



## Measuring and Inspection Systems for Rubber and Tire Industry





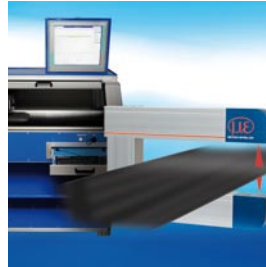
Unique

Innovative

Revolutionary

Efficient

Superior



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## Inline and offline profilometer for strip thickness measurement



### POTENTIAL APPLICATIONS

- Thickness profile measurement in
- Tire installations
  - Extruder lines
  - Rollerhead installations
  - Calenders
  - Doubling installations

### MATERIAL PARAMETERS

- Material width up to 450mm
- Material thickness from <math>< 1\text{mm}</math> to 18mm
- Accuracies from  $\pm 5\mu\text{m}$

## thicknessCONTROL RTP 8302

The modularly designed C-frame based systems of the RTP8302 family are convincing due to their flexibility and performance in the rubber processing industry. Applying them in extruder lines or measuring rooms provides reliable measurement results in high precision and thus creates the basis for controlling the production process and eventually the quality achieved.

### Precise

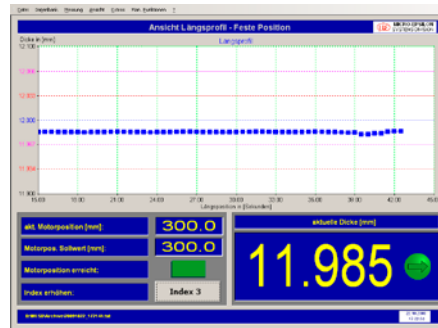
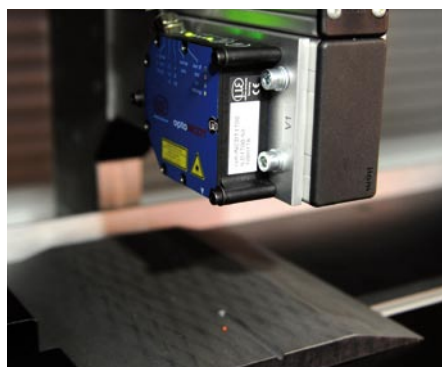
The system measures differentially i.e. an application-specific displacement sensor is integrated in the upper and lower flange of the C-frame. The thickness of the target material is the difference between the sensors to each other and the amount of signals. In combination with highly-efficient signal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

### 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 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 and possible applications thicknessCONTROL RTP 8302 offers a unique range of solvable applications regarding profile thickness measurement in the rubber processing industry.



## SYSTEM INTEGRATION INLINE PROFILOMETER

The inline profilometer can be used as a traversing thickness measuring system on applying linear axis in order to ensure complete width measurements of the target. 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 INLINE-PROFILOMETER

- Special features inline profilometer
    - Laser triangulation point
    - Laser line triangulation
    - Capacitive / eddy current
- offer a unique range of solvable applications

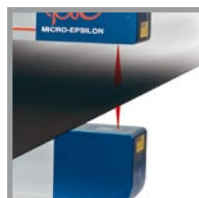
- No consequential costs due to isotopes or X-rays
- Integrated system for monitoring inspection

## APPLICATION-SPECIFIC USE AS OFFLINE-PROFILOMETER

The systems can be integrated into standalone solutions and can therefore be applied in measuring rooms as offline-profilometer. Using them for extrusion processes of tread and side wall or innerline material, they can additionally be equipped with application specific software such as thicknessCONTROL TTP or thicknessCONTROL TIP.

## SPECIAL FEATURES INLINE-PROFILOMETER

- Manually measurements which are prone to error can be replaced
- Optimising quality control
- More efficient, manual settings of the extrusion nozzle reduces consumption of material
- Economical solution to control various lines by one system



RTP 8302.LLT  
Laserline triangulation



RTP 8302.L  
Laser triangulation



RTP 8102.EC  
Capacitive / eddy current

## Profilometer for innerline thickness measurement



### POTENTIAL APPLICATIONS

Thickness profile measurement in

- Tire installations
- Extruder lines
- Rollerhead installations
- Calenders
- Doubling installations

### MATERIAL PARAMETERS

- Material width up to 4,000mm
- Material thickness from <1mm to 20mm
- Accuracies from  $\pm 5\mu\text{m}$

## thicknessCONTROL TIP 8301

The systems of the TIP 8301 family are designed as O-frames and significantly impress by large material width and stability as well as high precision during thickness measurements. Applying them in tire 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. the thickness of the material is calculated from two distance signals. However, the sensors are applied on one side of the TIP8301.EO and the material is guided over a measuring roller, in the case of TIP 8301 one displacement sensor is integrated on the upper and lower flange of the O-frame on a mechanical carriage. The thickness of the target material is the difference between the sensors to each other and the amount of signals.

### Robust

The systems offer an efficient cleaning mechanism. This provides high resistance against steam and particles. Therefore, they are ideal for applications in harsh industrial environment. Furthermore, they offer efficient operation facilities due to large maintenance-free intervals. Thanks to integrated in-situ calibrations which do not vary with temperature, they can be also applied under harsh climate environmental conditions e.g. in the rubber processing industry. 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 TIP8301 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 rubber 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.

### FEATURES:

- Various physical sensor technologies
  - Laser triangulation point or line
  - Laser micrometer
- offer a unique range of solvable applications
- No consequential costs due to isotopes or X-rays
- Integrated system for monitoring inspection



TIP 8301.EO  
Laser thrubeam /  
eddy current



TIP 8301.CT  
Laser triangulation

## Profilometer for thickness measurement of treads and side walls



### POTENTIAL APPLICATIONS

Thickness profile measurement in

- Tire installations
- Extruder lines
- Rollerhead installations
- Calenders
- Doubling installations

### MATERIAL PARAMETERS

- Material width up to 2,000mm
- Material thickness from < 1mm to 18mm
- Accuracies from  $\pm 5\mu\text{m}$



## thicknessCONTROL TTP 8301

The systems of the series TTP 8301 are based on the light intersection method, traversing triangulation, respectively. They are designed as O-frames and offer precise results in the case of non-contact geometry measurement of rubber webs. Therefore, the systems make an important contribution for more efficiency and quality in the process controlling of the tire production.

### Precise

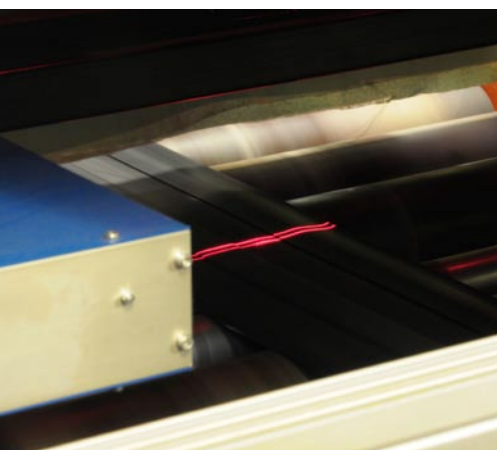
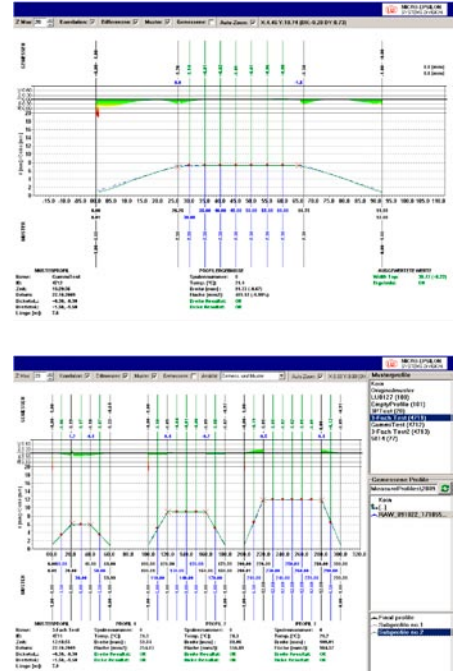
The systems measure differentially i.e. the thickness of the material is calculated from two distance signals. Using the TTP 8301.I, a laser line is projected onto the material which is then detected by a camera, in the case of TTP8301.T one displacement sensor is integrated on the upper and lower flange of the O-frame on a mechanical carriage. The thickness of the target material is determined by the distance of the sensor and cameras to each other and the amount of signals.

### Robust

In addition to the fully-automatic in-situ calibration, the systems dispose of compensation frames which do not vary with temperature ensuring the measurement is not affected by temperature influences. 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.

### Revolutionary

Systems and machines of the thicknessCONTROL TTP 8301 series offer precise results which correspond to future requirements in the tire production industry due to the patented linearisation method.



## SYSTEM INTEGRATION

The operators can use extensive software tools for process evaluation e.g.

- Customer specific trend analysis
- User-friendly data base
- Offline analysis
- Report writer

Various connecting options for the system via TCP/IP or field bus interfaces allow an efficient integration into the production line.

## FEATURES:

- Various physical sensor technologies
    - Laser triangulation point or line
    - Light intersection method
- offer a unique range of solvable applications

- No consequential costs due to isotopes or X-rays
- Integrated system for monitoring inspection



TTP 8301.I  
Laserline



TTP 8301.T  
Laser triangulation

## Tire geometry inspection system



### POTENTIAL APPLICATIONS

Thickness tire geometry measurement in

- TU machines for passenger car tires
- TU machines for truck tires
- TU machines for commercial vehicles tires

### MATERIAL PARAMETERS

- Tire width from 100 to 460mm
- Resolution 640 points/profile
- Measuring time 1s / 60 tires/min)
- Repeatability <0.04mm (3-Sigma)

## dimensionCONTROL TGI 8302.LLT

The systems belonging to the TGI 8302.LLT family are equipped with three application-specific triangulation laser scanner. They reliably detect the radial and axial unbalance as well as bulges and constrictions on the tire. Therefore, they make an important contribution regarding reliability and quality during the production of the tire, one component of the vehicle which is relevant to high safety in the automotive and commercial vehicles production.

### Precise

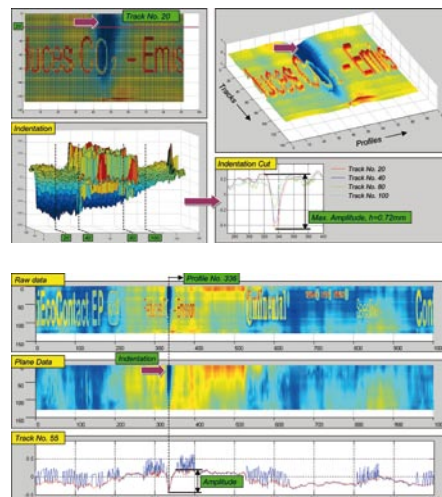
Three laser line scanner are integrated in the TGI 8302.LLT. Using those profile sensors, the whole surface is scanned, bulges and constrictions are detected in angles, lateral size and depth. Efficient signal processing algorithms ensure reliably letter elimination. Additionally, the radial and lateral unbalance of the tire subject for inspection is detected. This value is evaluated as average value, peak-to-peak value. Furthermore, the vibration behaviour is shown.

### Robust

The mechanical basis of TGI 8302.LLT is a C-frame in which the upper and lower flange as well as the tread sensor are controlled according to the tire size due to full-automatic controlling methods. The actuators can be alternatively operated by servo or step motors. The controlling parameter can be stored in the database.

### Superior

Using laser line triangulation sensors which are optimised regarding the installing situation for the application in measuring system for tire geometry, the systems can be applied in various existing TU machines. Due to the special arrangement of optics, they have an excellent ratio of line length and measurement range to installation space.



## SYSTEM INTEGRATION

The system is designed as autonomous tester which can be easily integrated in various TU machines due to its compact design. Via TCP/IP or various field bus types the real time control system of the TGI 8302.LLT, compatible with PC can be connected to the control desk.

### FEATURES:

- Optimised design for TU machines retrofit
- Applicable in various TU machines
- Defect classification
- Automatic selection of the measuring range
- Scan of the total surface
- Reliable letter elimination
- Integrated system for monitoring inspection



Bulge and dent on a tire surface

## Systems for color inspection for width and length measurement



### POTENTIAL APPLICATIONS

- Thickness tire geometry measurement in
- Tire installations for passenger car tires
  - Tire installations for truck tires
  - Tire installations for commercial vehicle tires

### MATERIAL PARAMETERS

- Material width from 200 to 550mm
- Material thickness up to 50mm
- Material feed up to 30m/min

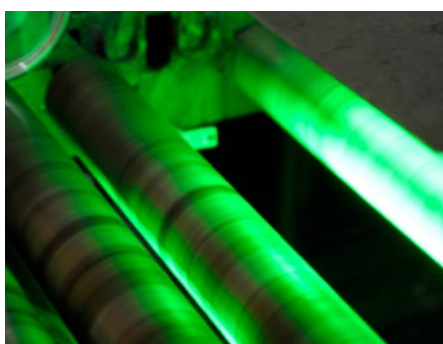
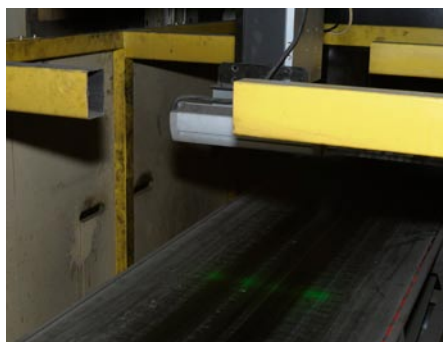
## dimensionCONTROL TLS 8303.I

### Precise

The TLS 8303.I is applied in the extrusion line immediately after the cutting machine including two cameras in order to verify rubber strips regarding their profile and length for tire production. The cameras record synchronously the cutting edge of the strips and detect deviations from the nominal cutting edge applying intelligent composition proceedings. Consequently, the length of the strips can be evaluated from the distance of the cameras to each other and the dimensions of the cut surface.

### Robust

The system uses signal processing algorithms and filters in order to avoid interferences such as vibrations, incidence of external light etc. in order to ensure stable results.



## dimensionCONTROL TCS 8303.I

### Efficient

Using the system TCS 8303.I the treads of tires are coded in color. The cartridges for the marking are inserted in a holder. A pneumatic height adjustment and a servo controlled horizontal positioning ensure a straight line and optimal position of the code lines which are verified by an image processing system in situ. At the same time to inspection of the color code the system measures the width of the rubber strips.

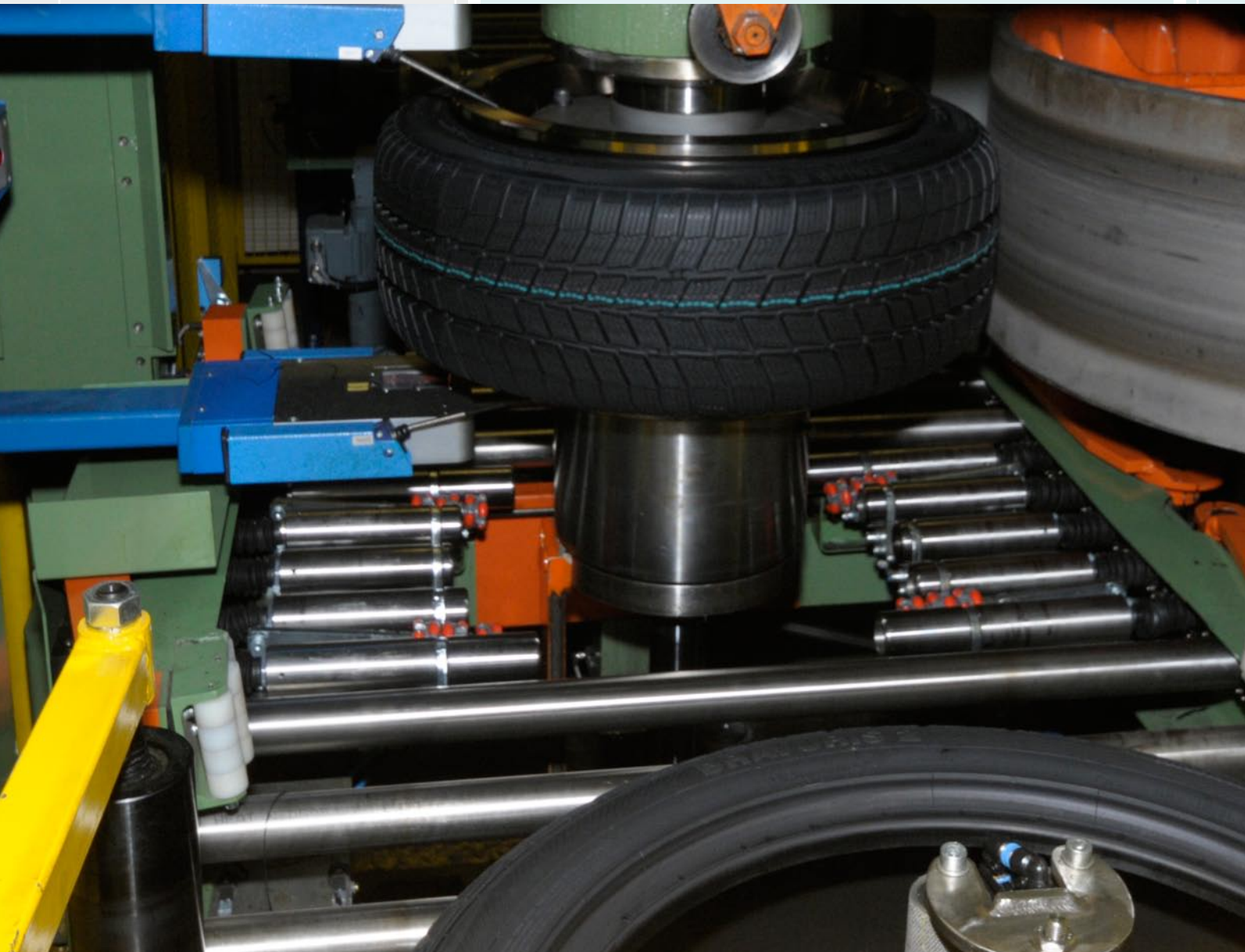
### FEATURES COLOR INSPECTION

- Integrated detection of the color code and width measurement of running stripes
- Reproducibility <math>< 0,1 \text{ mm}</math>
- Positioning of the marking unit
- Detection of missing, wrong or incomplete lines
- Color code and positioning accuracy classification

### FEATURES WIDTH MEASUREMENT

- Application directly after the cutting machines
- Geometrically independent comparison of cutting edges
- 2M pixel camera with 0.125mm/pixel resolution
- Edge detection and filters increase data quality
- Measurement reproducibility  $\pm 0,25 \text{ mm}$
- Strips lengths from 1,500mm to 2,500mm

## Retrofit of TU machines



### POTENTIAL APPLICATIONS

Please find below the models that can be equipped with a retrofit:

- Akron D70
- Meyer Beulenprüfmaschinen
- Hoffmann TU RGM-E

### INNOVATIVE SOFTWARE CONCEPT

One IPC for

- Machine control
- Uniformity measuring system
- Geometrical measuring system
- Inspection of markings

## dimensionCONTROL TRP 8309.M

ME-Inspection SK, a subsidiary of Micro-Epsilon Messtechnik, provides extensive services for the retrofitting and modernisation of already-installed TireUniformity machines. Therefore, these machines are technically updated.

### Precise

Beyond question measurement technology is the core competence of the Micro-Epsilon Group. This ensures higher precision for uniformity and geometry technology within the retrofit packages TRP8309.M. Based on standard products that have been used in hundreds of applications, special sensors have been developed that are ideal for retrofit applications due to their technical characteristics.

### Intuitive

The compact concept of the TRP8309.M, which enables the control of all stations and reproducing all measured data with only one IPS, provides a reliable operating machine. This reliability is demonstrated in terms of operation and maintenance, as well as flexibility, which can be adapted to customer-specific requirements. Innovative elements such as the real time control of markings by using image processing, update the latest machines, offering high performance inspection testing.

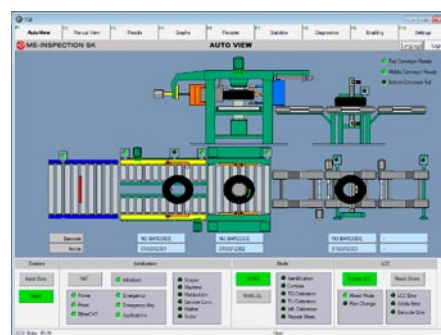
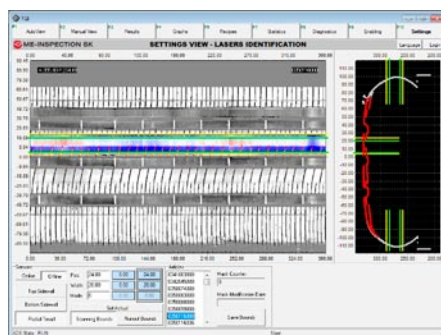
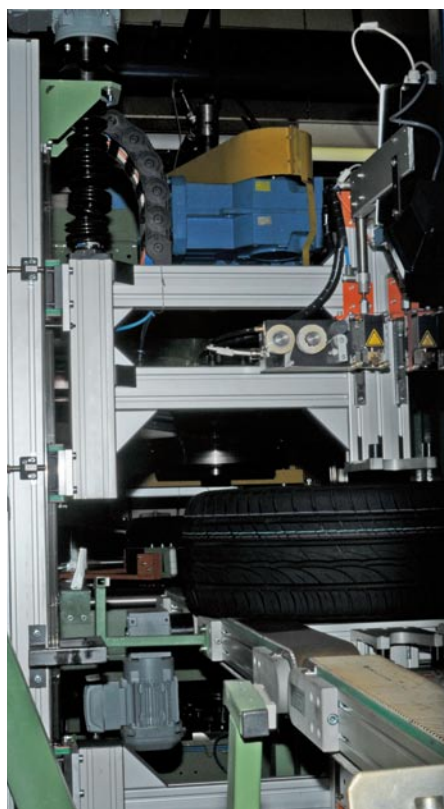
### Reliable

In order to ensure smooth operation of the machines during production, Micro-Epsilon offers 24-7 telephone technical support. Additionally, our personal service also includes onsite support at any time.

## EQUIPMENT

The package for modernising TU machines consists of the following upgrades:

- electrical components
- a control system, either Beckhoff or Siemens-based systems
- a bead moistening station, the feeding and transportation unit
- a marking station (optional optical inspection by image processing)
- a sorting unit (lift or 3 positions sorting with electromechanical positioning)
- a safety gate
- a pressure filling station which is software-controlled
- a geometrical and uniformity measurement



## High performance sensors made by Micro-Epsilon



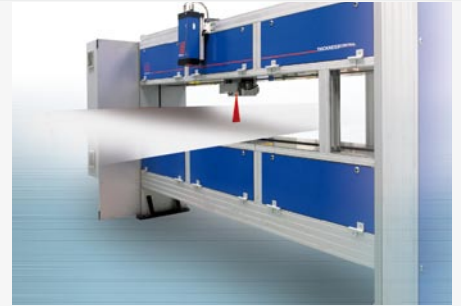
### Sensors and Systems for displacement, position and dimension

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 tire and rubber  
for web material  
for painted surfaces



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.

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