



DELTA[®]-COOL 24

**Phase Change Material –
Thermal Storage Mass
for a Comfortable
Interior Climate.**

Permanent function without energy input.
Easy and quick installation.

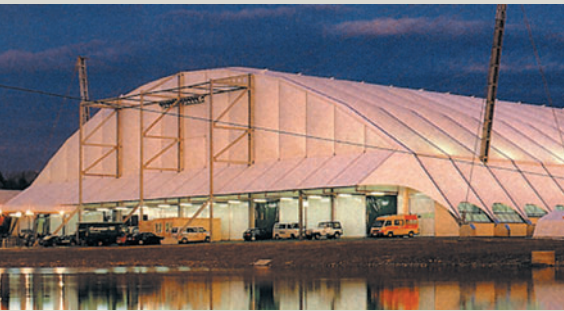


■ For
lightweight

■ For ceilings

■ For building
construction and

Uncomfortable climate through excessive heat accumulation!



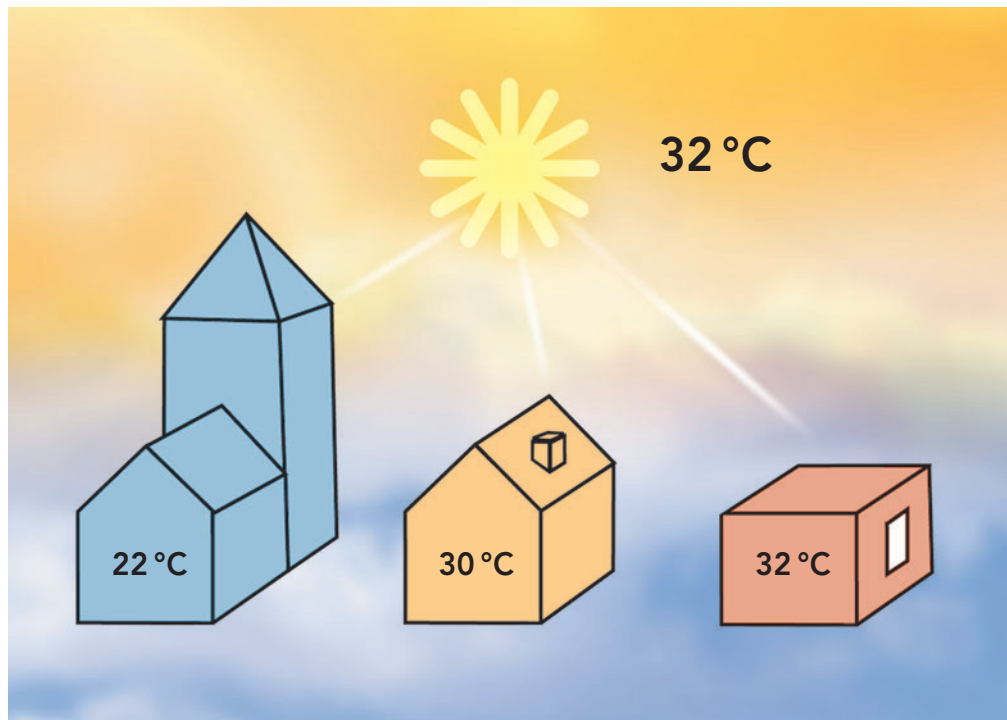
The situation:

Older buildings, churches, castles etc. all have an adequate thermal storage mass for retaining heat energy. This ensures that interiors remain nice and cool despite the summer heat outside. In lightweight constructions, where this thermal storage capacity is lacking, room temperatures quickly rise to a level that is equal to or even higher than the temperature outside. Conventionally, this problem is solved by installing air-conditioning systems which, however, are encumbered with economic and ecological drawbacks: They are expensive to buy and operate, and their energy consumption is huge. What is more, the room user's comfort is decreased by drafts, noise, and the dryness of the air.

The Easy Way towards a Feelgood Atmosphere:

DELTA[®]-COOL 24

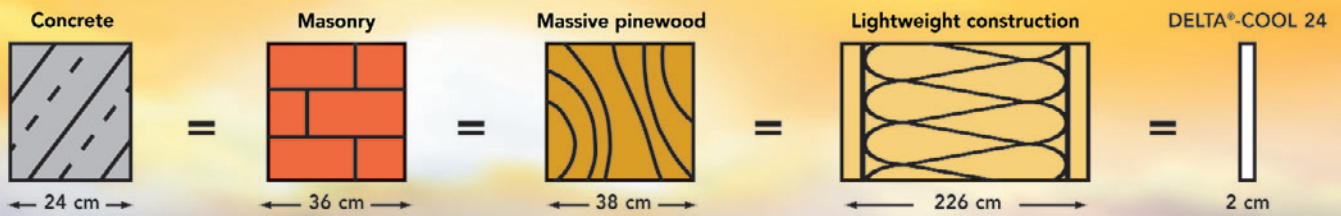
Stable Room Temperatures of



The lower the thermal storage mass of a building, the sooner it will overheat.



DELTA[®]-COOL 24 is available in various forms of encapsulation.



Various material thicknesses having a heat storage capacity of 5,700 kJ (10 °C temperature increase).

25 °C. Saves money and energy.

DELTA®-COOL 24 ...

- ... ensures comfortable room temperatures of around 25 °C.
- ... features high energy density in its functional temperature range of 22 °C to 28 °C: 1 litre of DELTA®-COOL 24 will absorb as much energy as 10 litres of water.
- ... can be easily placed on top of suspended ceilings. Dimensions are conformable with standard system grids. Even retrofitting is no problem: Simply place the elements on top of the ceiling panels.
- ... has been tested by the German Institute for Construction Technology and officially certified for general construction use.
- ... is a high-quality material: Successful tests extending over more than 10,000 cycles document the capability of the material to continue functioning without maintenance for more than 25 years without loss of performance – a service life that is markedly longer than that of an air conditioner.
- ... is 100 % recyclable.
- ... is non-toxic and flame-retardant.
- ... is environmentally-friendly and functions on a largely passive basis: No energy input is required. No drafts, no irritating noise. Locations can be selected without taking power-supply lines into consideration. Room use is not impaired because the system requires very little space.
- ... quickly pays for itself because first cost is low and operating cost is nil.



DELTA®-COOL 24 can be easily placed on top of suspended ceilings.

Why not benefit from the DELTA®System?

The fact that known deposits of fossil fuels are limited implies not only that supplies will not remain adequate forever, but also that prices will go on increasing steadily. Very recently, other developments such as, for instance, the introduction of a carbon tax have been confirming this trend towards ever-growing energy costs. The innovative system solution embodied in DELTA®-COOL 24 works without any energy input whatsoever, which is why the one-off cost of investment will pay off very soon.



Obvious Advantages at a Glance.

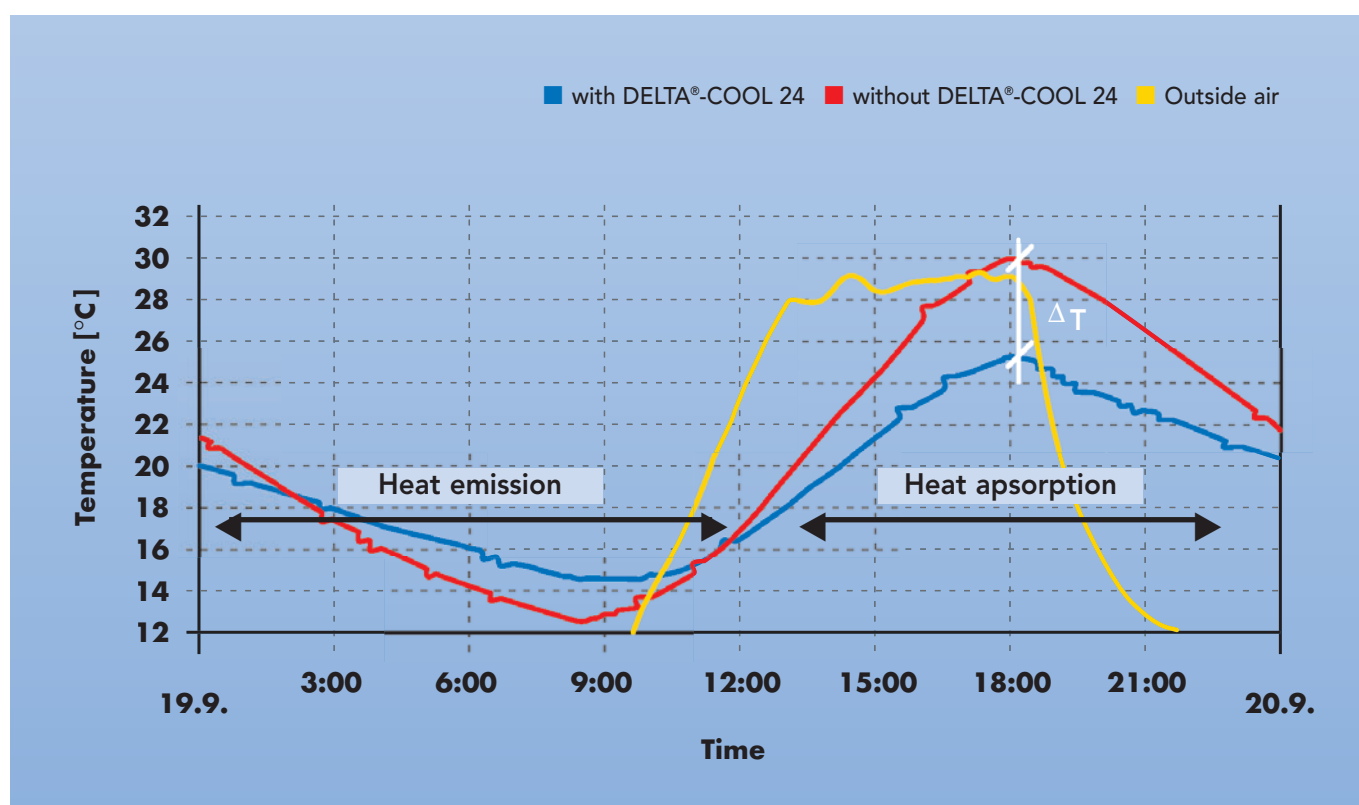
Stable room temperatures of about 25 °C are generally appreciated as very comfortable. There are various ways and means of reaching that value.

The following comparison considers the performance of 8 kg/m² of DELTA®-COOL 24 with a latent heat storage capacity of 350 Wh/m².

	Without PCM	With PCM
Specific cooling load per hour	50 W/m ²	50 W/m ²
Duration	10 h	10 h
Total cooling load	500 Wh/m ²	500 Wh/m ²
DELTA®-COOL 24 cooling capacity	-	300 Wh/m ²
Active cooling capacity required	50 W/m ²	20 W/m ²

Conclusion: The above comparison shows that the amount of cooling energy required is lowered considerably by DELTA®-COOL 24. This reduces the demands on the air conditioning system, which may even be rendered entirely superfluous.

Typical 24-hour temperature curves in rooms with and without DELTA®-COOL 24.



Conclusion: The performance capability of DELTA®-COOL 24 has been established beyond doubt in extensive studies. With this system solution installed, the peak temperatures encountered in lightweight constructions were reduced by as much as 6 °C.

Excellent cooling capacity of 25 – 40 W/m²

DELTA[®]-COOL 24 – Small but Highly Effective Heat Storage Elements.

Developed by Dörken GmbH & Co. KG, this passive phase change material (PCM) cooling system may be integrated in ceilings to accumulate heat, thus increasing the thermal storage mass of the building. In this instance, salt hydrates are used as PCMs.

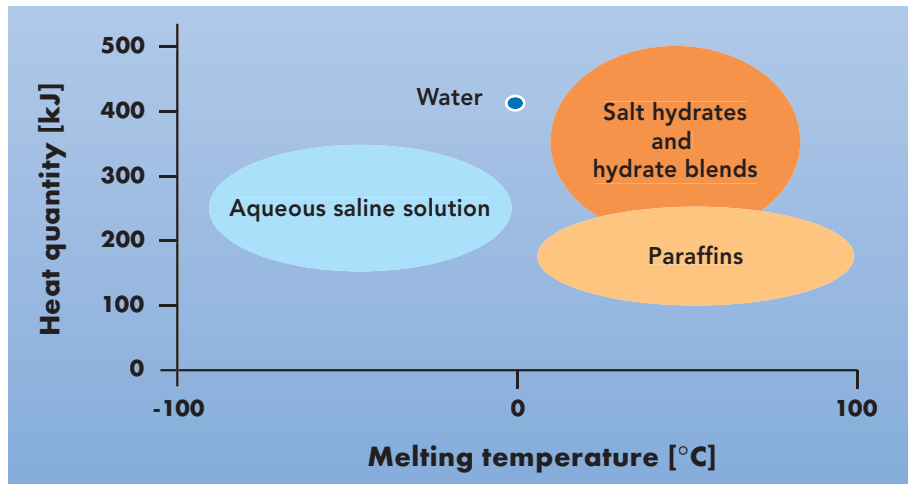
Under the impact of heat, the salt hydrates in DELTA[®]-COOL 24 change their state of aggregation from solid to liquid as they reach their melting temperature, absorbing energy (e.g. ambient heat) in the process. As soon as interior temperatures drop below the recrystallisation level, their phase changes back from liquid to solid, and they emit the heat stored previously.

The phase change process occupies a certain amount of time, during which temperatures remain approximately constant. This process allows storing large quantities of energy while temperatures remain the same.

To maximise performance, there should be a natural ventilation system (cross-venting) to ensure that heat can be dissipated during the night. Having thus disposed of its stored heat, DELTA[®]-COOL 24 will be ready again the next morning, prepared to store the heat of the day.

DELTA[®]-COOL 24 cannot absorb extreme heat loads such as those caused by direct solar irradiation. Steps should be taken to avoid such extreme exposure.

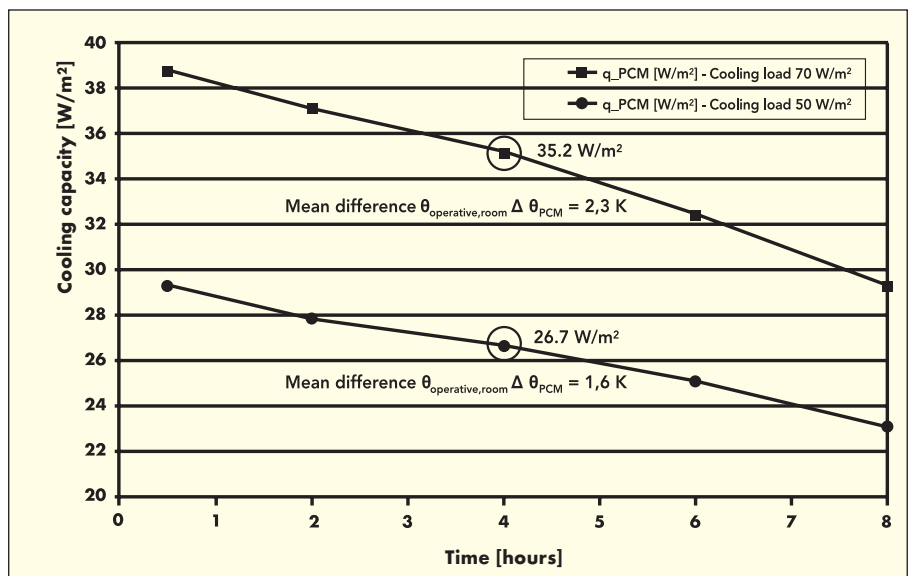
Typical phase change temperatures of various PCM types.



Outstanding Performance in Scientific Tests.

The thermal behaviour of DELTA[®]-COOL 24 and its influence on room temperature levels have been examined by the Institute for Building and Solar Technology of Braunschweig Technical University (Prof. Dr.-Ing. M. N. Fisch and Dipl.-Ing. L. Kühn) in laboratory tests at cooling loads of 50 and 70 W/m². The PCM material was arranged on top of a suspended ceiling at a square weight of 8.7 kg/m².

Demonstrated temperature differences with/without DELTA[®]-COOL 24 > 4K



Cooling capacities per unit area correspond to mean values determined during the measuring time interval.

DELTA®-COOL 24

Technical Data Overview:

Basic ingredient	Salt hydrate
Melting temperature	22-28 °C
Crystallisation temperature	22 °C
Cooling capacity	25-40 W/m ²
Melting energy	158 kJ/kg = 44 Wh/kg
Density (solid/liquid)	1.6/1.5 kg/L
Thermal capacity (solid/liquid)	2.7/2.2 kJ/kg K
Thermal conductivity (solid/liquid)	1.12/0.56 W/m K
Maximum service temperature	60 °C
Weight	Dependent on energy capacity
Dimensions	300 x 600 mm

As good thermal conduction supports the reaction by which energy is absorbed, we recommend placing DELTA®-COOL 24 either on top of metal ceiling panels or in a forced-ventilation system.

Risk phrases: R 36 – Irritating to eyes.

Safety phrases: S 2 – Keep out of the reach of children.
S 24 – Avoid contact with skin. S 26 – In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

DELTA®-COOL 24 in Application.

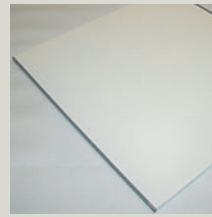
Dörken makes your life easier – systematically.

DELTA®-COOL 24 comes in various forms of encapsulation.



Pouches

Optimum heat transfer and flexible performance for passive climate control in commercial buildings.



Panels

Dimensionally stable package for passive cooling. Also available in a translucent version.



Balls

For heat storage in active systems, particularly in combination with solar energy and heat pumps. Cold storage in climate control and industry.



Dimple sheet

Compact sheets for floor heating systems and cold frames.

DELTA® is a registered trademark of Ewald Dörken AG, Herdecke, Germany.

DELTA®



DELTA® System ...

... for owners:

"... What I get is a mature problem solution provided at a fair price by a top specialist in quality branded products!"

... for workmen:

"... What I get is a complete system made by a single manufacturer that enables me to do anything to the owner's entire satisfaction. There is no safer way!"

... for planners:

"... I can be certain that both innovative and standard products will be used in implementing my roof and cellar plans in a systematic and forward-looking way."

DÖRKEN

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A company of the Dörken Group.

■ Visit www.doerken.de on the internet to obtain valuable information on DELTA® products from the following ranges: PCMs; roofing; foundation protection, drainage and waterproofing; tarpaulins; garden sheets; pond liners.