

TLM-SCAN

Finger geometry

An optional second arm equipped with a microscope camera, white LED illumination and a contacting surface profilometer is a practicable low-cost alternative to confocal microscopy.

Finger width:

Our contour recognition algorithm increases the precision and helps verify that the margin of the fingers is properly identified.

Larger dimensions can be measured using the chuck positioning and a crosshair in the image.

Finger height:

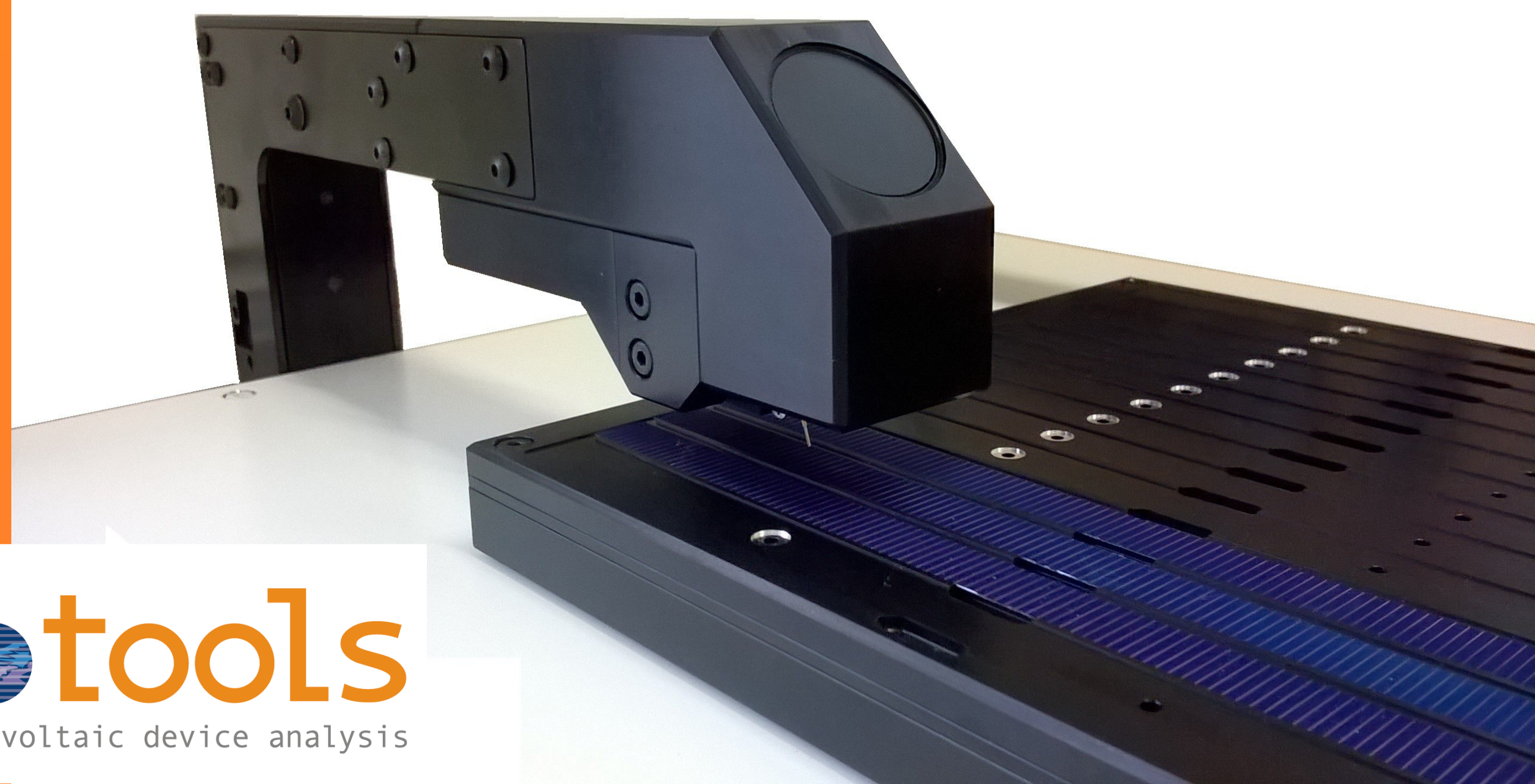
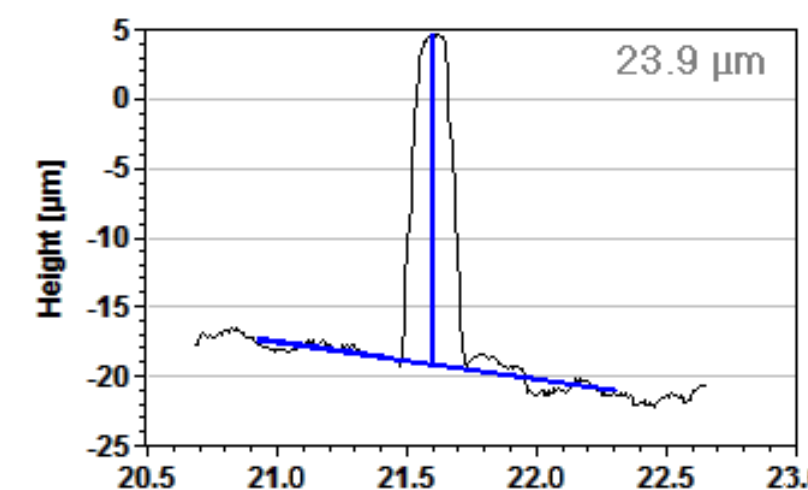
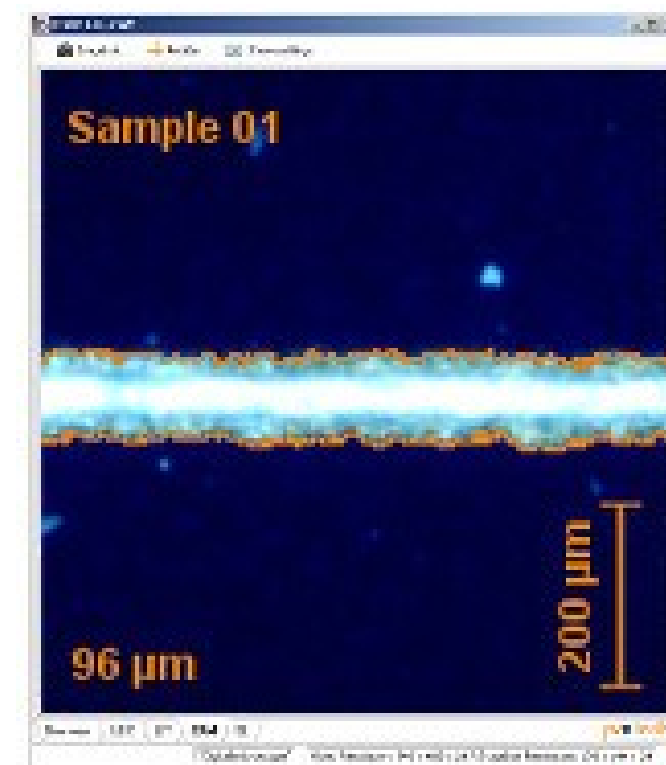
The surface topology is scanned with a stylus with a tip radius of 100 μm and a contact force of 10 mN. The maximum elevation is automatically evaluated and displayed in the graph. The range is 100 μm , the noise less than 50 nm.

Mappings:

The width and height can be mapped over the entire cell and displayed together with the TLM mapping.

Sequence:

Mappings of width, height and contact resistivity can be generated by pushing a single button.



TLM-SCAN+

Contact Resistivity Mapping & More

Methods:

- Contact resistivity
- Finger line resistance
- Finger width with microscope
- Finger height with surface profiler
- Wafer resistivity with four point probe
- Sheet resistance with four point probe

Highlights:

- Adjustable TLM probe head
- Mappings over entire solar cell
- Chuck for 14 stripes with separate vacuum

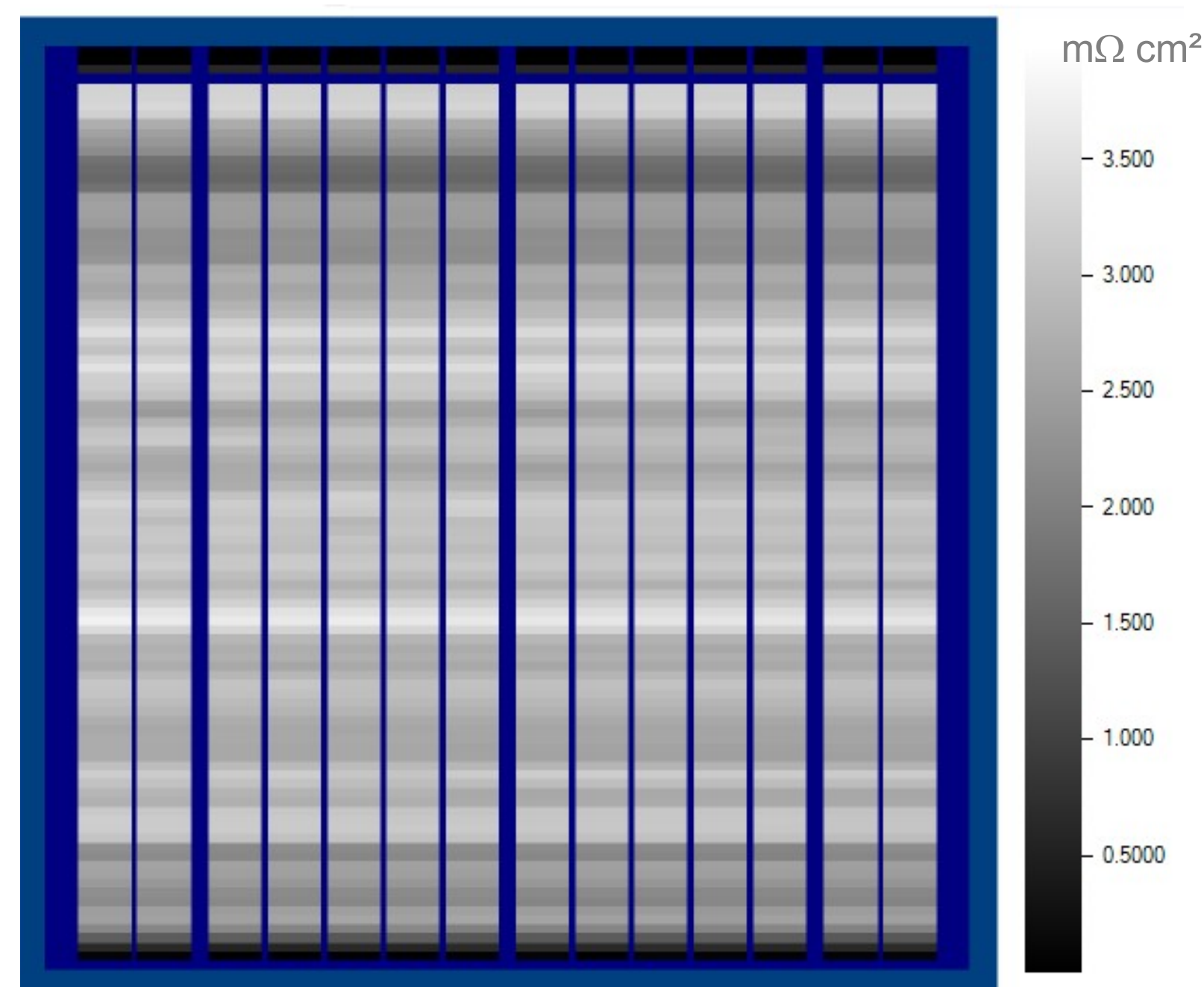


TLM-SCAN

Contact Resistivity Mapping

The transfer length method with a suitable test structure is the most accurate method to measure the contact resistance of the front metallization. However, the contact resistance may vary considerably over the solar cell such that a spatially resolved method to measure it on the finished solar cell is necessary. The TLM-SCAN creates mappings of the contact resistivity of a solar cell that is cut into stripes with a laser or a dicing saw.

Excellent repeatability:
Contact resistivity measured
14 times on the same stripe.



Adjustable probe head covers a range
of 0.6 mm between 1.2 mm and 3 mm



SPATIALLY RESOLVED:

- Mappings of all results over entire solar cell
- Single finger resolution

FAST:

- All combinations between 8 needle pairs measured in one second.

FLEXIBLE:

- Various probe heads for classical TLM test patterns and finished solar cells as well as for line resistance.
- Combination with other measurements
- Supports selective emitters

PRECISE:

- Resolution typically 0.2 mΩ cm²
- Uncertainty values reported
- Correction for shunts
- Correctly accounts for intermediate fingers
- Pin check to disregard fingers with invalid four-wire contact setting
- No light -related artifacts
- No reliability problems connected to relay-matrix

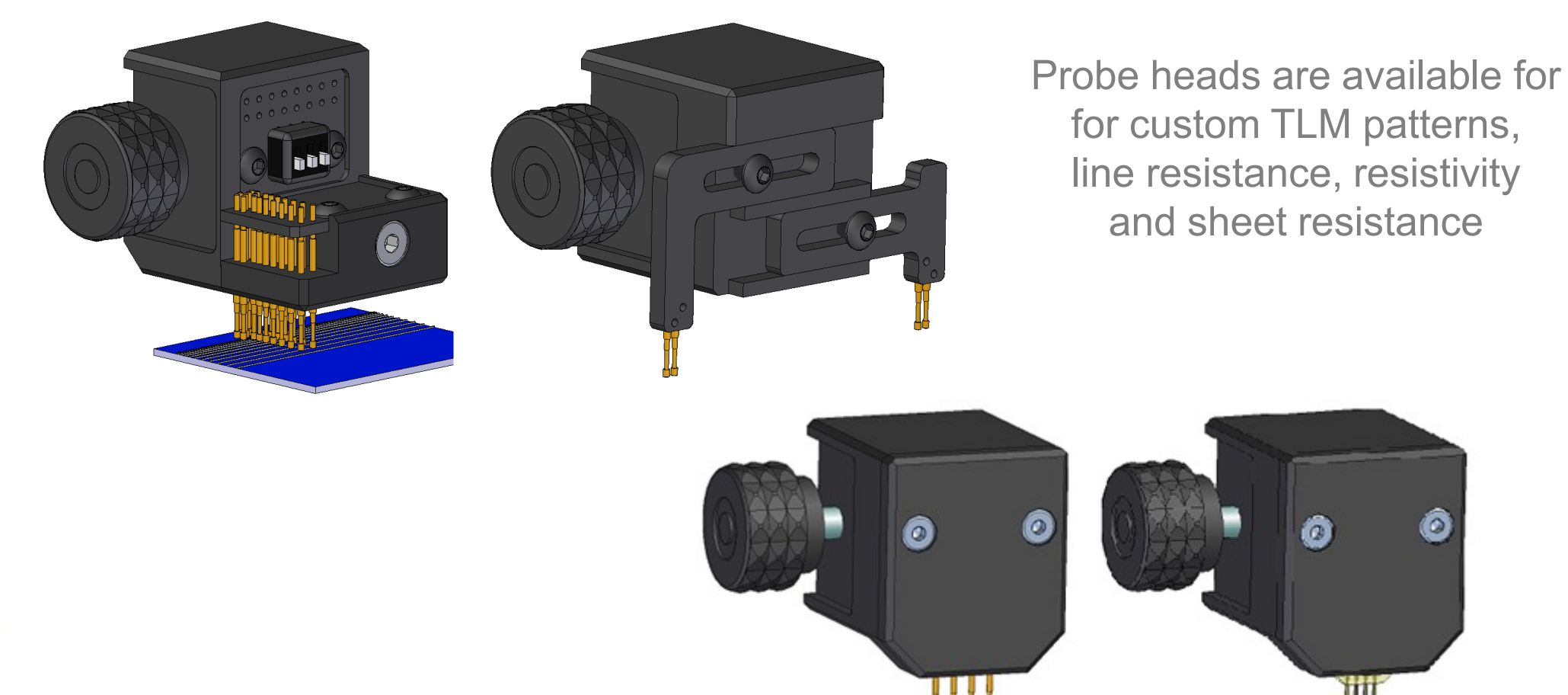


EASY TO USE:

- Change probe heads within seconds
- All settings stored in recipes
- Automatic position correction for best contacting quality
- Auto-start when lid is closed
- Probe heads recognized by software
- Batch mode for multiple TLM test patterns on one sample

DESIGNED WITH PASSION :

- Positioning and re-measuring single points by clicking on images
- Precise joy-stick position control
- Function buttons on machine and auto-numbering for operation without touching PC
- Assess and re-evaluate measurements from database on other PCs



Chuck for 14 solar cell stripes
with individual vacuum switches