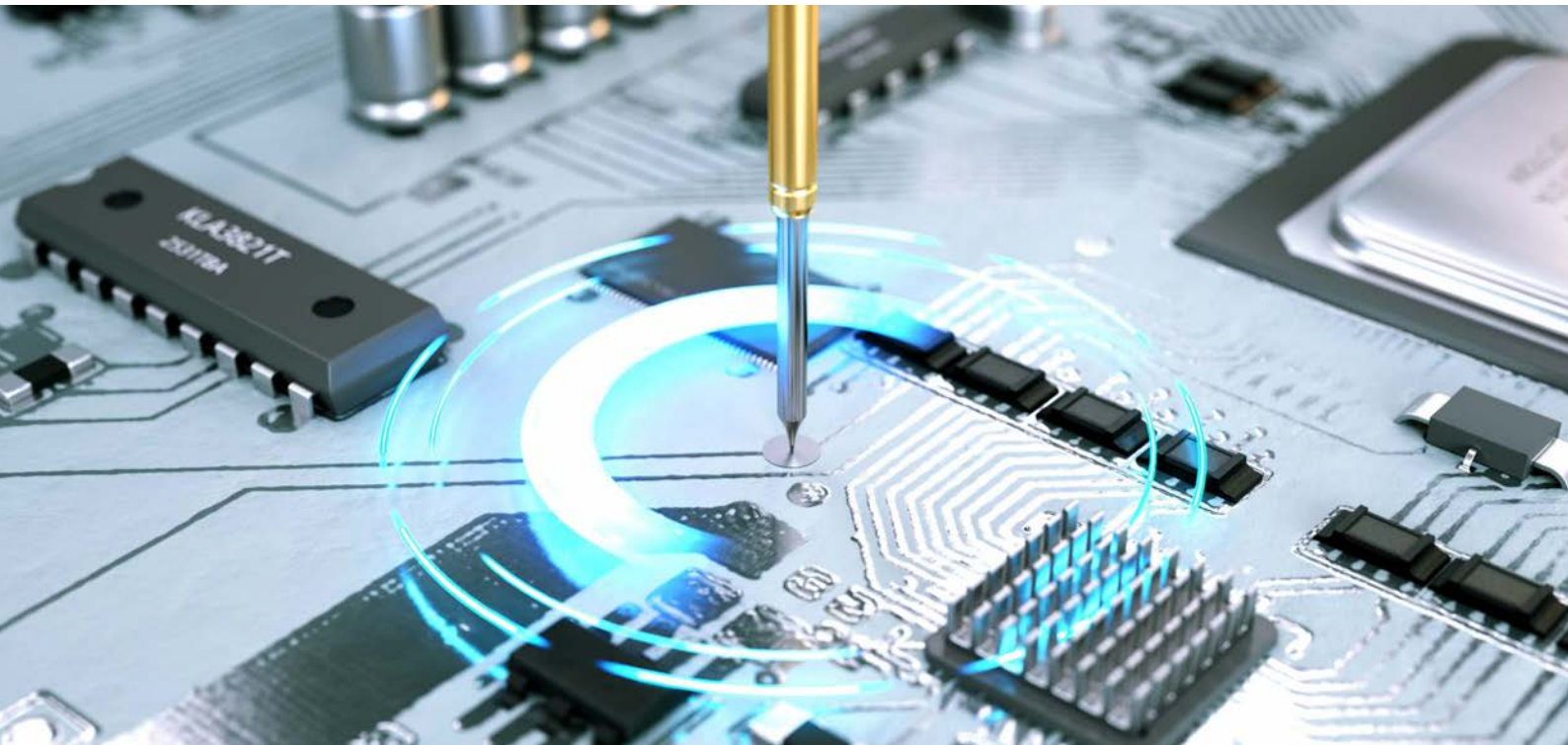




Whitepaper

Cleaning mats for the cleaning of test probes

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1. Abstract

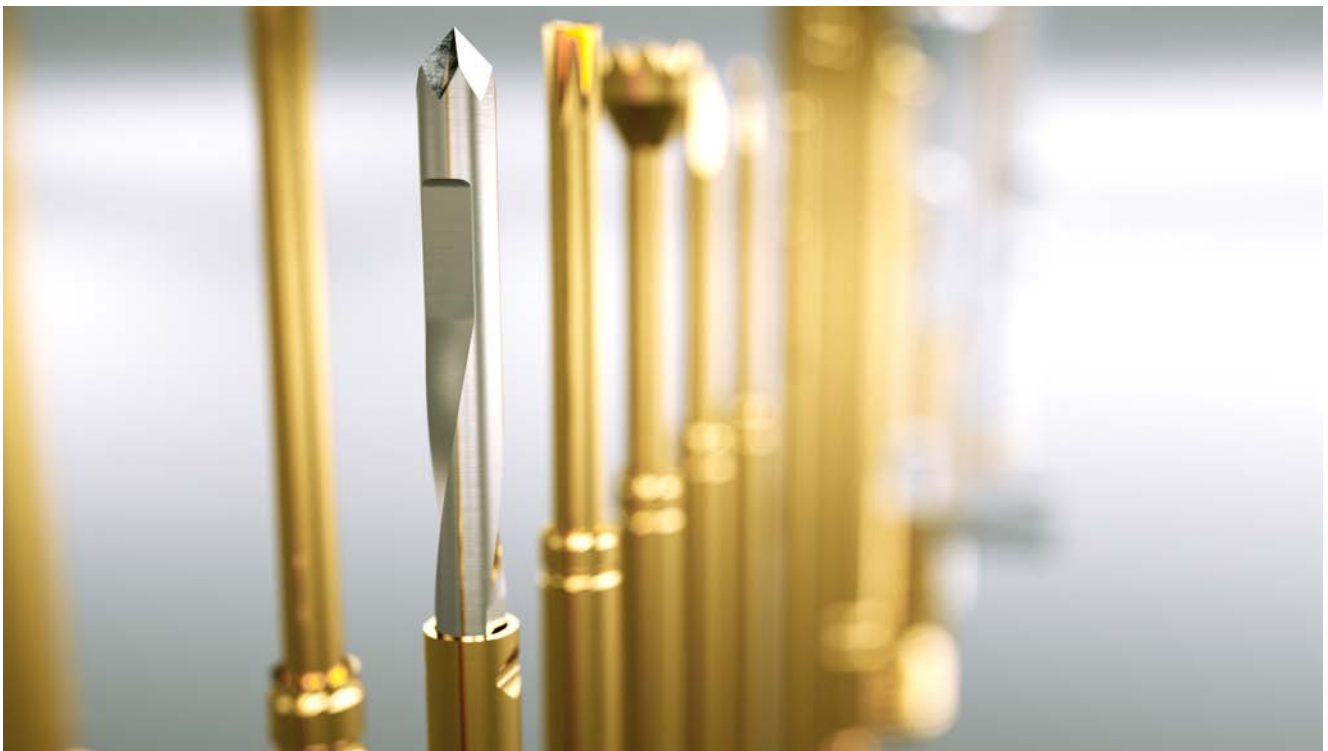
The INGUN cleaning mats are suitable for use with a wide range of test probes. These mats can easily be used in numerous applications for quick, easy maintenance of probes installed in test fixtures. Cleaning the plunger tips

is a simple measure which helps to prolong the service life of the test probes. This whitepaper features an overview of the INGUN cleaning mats and how they are used.

2. INGUN cleaning mats: definition

The INGUN cleaning mats are pre-cut pieces of material made of a robust silicon/quartz compound. This material provides the ideal amount of abrasion to remove contamination from test probe plunger tips without damaging the layer of plating (usually gold) on the plunger which ensures optimal conductivity. In addition, the contamination that is dislodged during the cleaning process permeates the surface of the mat and is absorbed. Once the maximum degree of saturation is reached, resulting in reduced

effectiveness of the cleaning process, the mat can be repositioned or turned over to provide a fresh cleaning surface. This durable product can be used multiple times (up to 1000 cleaning cycles in trials) before it needs to be replaced.



3. Tip styles suitable for use with INGUN cleaning mats

- INGUN cleaning mats are a particularly effective way to clean aggressive tip styles with sharp points. Such tip styles include 01, 09, 15, 31, 51, 77, 91, 93, 97, 98.

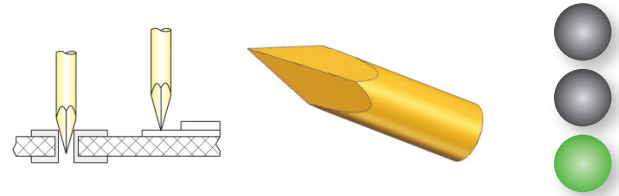


Figure 1: Cleaning mats work best on sharper tip styles

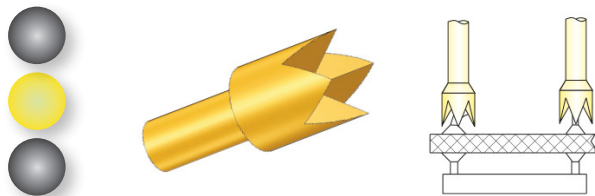


Figure 2: Cleaning mats can also be used to clean multi-point crown tip styles

- INGUN cleaning mats are largely ineffective when used with less aggressive, rounded tip styles, or those with inverse cone forms (02, 03, 05, 19, etc.). These tip styles can be effectively cleaned using cleaning brushes made from either fibreglass or brass.



Figure 3: Cleaning mats are not suitable for less aggressive tip styles

Please refer to INGUN's test probe catalogue for a comprehensive overview of available tip styles.

4. Product details

The INGUN cleaning mats are available in three thicknesses:

Version 1

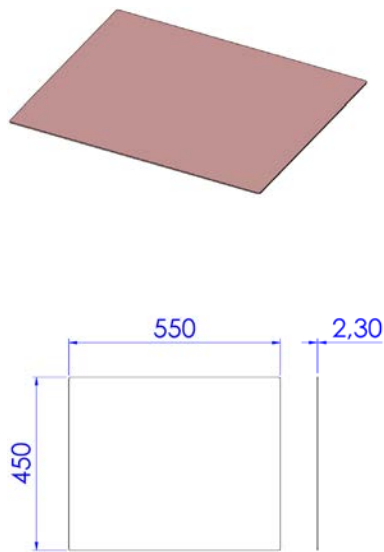
Mat thickness: approx. 2 mm

Part number: **112766**

Designation: **KRM-550-450-02**

Dimensions:

550 x 450 x 2.3 ±0.4 mm (W x D x H)



Version 2

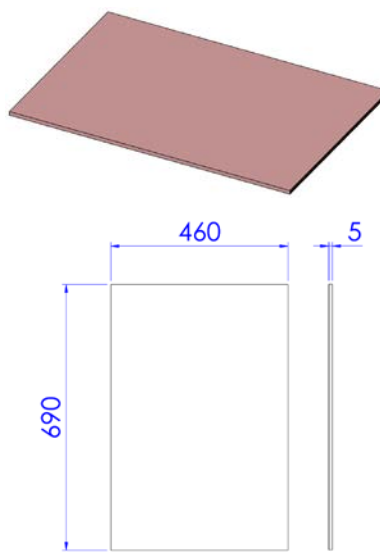
Mat thickness: approx. 5 mm

Part number: **113133**

Designation: **KRM-690-460-05**

Dimensions:

690 x 460 x 5 ±3 mm (W x D x H)



Version 3

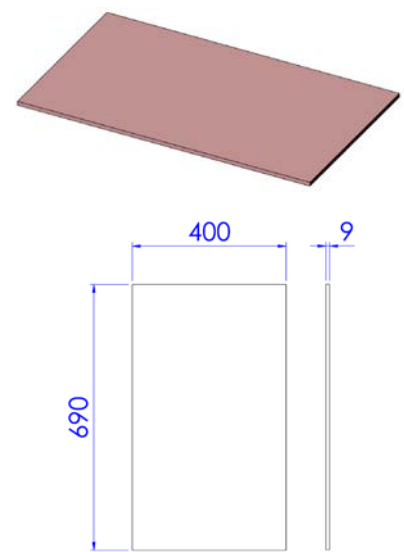
Mat thickness: approx. 9 mm

Part number: **56718**

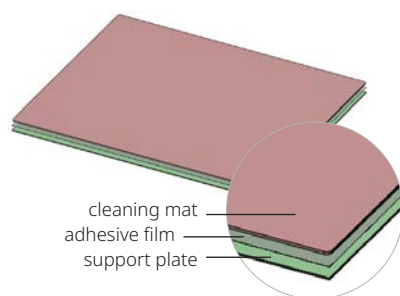
Designation: **KRM-400-690-09**

Dimensions:

690 x 400 x 9 ±3 mm (W x D x H)



Version 1 can be joined to a thin board stack with support plate to make ideal PCB dummies.



You will find additional information on our website:
<https://ingun.com/KRM-550-450-02/112766>

Part number: **56950**

Designation: **KRM-460-690-09**

Dimensions:

690 x 460 x 9 ±3 mm (W x D x H)

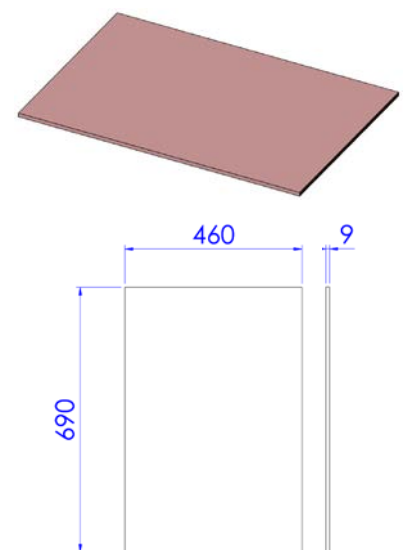


Figure 4: Cleaning mat dimensions (mm)

5. Instructions for use

Version 1

- The thin cleaning mat is affixed to a support plate. Both the support plates and the adhesive film can be purchased separately from INGUN.
- Create application-specific PCB dummies from the layered materials by using machining processes, such as milling or water jet cutting. If customisation accessories such as PCB supports and pushrods are used, holes for these must be cut out of the cleaning mat to ensure they meet the surface of the support plate. Further instructions for creating application-specific PCB dummies can be found in the customising instructions (INFO 4584).
- Remove the DUT or PCB from the test fixture and insert the application-specific PCB dummy.

Version 2 and 3

- If necessary, cut the cleaning mat to the size of the DUT/PCB.
- Remove the DUT or PCB from the test fixture and insert the cleaning mat.
- Please note that the test fixture cannot be completely closed, as there is a risk of fully compressing the test probe plungers and damaging them.

Version 1, 2, and 3

- The test probes installed in the test fixture do not have to be removed or readjusted. The probes can be cleaned regardless of whether they are installed for bottom or top contacting.

- Close the test fixture. This will press the tips of the probes' plungers into the cleaning mat.
- The specialised composition of the cleaning mats provides the ideal degree of abrasion to remove impurities from the test probes as they penetrate the mat.
- Depending on the severity of the contamination on the test probes, the probe tips should penetrate the mat between one and three times. In the case of severe contamination, more cleaning cycles can be performed in order to achieve an optimal cleaning effect.



Figure 5: Placement of the thin cleaning mat in a manual test fixture.

6. Optimum cleaning results

- Daily cleaning of heavily contaminated test probes is recommended. This can be done at the end of each shift, or before testing commences.
- Cleaning of test probes which are used less often, or which are only slightly contaminated, is recommended once a week.
- Regardless of regular cleaning, the test probe plating is subject to wear. Loss of conductivity or electrical performance as a result of the mechanical wear cannot be restored. This is an indication that test probes should be replaced.

Results of cleaning process:

Contaminated test probe, contacted on gold-plated PCB pads, after various cleaning stages:



Plunger tip after
0 penetration cycles



Plunger tip after
5 penetration cycles



Plunger tip after
10 penetration cycles

7. Use of cleaning mats in other applications

Cleaning mats can be cut to size using scissors, utility knives, or by using a punch, allowing the material to be used for a variety of applications. Cleaning mats can be used as in the probe field of the test fixture, as well as for inline system and in test sockets.

Detailed below is one example of cleaning mat material being used in an in-situ cleaning cell for battery test applications.

Spring-loaded probes are often used to determine weld-resistance on battery cells or to form or condition batteries. The applications here can be quite diverse and range from cylindrical cells to pouches to car-battery style form factors or solar batteries (SLA's).

One common theme is that even though the cells themselves remain reasonably clean, electrochemical processes, outgassing, and other factors can lead to probe tip contamination over time.

Some cells are tested, charged, and formed in a tray, others in an inline station, however, that is mainly for weld impedance testing and not for charging. Regardless of

whether cells are in a tray or an inline setup, the use of a dummy cell covered with a cleaning mat can help to automatically clean the probe tips periodically.

In this example, the dimensions of the cell were determined using calipers and step files then used to design a dummy cell to hold the cleaning mat in SolidWorks. Using an industrial 3D printer, the dummy cell was printed using durable plastic to withstand the test environment. Circular sections of cleaning mat were then cut using a vice and a hole punch and subsequently fitted into the cell.

This procedure can also be used for other applications.

For whole module testing, trace the outline of the module and place cleaning mat material in the areas where the connectors would be.



Figure 6: Making an in-situ cleaning cell using contact cleaning mats (1)



Figure 7: Making an in-situ cleaning cell using contact cleaning mats (2)

8. ESD compliance

Cleaning mat materials are typically not ESD compliant. If test applications feature highly sensitive ESD detectors, these should be disconnected before cleaning and the probes discharged with a dissipative/conductive path to ground before reconnecting to the tester.



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Further literature:

M. Zapatka and R. Ziser, "An introduction to coaxial RF probing solutions for mass-production tests," 2009 74th ARFTG Microwave Measurement Conference, Broomfield, CO, USA, 2009, pp. 1-6, doi: 10.1109/ARFTG74.2009.5439097.

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