

# The principle of heating

GR glass panels as well as MR marble panels use the principle of so-called radiant heating, which uses infra-red radiation for the transfer of thermal energy. This radiation doesn't heat the air but passes freely through it, hitting parts of the building's structure and objects in the room and thus heating their surface. The air in the room is subsequently warmed from the warmed surfaces of the structural elements and objects. This system is also described in the chapter [The principle of radiant heating for ECOSUN panels](#). The main advantage of radiant heating is the **better quality of the microclimate** in the heated room – minimum dustiness and stable humidity, and **more economical operation** – thanks to the radiation, thermal comfort is achieved at a lower temperature.

Generally, the intensity of radiation is most influenced by the surface temperature of the radiant heater – the higher the surface temperature of the heater the less heat (proportionally) is conveyed by convection and the more by radiation because the circulating air doesn't manage to cool the surface. When high temperatures are reached, not only thermal – infra-red radiation is created but also radiation in the visible part of the spectrum – light. This phenomenon is visible e.g. in halogen radiators in which the temperatures of the heating tubes range between 1000-2000°C. Intensive thermal radiation, created thanks to the high temperatures of halogen radiators, can be used e.g. in outdoor environments where standard radiant panels with a surface temperature of up to 100°C would be ineffective. On the other hand, it is unsuitable for the permanent heating of standard rooms.

Other factors influencing the intensity of radiation are e.g. the material and colour of the heater (these are not main factors), while the mounted position of the heater is of great significance. A radiant panel which is placed in a horizontal position under the ceiling transfers the majority of its energy by radiation because the air cannot circulate. If the same panel is placed in a vertical position on the wall, approx. 50% of the energy is now conveyed by convection because the air which is warmed from the surface of the heater will start to rise, and natural circulation occurs.

Glass as well as marble panels cannot be placed on the ceiling for structural reasons but only on a wall in a vertical position, and therefore, they transfer approx. 50% of energy by convection in comparison with ECOSUN ceiling panels. This fact doesn't mean that there will be energy losses or lower efficiency, only that the ratio concerning the way heat is transferred will change percentually. It can even be an advantage for living spaces because it compensates for one of the few disadvantages of purely radiant heating – i.e. the slow dynamics of the heating system. On the other hand, for areas where a great amount of air exchange is expected (e.g. shops) or in the case of zonal heating when people in a limited area are warmed using the panels, it is more suitable to use panels on the ceiling because the convection arising due to them is significantly lower.

Because with radiant panels which are installed vertically, a significant part of the energy transfer is by convection, these panels are placed approx. 15 cm above the floor, similarly as in the case of standard radiators. Thus, the air is already heated from the floor. If the panel is placed higher, there is a potential danger of poor distribution of

temperatures in the room and the appearance of a “cold zone” under the bottom level of the radiant panel. In contrast with standard radiators, where the radiant element of their energy transfer is represented by approx. 20% of the total thermal energy or even less (low-temperature systems), it isn't possible to place furniture or equipment which would prevent the distribution of the radiant flow into the room in front of the radiant panels.