



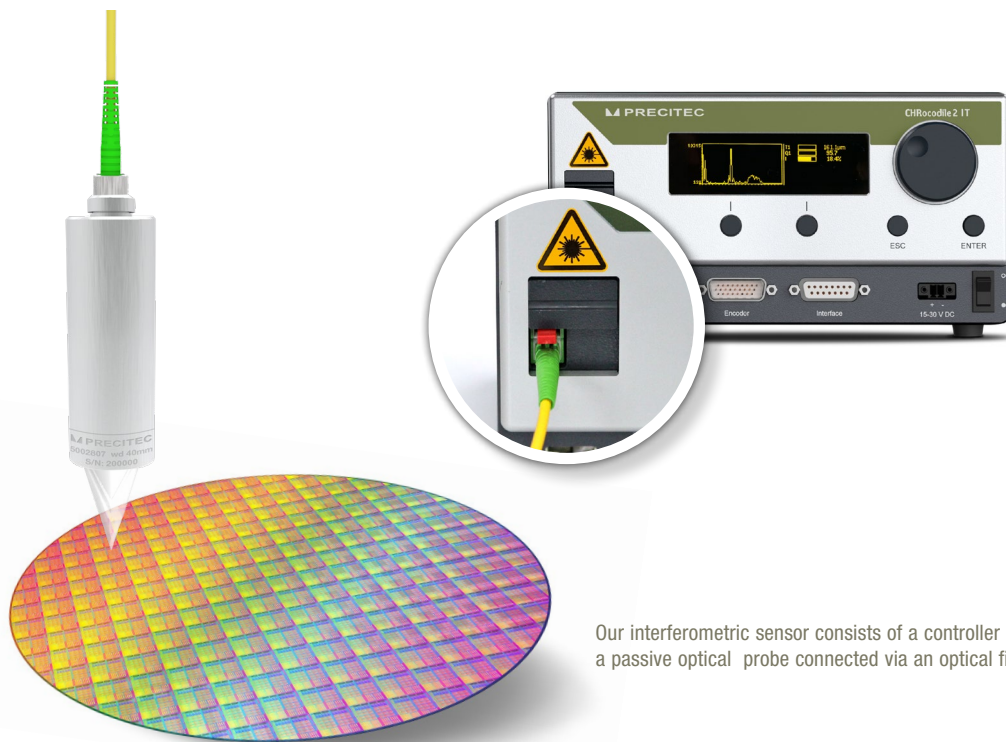
OVERVIEW INTERFEROMETRIC POINT SENSORS

- ▶ Ultra-precise thickness measurements from 2 μm - 12,600 μm
- ▶ Measurement of all infrared-transparent materials with rough, reflective or opaque surfaces
- ▶ Sensor technology suitable for harsh industrial environments, even for measurements in liquids such as water, oil or acids
- ▶ Insensitive to heat, humidity or vibration
- ▶ Ideal for high speed inline inspections up to 70 kHz

DISTANCE

THICKNESS

TOPOGRAPHY



Our interferometric sensor consists of a controller and a passive optical probe connected via an optical fiber

MULTIFUNCTIONAL INTERFEROMETRIC SENSORS

Precitec Optronik's high resolution coaxial interferometric point sensors enable non-contact measurements of distance and thickness in a measuring range up to 12,600 µm. Due to their nanometer resolution, they are also used for measuring microstructures, for instance on wafers. Furthermore, the thickness of multiple individual layers can be determined simultaneously in one measurement.

Our optical measuring technology offers quality control for infrared transparent materials such as rough, doped & highly doped wafers, semi-transparent and opaque plastics, glass, coatings and adhesives.

Optronik's interferometric sensors with their small and compact footprint are easy to integrate into high-end measuring machines and difficult-to-access areas. Due to the non-contact technology, there is no need for maintenance or replacement.

The DLL developed by Precitec Optronik provides an universal interface for integrating CHRocodile devices. For specific sensor requirements, feel free to contact us regarding a customized solution.



Measuring the thickness of multilayer plastic foils

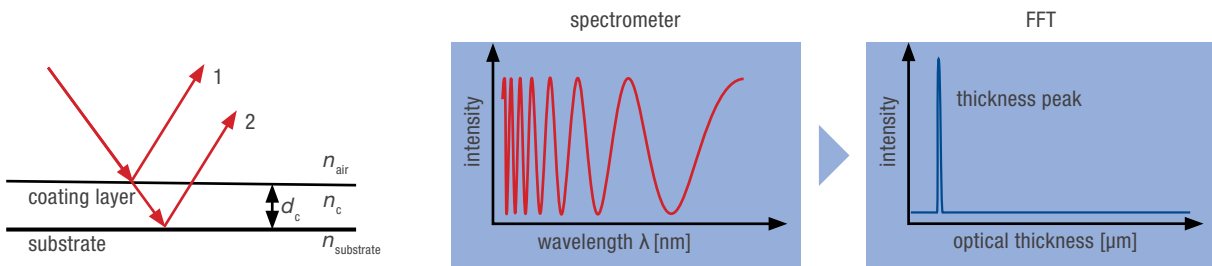
INFRARED LIGHT INTERFEROMETRY

| CHRocodile UNIT | measuring rate | measuring range ¹⁾ | axial resolution | item number | note/ main application |
|-----------------------------------|-----------------|-------------------------------|------------------|-------------|--|
| CHRocodile 2 IT 400 | up to 70,000 Hz | 29 µm - 3200 µm | 1 nm | 5009506 | wafer and polished surfaces |
| CHRocodile 2 IT 500 | up to 70,000 Hz | 38 µm - 4300 µm | 1 nm | 5007391 | wafer and polished surfaces |
| CHRocodile 2 IT 1000 | up to 70,000 Hz | 66 µm - 7500 µm | 2 nm | 5007546 | wafer and polished surfaces |
| CHRocodile 2 IT 1300 | up to 70,000 Hz | 87 µm - 10500 µm | 3 nm | 5009529 | undoped wafer and multi-layer structures |
| CHRocodile 2 IT 1700 | up to 70,000 Hz | 114 µm - 12600 µm | 4 nm | 5010786 | undoped wafer and multi-layer structures |
| CHRocodile 2 IT RW 500 | up to 70,000 Hz | 44 µm - 4900 µm | 1.5 nm | 5007389 | rough wafer and surfaces |
| CHRocodile 2 IT RW 1000 | up to 70,000 Hz | 57 µm - 6400 µm | 2 nm | 5007547 | rough wafer and polished surfaces |
| CHRocodile 2 IT DW 250 | up to 70,000 Hz | 15 µm - 1800 µm | 1 nm | 5007388 | doped and highly doped wafers, multi-layer structures, measurements in liquids |
| CHRocodile 2 IT DW 500 | up to 70,000 Hz | 29 µm - 3100 µm | 1 nm | 5009792 | doped and highly doped wafers, multi-layer structures |
| CHRocodile 2 IT DW 1000 | up to 70,000 Hz | 66 µm - 7600 µm | 2 nm | 5010253 | doped and highly doped wafers, multi-layer structures |
| CHRocodile 2 IT HDW 250 | up to 4,000 Hz | 15 µm - 1800 µm | 1 nm | 5009667 | doped and highly doped wafers, multi-layer structures |
| CHRocodile 2 IT HDW 500 | up to 4,000 Hz | 29 µm - 3100 µm | 1 nm | 5009793 | doped and highly doped wafers, multi-layer structures |
| CHRocodile 2 IT HTW ²⁾ | up to 4,000 Hz | 4 µm - 300 µm | 1 nm | 5010580 | thin wafer, external light source |
| CHRocodile 2 LR | up to 66,000 Hz | 16 µm - 2600 µm | 1 nm | 5007393 | coatings, films, dark glasses |
| CHRocodile 2 K ³⁾ | up to 4,000 Hz | 15 µm - 1500 µm | 5 nm | 5100171 | plastics, blown films |

¹⁾ optical length | ²⁾ CHRocodile 2IT HTW: light source - halogen lamp | ³⁾ CHRocodile 2 K: linearity - 6.6×10^{-4} x upper measuring range limit

OPTICAL PROBES

| measured value | distance, thickness | | | |
|--|--|---|--|--|
| working distance ¹⁾ | 40 mm | 40 mm | 100 mm | 100 mm |
| lateral resolution | CHRocodile 2 IT HTW: 30 μ m CHRocodile 2 IT LR: 3 μ m | CHRocodile 2 IT 500 1000 1300 1700 400: 5.5 μ m CHRocodile 2 IT RW 500 RW1000: 6.2 μ m CHRocodile 2 IT DW 250 DW 500 DW 1000 HDW 250 HDW 500: 3.7 μ m | CHRocodile 2 IT HTW: 75 μ m CHRocodile 2 IT LR: 7.5 μ m | CHRocodile 2 IT 500 1000 1300 1700 400: 14 μ m CHRocodile 2 IT RW 500 RW 1000: 16 μ m CHRocodile 2 IT DW 250 DW 500 DW 1000 HDW 250 HDW 500: 9.3 μ m |
| numerical aperture | 0.1 | 0.1 | 0.04 | 0.044 |
| measurement angle to surface 90° ²⁾ | $\pm 5^\circ$ | $\pm 5^\circ$ | $\pm 2^\circ$ | $\pm 2.5^\circ$ |
| dimensions (without fiber connector) | l = 58 mm d = 15 mm | l = 48 mm d = 15 mm | l = 61 mm d = 15 mm | l = 57 mm d = 15 mm |
| weight | 57 g | 52 g | 55 g | 55 g |
| item number | 5002807 | 5101549 | 5006420 | 5102340 |
| note | accessories available for distance measurement | | | |



The thickness determination is based on an interferometric measurement. Broad-band infrared or visible light is focused onto the workpiece by our optical probes. In the coaxial con-

figuration the reflections from different surfaces are collected by the same optical probes and then analyzed spectrally. By Fourier Analysis of the interference spectrum the thicknesses of all layers are determined.

All interferometric CHRocodile units are equipped with one measuring channel and provide following technical specifications:

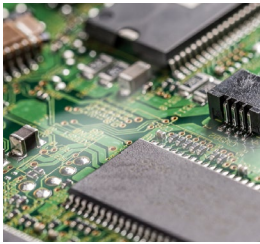
| | |
|---------------------------------------|---|
| linearity | $3.3 \times 10^{-4} \times$ upper measuring range limit ³⁾ |
| synchronization with external devices | trigger input, synchronizing output, 5 encoder inputs |
| interface | Ethernet, RS-422, 2 x analog (-10 V to +10 V, 16 Bit) |
| transfer rate | Ethernet (100 Mbit), RS-422 (up to 10 MBaud) |
| light source | SLD ⁴⁾ |
| operating temperature | +5°C up to +50°C |
| dimension (width x height x depth) | 220 mm x 110 mm x 125 mm |
| weight | 2 kg |
| supply voltage | 16 - 30 V DC (with separate power supply 90 - 264 V AC) |
| rated power | 20 W |

¹⁾ Bottom of optical probe to middle of measuring range | ²⁾ Decreasing accuracy for large incident angles

³⁾ CHRocodile 2 K: linearity - $6.6 \times 10^{-4} \times$ upper measuring range limit | ⁴⁾ CHRocodile 2IT HTW: light source - halogen lamp

VISIBLE LIGHT INTERFEROMETRY

| CHROcodile UNIT | CHROcodile 2 S / CHROcodile 2SE ¹⁾ | CHROcodile 2 S HS ¹⁾ |
|---------------------------------------|--|-----------------------------------|
| measured value | distance, thickness | |
| measuring rate | up to 66,000 Hz | up to 10,000 Hz |
| measuring range | 2 µm up to 180 µm | 2 µm up to 150 µm |
| number of measuring channels | 1 | |
| synchronization with external devices | trigger input, synchronizing output, 5 encoder inputs | |
| interface | Ethernet, RS-422, 2 x analog (-10 V up to +10 V, 16 Bit) | |
| transfer rate | Ethernet (100 Mbit), RS-422 (up to 10 MBaud) | |
| light source | LED | |
| operating temperature | +5°C up to +50°C | |
| dimension (width x height x depth) | 220 mm x 110 mm x 125 mm | |
| weight | 2 kg | |
| supply voltage | 16 - 30 V DC (with separate power supply 90 - 264 V AC) | |
| rated power | 20 W | |
| item number | 5007530 (CHROcodile 2 S) / 5007531 (CHROcodile 2 SE) | 5100981 |
| note | CHROcodile 2 SE: external coupler | measurement on absorbing surfaces |



Thickness measurement of conformal coating in submicron range.



OPTICAL PROBE

| measured value | thickness | | |
|--|------------------------|------------------------------|--|
| working distance ²⁾ | 27 mm | 10.6 mm | 18.1 mm |
| lateral resolution | 20 µm | 6.5 µm | 25 µm |
| numerical aperture | 0.1 | 0.2 | 0.1 |
| measurement angle to surface 90° ³⁾ | ± 5° | ± 10° | ± 5° |
| dimensions (without fiber connector) | l = 54 mm d = 15 mm | l = 67 mm d = 8 mm | l = 40 mm d = 8 mm |
| weight | 21 g | 23 g | 10 g |
| item number | 5005000 | 5003517 | 5002947 |
| note | | optical fiber fixed on probe | extra compact, optical fiber fixed on probe |

¹⁾ CHROcodile unit can switch between interferometric and chromatic confocal mode | ²⁾ Bottom of optical probe to middle of measuring range

³⁾ Decreasing accuracy for large incident angles

The given data was generated for a typical application and may be different given other circumstances. Furthermore misprints, changes and/or innovations may lead to differences in the listed measurements, technical data and features. Therefore all information is non-binding and technical data, measurements as well as features are not guaranteed.

Precitec 3D Metrology - measure more precisely with light.