



the smart way to measure time & temperature

Timestrip Plus™ FAQ

How does Timestrip Plus work?

A colored liquid dye housed in a blister is held adjacent to a specialized microporous membrane. Upon squeezing the blister, the dye comes into contact with the membrane. If the temperature of the product is below the stated 'stop' temperature, the dye changes state to solid form, and it is unable to move through the membrane. If it rises above the threshold temperature, it changes to liquid form and moves at a precise rate through the membrane. A scale printed on the surface indicates the amount of time above the threshold temperature.

Why do they have a start/threshold temperature and a 'stop' temperature?

The freezing point of a liquid is always lower than its melting point. For example, water doesn't freeze at precisely 0°C (32°F), it freezes when the first ice crystals form, which is typically lower than 0°C. Its melting point is precisely at 0°C however. Timestrip Plus™ works by diffusion of liquids that form crystals and therefore the 'stop' temperature is lower than that of the precise starting point. More technically, the behavior of liquids in a membrane is different again to normal freezing due to many other factors, all of which we take into account when defining the products. We offer the best performance in this category of products.

Do I need to condition the products prior to activation?

No. Unlike other threshold temperature products, Timestrip Plus™ does not require pre-conditioning. You need to activate above the product's threshold temperature, as you cannot squeeze the blister in solid form. Immediately after activation, stop the process by placing below the 'stop' temperature. The fastest way to do this is by placing in an environment much colder than the stop temperature for a short period of time.

Do they have any special storage requirements before activation?

No, unlike other threshold temperature products, they can be held at ambient temperatures.

Do they have a shelf-life?

Timestrip Plus™ shows no degradation in performance over time. We only provide a general guideline of 2 years due to the pressure sensitive adhesive on the bottom, which allows you to use the product as an adhesive label. All standard adhesives have such disclaimers regarding their shelf life.

Can Timestrip Plus indicate if a temperature has fallen below a certain point?

Timestrip Plus™ can only show ascending temperature excursions. We have other products that do this type of descending temperature indication.

How accurate are they?

+/- 1°Celsius for the temperature component and +/- 15% for the time component.

What can they be used on?

Anything where elevated temperatures are an issue. Common applications are frozen or chilled foods, medicines, vaccines, blood products and adhesives.

Can you customize for us?

We have a growing range of standard products that meet most cold chain requirements. As a general rule, if you require more than 50,000 units, we can customize the print, and in many cases, even the melt temperature, although we have an extensive existing range. There is a premium for this service. We can also quote on custom carrier cards and backing labels, if you need to provide instructions, add other languages, or a form to provide a permanent record.

Timestrip Plus™ compare with data loggers?

There are several fundamental differences, and in some cases data loggers and Timestrip Plus™ can be used in complementary ways to help monitor cold chain integrity. Timestrip® also sells an exceptional range of data loggers if more appropriate to your requirement. Data loggers are expensive and typically are designed to go on a large shipments, typically need to be returned to be read, and to be used again to justify the expense.

(continued)

(continued) Timestrip Plus™ are inexpensive, single use products that can be used on a large shipment, but also on carton or even single dose level. Data loggers provide a full history of temperature from the time of activation. Timestrip Plus™ records how long a product has been above its threshold temperature, but cannot tell you when the breach or breaches occurred. Timestrip Plus™ is most often used to monitor and validate the “last-mile” of the cold chain where the product gets closest to its eventual use. Data loggers and other digital recorders are too expensive, and complicated to read and interpret. Timestrip Plus™ give end users immediate visual messages that can then form the basis of a “use/don’t use” decision for temperature sensitive goods- even by untrained recipients.

What is the accuracy of the hour marks?

Every Timestrip Plus™ product is calibrated to a temperature of 2°C above its stated threshold temperature. For example, Timestrip Plus™ 12°C is calibrated to a temperature of 14°C. When the product breaches its threshold temperature and is held at a constant temperature(i.e. isotherm) of 14°C, it will reach the 1 Hour print mark within 1 Hr (+/- 15% in time).

What is the maximum run-time Timestrip Plus™ range can offer?

Timestrip Plus™ products use low viscous liquids and inherently fast progressing. Typically the progression rate of these liquids is roughly 15–25mm in 24 Hours at room temperature. Timestrip Plus™ products feature a blister located on top of the product, reducing the available window. Usually, the available run-out window is limited to a maximum of 12mm which is roughly correlated to a maximum of 24 Hours. This value is liquid and temperature dependant thus can change from product to product.

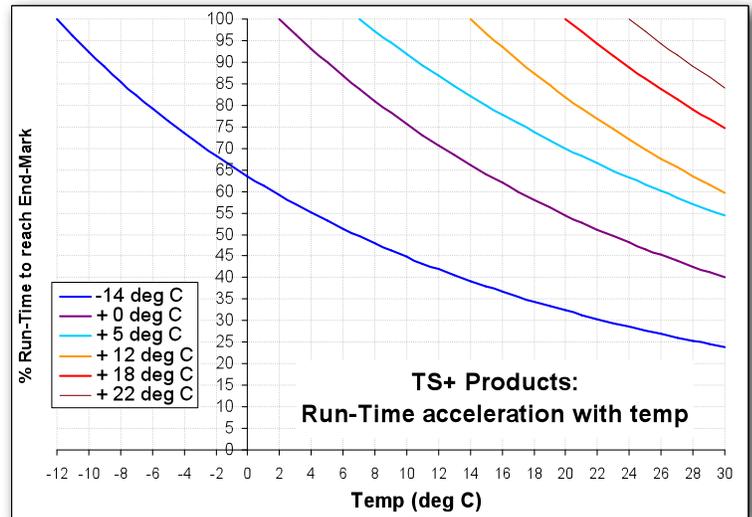
Why is there an activation window and a run-out window?

Timestrip Plus™ products are implemented by activating the product at temperatures above the threshold and placing them below the stated ‘stop’ temperature, which stops the dye from moving throughout the window. In order to provide a breach/no-breach indicator there are 3 – 3.5 mm of progress from activation to the run out window. This distance correlates to roughly 30–60 minutes and is strictly liquid and temperature dependant (it can change from product to product). Therefore the run-out window starts showing breaches lasting 30-60 minutes depending on the product needed.

What happens at elevated temperatures?

Due to the nature of liquids, higher temperatures reduce Timestrip Plus™ dye viscosity. The correlated result is faster/shorter run-times (the progressing colored dye will reach each printed time-mark sooner than intended).

This graph represents the run-time acceleration with temperature of different Timestrip Plus™ products. For example, Timestrip Plus™ 0°C is calibrated to 2°C (pink line). When the product is held at an isotherm of +2°C it will reach each print-mark (i.e. 1, 2, 4, 8 Hour, etc.) within the exact time (i.e. 1, 2, 4, 8 Hour, etc.). However, if the product is exposed to an isotherm of +10°C then it will reach each print-mark with only 75% of the run-time. In other words, it will reach the 1 Hour time-mark within 75% of 1 Hour (45 minutes), the 2 Hour time-mark within 75% of 2 Hour (90 minutes), the 4 Hour time-mark within 75% of 4 Hour (180 minutes), etc. At 23°C the progressing front-line will reach each print-mark with only 50% of the run-time, etc...



(continued)

(continued)

How are Timestrip Plus™ products evaluated for their time accuracy?

Timestrip Plus™ products are polymeric multi-layer indicators. They are based on spontaneous lateral wetting by a colored liquid inside a porous substrate and not a chemical reaction. Each production batch (7000 – 8000 products) undergo restrictive quality control tests to validate its time accuracy.

This is conducted via a specially designed computer vision software (TSCV) which analyzes scanned photos of seven randomly-selected products from each batch (roughly 0.1% of the population). The photos are taken at different elapsed times and the tested products are placed at their designated temperature through the entire test period. The software automatically analyses the lateral progress and the elapsed time of each product tested and the data is presented numerically and graphically in a specific file which is obviously batch-related. This data is translated into a final release report which is attached to the outgoing product batches.

An example for such run-time accuracy analysis of a specific production batch (Timestrip Plus™ 12 °C, PL825-14) is given below. The first graph represents the individual progress of the seven representative products versus time. The second graph represents the average progress of the seven tested products versus the square root of time together with the required progress (continues black line) and borders of acceptance tolerance (two continues grey lines). In this case the run-time accepted tolerance of the averaged group is +/-15%.

