



# Inseto

## Probe Station Wafer Chucks

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- SCOPE: A guide to wafer chucks for probe stations

Wafer chucks are used to hold wafers & die in place whilst they are being probed. Chucks can either use a mechanical clamp to hold the wafer in place, or apply a small vacuum from the backside of the wafer. The vacuum chuck is the preferred option in most applications.

Chucks come in a variety of sizes, materials and shapes depending on the wafer or die to be probed. Typically they are slightly larger than the size of the wafer and have concentric circular vacuum rings to allow them to hold multiple sizes of substrate.

Most chucks are made from aluminium and have nickel or gold plating, but some are manufactured from steel should the application require it. They will typically have flatness specifications that range from  $\pm 4 \mu\text{m}$  to  $\pm 8 \mu\text{m}$ .

It is standard practice for the chuck to be customised to the application, and so there are a great many types of chuck available to the operator when configuring their probe station. Examples include:

- Thermal chucks
- Double sided chucks
- High frequency/microwave chucks
- High voltage chucks
- Packaged part holders
- Lift pin chucks
- MEMS chucks



Standard Chuck



HF chuck



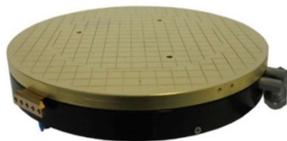
Double sided chuck



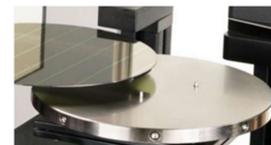
Thermal chuck



Packaged part holder



Thermal chuck with gold plating



Lift pin Chuck

### Thermal chucks

One very common requirement for chucks is the ability to heat or cool the substrate. This requires a thermal chuck, sometimes referred to as a "hot" chuck. Thermal chucks can cover a wide range of temperatures; a standard range is from ambient (room temperature) to 200°C. At higher temperatures such as 300 or 400 °C, the materials of the probe arms, platen and chuck adapters need to be considered carefully, to avoid exposing the operator to hot surfaces.

Thermal chucks with a cooling capability require a chiller and cooling fluid, as well as shielding from the ambient environment. A number of cooling fluids are available such as water, nitrogen, Galden or clean dry air (CDA).

### Localised environmental chamber

To shield a device from the ambient air and to be able to probe below the ambient temperature, a localised environmental chamber (LEC) is required. These are chambers which encompass the device under test and allow for the creation of a controlled frost-free, light-free and EMI-free environment. They must be designed to adapt and fit within the probe station and allow the manipulators and probe arms to move and test without restriction.

### Double sided chucks

Some applications require the device under test to be accessed from both the front and backside simultaneously. For these a double sided chuck is available. These chucks can be configured to have openings below to allow the wafer to be optically inspected, or to be contacted by a probe, as the test application demands.

### **High frequency chucks**

High frequency chucks are often manufactured to hold a wafer as well as two calibration substrates, or a calibration substrate and a contact substrate. They are provided with a vacuum manifold kit that provides independent vacuum control to three quadrants. These are designed to be used to test devices at high frequencies.

### **High power chucks**

These are designed specifically for use in high power probing systems. Voltages up to 3 kV or 10 kV with coaxial, triaxial or Kelvin connectors are typical. They are available in both ambient and thermal configurations.

### **Packaged part holders**

A variant from the standard flat chuck, a packaged part holder is a fixture that can hold packaged parts, substrates and printed circuit boards. They can also be used to hold wafer chucks, allowing a single system to perform testing of whole wafers and packaged parts.

### **Lift pin chucks**

Chucks with lift pins are used in fully automated solutions where the wafers are transferred by a robot arm. The lift pins allow for safe and repeatable material handling when raising the wafer off the chuck base. The pins can be mechanically, pneumatically or electrically driven to raise and lower the wafer or substrate.

### **MEMS chucks**

These are chucks which can be inclined in X or Y to allow probing of particular regions of the MEMS device, which cannot be easily accessed from above or below. They are also suitable for use within vacuum chambers.

Whatever the probing application or specific requirements of your testing needs, a chuck or custom solution will be available.