Probe Station Manipulators

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KNOWLEDGE BASE FACT SHEET

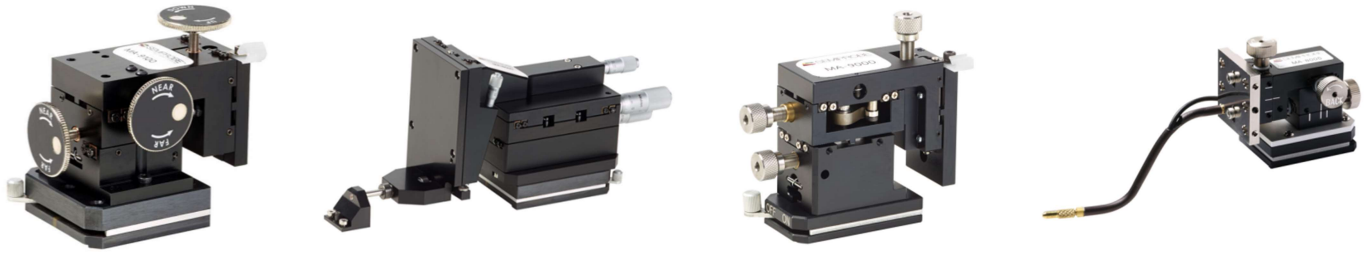
- SCOPE: An overview of probe station manipulators used on semiconductor wafer probing equipment.

Probe Station Manipulators, also referred to as micro-manipulators or micro-positioners, are one of the 6 main components that make up a wafer probe system. Into the manipulator the probe arm & tip are inserted, and it is the manipulator that positions these with the device under test. These devices really are crucial to the ability of the probe station to precisely test your device.

The manipulators are held in place by magnets, vacuum or in some applications fixed down by bolts. All manipulators are equipped with mechanisms to adjust the probe tip in three planes; X, Y & Z. In RF and optical setups, it is occasionally required that the micropositioners also have a roll adjustment to align the angle of the probe tip with the device. The manipulators allow the operator to have precise control over the position of the probe arms on the device under test.

Generally, micropositioners are moved into position by hand and then fixed in place, with thumbscrews, knurled knobs or micrometers used for the final precise adjustments. This whole process can, however, be automated through the use of programmable micropositioners, which are adjusted using the probe station control system, allowing for the development of fully automated solutions.

When selecting a manipulator for your wafer probe station, it is crucial to know the type of measurement taking place as this allows you to select the correct probe arm and tip. The length and weight of the probe arm will help determine the size of the manipulator that is best suited to your application.



Manipulators of different sizes with thumbscrews, knurled knobs and micrometers

Manipulators come in a range of sizes, with smaller micropositioners working well for simple DC measurements. As the frequencies involved increase, the cables and waveguides required get larger and heavier and so a more robust manipulator is then required.

The final point to note is the precision of the adjusting screws; this is measured in threads per inch (TPI). As the TPI increases, the fineness of the pitch of the thread increases, allowing more control and precise positioning. It will, however, slow down the throughput and coarse adjustments will take longer.

Probe Cards

If the number of manipulators required is greater than the number that can be accommodated on the platen (typically 8-12), then instead of manipulators a probe card will have to be used.

Probe cards come in a variety of types and sizes, and are customised to the testing application. A probe card with cantilevered probe tips is often used with a probe station. These tips protrude below the top surface of the card and make contact with the device under test.

The probes are mounted and soldered to a trace on a printed circuit board (PCB) and are suitable for use with manual, semi-automatic and fully automated probe stations. The PCB can be as simple or complex as is required for the test protocol and can allow for simultaneous multi-site testing on a single device.

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9 June 2020