MICRO-EPSILON

Inspection Systems for the Tire Industry

MICRO-EPSILON SYSTEM DIVISION

MICRO-EPSILON

ME-INSPECTION SK
a MICRO-EPSILON company

Best Efficiency, by Mastering Microns

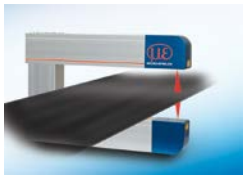
Performance, quality as well as reliability of products and service developed and manufactured in close cooperation have made Micro-Epsilon Messtechnik GmbH & Co. KG and ME-Inspection SK to leading suppliers of inspection systems for tire industry. More than 150 installations in 16 countries all over the world placed in the preparation area, final finishing and wheel assembly speak for themselves. Generating all required core components like sensors, software and measurement specific mechanic construction inside the company group provides unique innovative skills which are mirrored in the product portfolio of Micro Epsilon.

References (extract)

GOODYEAR
BRIDGESTONE
Firestone
RODOLFO COMERIO
Continental
SEMPERIT
PIRELLI
Krauss Maffei Berstorff
MRF TYRES
TROESTER
EXCELLENCE IN EXTRUSION.
EUROFIT
HARBURG FREUDENBERGER

Overview **Preparation Area**

Tire Component Profilometer
thicknessCONTROL TCP 7303.ET
Page 4-5



Tire Component Profilometer
thicknessCONTROL TCP 8302.T/LLT
Page 6-7

Tire Component Offline Profilometer
thicknessCONTROL TCP 8302.T-Offline
Page 8-9

Tire Component Profilometer
thicknessCONTROL TCP 8301.EO
Page 10-11

Tire Component Profilometer
thicknessCONTROL TCP 8301.CT/CLLT
Page 12-13

Tire Component Profilometer
thicknessCONTROL TCP 8301.I
Page 14-15

Tire Color Inspection
dimensionCONTROL TCI 8303.I
Page 16-17

Tire Length Inspection
dimensionCONTROL TLI 8303.I
Page 18-19

Tire Piece Weight Inspection
dimensionCONTROL TWI 8302.C.TT
Page 20-21

Tire Component Profilometer

thicknessCONTROL TCP 7303.ET

Installation sites & possible applications

Thickness measurement in

- Extrusion lines
- Innerliner calender
- Ply calender
- Textile or fabric cord calender

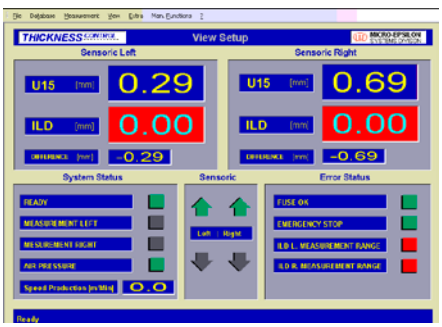
Realized as a gantry, thicknessCONTROL is a cost-effective and precise way to measure the thickness in a fixed position in form of a length profile inside tire component lines.

Flexibility in several variations

thicknessCONTROL TCP 7303.ET can be equipped with up to three sensor combinations. One of these combinations consists of a laser triangulation sensor and an eddy current sensor. The eddy current sensor features an opening, where the light spot and the reflection of the triangulation sensor pass through, forming a concentric measurement spot. These sensors are combined with a roller that guides the material. This roller is not necessarily a special measurement roller, it can also be a calender roller.

The eddy current sensor detects the surface of the roller and therefore the lower side of the tire component, whereas the laser triangulation sensor measures the upper side. The thickness of the target is the difference between the two displacement sensor signals. Due to the fact that the result is always based on the measured displacement between the gantry and the roller, effects on the frame caused by temperature gradients do not influence the gauge.

The sensors are mounted on a linear guiding and can be adjusted manually in X direction to the desired position.



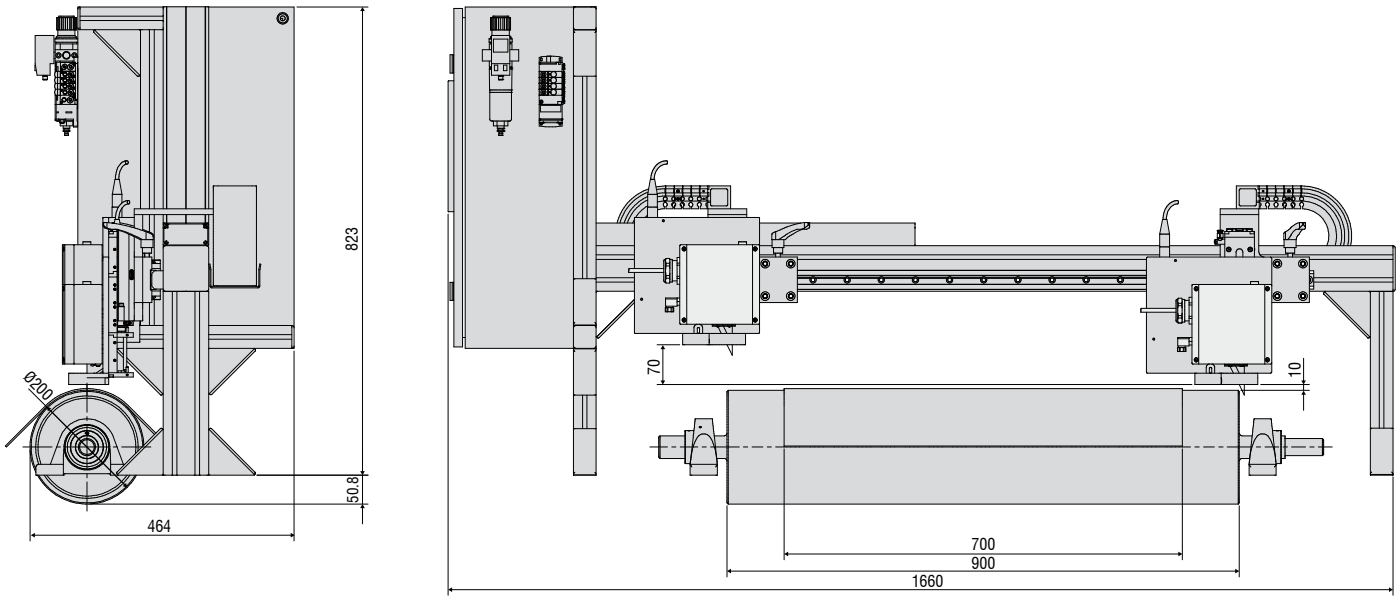
Control view of the sensor values

thicknessCONTROL TCP 7303.ET view in product direction

combiSENSOR of thicknessCONTROL TCP 7303.ET

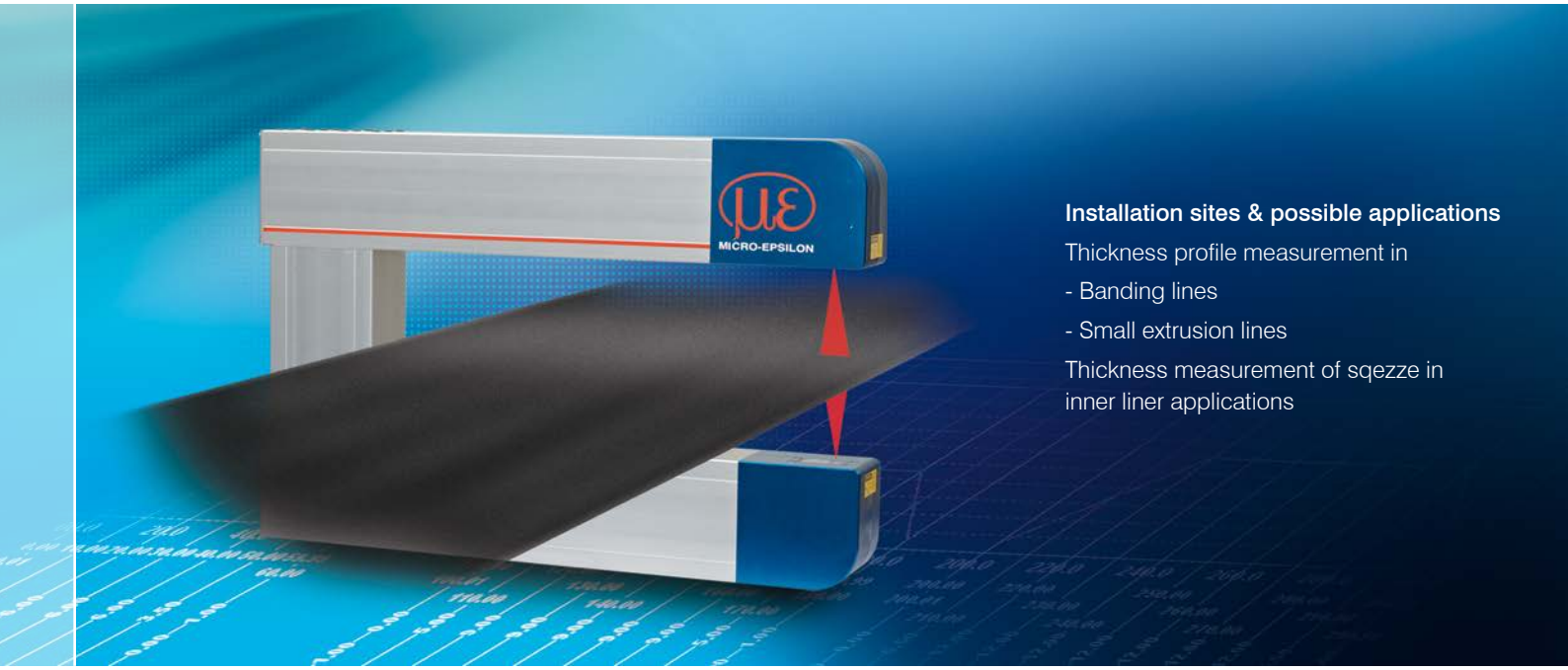
Description (no. of tracks)	-8/900(1)	-8/900(2)	-8/900(3)
Article No.	4350288.20	4350288.21	4350288.22
Roller width	900mm		
Material width max	900mm		
Threading Gap	80mm		
Measuring Gap	10mm		
Measuring Range max	8mm		
Linearity in % nom. MR	0.2%		
Linearity nom. MR	± 0.02mm		
Roller diameter	200mm		
Sampling rate	2.5kHz		
Dimensions (L x W x H) in mm	534 x 1374.5 x 603.5		
Protection class	IP54		
Ambient temperature	min. +15°C max. +40°C		
Relative Humidity	max. 75% within temperature range stipulated without condensation		

MR = measuring range



Tire Component Profilometer

thicknessCONTROL TCP 8302.T/LLT



Installation sites & possible applications

Thickness profile measurement in

- Banding lines
- Small extrusion lines

Thickness measurement of sqezze in inner liner applications

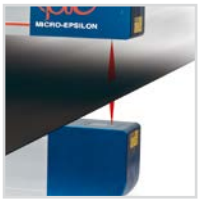
The modularly designed, C-frame based systems of the thicknessCONTROL TCP 8302 series convincedue to their flexibility and performance in the long term. Their compact design enables to introduce precise inspection technology also in lines with low packaging space.

High data volume

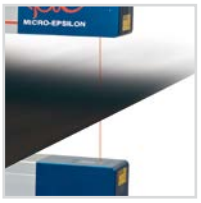
In the upper and lower flange of the C-frame, either laser triangulation point (ILD) or laser triangulation line (LLT) sensors are integrated. The result, showing the profile of the target material is calculated with the difference of the added amount of the sensor signals and the calibrated working gap. In combination with highly-efficient signal processing algorithms of the analysis and visualization software, accuracies in the micrometer range are reached.

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 characterized by permanently providing inline precision. The sensor technologies measure without contact, wear-free and without isotopes or X-rays. This process provides long-term reliable measurement results while avoiding consequential costs.

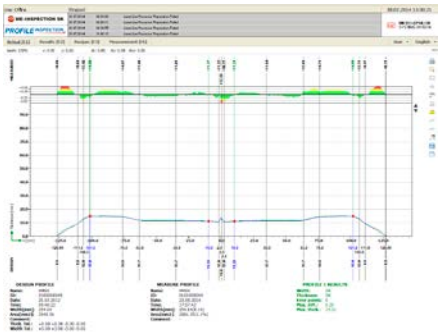
Using integrated laser line sensors, generating a high data volume of 128.000 data points per second, the thicknessCONTROL TCP 8302.LLT offers a unique range of solvable applications regarding profile thickness measurement in the tire industry.



TCP8302.LLT
Laserline triangulation



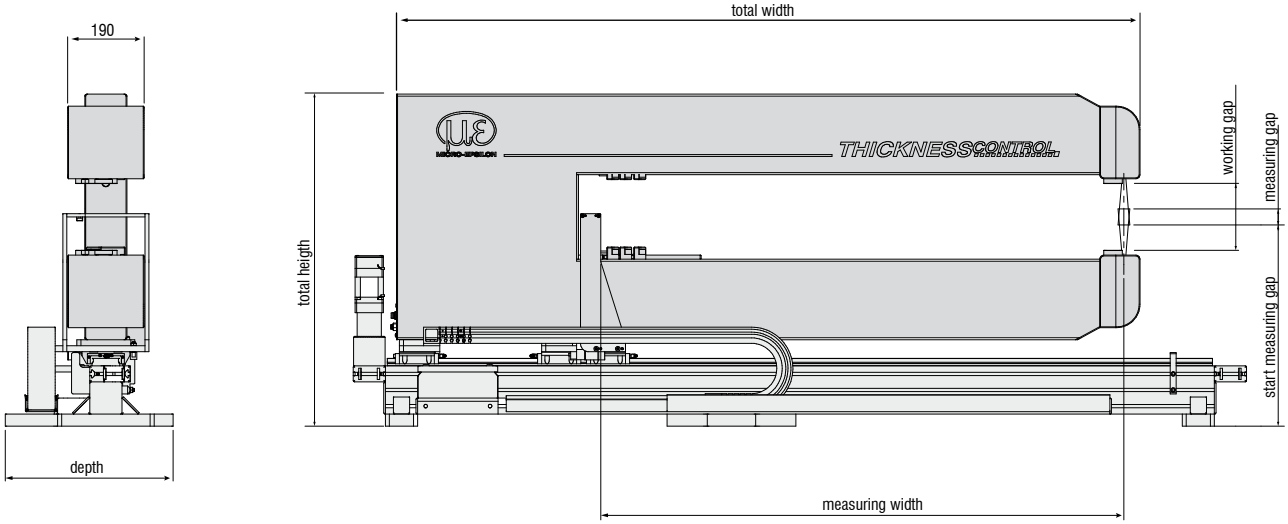
TCP8302.T
Laser triangulation



Traversing measurement of cross profile

thicknessCONTROL TCP 8302.T/LLT								
Description	-20/500	-50/500	-20/800	-50/800	-25/500	-50/500	-25/800	-50/800
Article No.	4350127.230	4350127.231	4350127.232	4350127.233	4350127.234	4350127.235	4350127.236	4350127.237
Sensor	Laser Point Sensor				Laser Line Sensor			
Laser class	2M							
Measuring width	500mm	500mm	800mm	800mm	500mm	500mm	800mm	800mm
Working gap	70mm	156mm	70mm	156 mm	190mm	420mm	190mm	420mm
Nominal measuring gap	20mm	50mm	20mm	50mm	25mm	50mm	25mm	50mm
Measuring gap max	20mm	50mm	20mm	50mm	40mm	100mm	40mm	100mm
Start of measuring gap	410mm	415mm	410mm	415mm	306mm	391mm	306mm	391mm
Linearity nom. MG	±6µm	±15µm	±6µm	±15µm	±5µm	±10µm	±5µm	±10µm
	±0.3%				±0.4%			
Sampling rate max	20kHz				128kHz			
Dimensions in mm	973 x 168 x 635*	973 x 168 x 665*	1273 x 168 x 635*	1273 x 168 x 665*	818 x 204 x 601*	818 x 204 x 831*	1028 x 204 x 601*	1018 x 204 x 831*
Weight	approx. 80kg packaging included							
Protection class	IP54 (higher on request)							
Ambient temperature	min. + 15 °C max. + 40 °C							

MG = measuring gap *=length without linear axis



Example for thicknessCONTROL TCP 8302.LLT

Tire Component Offline Profilometer

thicknessCONTROL TCP 8302.T-Offline

Installation sites & possible applications

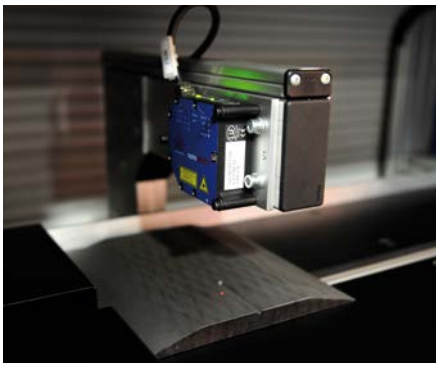
Thickness and width profile measurement in

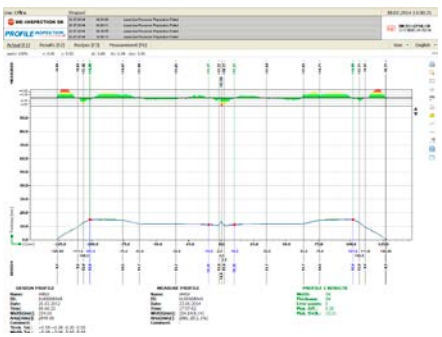
- Extrusion lines
- Innerliner calender
- Ply calender
- Steel cord calender
- Textile or Fabric cord calender

With the thicknessCONTROL TCP 8302.T-Offline, a line independent tool measuring the profile thickness and width is available. Multiple lines can be controlled semi-automatically and very cost-effectively.

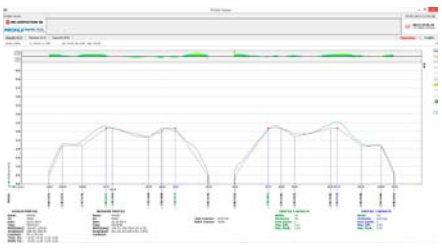
Improving qualitiy control

An integrated, traversing C-Frame with two optical laser triangulation sensors carries out the inspection of the entire profile. The system contains fully automated, integrated calibrations. The process of the calibration and control measurement takes approximately 10 seconds. The visualization software of the profilometer contains tools for statistic processing of measured profile results and for exporting measurement results in different formats for further processing. The measurement system is fully covered; therefore the influence of external light on the measurement process and the creation of parasitic reflections is minimized. This is a cost-effective solution of profile measurements performed outside the line.

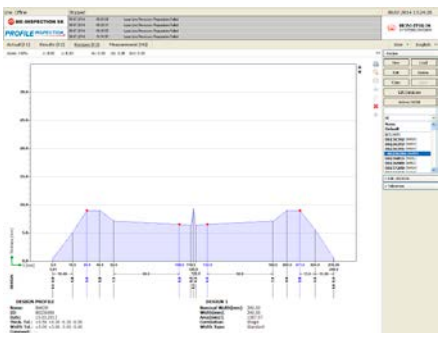




Cross profile - single inspection



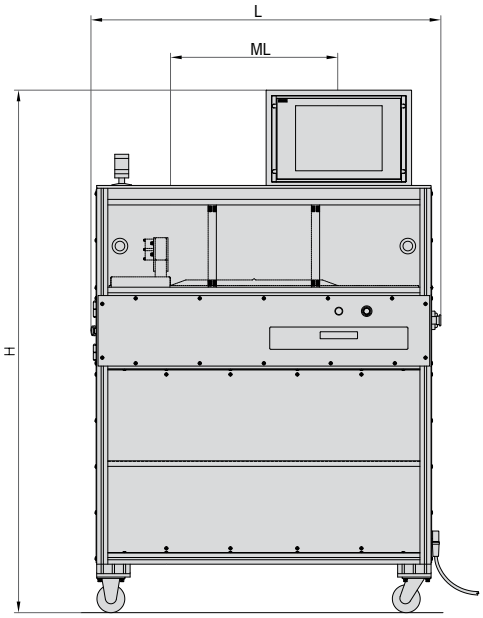
Cross profile - parallel inspection

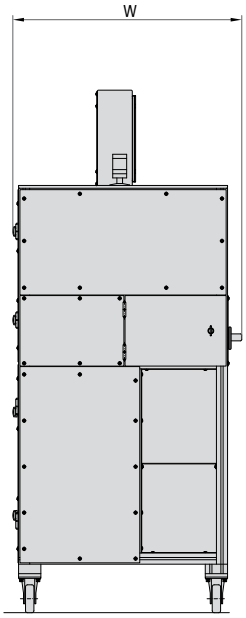


Recipe editor

thicknessCONTROL TCP 8302.T-Offline				
Description		-10/600	-10/800	-10/1000
Article No.		4350142.01	4350142.02	4350142.03
Laser class		2M		
Measuring range	max. thickness	50mm		
	max. width	600mm	800mm	1000mm
Material range	max. thickness	47mm		
	max. width	580mm	780mm	980mm
Max. material tilt		80°		
Linearity nom. MR	Thickness	±10µm		
	Width	±50µm		
Resolution	Thickness	1µm		
	Width	10µm		
Measurement speed		10mm/s		
Measurement rate		20kHz		
Communication with the master system		Ethernet - UDP or TCP/IP protocoll		
Dimensions (L x W x H) in mm		1050 x 800 x 1800	1200 x 800 x 1800	1450 x 800 x 1800
Weight app. (exclusive transport case)		400kg	450kg	500kg
Protection class		IP42		
Ambient temperature		min. +15 °C max. +40 °C		
Relative air humidity		max. 75 % in declared temperature without condensation		

MR = measuring range





Tire Component Profilometer

thicknessCONTROL TCP 8301.EO

Installation sites & possible applications

Thickness profile measurement in:

- Extrusion lines
- Innerliner calender
- Ply calender
- Textile or Fabric cord calender

The thicknessCONTROL TCP 8301.EO family is manufactured as O-frame and significantly impresses by large material width and stability as well as high precision during thickness profile measurements.

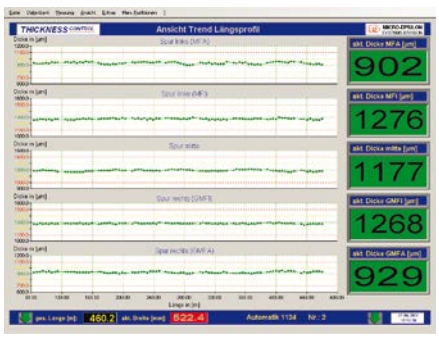
Application-specific sensors

The system measures differentially i.e. the thickness of the material is calculated from two distance signals. The combination of an eddy current sensor and a Thru-Beam sensor is applied on one side of the thicknessCONTROL TCP 8301.EO whereat the material is guided over a measuring roller. The thickness of the target material is the difference between the sensors to each other and the amount of signals.

With the color-independent functioning of the integrated Thru-Beam sensor, measuring the upper edge of the rubber, the system supplies results in extraordinary precision. It is also equipped with an efficient cleaning mechanism providing high resistance against steam and particles. Therefore, the system ideal for applications in harsh industrial environments. Furthermore it offers efficient operation facilities due to large maintenance-free intervals.

Using application-specific customized sensors the thicknessCONTROL TCP 8301.EO is, amongst other things, impressive due to its excellent ratio of measuring range.

Set-up mode sensors and system control

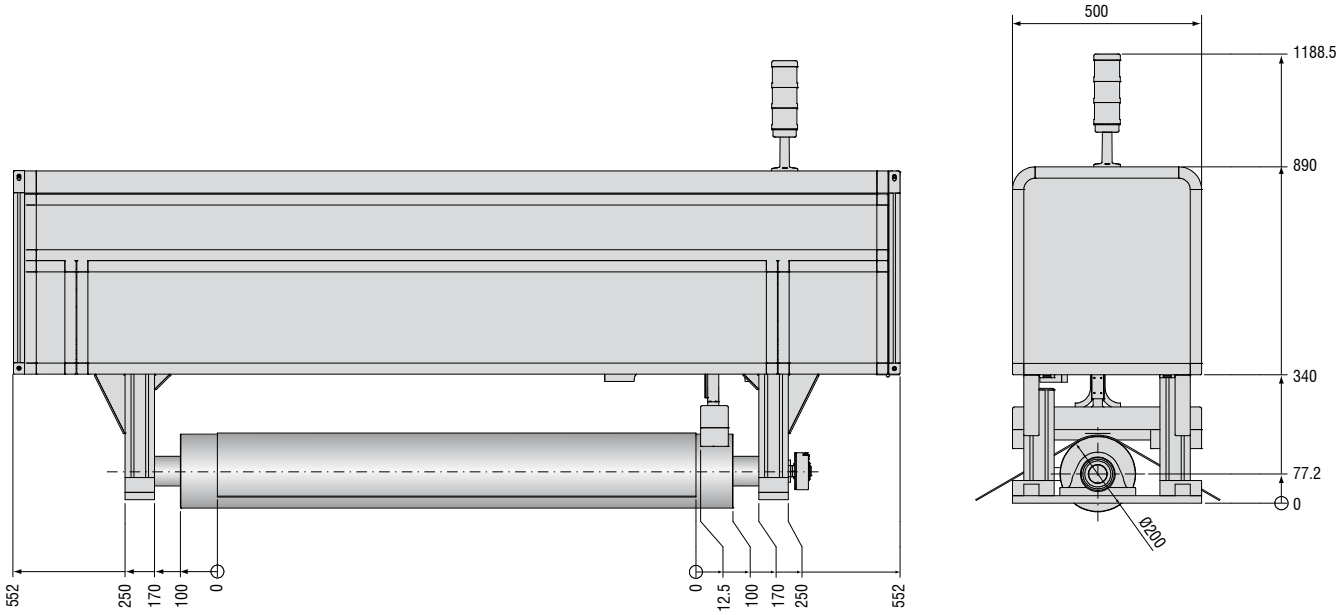


Longitudinal trend for 5 tracks TCP 8301.EO

Thickness measurement with TCP 8301.EO

thicknessCONTROL TCP 8301.EO							
Description	-10/1000	-10/1500	-10/2000	-10/2500	-10/3000	-10/3500	-10/4000
Article No.	4350039.100	4350039.101	4350039.102	4350039.103	4350039.104	4350039.105	4350039.106
Light source	red LED						
Traversing width (gross width)	1200mm	1700mm	2200mm	2700mm	3200mm	3700mm	4200mm
Material width max. (net width)	1000mm	1500mm	2000mm	2500mm	3000mm	3500mm	4000mm
Threading gap	100mm						
Measuring gap	12mm						
Measuring range max.	10mm						
Linearity in % nom. MR	0.06 % *						
Linearity nom. MR	±3µm *						
Roll diameter	≤200mm						
Band angle	>60°						
Sampling rate max.	≤4kHz						
Traversing speed	6000 to 15000 mm/min						
Lateral spatial resolution	0.025mm						
Dimensions (L x W x H) in mm	2000 x 500 x 900	2500 x 500 x 900	3000 x 500 x 900	3500 x 500 x 900	4000 x 500 x 900	4500 x 500 x 900	5000 x 500 x 900
Protection class	IP54						
Ambient temperature	min. +15°C max. +40°C						
Relative air humidity	75% max. within temperature range stipulated without condensation						

MR = measuring range * in relation to standard roll (higher linearity can be achieved using special rolls)



Tire Component Profilometer

thicknessCONTROL TCP 8301.CT/CLLT

Installation sites & possible applications

Thickness profile measurement in

- Extrusion lines
- Innerliner calender
- Ply calender
- Steel cord calender
- Textile or Fabric cord calender

The systems of the thicknessCONTROL TCP 8301.CT/CLLT family are developed in form of an O-frame where the sensors are integrated in the upper and the lower boom. They work while traversing and succeed through an innovative coordinated package consisting in sensors, mechanics and software.

Closed-loop temperature compensation

The systems measure differentially i.e. the thickness of the material is calculated from two displacement signals. Two sensors are integrated on the upper and lower boom of the O-frame on a mechanical carriage. The thickness of the target material is the displacement between the sensors to each other and the amount of signals.

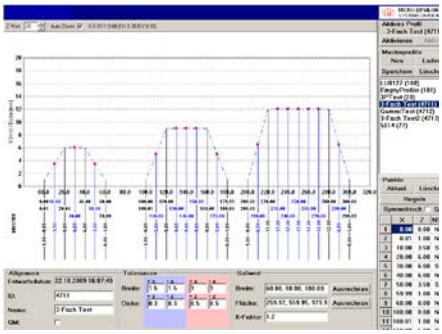
Offering an efficient cleaning mechanism, high resistance against steam and particles is provided. Therefore, the devices are ideal for applications in harsh industrial environments. Furthermore, they offer efficient operation facilities due to large maintenance-free intervals. Thanks to integrated in-situ 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.

Using a patented closed-loop concept for compensation of temperature driven parasitic effects on the mechanics, the thicknessCONTROL TCP 8301.CT and thicknessCONTROL TCP 8301.CLLT present a revolutionary stability in the production.

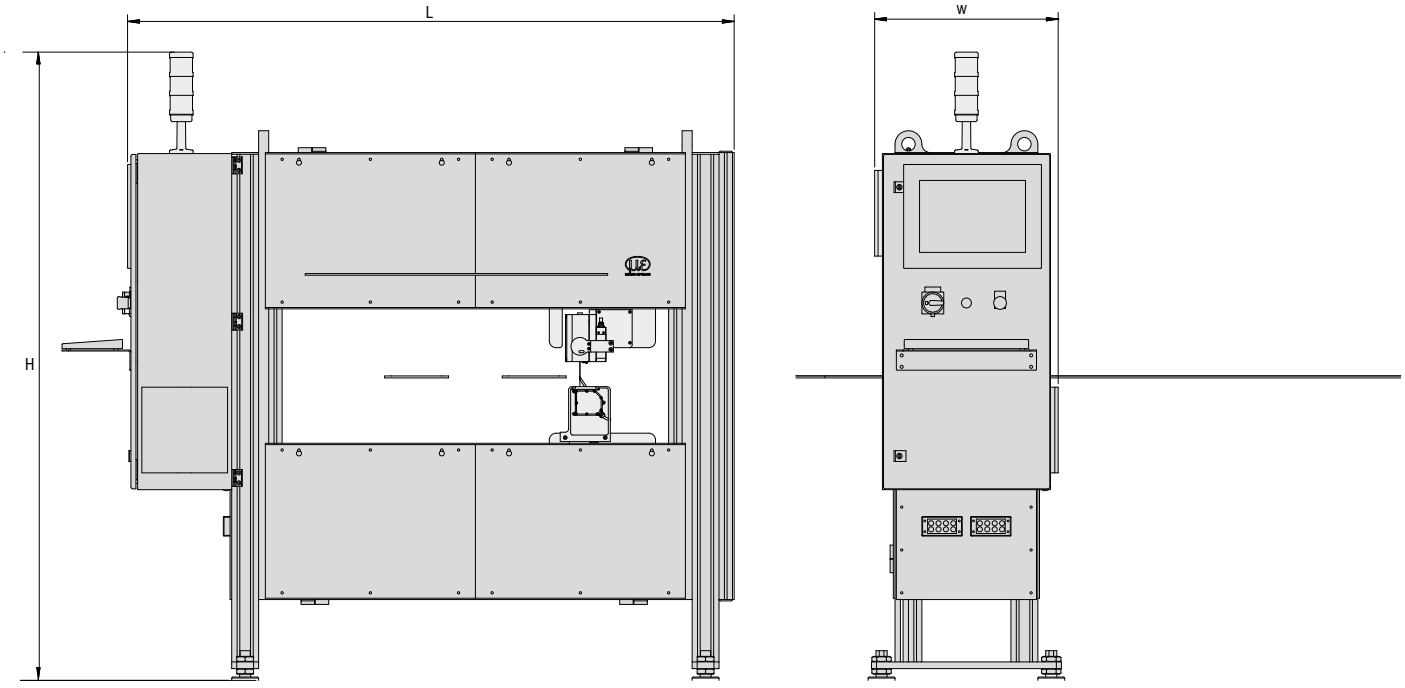
thickness measurement with TCP 8301.T

Combination profile8301.CT; vertical cursors show the points which are used for calender control



thicknessCONTROL TCP 8301.CT/CLLT						
Description	-20/700	-20/1200	-20/1700	-20/2200	-20/2700	-20/3200
Article No.	4350133.100	4350133.101	4350133.102	4350133.103	4350133.104	4350133.105
Light source	Laser class 2M					
Traversing width	750mm	1250mm	1750mm	2250mm	2750mm	3250mm
Material width max. (net width)	700mm	1200mm	1700mm	2200mm	2700mm	3200mm
Threading gap	400mm					
Measuring gap	70mm					
Measuring range max.	20mm					
Linearity in % nom. MR	0.1% FSO					
Linearity nom. MR	±10µm					
Sampling rate max.	≤4kHz					
Traversing speed	6,000 bis 15,000mm/min					
Lateral spatial resolution	0.025mm					
Dimensions (L x W x H) in mm	2000 x 585 x 1869.4	2500 x 585 x 1869.4	3000 x 585 x 1869.4	3500 x 585 x 1869.4	4000 x 585 x 1869.4	4500 x 585 x 1869.4
Weight appr.	500kg	560kg	620kg	680kg	740kg	800kg
Protection class	IP20					
Ambient temperature	min. +15°C max. +40°C					
Relative air humidity	75% max. within temperature range (without condensation)					

MR = measuring range FSO = Full Scale Output



Tire Component Profilometer

thicknessCONTROL TCP 8301.I

Installation sites & possible applications

Thickness and width profile measurement in

- Extrusion lines
- Innerliner calender
- Ply calender
- Steel cord calender
- Textile or Fabric cord calender
- Cap stripe line

The non-traversing profilometers of the thicknessCONTROL TCP 8301.I series enthuse with the complete profile measurements in one single shot. Working nearly without moving parts the systems provide a solution at low maintenance requirements.

Prepared for additional control

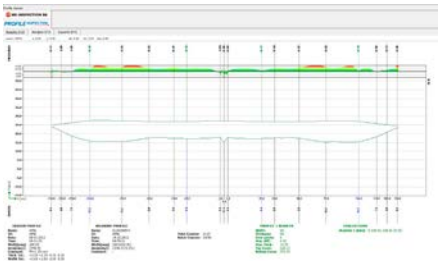
Based on the optical triangulation principle two parallel lines are projected by laser light sources onto the upper and the lower side of the material. The reflection of the laser light is detected by cameras.

The measurement system contains fully automated integrated calibrations. The patented process of the calibration takes approximately 5 minutes.

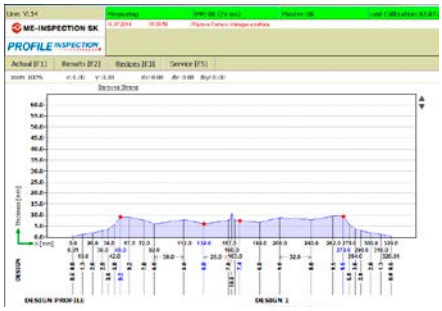
The visualization software of the profilometer contains tools for statistic processing and exporting measurement results in different formats. The measurement system is fully covered; therefore the influence of external light on the measurement process and the creation of parasitic reflections is minimized.

Prepared for additional integration of the length inspection dimensionCONTROL TLI 8303.I and the dimensionCONTROL TPI 8302.C.TT, the profilometer is the efficient base for a complete quality control of an extrusion line.

Integration:
PWI 8302.C-TT
TLI 8303.I
TCP 8301.I



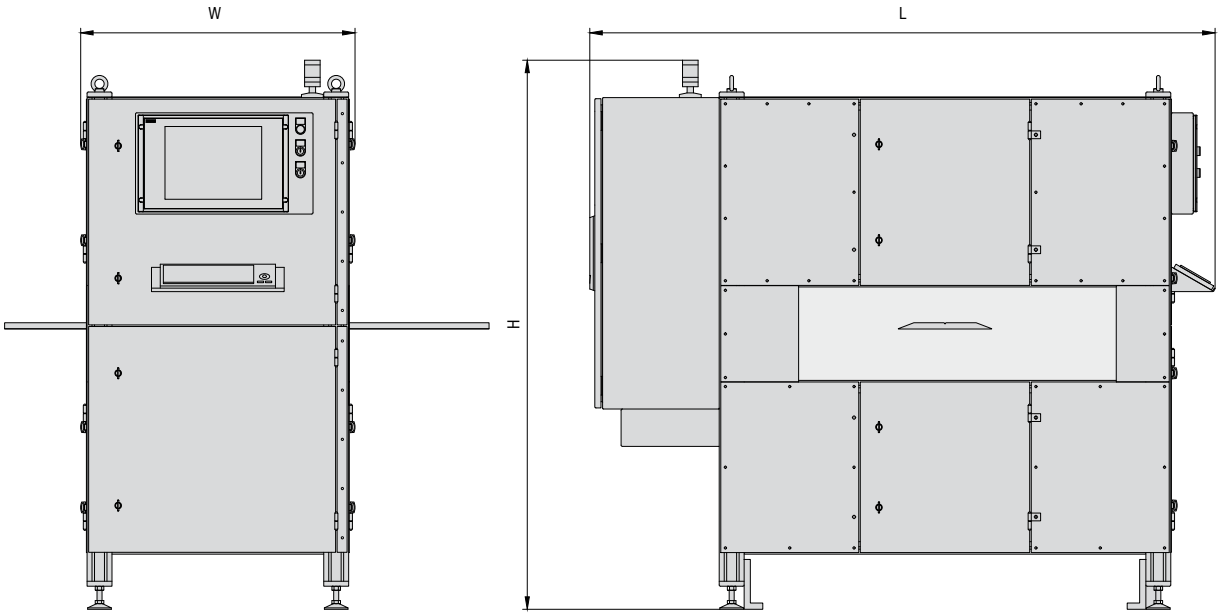
Profile shape mode



Cross profile

thicknessCONTROL TCP 8301.I									
Description		-10/170	-10/350	-10/450	-10/550	-20/550	-20/750	-20/860	-20/1220
Article No.		4350121.105	4350121.106	4350121.107	4350121.108	4350121.101	4350121.102	4350121.104	4350121.103
Laser class		2M							
Measuring range	max. thickness	20mm	40mm	40mm	40mm	50mm	50mm	50mm	50mm
	max. width	170mm	350mm	450mm	550mm	550mm	750mm	860mm	1200mm
Material range	max. thickness	15mm	35mm	35mm	35mm	45mm	45mm	45mm	45mm
	max. width	150mm	330mm	430mm	530mm	530mm	730mm	860mm	1150mm
Material fluctuation	max. thickness fl.	±2.5mm							
	max. width fl.	±10mm							
Max. material tilt		50°							
Linearity nom. MR*	Thickness	±12µm	±12µm	±12µm	±12µm	±20µm	±20µm	±20µm	±20µm
	Width	±100µm	±150µm	±150µm	±150µm	±200µm	±200µm	±200µm	±200µm
Resolution	Thickness	1µm							
	Width	10µm				20µm			
Number of measurements per second		40							
Communication with the master system		Ethernet - UDP or TCP/IP protocoll							
Dimensions (L x W x H in mm), adaptation possible		1600 x 800 x 1650	1600 x 800 x 1650	1800 x 800 x 1650	2000 x 800 x 1650	2000 x 800 x 1650	2300 x 800 x 1650	2400 x 800 x 1650	2500 x 800 x 1650
Weight app. (exclusive transport case)		500kg		550kg	600kg	600kg	650kg	650kg	700kg
Protection class		IP42							
Ambient temperature		min. +15 °C max. +40 °C							
Relative air humidity		max. 75 % in declared temperature without condensation							

MR = measuring range
* Deviation 1 sigma



Tire Color Inspection

dimensionCONTROL TCI 8303.I

Installation sites & possible applications

Color coding, color code inspection, width measurement in

- Extrusion lines for sidewall or tread

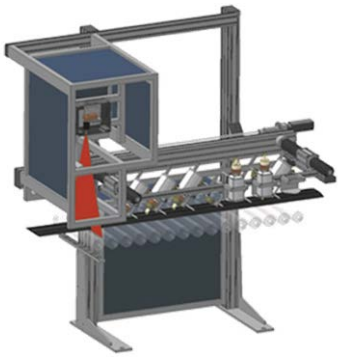
The Tire Color Inspection dimensionCONTROL TCI 8303.I provides fully equipped color coding, color code inspection and width inspection of extruded tread, and therefore represents a powerful component of a modern extrusion line.

Reducing waste

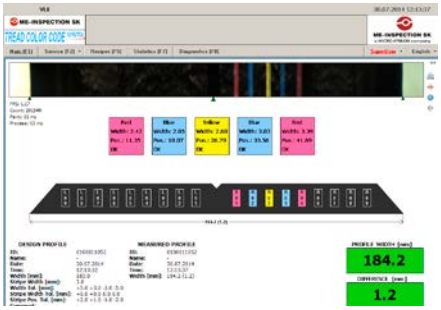
The basic model of dimensionCONTROL TCI 8303.I has been designed for inspection of color code applied on running profiles behind the extruder. Due to the fact that the correct width position of the color code has to be checked, the system measures also the complete width of the tread. The inspection is implemented as vision system, containing one color camera and two surface light sources. The measurement is continuous; position and width of respective colors are calculated as an average value in one image.

The system detects overflow or interruption of color strips and incorrect colors on defined positions. It is covered as much as possible in order to resist harsh environments especially behind the extruder head.

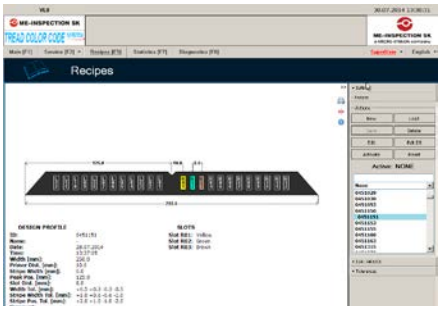
Beside the inspection, two different upgrades of dimensionCONTROL TCI 8303.I are available enabling an automatic color application. In the first version the single color tracks have a fixed distance to each other and a whole frame is controlled in relationship to the edge of profile. In the enhanced version every color track is controlled separately with an own motion control. The performance of the system reduces the waste material dramatically, compared to manual adjustment of tracks during recipe changings or while starting the extrusion line.



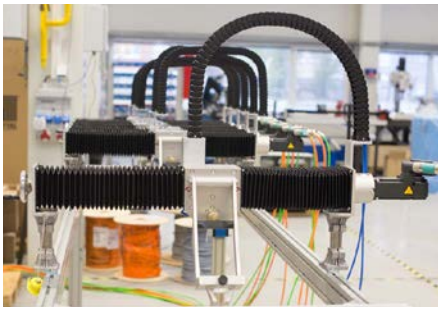
Principle of measurement



Visualization of inspected color code



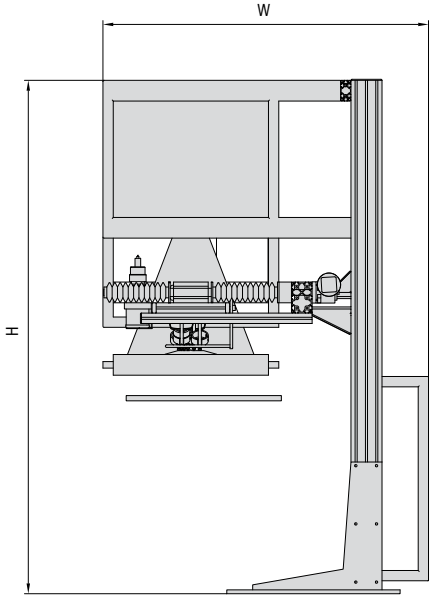
Recipe editor

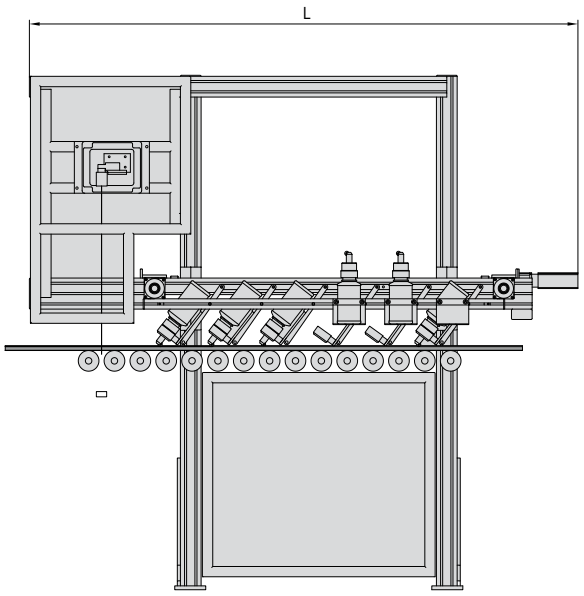


Multi axis positioning system

dimensionCONTROL TCI 8303.I		
Description	-350	-550
Article No.	4350148.01	4350148.02
Width measurement range	350mm	550mm
Max. material speed	40m / min	
Minimum width of color detected (mm)	1mm	
Size of scanned image (width x length)	400x135mm	600x135mm
Number of color bottles	6	
Stroke of electrical axis (mm)	±200mm from middle of conveyor	
Linearity nom. MR	±150µm	
Resolution	100µm	
Number of measurements per second	20	
Communication with the master system	Ethernet - UDP or TCP/IP protocoll	
Dimensions (L x W x H) in mm	1400 x 1400 x 1800	
Weight app. (exclusive transport case)	400kg	
Protection class	IP42	
Ambient temperature	min. +15°C max. +65°C	
Relative air humidity	max. 75 % in declared temperature without condensation	

MR = measuring range





Tire Length Inspection

dimensionCONTROL TLI 8303.I

Installation sites & possible applications

Length measurement in

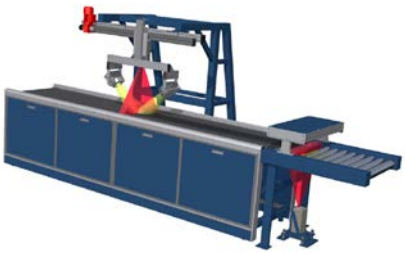
- Extrusion lines for sidewall or tread

Highly efficient image processing algorithms award the dimensionCONTROL TLI 8303.I for precisely mapping the needs of later process steps in the tire building.

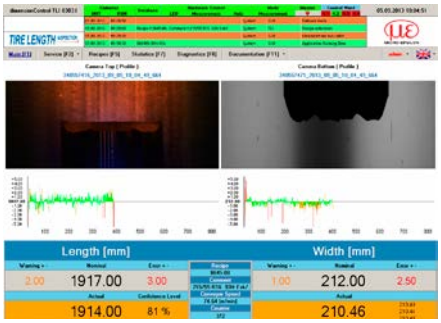
Optimized process mapping

The vision system dimensionCONTROL TLI 8303.I contains two cameras for profile length inspection in extrusion lines . The first camera is mounted on an electrical axis at the beginning of the profile - above the scale, the second is installed at the end of the profile.

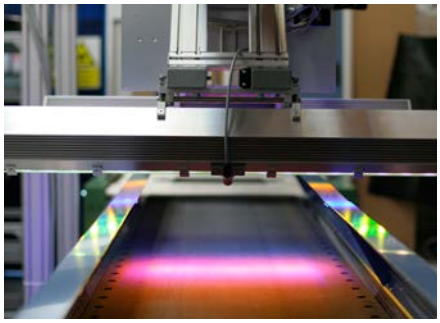
Depending on the concept it is either under the rollers at the end of the scale or above the scale. The moveable camera is positioned according the nominal length received from the master of the extrusion line. The calculation of the profile length is based on the form of the cuts at each edge. To optimize the mapping of the inspection result and the real profile fit in the building machine, the edges are connected virtually to each other according to the scanned surfaces. Based on these values and the position between the cameras the final length is calculated.



Principle of measurement



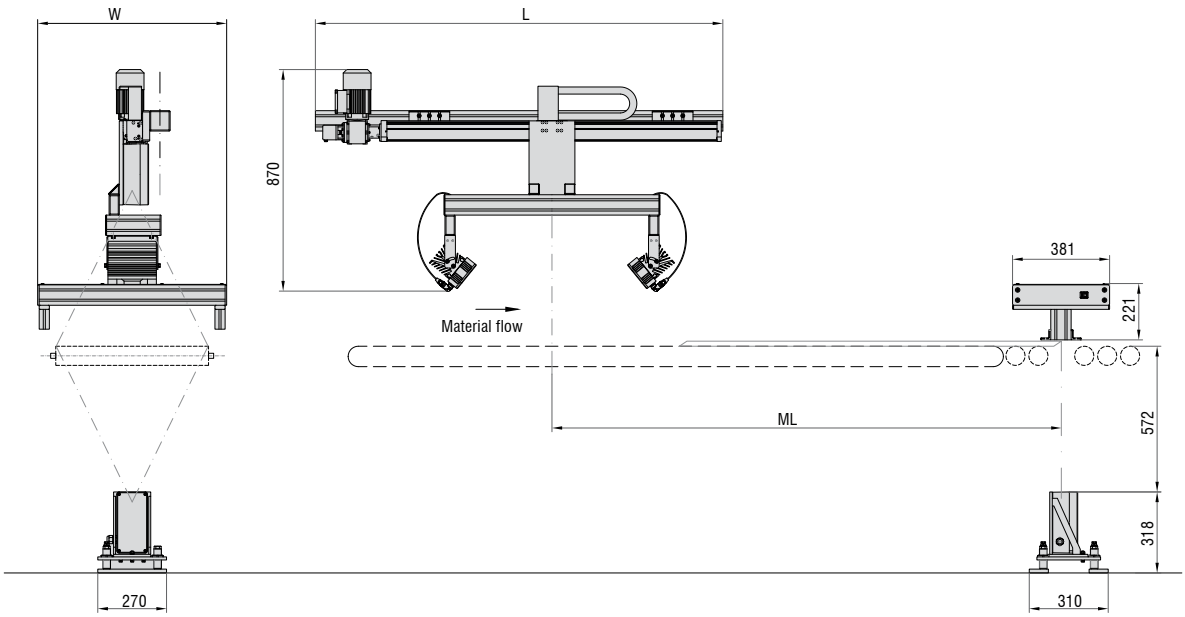
Visualization of the cutted edges, the length and the width



Illumination for the upper side

dimensionCONTROL TLI 8303.I					
Description		-1000(DU)	-1000(UU)	-2700(DU)	-2700(UU)
Article No.		4350149.02	4350149.03	4350149.04	4350149.05
Position of cameras		Up / Down			
Profile length	min.	1500mm	1500mm	1300mm	1300mm
	max.	2500mm	2500mm	4000mm	4000mm
Thickness	min.	5mm			
	max.	50mm			
Evaluation area of profile width		350mm			
Max. material speed		110m / min			
Linearity nom. MR		±100µm	±200µm	±200µm	±300µm
Resolution		100µm			
Maximum material fluctuation (vertically to the flow of material)		10mm			
Maximum material rotation (based on material flow)		10mm			
Communication with the master system		Ethernet - UDP or TCP/IP protocoll			
Dimensions (L x W x H) in mm		1400 x 850 x 300		2700 x 850 x 300	
Weight app. (exclusive transport case)		180kg		250kg	
Protection class		IP42			
Ambient temperature		min. +15 °C max. +40 °C			
Relative air humidity		max. 75 % in declared temperature without condensation			

MR = measuring range



Tire Piece Weight Inspection

dimensionCONTROL TWI 8302.C.TT

Installation sites & possible applications

Weight measurement in

- Extrusion line for sidewall or tread

When taking a new direction by using displacement sensors, dimensionCONTROL TWI 8302.C.TT stands for extraordinary precision in inspecting running tread profiles for truck tires.

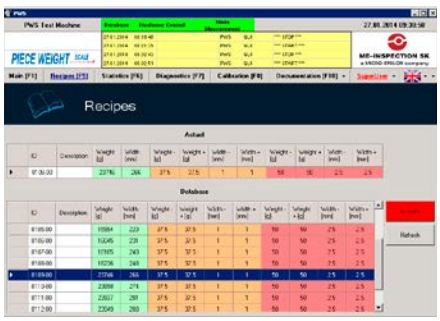
Completing quality control

The device is based on a steel C-frame, containing two highly precise capacitive sensors. The deflection of a steel beam is measured with a high sampling rate. The data processing of the obtained sensor values is implemented in an electronic system and the weight is determined mathematically. The C-frame is attached to a massive construction, which ensures a long-term mechanical stability of the TWI 8302.C.TT. Covered in a high degree it resists harsh environments in the preparation area.

The included software contains a wide range of statistic measurement processing, definition of design profiles, statistical analysis of measured profiles and diagnostic tools. Together with the dimensionCONTROL TCI 8303.I, the dimensionCONTROL TLI 8303.I and the thicknessCONTROL TCP 8301.I it allows the complete quality assurance and also a closed loop control of the extrusion line.

Integration:
TWI 8302.C.TT
TLI 8303.I
TCP 8301.I

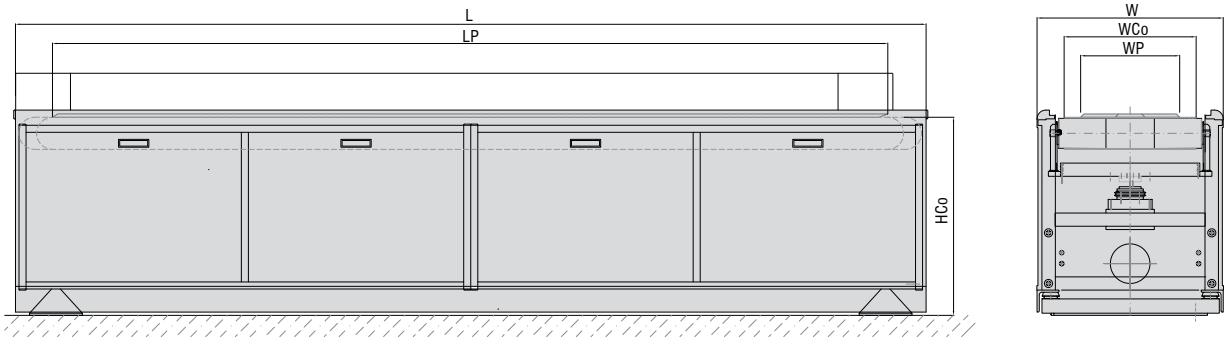
Visualization of weight and width results



Display fo SPC data

dimensionCONTROL TWI 8302.C.TT		
Description		-3800
Article No.		4350220
Measuring range	max. weight	50kg
	max. tlength	3800mm
Material range	max. weight	45kg
	max. tlength	3750mm
Max. material speed		70m / min
Linearity nom. MR		±25g
Resolution		5g
Measurement rate		1kHz
Communication with the master system		Ethernet - UDP or TCP/IP protocoll
Dimensions (L* x W x H) in mm		4800 x 1400 x 1800
Weight app. (exclusive transport case)		800kg
Protection class		IP42
Ambient temperature		min. +15 °C max. +40 °C
Relative air humidity		max. 75 % in declared temperature without condensation

MR = measuring range
* Length dimension exemplary for max. measurement range. Length of machine = max length of product + 1000mm



Unique

Innovative

Revolutionary

Efficient

Superior

Overview **Final Finishing**

Tire Geometry Inspection
dimensionCONTROL TGI 8302.LLT/T
Page 24-25

Tire Mark Inspection
identityCONTROL TMI 8303.I
Page 26-27

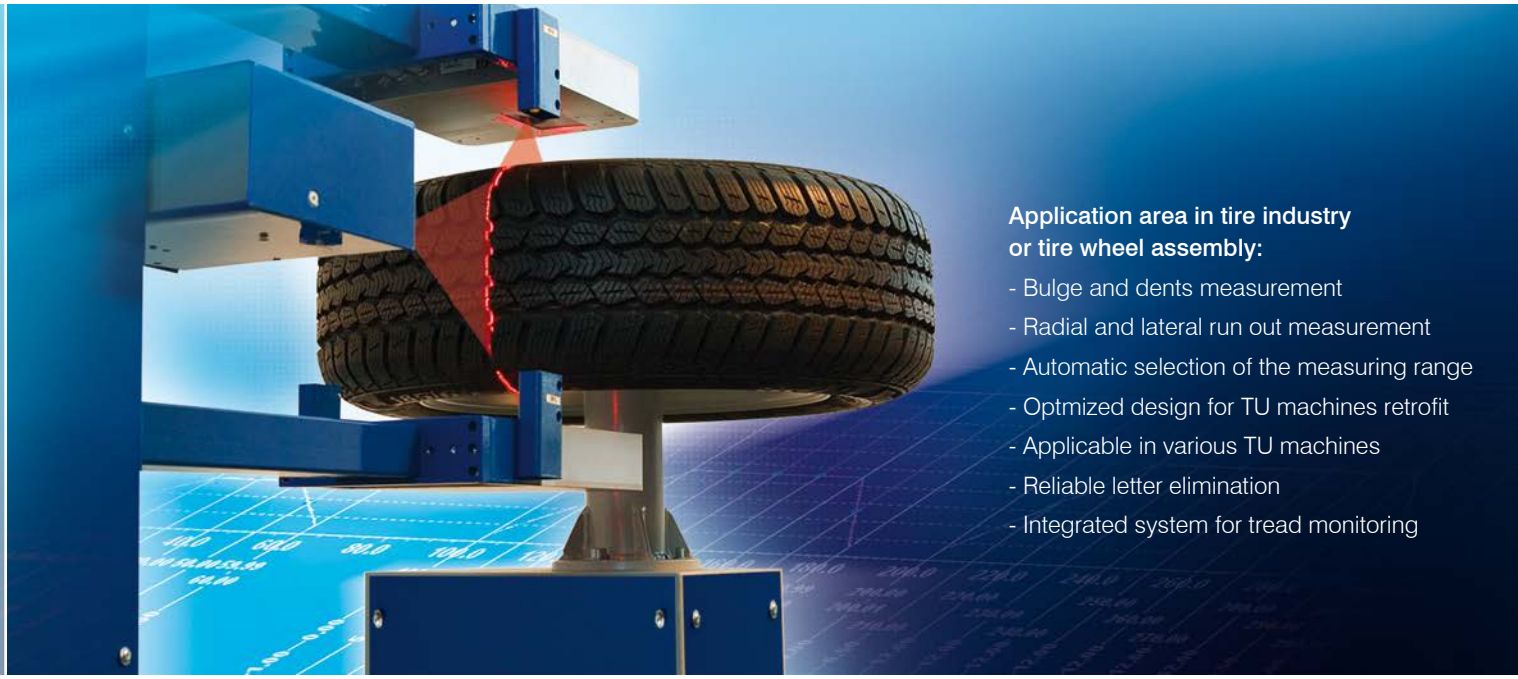
Retrofit Tire Geometry Line
RTG
Page 28

Retrofit of Tire Uniformity Line
RTU
Page 29

Retrofit of Balancing Line
RTB
Page 30

Tire Geometry Inspection

dimensionCONTROL TGI 8302.LLT/T



Application area in tire industry or tire wheel assembly:

- Bulge and dents measurement
- Radial and lateral run out measurement
- Automatic selection of the measuring range
- Optmized design for TU machines retrofit
- Applicable in various TU machines
- Reliable letter elimination
- Integrated system for tread monitoring

With the precise inspection of radial and axial run out, as well as bulges and constrictions on the tire, the dimensionCONTROL TGI 8302.LLT/T series make an important contribution regarding quality during the production of the tire.

Compatible for various TG/TU types

Using customized laser line triangulation sensors, located on a solid and precisely positioned frame which ensures optimal reading of the sides and patterns, dimensionCONTROL TGI 8302.LLT/T measures the size of defects (bulges, depressions) and evaluates the radial and lateral run out. The system processes displacement data in relationship to angular positions, detected by an encoder, to create a partial 3D model of the shell. It can eliminate imprinting, detect positions of defects and state the size. During the inspection of the run out, the system creates a harmonic analysis and applies filtrations for the suppression of high frequency noise.

The mechanical basis of dimensionCONTROL TGI 8302.LLT/T is a C-frame where the upper and the lower sidewall sensor as well as the tread sensor are controlled according to the tire size due to fully automatic controlling methods. The actuators can be alternatively operated by servo or stepper motors. The controlling parameter can be written in a database.

With the laser line triangulation sensors, optimized regarding packaging situation of the application, the system is compatible to 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.

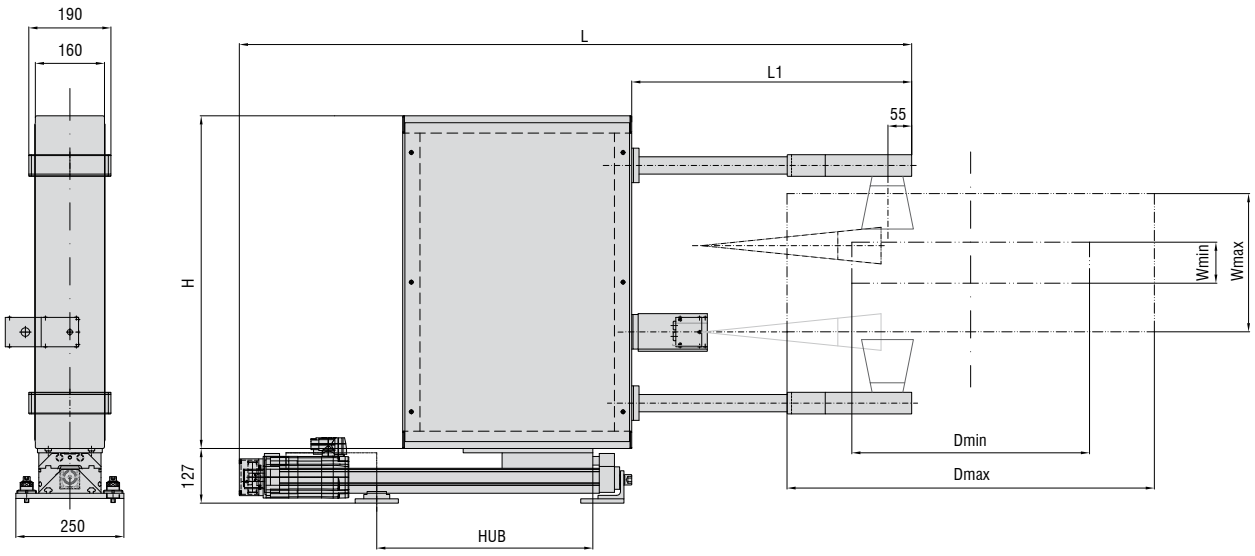
Visualization of sidewall inspection

Integration to Tire Uniformity machine

Integration to Balancing machine

dimensionCONTROL TGI 8302	.LLT	.T
TGI sensors	Laser line triangulation sensors	Laser point triangulation sensors
Article No.	4350136.04	4350136.05
Laser class sensors	3B	
Measurement speed	2000 measurements / second	up to 10 000 measurements / second
Number of sensors	3 or 4	
Tire rotation speed	Max. 60rpm	Max. 560 rpm
Measurement object	Tire / Wheel	
Tire tread width	min. 95mm max. 400mm	
Tire outside diameters	min. 500mm max. 900mm	
Bead diameters	min. 13inch max. 24inch	
Repeatability (1σ)	<0.02mm	
Communication	Ethernet (TCI/IP, UDP), Digital I/O	
Protection class	IP43	
Ambient temperature	min. +15 °C max. +40 °C	
Relative air humidity	max. 75 % in declared temperature without condensation	

OEM solution for truck tires



Tire Mark Inspection

identityCONTROL TMI 8303.I

Installation possibilities:

- Central conveyor
- Directly after marking systems behind TG/TU

Inspection:

- Type of marks
- Geometry of marks
- Color of marks
- Quality of marks
- Marking diameter
- Reference angles

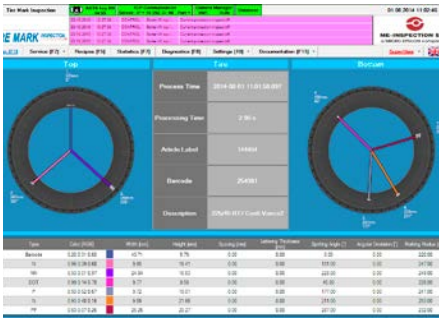
To complete quality assurance, identityCONTROL TMI 8303.I secures with efficient vision technology the documentation of the classification of tires or wheels displayed by marks on the sidewall.

Closed loop quality assurance

High-speed cameras are the central component of the identityCONTROL TMI 8303.I. They read the illuminated surface at the sidewall by analyzing the images in each instance.

The imprinting of the sides and reflections originating on the surface are eliminated. The detected marks are qualitatively evaluated ofdepending on type, physical dimensions, turning towards the barcode, deformation and color.

Checking even the quality of marks and showing the quality classification, the identityCONTROL TMI 8303.I closes the loop of a modern quality assurance.

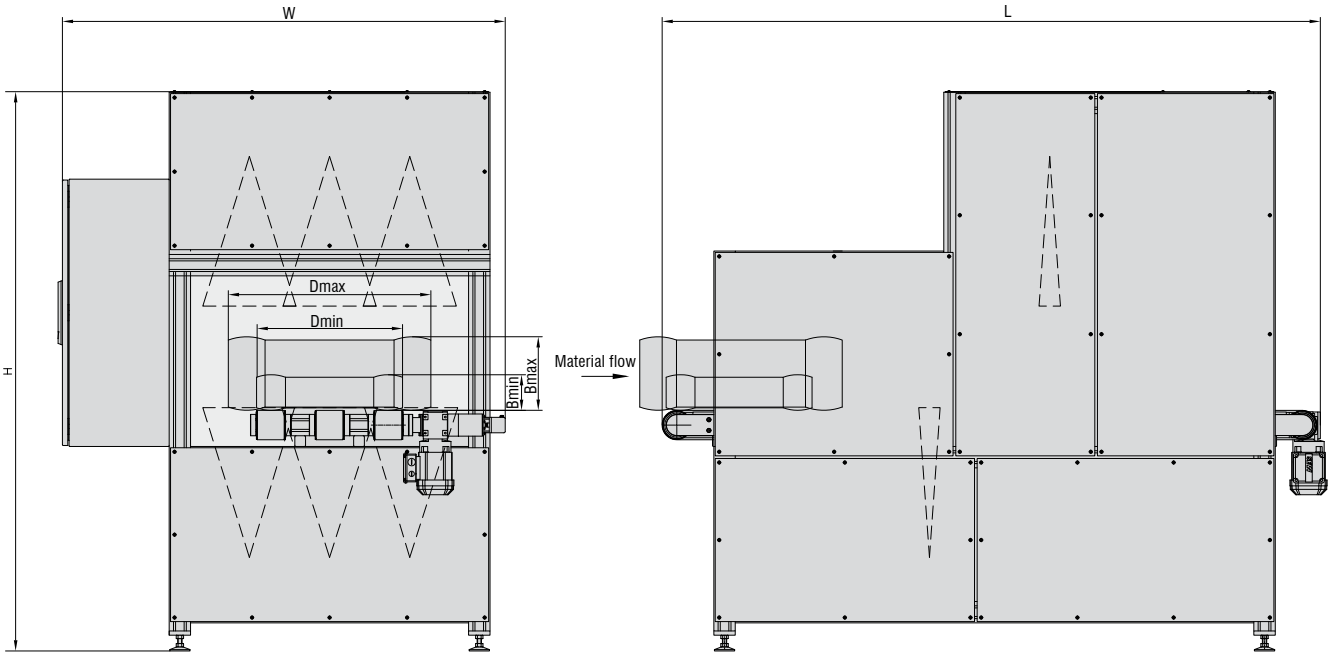


Position and Classification of inspected Marks

Recipe Editor

Visualization of SPC-Data

identityCONTROL TMI 8303.I		
Description	-200(TU)	-250(CV)
Article No.	4350290.01	4350290.02
Measuring range (X x Y x Z)	150 x 100 x 200mm	850 x 850 x 250mm
Measured material (X x Y x Z)	150 x 100 x 200mm	800 x 800 x 240mm
Resolution: X and Y	125µm	200µm
Type of camera	Color CCD / CMOS	Color CCD / CMOS
Daily capacity of inspection	7200 tires	20.000 tires
Dimensions (L x W x H) in mm	1050 x 800 x 1800	1200 x 800 x 1800
Weight app. (exclusive transport case)	400kg	420kg
Protection class	IP42	
Ambient temperature	min. +15 °C max. +40 °C	
Relative air humidity	max. 75 % in declared temperature without condensation	



identityCONTROL TMI 8303.I - 200(TU)

Retrofit Tire Geometry Line

RTG

Retrofit includes:

- Mechanical retrofit
- Electrical retrofit
- Control&Drive retrofit
- New software for control of line and visualization
- Integration of TGI 8302.LLT
- Integration of tread color inspection
- Delivery of new lubber station
- Delivery of feeding device station
- Delivery of conveyors
- Delivery of marking station
- Delivery of sorter / lift
- Delivery of computer controlled inflation system

Bringing old TG lines to thr state of the art regarding precision and collection of shop floor data with a retrofit of the measuring technology, is an excellent opportunity to optimize the tire production and cost.

Precision by sheet of line technology

The retrofit of TG lines consists in the replacement of electric and pneumatic components including the dimensionCONTROL TGI 8302.LLT measuring system.

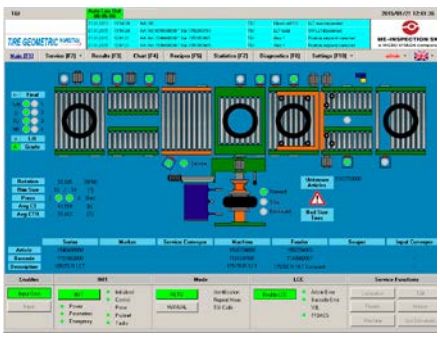
A new control system ensures the stable operation of the whole line, as well as the proper communication with the other components (conveyors, master systems for control and collection of data). The dimensionCONTROL TGI 8302.LLT/T measuring system ensures the measurement of the size of defects (bulges, depressions) and the evaluation of the value of the radial and lateral run out with the use of laser line sensors. It's characteristics can be seen on the previous pages.

Possible control systems:

SIEMENS

BECKHOFF

Rockwell Automation



Process visualization

Geometry inspection

Lubber station

Retrofit of Tire Uniformity Line
RTU

Application area in tire industry or tire wheel assembly:

- Bulge and dent measurement
- Radial and lateral run out measurement
- Automatic selection of the measuring range
- New software for control of line and visualization
- Optimized design for TU machines retrofit
- Applicable in various TU machines
- Reliable letter elimination
- Integrated system for tread monitoring

One of the most cost-effective ways for increasing productivity is upgrading an existing TU line with a new control system including a comprehensive interface to the measuring system.

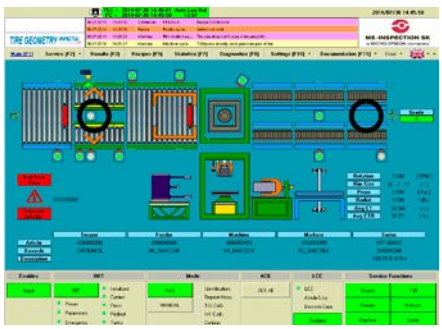
Precision by elimination of parasitic influences

The reconstruction of TU lines is composed of replacing electric and pneumatic components as well as the measuring system for detecting the tensiometric forces. Coming up with an efficient control system the reliability of the whole line is ensured. Also the communication with other parts such as conveyors, master systems for control and collection of data is performed by this renewed system. The measuring system, recording the values of radial and lateral forces - absolute values, peak - peak values, harmonic analysis and calculating conicity and plysteer, is calibrated by a set of certified ballasts.

The consequent elimination of various external influences such as compensation of electric noise on analog inputs, compensating real nominal down pressure and pressure variations during measurement distinguishes the retrofitted line. Monitoring of the parameters influence the overall class of the shell on the basis of which the shell is marked or classified at the end of the line.

Possible control systems:

SIEMENS
BECKHOFF
Rockwell Automation

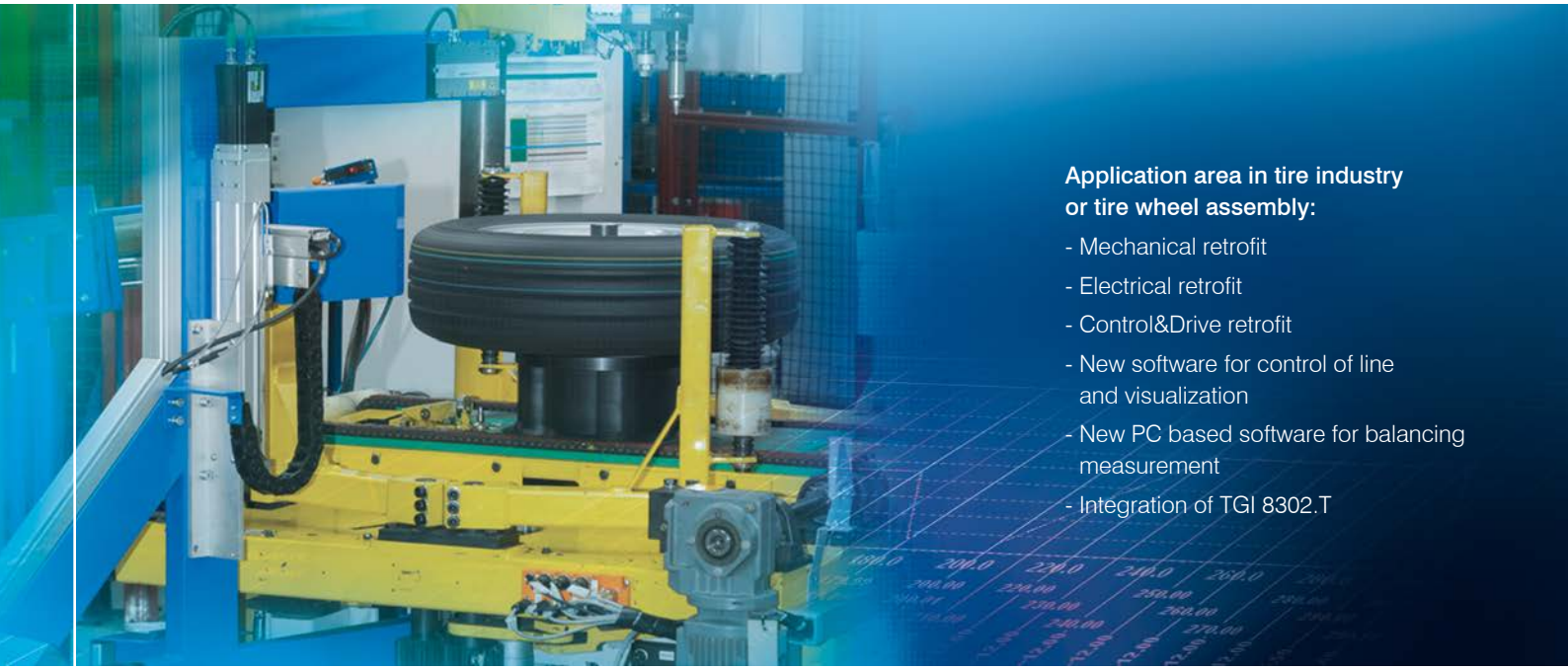


Process visualization

Marking station integrated with:
- Service conveyor
- Mark quality inspection
- Sorting conveyor

Retrofit of Balancing Line

RTB



Application area in tire industry or tire wheel assembly:

- Mechanical retrofit
- Electrical retrofit
- Control&Drive retrofit
- New software for control of line and visualization
- New PC based software for balancing measurement
- Integration of TGI 8302.T

The renewing of the measurement technology of a balancing line is an investment with an outstanding cost to service relationship to provide new evidence about the production

New performance until the marking

For the revision of the balancing lines new electric and pneumatic components are installed together with an up-to-date measuring system for reading the forces. Another important module is a new control system, which runs the whole line and coordinates the communication of the single subsystems. The static non-balance and the dynamic non-balance are measured in two areas.

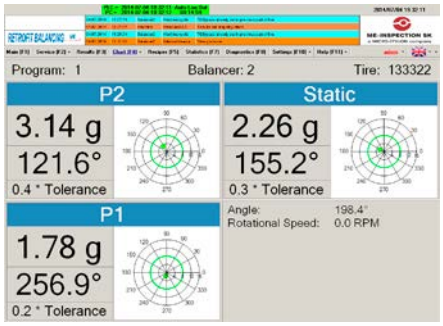
Due to fact, that the monitored characteristics have a significant influence on the tire quality, a quality classification based on the results of the inspection is carried out. The tire is marked in accordance with the above-mentioned quality classification at the end of line or in the central marking station. These items are also part of the machine retrofit, beside the possibility to install a new marking station.

Possible control systems:

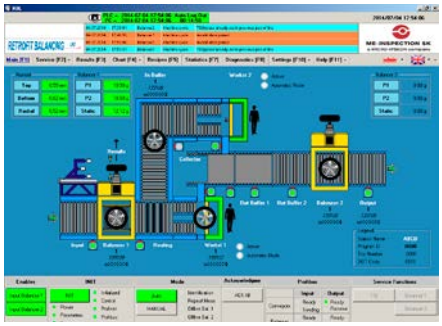
SIEMENS

BECKHOFF

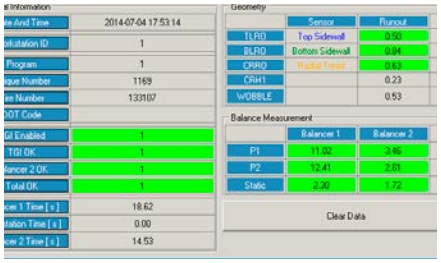
Rockwell Automation



Graphical display of the result



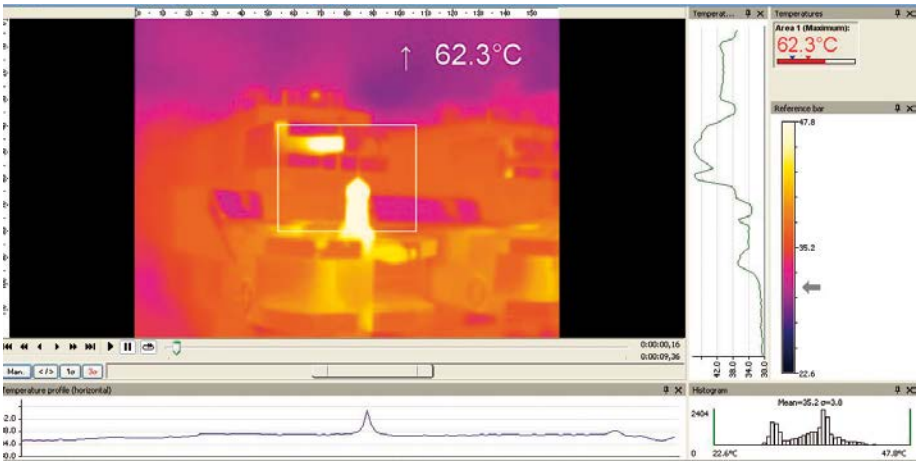
Process visualization



Result in table form

Micro-Epsilon
in the rubber and tire industry

Temperature measurement in the rubber and tire industry
Micro-Epsilon offers a wide range of infrared thermometers, pyrometers and ratiometric pyrometers as well as IR cameras which allow you to precisely measure the temperature of the object temperature.



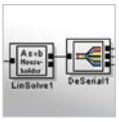
Micro-Epsilon has been a reliable industrial partner for more than 40 years for precision measurement technology applied in inspection, monitoring and automation. Systems and components from Micro-Epsilon are used in the rubber and tire industry in order to develop efficient production.

The medium sized company employs approx. 800 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 and speed, 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 worldwide.

Furthermore, the company, specialized in measurement technology, is also known for unconventional solutions where requirements have to be strictly observed in processing lines. Solutions are devised in the shortest time and matched on site.

Sensors:
worldwide market and proven sensors as base of the systems, with the possibility for adaptation increasing the precision



Software:
graphical software development environment guarantees group wide synergetic development

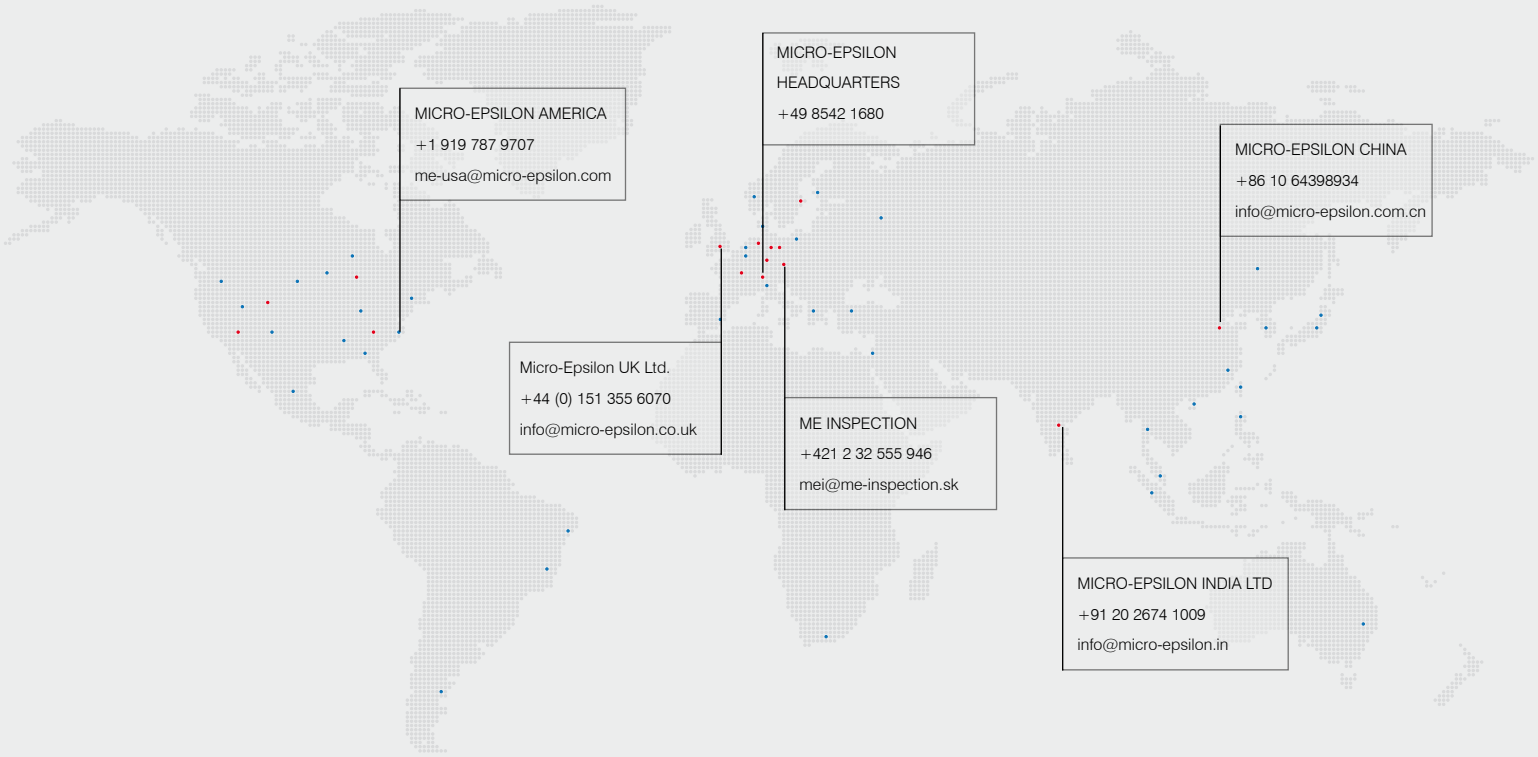
Mechanics:
high quality mechanical design, mechanical manufacturing and assembly

Machinery:
for tire industry, tire wheel assembly and automotive

Automation:
electrical design, PLC programing and assembly

Service:
technical support 7days 24hours

Your local support



Successful installations in following countries

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