



Inspection systems for the Plastics Industry





VAREX®

References (extract)



Unique
Innovative
Revolutionary
Efficient
Superior

Overview

Measured features

- Thickness
- Profile
- Diameter
- Roller gap
- Surface inspection



C-frame systems
for thickness measurement
thicknessCONTROL FTS 8102
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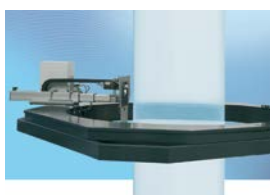
Capacitive systems for inspection of
extruder bore holes
thicknessCONTROL MTS 8201.LLT
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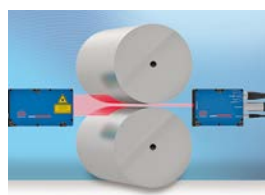
O-frame systems for
profile thickness measurement
thicknessCONTROL FTS 8101
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Deflectometry systems for automatic
inspection of shiny surfaces
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Reverse-frame systems for
the profile measurement of blown films
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Micro-Epsilon systems
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thicknessCONTROL FTS 8102

C-frame systems for thickness measurement of flat film



thicknessCONTROL FTS 8102

The modularly designed FTS 8102 C-frame systems convince in the plastics-processing industry due to their flexibility and performance. Applying them in extrusion and calender lines provides reliable measurement results in high precision and thus creates the basis for controlling the production process and eventually the quality achieved.

Precision

The systems operate according to the differential operation i.e. an application-specific displacement sensor is integrated in the upper and lower flange of the C-frame. The thickness of the target material is the difference between the distance of the sensors to each other and the amount of signals. In combination with highly-efficient signal processing algorithms of the analysis and visualisation software, accuracies in the sub-micrometer range are achieved.

Robustness

A fully-automatic in-situ calibration ensures the measurement to be independent from temperature influences, thus the system can be applied in harsh industrial environments being characterised by permanently providing inline precision. All sensor technologies applied measure without contact, wear-free and without isotopes or X-rays. This process provides long-term reliable measured data while avoiding consequential costs.

Unique

Being supported by various physical measurement technologies, thicknessCONTROL FTS 8102 offers a unique range of solvable applications regarding profile thickness measurement in the plastics-processing industry.

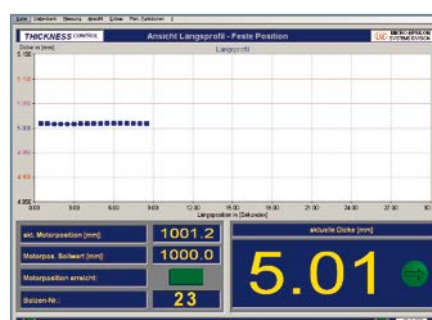
Possible applications

Thickness profile measurement in

- extrusion lines for cast film
- extrusion lines for deep drawing film
- blown film lines after collapsing
- melting calender lines
- extrusion for plastic profiles and plates

Material parameters

- Material width to 450mm
- Material thickness from 10µm to 50mm
- Accuracy from $\pm 1\mu\text{m}$



Data collection is realised via an industry PC or a compact universal controller (caption).

System integration

Using linear axes, the C-frame can be extended to a traversing thickness measurement system in order to enable measurements over the complete target width. The control and analysis software provides all required functions in order to record and evaluate the quality of production without any interruption. Various interfaces which enable an excellent integration into the line are available to communicate with the control system of the production line.

Special features

- No consequential costs due to isotopes or X-rays
- Sensors can easily be exchanged
- Various measurement lines on one evaluation system
- Integrated system for monitoring inspection
- Various physical sensor technologies offer a unique range of solvable applications:
 - laser triangulation point or line
 - combiSENSOR consisting of capacitive and eddy current sensor
 - confocal



FTS 8102.LLT
Laser line triangulation



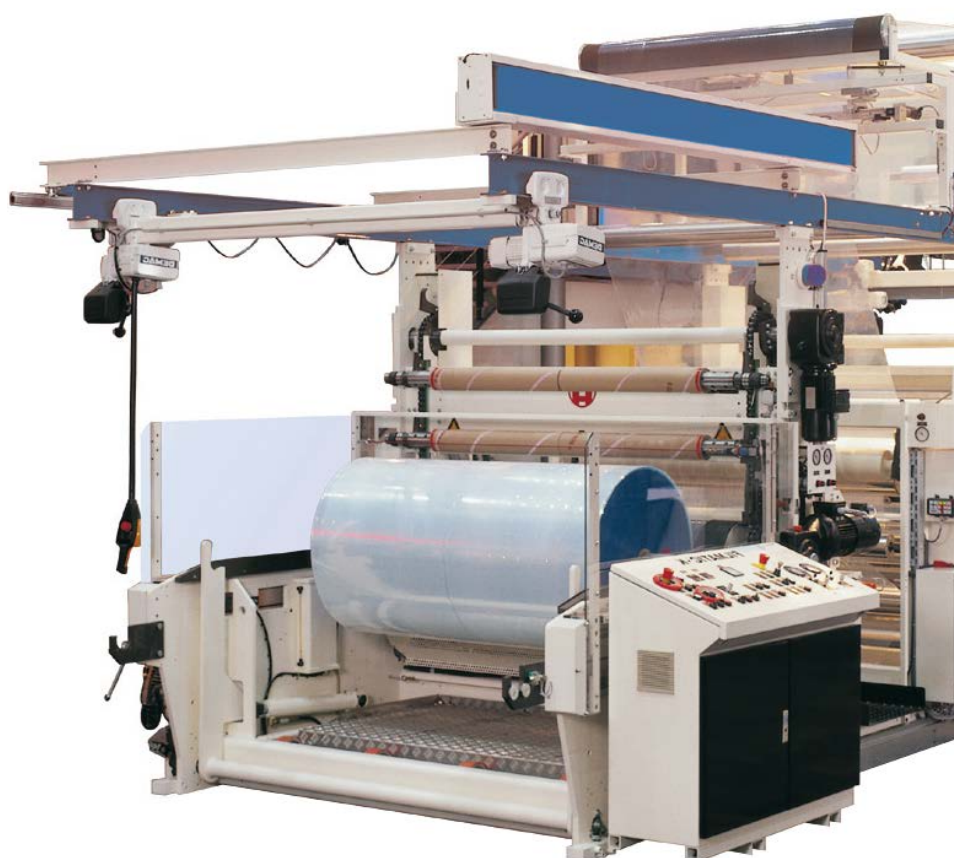
UTS 8x02.K
Confocal



FTS 8102.EC
Capacitive / eddy current



FTS 8102.L
Laser triangulation



thicknessCONTROL FTS 8101

O-frame systems for profile thickness measurement



thicknessCONTROL FTS 8101

The O-frame systems of the FTS 8101 series offer thickness measurements with extreme stability and accuracy. Applying them in extrusion and calender lines provides reliable measurement results in high precision and thus creates the basis for controlling the production process and eventually the quality achieved.

Precision

The system operates while traversing in combination mode i.e. an application-specific displacement sensor is integrated on a mechanical carriage in the upper and lower flange of the O-frame which detects the upper side of the target material. It is combined with an eddy current sensor in one housing. The sensor indirectly detects the bottom side of the opposite target via a measuring roller. The thickness of the target material is the difference of the sensor signals. Additionally, IR sensors are integrated on the traversing mechanical carriage in order to measure the temperature of the material. Therefore, faults due to temperature are compensated for.

Robustness

As well as the fully-automatic in-situ calibration, the sensor provides protection mechanisms against soiling, steam and further influencing material. Therefore, they are ideal for applications in harsh industrial environment. Furthermore, the precision can permanently be presented inline. All sensor technologies applied

measure without contact, wear-free and without isotopes or X-rays. This process provides long-term reliable measured data while avoiding consequential costs.

Innovation

Using different, application-specific measurement methods the systems of the thicknessCONTROL FTS 8101 series are, amongst other things, impressive due to their excellent ratio of measuring range to vertical material movement. Therefore, they can be ideally applied – adapted to requirements – for the profile thickness measurement in the plastics-processing industry.

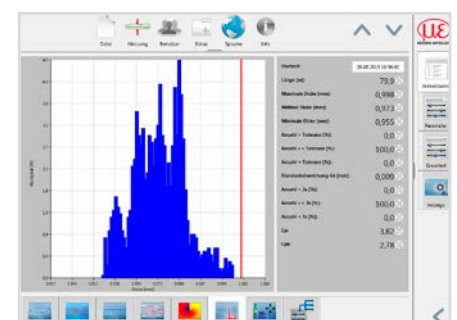
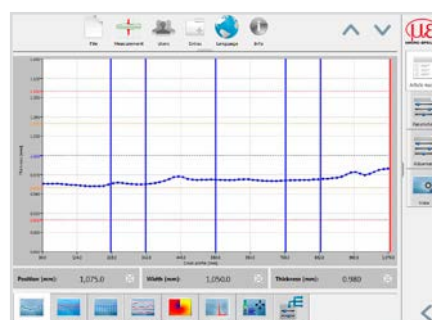
Possible applications

Thickness profile measurement in

- extrusion lines for cast film
- extrusion lines for deep drawing film
- blown film lines after collapsing
- melting calender lines
- extrusion for plastic profiles and plates

Material parameters

- Material width up to 4,000mm
- Material thickness from $<100\mu\text{m}$ to 10mm
- Accuracy from $\pm 5\mu\text{m}$



System integration

For different application areas, corresponding tools for process visualisation and documentation are provided for the plant operators. Various interfaces which enable an excellent integration into the line are available to communicate with the control system of the production line.

Special features

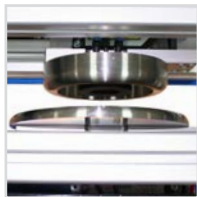
- No consequential costs due to isotopes or X-rays
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 - laser micrometer
 - combiSENSOR consisting of capacitive and eddy current sensor
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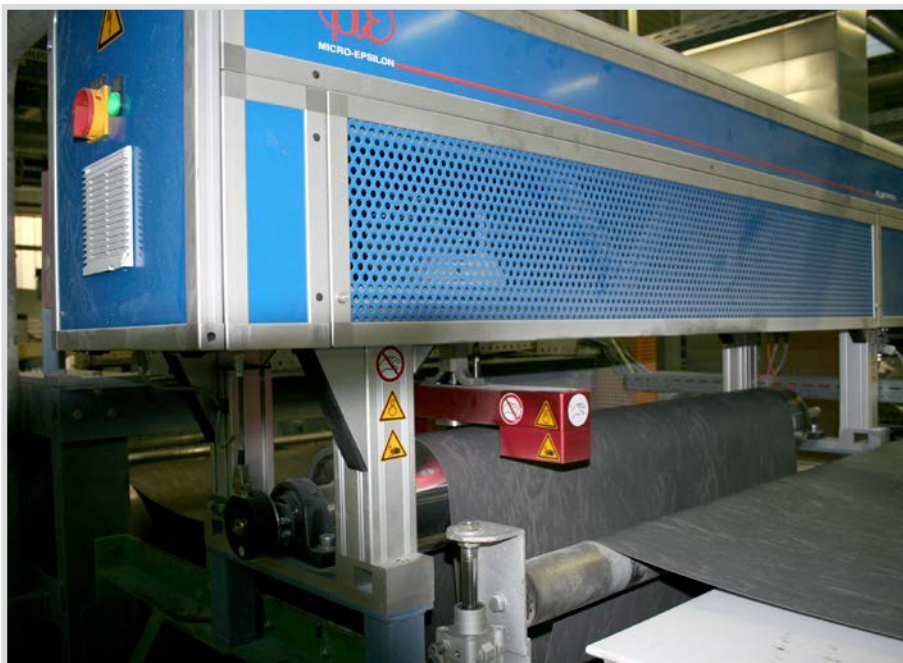
FTS 8101.E0
Eddy current
Laser-ThruBeam



FTS 8101.EC
combiSENSOR capacitive
and eddy current



FTS8101.ET
Eddy current and laser
triangulation



thicknessCONTROL BTS 8104

Reverse-frame systems for the profile measurement of blown films



thicknessCONTROL BTS 8104

The systems of the BTS 8104 family are designed as reversing systems and are based on the capacitive technology. They are directly applied behind the calibration cage on the bubble and therefore offer a very fast and efficient control. Adaptive reversing speed allows an ideal adjusting of the measurement to each phase of the extrusion process. Therefore, these systems present the basis for a perfect film production regarding quality and material input.

Precise

The non-contact version thicknessCONTROL BTS 8104.NC is based on a patented pneumatic position control. This version works with the non-contact air bearing technology which allows a perfect compensation of the movement on the bubble.

Robust

These systems offer a remarkable long-term stability while avoiding interval-oriented re-calibration processes. Therefore, long measurement gaps in which the process can drift away from the target value without any control are avoided. These systems measure as a modern alternative solution to isotope or X-ray measurement units while avoiding consequential costs.

Revolutionary

The family thicknessCONTROL BTS 8104 is significantly impressive regarding the NC version. This 100% non-contact, capacitive measurement system allows precise measurement on highly-adhesive surface protection films on the bubble in a short distance to the blow head. Even in this harsh technology field, a short control loop is guaranteed in contrast to measurements behind the collapsing. Therefore, an ideal extrusion process is ensured.

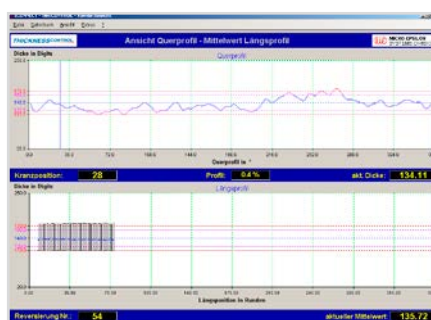
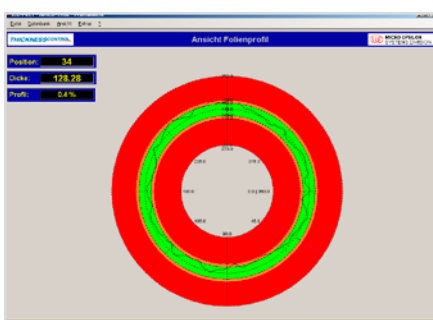
Potential applications

Profile thickness measurement in the blown film extrusion

- Packaging (e.g. fruits for supermarkets, cheese and sausage)
- Agricultural films (e.g. used for strawberry or asparagus fields)
- Bin liner
- Carrier bags
- Freezer bags
- Shrink covers

MATERIAL PARAMETERS

- Work width from 255mm to 3600mm double flat
- Film thickness from $5\mu\text{m}$ to $300\mu\text{m}$
- For non-conductive films



System integration

The BTS8104 blown film measurement systems can be operated with different sensor models. Depending on the film type, non-contact or tactile sensors can be integrated into the system.

Special features

- 100 % non-contact and contact capacitive measurement methods
- Different coating for different film types
- Adaptive reversing speed to ensure fast controlling
- No consequential costs due to isotopes or X-rays
- Short control loop due to measurement on the bubble



thicknessCONTROL 8104.CI
(for abrasive film)



thicknessCONTROL 8104.CII
(for abrasive film)



thicknessCONTROL 8104.CIII
(teflon® coating)



thicknessCONTROL 8104.C
(electrode made of stainless
steel/uncoated)



thicknessCONTROL 8104.NC
(non-contact)

Capacitive systems for inspection of extruder bore holes



dimensionCONTROL0 IDS 8100.C

The diameter of housing bores of extruders can be detected precisely using the IDS 8100.C. Continuous wear of the housing bore is caused by abrasive raw materials together with temperature and pressure. Therefore, exact maintenance intervals are required in order to avoid failure. As the system can be applied in every extrusion line, an improved planning of the service intervals is given.

Precision

The IDS 8100.C operates with integrated capacitive displacement sensors. The actual bore diameters are detected over the whole process part length. As the axial sensor positions are detected as well, local deviations in diameter can be found reliably and quickly using a cable-length measurement system. In doing so, each sensor position is related to a diameter in the longitudinal axis of the bore hole.

Robustness

The sensors are installed opposite each other and determine the diameter of the system. During this process, the sensor unit is centred on the end of the measurement cylinder via spring-loaded rollers. Metal pins on the measuring cylinder run along the saddle of the two bores and prevent any twisting of the cylinder during the measurement process. By turning the cross rollers through 40°, the housing bore can be measured on a total of six measuring tracks.

Efficiency

As a result, the diameter length profiles are provided in six tracks and with a spatial resolution of 5mm. The wear is calculated from the respective diameter values using the evaluation software. As on using the IDS 8100.C, removing the extruder case is not necessary, the maintenance can be effected significantly faster, easier and, above all, less expensive.

Possible applications

Inspection of extruder bore holes

Material parameters

- For housing diameters from 40mm to 180mm
- Diameters of 8mm or 16mm
- Suitable for all metals

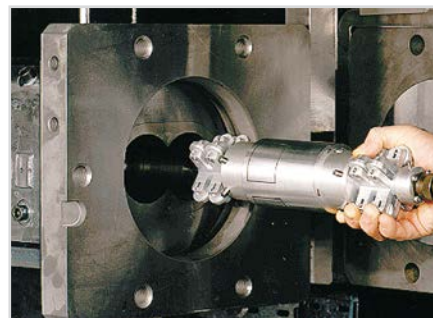


System integration

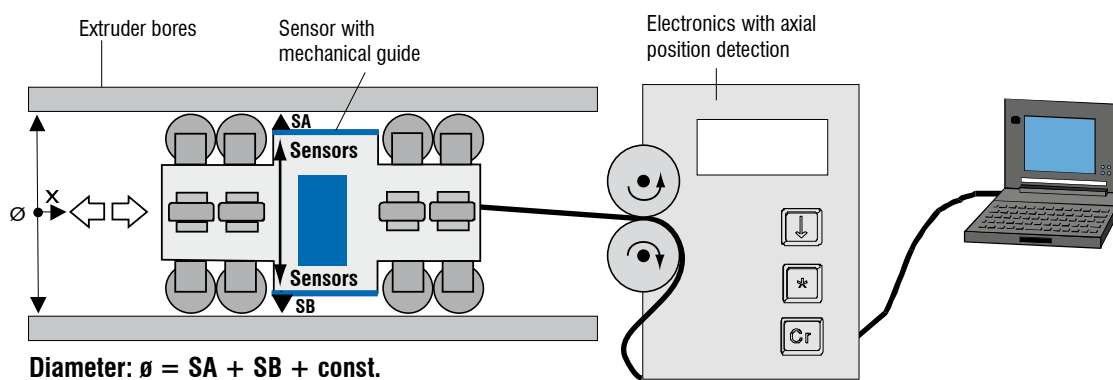
The sensor is designed as so-called sensor unit which can be pushed towards the upstream end of the machine. The sensor is removed – while providing measurement values – on a reinforced cable which is mounted via a special plug on the sensor.

Special features

- Significant reduction of the time required for a service intervention
- Enables the targeted exchange of defective segments
- Suitable for all metals without further calibration
- Evaluation options on site



Principle



reflectCONTROL

Deflectometry systems for automatic inspection of shiny surfaces



reflectCONTROL

reflectCONTROL systems operate according to the principle of phase measuring deflectometry. Their performance during inspection on reflecting surfaces is excellent. The systems are available in different designs which are adapted to the respective requirements in the plastics processing industry.

Precision

The surface analysis based on deflectometry evaluates the deformation of the mirror image of a given pattern. Therefore, the system works similarly to an auditor who "puts the image in perspective" in order to detect irregularities in the mirror image.

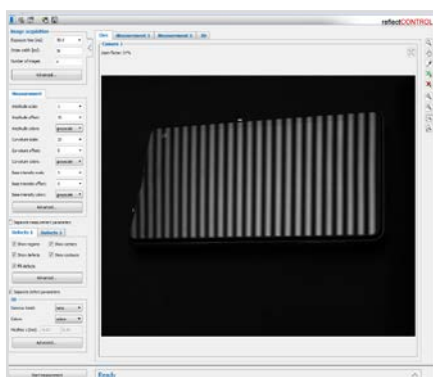
Robustness

In contrast to manual and visual inspection which is laborious, time-consuming and often subject to strong daylight fluctuations regarding repeatability particularly in the case of boundary samples, reflectCONTROL evaluates the surface quality quickly, reproducibly and objectively.

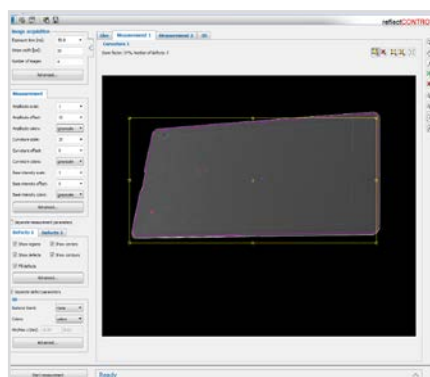
Potential applications

Defect inspection of shiny, reflecting surfaces

- Pores, craters
- Slide marks, scoring, chatter marks
- Welding beads
- Soiling, impressions, contacts



Phase image



Defect detection

System integration

For different application areas, corresponding tools for setup, implementation and documentation of the measurement are provided for the plant operators. Various interfaces which enable an excellent integration into the line are available to communicate with the control system of the production line.

Special features

- Suitable for complex characteristics and web-shaped material
- Modular concept for the application in production and laboratory
- Objective surface inspection
- Complete integration in the production line
- Intuitive user interface
- Local 3D defect reconstruction
- Comprehensive defect evaluation and recording



reflectCONTROL Automotive



reflectCONTROL Automation



reflectCONTROL Compact



Micro-Epsilon in the plastics industry



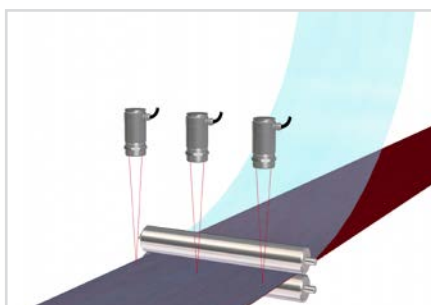
Micro-Epsilon has been a reliable industrial partner for more than 45 years for precision measurement technology for inspection, monitoring and automation. Systems and components from Micro-Epsilon are used in the plastic processing in order to develop efficient production. The medium sized company employs more than 900 people throughout the world and provides Europe's most comprehensive range of measuring technology for measuring thickness, width, profile and surface – however also

temperature, length, vibration, runout, gap and many other factors. As components, they are often indispensable integral parts in the products of many machine and line constructors and electrical equipment suppliers worldwide. As specialist in measurement technologies, Micro-Epsilon is also renowned for providing custom measurement solutions that fulfill the highest requirements in processing lines. Solutions are devised in the shortest time and matched on site.

Temperature measurement in the plastics industry

Micro-Epsilon offers a wide range of non-contact, infrared thermometers, ratio pyrometers and thermal imagers which enable to precisely measure the temperature of the target.

- Extrusion of blown film, flat films and plates
- Thermoforming
- Laminating and embossing
- Injection moulding
- Coating
- Plastics welding



Micro-Epsilon in the plastics industry



Non-contact colour measurements

In non-contact monitoring of continuously produced transparent strips of film, each millimetre of strip produced must be identical in colour. As well as colour fluctuations, streaks can occur during production. As these films are translucent, the colour is measured in transmission using the high speed, high precision colorCONTROL ACS7000 inline colour measurement system, which is connected to a transmission sensor head (ACS3) comprising a transmitter unit (tt) and a receiver unit (TR). By traversing over the entire width of the strip, this system enables the early detection of any slight changes in colour and streaks, allowing production parameters to be modified accordingly. As a result, productivity increases many times over and waste is reduced.



Measurement of the sprayed skin thickness

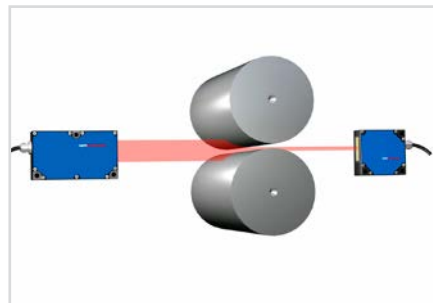
Sprayed skins for vehicle instruments and controls and for airbag cladding are sprayed in a heated mold using a robot-guided nozzle. Here, tight tolerances are required, particularly with the airbag as a safety-relevant part. For this reason, the thickness of the sprayed skin must be inspected inline during the spraying process. To achieve this, the combination sensors are attached directly to the robot arm.

An eddy current sensor in combination with an optoNCDT laser-optical triangulation sensor is used. The eddy current sensor measures the distance to the nickel-coated spray mold. The eddy current sensor has an opening in the centre through which the optoNCDT laser sensor measures the distance to the sprayed part. When subtracted, both signals provide the thickness of the applied sprayed skin.



Roller gap measurement

In order to ensure precise, permanent and regular material processing, the gap between the roller has to remain constant. Micro-Epsilon offers various measurement technologies for the detection of the gap. The appropriate measurement method is chosen depending on the measurement task, ambient conditions and accuracy requirements. The image exemplary shows the measurement of a roller gap using 2 laser micrometers.



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Successful installations in following countries

