
Clay … used for thousands of years

ArgillaTherm®

Argillatherm: the base is clay. It prooved for thousands of years its value. We make tiles in pressed clay: the secret and the base of the system

High quality heating and cooling system

wSYSTEM

Manufactured using the dry surface pressing process (adjusted extra clayminerals).

components:

- Building clay with around 5% of 3-layer clay-minerals (normal)
- **Surcharge of around 35% of 3-layer clay-minerals (approx. 40% swellable)**
- brickdust
- Miscanthus fibers (< 1%)

eSYSTEM

- Production almost CO2 neutral (UPD in the fourth quarter of 2020)
- Addition of the extra clayminerals as binders | sorption enhancers (proportion >35%)
  the clay-minerals touch each other and become „highways“
- **Highly absorbent, dimensionally stabil and free from cracks**
- Without the use of mesh, 100% recycable (cradle to cradle)
- 20 years manufacturer guarantee

airconditioning vs ceiling cooling not specific Argillatherm

Air-guided central systems	Convection cooler	Cooling by ceiling
High air mass flow required (> 3000 times then of water)	High air mass flow required (> 3000 times then of water)	Low water mass flow required
High energy losses (canal-system)	Low energy losses	Low energy losses
Noise generation	Noise generation	Free of noise generation
Needed more space	Moderate space requirement (construction heights)	Little need for space
High maintenance effert (mandatory): filters, drives, protective belt flaps, etc.	High maintenance effert (mandatory): filters, drives, protective belt flaps, etc.	Low (NO) maintenance effort
High maintenance cost	High maintenance cost	Little (NO) maintenance cost
Examination obligation (in moiture carrying systems)	No examination obligation	No examination obligation
Risk of germ infestation (kiem)	Risk of germ infestation (kiem)	No risk of germ infestation
Risk of virustransport (for example aerosol drops in times of corona)	Gefahr von Virentransport (z.B. Aerosoltropfen in Zeiten von Corona)	No virustransport
Skilled craftsman (ventilation engeneer required)	Fachhandwerker (Heizungsbauer) erforderlich	Construction (drywall construction companies, etc) sufficient
Specialist planner for ventilation construction required	Planning by engineering offices, heating engineers and manufacturer possible	Planning by engineering offices, heating engineers and manufacturer possible
High cooling performance required	High cooling performance required	Lower cooling capacities
No increase of relative humidity of air	No increase of relative humidity of air	Increase in room air humidity during cooling (mechanical dehumidification required)

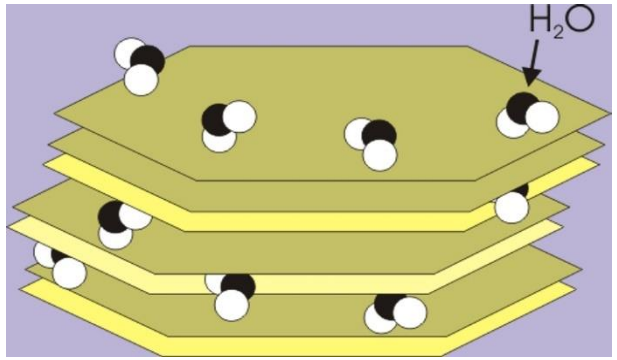
How can you prevent the increase in humidity?

Use of hygroscopic material to counteract the natural increase in room air humidity when cooling!

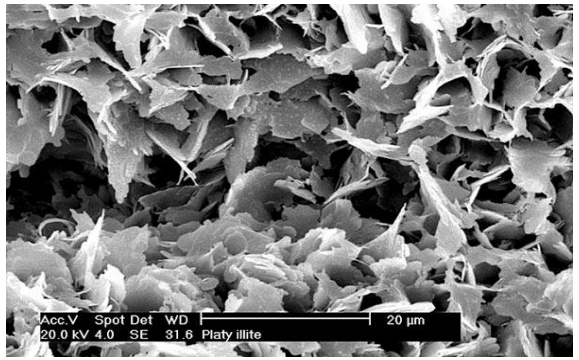
„sorptive / selfregulating clay-minerals“

What types of clay minerals are there?

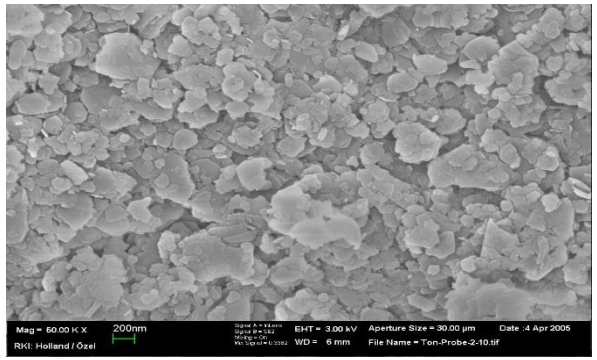
- **Structure in layers / platelets (layered silicates)**
- 2-layer clay minerals (f.e. kaolin)
  cohesion very low, sorption very low
- **3-layer clay minerals (building clay) f.e. illite, smectite**
  cohesion very high, sorption very high
- 4-layer clayminerals f.e. chlorite
  cohesion very low, sorption very low



Schematische Darstellung



Tonminerale unter dem Mikroskop
Quelle: www.waldwissen.net



Oberfläche-Smektit unter dem Mikroskop
Quelle: Holl, Holland, Oezel, TU Berlin, 2005

The three-layer structure consists of two tetrahedral layers that are electrostatically cross-linked via the cautions of an octahedral intermediate layer. Smectites consist mainly of montmorillonite, but also contain quartz and calcite dust.

Clayminerals in buildingclay

Of what is building clay made?

- Sand (grainsize > 63 µm)
  share > 90%
- silt (grainsize > 2 µm)
  share 2-4% (slib)
- **Sorbent clay minerals (ton) (grainsize < 2 µm)**
  share 4-6%

Due to the uniform orientation (plastic stage), the proportion of max 6% of sorbent clay minerals cannot be exceeded. Otherwise the following happens.

How can the proportion of sorbent material be increased without cracking and shrinkage occurring?

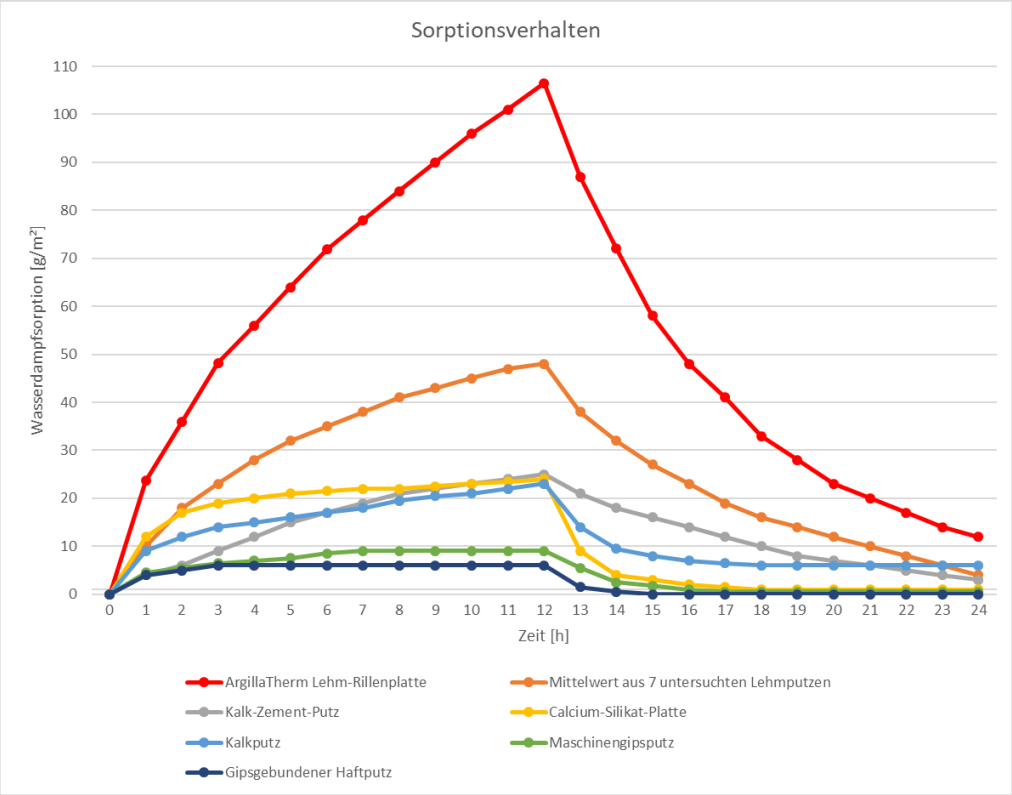
Dry surface pressing process

- **No plastic stage, therefor no uniform alignment of the sorbent material possible**
- **Tangled position guarantees the properties of the sorbent material in all directions**

Building up climate ceiling argillatherm and advantages

- heating, cooling and regulation of airhumidity
- Low energysystem
- 98% heating and cooling by radiation
- Extremely high sorptioncapacity
- Very healthy insideclimate
- 100% circular
- Modular, simple installation, multi-usable
- Fire resistance 1 hour
- Acoustic possibilities

Sorption according to standard, rLF = 50% - 80% - 50%



The Sorption reuglates everything!

- **Automatic regulation of room air humidity**
- **Permanent room purification**

classified in Sorptionclass I - III

Necessary values to achieve the higherst sorption class III according to DIN 18948, 2018-12

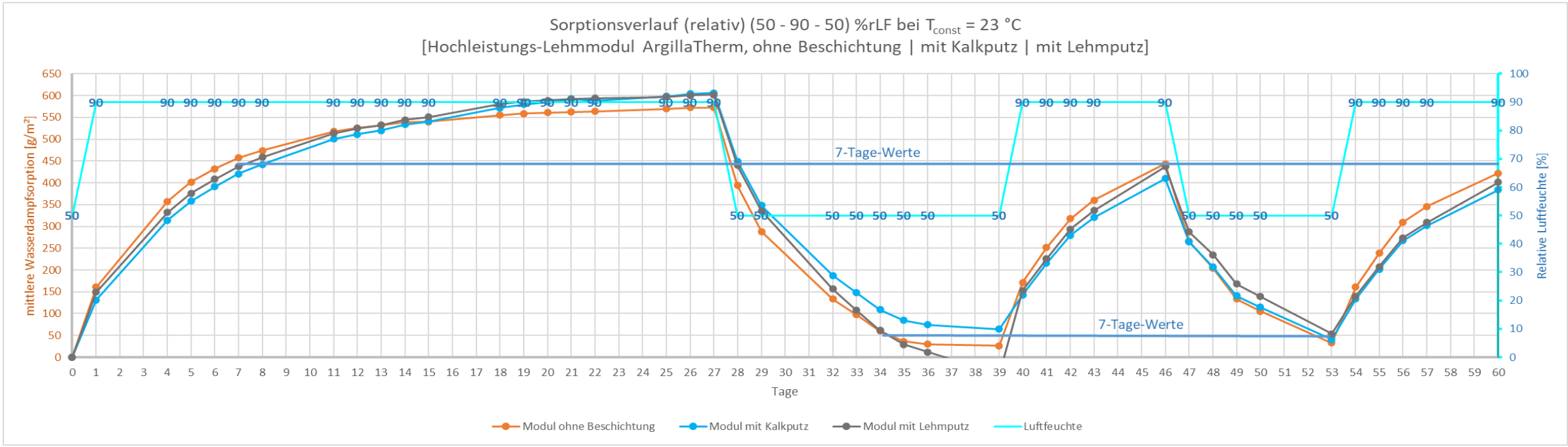
Time	must b	ArgillaTherm
0,5 Std.	≥ 6,5 g/m²	15,2 g/m²
1,0 Std. .	≥ 13,0 g/m²	23,7 g/m²
3,0 Std. .	≥ 26,5 g/m²	48,2 g/m²
6,0 Std. .	≥ 40,0 g/m²	71,9 g/m²
12,0 Std. .	≥ 60,0 g/m²	106,5 g/m²

Prooved by university of MFPA-Weimar.

The high performance clay modules multiply the positive clay properties and thus ensure a perfect roomclimate.

Long-term sorption measurement rLF = 50% - 90% - 50%

Locked back and side surfaces, with and without surface coating



Results:

- When installed, the high-performance clay modules can absorb more than 150g of watervapor pro m² within 24 hours and completely release it again within a very short time.
- After about 21 days at 90% RH saturation is reached with a vapor absorption of about 550g/m².
- On the 15th day, the plastered modules reach the sorption level of the unplastered modules, then the plastered modules dominate – now the plasters are filled up?!
- When fully saturated, the modules have absorbed around 2% by mass of theri own dry weight in water vapor.
- Deformation, selling or moisture penetration of the modules were not found

Advantages when heating

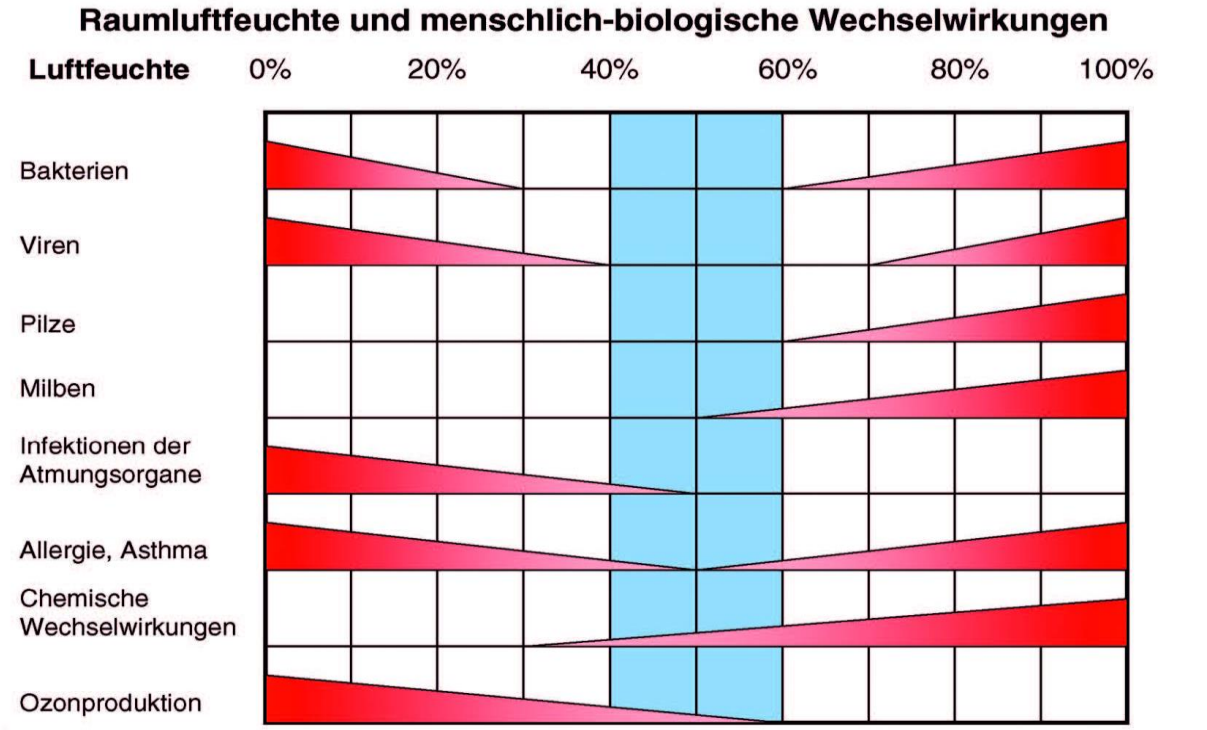
properties	floorheating	Wallheaters	ceilingheating
Share of thermal radiation	50%	70%	98%
Share of convection, rising warm air	50%	30%	2%
Radiant heat intensity per degree of excess temperature of the surface	≈ 6 Watt/m² At 11 watt input	≈ 6 Watt/m² At 8 watt input	≈ 6 Watt/m² At 6 watt input
Even heat distribution	Very good	good	Very good
Dust-air movements in space	Very high	moderate	Very low
Setup restrictions	Moderate	Very high	Very low
Long warm-up and post heating phases	Very high	Very low	Very low
Controllability	insufficient	Very good	Very good

Ceiling heaters are not only responsive and clean, but also by far the most efficient!

(20% energysaving to floorheating)

Advantage of highperformance clay module

Basis for ecological, allergy sufferers and asthmatics suitable hetaing / cooling systems with a minimal expenditure of primary energy in the production



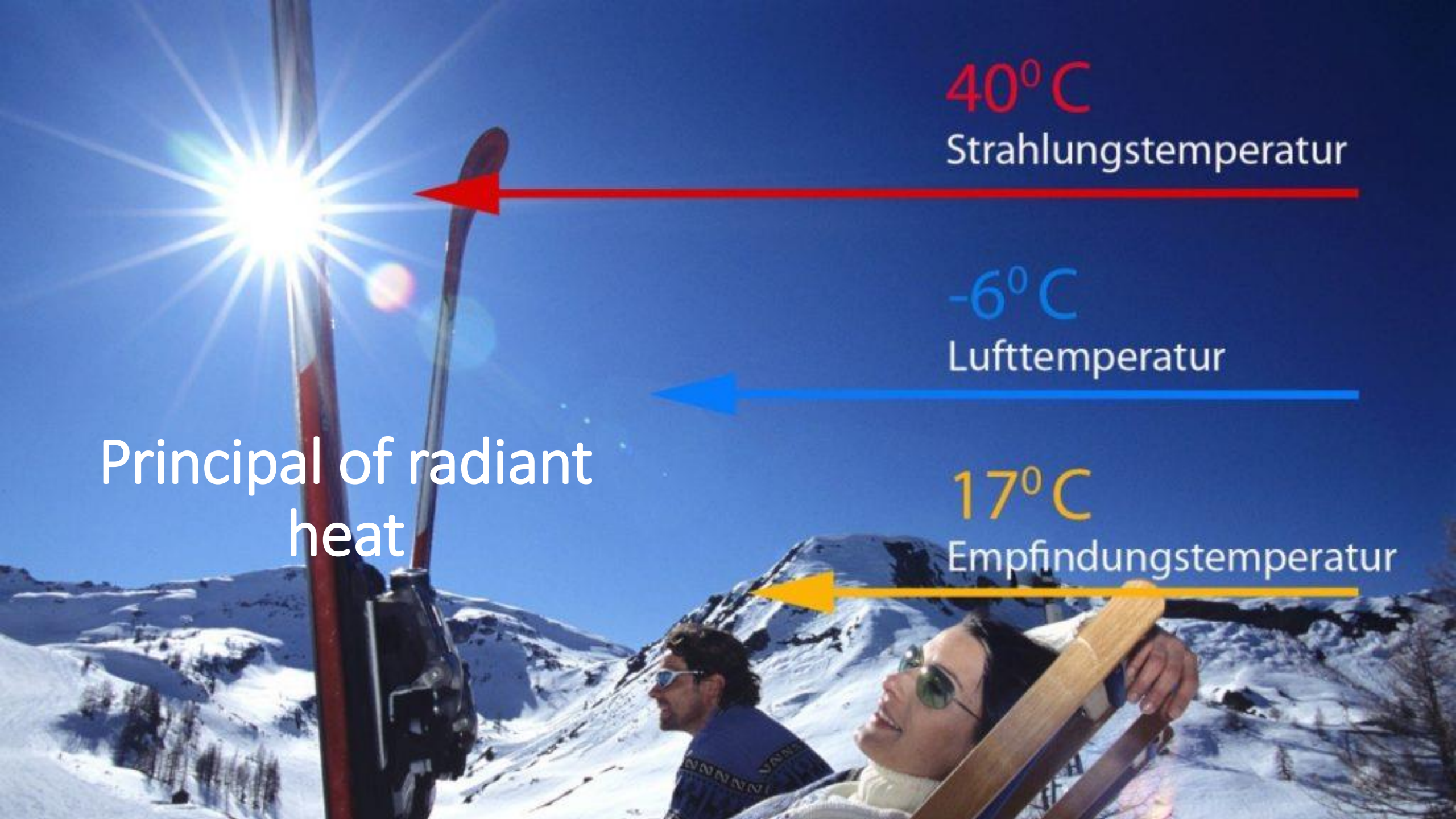
Gegenüberstellung der hygienischen Wirkungsänderungen in Abhängigkeit der relativen Raumluftfeuchte

Entwicklung biologischer Organismen und Wechselwirkungen mit menschlichen Organen und der Umgebung

Nach Scofield und Sterling ASHRAE-Journal 34

More advantages

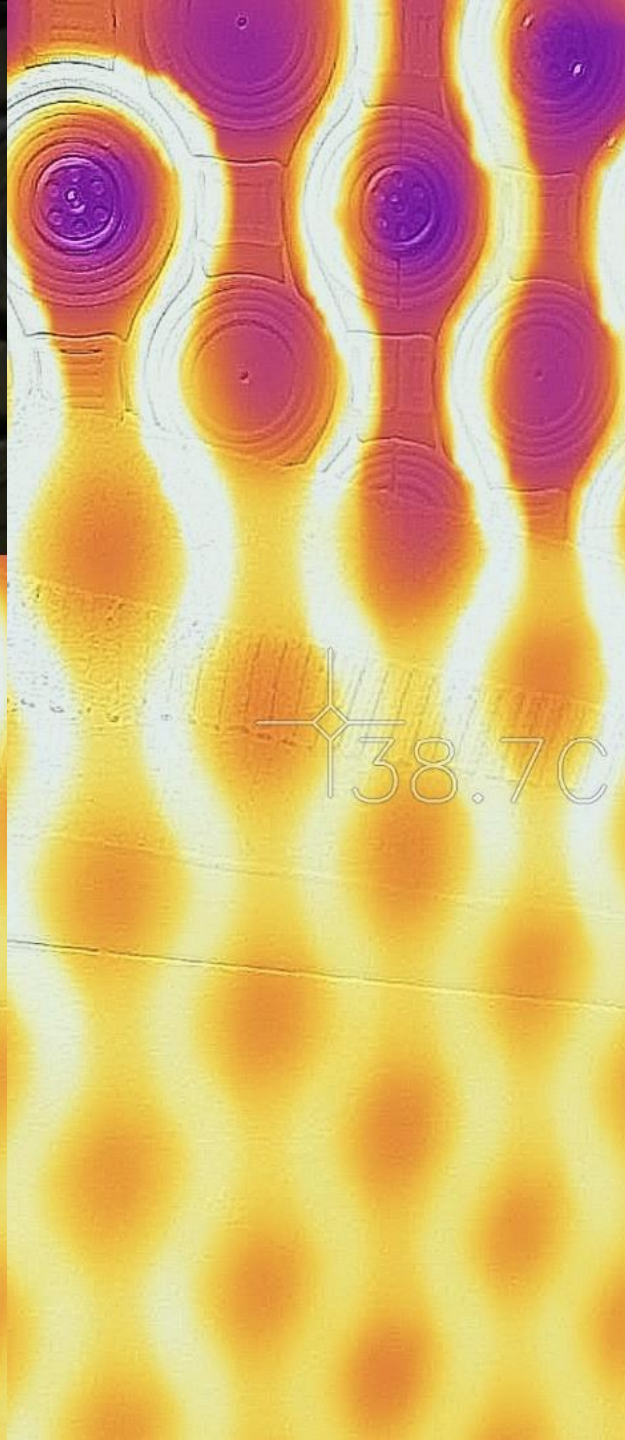
- No prefabricated modules: by placing the grooved plates next to one another, an endless matrix is created for **the coupling free laying** of the pipes.
- **Modular open system:** every ceiling geometry can be covered and occupancy rates of > 90% can be achieved without any problems.
- **Suitable for 4-pipe systems:** with permanently changing system temperatures.
- The highly compressed modules are a **very good energystore**. For more then an hour it keeps it temperature without any significant drop.
- Due to the modular design, no time and money required for preliminary planning
- No risk of cracks forming in heating mode (with plasterboard ceiling the RH in the room must not fall below 40%)
- The total construction height with UK is only 52 mm.



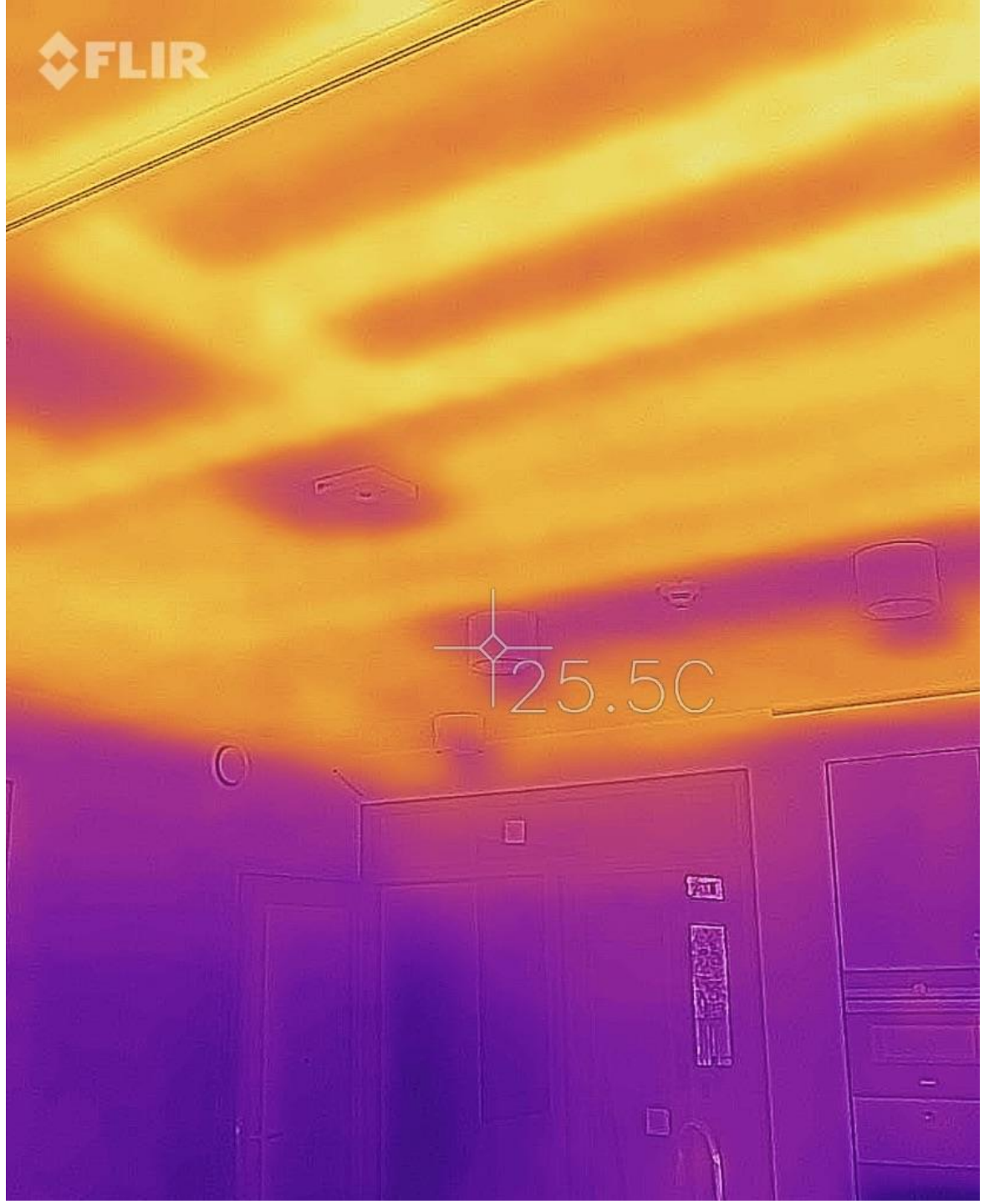
Principal of radiant heat


Decke
Wand
Fußboden
Mauerwerk
ε = 0.91
Oberflächentemperatur
23.3 °C
Fliesen
ε = 0.92
Oberflächentemperatur
22.4 °C
Fliesen
Oberflächentemperatur
23.1 °C

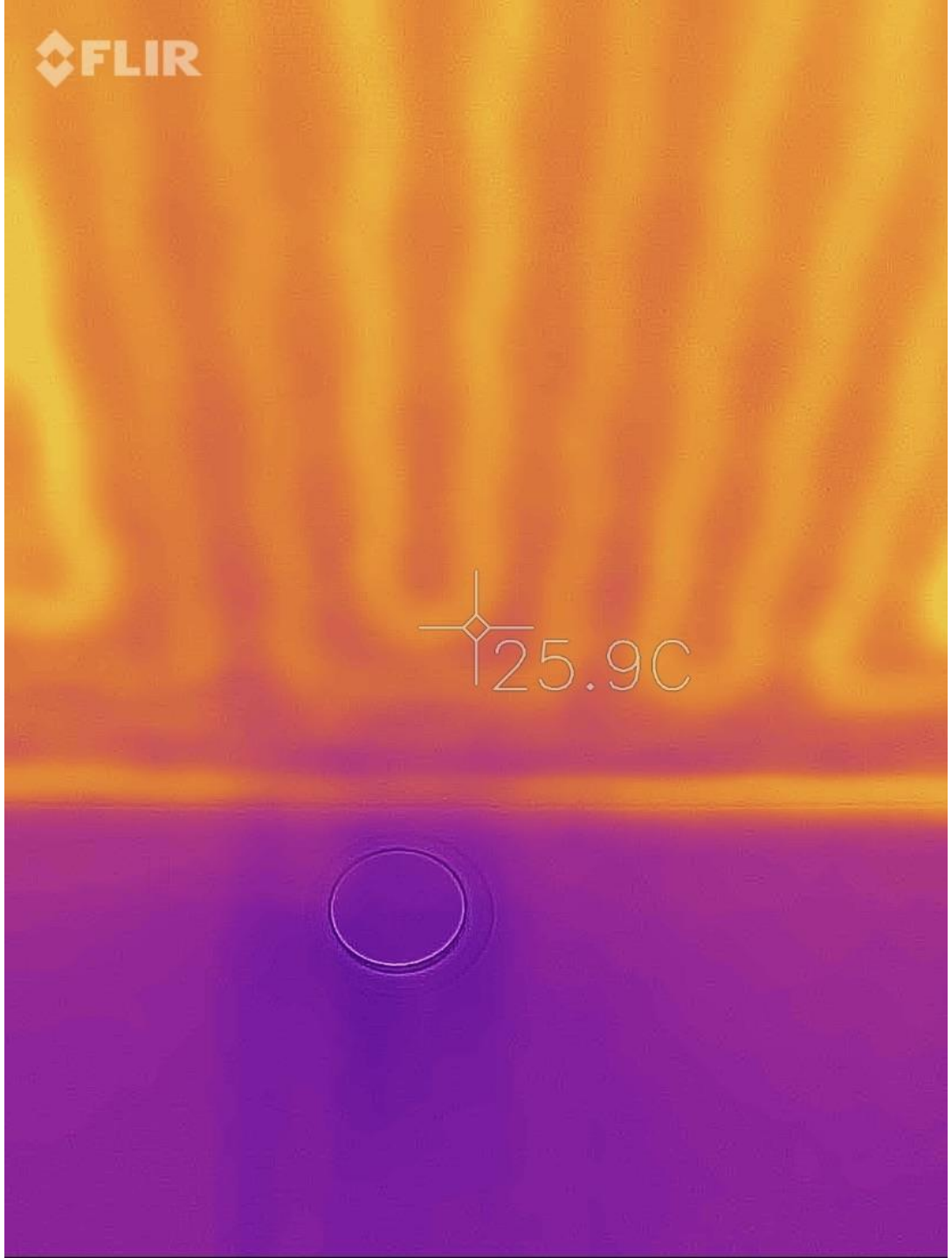
Principal of heat distribution




FLIR
25.5C


FLIR
25.5C

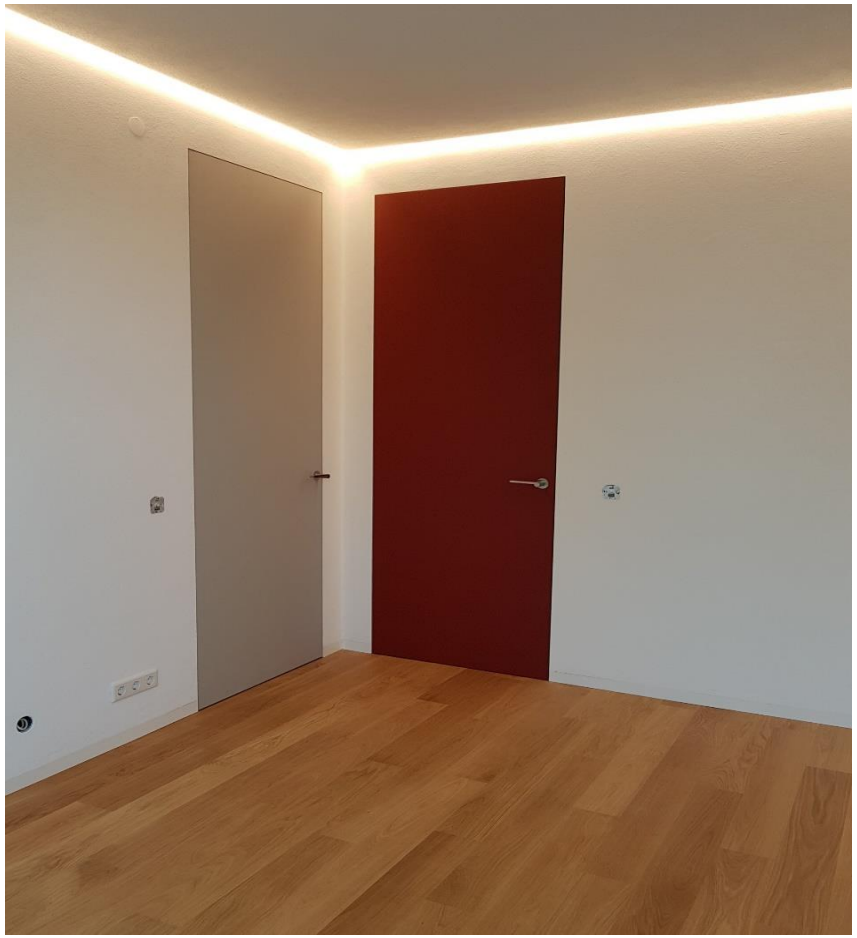

FLIR
25.9C


FLIR
25.9C

Practical examples

W-system in a hotelproject in Belgium

Practical examples



Water-guided all over without wallconnection with indirect lighting.

Practical examples

Deckensegel, wassergeführt von oben angebunden.

Practical examples

Heating and coolingceilings in professional buildings

Psychiatric clinic in Belgium

Application area Argillatherm

heating / cooling / moisture regulation in a professional environment

The Circus Hotel Berlin, Start 08-2020

Hotel: cause you can cool in one room and heat in the other.

Hotel: cause it‘s fast. Only 8mm of clay or chalk under the pipes >< floorheating

Hotel: cause airco is expensive, unhealthy and you need big pipes to take off the humid air (every °C you cool, moisture will rise with 9 %

Hotel: cause it‘s circular

5-Sterne-Hotel in Füssen

5-star hotel in füssen.

Application area Argillatherm

heating / cooling / moisture regulation in a professional environment

Charité Berlin; 12000 m² hospital

Hospital: because of moisture regulation
There was not enough space in the ceilings for ventilation with classic heating system. The volume of fresh air necessary was to big. With Argillatherm it was much less. Why?

Hospital: cause of health.

Hospital: cause it‘s circular.

Application area Argillatherm

heating / cooling / moisture regulation in a professional environment

Hafencity Hamburg 8500 m², offices, new 2022 // zero-emmision

Application area Argillatherm

heating / cooling / moisture regulation in a professional environment

Musea: cause of the moisture regulation

Musea: cause you don‘t see it, but it feels good

Musea: cause it‘s natural, it breaths and its circular

Examples: kunsthaus Wiesbaden (D): atelier and galery (ready end of 2021

Example sience: Cologne, German researchlab for air- and aerospace engeneering (DLR) for a very sensitive electron microscope. With no other system they could reach the results they wanted.