Sensors and measuring systems for plastics production
Miniaturization and increased production speeds together with rising economic efficiency are the determining factors in the production and processing of plastics. Quality, function and touch-screen communications of the final product require reliable measurement and inspection procedures in every manufacturing stage.

Compact and high speed sensors ensure highest reliability in almost any area where high precision is expected - from machine monitoring to fully automatic quality control of the final product.

**scanCONTROL**
High-end laser scanner for high precision profile measurements
- Inline measurement of gaps, profiles, steps, angles
- Red or blue laser line versions
- Measurement on numerous surfaces, also reflecting and matt

**colorSENSOR CFO100 & CFO200**
Sensors for color recognition in industry and automation
- Ideal for integration into processing lines due to high measuring rates
- High accuracy
- Robust and suitable for industrial applications

**interferoMETER**
High precision white light interferometers for distance & thickness measurements
- Distance-independent thickness measurements and multi-layer thickness measurement
- Miniature light spot of 10 µm for the detection of smallest details
- Robust and suitable for industrial applications

**thicknessCONTROL**
Turnkey measuring systems for thickness measurement of films and plates
- Measurement of thickness and thickness profile
- No consequential costs for radiation protection due to isotope and X-ray free measuring principle
- Easy integration into processing lines
- Film thickness from 30 µm to 6 mm
Precise thickness measurement of coated plastic film
The compact thicknessGAUGE sensor system is used for coating thickness measurement of separator film. It is equipped with a white light interferometer and detects both the film thickness and the coating thickness with submicrometer accuracy.

Measuring system: thicknessGAUGE
Sensor system for thickness measurement of film, plates and sheets
ThickGage sensor systems are used for precise thickness measurements of strip materials, plates and sheets up to 25 mm. These systems can be equipped with different sensor types, measuring ranges and measuring widths, which enables inline thickness measurement of different materials and surfaces.
Measuring system: thickGage

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Measuring system: thickGauge

Thickness profile measurement of strips and plates
The thickGauge CONTROL measuring system is used for thickness measurement of plates and strip materials. Depending on the measurement task and materials, the head is equipped with different sensors that measure in a fixed track or in a traversing method. Comprehensive software packages and interfaces enable measurement, evaluation and recording of readings.
Measuring system: thickGauge CONTROL

Geometrical monitoring of cable ties
The “width” and “height” of the cable tie strap, as well as the “tooth pitch” are monitored constantly during the production of cable ties. The measurement is performed using two optical precision micrometers and a laser displacement sensor which are attached behind the extruder. The laser micrometers are positioned horizontally and vertically respectively while measuring the height and width of the strip. The laser sensor detects the tooth pitch from above. The sensors provide reliable and reproducible measurement results and accelerate the production process while minimizing the rejects.
Sensor: optoCONTROL 2520 / optoNCDT 2300-2DR
Color measurement

colorSENSOR CFO100 / CFO200
- High measurement speed for dynamic processes
- Large color memory for different test batches
- High color accuracy
- High measuring rate, ideal for quality assurance and documentation in the processing line
**Color recognition in component sorting tasks**
Particularly with automated mounting, components must be sorted according to their color. The colorSENSOR CFO is ideally suited for these high production speeds. Adjustable colors and tolerances enable high flexibility.

*Sensor: CFS4 reflection sensor, colorSENSOR CFO*

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**Inline color monitoring of plastic bottles**
Plastic bottles are frequently manufactured in different shapes and sizes. In this respect, color homogeneity is indispensable particularly with brand products. Due to different bottle shapes, distance-dependent color deviations occur which must be compensated for by the color sensor. Therefore, colorSENSOR CFO200 sensors are used as they offer a multi-teach function combined with a high measuring rate and color accuracy. With more than 320 colors in 256 color groups, different production batches and variants can be detected reliably.

*Sensor: Circular sensor CFS2, colorSENSOR CFO200*

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**Inspection of polycarbonate sheets**
The production of polycarbonate sheets involves inline color monitoring. The measuring principle applied with these transparent sheets is based on the transmitted light principle using colorSENSOR CFO200 sensors. The sensors detect color deviations from taught reference colors. If deviations occur, the plastic mixture is adapted accordingly. With its high light intensity, the CFO200 is also suitable for semi-transparent objects. The CFS3 transmission sensor used enables measurement of different material strengths with only one channel.

*Sensor: CFS3 transmission sensor, colorSENSOR CFO200*

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**Inline color measurement of granulate**
For color monitoring of granulate, True Color sensors such as the colorSENSOR CFO200 from Micro-Epsilon are used. The sensor measures the color of the pellets through a sight glass in the suction box of the finished product conveyor and reliably detects the smallest color deviations (ΔE < 1). The recorded values can then be forwarded directly from the sensor to a higher-level control system via a signal output.

*Sensor: CFS2-M11, colorSENSOR CFO200*
Color measurement

colorCONTROL ACS
- Inline color measurement at the highest precision
- Optimized sensor models for different surfaces, e.g., reflecting, transparent, curved
- High measuring rate, ideal for quality assurance and documentation in the processing line
Inline color measurement of transparent films
As well as color fluctuations, streaks can occur during production. With translucent films it is possible to measure the color based on the transmitted light principle. The colorCONTROL ACS7000 measures the film color inline at high speed and at maximum precision.

Sensor: ACS3 transmission sensor, colorCONTROL ACS7000

Color measurement of floorboards
Plastic floorboards are made of colored granules and shaped in a deep-drawing process. Here, it must be ensured that the color of the floorboards is homogeneous and that there are no color differences. The inspection is carried out using the colorCONTROL ACS7000 spectral color measuring system and the ACS2 circular sensor (R45°c:0°). Absolute color measurement enables monitoring of the actual produced color shade and to recognize early any process-related defects.

Sensor: ACS2 circular sensor, colorCONTROL ACS7000

Inline detection of protective film on PVC window frames
After their extrusion, a transparent protective film is applied onto the plastic profiles. The color shade of the plastics profile alters a little after the transparent film has been applied. Based on this color change, the colorCONTROL ACS7000 color measuring system recognizes if the film has been applied on the window frame. Its high measuring rate enables the color measuring system to be used inline.

Sensor: Standard ACS1, colorCONTROL ACS7000

Inline color measurement of injection-molded plastic parts
In plastics injection molding, color measurement can be performed only after the cooling process, as colors still can change. An empirically determined correlation between warm and cold pieces enables the ACS7000 to measure the color directly after the injection molding process and to determine any deviations early.

Sensor: ACS2 circular sensor, colorCONTROL ACS7000
Non-contact temperature measurement

Thermography for injection molding processes
moldCONTROL is a thermography solution for recognizing quality fluctuations in injection molding production. The compact, industrial thermal imaging camera captures a thermal image of the component directly after the injection molding process. The software compares the infrared images associated with the component (actual) to stored references (target). The identified temperature differences provide the basis for a good/bad decision reported back to the handling system.
Temperature measurement in the plastics industry
Micro-Epsilon offers a wide range of non-contact, infrared thermometers and thermal imagers, which enable precise temperature measurement. The infrared measuring devices are used in a wide range of applications:
- Extrusion of blown film, flat film and plates
- Thermoforming
- Laminating and embossing
- Injection molding
- Coating
- Plastics welding

Line scan feature for the detection of temperature profiles
In order to ensure homogeneity of high temperatures, e.g., in thermoforming and calendering processes, the line scan feature is used. The thermal imaging camera provides temperature profiles per line. This enables the evaluation of the temperature distribution across the entire production line.
Inspection of attachments

- Measurement & inspection of diffuse reflecting measurement objects
- Continuous process monitoring
- Detection of different shape defects
- Clear definition of the failure criteria in supplier relations
- Objective evaluation of the deviations
- Less working steps, reduced reconditioning and reject costs
- Optical error marking on the component with back projection
Measurement of the sprayed skin thickness
Sprayed skins for vehicle dashboards and for airbag cladding are sprayed into a heated mold using a robot-guided nozzle. For safety reasons, extremely low tolerances are required for airbags. For this reason, the thickness of the sprayed skin must be inspected inline during the spraying process. The measurement is performed using a combination sensor (an eddy current displacement sensor and a laser displacement sensor) which is attached to the robot arm. The eddy current sensor measures the distance to the nickel-coated spray mold and has an opening in the center through which the laser sensor measures the distance to the sprayed skin. When subtracted, both signals provide the thickness of the sprayed skin.

Sensor: optoNCDT / eddyNCDT

Surface inspection of cockpit and dashboard
As well as the visual requirements, instrumentation panels also have to fulfill functional and security requirements. Often the passenger airbag has a predetermined breaking line which is generated using a laser. This “weak point” ensures the safe opening of the airbag at the predetermined breaking line. Sink marks may appear, which can be recognized under certain light conditions. In order to recognize these defects, surfaceCONTROL inspection systems are used. They enable fast, objective evaluations of any shape deviations, both on grained and smooth surfaces.

Inspection system: surfaceCONTROL

Fuel filler flap inspection
One component that many automotive manufacturers and suppliers produce in plastic is the fuel filler cap. As fuel filler flaps are positioned in a prominent location, the surface must meet the high quality requirements. During production, small sink marks can appear on the visible side of the flap. These are only a few micrometers deep but visible to the human eye depending on the painting. The surfaceCONTROL is used for surface inspection of fuel filler flaps. Both in production monitoring and when inspecting incoming goods, the system reliably detects and evaluates the fuel filler flaps.

Inspection system: surfaceCONTROL

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Sensor: optoNCDT / eddyNCDT
Profile measurement

scanCONTROL
- 2D/3D laser scanner
- High resolution profile measurement
- Ready for dynamic measurement tasks
- Compact with integrated controller
- Red laser and patented blue laser
**Defect recognition on worktops**
Foreign bodies, uneven distribution of the adhesive or unevenness when closing may produce open joints between the worktops and the sidebars. The scanCONTROL laser profile sensors check if there are open joints and detect their gap size.

**Dimensional measurement of extremely small, mechanical structures**
While the plastic components are fed into the line, the laser scanner detects the dimensions of the smallest of structures. Deviations in the micrometer range are reliably measured using a Blue Laser Scanner.

*Sensor: scanCONTROL BL*

**Inspection of protruding adhesive beading**
- Maximum height of protrusion is limited
- Adhesive drops on shiny surfaces are also recognized
- Inspection of liquid adhesive

**Gap measurement of plastic profiles**
- High speed measurements
- Shiny, black surfaces
More Precision

Whether it is for quality assurance, predictive maintenance, process and machine monitoring, automation or R&D – sensors from Micro-Epsilon make a vital contribution to the improvement of products and processes. High precision sensors and measuring systems solve measurement tasks in all core industries – from machine building to automated production lines and integrated OEM solutions.