considered for the application are the following:

GKC

KC120X200 1200x2000 mm 2,4 m²
KC120X100 1200x1000 mm 1,2 m²
KC60X200 600x2000 mm 1,2 m²

GKCS

KSX200 1200x2000 mm 2,4 m²
KSX100 1200x1000 mm 1,2 m²
KSX200 600x2000 mm 1,2 m²

For GKC-C100 panels, by fixing some typical operation conditions, we obtain:

SUMMER STANDARD DATA	WINTER STANDARD DATA
T_m = 14 °C	T_m = 38 °C
T_r = 16 °C	T_r = 35 °C
T_a = 26 °C	T_a = 20 °C
DT = 11 °C	DT = 16,5 °C
Q_C = 53,8 W/mq	Q_H = 69,7 W/mq

With these conditions, the obtainable outputs of the various panels are

Panel type	Surface [m²]	Cooling [W/panel]	Heating [W/panel]
KC120X200	2,4	129,1	167,3
KC120X100	1,2	64,6	83,6
KC60X2000	1,2	64,6	83,6

In the same conditions, for GKCS panels on the contrary we obtain

SUMMER STANDARD DATA	DATI STANDARD INVERNALI
T_m = 14 °C	T_m = 38 °C
T_r = 16 °C	T_r = 35 °C
T_a = 26 °C	T_a = 20 °C
DT = 11 °C	DT = 16,5 °C
Q_C = 48,4 W/mq	Q_H = 64,2 W/mq

With these conditions, the obtainable outputs of the various panels are

Panel type	Surface [m²]	Cooling [W/panel]	Heating [W/panel]
KS120X200	2,4	116,2	154,1
KS120X100	1,2	58,1	77
KS60X2000	1,2	58,1	77

Corrective factors of the output

The indicated outputs have been obtained in test room, by following the directions given by the mentioned standards. In order to obtain the outputs to be used in the design, three factors shall be considered:

- Height factor

The tests have been carried out at a determined height (normally between 2,6 and 2,7 m). In order to obtain the output with the real installation height, use the hf height factor, calculated according to the following formula:

hf = a – b H

where H (m) is the real installation height;

a=1.117 constant

b=0.045 constant

for H = 2,7 m we have hf = 0.9955; the formula is valid for installations up to 5 m.

- Ventilation factor

The various standards concerning output tests impose maximum limits to the air speed in the test room; this because the air motions close to the false ceiling, increase the output of the radiant ceiling.

With the air motion of a room mechanically ventilated (so in all cases), the factor becomes Vf = 1,15 (experimental tests at HLK University Institute). If the room is not ventilated, or the ventilation does not interact with the false ceiling Vf =1.

Façade factor

During the tests, the temperature of the room walls shall be controlled too. In reality, the walls and above all the large windows constitute the principal source of sensible thermal load. To consider this, the façade factor is used. It depends on the thermal asymmetry between the ceiling and the walls. It is experimentally calculated with the function:

Ff (internal q + recess q) / (internal q + 0,5 q from outside)

In case of thermal contribution due for 45 W/m2 to internal ones and for 45 W/m2 to contribution from outside, we have Ff = 1,33. According to experimental tests by HLK (Stuttgart University), such increase depend on the relationship between the window surface and their height as regards to the height of the room wall. With reference to the examined experimental data, we feel to recommend, prudentially, in absence of direct experimental measures, a maximum increase of 20%, therefore it is normally advised to use Ff=1,1-1,2.

Summer dimensioning

The necessary radiant surface is obtained by

$$S_R = \frac{Q_{S\ max}}{q_C}$$

Where

S_R = radiant surface [m²]

Q_{Smax} = peak sensible thermal load, to be discharged by the radiant system [W]

q_C = obtainable specific output [W/m²], according to the expected operation conditions

At this point, with graphic and analytical method, the ΔT_c temperature difference corresponding to the required output, can be gained:

$$\Delta T_c = \sqrt[n_c]{\frac{q_c}{C_c}}$$

Consequently, know the Ta room temperature, you can determine the Tm delivery temperature; it shall not be lower than 12°C (when in the room, the dew point is equal to 14-14,5°C), corresponding to a superficial temperature of 16°C.

The S_R radiant surface shall be then subdivided among the various available panel sizes, according to the room shape and dimension.

REMARK: as for all radiant systems, a humidity treatment system shall be provided for, in order to cut down the bound charge.

Winter dimensioning

The necessary radiant surface is obtained by

$$S_R = \frac{Q_{max}}{q_H}$$

where

S_R = radiant surface [m²]

Q_{max} = peak winter load [m²]

q_H = specific requested output [W/m²]

At this point, with graphic and analytical method, the required DT value can be gained:

Consequently, know the Ta room temperature, you can determine the Tm delivery temperature; it shall not be such to bring a superficial average temperature higher than 35°C.

The Sr radiant surface shall be then subdivided among the various available panel sizes according to the room shape and dimension.

Summer and winter dimensioning

If the system will work either in heating or in cooling, the dimensioning shall be carried out with the heaviest thermal load, then determine the operation condition in the other season with the same number of radiant panels.

Water capacity

The water capacity of a circuit is calculated as:
where

$$G = \frac{Q_{circuito}}{\Delta t} \bullet 0{,}86$$

dove
G = water capacity [l/h]
$Q_{circuit}$ **=** thermal output of the circuit panels [W]
Δt **=** $|T_m - T_r|$ thermal difference of the water [°C]

GKC panels

The capacity of a single circuit shall be at least 160 l/h, so that the water flow in the panels will be in turbulent field (and therefore the indicated outputs are valid). This way, there is also the benefit of having water circulating into the connection pipes at a speed higher than the critical one, that can transport possible air bubbles that form inside the pipes themselves.

GKCS panels

Per la tipologia GKCS in ciascun circuito all'interno del pannello deve essere garantita una portata minima di 40 l/h e quindi:

Panel type	Dimensions	Circuit n°	Minimum capacity
KS120X200	1200x2000 mm	2	80 l/h
KS120X100	1200x1000 mm	1	40 l/h
KS60X2000	600x2000 mm	1	40 l/h

Consequently, the capacity is not a calculation data normally, but an imposed value according to which, we calculate the Δt with the following formula:

$$\Delta t = \frac{Q_{circuit}}{G} \bullet 0{,}86$$

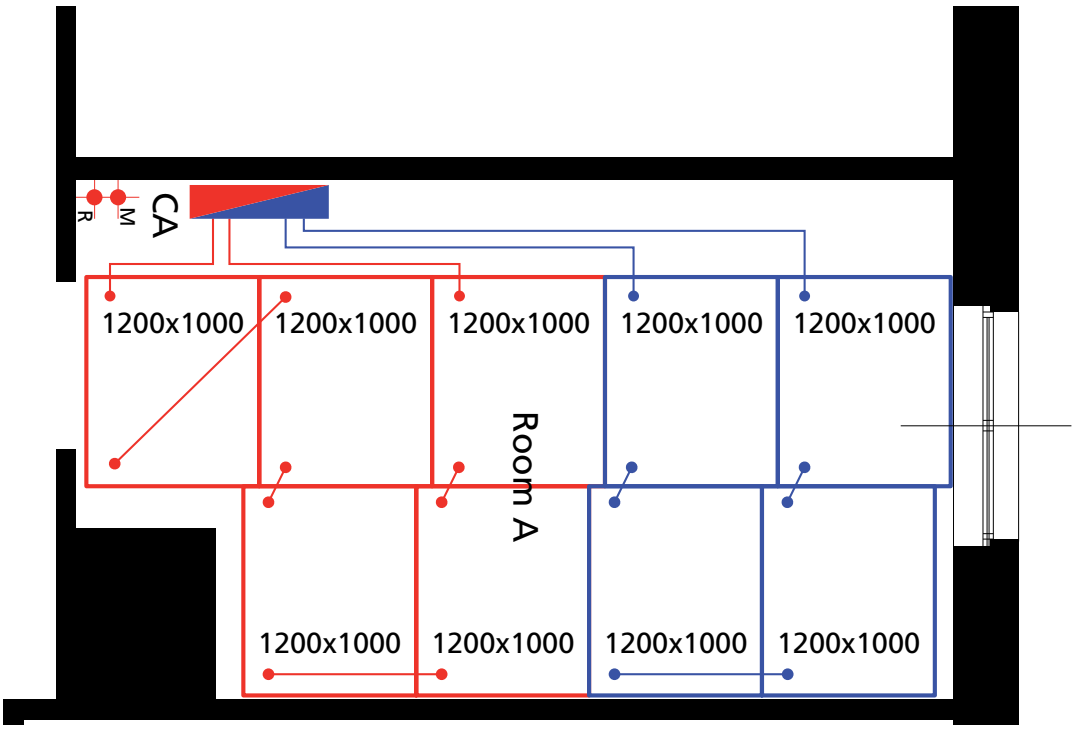
Connection method and loss of pressure calculation

GKC and GKCS panels connect with a different method, therefore it is necessary to treat this part separately for the two types:

Circuits with GKC panels

With GKC panels, make the circuits by connecting the panels in series, as in the following scheme:

GKC C100 CONNECTION SCHEME



Kv values for GKC panels are the following:

1200x2000 mm panel	K_{v1}= 1,42
1200x1000 mm panel	K_{v2}= 1,97
600x2000 mm panel	K_{v3}= 2,7
16x1,5 connection pipes	K_{vt}= 3,71

Known the capacity of Δp series (l/h), the Δp loss of pressure (w.c. mm) is given by

$$\Delta p = \left(\frac{G}{K_{V1}}\right)^2 \bullet \frac{n_1}{100} + \left(\frac{G}{K_{V2}}\right)^2 \bullet \frac{n_2}{100} + \left(\frac{G}{K_{V3}}\right)^2 \bullet \frac{n_3}{100} + \left(\frac{G}{K_{Vt}}\right)^2 \bullet \frac{m_t}{100}$$

Where the Kv values are those one previously indicated and

G circuit capacity [l/h]

n_1 number of 1200x2000 mm panels

n_2 number of 1200x1000 mm panels

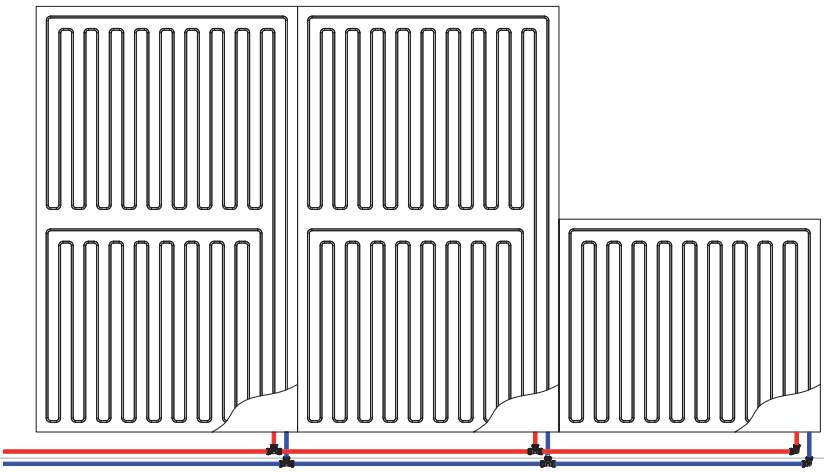
n_3 number of 600x2000 mm panels

m_t meters of connection pipe of the series [m]

Normally, in order to have not too high losses of pressure, maximum 4-5 1200x2000 mm panels are connected in a single circuit (or in case of 1200x1000 mm and 600x2000 mm panels, the equivalent in surface)

Circuits with GKCS panels

I pannelli GKCS devono essere collegati fra loro in parallelo, secondo il seguente schema:GKCS panels shall be connected in parallel, according to the following scheme:



Use RC push fittings as Tee (RC150), straight (102) or angle type (RC122) to carry our the connections.

RC122

RC102

RC150

As the various panels are connected in parallel, in the loss of pressure calculation, the one in the panel shall be considered (if present a panel size 1,2x2 m, in alternative one of the smallest, where the minimum capacity, previously indicated, will circulate), and also that one in the adduction pipe (here to simplify the calculations as a precaution, all capacity of the circuit for its total length shall be considered).

In practice, the formula to be used is the following:

$$\Delta P = \left(\frac{G_p}{K_{V1}}\right)^2 \bullet \frac{1}{100} + \left(\frac{G}{K_{Vt}}\right)^2 \bullet \frac{m_t}{100}$$

Where:

G = circuit capacity (l/h

G_p = capacity in the largest panel, installed into the circuit (l/h)

m_t = meters of connection pipe of the series [m]

K_{Vt} = connection pipe K_v

The Kv values to be used are the following:

1200x2000 mm panel	K_{v1}= 0,19
1200x1000 mm panel	K_{v2}= 0,095
600x2000 mm panel	K_{v3}= 0,095
Connection pipes (16x1,5 mm)	K_{vt}= 3,71

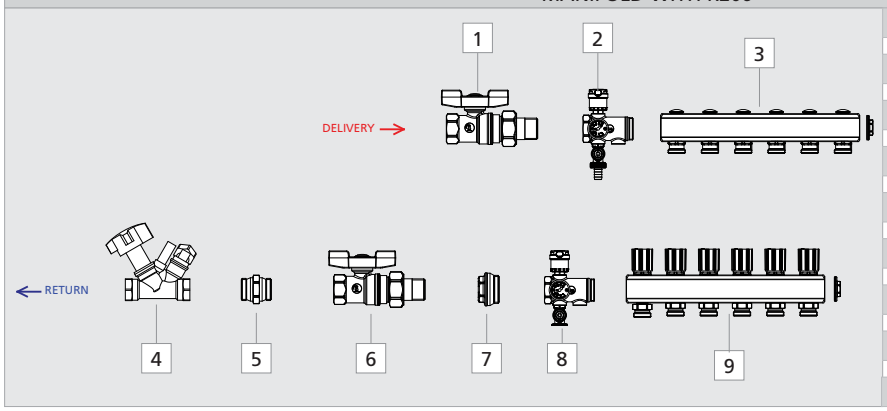
Normally, in order to have not too high losses of pressure, maximum 4 1200x2000 mm panels are connected in a single circuit (or in case of 1200x1000 mm and 600x2000 mm panels, the equivalent in surface).

Plant scheme

The preferable distribution is that one with manifolds: it permits to have interceptions, balancing and regulations for more rooms in a single inspection folding door.

The used manifold is modular or in bar, with or without flow meter on the delivery, and electrical actuators or zone valves on the return; on the return manifold also a balancing valve can be provided for.

MANIFOLD WITH R206

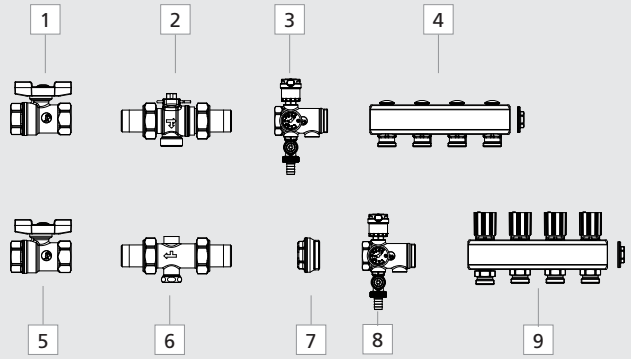


1	R259D ball valve
2	R554DY005
3	1” connection manifold
4	206Y105
5	R189DY004
6	R259005
7	R593DY005
8	R554DY005
9	1” connection manifold

Manifolds with preformed insulating shells

Manifolds with preformed insulating shells

When the manifold supplies a single zone, instead of the electrical actuators, two or three way zone valves can be used, by maintaining on the return the manual interceptions for the filling phase.



1	R251X005
2	R278Y004 delivery.
3	R554DY005
4	1” connection manifold
5	R251X005
6	R278Y004 return
7	R593DY005
8	R554DY005
9	1” connection manifold

Thermoregulation

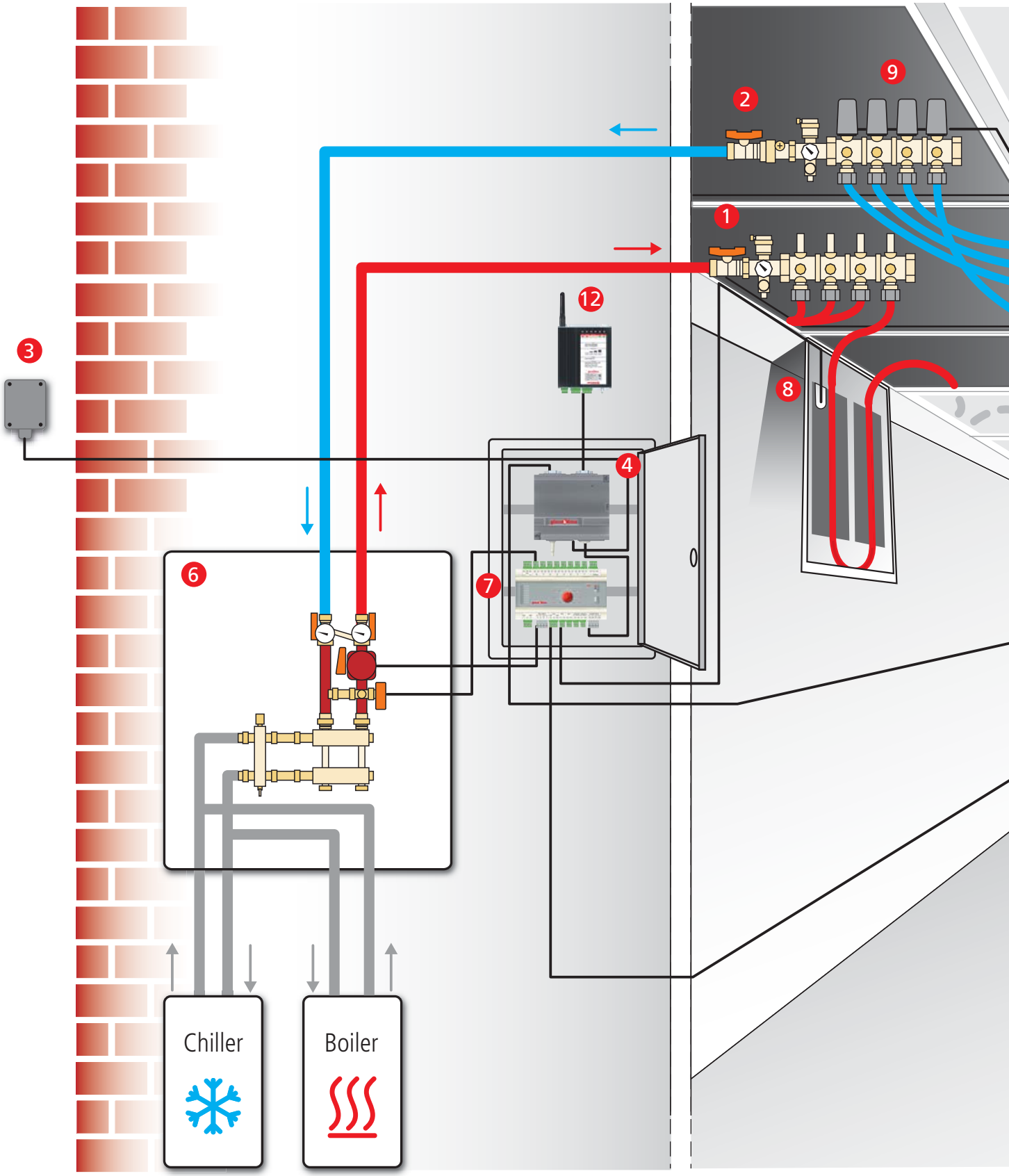
In order to satisfy the requirements of a more elevated comfort, a sensible energy saving and a higher safety, giacoklima thermoregulation system has been developed, expressly oriented to the climatic regulation of floor and ceiling radiant panel systems. The devices of the giacoklima thermoregulation range are equipped with higher intelligence and can exchange information among themselves, thanks to the modern bus technology; the devices are connected by means of a signal wiring, that is employed to transfer opportunely codified messages. In a bus technology system, a "point to point" connection between room thermostats and implementation devices (electrical actuators or motors for zone valves) is no more needed; it is sufficient connecting thermostats and adjustment regulators to the bus, without the need to respect a prearranged sequence. Thanks to the possibility of configuring the system for different regulation methods (fixed point and/or climatic compensation), it is possible replying in a targeted way to the different regulation requirements in heating and cooling. The availability of information and the option of interfacing the bus system locally or remotely, offer new opportunities to optimize the system operation, its maintenance and the handling of events and alarms. As each device can communicate on the bus, centralized functions can be easily made and further information can be displayed for the final user, the maintenance worker or the building owner, either locally or remotely.

Giacomini thermoregulation components:

				
R296, R298, K297 mixing valves			**KM203** control and supervision unit	**KPM20** regulation unit
				
K274, K274J, K281, K282 servomotors for mixing valve				**KD300** touch-screen control unit
				
K485 room sensor	**K481** thermostat	**K483** thermostat	**KD200** display	**KSMS** remote control module

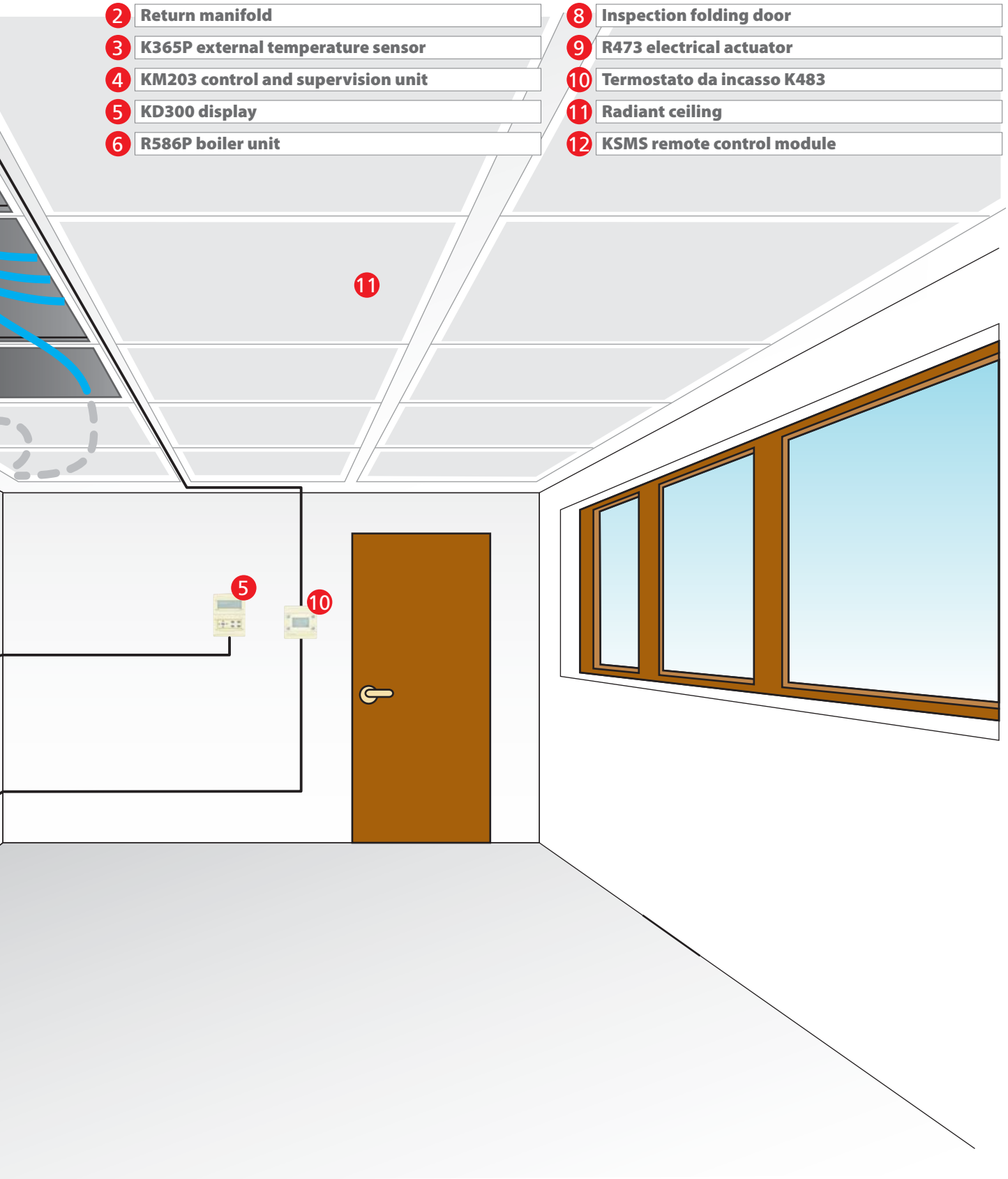
Refer to the relevant technical sheets, for the features of the single products.

Application example in house: giacoklima thermoregulation system in combination with radiant ceiling heating and cooling system



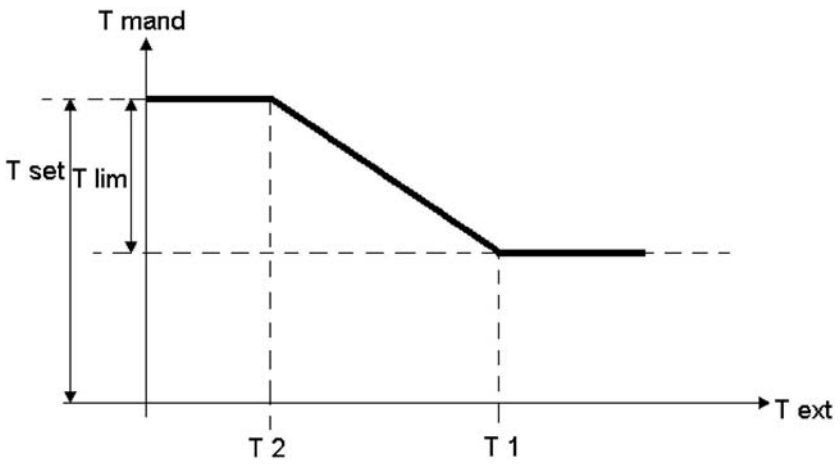
LEGEND

1. Delivery manifold
2. Return manifold
3. K365P external temperature sensor
4. KM203 control and supervision unit
5. KD300 display
6. R586P boiler unit
7. KPM20 input/output unit
8. Inspection folding door
9. R473 electrical actuator
10. Termostato da incasso K483
11. Radiant ceiling
12. KSMS remote control module



Winter regulation

The delivery temperature is defined according to a climatic compensation curve of the type represented in the following figure.



Climatic compensation curve for the operation of the radiant ceiling in heating

The secondary regulation is controlled by giacoklima room thermostats, that control the opening and the closing of the zone actuators depending on the achievement or not, of the planned set-point.

Summer regulation

K481AY002 and K483AY002 giacoklima room thermostats are equipped with a built-in relative humidity sensor and can transmit the value detected on the communication bus, to which they are connected: due to this, the system is able to know the dew point in all rooms, where these thermostats are installed; therefore it is possible making the feedback on the delivery temperature regulation; it is such to allow having the maximum possible output without the risk of superficial condensate forming. KM203 control and supervision unit uses the following algorithm at this purpose:

$$T_m = \max (T_{DP} + K_c; T_{min})$$

The standard vaues of the temperatures to be used in the algorithm are reported in the following table.

Coefficient value for A220 and C75 activation type

K481AY002 room thermostats work also as anti-condensate safety: they compare the room dew point with the delivery temperature and, if this is too low, they close the hydraulic supply to the room. The same thermostat type is available also in blind sensor version (K485AY002).

Technical features of GKC panels

Panels	1200x2000 mm	KC120X200	radiant
	1200x1000 mm	KC120X100	radiant
	600x2000 mm	KC60X200	radiant
	1200x2000 mm	KG120X300	not radiant, for compensation

Materials

Plasterboard sandwich (10 mm) and expanded polyurethane (40 mm). Between the two layers, an aluminium sheet (0,1 mm) with steam barrier function is present. 50 mm total thickness.
Crossed carrying structure with carrying elements in 0,5 mm thickness steel. Recommended laying: Double crossed structure

Diffusers	KC120X200	6 diff. 1700x100 mm
	KC120X100	6 diff. 700x100 mm
	KC60X200	3 diff. 1700x100 mm

Material: passivated extruded aluminium

Circuit pipe

Copper 16x1,5 mm

Connection pipe

Preinsulated polybutylene 16x1,5 with anti-oxygen barrier

Weight	active surface	19 kg/mq (carrying structure included)
	inactive surface	11 kg/mq (carrying structure included)

Water content

Panels	1200x2000 mm	KC120X200	2,0 litres
	1200x1000 mm	KC120X100	1,1 litres
	600x2000 mm	KC60X200	1,1 litres

Certifications	Cooling output	(see page 35)	WSP Lab. Stuttgart (DE)	
	Heating output	(see page 35)	WSP Lab. Stuttgart (DE)	
	Fire reaction		B-S1D0	CSTB (F)

Technical features of GKCS panels

Panels	1200x2000 mm	KS120X200	radiant
	1200x1000 mm	KS120X100	radiant
	600x2000 mm	KS60X200	radiant
	1200x2000 m	KS120X300	not radiant, for compensation

Materials	Plasterboard sandwich (15 mm) and expanded POLYSTYRENE (30 mm). 45 mm total thickness. Crossed carrying structure with carrying elements in 0,5 mm thickness steel. Recommended laying: parallel structure

Circuits	KS120X200	2 circuits
	KS120X100	1 circuit
	KS60X200	1 circuit

Connection pipe	Preinsulated polybutylene 16x1,5 with anti-oxygen barrier

Weight	active surface	14,6 kg/mq (carrying structure included)
	inactive surface	14,6 kg/mq (carrying structure included)

Water content			
Panels	1200x2000 mm	KG120X200	0,9 litres
	1200x1000 mm	KG120X100	0,5 litres
	600x2000 mm	KG60X200	0,5 litres

Certifications	Cooling output	(see page 35)	WSP Stuttgart (DE)
	Heating output	(see page 35)	WSP Stuttgart (DE)
	Fire reaction	B-S1D0	LGAI Barcelona (E)

Product specifications

KS120 panel for radiant plasterboard ceiling (1 circuit)

Active panel with plasterboard finish to make a radiant false ceiling heating and cooling system o
the GKCS series. Thermal activation with 1 hydraulic circuit carried out by means of PE-X pipe
size 8x1 mm with anti-oxygen barrier, thermal insulation made of sintered expanded polystyrene
(EPS) on the upper side. 45 mm total thickness, 1,2 m² surface.

Main features

- 15 mm plasterboard plate
- 30 mm EPS insulation layer
- 1 circuit with PE-X pipes size 8x1 mm with anti-oxygen barrier
- 1200x1000x45 mm dimensions (LxHxD)
- Weight 15 kg

chnical data

=0,095 with l/h capacity and mm water column loss of pressure
inal output – cooling (according to EN14240): 43,8 W/m² with ΔT water-room of 10 K – in
(according to EN14037): 58,0 W/m2 with ΔT water-room of 15 K

de:

comini S.p.A.

GKC series

Radiant false ceiling for heating and cooling composed by:

• Carrying structure composed by primary carrying elements hooked to the slab by means of suspension hangers of 4 mm diameter, and secondary carrying elements snap fixed on the primaries:

- C shape primary carrying elements 40x28x0,7 mm, 4 m length;
- C shape secondary carrying elements 50x27x0,6 mm, 4 m length;

• The carrying elements are made of steel sheet, thickness 0,8 mm.

• The panels are sandwiches composed by (starting from the side facing the room) 10 mm plasterboard, aluminium sheet 0,1 mm thickness, 40 mm expanded polyurethane (CFC free).

The radiant panels are of three sizes:

- 1200 mm width and 2000 mm length
- 1200 mm width and 1000 mm length
- 600 mm width and 2000 mm length

Inside the polyurethane, the thermal diffusers are drowned. They are made of extruded passivated aluminium of 1000 mm x 1600 mm or 1000 mm x 700 mm dimensions, supplied with the needed fittings for the connection of adjacent panels, by means of brass push fittings and preinsulated polybutylene pipes with anti-oxygen barrier (a thermal insulation shall be expected for possible not preinsulated parts). The passage of the water inside the panel, is made through a copper serpentine having 16 mm diameter.

To close the perimeter zones, insulated plasterboard panels are used (10 mm plasterboard and 40 mm expanded polyurethane) having 1200x2000 mm dimensions.

The panels are fixed to the carrying structure with screws. In order to make their positioning on the surface easier, the drawing of the internal structure is reported (diffusers and pipes).

The panels installed in bathrooms or in other zones, where the presence of a high humidity rate is possible, shall be treated with suitable water repellent paint.

Finished overall dimension minimum 110 mm

Cooling output certified into test room according to EN 14240 norm:
48,8 W/m^2 with logarithmic average DT 10 K

Heating output certified into test room according to EN 14037 norm:
62,9 W/m^2 with logarithmic average DT 15 K

Outputs related to the active surface of the panel

GKCS series

Radiant false ceiling for heating and cooling composed by:

- Carrying structure composed by primary carrying elements hooked to the slab by means of suspension hangers of 4 mm diameter, and
- secondary carrying elements snap fixed on the primaries:
- C shape primary carrying elements 40x28x0,7 mm, 4 m length;

- The carrying elements are made of steel sheet, thickness 0,8 mm.

- The panels are sandwiches composed by (starting from the side facing the room) 15 mm plasterboard, 30 mm expanded polystyrene.

The radiant panels are of three sizes:

- 1200 mm width and 2000 mm length (base module)
- 1200 mm width and 1000 mm length
- 600 mm width and 2000 mm length

To close the perimeter zones, insulated plasterboard panels are used (15 mm plasterboard and 30 mm expanded polystyrene) having 1200x2000 mm dimensions.

The panels are fixed to the carrying structure with screws. In order to make their positioning easier, the drawing of the internal serpentine is reported on the lower surface of the panels.

Inside the radiant panels, 1 or 2 circuits are drowned. They are made of serpentine in 8x1 mm PE-X pipe with anti-oxygen barrier. The connection to adjacent panels occurs by means of brass push fittings and preinsulated polybutylene pipe with anti-oxygen barrier (a thermal insulation shall be expected for possible not preinsulated parts).

The panels installed in bathrooms or in other zones, where the presence of a high humidity rate is possible, shall be treated with suitable water repellent paint.

Finished overall dimension minimum 110 mm

Cooling output certified into test room according to EN 14240 norm:
43,8 W/m^2 with logarithmic average DT 10 K

Heating output certified into test room according to EN 14037 norm:
58,0 W/m^2 with logarithmic average DT 15 K

Testing procedure for plasterboard radiant ceilings

Testing procedure

The radiant ceilings of the GKC and GKCS series, as all systems containing fluids, shall be subjected to hydraulic test after the mounting, and preliminarily to the use of the rooms where they are installed.
The testing steps, that shall be scrupulously pursued, are the following:

1)Pressure tightness test with air
2)Pressure tightness test with water at room temperature
3)Pressure tightness test with heated water
4)Pressure tightness test with chilled water

1) Pressure tightness test with air

After completion of the connection of the single panels of a series, and to the supply lines, it is opportune to effect a first tightness test in pressure with compressed air at least at 4 relative bar (if a compressor with sufficient power is available, the running test at the nominal working pressure equal to 6 bar is to be preferred). All installed rings of the radiant ceiling shall be subjected to tightness test. In order to effect correctly the test, it is necessary to intercept the air automatic discharges and supply one at a time the system circuits. In case of localized losses inside a ring, proceed by intercepting the ball valves placed on the supply lines and act to determine and eliminate the loss cause.
The circuit under testing shall be kept in pressure for not less than 24 hours, then proceed by discharging the air so as to bring the circuits back to the atmospheric pressure.

2) Pressure tightness test with water at room temperature

Supply the principal distribution lines with water at room temperature and eliminate all present air, then proceed by supplying the radiant circuits one by one, letting to the air present in the rings, the time to come out from the automatic vents. When all circuits are filled up with water, increase the pressure to the working value, by checking that there are no leaks. Later start the system circulators to let the last air pockets coming out from the circuits. To effect this operation correctly on big systems, you shall previously proceed with a balancing of the rings to avoid that water flows only on those having lower loss of pressure, and flows little or nothing in the rings having higher loss of pressure. When the air has completely came out from the system (after about 24 hours), it is possible to stop the circulators and bring the pressure to 1,5 times the working pressure with a minimum of 6 bar (UNI 9182, 27.2.1). The system shall be left in these conditions for at least other 24 hours during which, the tightness of the circuits shall be checked. In case of localized loss of pressure inside a ring, proceed by intercepting the ball valves placed on the supply lines and act to determine and eliminate the loss cause. After completion of the testing cycle, bring the pressure back to the working value.

3) Pressure tightness test with heated water

By keeping the system pressure at the working value with operating circulators, slowly bring the water temperature at the value of 40°C, and let the system working for about 24 hours. Afterwards always with working circulators, let the water cool up to the room temperature value.
The test purpose is to verify the water circulation inside all rings connected to the main supply lines, as well as to subject the pipes and fittings to a thermal heating cycle, that allows to eliminate the mounting stresses by stabilizing the joining.

4) Pressure tightness test with chilled water

By keeping the system pressure at the working value with running circulators, slowly bring the water temperature to the value of 12°C and let the system working for about 24 hours. Afterwards always with running circulators, let the water warm up to the room temperature value.

In order to avoid superficial condensation phenomenon over the panels, in the installation rooms low values of absolute humidity are needed, to make this test. In case of high humidity values that involve dew temperatures higher than 13°C, it is opportune to start the air treatment machines, to control the room humidity by keeping it to values that do not consent the superficial condensation.

The running tests expressed at points 1) and 2) are to be considered indispensable.

The running tests expressed at points 3) and 4) are strongly recommended because they subject the system components to a cyclic temperature test, therefore they guarantee a very high safety level after the running test. Moreover, during test 3 or test 4, we recommend to make a complete thermovision of the system, to verify the correctness of the superficial temperatures of the false ceiling.

The above mentioned testing, the search for possible leakage and the connected repair are at the plant Customer's charge. Giacomini S.p.A. does not assume any responsibility for possible damaged caused to persons and things during the testing phases. Only the replacement of components, showing defects before the mounting, is recognized to the Customer.

General prescriptions for the realization of radiant ceiling systems

Directions for the phases preceding the installation

- Verify available spaces and installation height;
- Verify the stability of the anchorage surface of the hangers;
- Verify that the project drawings correspond to the real construction site situation;
- Verify that all surfaces correspond to the project drawings

Directions for the material storage

- At the supply moment, check the good status of the provided material;
- Deposit the material in a dry place, not exposed to the sun light;
- Move the material with care to avoid scratches, bending or ruptures.

Directions for the installation steps

- Before proceeding with the installation, analyze the project drawing and read the instructions contained either in the project or in the various instruction sheets attached to the single products;
- Follow the project drawings; for possible changes, contact the management of works;
- While making the connections with RC push-fittings, do not forget to use the RC900 support sleeves and verify the introduction depth of the pipes (see attached instructions);
- If not previously agreed, use only the material supplied by Giacomini S.p.A. for the bracketing;
- In case of components having protective film (for example prepainted elements) remove the film itself at the installation moment.

Directions for the running test and system start up

- Follow the directions for the pressure testing and system filling up (if not available, ask them to Giacomini S.p.A.);
- Put in the system the K375 protective liquid, following the conditions and batching indicated in the attached instructions.

Panel cleaning

For a correct panel cleaning, remove the dust from the painted surfaces with a clean and soft cloth. Grease and imprints shall be removed with a delicate cleansing suitable to this use. Do not use abrasive cleansings and do not scratch the surfaces in any way.

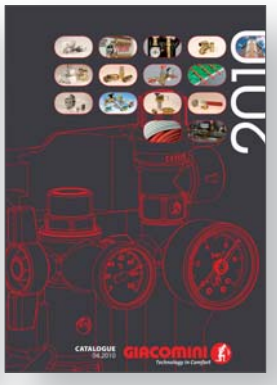
Other available technical documentation

Panel	Series	Technical sheet
KC120	KC120X200	GKC 0355EN
KC60	KC60X200	GKC 0355EN
KC120	KC120X100	GKC 0355EN
KC120	KC120X300	GKC 0355EN
KS120	KS120X200	GKCS 0353EN
KS60	KS60X200	GKCS 0353EN
KS120	KS120X100	GKCS 0353EN
KS120	KS120X300	GKCS 0353EN

QUALITY CERTIFICATIONS

FURTHER INFORMATION

The technical documentation and the product specifications of the giacoklima GKC and GKCS radiant ceiling systems are available also in electronic format on www.giacomini.com web site. For more information about giacoklima GKC and GKCS radiant ceilings, consult also the Product Catalogue 0150EN and the References brochure 0300EN.
For information about the other Giacomini components and systems, ask for the last issue of the general Catalogue/Price list.



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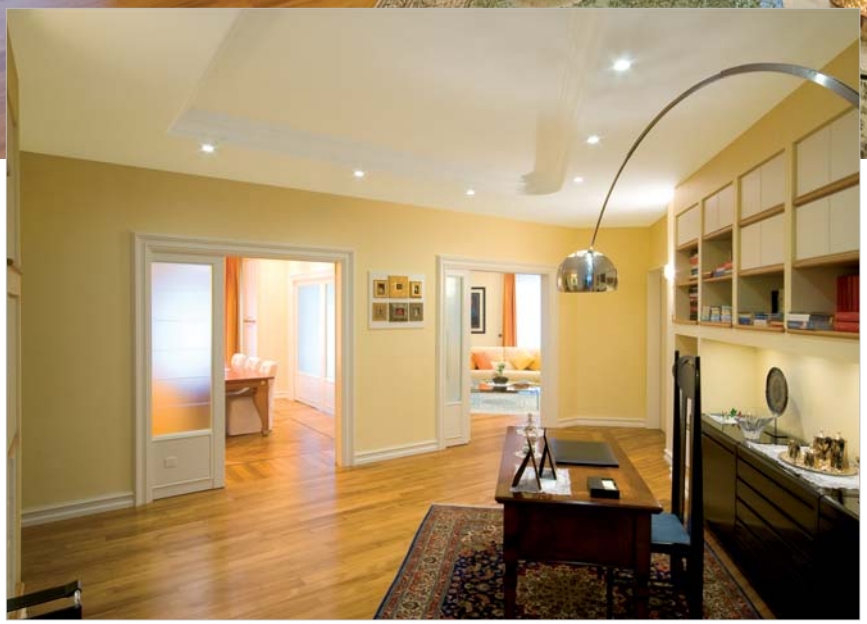

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