

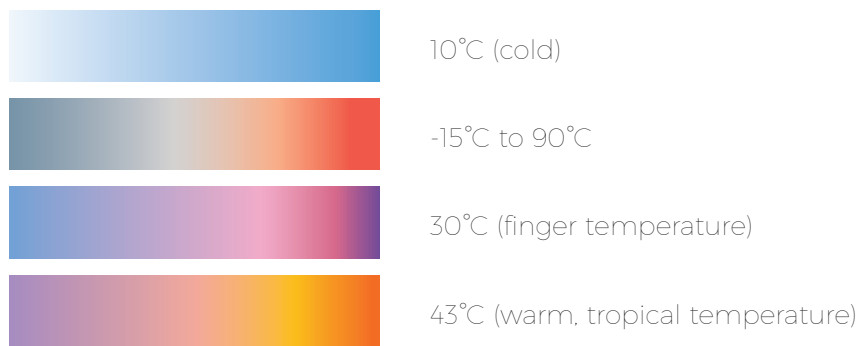
# THERMOCHROME PIGMENTE

Thermochromic pigments are a type of colour-changing pigment that respond to changes in temperature. They are designed to change colour or become transparent when exposed to heat, and then revert back to their original colour as they cool down.

Cordulan Vertriebs AG has had the distribution for Germany, Austria and Switzerland since 2008.

The thermochromic pigments are designed so that each temperature is represented by a different colour. These can be used for testing body temperatures, or used on fridges or freezers. The bright colored pigments are easy to read at each temperature.

The corresponding envelope bandwidths (IncreasingTemp./ DecreasingTemp.) are also available and will be provided upon request.



Thermochromic pigments are made up of microcapsules or microspheres containing a colourant that is sensitive to temperature. These microcapsules are typically mixed into paints, inks, or coatings, allowing them to be applied to various surfaces.



The pigments are engineered to undergo a reversible colour change at a specific temperature range, known as the activation or transition temperature. Below this temperature, the pigment exhibits one colour, and as the temperature rises above the activation temperature, it transitions to a different colour or becomes transparent. Once the temperature drops back below the activation temperature, the pigment reverts back to its original colour.

The colour change of thermochromic pigments is based on the principles of thermochromism, which involves the rearrangement of molecules within the pigment's structure in response to temperature variations. This rearrangement affects the absorption and reflection of light, resulting in a noticeable change in colour.

Thermochromic pigments have various applications. They are commonly used in temperature-sensitive packaging, such as labels on beverage cans or baby bottles, to indicate if a product is too hot to touch or consume. They are also utilized in novelty items, toys, clothing, and mood-changing products where the colour change adds an interactive and dynamic element.

It is important to note that thermochromic pigments can have specific temperature activation ranges and durability limitations. Extreme temperatures, prolonged exposure to sunlight, or certain chemical interactions may affect their performance and lifespan. Therefore, careful consideration should be given to the specific requirements and application guidelines provided by the manufacturer when working with thermochromic pigments.

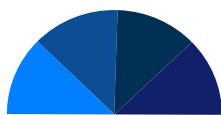
## POTENTIAL FIELDS OF APPLICATION

Frozen food  
Chilled food



-18 bis -15  
0 bis +4

Classic refrigerator application  
White wine / beer  
Red wine



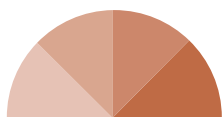
10  
8 bis 12  
14 bis 18

Cold drinks, cold packs etc. that still display a certain coldness even at room temperature



15

Classic hand warmers



29

Release by rubbing, for combinations and mutithermochromes



33

## How is thermochromic ink made?

A method of making a solvent based ink formulation which includes a thermochromic pigment, wherein the pigment being formed of microcapsules, includes drying a slurry that contains the pigment to a solids concentration between 70% and 99%, mixing the dried slurry in an appropriate mixing base, and adding any desired ... (something is missing here)

In general, it can be assumed that each temperature setting can have a tolerance of +/- 2 °C. The products have a shelf life of at least 6 months (dry and protected from light at a room temperature of 5-30 °C). The packaging container must be closed again after the product has been removed.

As with all slurries, sedimentation should be prevented by stirring regularly. The product quality remains at the same level. The thermochromic effect is more or less unlimited in time (approx. 3000 temperature cycles). The products can be purchased either as slurry (approx. 41% is standard, between 30% and 60% on request) or pigment/powder. Pigment is obtained from the slurry by drying it. The colour strengths of the slurry and pigment are identical, but the distribution of the pigment particles in the slurry is more regular and the particle size is smaller. This is why slurries are often preferred for economic reasons. The dosage is also easier to manage.

The products are tested according to EN71. (Safety of Toys) Part 3 (Migration of certain elements). They contain no heavy metals, no halides and are free of diaryl pigments. The FDA regulations regarding 21 CFR (Code of Federal Regulations) Part 177.1520 are met (e.g. PP masterbatch)  
All the Pigments are pre-registered for REACH

## The packaging sizes are:

1, 5 and 10 kg for pigments  
2.5 and 5kg for slurry