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Glass-thickness-sensor CAS

Sensor head for highly accurate distance and thickness measurement with large working distance for rough and polished surfaces with numerous possibilities of use like glass thickness measurement, 3D-flatness measurement, wafer thickness measurment

1. The measuring head

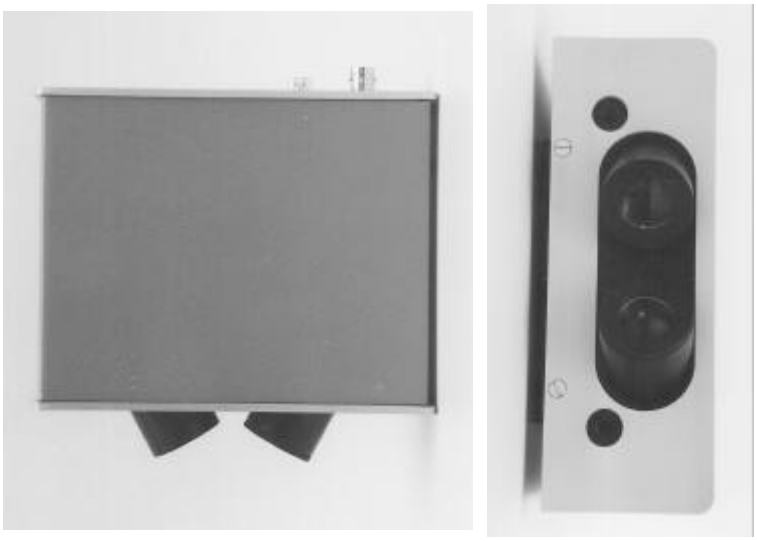

Fig.1: Side- and front view of the CAS - sensor

The measuring head contains a laser, a projection objective, a measuring objective, a miniature CCD-matrix camera with 440.000 Pixel resolution.
The standard version CAS-30/30 uses a symmetrical beam, which optical axis of the projection and of the measuring objective form with the surface-normal of the surface both an angle of 30 degree. A shift of the specimen surface in measuring direction (dz) causes a shift of the measuring signal on the CCD matrix around the way dx. The way dx is measured with subpixel resolution by the image processing system. By help of a highly accurate calibration a resolution of 0,1 micron can be reached with a free work distance of 22 ± 5mm.

2. Evaluation of the measuring signal

The image processing system COMEF_CAS consisting of software, PC and frame grabber is used for data akquisition and –evaluation.
The software is very comfortable and easy to use. The measured values can be both sequentially displayed and stored in freely configurable protocols. The calibration of the measuring system can take place via the user. The evaluation software is adapted special to the application in connection with the CAS distance sensor and supplies by its efficient algorithms for the highly exact determining position of objects highly exact results of measurement.

3. Technical data of CAS-30/30 sensor

Size:	(155 x 55 145) mm
Weight:	400 g
Free working distance:	22 ± 5 mm
Power supply:	extern, 5V and 12V DC
Working distance:	670 nm
Measuring time:	depending from PC, measuring field and Choosed filters between 0,1 and 0,5 seconds

	Polished surfaces	Rough surfaces
Resolution	0,05 µm	0,1 µm
Accuracy in every 100 µm measuring range	±0,2 µm	±0,25µm

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Accuracy over the whole measuring range	±0,5 µm	±2µm
Measuring range	800 µm ±400 µm	600 µm ±300 µm

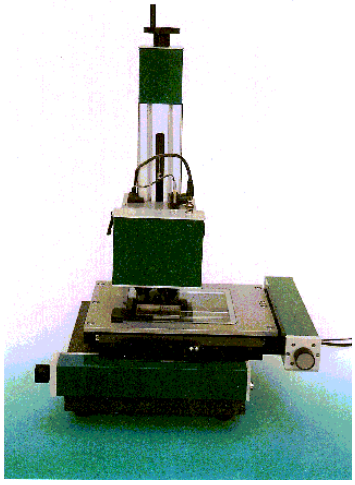
4. Possible applications

1. Thickness measurement on silicon wafers

The measuring head is mounted hight adjustable to a measuring stage. A suitable construction guarantees a defined position of the specimen for the avoidance of measuring errors. A sample (master) is needed, to which all further measurements are referred. The device displays the thickness deviation of the specimen opposite the master with the indicated measuring accuracy.

2. Thickness measurement on thin, transparent specimens

If thin transparent and polished samples are measured (glass substrates, plastic foils), two measuring signals are resulting, which are due to the front and rear side. The distance of the signals on the CCD chip results from refractive index, thickness and angle conditions of observation path of rays and lighting. After calibration with a mechanically measured sample of same refractive index the thickness of further samples can be measured contactlessly. In connection with a cross table thickness profiles of the samples (e.g. WARP measurement of glass plates) can be created.



The measuring range for glass plates or foils is situated between minimum 30µm and max. 1500µm. For thicker and thinner samples special preparations of the measuring head are possible. The resolution amounts to 0,05µm.
A substantial advantage of this procedure consists of the fact that absolute values are measured (naturally the accuracy is influenced by the calibration). With thickness mappings therefore the inaccuracy of the sample positioning mechanism does not have influence on the result of measurement. The sensor is in-process-able.

3. Profile measurement for rough and polished surfaces

In principle the measurement setup of point 1 is used. Instead of the measuring desk for the semiconductor wafer a linear guidance or a cross table with appropriate specimen mounting plate is used.

Depending upon request optionally guidance with high absolute accuracy or with smaller absolute accuracy and computational correction of the guidance errors can be selected. Thus device versions of different accuracy and price levels for the automatic two and three-dimensional surface measurement are possible.

See also →FLATSCAN_CAS and →GPM Glass thickness profile measurement