The non-contact displacement optoNCDT product group utilizes optical triangulation as a measuring principle. A laser diode projects a visible spot of light onto the target surface (laser class 2). The light reflected from this spot is directed through an optical receiving system onto a position-sensitive element. Optical displacement sensors measure with a large reference distance and a very small measuring spot diameter. A digital CMOS and CCD array is used as the position-sensitive measuring element (series 1300, 1401, 1700 and 2200). The 1607 series is equipped with analog signal processing.

### Advantages
- Small targets through tiny spot size
- Long measuring ranges
- Large stand off
- Extreme resolution
- Excellent linearity
- High measuring rates

---

**Parts measurement**
On machined surfaces of metal products, the optoNCDT is employed for quality assurance. Quantities such as roundness, concentricity, eccentricity and bending deflection are determined.

**Surface profiling**
Due to the small measuring spot and RTSC (Real-Time Surface Compensation), optoNCDT is excellent for the high precision mapping of any target regardless of its reflectivity, angle, shape and color.

**Contour measurement on aluminum wheels**
After casting, aluminum wheels are measured for a range of features, e.g. hub depth, roundness, bulging, etc., before being processed further.
RTSC: Real-Time Surface Compensation

With RTSC, a world-wide unique innovation, the degree of reflection from the target is compensated during the on-going exposure in real-time. The exposure time or the amount of light produced by the laser is optimally matched to the currently running exposure cycle. Only sensors from Micro-Epsilon are equipped with this innovative real-time control and consequently they always achieve optimum results even with changing surfaces.

Synchronization of two sensors

Simultaneous measurement using two sensors is necessary in order to obtain precise results, with thickness or differential measurements, when the target is moving or oscillating. With the IF2004 PCI interface card the data from up to four sensors can be synchronously read.
The confocal-chromatic measurement system, optoNCDT 2400, consists of a controller and a sensor. Polychromatic white light is focused onto the target surface by a multi-lens optical system. The lenses are arranged such that the white light is dispersed into a monochromatic light by controlled chromatic deviation. A certain distance is assigned to each wavelength by a factory calibration. Only the wavelength which is exactly focused on the target is used for the measurement. This light reflected from the target surface is passed via a confocal aperture to the receiver which detects and processes the spectral changes. This unique measuring principle enables displacements and distances to be measured with high precision. Both diffuse and specular surfaces can be measured. With transparent materials a one-sided thickness measurement can be accomplished along with the distance measurement. Since the emitter and receiver are arranged in one axis, shadowing is avoided.

**Advantages**
- Extreme high resolution
- Target independent measurement
- Tiny, constant measuring spot
- Compact course of beam
- One-sided thickness measurement of transparent materials

**Thickness measurement of sleeves**
Two synchronized sensors acquire the bottom thickness of sleeves in a double-sided layout.

**Liquid level**
The confocal measurement principle facilitates measurements against reflecting surfaces (glass, mirror), as well as liquids.

**Surface scan**
The extreme spatial resolution in x-axis and the submicron accuracy in the z-axis make it a perfect sensor for surface scans.
One-sided thickness measurement of transparent materials
The unique measurement principle enables a single-side thickness measurement on transparent materials such as glass. Here, just one sensor measures the thickness with nanometer accuracy.

Confocal miniature sensors
Special miniature sensors with a diameter of 4 mm measure in confined installation spaces, e.g. in drilled holes and recesses. Furthermore, the 90° version of these sensors enables the inspection of the smallest internal walls.

Extreme resolution
The confocal sensors facilitate optical measurements in the submicrometer resolution in x and y-axis. In this way, the smallest structural changes or displacements can be resolved extremely accurately.
The time of flight series optoNCDT ILR are optoelectronic sensors for accurate non-contact gap and distance measurements. The sensor operates according to the principle of light propagation time measurement. A laser diode in the sensor produces a short laser pulse which is projected onto the measurement object. The light reflected from the measurement object is detected by the sensor element. The propagation time of the light pulses to the measurement object and back determines the measurement distance. The integrated electronic inside the sensor calculates the distance from the propagation time and conditions the signal for analog or digital output.

Propagation time sensors in the series ILR are designed in two types which are suitable for different applications: The laser gauging sensors are designed for direct measurements against an object at distances of up to 10 m. If very high accuracy at large distances (up to 250 m) are required, then the distance sensors are used by measuring against a special reflector mounted onto the measurement object.

**Advantages**
- Outstanding repeatability
- Fast response time
- Excellent price-performance ratio
- Various interfaces, analog and digital
- Sighting laser
- Easy to use with class 1 laser

**Position acquisition storage and retrieval units**
Fast response time in combination with high measurement accuracy facilitate the exact positioning of storage and retrieval units.

**Distance measurement on monorail conveyors**
To control the flow of production and to prevent damage to the parts, the spacing between the conveyors is monitored.

**Acquisition of coil diameters**
The quantities of steel, paper and fabric wound on and off are monitored via the acquisition of coil diameters using laser probes.
Synchronous data acquisition

Synchronization facilitates applications in geometrical measurement, for example for the three-dimensional acquisition on conveyors. If a number of sensors are arranged such that both the height and the width of the measurement objects are determined in only one measurement pass, the signals can be synchronized at the point of measurement via the IF2004 interface card.

With the PCI interface card IF2004, the data from up to four sensors are read in synchronously via a FIFO memory in order to facilitate real-time processing. The fourth channel can alternatively be assigned to map an encoder or a linear measurement system with the sensors.
The laser-line profile sensor scanCONTROL makes use of the triangulation principle for two dimensional acquisition of profiles on the most varied target surfaces. In contrast to familiar point laser sensors, a line optical system projects a laser line onto the surface of the object to be measured. The back scattered light from the laser line is registered on a CMOS array by a high quality optical system. Along with distance information (z-axis), the controller also computes the true position along the laser line (x-axis) from the camera image and outputs both values in the sensor two dimensional coordinate system. A moving object or a scanning sensor will generate three dimensional representation of the object.

Advantages
- High accuracy
- Very high measuring rate
- Flexible field of view
- High-performance signal processing unit
- Trigger and synchronization options
scanCONTROL

Measuring ranges  
z-axis  25 - 245 mm  
x-axis  13 - 140 mm

Linearity  
z-axis  ±0.2 %

Resolution  
z-axis  0.04 %  
x-axis  1024 points/profile

Profile frequency  
up to 4000 Hz

Measuring rate  
up to 256 kHz

Applications scanCONTROL 2800

scanCONTROL 2800 is a basic unit for applications programmed by the customer. The Series 2800 supplies highly accurate x and z values in fast profile sequences for individual data processing, e.g. for applications in coordinate measuring machines.

Applications scanCONTROL 2810

scanCONTROL 2810 is equipped with a preprogrammed signal processor which is designed for the computation of profile data (grooves and beading). The Series 2810 is employed in automated applications.

High speed and variable measuring field

Due to the high measuring rate of up to 256,000 measuring points/s, a significant improvement in the cycle times during quality inspection is achieved. Here, the resolution and profile frequency can be set to suit the requirements of the application. If the point resolution of the x-axis is reduced, a correspondingly higher profile frequency can be achieved. With higher point resolution the profile frequency is lower.

Apart from the processing rate and number of measuring points to be read out, the height and width of the measuring field can be set, e.g. 512 points over a narrow measuring strip (e.g. for edge detection) or 256 points over a wide strip for high speed applications (e.g. control of adhesive beading).

Laser Class 3B for difficult surfaces

For difficult surfaces such as rubber a special version with the Laser Class 3B is available which compensates for the weak level of reflection by a high light intensity. Consequently, high precision measurements, e.g. on tire rubber, are possible.
Optical micrometers in the product group optoCONTROL are based on various measuring principles. Apart from the CCD camera technique using laser or LED light, the principle of light quantity measurement is used. The micrometers consist of a light source and a receiver or a CCD camera. The light source produces a parallel continuous light curtain which is lined up with the receiver. If an object interrupts the light curtain, this shadow or darkening is detected at the receiver unit.

The Series optoCONTROL 1200 here acquires the incident quantity of light, whereas the Series 2500 and 2600 measure the exact shadow via a CCD array. In this way dimensional quantities such as diameter, gap, position and also segment can be acquired. These units use state of the art high speed CCD cameras with solid state technology which eliminates the measurement errors caused by the traditional scanning laser micrometer.

**ThruBeam principle:**

**optical micrometer**

**Advantages**
- Various models for different applications
- Laser- or LED light source
- Extreme compact construction
- Very accurate measurements
- High speed measurements

During the stamping of threaded rods, micrometers are used for quality assurance in order to determine the exact thread guidance.

Optical micrometers are used for acquiring roller gaps to ensure a constant gap height.

Synchronized micrometers acquire the vibration of tensioned steel lift cables in order to control the vibration behavior.
Innovative dual sensor system

To determine material thicknesses a sensor system consisting of a micrometer and an eddy current sensor is fitted above a roller. The eddy current sensor measures the reference distance to the roller and the micrometer acquires the web surface. The material thickness is found from the combination of the two signals.

Checking for presence in fast processes

Apart from measurement tasks, the Series 1200 can be employed for ascertaining the presence of components. The versatile concept with enormously high cut-off frequency and compact design opens up numerous fields of application.

Measuring transparent materials

The Series 2600 uses LED light sources to achieve a high measurement accuracy. Along with the excellent performance data, the Series 2600 is suitable for measurement against transparent measurement objects such as glass bottles, bulbs or tubes. The acquisition of transparent and extremely thin materials is simplified due to the adjustable edge detection threshold.

Innovative dual sensor system

To determine material thicknesses a sensor system consisting of a micrometer and an eddy current sensor is fitted above a roller. The eddy current sensor measures the reference distance to the roller and the micrometer acquires the web surface. The material thickness is found from the combination of the two signals.