

# USAGE INSTRUCTION

## non-toxic measurement inks (test inks)

### 1. Surface measurement - Introduction

The measurement is based on DIN 53364 or ISO 8296 and ASTM D 2578-84. These standards describe the measurement with test liquids that are produced from the toxic and mutagenic substances formamide, 2-ethoxyethanol and methanol. The non-toxic test inks from SEST GbR were specially developed to replace those formamide-containing DIN / ISO inks. The SEST inks generally show the same measurement results as the inks containing formamide. Other inks such as inks based on ethanol show large deviations in the measured surface tension compared to DIN-ISO and the non-toxic SEST ink.

The test inks are suitable for any surface that does not absorb liquids or only absorbs them slowly, especially for plastic and metal surfaces. For example, if the surface of a substrate has a surface tension of 38 mN/m, then test inks with a surface tension of up to and including 38 mN/m will wet the surface and inks with a surface tension higher than 38 mN/m will roll off and contract (see Figure 1). The special red ink color is clearly visible everywhere, even on black surfaces where e.g. a blue colored ink is hardly visible.

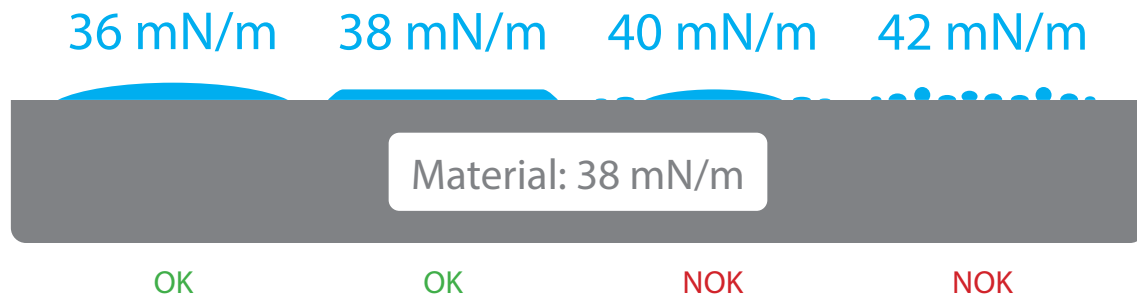


Figure 1: Enlarged schematic representation of the behavior of test inks different surface tension values on a substrate in cross section.

### 2. Cleaning the surface of the substrate to be tested

- Please note that contamination of the brush and / or the test liquid can falsify the measurement result.
- The same applies to contamination of the felt tip of the test pens.
- In order to avoid the entry of dirt into the test ink, the surface to be tested should be as free of dust and grease as possible. It is advisable to clean the surface beforehand with a suitable solvent. Be sure to use a lint-free cloth.
- If you do not want to clean a contaminated surface, use cotton swabs or cotton balls to apply and replace them regularly.
- It is also possible to replace the brush closures or the felt tips of the test pens at regular intervals. You can obtain brush caps, empty bottles and storage bottles from us and refill or replace them as required. You can also obtain the replacement felt tips for the test pens from us.

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### 3. Execution of the surface tension measurement

- For the first measurement, select a test ink with a surface tension value in the order of magnitude of the expected surface tension of the substrate. The standard climate 23/50 (see ISO 291) is specified in ISO 8296.
- You can apply the ink with our test pen (valve marker), a brush, a cotton swab or a cotton ball, as well as pour it directly onto the surface to be examined to examine large surfaces.
- To do this, quickly apply the ink flat or in the form of a five to twenty centimeter long line without larch. According to ISO 8296, the thickness should be approx. 12  $\mu\text{m}$ . In practice, it is sufficient to apply the ink very thinly. The ISO specifies an area of at least 6  $\text{cm}^2$ .
- The liquid must not be applied too thickly but also not too thinly. When using a brush, lightly wipe the brush off the edge of the bottle before applying. When using the test pen, press the felt onto the surface with gentle pressure to open the valve.
- After applying, carefully observe the behavior of the liquid. Also, pay attention to the edges of the applied ink.
- If the test ink pearls or contracts within 3 seconds and no longer wets the surface, the value of the surface tension of the substrate is below that of the ink. In this case, use inks with lower surface tension for further testing.
- If the test ink does not contract within 3 seconds, the value of the surface tension of the substrate is higher than or equal to that of the test ink. Now use an ink with a higher surface tension for further measurements.
- Carry out this until you have the highest value of the test ink that just wets and the lowest of the test ink that no longer wets. The value of the surface tension of the surface is given as the highest surface tension value of the wetting ink. According to ISO 8296, this value should be verified by at least two further measurements.
- On some surfaces a kind of phase separation between an inner colored phase and an outer colorless phase can occur without them contracting at the edge. At first glance, this behavior appears to be a contraction of the ink; in fact, it is a question of wetting; i.e. the surface tension value is reached. This behavior can also occur with formamide-containing DIN / ISO inks.
- Subsequent cleaning (if necessary for downstream processes): The ink is readily soluble in water and short-chain alcohols. It is best to clean thoroughly with a dry paper or cotton cloth. Then use a cloth with 2-propanol or a mixture of 2-propanol / deionized water (50/50%) for further cleaning until the surface is sufficiently cleaned.

### 4. More information

#### Storage temperature:

Between 16 and 25 °C. At temperatures below 16 °C, individual values of the test inks can freeze out. Then leave the inks in a warm place, e.g. on a radiator, for a while until the liquid is clear again. The measurement result and the quality of the test inks are not affected by the temporary freezing. Never take measurements if there are crystals in the liquid. Keep container tightly closed. Protect from direct sunlight.

#### Processing temperature:

8 to 23 °C. Please note that different temperatures and roughness of the surface as well as electrostatic charges can influence the measurement result.

#### Durability:

When stored protected from light at 16 °C to 25 °C, it can be kept for at least 18 months. The test ink has a shelf life of at least 6 months from the date of opening. Please note that a single entry of foreign substances into the ink can noticeably change the surface tension of the test liquid. According to ISO 8296, if the inks are used frequently, they should be renewed every three months.