

# Thermochromic Liquid Crystal Reversible Temperature Indicating Strips

The **Thermochromic Liquid Crystal (TLC)** range of reversible temperature indicating labels forms a fast, easy to interpret indication of actual temperature. They are also convenient, easy to use and inexpensive.

## *What They Are:*

These self adhesive labels consist of a series of temperature-sensitive elements containing microencapsulated TLC coated on a black backing. Each element changes colour distinctly as its rated temperature is reached, passing through the colours of the spectrum in sequence (Orange, Yellow, Green, and Blue before turning black at a higher temperature). The TLC strips are calibrated so that the indicator that shows green indicates the actual temperature. The colour changes are reversible and the reflected colours will be observed in the reverse order upon cooling.

## *How the labels work:*

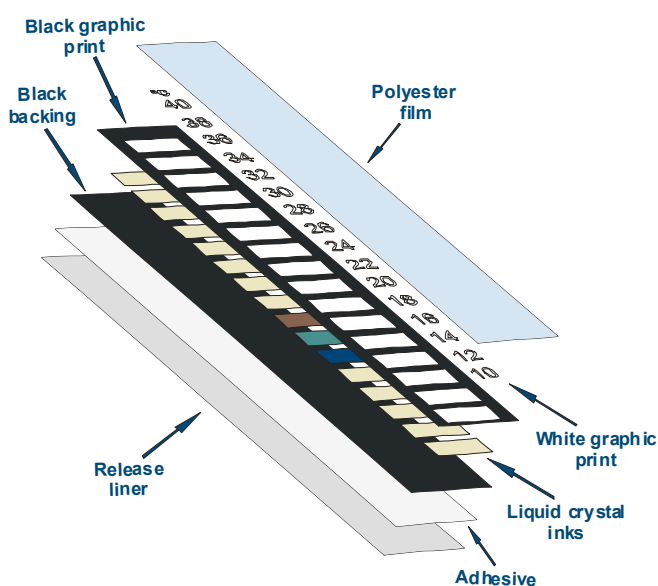
The temperature-sensitive elements contain TLC molecules that are very sensitive to temperature and change position / twist in relation to changes in temperature. This change in molecular structure affects the wavelengths of light that are absorbed and reflected by the liquid crystals, resulting in an apparent change in the colour of each temperature event.

When the rated temperature of an indicator is reached the TLC molecules twist slightly causing the TLC substance to absorb the red and blue portions of the visible light and reflect the green part. This causes the temperature event to appear green. When the temperature decreases, the molecules begin to twist in the opposite direction, and the TLC reflect a different portion of the spectrum.

## *Label Construction:*

<u>Component:</u>	<u>Thickness</u>
Polyester film	>75, 125, 175 $\mu$ (Depending on label type)
Graphic Print	10-20 $\mu$
Liquid Crystal Ink	10-50 $\mu$
Black Backing	10-20 $\mu$
Adhesive & carrier	150-180 $\mu$
Release Liner	75 $\mu$

Example shown right is A523-01



Above values are general guides using the standard products as a representative example.

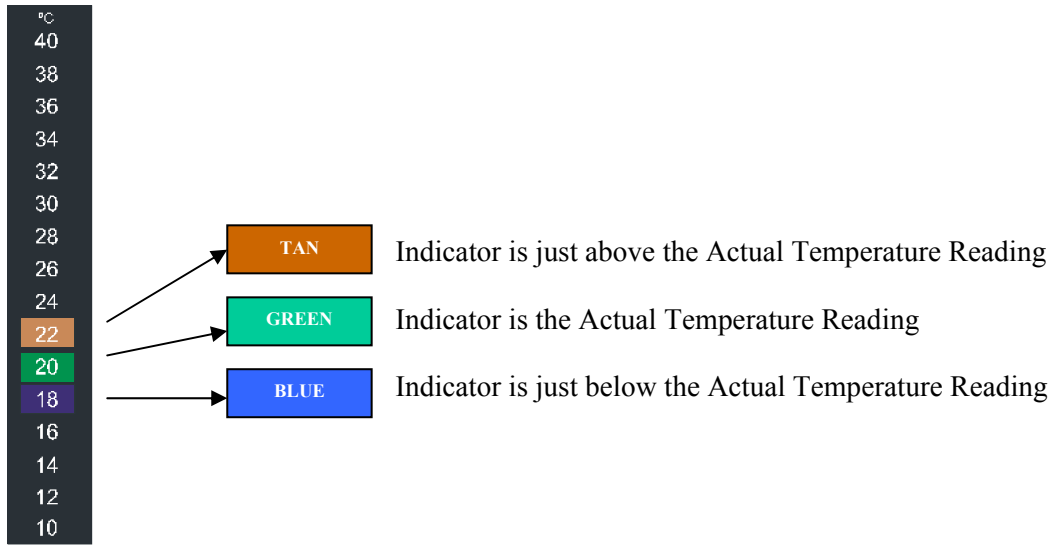
## *Label Accuracy:*

The tolerance on all our products is  $\pm 1^{\circ}\text{C}$  of the rated temperature, with the exception of the medical products (forehead thermometers and drug test strips) that have a tolerance of  $\pm 0.5^{\circ}\text{C}$  of the rated temperature

It should be noted that for forehead, drug test and wine thermometers an “offset” is applied to the rated temperature. The “offset” allows for the difference in temperature readings between the outside and inside of a host item. For example the surface skin temperature of a human is lower than the core body temperature due to heat loss from the surface. A great amount of research has been carried out on this subject to ensure the correct offset has been assigned.

***Reading TLC Thermometers:***

The correct temperature is indicated by the square on the TLC thermometer that turns green. If green is not visible the temperature will be mid way between the indicators that are illuminated tan and blue as follows:



**Please note the above colours are a guide for demonstrative purposes and the actual colours observed could be slightly different depending on label type.**

Generally liquid crystal thermometer strips / temperature indicators can be read accurately to within half the increment between adjacent temperature events. For example the A296 series products, which have events sequenced every  $5^{\circ}\text{C}$ , the temperature can be read to within  $2.5^{\circ}\text{C}$ . For A523 series where events are sequenced every  $1^{\circ}\text{C}$  or  $2^{\circ}\text{C}$  and medical products (including forehead and drug test strips) the temperature can be read to within  $0.5^{\circ}\text{C}$  and  $1^{\circ}\text{C}$  respectively.

***Custom Products:***

In addition to the standard **Liquid Crystal** labels available, which cover the temperature range of  $-30 - 120^{\circ}\text{C}$ , a full custom manufacturing service is available and products can be manufactured to meet customers' precise requirements of, for example, size, shape, colour, temperature range, number of temperature elements, graphic printing (logo's etc). Please ask for details.