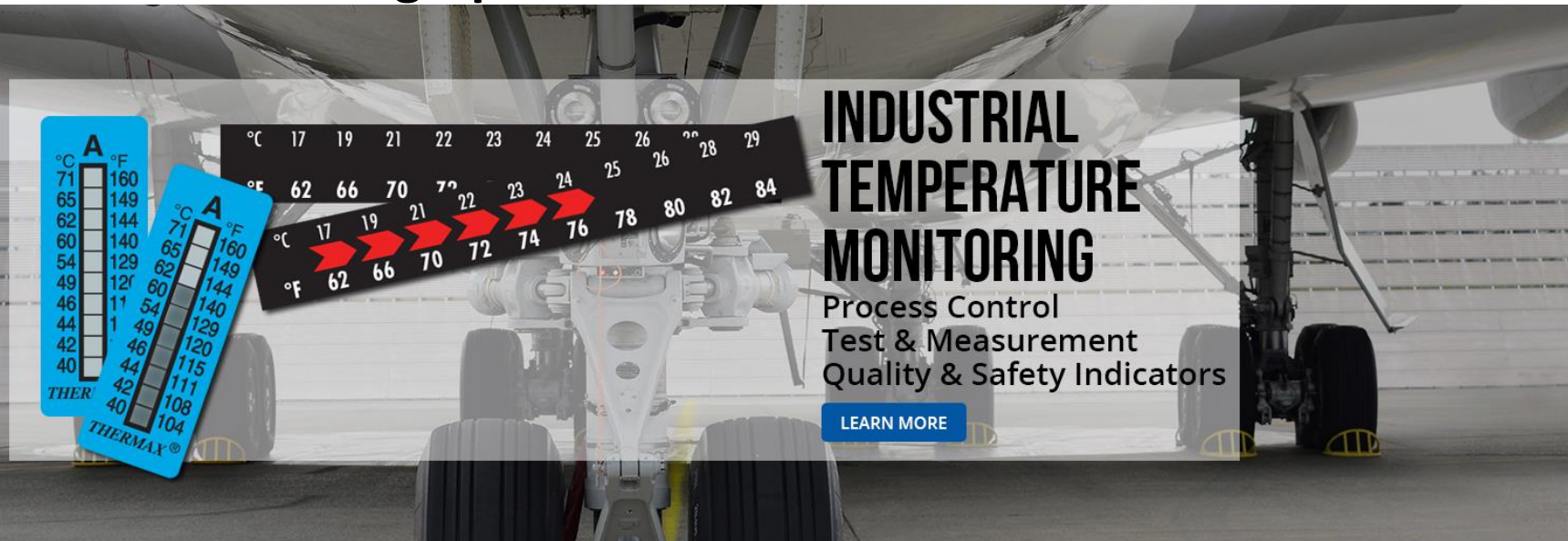


LCRHallcrest

About

Global leader in the design, development and manufacturing of temperature sensitive, color changing and chemical reactive temperature measurement labels, indicators and graphics.

The graphic features a semi-transparent white box overlaid on a background image of an aircraft's landing gear. On the left side of the box, there are two vertical temperature scales. The top one is labeled 'A' and has a scale from 40 to 71 in both Celsius and Fahrenheit. The bottom one is labeled 'THERMAX' and has a scale from 40 to 160 in both Celsius and Fahrenheit. In the center, there is a horizontal scale with red arrows pointing right, labeled with temperatures in both Celsius and Fahrenheit. On the right side of the box, the text 'INDUSTRIAL TEMPERATURE MONITORING' is written in large, bold, black letters. Below this, the text 'Process Control', 'Test & Measurement', and 'Quality & Safety Indicators' is written in a smaller font. At the bottom right of the box, there is a blue button with the text 'LEARN MORE' in white.

**INDUSTRIAL
TEMPERATURE
MONITORING**

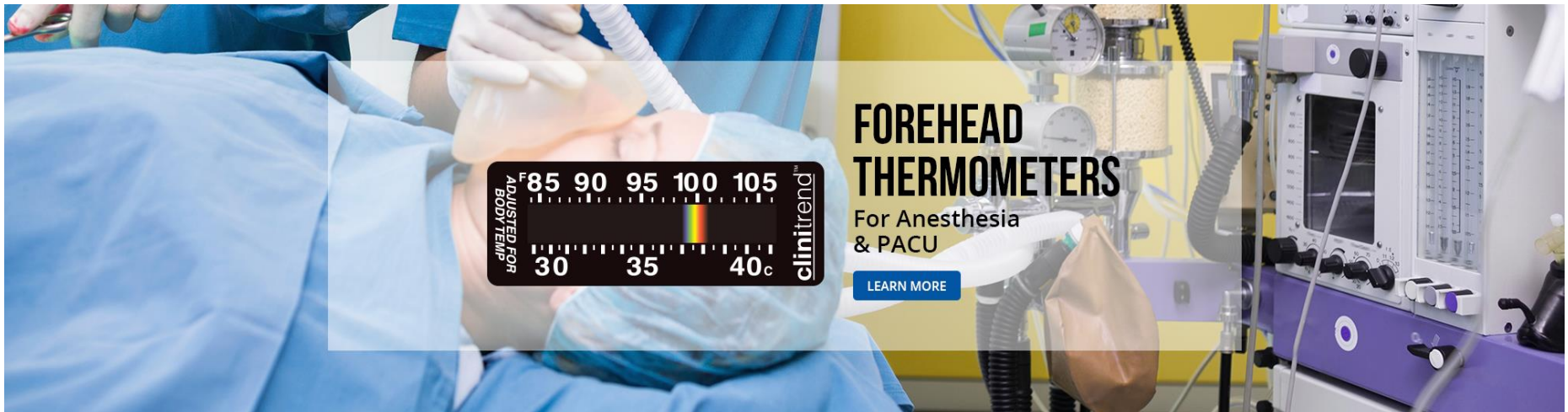
Process Control
Test & Measurement
Quality & Safety Indicators

[LEARN MORE](#)

LCRHallcrest

About

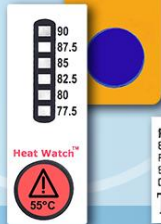
The company services primarily the industrial and healthcare temperature measure markets with regulatory sensitive products distributed through reseller, private label and OEM channels.



LCRHallcrest

About

The company is the leading provider of custom color change process indicators, manufacturing monitors, test and measurement tools servicing process and industrial control industries.



SMART, INNOVATIVE, CUSTOM TEMPERATURE INDICATORS

- Thermometers
- Temperature Recorders
- Process Indicators
- Safety Alerts

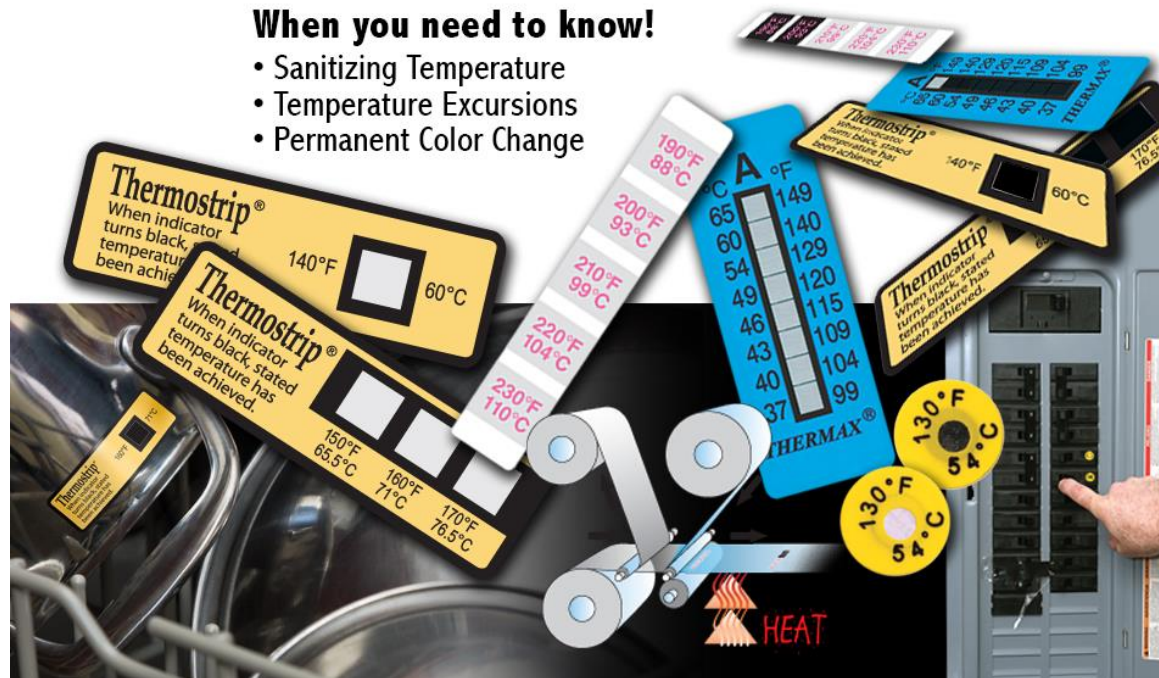
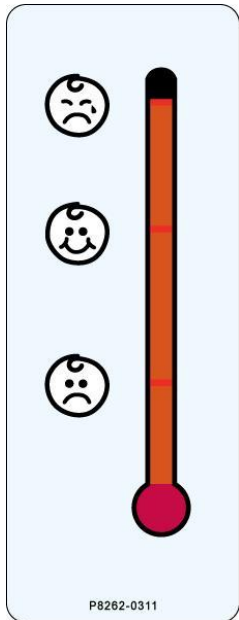


About

Offering Standard Temperature Indicating Product Portfolios and Designs, Develops & Manufactures Custom / Private Label Products

When you need to know!

- Sanitizing Temperature
- Temperature Excursions
- Permanent Color Change



LCRHallcrest

ABOUT

Glenview IL



Deeside UK
Poole UK



LCR*Hallcrest*

About



- FDA regulated, adhering to cGMP's
- Maintains in house engineering, chemical and regulatory support

Produced over 100,000,000 temperature labels in 2018

LCRHallcrest

ABOUT

LCRHallcrest

**Thermo-
chromic**

**Photo-
chromic**

**Wax melt
indicators**

**Micro-
encapsulation**

**Liquid
Crystal**

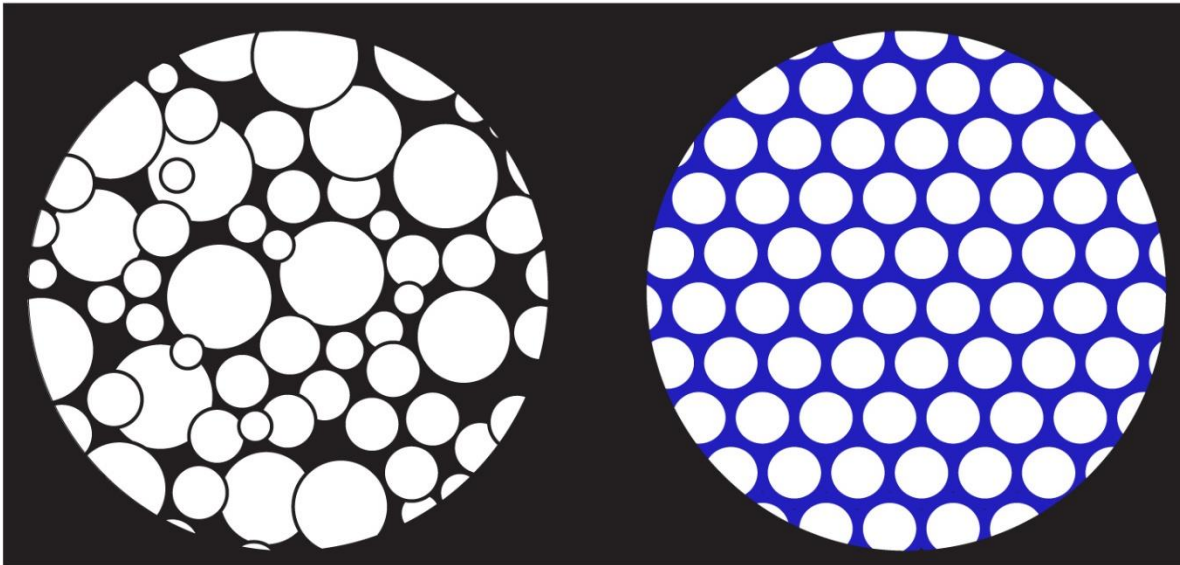
**Leuco
Dye**

**Permanent
Change Ink**

LCRHallcrest

About

- **Formulates and microencapsulates liquid crystal mixtures**
- **Manufactures color changing pigments, inks and dyes**



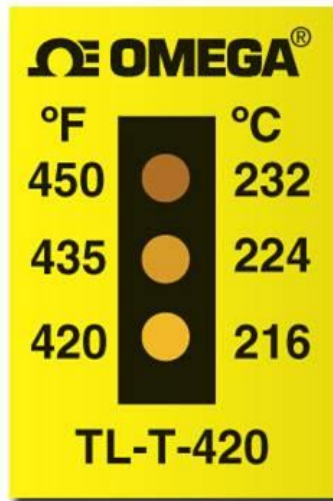
Current Method

Membrane Emulsification



About

- Manufacturer liquid crystal and chemical indicating temperature color change sensitive labels.
- Screen & automated label process printing



Capability

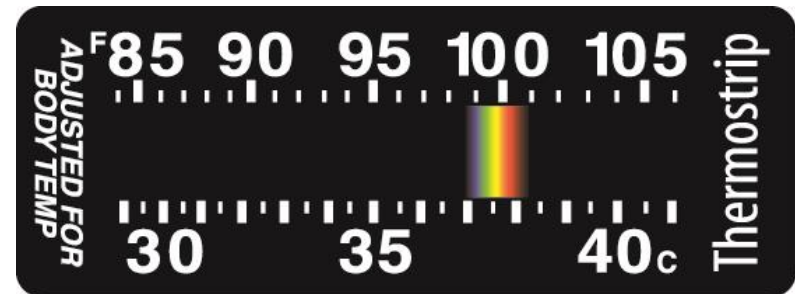
- **Liquid Crystal Analog Temperature Sensitive Label Production**



LCR*Hallcrest*

Capability

- Analog Liquid Crystal Temperature Sensitive Label Production
- Standard and Custom Products



LCRHallcrest

Capability

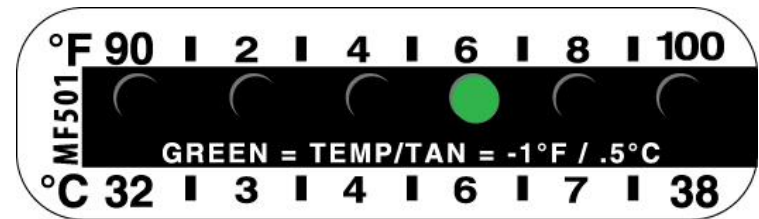
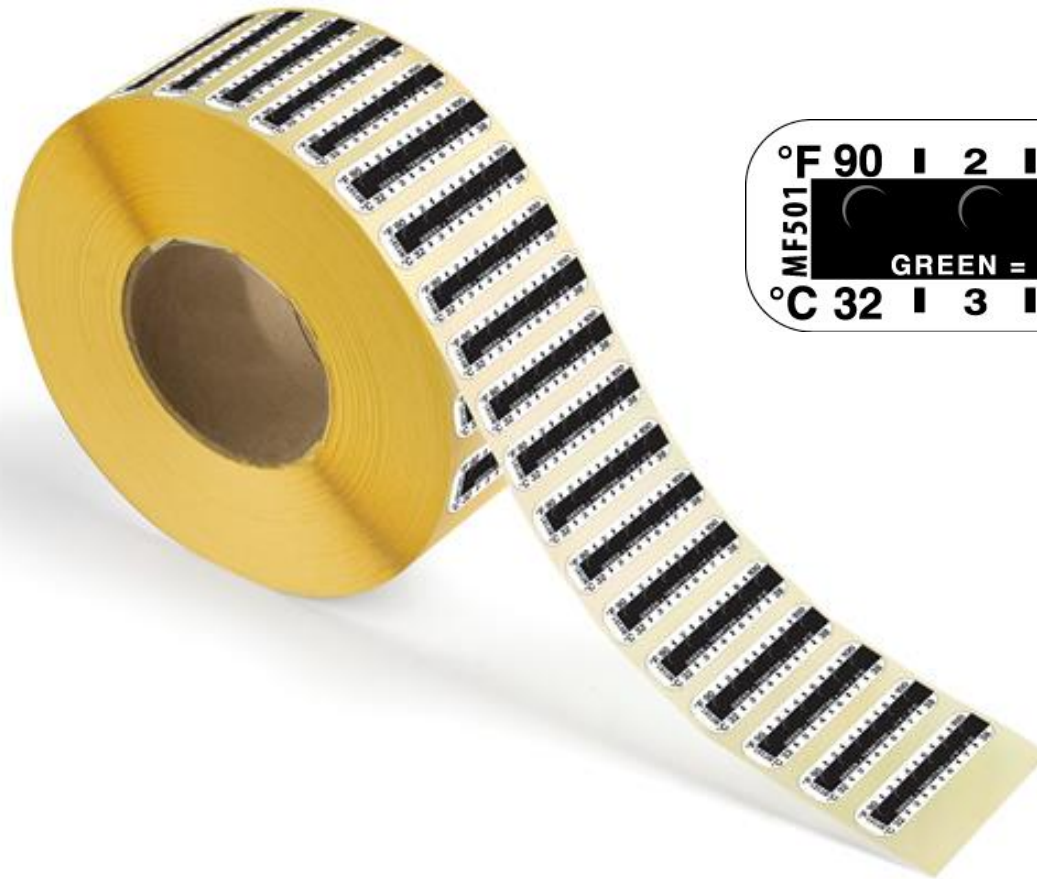
- High Speed Temperature Sensitive Dotted Label Production



LCRHallcrest

Capability

- High Speed Temperature Sensitive Dotted Label Production



LCRHallcrest

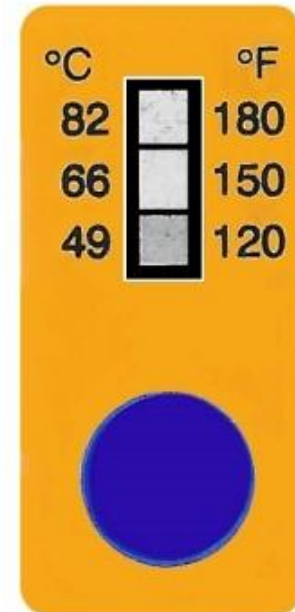
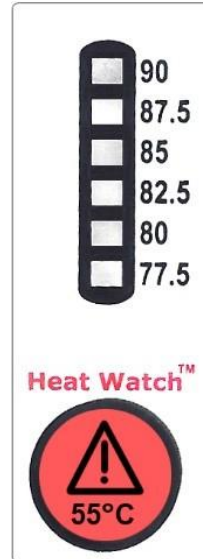
Capability

- Digital & Screen High Speed Combination Printing



Capability

- Digital & Screen High Speed Combination Printing

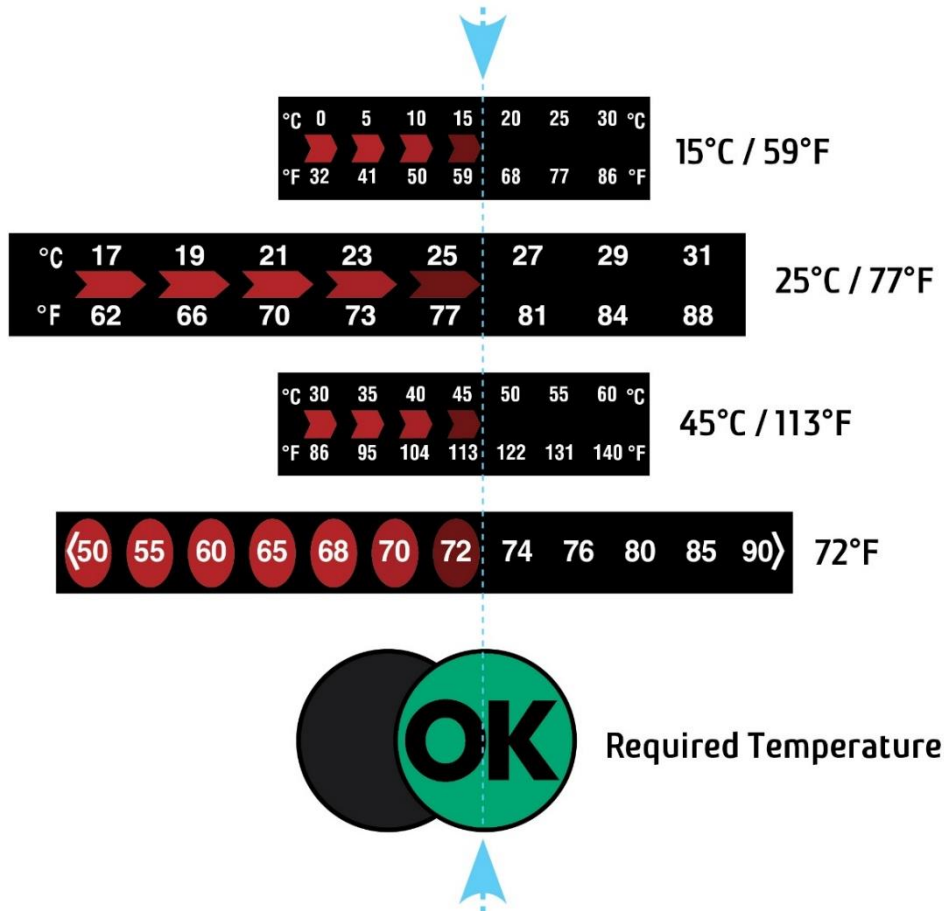


New Products

- **Next Generation**
 - **EZ Read Thermometers**
- **Food Safety**
 - **Safetemp**
 - **Thermostrip DS**
 - **OK**
- **Test & Trial**
 - **Moisture**
 - **Paint Kits**

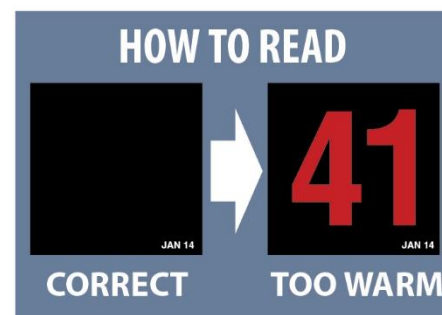
EZ Read

- Next Generation in Liquid Crystal Thermometry
- Complete Portfolio Available



Safetemp

- Retail Food Display Temperature Monitoring System
- System Activates when Temperature Not Correct



Safetemp

Reversible color change standard retail food safety



LCRHallcrest

Thermostrip DS

- Dishwasher Disinfection Test Strip
- Black to Orange at Rated Temperature



Thermostrip DL

Irreversible color change standard food safety



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OK Thermometer

- OK lights up to indicate correct refrigeration temperature
- Adhesive backed disk or refrigeration hanger



Thermochromic & Photochromic Test Sizes

- Individual 50gm Bottles
- Touch - Color to Clear and Cold Temperature - Clear to Color
- Photochromic - Clear to Color



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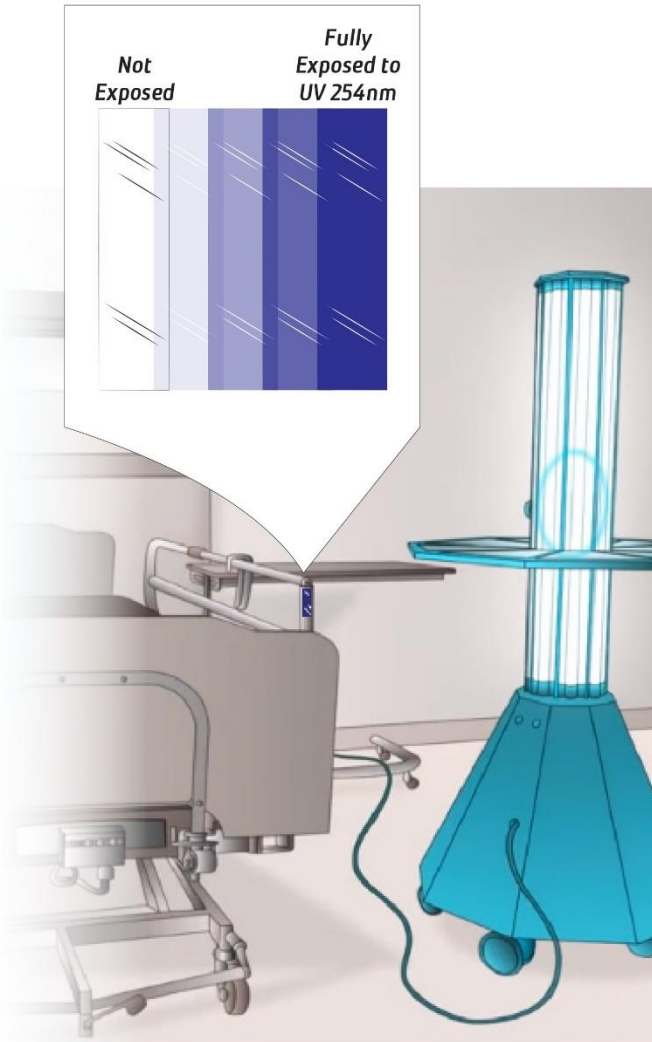
Moisture Test Label

- Dot label changes from red to white when exposed to moisture



UV Test Label

UV Test Label changes permanently from clear to color at 254nm



LCRHallcrest

Support

- **Informational Press Releases**
- **Online Training Site For Safetemp**
- **Application Notes**
- **Technology Brief**
- **Website**
 - **Color Change Basics**
 - **Irreversible Temperature Labels**
 - **Wax Melt “How they work”**
 - **FAQ**

Support

Screen Shot - Wax Met Technology

Wax Melt Temperature Indicator Label Technology

The most common application associated with wax melt temperature indicating technology is self adhesive labels that consist of a series of temperature-sensitive elements sealed between heat-resistant substrates with transparent windows. Each element changes color distinctly as its rated temperature is exceeded. The changes are irreversible, providing a temperature history of the surface being monitored. The labels will not de-laminate when removed for reference and can be attached to an inspection report to serve as a permanent record of attained temperature. Typically used in the industrial setting.

HOW THE LABELS WORK:

The temperature-sensitive elements are phase-change indicators which use the sharply defined melting points of a series of specially purified organic chemicals to give the unique, high precision, color change effects. Each temperature element uses a different chemical compound and is made separately by applying a coating containing the chemical to a special absorptive paper substrate which is usually black. When the rated temperature is exceeded, the chemical melts and is absorbed by the substrate, causing a permanent color change to black. Up to ten elements can be combined together on a single label.

TYPICAL LABEL CONSTRUCTION:

| Component: | Thickness |
|--|---------------|
| Print Foil | >10 μ |
| Melinex Polyester Film (171°C and below) | 50 μ |
| Kaladex Film (177°C to 204°C) | 50 μ |
| Kapton Polyimide Film (210-°C and above) | 50 μ |
| Adhesive & Carrier (without liner) | 75 - 85 μ |
| Black Coated Paper & Backing | >150 μ |
| Release Liner | 75 μ |

Above values are general guides for illustration purposes only.

Process Temperature Indicator

Recording Dishwasher Surface Temperature

Permanent Record of Highest Temperature

LABEL CONSTRUCTION

- Clear Top Layer
- Foil Print 2 colors
- Fusing Material and Backing Paper
- Adhesive

Support

Screen Shot - FAQ

The screenshot shows a web browser window displaying the FAQ page for LCRHallcrest. The browser's address bar shows the URL www.hallcrest.com/color-change-basics/faq. The page header includes the LCRHallcrest logo, contact information (847-998-8580, info@hallcrest.com, +44 (0)1244817107, sales@lcrhallcrest.com), and social media icons. The main content area is titled "FAQ" and lists several questions related to Thermochromic Liquid Crystals (TLCs). The questions are:

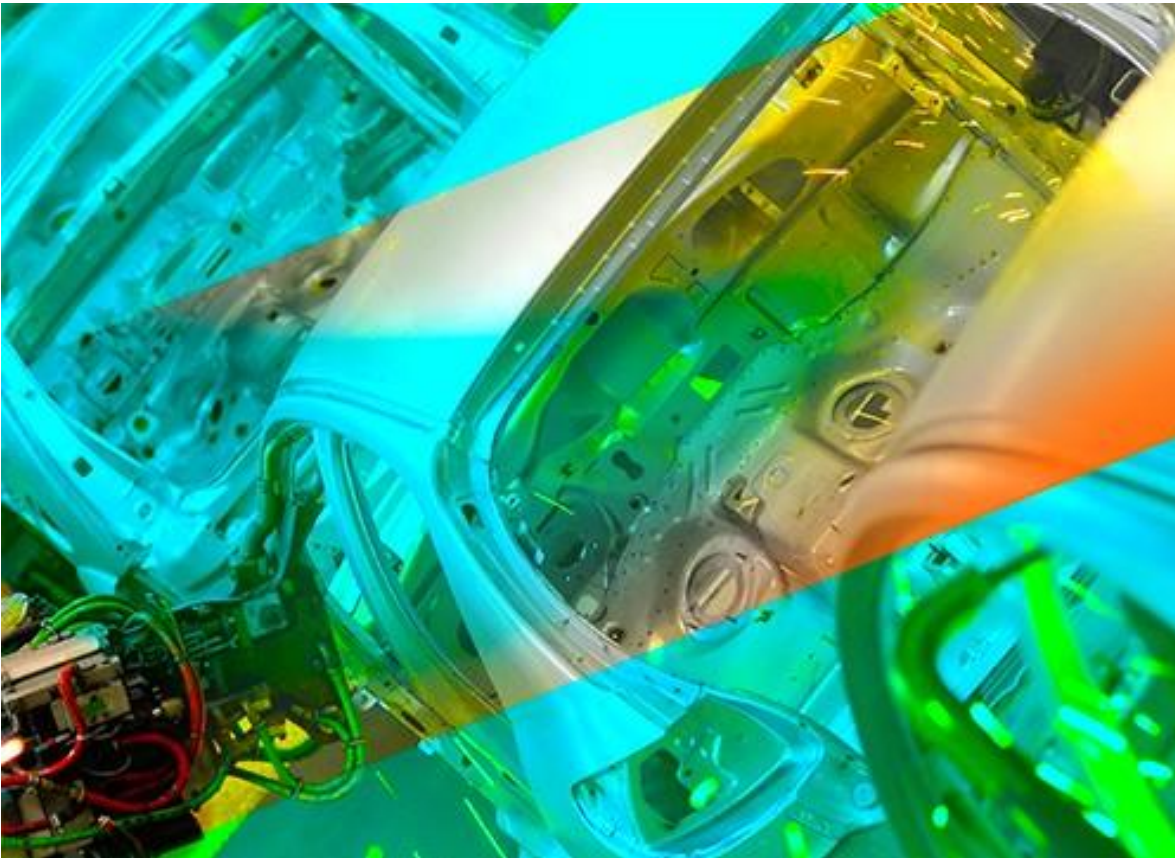
- Q: What are Thermochromic Liquid Crystals?
- Q: How do they work?
- Q: What is bandwidth?
- Q: What is color play?
- Q: Are there any standard color plays available?
- Q: Are there any standard color plays available?
- Q: What are the response times of TLCs to temperature changes?
- Q: Do TLCs exhibit hysteresis?
- Q: Are TLCs UV stable?
- Q: What chemicals are TLCs incompatible with?
- Q: Do the TLC products contain any heavy metals?
- Q: What is the shelf life of the TLC products?
- Q: Can two different TLC products be used together?

Below the list of questions, the text "What are Thermochromic Liquid Crystal?" is visible. The browser's taskbar shows the time as 5:16 PM on Thursday, 5/4/2017. The page footer includes a "Wax Melt Technol...html" link and a "Show all" button.

Applications

Automotive Process Control

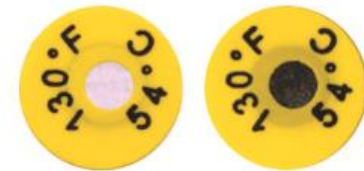
Welding Affirmation Paint



LCR*Hallcrest*

APPLICATIONS

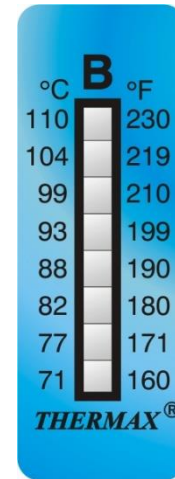
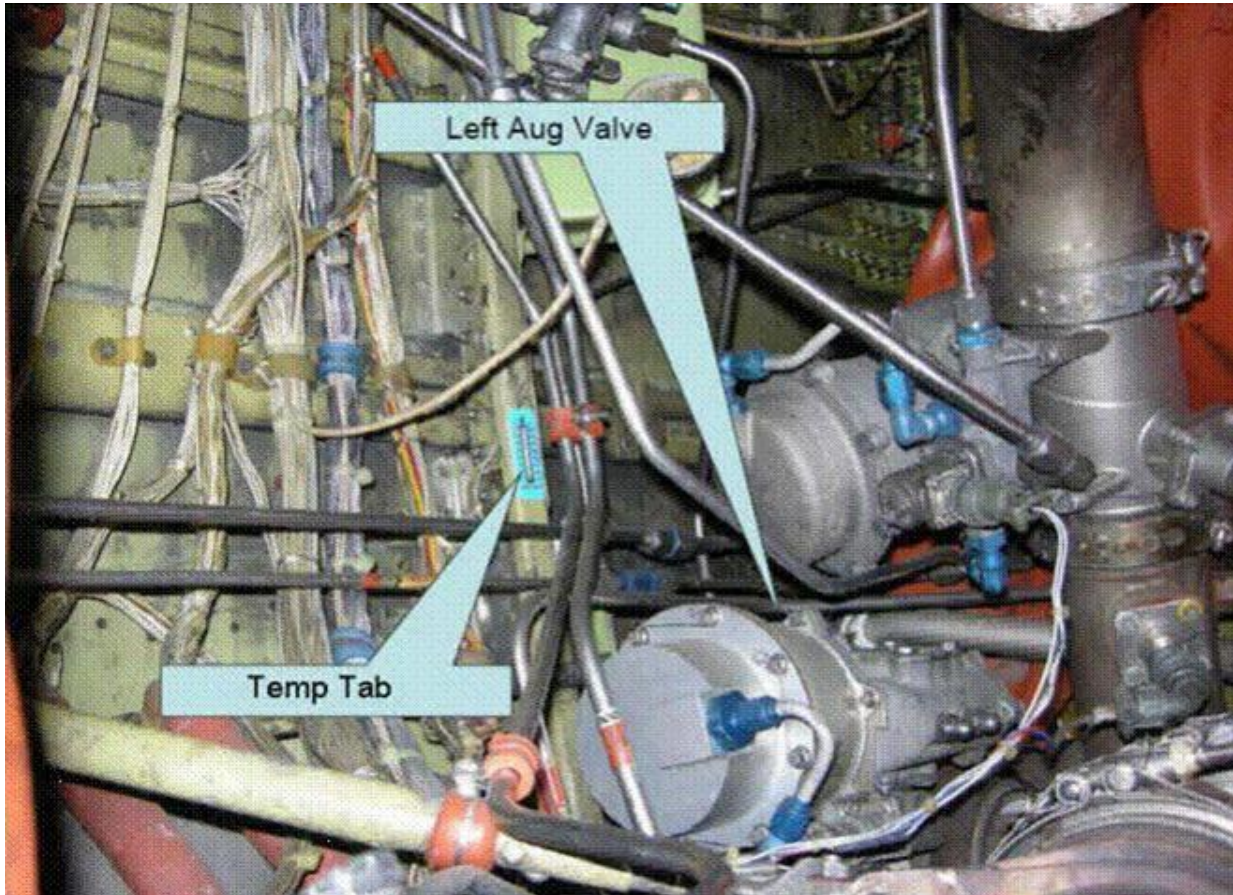
Irreversible color change standard



LCRHallcrest

APPLICATIONS

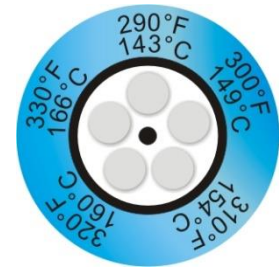
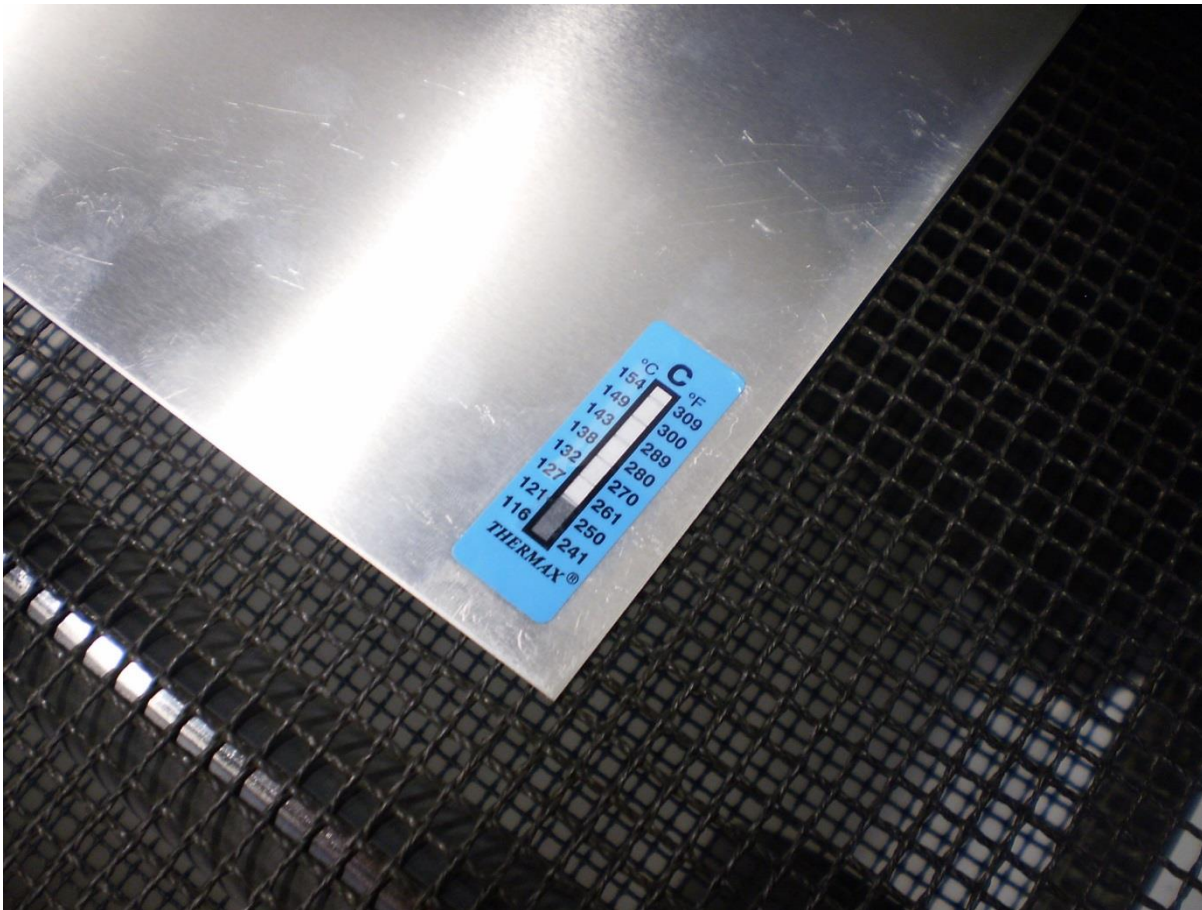
Irreversible color change standard



LCRHallcrest

APPLICATIONS

Irreversible color change standard



LCRHallcrest

APPLICATIONS

Irreversible color change custom automotive



Wheel Overheating Alert

Label read out:



Ambient

Ambient After

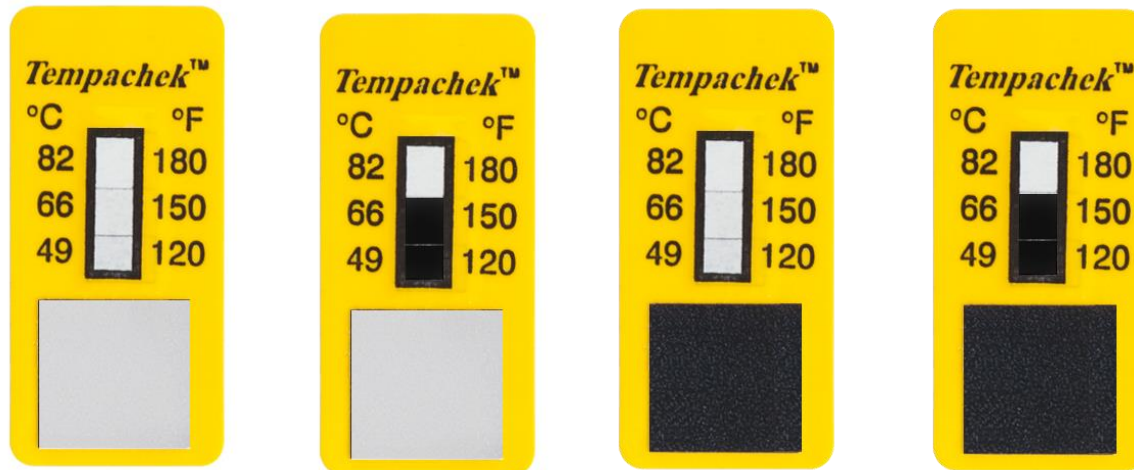


Irreversible Change

LCRHallcrest

APPLICATIONS

Irreversible color change custom healthcare “Cart Wash Disinfection”



Combined Temperature and Water Alert

LCRHallcrest

APPLICATIONS

Irreversible color change custom healthcare UV Disinfection Indicator



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APPLICATIONS

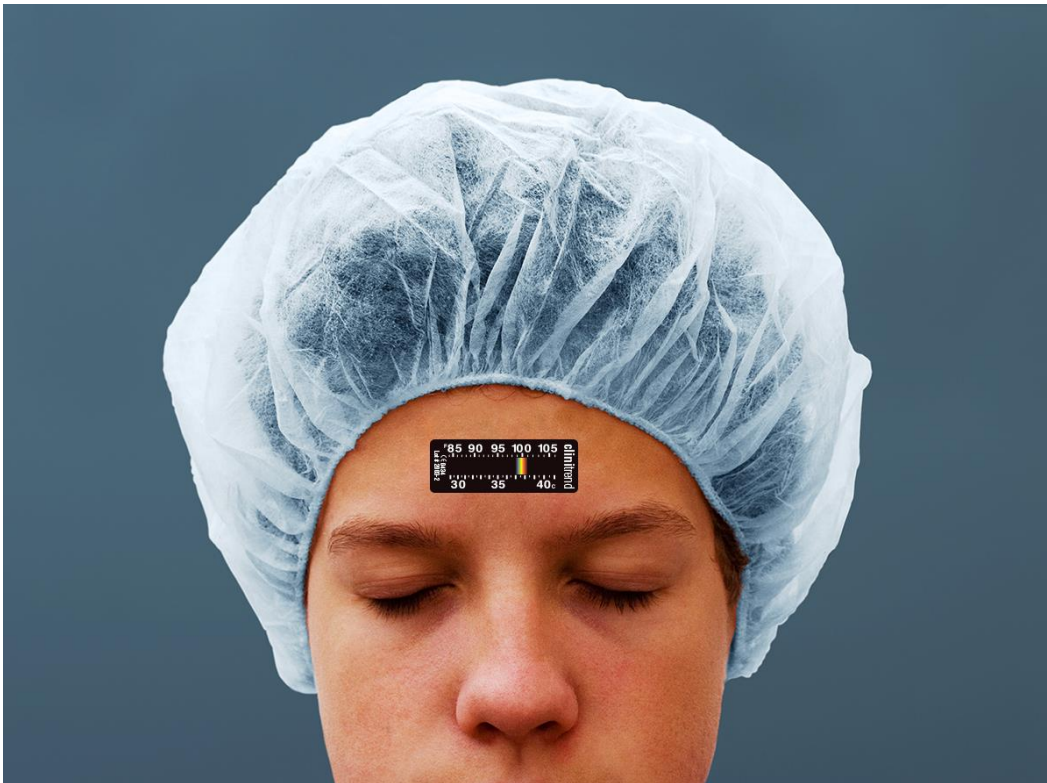
Custom Combination Reversible & Irreversible Color change Labels



APPLICATIONS

“A disposable liquid crystal thermometer performs as well as a non-disposable temporal artery infra-red thermometer.”

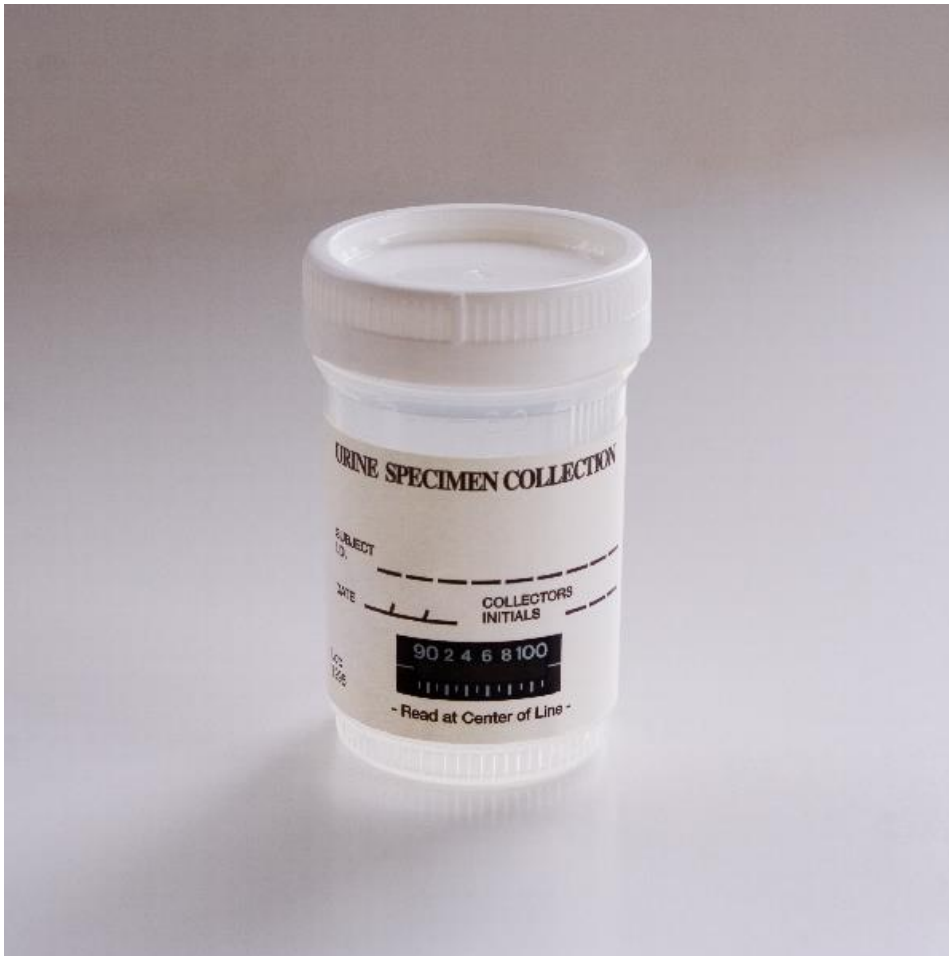
Journal of Anesthesia Practice September / October 2014, Volume 8 Issue 5



LCRHallcrest

APPLICATIONS

Reversible color change standard healthcare



LCRHallcrest

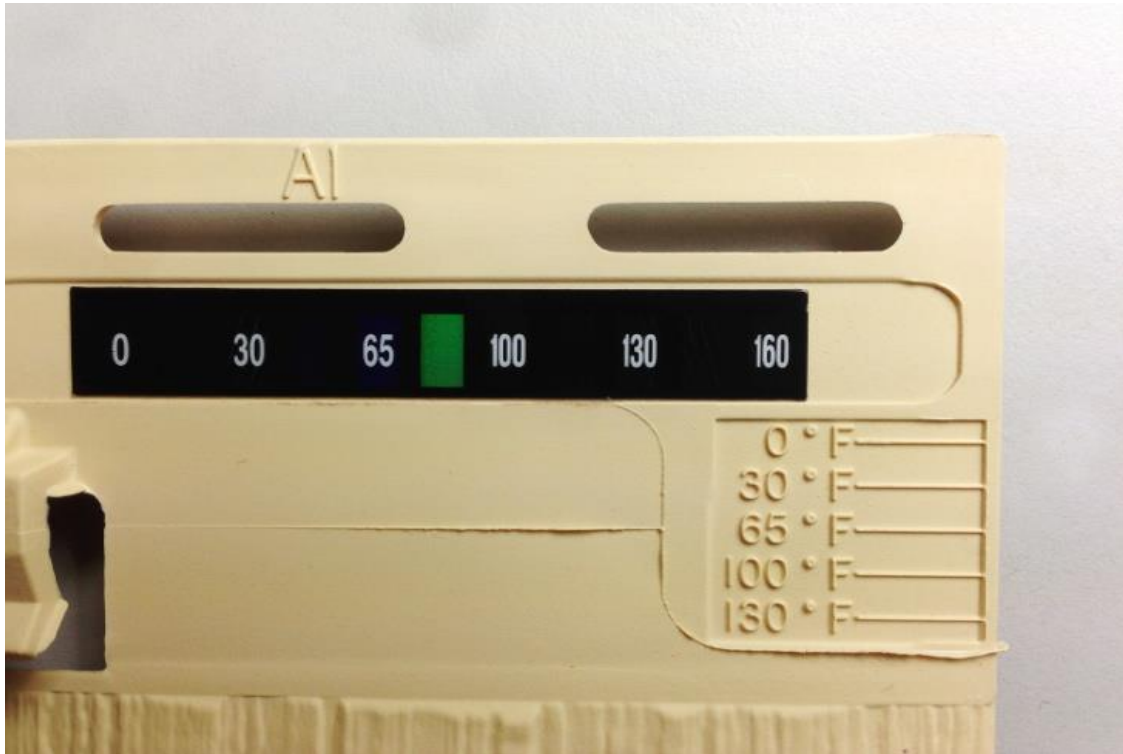
APPLICATIONS

Reversible color change food safety



APPLICATIONS

Reversible color change custom shingle installation



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APPLICATIONS

Reversible color change custom baby bath



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APPLICATIONS

Reversible color change custom

109

IS YOUR WATER TOO HOT?

The Hot Water Gauge

1. Insert the bottom of this card into a cup of hot water. (Run water for 3 to 5 minutes.)
2. If a number appears and it is:
GREEN - that is the temperature of the water.
BLUE - the temperature is more than that number.
TAN - the temperature is less than that number.
RED 150+ the temperature is 150° or greater.
3. If no change occurs, the water temperature is under 120°.
4. For most uses 120° to 130° should be adequate.
If yours is hotter, turn down your water heater thermostat to save money, and lessen the danger of tap water scalds.

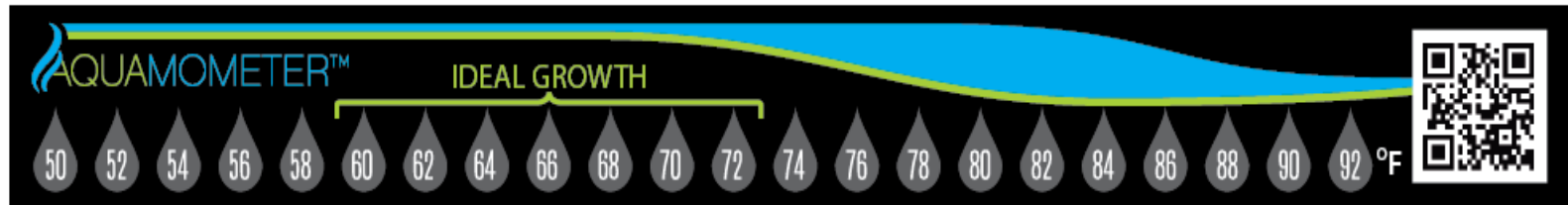
imprint: 1.75"W x .5"H

120 130 140 150+

LCRHallcrest

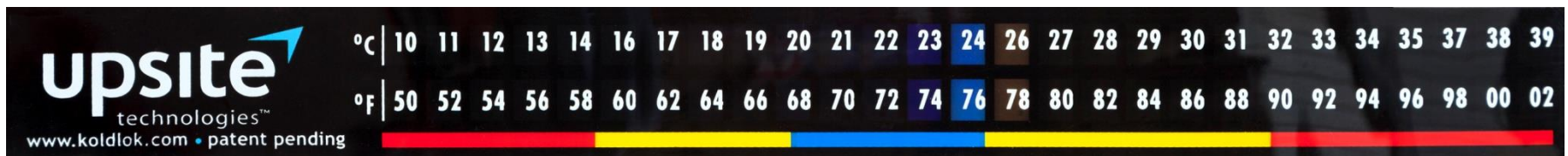
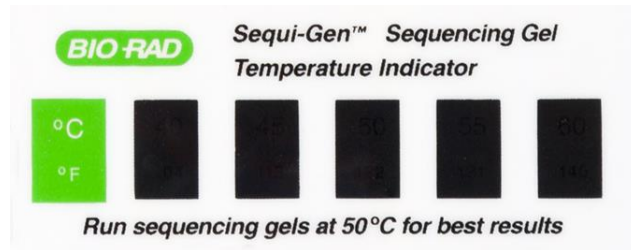
APPLICATIONS

Reversible color change custom with QR Code



APPLICATIONS

Reversible color change custom



LCRHallcrest

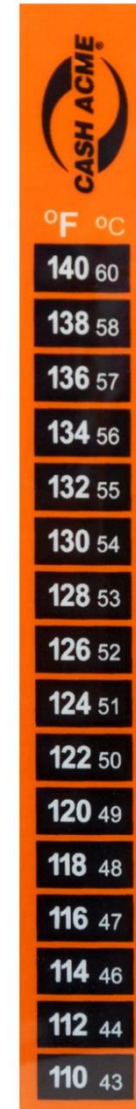
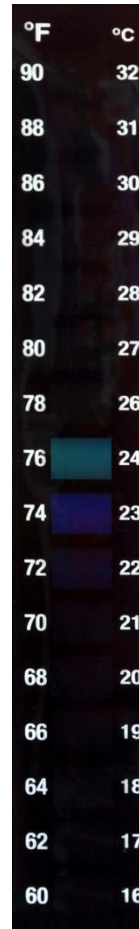
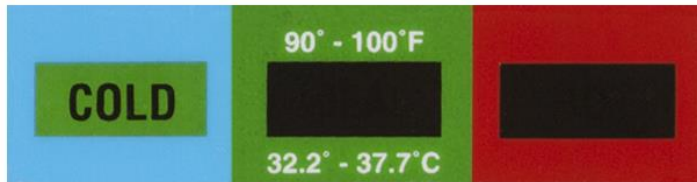
APPLICATIONS

Custom color change safety alerts

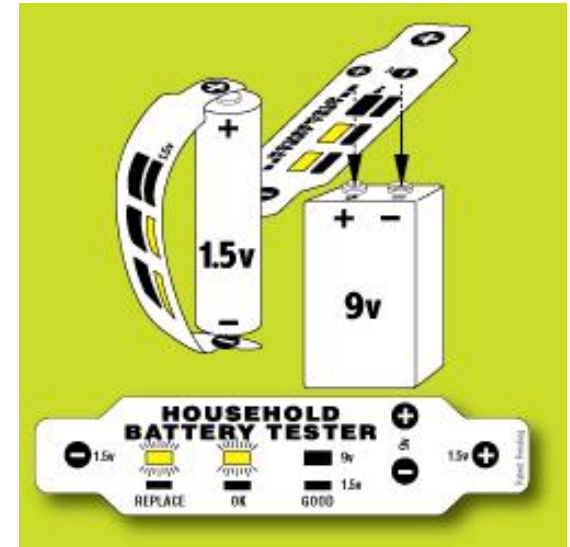
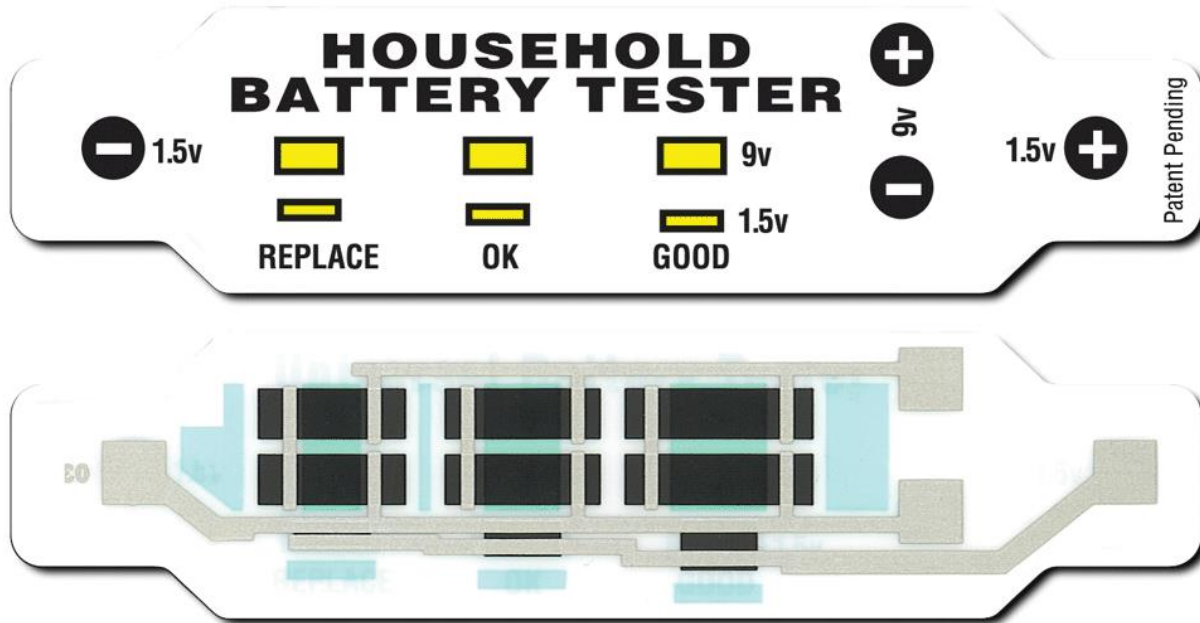


APPLICATIONS

Reversible color change custom



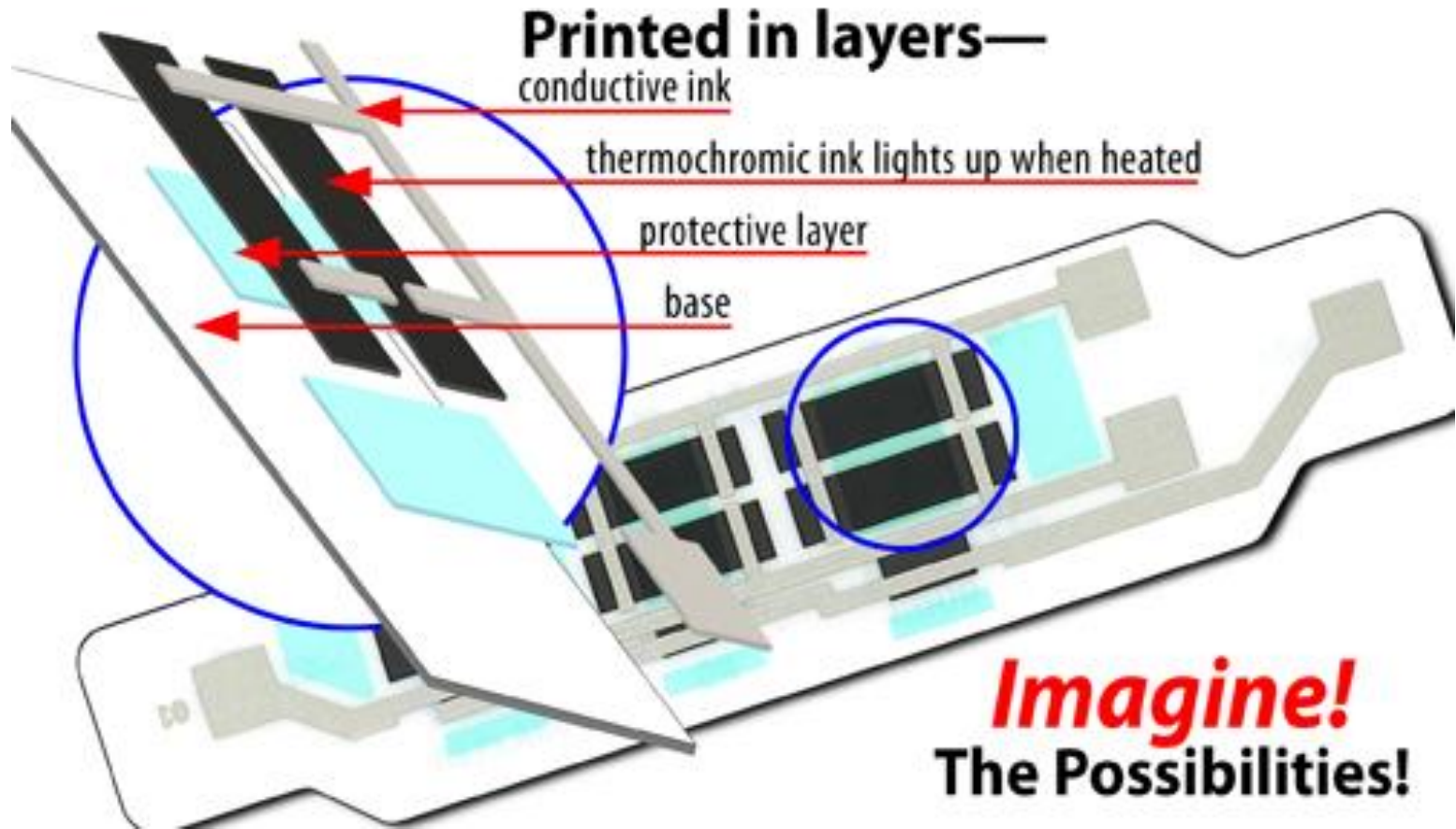
APPLICATIONS



LCRHallcrest

APPLICATIONS

Conductive and Thermochromic Ink



Imagine!
The Possibilities!

LCRHallcrest