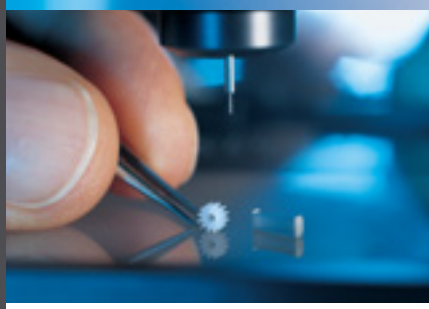
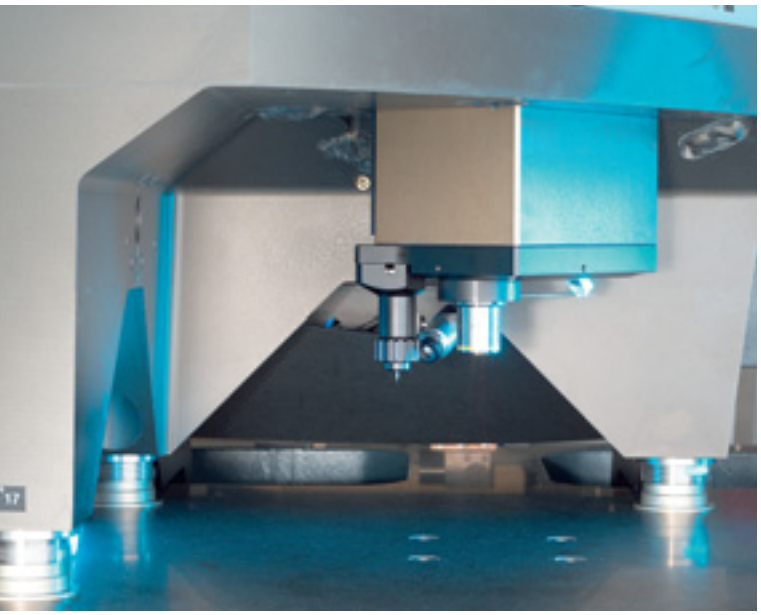
# F25
# Measuring Nanometers

- Ultra-precise kinematics
- Miniature touch stylus
- Multi-sensor system

We make it visible.

# Smallest Parts – Maximum Precision



**Micro-motors, micro-switches and precision components are showing up in more and more areas of our lives. Their reliability depends on their quality which is defined by measuring. With its intricate parts, micro-system technology is the challenge facing touch or optical measuring. Extremely small dimensions and different forces exist here; other principles apply.**
**With the F25, Carl Zeiss has developed a coordinate measuring machine capable of measuring micro-system components.**

## Overview

3D coordinate measuring machines supported on air bearings with a measuring volume of one cubic decimeter. The ultra-precise kinematics combined with the highly accurate measuring system enable measuring uncertainty of 250 nanometers at a resolution of 7.5 nanometers. Using minimal probe forces, this resolution, along with optimum control of the linear drives, enables touch measurements even in bores less than one millimeter in diameter.

### Touch scanning sensor

A touch, passive measuring stylus was developed based on a 6.5 x 6.5 mm silicon chip membrane and integrated piezo-resistive elements. The stylus permits measurements in both single point and scanning mode.
The 3D micro-stylus is designed for stylus diameters of 50 – 500 micrometers and stylus tip diameters of 100 – 700 micrometers. With a free shaft length of up to 4 mm, it is possible to measure in small, deep-lying structures with probe forces of less than 0.5 mN/µm.

### Optical sensor

The ViScan camera sensor from the standard program, combined with an objective lens based on those used in Zeiss microscopy, is used as an optical sensor for 2D measurements. These optics, which are optimized for depth of field and have minimized distortion, ensure accurate measuring results with maximum resolution in reflected and transmitted light.

### Multi-sensor system

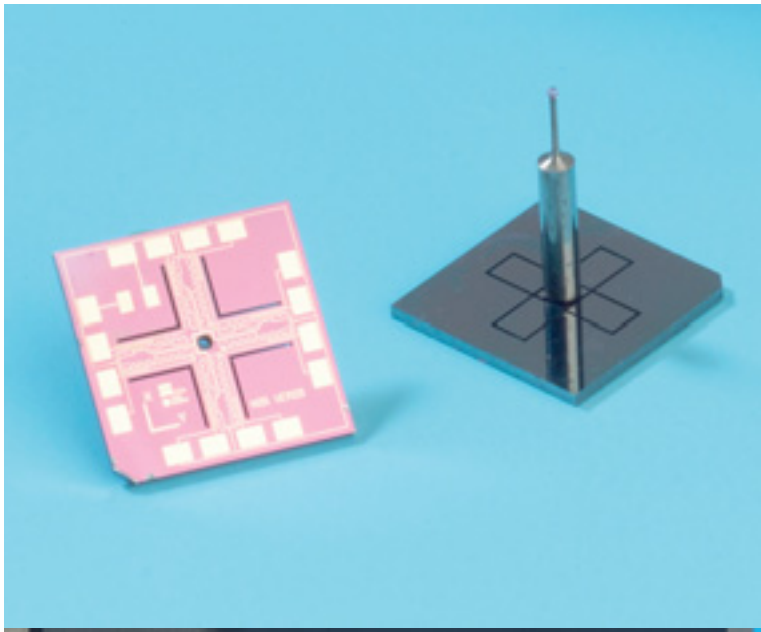
The combination of touch and optical sensors enables measurements of 2D and 3D structures in the same coordinate system. An additional camera aids visualization when probing the miniaturized features, thus simplifying part programming.

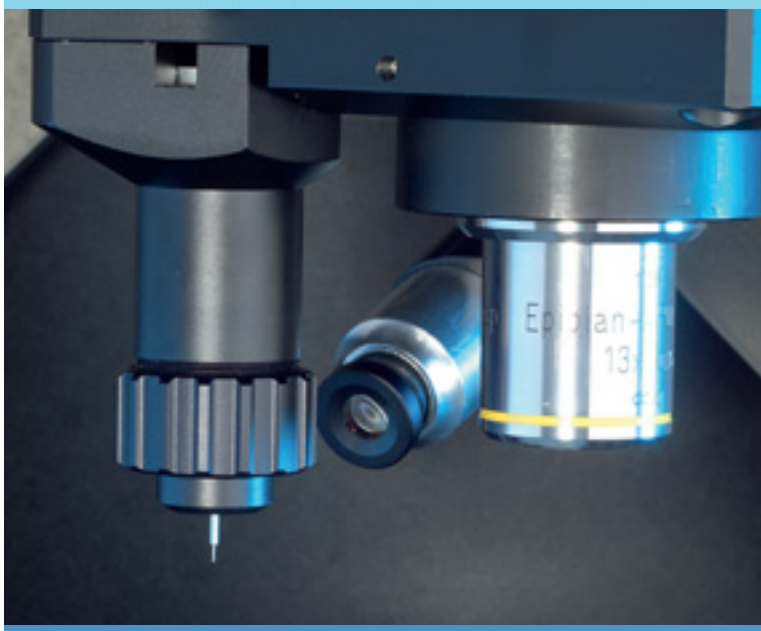
### Software

Time-tested CALYPSO from Carl Zeiss enables you to evaluate captured data using standard measuring software with an intelligent user interface that can also be used on all other coordinate measuring machines.

### Range of applications

- Rotation symmetrical parts with freeform surfaces, small radii, undercuts
- Prismatic parts with small and deep bores
- Flat metal parts with low form stability
- 2D parts with bores and cut-outs





## F25 description

| | |
|---|---|
| **Kinematics** | Highly accurate, air-bearing kinematics with linear drives and base with active air damping |
| **Measuring systems** | Ultra-precise, incremental length measuring systems with glass-ceramic scales in all machine axes with a resolution of 0.0078 µm |
| **Touch sensor system** | Highly accurate silicon stylus kinematics with integrated sensor system and resolution of 0.001 µm including flexible changer |
| **Optical sensor system** | |
| Camera system for image analysis | S/W CCD camera (based on ViSCAN) |
| Illumination | Reflected light LED ring (orange 605 nm)<br>Transmitted light Light table white |
| Optical system | Highly accurate lens with 13x magnification, 17 mm working distance |
| Observation camera | Single lens with focus on the touch sensor system S/W CCD camera |

## F25 measuring ranges, dimensions, weight

| **Measuring range** | Touch | Optical | Touch and optical |
|---|---|---|---|
| X [mm] | 135 | 135 | 100 |
| Y [mm] | 135 | 135 | 100 |
| Z [mm] | 100 | 100 | 100 |

| | |
|---|---|
| **Dimensions** (W x H x D) | approx. 1650 x 1450 x 2000 |
| **Max. workpiece weight** | up to 5 kg |
| **F25 weight** | 600 kg |
| **Weight of base** | 150 kg |

## F25 accuracy

| | |
|---|---|
| **Solid state joint probe**<br>Linear measuring tolerance<br>MPE complies with DIN EN ISO 10360-2<br>L* = measuring length in mm | for E (µm) at 19.5 – 20.5 °C (67.7 – 68.9°F) 0.25 + L*/666 |
| **Probing tolerance**<br>MPE complies with DIN EN ISO 10360-2 | for P (µm) 0.25 |
| **ViScan (Optical image analysis)**<br>Probing tolerance<br>Complies with VDI 2617-6 | R2 (µm) 0.4 |
| **Acceleration** | 300 mm/s$^2$ per axis |
| **Travel speed** | 20 mm/s per axis |

## F25 Ambient conditions

| | |
|---|---|
| **Humidity** | 40% (+59°F) to 60% (86°F) |
| **Ambient temperature for operational readiness** | +15 °C (+59°F) to +30 °C (86°F) |
| **Temperature conditions to guarantee specifications** | Complies with measuring lab class 1 in accordance with VDI/VDE 2627 |
| Ambient temperature | 20 °C (68°F) ± 0.5 K |
| Temperature gradient | 0.2 K/h 0.4 K/d 0.1 K/m |

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