



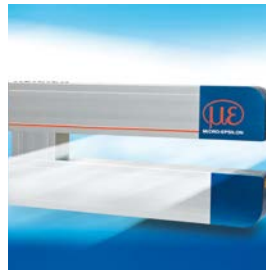
## Measuring and inspection systems for plastics processing industry



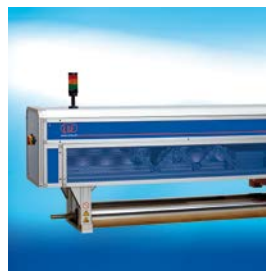


Unique  
Innovative  
Revolutionary  
Efficient  
Superior

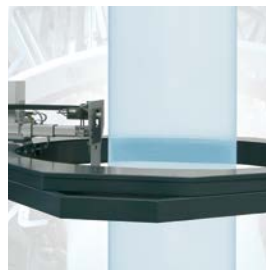
## References (extract)



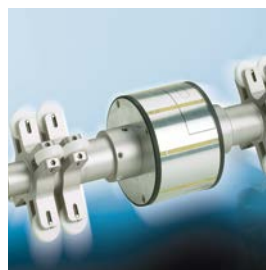
**C-clamp system  
for thickness measurement**  
Page 4-5



**O-frame system  
for profile thickness measurement**  
Page 6-7



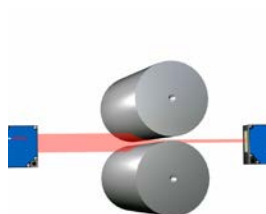
**Reverse-frame systems for  
the profile measurement of blown  
films**  
Page 8-9



**Capacitive systems for  
extruder bore inspection**  
Page 10-11



**Systems based on the  
deflectometry principle for the  
inspection of shiny surfaces**  
Page 12-13



**Micro-Epsilon sensors  
for plastic processing industry**  
Page 14-15

## C-clamp system for thickness measurement



### POTENTIAL APPLICATIONS

Thickness profile measurement in

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

### MATERIAL PARAMETERS

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

## thicknessCONTROL FTS 8102

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

### Precise

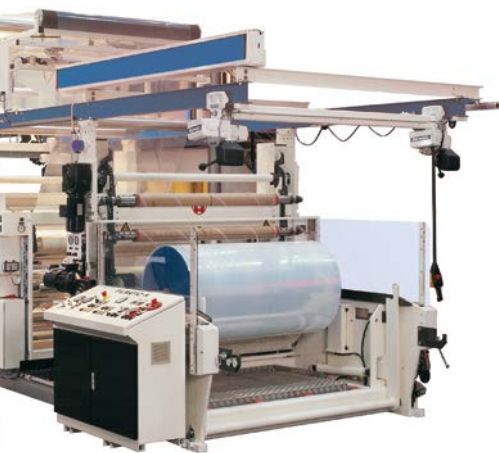
The system measures differentially i.e. an application-specific displacement sensor is integrated in the upper and lower flange of the C-clamp. The thickness of the target material is the difference between the sensors to each other and the amount of signals. In combination with highly-efficient signal processing algorithms of the analyses and visualisation software, accuracies in the sub-micrometer range are achieved.

### Robust

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.

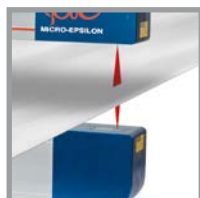


## SYSTEM INTEGRATION

The C-clamp can be used as a traversing thickness measurement system on applying linear axis in order to ensure 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 to 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
  - combi sensor consisting of capacitive and eddy current sensor
  - confocal



FTS 8102.LLT  
Laser line triangulation



FTS 8102.K  
Confocal



FTS 8102.EC  
Capacitive / eddy current



FTS 8102.L  
Laser triangulation

## O-frame system for profile thickness measurement



### POTENTIAL APPLICATIONS

Thickness profile measurement in

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

### MATERIAL PARAMETERS

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

## 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.

### Precise

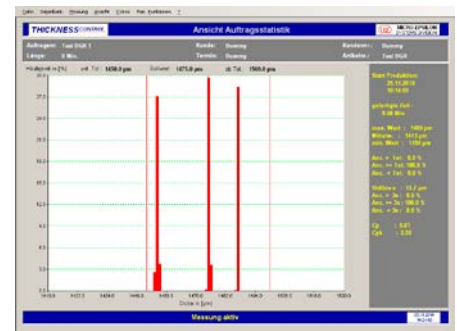
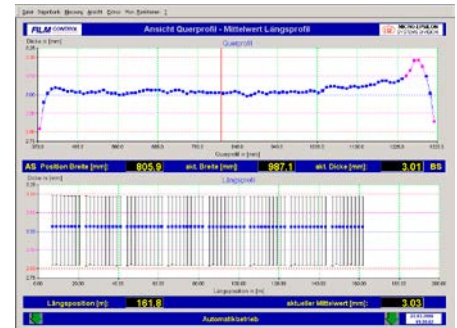
The systems measure differentially i.e. an application-specific displacement sensor is integrated on a mechanical carriage in the upper and lower flange of the O-frame which detects the upper side of the target material. It is combined with an eddy current sensor in a housing. The sensor detects the lower side of the opposite target via a measurement roll. 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.

### Robust

Besides the fully-automatic in-situ calibration the sensor provides protection mechanism 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.

### Innovative

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



## SYSTEM INTEGRATION

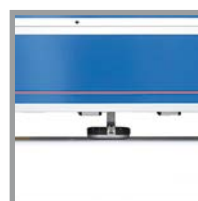
For different application areas, corresponding tools for process visualisation and documentation are provided for the plant operators. Various interfaces which enable an excellent integration to the line are available to communicate with the control system of the production line.

## SPECIAL FEATURES

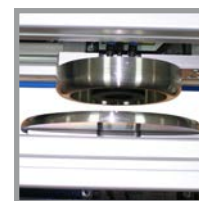
- No consequential costs due to isotopes or X-rays
- Integrated system for monitoring inspection
- Various physical sensor technologies offer a unique range of solvable applications
  - laser triangulation point or line
  - laser micrometer
  - combi sensor consisting of capacitive and eddy current
  - confocal



FTS 8101.E0  
Eddy current  
Laser-ThruBeam

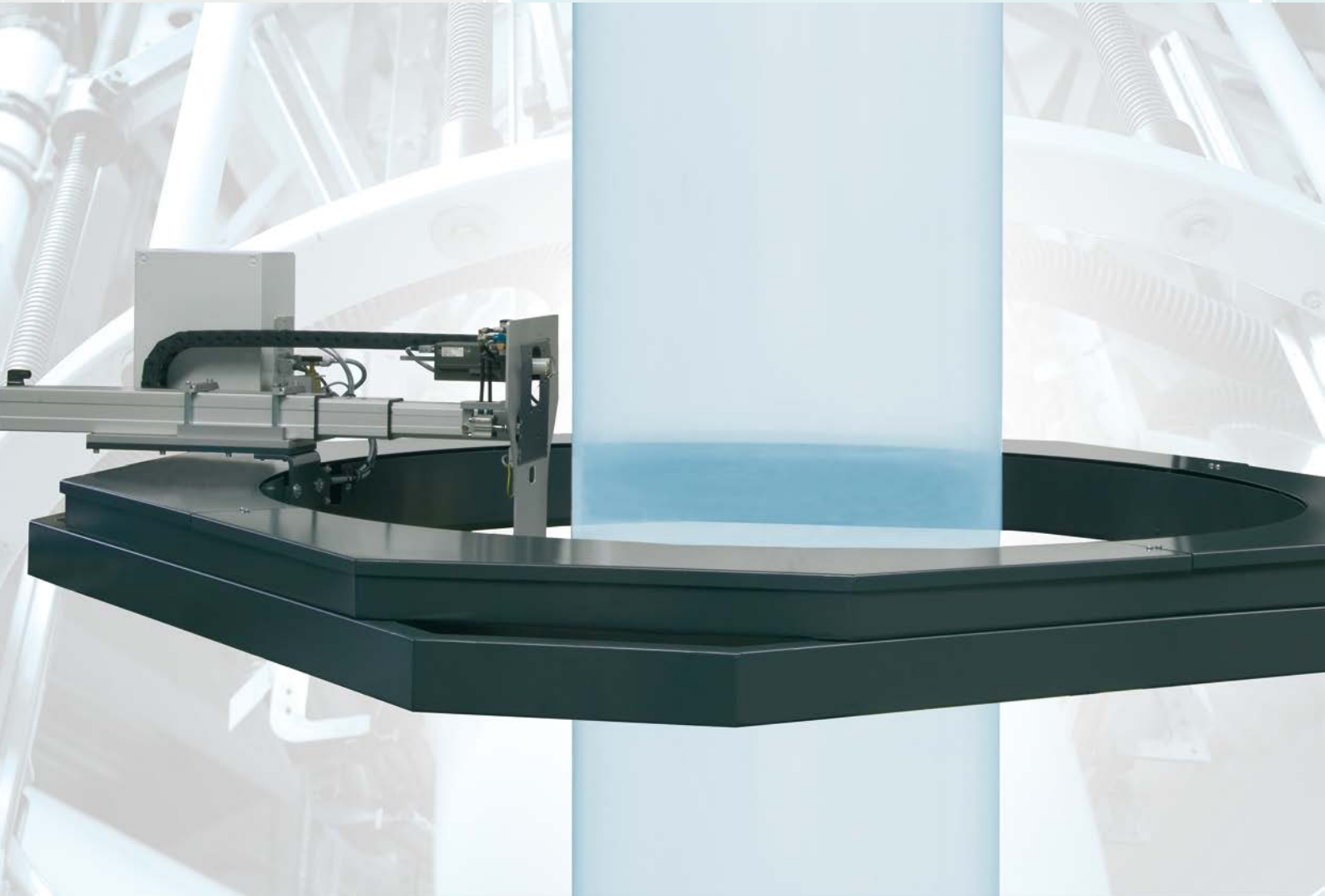


FTS 8101.EC  
Combisensor capacitive  
and eddy current



FTS8101.ET  
Eddy current and  
laser triangulation

## Reverse-frame systems for the profile measurement of blown films



### 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



## 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 immediately 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 basic for a perfect film production regarding quality and material input.

### Precise

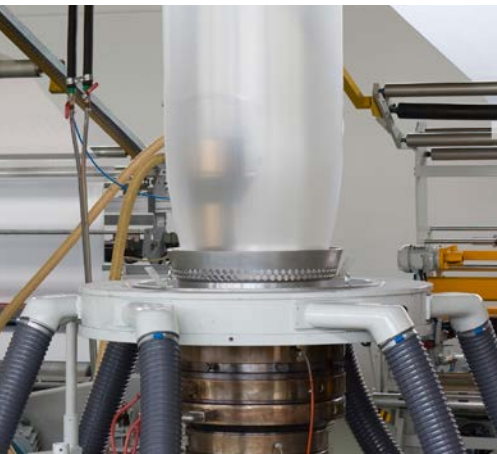
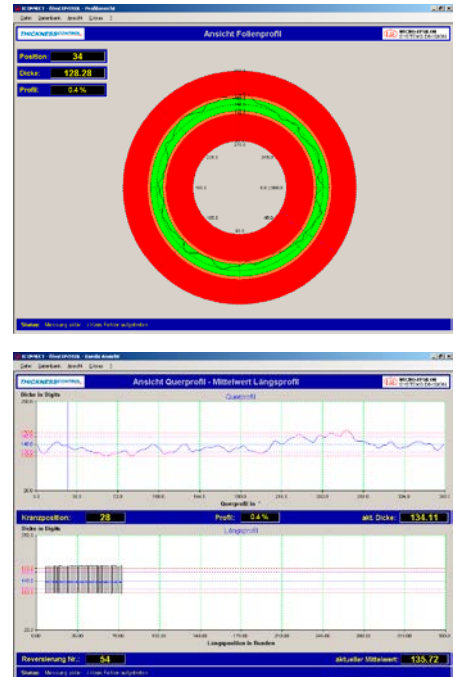
The non-contact version thicknessCONTROL BTS 8104.NC is based on a patented pneumatic position control. This version works with the non-contact air bearing technology which allows a perfect compensation of the movement on the bubble.

### 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. Additionally, even in this harsh technology field short control line is guaranteed in contrast to measurements behind the collapsing. Therefore, an ideal extrusion process is ensured.



## SYSTEM INTEGRATION

The systems provide reversing rings of various manufacturers. Field bus interfaces are available, the protocols of which can be adapted to the requirements of individual customers.

## 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 ensured by measurement on the bubble



thicknessCONTROL 8104.CI



thicknessCONTROL 8104.CII



thicknessCONTROL 8104.CIII



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



thicknessCONTROL 8104.NC  
(non-contact)

## Capacitive systems for extruder bore inspection



### POTENTIAL APPLICATIONS

Inspection of extruder bores

### MATERIAL PARAMETERS

- For housing diameters 40mm to 180mm
- Diameter versions 8 or 16mm
- Suitable for all metals

## dimensionCONTROL IDS 8100.C

Applying the IDS 8100.C the diameter of case bores of extruders can be detected precisely. The wear of the machine which has been generated due to abrasive raw material, temperature and pressure can be controlled without contact. As the system can be applied in every extrusion line, an improved planning of the service intervals is given.

### Precise

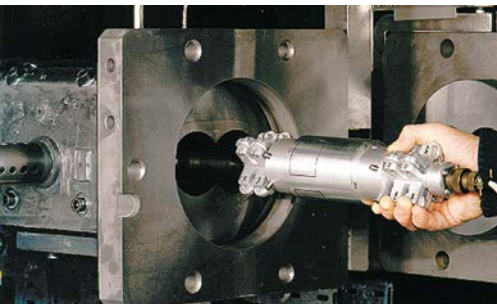
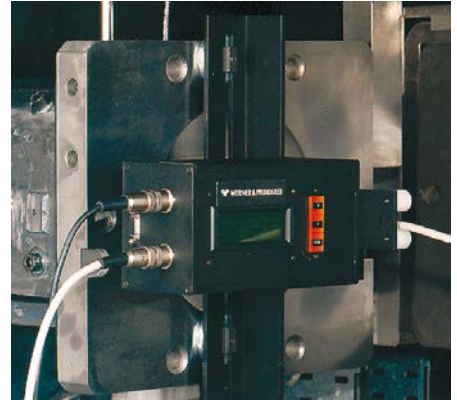
The IDS 8100.C works with integrated capacitive displacement sensors. The actual bore diameters are detected over the whole process part length. As the axial sensor positions are detected as well using a cable-length measurement system, local deviations in diameter can be reliably and quickly found.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

### Robust

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. The casing bore on a total of six measuring tracks can be measured by turning the cross rollers through 40°.

### Efficient

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



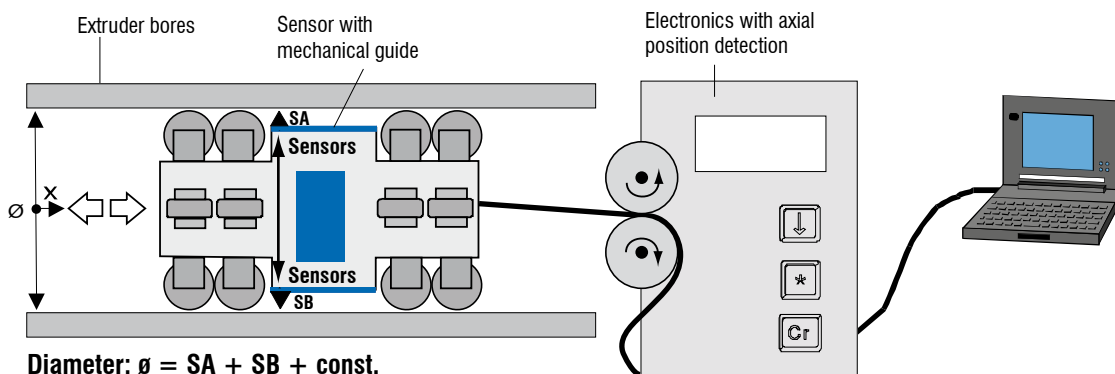
## SYSTEM INTEGRATION

The sensor is designed as so-called sensor unit which can be pushed as far as the downstream 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 in the time required for a customer service engineer
- Allows the exchange of defective segments
- Suitable for all metals without further calibration
- Local evaluation options

### Principle



## Systems based on the deflectometry principle for the inspection of shiny surfaces



### POTENTIAL APPLICATIONS

Defect inspection of reflecting surfaces regarding:

- Pores, craters
- Moulding defects, shell defects
- Slide marks, scoring, chatter marks
- Splitters
- Soiling, impressions, contacts

### MATERIAL PARAMETERS

- Lateral defects from  $2\mu\text{m}$
- 3D defect reconstruction
- Color independent modes
- Provides OK / NOK decisions, evaluations and defect reports

## reflectCONTROL PSS 810X.D

The systems of the series PSS 810X.D are based on the phase measuring deflectometry principle. Their performance during inspection on reflecting surfaces is excellent. The systems are available in different designs which are adapted to respective requirements in the metallurgical industry.

### Precise

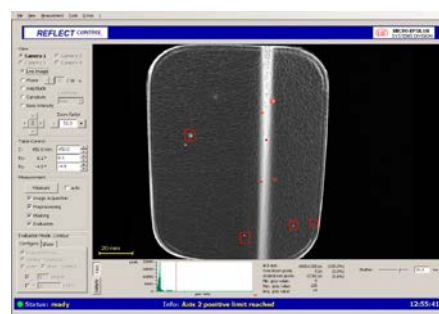
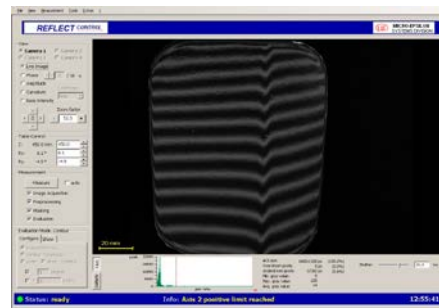
The irregularities in the mirror image of a given pattern are evaluated by the surface analysis based on deflectometry. Therefore, the system works similarly to an auditor who "puts the image in perspective" in order to detect irregularities in the mirror image.

### Robust

Contrary to manual and visual inspection which is laborious and time-consuming and unfortunately subject to strong daylight fluctuations particularly in the case of boundary samples regarding repeatability, the surface quality is assessed quickly, reproducibly and objectively on applying products of the reflectCONTROL series.

### Superior

Systems and lines of the family reflectCONTROL not only master the detection of surface defects but manage the measurement of characteristics and depth. Even dents and bulges are detected accurately in the micrometer range.



## SYSTEM INTEGRATION

In order to support production reflectCONTROL PSS 810X.D can be applied as a sensor to be integrated, laboratory storage or as robot-based line. The fully-automatically detected defects are classified and documented on providing OK / NOK decisions, evaluations and defect reports.

## SPECIAL FEATURES

- Surfaces resolution can be adjusted down to the micrometer range
- 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



MSS 8205.D  
reflectCONTROL Robotic



MSS 8206.D  
reflectCONTROL Compact



MSS 8200.D  
reflectCONTROL Sensor

## Micro-Epsilon application examples

Micro-Epsilon has been a reliable industrial partner for more than 40 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 size company employs approx. 500 people throughout the world and provides Europe's most comprehensive range of measuring technology for measuring thickness, width, profile and surface – however also temperature, for measuring vibration, impact, 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 world wide. But the company, specialising as it does in measurement technology, is also known for unconventional solutions where requirements are strict in the area of process lines. Solutions are devised in the shortest time and matched onsite.

### Glue bead inspection with laser scanner

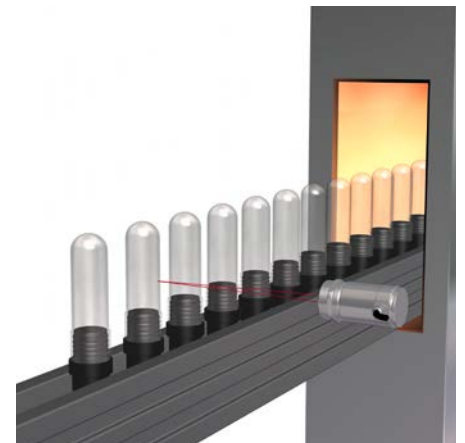
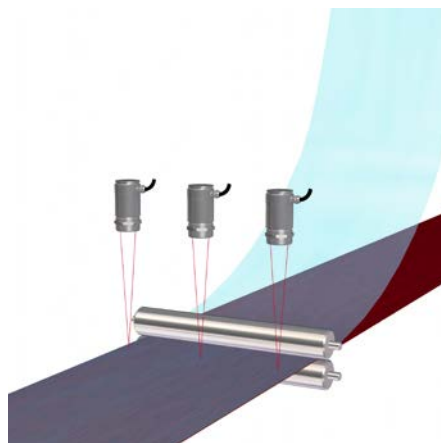
The measurement system scanCONTROL 2710 is used to detect the adhesive beading applied while monitoring the required height and width of the adhesive beading during the process. Being controlled by a line controller, the laser scanner permanently offers OK/NOK values. Since the adhesive beading is applied by lateral movements of the pane and rotating movements of the nozzle, the sensor carries out the corresponding rotating movements. If a deviation occurs anywhere, a signal is initiated and the plane can be rectified manually.



### Temperature measurement in the plastic processing industry

Micro-Epsilon offers a wide range of infrared thermometers, ratioetric pyrometers and IR cameras which allow you 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



### Thickness measurement of rubber film

Close thickness tolerances are specified for the manufacture of rubber film which is rolled using calender rollers. Random-sample manual measurements, as previously carried out, are no longer sufficient for today's demands on quality assurance. Consequently, a system with three fixed tracks has been adapted for in-line inspection of the thickness. For each track an eddy current sensor is built into a jockey follower system which measures against a stainless steel roller.

The stainless steel roller represents the reference system for the measurement. When the jockey follower is located on the roller, the measurement system supplies a thickness of 0mm. When the jockey roller is located on the rubber material, then the eddy current sensor moves away from the calender roller and the distance of the sensor to the roller corresponds to the thickness of the material.



### Measurement of the sprayed skin thickness

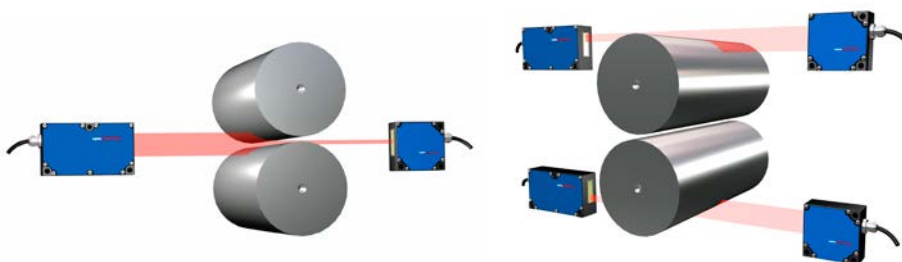
Sprayed skins for vehicle instruments and controls and for airbag cladding are sprayed in a heated mold using a robot-guided nozzle. Here, tight tolerances are required, particularly with the airbag as a safety-critical part. For this reason the thickness of the sprayed skin must be inspected during 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-based 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 center 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.



### Roll gap measurement

In order to ensure precise, permanent and regular material processing, the gap between the roll has to remain. Micro-Epsilon offers various measurement technologies for the detection of the gap. The suitable measurement method is chosen, depending on the measurement task, ambient temperatures and accuracy requirements.



## High performance sensors made by Micro-Epsilon



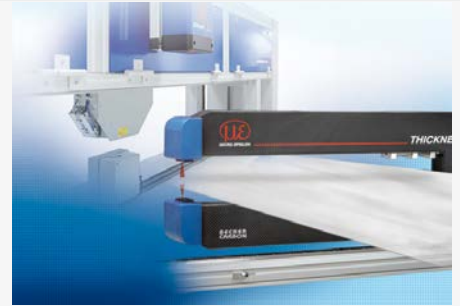
### Sensors and Systems for displacement, position and dimension

Eddy current sensors  
Optical and laser sensors  
Capacitive sensors  
Inductive sensors  
Draw-wire sensors  
Optical micrometers  
2D/3D profile sensors  
Image processing



### Sensors and measurement devices for non-contact temperature sensors

Thermal imager  
Online instruments  
Handheld devices



### Measuring systems for quality control

for plastic and film  
for tyre and rubber  
for web material  
for automotive components  
for glass and panes



Micro-Epsilon (Germany)



Atensor (Austria)



ME Inspection (Slovakia)



**MICRO-EPSILON**

Micro-Epsilon Systemtechnik is specialised on system solutions within the group of companies. The required components such as measurement technology, software and mechanics are developed and produced on three locations. All core capabilities and the corresponding know-how come from one group of companies – and this is mirrored in the innovative and reliable products of Micro-Epsilon.

MICRO-EPSILON MESSTECHNIK GmbH & Co. KG  
Koenigbacher Str. 15  
94496 Ortenburg / Germany  
Tel. +49 (0) 8542 / 168-0  
Fax +49 (0) 8542 / 168-90  
info@micro-epsilon.com  
www.micro-epsilon.com



### SCIGATE AUTOMATION (S) PTE LTD

No.1 Bukit Batok Street 22 #01-01 Singapore 659592  
Tel: (65) 6561 0488 Fax: (65) 6562 0588  
Email: sales@scigate.com.sg Web: www.scigate.com.sg  
Business Hours: Monday - Friday 8.30am - 6.15pm