



Height measurement of wafer bumps

Computer chips are manufactured in large quantities on a wafer. On the chips there are countless small, spherical contact surfaces, so-called bumps. These must be of a uniform height in order to function properly when stacked later.

Up to now, the 50 to 350 μm small bumps are normally inspected by camera systems during production. The decisive disadvantage of this method is that only the presence or position is checked. The height can only be determined offline, by means of sections taken with a measuring microscope. Therefore, confocal chromatic sensors from Micro-Epsilon are used here.

These measure precisely on the shiny and structured surfaces of the computer chips. Thanks to the focused light spot, a high lateral resolution of around 4 μm is also achieved. By integrating three confocalDT IFS2405 sensors, the height is determined inline with micrometer precision. The sensors are positioned slightly offset above the wafer.

This generates three tracks on one bump. A central crossing is not required. From the three tracks, both the spherical shape and the height can be calculated exactly. This is possible because three controllers are connected via Ethernet and trigger input to perform a synchronous measurement. In addition, the encoder value of the motion unit is fed in. The calculation and evaluation is performed by the customer in external software.

In order to be able to measure the large number of chips and thus also the bumps in the shortest possible time, Micro-Epsilon sensors offer an extremely high measuring rate of 50 kHz.

Requirements for the measurement system

- Measurement on reflective and structured material
- Very fast measurement at 50 kHz
- High resolution of 100 nm
- Linearity < 1 μm

Ambient conditions

- Semiconductor manufacturing: Clean environment (clean room but no vacuum)
- Constant room temperature

System design

- Controller: IFC2471
- Sensor: IFS2405 with 1 mm measuring range
- Cable: C2401 with 3 m length

Advantages

- Automated inline measurement saves time and increases throughput
- Fast reaction and influence on process reduces scrap
- High measurement speed and precision enables 100 % control