MICRO-EPSILON

More Precision

reflectCONTROL RCS3500-300 3D-Wafer-Warpage

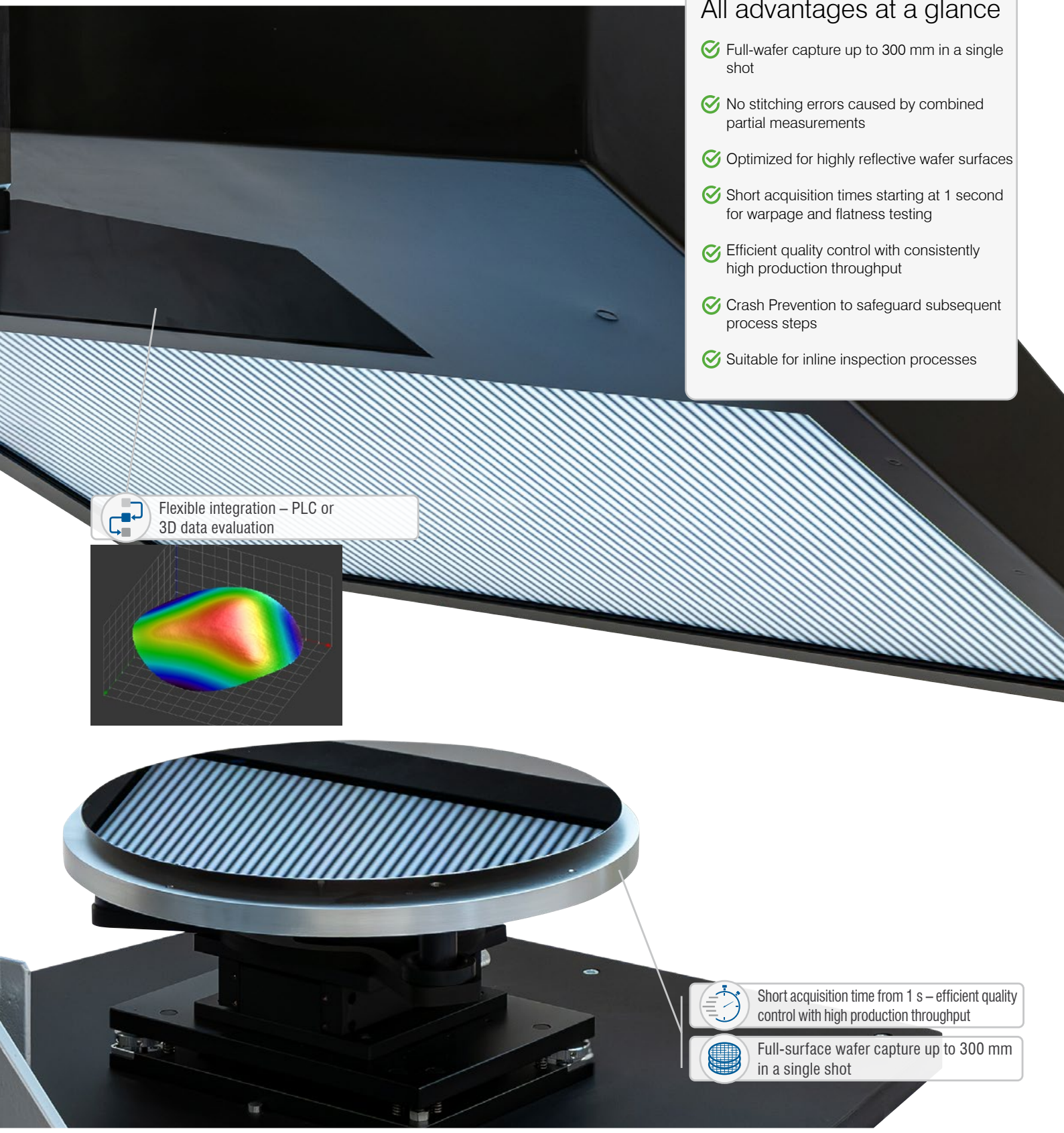


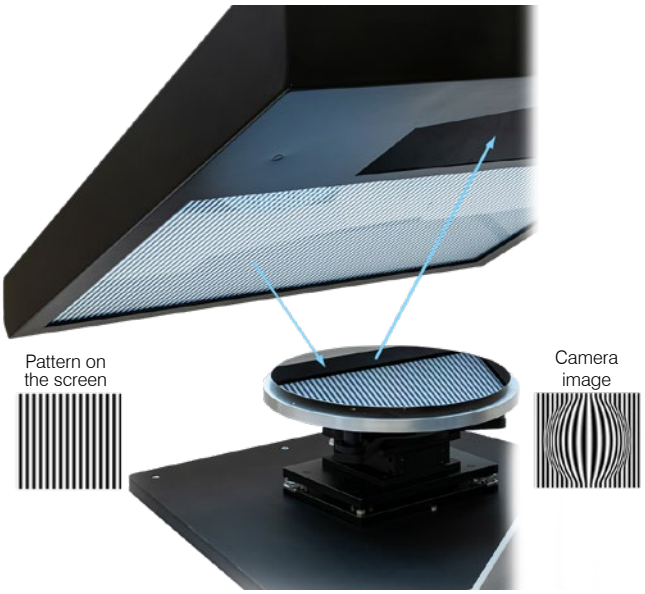
Sensor for precise 3D wafer warpage and flatness testing
reflectCONTROL RCS3500-300 3D-Wafer-Warpage

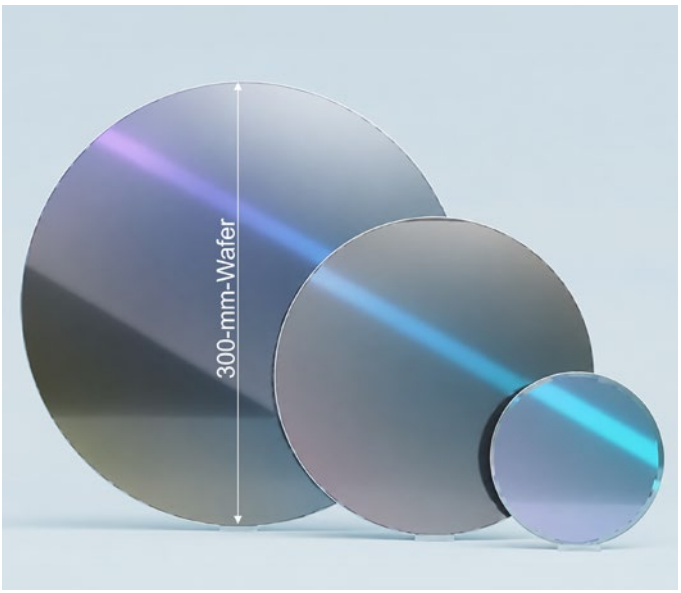
The reflectCONTROL RCS3500-300 enables fast, non-contact 3D measurement of wafers with a diameter of up to 300 mm. The entire wafer surface is captured in a single shot and precisely inspected for warpage, bow, flatness, and local deformations. Deviations can therefore be detected at an early stage, before they affect subsequent process steps. Short acquisition times enable efficient quality control with high production throughput.

All advantages at a glance

- Full-wafer capture up to 300 mm in a single shot
- No stitching errors caused by combined partial measurements
- Optimized for highly reflective wafer surfaces
- Short acquisition times starting at 1 second for warpage and flatness testing
- Efficient quality control with consistently high production throughput
- Crash Prevention to safeguard subsequent process steps
- Suitable for inline inspection processes







Deflectometry measuring principle

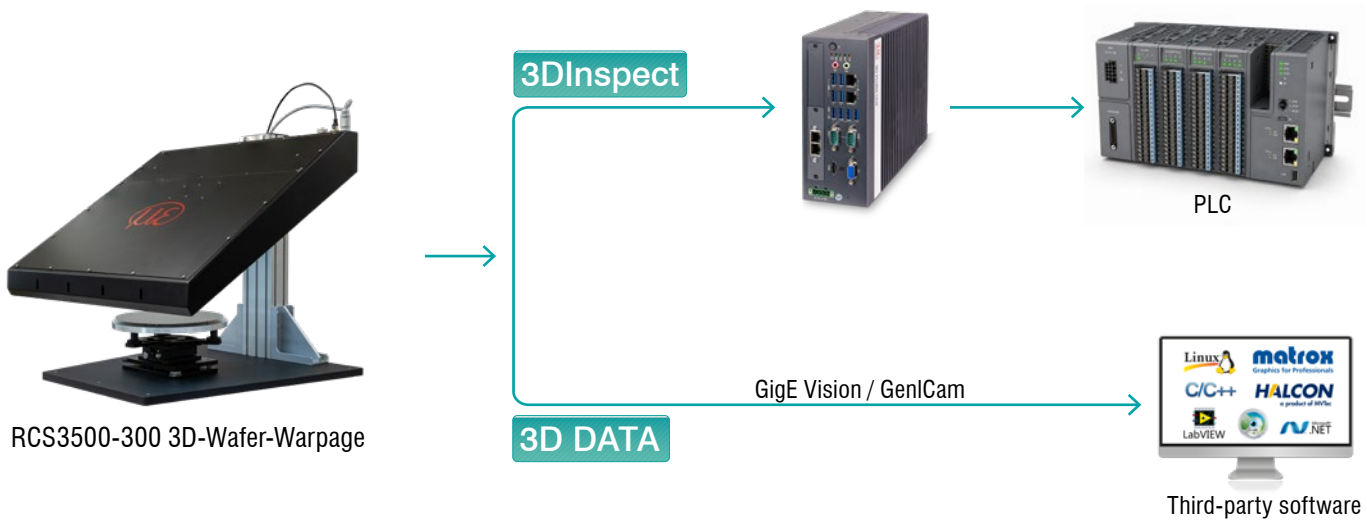
The measuring principle is based on phase-measuring deflectometry. Deflectometry specifically uses the reflective surface of the wafer for measurement. A striped pattern is displayed on a screen and mirrored on the wafer surface to be examined. Two cameras capture and reconstruct the wafer topography with high precision based on the distortion of the reflected pattern. The captured image data is used to generate a 2D phase image and a high-resolution 3D point cloud.

Full-surface 3D measurement of wafers up to 300 mm

The reflectCONTROL RCS3500-300 3D-Wafer-Warpage inspects wafer topography, in particular of unstructured wafers, and enables a reliable determination of whether the wafer should be approved for the next process step or rejected. Within the standard measuring range, the sensor captures the entire surface of a wafer up to 300 mm, non-contact and full-surface acquisition with a single shot. This results in a consistent 3D data set without mechanical scanning and without stitching of multiple partial measurements. Overlap, axis, or stitching errors are avoided, while warpage, bow, flatness, and local deflections can be evaluated quickly and reliably.

Customer integration or evaluation via 3DInspect – the choice is yours!

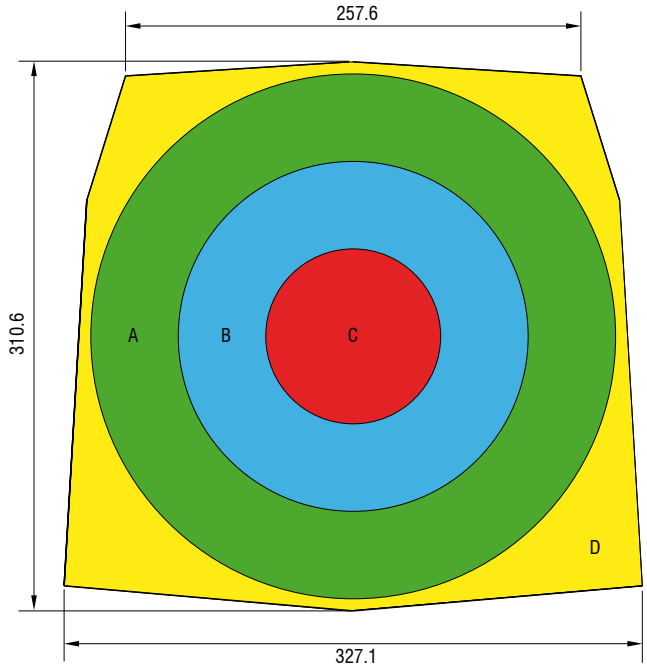
For customer-side integration, the measurement data is provided via GigE Vision / GenICam. Using the Micro-Epsilon 3D SDK, the data can be flexibly integrated into customers' own image processing and automation environments and further processed there.
Alternatively, 3D analysis can be performed directly using 3DInspect on the Industrial Performance Unit (IPU) or on a customer's PC.



Sensor for precise 3D wafer warpage and flatness testing
reflectCONTROL RCS3500-300 3D-Wafer-Warpage

Model		RCS3500-300 3D-Wafer-Warpage
Measurement area [1]	Standard x, y [2]	300 mm diameter
	Extended x, y	327.1 x 310.6 mm
Working distance	Standard z	370 ±0.5 mm
	Extended z	370 ±5 mm
Flatness deviation [3]		1 µm
Resolution	x, y	up to 200 µm
Acquisition time		typ. 1 s ... 2 s
Processing time		typ. 2 s ... 3 s
Light source		LED screen
Supply voltage [4]		24V DC
Power consumption		< 150 W
Digital interface		Gigabit Ethernet (GigE Vision / GenICam)
Connection		RJ45 socket for GigE Vision (in/out); RJ45 socket for Ethernet (in/out); 4-pin. Lemo socket for power supply
Temperature range	Storage	-10 °C ... +60 °C
	Standard	+18 °C ... +24 °C
	Extended	+10 °C ... +40 °C
Humidity	Standard	40 % ... 50 %, non-condensing
	Extended	15 % … 75 %, non-condensing
Material		stainless steel
Weight		< 30 kg
3D sensor SDK		Micro-Epsilon 3D sensor SDK
3D evaluation software		Micro-Epsilon 3DInspect
Special features		Stainless-steel housing; version with integrated controller and passive cooling; no moving parts in the sensor

[1] Dimensions are based on the standard working distance (z). For the exact dimensions of the extended measurement area, please refer to the drawing (area D).
[2] The wafer must be positioned to within ±2 mm in x and y.
[3] This specification was determined under the following conditions: SN 26030902, vibration-isolated measurement setup. After calibration, the relative humidity varied between 37.1% and 41.3%, and the temperature between 22.1 °C and 22.3 °C. Measurements were taken in measurement area B using a 300 mm λ/10 mirror.
Without averaging or filtering, 99.86% of the 2,199 flatness measurements taken over a period of 72 h were below 1 µm.
[4] Must not exceed 26 V.



Standard measurement area (A); extended measurement area (D)

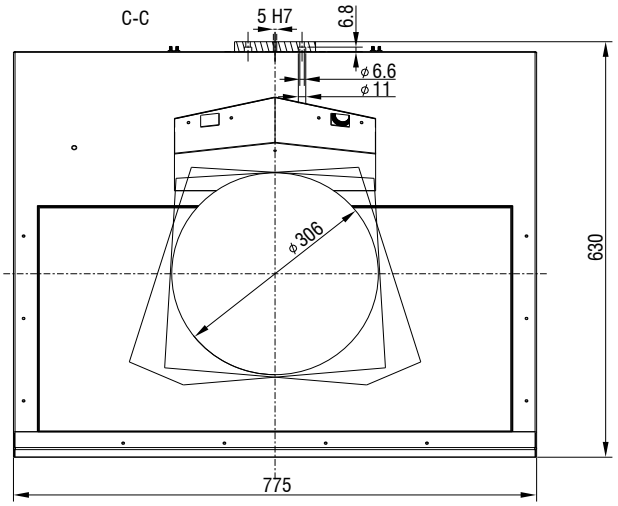
Flatness deviation (PV)

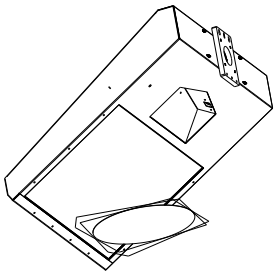
RCS3500-300 3D-Wafer-Warpage (Serial No.: 26030902)

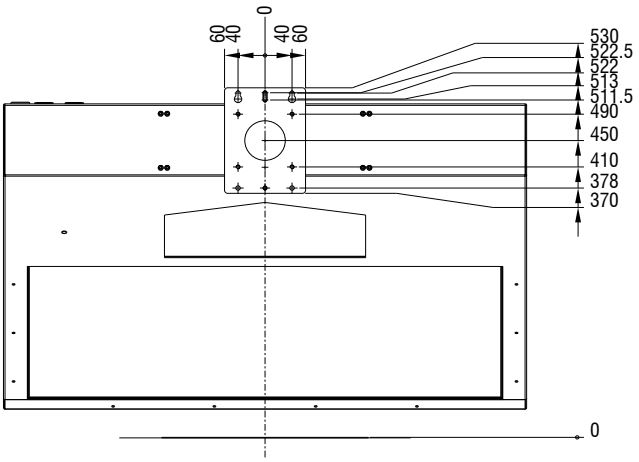
	Measurement area x, y		
Working distance z	300 mm (A)	200 mm (B)	100 mm (C)
370 ±0.5 mm	1.87 µm	0.69 µm	0.21 µm
370 ±3 mm	2.60 µm	1.04 µm	0.25 µm
370 ±5 mm	4.94 µm	2.16 µm	0.48 µm

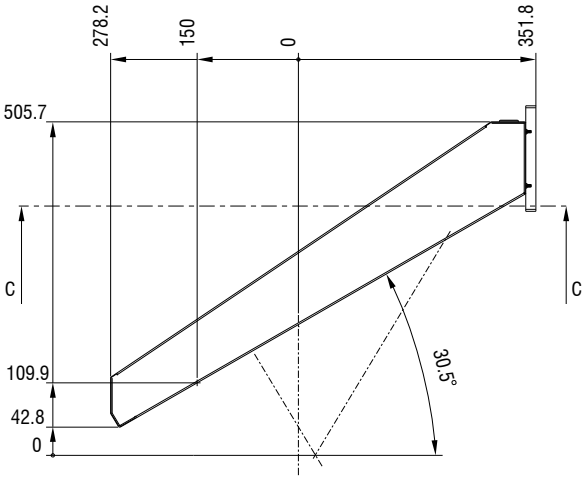
The values shown are intended to illustrate the influence of measurement distance and measuring field size on measurement accuracy. They were determined under ideal conditions and do not take into account manufacturing-related variations or deviations under real operating conditions.

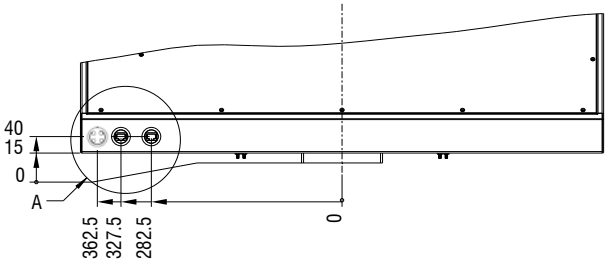
Dimensions:

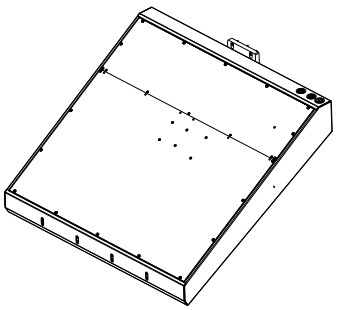


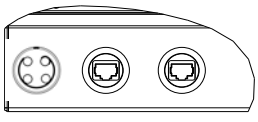












A

(dimensions in mm, not to scale)

Accessories
reflectCONTROL RCS3500-300 3D-Wafer-Warpage

Supply cable ECR3500-5
Article number: 29011849

Power supply cable for drag chains and robots
4-pin plug to open ends
Cable length: 5 m

Reference mirror with holder (optional)
Article number: 4351008

To perform a measurement with maximum precision, it is necessary to calibrate using a reference mirror. This adapts the measuring system to the current measurement environment. The reference mirror has a mirror surface with a diameter of Ø320 mm and a surface flatness of λ/10. When closed, the reference mirror holder has overall dimensions of 491 x 396 x 70 mm.

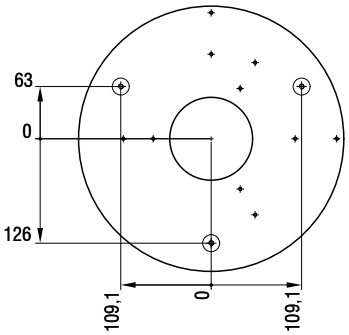


3-point wafer support for RCS3500-300 (optional)
Article number: 4351010

The adapter plate with three positioning pins ensures optimal support for the wafer while minimizing the contact area. The spatial position (the Z-plane as well as the tilt in the X and Y directions) is precisely defined mathematically by the three fixed points and is therefore reproducible at any time.

Dimensions of 3-point wafer support without positioning pins:
ø320 x 47.2 mm





Laboratory setup (optional)
Article number: 4351009

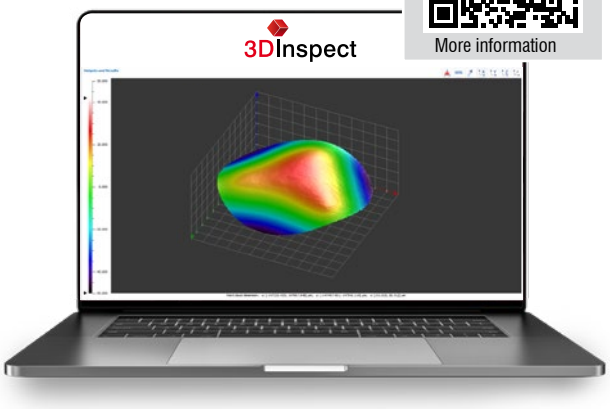
An optional laboratory setup for near-line or at-line measurements offers a high degree of flexibility and control right on the production line. The package includes a base plate with a lifting and tilting table, as well as a column for mounting the sensor. The sensor itself is not included. The laboratory setup allows for the precise and rapid positioning and alignment of the reference mirror holder and wafer support within the measurement plane.
The 2-axis kinematic tilt table offers a tilt angle of ±0.7° / ±0.6° with dimensions of 160 × 220 mm. The lift table has a stroke of 10 mm and measures 125 × 125 mm. The laboratory setup, including the mounted sensor, has overall dimensions of 780 × 775 × 708 mm (H × W × D). The dimensions listed include the connector and the cable outlet.



Sample image showing the sensor installed

Software for surface inspection and 3D measurement
3DInspect

More information



3DInspect
Powerful software for 3D measurement and inspection tasks

3DInspect is powerful software for industrial measurement and inspection tasks. The 3D measurement data transmitted via Ethernet are processed, evaluated, and automatically assessed in the software based on defined criteria. Measurement results can be visualized, logged and, if required, output directly to a machine or line PLC. In addition, both the measurement results and the complete 3D data can be saved for documentation and later analysis.

3DInspect with reflectCONTROL
The 3DInspect software supports RCS3500-300 3D-Wafer-Warpage and RCS130-160. Defect detection in 2D images is also possible with reflectCONTROL sensors. Both sensors require an external computing unit for evaluation.

Advantages at a glance

- User-friendly interface – easy creation of measurement programs
- Automated inline evaluation with 3DInspect on the Industrial Performance Unit
- Wide range of predefined programs for 2D & 3D geometry measurements and surface inspection
- Logging and storage of 3D data directly in the software
- Valid3D – Real 3D instead of only 2.5D enables a true representation of the measuring object without data loss
- Parameterization of fieldbus integration via automation interface

Functional extensions
Optional functional extensions allow the functionality to be tailored specifically to the application. The following functional extensions are available for reflectCONTROL:

Functional extension: Automation
The Automation extension enables the base software to be controlled via the PLC. Data and measurement results can be exchanged bidirectionally between the software and the control system.

Functional extension: Surface inspection
The Surface inspection extension enables reliable detection of deviations from a homogeneous surface. Tools such as Digital Stone, Digital Master, and defect detection with sorting and counting options are available from 3DInspect 3.1 onwards.

Optional accessories

More information



Industrial Performance Unit
Article no.: 6414160
The Industrial Performance Unit (IPU) is a high-performance computing platform for evaluating 3D data:
- Solving 3D measurement tasks
- Full compatibility and inline capability for customer applications
- Intuitive 3DInspect software with Valid3D technology
- Efficient commissioning of Micro-Epsilon sensors
- Industrial-grade hardware with passive cooling
- Integrated interfaces: Modbus/TCP, EtherCAT, PROFINET, EtherNet/IP

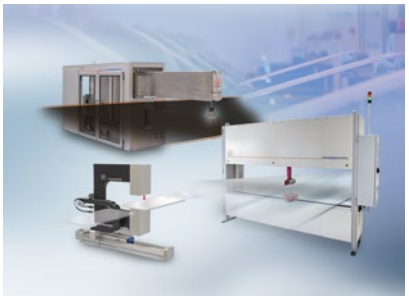
Sensors and Systems from Micro-Epsilon



Sensors and systems for displacement, distance and position



Sensors and measurement devices for non-contact temperature measurement



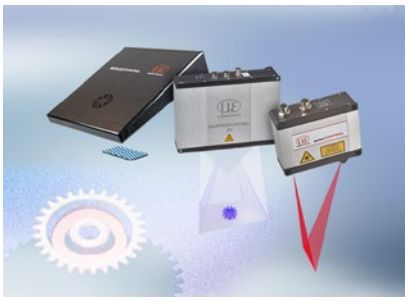
Measuring and inspection systems for metal strips, plastics and rubber



Optical micrometers and fiber optics, measuring and test amplifiers



Color recognition sensors, LED analyzers and inline color spectrometers



3D measurement technology for dimensional testing and surface inspection

Änderungen vorbehalten / Y9761963-A012106LDI

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