



PRECITEC



MOVE UP TO THE NEXT LEVEL IN MEASURING TECHNOLOGY

Improve processes and quality assurance
through high-end chromatic confocal sensors

WHAT TODAY'S INDUSTRY NEEDS

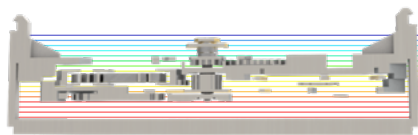
To stay competitive, today's manufacturing industry needs new state-of-the-art solutions in high-end measuring technology. This is particularly true if the demands of industry 4.0 are taken into account. Automated manufacturing processes require automated measuring and quality control systems. Such processes need sensor-based monitoring to remain stable and enable any necessary adaptation.

To meet the needs of high-speed production processes, ultra-fast inline measuring results are required. Such technology has to be contact-free, precise but robust, function error-free, and deliver high-resolution 3D imaging. CHRocodile[®] chromatic confocal sensors from Precitec Optronik fulfill these requirements.

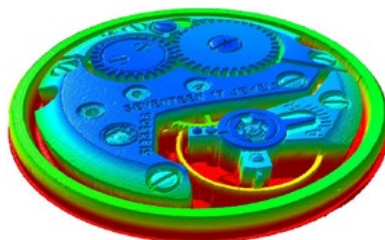
MULTI-TALENTED CHROMATIC CONFOCAL SENSORS

Our chromatic confocal sensors use high performance optical lenses to focus white light at different distances along the optical axis, and not on a single point. All visible wavelengths are in focus. These multi-talented optical sensors open up a new dimension in measuring technology:

- ▶ Measurement is possible on any kind of material – opaque or transparent, diffusive or reflective, absorbent, colored, rough or polished
- ▶ Coaxial measurements avoiding shadowing effects
- ▶ Very high slope acceptance and high numerical aperture allow up to 45° on reflective surfaces and >80° on diffusive surfaces
- ▶ Extremely high Z-axis resolution and accuracy – no Z-scanning to obtain a measurement, every measuring point delivers a measured value
- ▶ Our ultra-high speed multi-point line sensors allow parallel measurement of many points



- ▶ Small and constant spot size with high lateral resolution
- ▶ Our optical probe is totally passive, there are no moving parts or embedded electronics - ensuring high thermal stability, long-term reliability and reproducibility



topography of a watch measurement

WHAT OUR PRODUCTS DELIVER TODAY?

We offer you a wide range of chromatic confocal sensors for measuring thickness, distance, surface, topographies, etc. Our technology has major advantages over other technologies such as laser triangulation, as the table below shows:

ADVANTAGES OF CHROMATIC CONFOCAL TECHNOLOGY

Laser Triangulation Principle	versus	CHRomatic Confocal Technology
limited	shiny material	yes
no	reflective material	yes
limited	colored material	yes
limited	transparent material	yes
instable	Inclined or curved surface	stable
instable	smooth or rough surface	stable
limited	surface angle tolerance	excellent
limited	precision	submicron
low	lateral resolution	high
no	insensitive to heat and pollution	yes
no	simultaneous 3D and 2D display	yes

HOW YOU BENEFIT

In production processes the use of chromatic confocal measuring technology for computer-aided quality assurance in surface measurements brings multiple benefits:

- ▶ Utmost precision under all conditions
- ▶ High-speed real-time measuring and processing
- ▶ Enhanced speed through multi-point measurement – more than 1 million 3D points measured per second
- ▶ Wear-free durability
- ▶ Easy integration into production processes

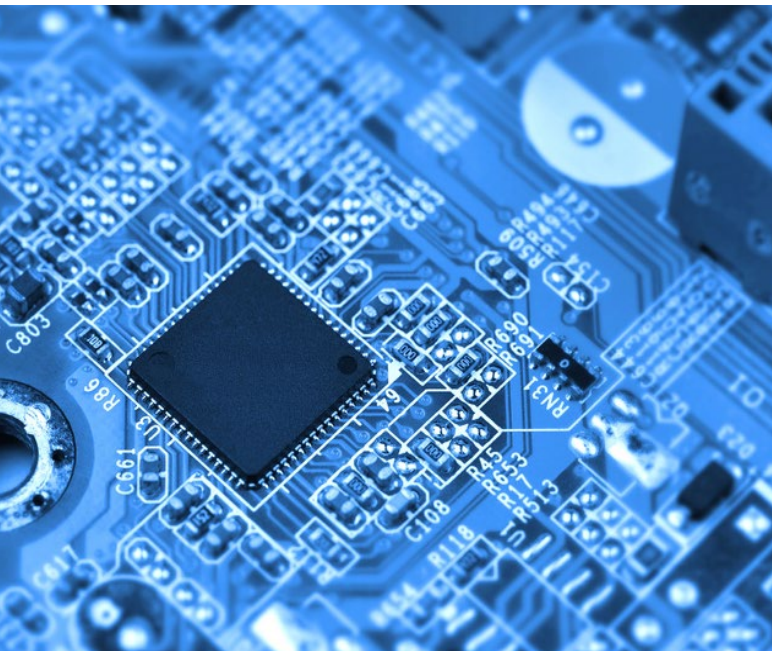
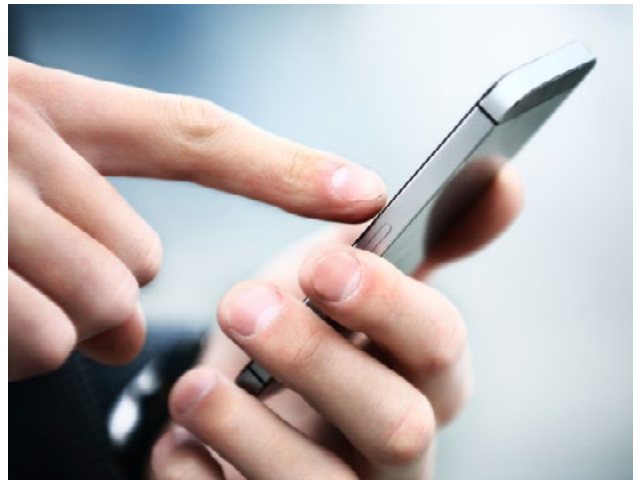


EXPERTISE TO ADVANCE A CUSTOMER'S BUSINESS

The expertise and experience we have gained in our areas of competence enable us to enhance our customer's production processes and make them more competitive. The application areas outlined below are a few examples of the various industries in which we have gained a great deal of experience over more than two decades. See page 11 for a complete list of all industries where our technology is applied.

CONSUMER ELECTRONICS

Smartphones, tablets and many other consumer electronics products combine metals and glass in increasingly refined ways. Our optical contact-sensors are utilized to inspect these layers and ensure they are seamlessly merged together. Working the coated, ultra-hardened screen glass in smartphone or tablets is an extremely demanding process, where the cut edges have to be carefully inspected to ensure the strictest standards are met. In single pass in inline mode our optical sensors measure the dimensions, thickness and warping of screen glass – and even the shape and depth of defects caused by grinding, cracks or laser ablation.





GLASS

Our state-of-the-art chromatic confocal sensors measure the thickness and topography of glass of any color or surface. They are the industry standard in wall thickness measurement of glass containers in inspection machines. Even circular deviations of bottles and the wall thickness of hot quartz pipes or function foil in pre-fabricated multi layers can be determined easily. The sensors do not heat up, even at glass temperatures of 1,700°C. For the production of container glass high-speed, contact-free measurement of wall strength and roundness are especially important.

Our CHRcodile MPS sensor, the glass industry standard, delivers 4,000 measurements per second in different positions through its four integrated optical probes. Even non-round containers can be accurately measured thanks to these high-performance, non-wearing optical probes. With a spot size of only a few hundredths of a millimeter in diameter, even the tiniest fault in the glass can be determined.

AUTOMOTIVE

Our chromatic point and line sensors tackle versatile measuring tasks in the quality assurance during car production. Due to their high measuring speed, these optical sensors can be integrated into the production line directly. This allows a 100% inline inspection at minimum cycle times, increasing the quality of the final product. Typical applications include 3D shape inspection of complex assemblies such as structured surfaces of engine cylinders or the geometry and roughness of gears.

Additionally, our sensors are used for measuring the protective and reflective coatings inside headlight housings and in rated break point inspections for dashboard airbags. By measuring the thickness and geometry of curved glass, the dimensions of windshields and panorama roofs can be quantified. The gap between the glass panes and the metal chassis can be measured in-line with an accuracy in the nanometer range. This demanding material mix of metal, glass and plastic with its different surface properties is an easy task for Precitec sensors.



WHY PRECITEC OPTRONIK STANDS OUT

As a pioneering inventor of chromatic confocal technology for non-contact measurements in industrial applications, we can point to more than 20 years of experience as an innovative market leader. With more than 25,000 systems in the field, our industrially proven products are renowned for their precision, robustness and customization. Our worldwide presence in application technology, sales and service ensures you always have a reliable partner at hand. And as a family-owned firm, we place particular emphasis on close customer relations built on trust, reliability and the highly skilled nature of our R&D, sales and service teams.

A BROAD PRODUCT PORTFOLIO

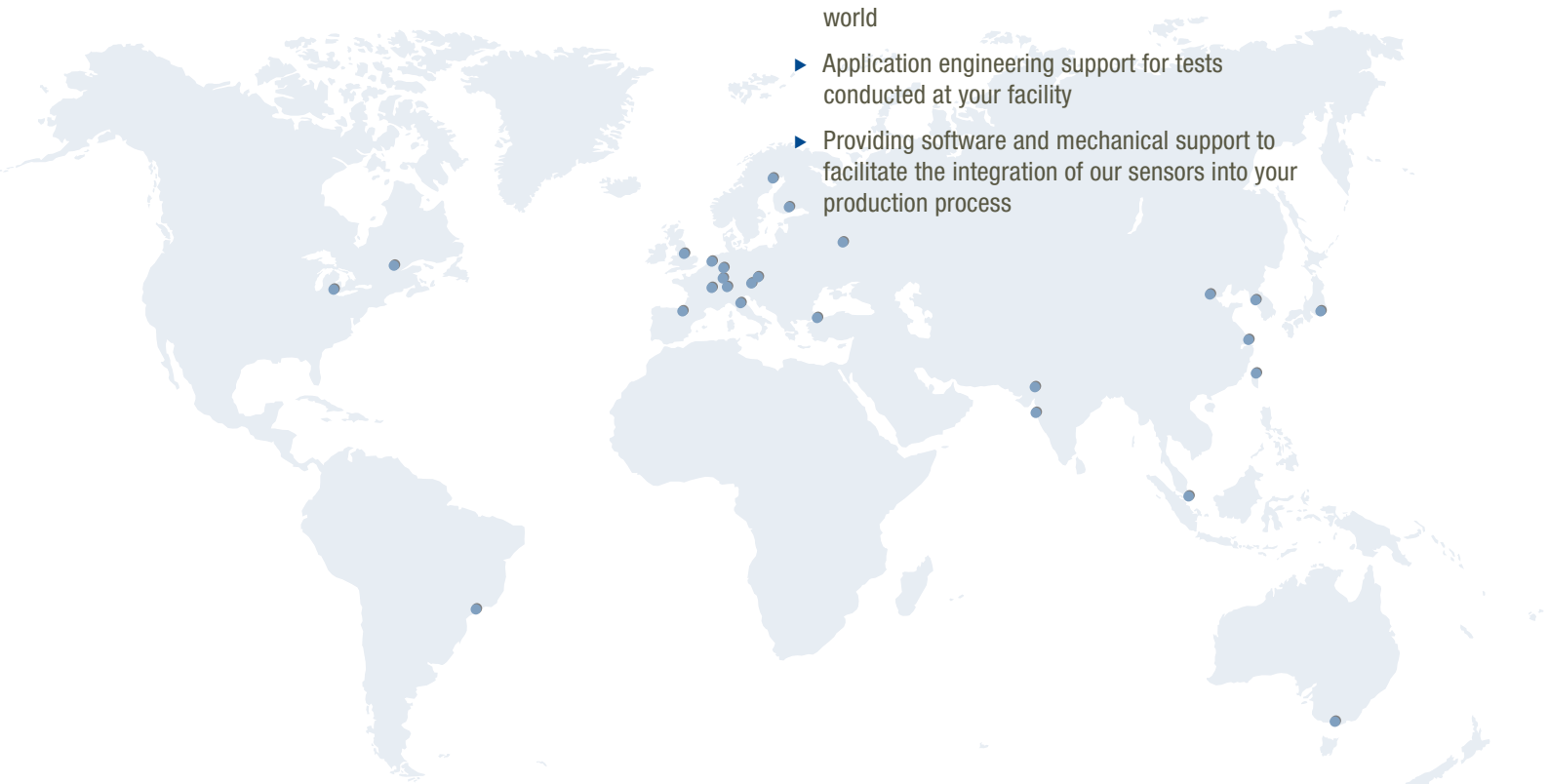
Whatever your needs are in high-precision chromatic confocal sensor technology, we can meet them through our broad product portfolio of line and point sensors, multi-point sensors, and as an OEM sensor supplier. If you have any specialized requirements, we will gladly work with you to develop a customized solution.

- ▶ Point sensors
- ▶ Line and multi-point sensors
- ▶ OEM sensor supplier

STANDARD-SETTING CUSTOMER SUPPORT

We are not just in the business of selling sensors. We regard each new customer from the perspective of sustainably supporting your business. That is why we invest heavily in standard-setting customer support through our worldwide sales and service team composed of highly qualified and experienced technicians. For us 360° customer service means:

- ▶ Finding solutions to your measurement needs through a dedicated R&D team
- ▶ Running free test measurements on your samples in our applications labs around the world
- ▶ Application engineering support for tests conducted at your facility
- ▶ Providing software and mechanical support to facilitate the integration of our sensors into your production process



CHROCODILE CLS-C LINE SENSOR – HIGH-SPEED, NON-CONTACT PRECISION

The CHRcodile CLS-C is industries best choice for ultra-fast 3D inspection of all materials, even in harsh industrial environments. The robust and highly integrated design is ideally suited for easy integration into production-line inspection machines.

Our chromatic confocal line sensor contains 192 inline measurement points with a data acquisition rate of 1.13 megapixels per second at 6 kHz. An outstanding large dynamic range and an exceptional signal-to-noise ratio make the CHRcodile CLS C the optimum measuring tool for all materials, including polished and highly tilted surfaces.

By integrating ultra-high measuring speed and precision, this sensor opens up new dimensions in defect inspection of semiconductor wafers and chips, surface topography of aerospace materials and cosmetic inspection of high end watch components.

HOW YOU BENEFIT

- ▶ Efficient: High-speed, ultra-precise, non-contact measurement
- ▶ User-friendly: Maintenance-free, robust and easy to integrate into production lines
- ▶ Versatile: Instantaneous inline profile measurement with interchangeable optical probes



CHROCODILE C POINT SENSOR – VERSATILE AND USER-FRIENDLY

The ultra-compact CHRocodile C sensor with its robust and integrated design delivers high-precision distance and thickness measurements. CHRocodile C is easily integratable into any kind of automatic inspection machine and especially suitable for industrial inline use in quality assurance applications. Its extraordinarily high dynamic range and outstanding signal-to-noise ratio ensure optimum measuring results on any kind of surface.

The revolutionary design of the CHRocodile C integrates optoelectronics and optical probes in a single housing no bigger than a cigarette packet. With several measuring probes that can be easily interchanged by the user, the system can incorporate precise coordinates and thus be adapted to a specific measurement assignment. Thanks to its compact dimensions and economical price the CHRocodile C is the ideal alternative to conventional laser triangulation sensors.



HOW YOU BENEFIT

- ▶ **Efficient:** Compact footprint, light weight and low power consumption
- ▶ **Versatile:** Measures distance and thickness on various surfaces and materials with interchangeable probes
- ▶ **User-friendly:** Maintenance-free and simple to integrate into production lines for non-contact measurement



HOW YOU BENEFIT

- ▶ High axial resolution of up to 0.7 µm and small spot diameter to measure complex structures
- ▶ Measurements on highly tilted, reflective and dispersive surfaces
- ▶ The right probe for every measuring task
- ▶ Compatible with all CHRocodile 2 sensors

OPTICAL PROBES IN OUTSTANDING QUALITY

Drawing on our optical expertise we have developed high-precision lens systems with a high numerical aperture that are perfectly suited for precise non-contact distance and thickness measurement.

With a measuring range varying from a few microns to several millimeters, these systems are available in ultra-high vacuum, vacuum, angled design, and a line sensor version. Our latest development is an ultra-thin 8 mm probe to measure boreholes. Whatever your measuring task is, we will find you the best possible solution.

CHROMATIC POINT SENSORS – THE RIGHT PRODUCT FOR THE RIGHT TASKS

As a successor to the CHRcodile sensor family, this second-generation sensor has been improved to adapt to the high demands of today's industrial applications. Newly enhanced high-performance electronics in combination with high-speed Ethernet connection, high-intensity white light LEDs and highly sensitive detectors, measuring rates of up to 66 kHz can be achieved with unprecedented measuring precision. This new generation of sensors is equipped with an automatic light control and is capable of performing non-contact

distance, topography and thickness measurements, even for complex geometrical shapes and materials of differing reflectivity, roughness and refractive indices. The measurements are highly accurate and reproducible, and very stable even with environmental influences. Additionally, these CHRcodile 2 sensors can easily switch between the chromatic confocal and interferometric operating modes offering additional measuring possibilities, e.g. on transparent plastics and multilayer films.



CHROCODILE 2 S/2 SE

HOW YOU BENEFIT

- ▶ The allround sensor for non-contact distance and thickness measurements
- ▶ High speed at up to 66,000 measurements per second
- ▶ Simple to integrate into product lines, maintenance-free and robust
- ▶ CHRcodile 2 SE option designed for use of high-intensity external light sources for high-speed measurements

CHROCODILE 2 S HS

HOW YOU BENEFIT

- ▶ Designed for a maximum signal-to-noise ratio
- ▶ Extraordinarily high dynamic response at up to 4,000 measurements per second
- ▶ Specially designed for measuring surfaces with differing reflectivity and high incident angles
- ▶ Simple to integrate into product lines, maintenance-free and robust

CHROCODILE 2 DPS

HOW YOU BENEFIT

- ▶ Two-sided thickness measurement of non-transparent materials
- ▶ Step height measurement
- ▶ Referencing process included

MULTI-POINT SENSORS – THE OPTIMUM IN FLEXIBLE MEASUREMENT

CHROCODILE MPS 12E/24E

This multi-point sensor carries out up to 24 simultaneous distance and thickness measurements. With 24 independent channels it is designed to use 24 individual chromatic probes and perfectly suited for applications where multiple measurement points are needed instantaneously.

Its extraordinarily high dynamic response and outstanding signal-to-noise ratio ensure optimum measuring results on surfaces with differing reflectivity and from different angles. By measuring at up to 108,000 points per second, the CHROcodile MPS makes ultra-short measuring times possible.



HOW YOU BENEFIT

- ▶ Efficient CHROcodile MPS 24: Replaces up to 24 individual sensors for simultaneous measurements
- ▶ CHROcodile MPS 12E: Flexible product configuration with 12 channels:
- ▶ Simple to integrate, maintenance-free and robust



CHROCODILE MPS 2L

This multi-point sensor carries out also up to 24 simultaneous distance and thickness measurements. Especially designed for flexible measuring tasks the device can be connected with several optical chromatic line and point probes. Multiple combinations are possible with a maximum of 24 measuring points. This flexibility allows the customer to resolve complex measuring tasks, on surfaces with differing reflectivity and from different angles, e.g. wall thickness measurement of container glass with intricate shapes and varying colors.

Two specially designed line probes are particularly suitable for inline inspection of container glass at the cold end. These line probes can use up to 12 measuring points in a length of 12.5 mm to ensure efficient detection of defects, voids or thin areas in container glass.

HOW YOU BENEFIT

- ▶ Measures layer thickness and distance along a line, replacing up to 24 individual sensors
- ▶ Flexible product configuration utilizing any combination of point and line measuring probes
- ▶ Simple to integrate in production -line inspection machines, maintenance-free and robust

WHERE YOU CAN PROFIT FROM OUR COMPETENCE

Let us help you make a decisive difference to your business:

- ▶ CONSUMER ELECTRONICS
- ▶ SEMICONDUCTORS INDUSTRY
- ▶ GLASS INDUSTRY
- ▶ MEDICAL AND PHARMACEUTICALS
- ▶ AUTOMOTIVE
- ▶ PLASTICS AND VARNISH
- ▶ MACHINE TOOLS
- ▶ PHOTOVOLTAICS
- ▶ FINE MECHANICS
- ▶ TOOL MANUFACTURING
- ▶ RESEARCH AND ACADEMIA
- ▶ AEROSPACE



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