MICRO-EPSILON

More Precision

3D Profile Unit // Automated inline 3D inspection and 2D profile evaluation

EtherCAT
PROFINET
EtherNet/IP

Smart 3D evaluation and results output of stitched profile data
3D Profile Unit

Profile stitching of 2 laser scanners

Integration in GigE Vision as a raw data supplier

Industrial Ethernet connection for control and transmission of measured values

Evaluation of composite 2D sections or 3D point clouds

Micro-Epsilon registration targets for automatic registration

Compatible with all scanCONTROL 30xx sensors

The 3D Profile Unit (3DPU for short) is a high-performance computer platform. It enables profile stitching and the calculation of up to two individual profiles of the scanCONTROL 30xx sensors in a common coordinate system. This is how a composite 2D profile or a composite 3D point cloud can be generated. It enables the detection of various geometries, the extension of measuring ranges and the performance of thickness measurements. The exact assignment of the sensors to a common coordinate system is carried out by registration. This can be done either automatically by an arrangement-specific registration target from Micro-Epsilon or by manual registration.

With the help of the powerful 3DInspect software, users can parameterize the system and evaluate recorded data. The smart 3D Profile Unit Controller in the 3DPU-2/IE version has an integrated 3D evaluation and results output in conjunction with an Industrial Ethernet connection. This makes it possible to control the application and output the measured values to a PLC. With the 3DPU-2 version, the 3D Profile Unit controller can be integrated into common image processing programs via GigE Vision and thus acts as a raw data supplier.

The flexible, industrial-grade hardware with passive cooling allows easy and space-saving installation. Therefore the unit can be installed in a control cabinet or mounted directly in the machine. An external PC can easily be connected to parameterize the system.

EtherCAT

PROFINET

EtherNet/IP
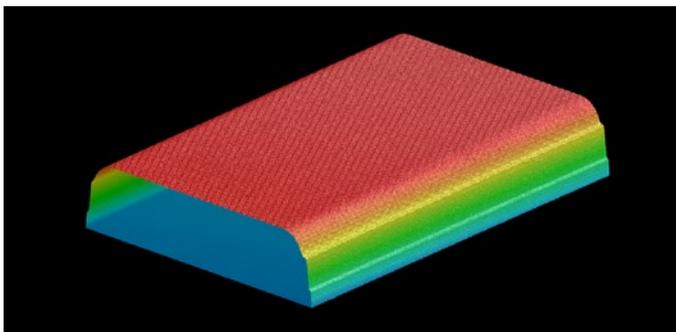
Profile measurement of a ski
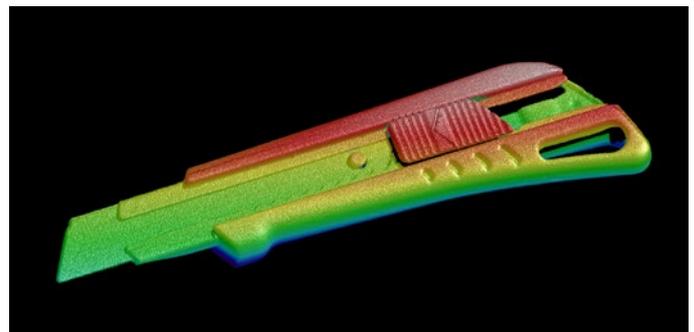
Quality control of carpet knives

Stitching

The 3D Profile Unit converts the profiles of several individual scanCONTROL sensors into a common coordinate system.

3D view of stitched profile sequence:
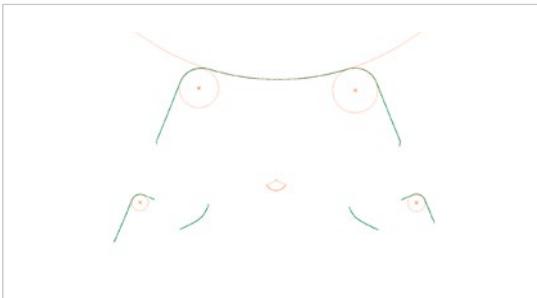
2D evaluation

Calculated profiles:
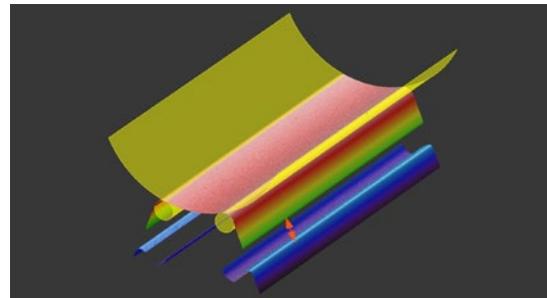
3D evaluation

Micro-Epsilon registration targets for automatic registration

After the sensors have been set up, the position of each individual scanCONTROL sensor is determined in a common overall coordinate system by means of registration. This is referred to as multi-sensor registration. Registration brings the individual sensor readings into a common coordinate system during the set-up process.

Micro-Epsilon offers an individual registration target for each measuring range of the scanCONTROL sensors and for each measuring arrangement. A special registration target can be designed for individual configurations and measurement setups. The sensors can also be registered without a registration target. In this case, registration is done manually via a Golden Sample.
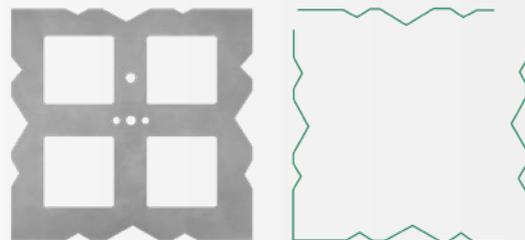
Automatic registration:
Registration with registration target in common coordinate system
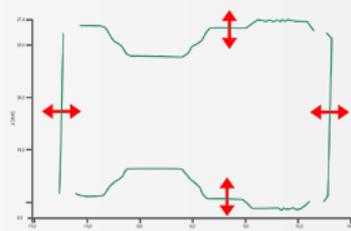
Manual registration:
Registration via Golden Sample

Software
3DInspect

Intuitive user interface

Real 3D evaluation, not just 2.5D

Object extraction in 3D

Direct feedback with algorithms

Compatible with all 3D sensors from Micro-Epsilon
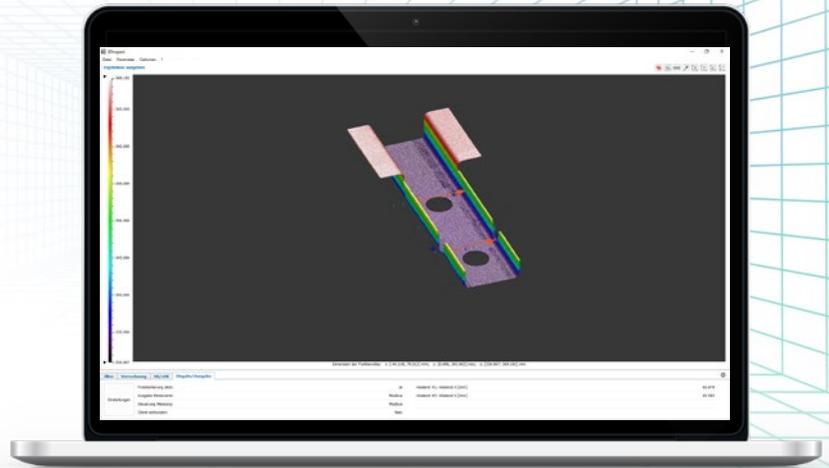
3DInspect

3DInspect software for 3D measurement and inspection tasks

The 3DInspect software is a powerful tool for sensor parameterization and for solving individual measurement tasks. With 3DInspect, the data from the 3D Profile Unit can be transferred to the PC via Ethernet and visualized there in 2D or 3D.

The data can then be evaluated and assessed in 3DInspect using measurement programs. If required, users can log the calculated measurement values and save the measured data.

The pre-defined measuring software programs are divided into the categories "Data preprocessing", "Find objects" as well as in "Combine objects".
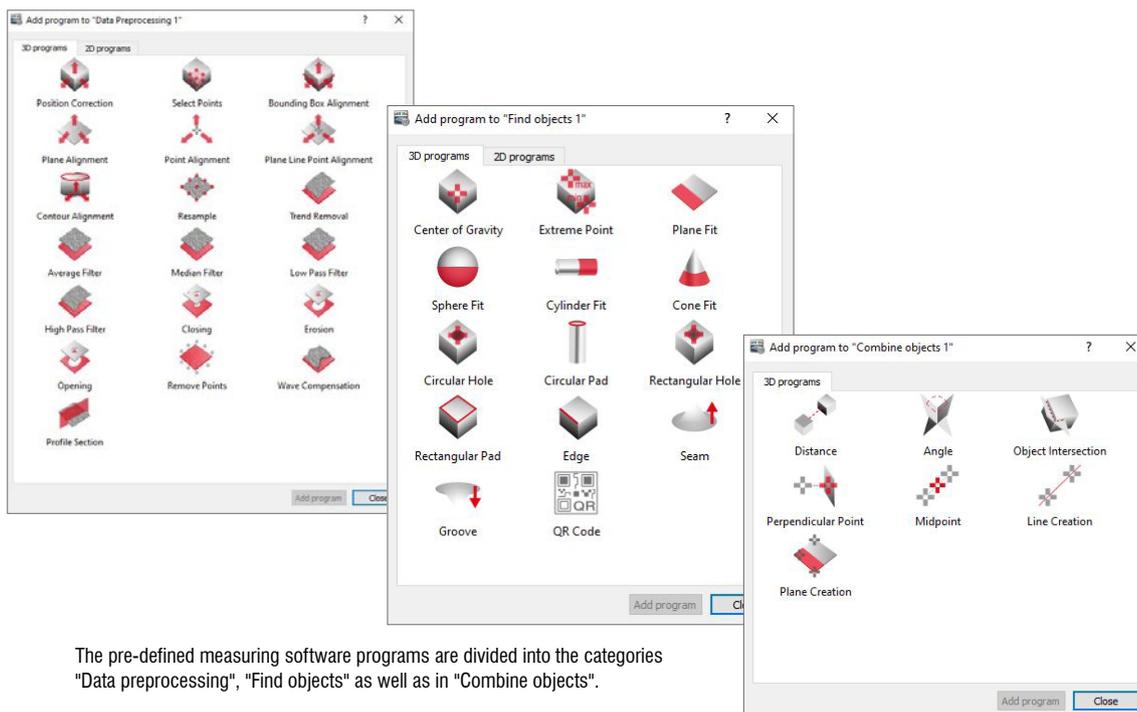
Laser scanners for 2D/3D profile measurements
scanCONTROL

Up to 2,048 points per profile

Up to 9,830,400 points per second

Compact size

High lateral resolution from 12 μm

Available with red and blue laser line

scanCONTROL 3002 and 3000

scanCONTROL laser line scanners use the laser triangulation principle for two-dimensional profile detection on different target surfaces. Line optics project a laser line onto the target surface. A high-quality optical system images the diffusely reflected light from this laser line onto a sensor matrix.

From this camera image, the controller calculates the distance information (z-axis) and the position alongside the laser line (x-axis) and outputs both in a two-dimensional coordinate system. In the case of moving objects or traversing the sensor, a 3D point cloud is obtained from the juxtaposition of the profiles.

LLT3000	LLT3002
2048 points/profile	1024 points/profile
Red laser / blue laser	Red laser / blue laser
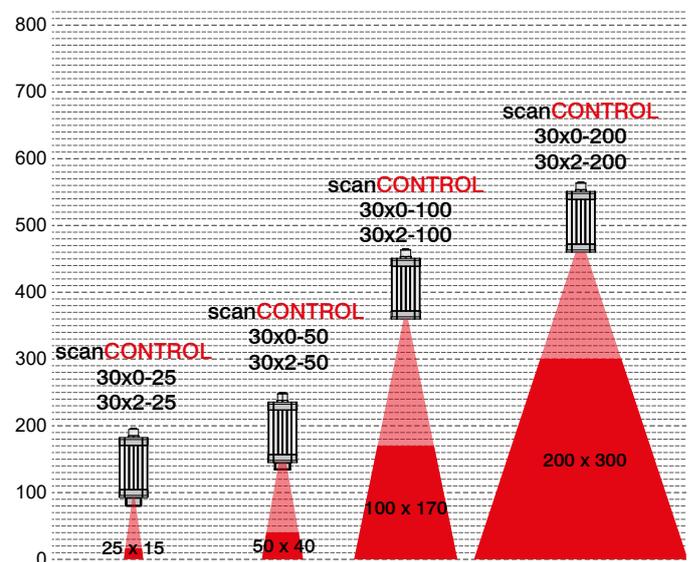
Micro-Epsilon application laboratory for 3D sensors

Micro-Epsilon has established application laboratories in various countries. The application laboratories focus on 3D sensor technology and test measurements.

These laboratories are equipped with the 3D Profile Unit. This enables surface inspections as well as geometric component inspections, position determinations, presence checks and flatness or planarity measurements.

In addition to the 3D Profile Unit, the laboratory's equipment includes the entire 3D product portfolio. The application laboratory offers both integrators and end users the opportunity to test new applications in the fields of 3D surface inspection and geometric measurement using various measuring principles and thus generate the optimum strategy.

Generation and transfer of stitched profile data
3DPU-2

Direct integration into image processing and 3D software

Communication with any GigE Vision clients

Calculation of the individual sensor signals into a large total point cloud -> stitching

Output of the recorded and stitched 2D/3D point cloud via Gigabit Ethernet (GigE Vision / GenICam)

2 LLT300x laser scanners

Transfer of profile data or 3D point clouds

Visualization and configuration via external PC with 3DInspect

A system that converts the profile data of several scanCONTROL sensors into a common coordinate system and then makes it available as 2D profiles or 3D point clouds via GigE Vision.

Model		3DPU-2
Operating mode		2D (profiles) / 3D (point clouds)
Connectable sensors		2
Output of measurement values		Profile data / point clouds via GigE Vision
RAM		16 GB
Memory		128 GB SSD
Supply voltage		9 ... 36 V DC
Power consumption	typ.	50 W
	max.	112 W
Measuring rate[1]		up to 2.5 kHz
Digital interface		Gigabit Ethernet (GigE Vision / GenICam)
Connection		4-pin supply terminal strip; 2x RJ45 for Gigabit Ethernet, 2x RJ45 for connecting sensors 1x HDMI, 4x USB3.2 (Gen1); 4x USB2.0, 1x VGA
Installation		Mounting holes; accessories for table or wall mounting; optionally available: Accessories for DIN rail mounting (see accessories)
Temperature range	Storage	-40 … 85 ℃
	Operation [2]	0 ... 50 ℃
Shock (DIN EN 60068-2-27)		20g / 11 ms half-sine
Vibration (DIN EN 60068-2-6)		3 g / 5 ... 500 Hz
Protection class (DIN EN 60529)		IP40
Material		Metal housing
Dimensions		230 x 192 x 77 mm
Weight		3.3 kg
Compatibility		scanCONTROL 30xx
Control and indicator elements		2 LEDs for storage and power; 4 LEDs for Ethernet status display, 1 power on/off switch
3D evaluation software		Configuration and visualization via Micro-Epsilon 3DInspect

[1] The measuring rate is the frequency at which the detected and calculated measured values (without data evaluation) can be output at the digital interface.
[2] Max. permissible operating temperature at 0.7 m/s air blow

Smart 3D evaluation and results output of stitched profile data
3DPU-2/IE

Integrated evaluation and configuration via 3DInspect

Industrial Ethernet interface for control and transmission of measured values

Calculation of the individual sensor signals into a large total point cloud -> stitching

EtherCAT
Technology Group

PROFINET

EtherNet/IP

Good/bad result of the measurement evaluated

PLC

2 LLT300x laser scanners

Transfer of measured values and measurement results

Gigabit Ethernet (GigE Vision / GenICam)

GiGE VISION

Visualization and configuration via external PC with 3DInspect

A system that converts the profile data from several scanCONTROL sensors into a common coordinate system, evaluates the 2D profiles or 3D point clouds and makes the measured values available via integrated fieldbus interfaces, e.g. as a good/bad result.

Model	3DPU-2/IE	
Operating mode	2D (profiles) / 3D (point clouds)	
Connectable sensors	2	
Output of measurement values	Profile data / point clouds via GigE Vision Integrated evaluation and measured value output to Industrial Ethernet	
RAM	16 GB	
Memory	128 GB SSD	
Supply voltage	9 ... 36 V DC	
Power consumption	typ.	50 W
	max.	112 W
Measuring rate[1]	up to 2.5 kHz	
Digital interface	Gigabit Ethernet (GigE Vision / GenICam) / PROFINET / EtherNet/IP / EtherCAT / Modbus TCP	
Connection	4-pin supply terminal strip; 2x RJ45 for Gigabit Ethernet, 2x RJ45 for Industrial Ethernet (ProfiNET, EtherNet/IP, Ethercat); 2x RJ45 for connecting sensors 1x HDMI, 4x USB3.2 (Gen1); 4x USB2.0, 1x VGA	
Installation	Mounting holes; accessories for table or wall mounting; optionally available: Accessories for DIN rail mounting (see accessories)	
Temperature range	Storage	-40 … 85 °C
	Operation [2]	0 ... 50 °C
Shock (DIN EN 60068-2-27)	20g / 11 ms half-sine	
Vibration (DIN EN 60068-2-6)	3 g / 5 ... 500 Hz	
Protection class (DIN EN 60529)	IP40	
Material	Metal housing	
Dimensions	230 x 192 x 77 mm	
Weight	3.3 kg	
Compatibility	scanCONTROL 30xx	
Control and indicator elements	2 LEDs for storage and power; 4 LEDs for Ethernet status display, 1 power on/off switch	
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[1] The measuring rate is the frequency at which the detected and calculated measured values (without data evaluation) can be output at the digital interface.
[2] Max. permissible operating temperature at 0.7 m/s air blow

Arrangement options
3D Profile Unit

Thickness measurement arrangement

The arrangement for thickness measurements allows two sensors to be positioned opposite each other so that the thickness and thickness profile of measured objects can be precisely detected. The calculated thickness profile can be displayed and evaluated via 3DInspect.

The arrangement is suitable for measuring both flat and thicker objects, for example. The distance between the sensors and thus the overlap of the two measuring ranges can be individually adjusted depending on the requirements and thickness of the target.

Sensor LLT300x	-25	-50	-100	-200
A (mm)	26.8	56.5	340	270
B (mm)	25.27	50.89	124.4	223.132
C (mm)	25	50.98	103.66	210.5
D (mm)	23	43.3	75.6	130
E (mm)	12.75	34	119	187
F (mm)	2.25	6	21	33
Line linearity (μm)	up to 1.5	up to 3	up to 9	up to 26
Resolution	512 to 4,096 points/profile			
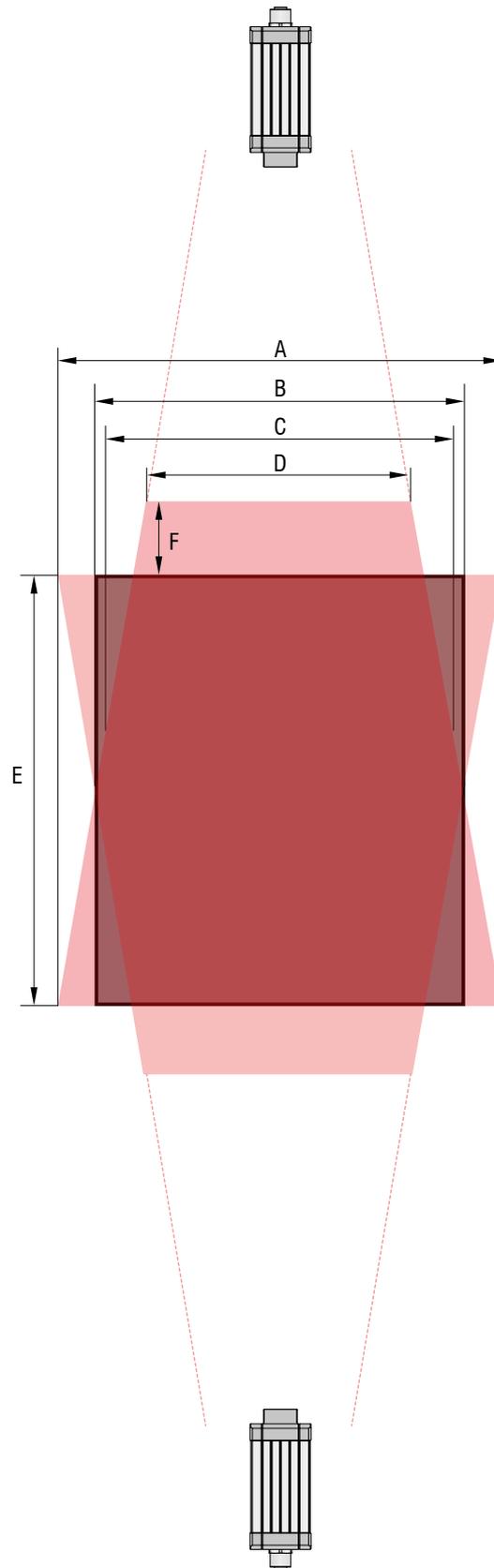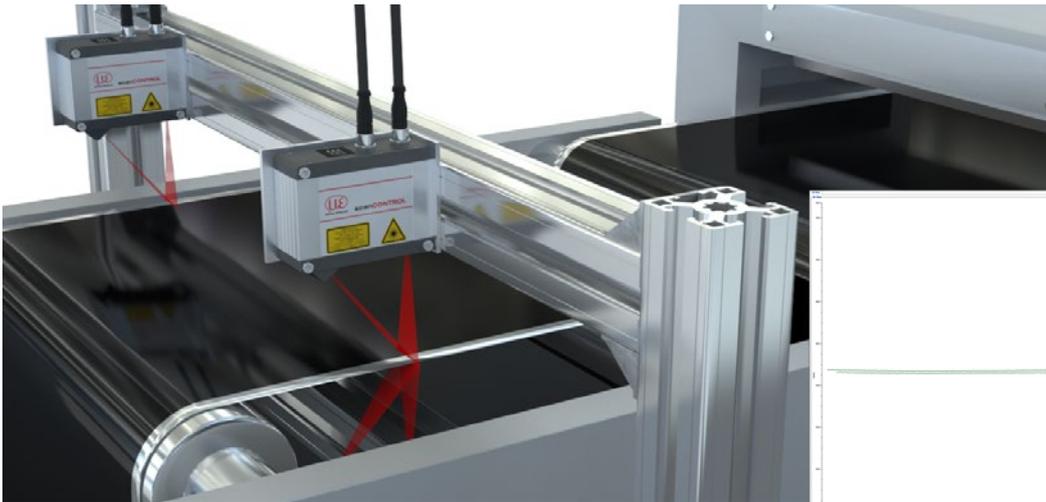
Width, thickness and Heavy Edge of battery film
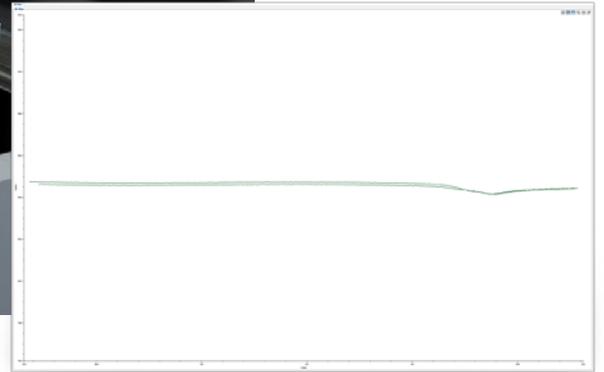
Thickness of smartphone carrier plates
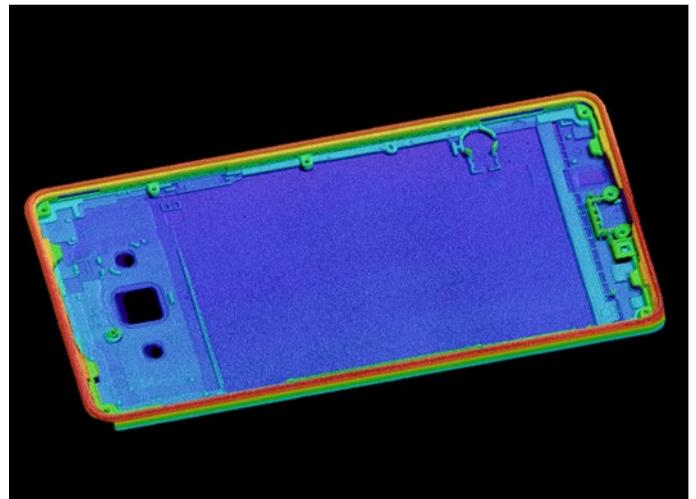
Stitched 3D point cloud of the smartphone carrier plate in 3DInspect
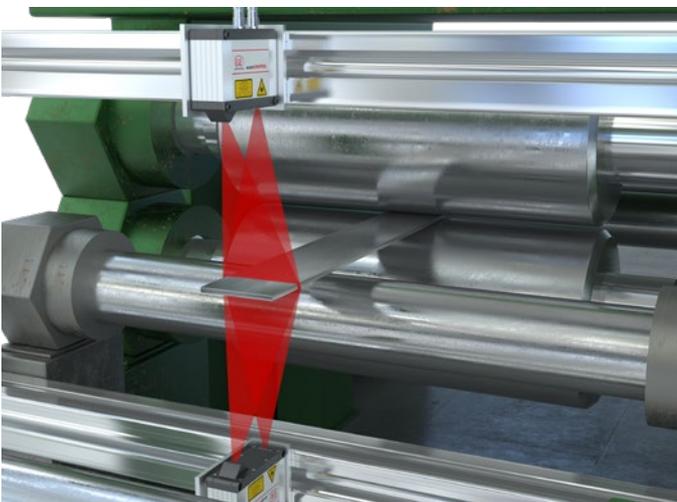
Thickness measurement of cold rolled steel strips
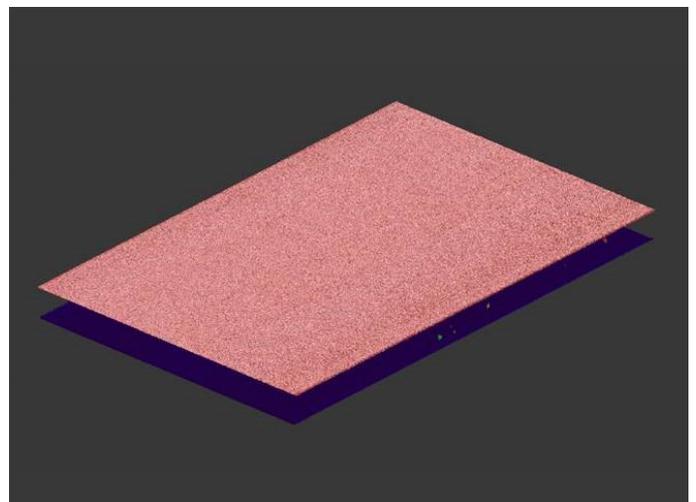
Stitched 3D point cloud of the rolled steel strip in 3DInspect

Arrangement options
3D Profile Unit

Arrangement with two sensors in parallel

Here, two sensors are arranged in parallel. The LLT300x-25 series sensors are slightly tilted towards each other so that their measuring ranges overlap. The sensors with measuring ranges of 50, 100 and 200 mm can easily be arranged in parallel. So objects with a size of up to 260 x 220 mm or 110 x 330 mm can be measured.

The distance between the sensors and thus the overlap of the single measuring ranges can be individually adjusted depending on the requirements and width of the goods to be measured.
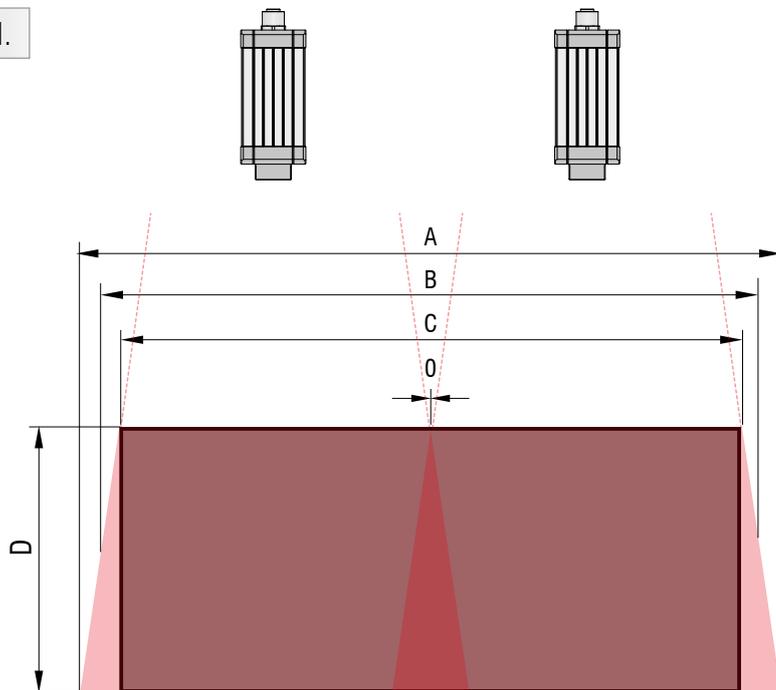
Sensor LLT300x	-25	-50	-100	-200
	I	I	I	I
A (mm)	46.09	99.8	200	400
B (mm)	46	93.3	175.6	330
C (mm)	45.71	86.6	151.2	260
D (mm)	12.49	40	140	220
E (mm)	0	0	0	0
Line linearity (µm)	up to 1.5	up to 3	up to 9	up to 26
Resolution	512 to 4,096 points/profile			
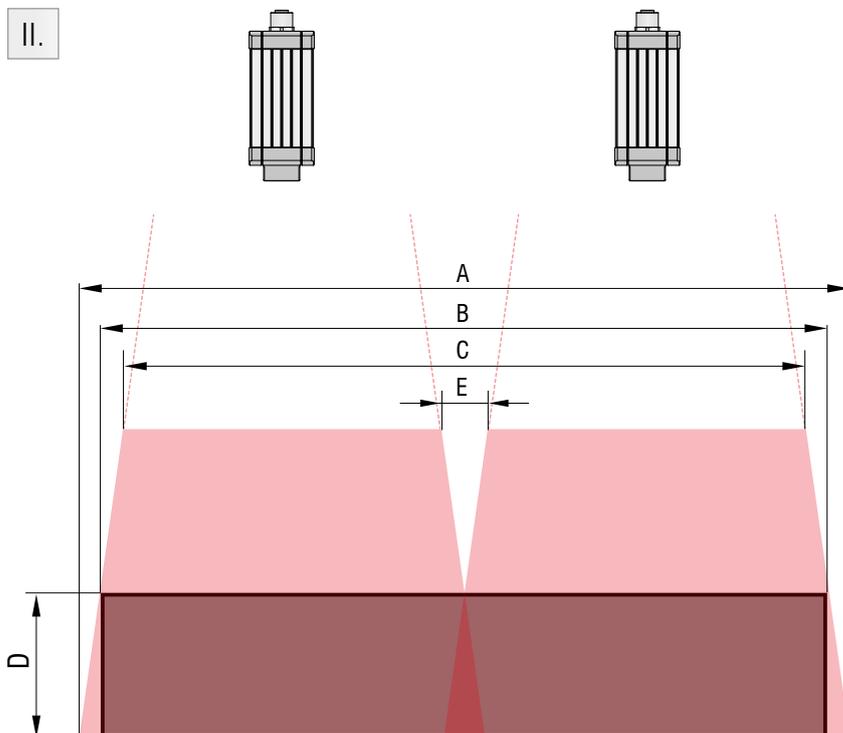
Sensor LLT300x	-25	-50	-100	-200
	II	II	II	II
A (mm)	50.14	106.5	224.4	470
B (mm)	49.78	100	200	400
C (mm)	49.23	93.3	175.6	330
D (mm)	7.53	20	70	110
E (mm)	3.44	6.7	24.4	70
Line linearity (µm)	up to 1.5	up to 3	up to 9	up to 26
Resolution	512 to 4,096 points/profile			

Paper web monitoring and width measurement with two sensors
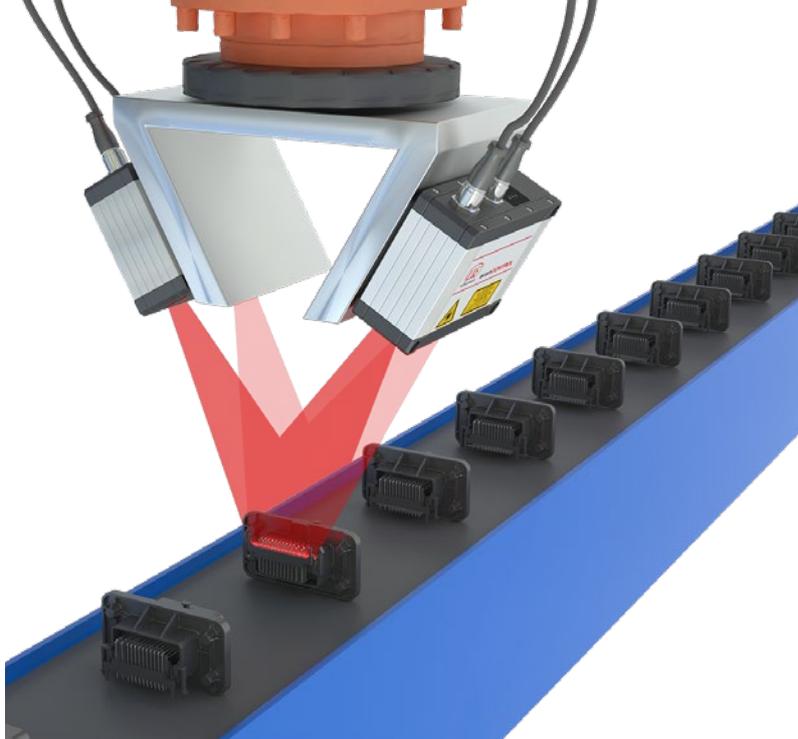
Pin testing on industrial connectors
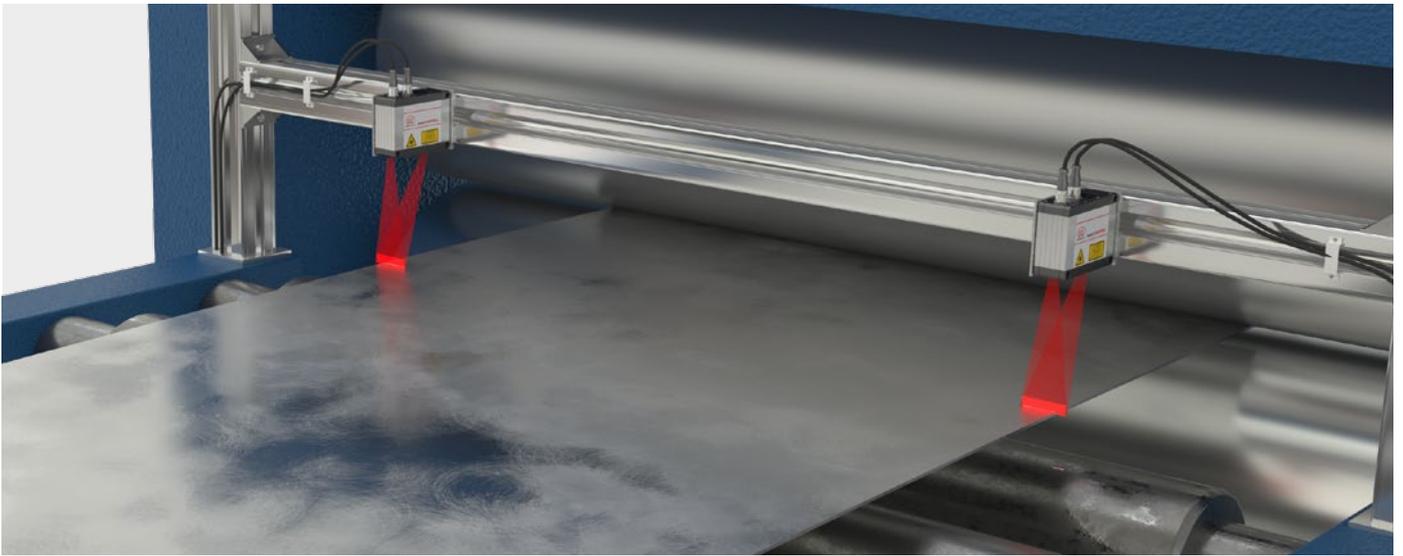
Web edge control in rolling mills
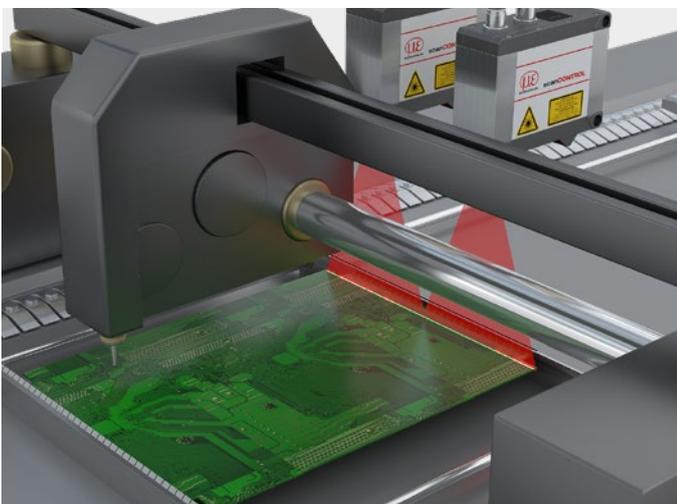
Completeness check of circuit boards
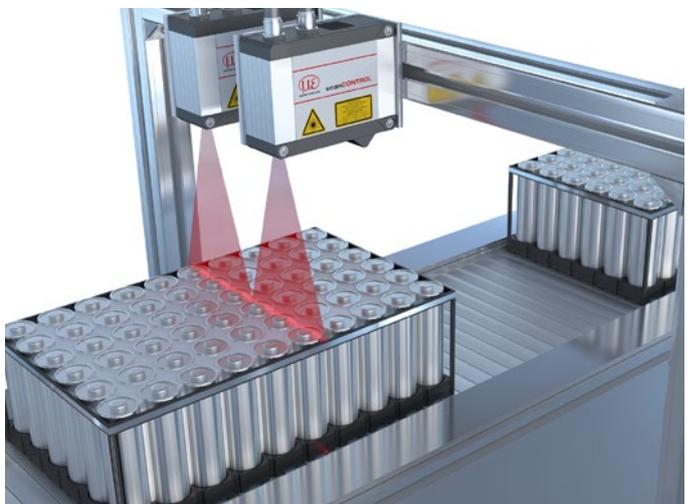
Battery cell digitization

Dimensions

3DPU-2
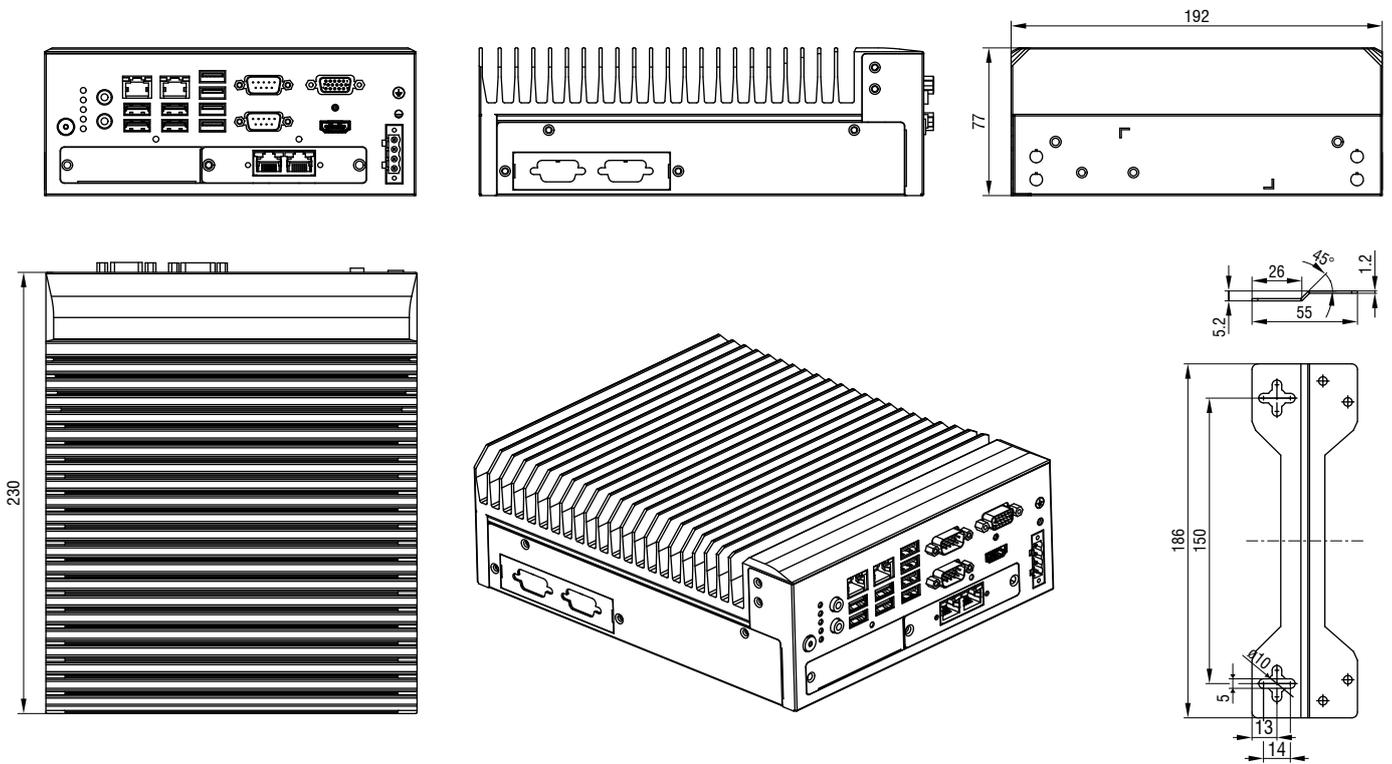
Accessories

Connection cables

PCR3000-x Multi-function cable

Cable for power supply, digital inputs (TTL or HTL),
RS422 (half-duplex);
suitable for drag chains and robots
Cable length (m): 2 / 5 / 10 / 15 / 20 / 25 / 35

47.5

ø15

12 braids

Sensor connector
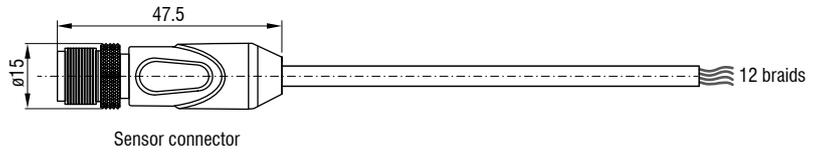
SCR3000A-x Ethernet connection cable

Cable for parameter setting, value and profile transmission;
suitable for drag chains and robots
Cable length (m): 0.5 / 2 / 5 / 10 / 15 / 20 / 25 / 35

47.5

52.6

ø15

11.8

8.1

Sensor connector

RJ45
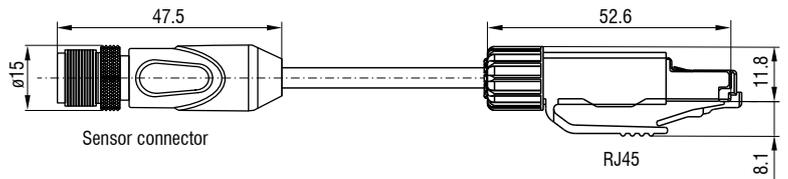
Accessories for controller mounting

Two mounting rails for table and wall mounting
are included in delivery

186

150

13

5

ø10

14

5.2

26

55

45°

1.2
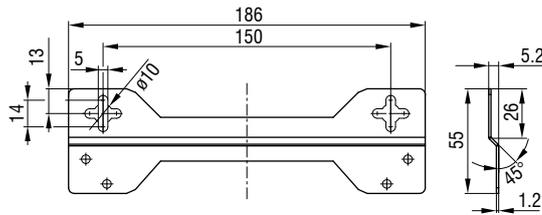
3D systems for precise 3D and thickness measurement

Sensor system for precise thickness measurement with thicknessGAUGE 3D

- Compact complete solution with 24V-supply
- For many types of surfaces / materials
- Traverses via linear axis
- Fully automatic calibration
- Integrated software
- Laser class 2M, no special safety precautions required

The thicknessGAUGE 3D is a precise sensor system for two-sided profile and thickness measurements of sheets and extrusion materials. Two opposing laser profile scanners detect synchronized profile data along a linear movement, which is merged into a 3D point cloud. From this point cloud, the thicknessCONTROL 3D calculates freely programmable target values to solve complex 2D or 3D measurement tasks.

The specific evaluation is parameterized using the 3DInspect software, where the measurement programs and parameters are transferred to the thicknessCONTROL software and processed automatically.

Ultimately, only the desired result is output. A linear axis moves the sensor system from the parking position to the measuring position. A measurement standard for fully automatic calibration is in the parking position.

3D systems for precise 3D and thickness measurement

Profile measurement of red-hot tubes with dimensionCONTROL MPG 9208

Laser profile gauges of the dimensionCONTROL Metal Profile Gauge (MPG) series help optimize the production of long products by measuring a wide range of dimensions and features.

At various positions along the rolling mill, they provide essential information for process control, quality assurance and the associated decision on "good" or "bad". The gradation of complexity with regard to the possible profile shapes to be measured results in a comprehensive product portfolio. Different technologies such as ThruBeam or red and blue laser line sensors are used, allowing the optimum solution to be selected for every application.

- Measuring range: up to 500 mm
- Compact design for easy integration into the line
- Can be equipped with ThruBeam sensors, red or blue
  laser line profile sensors
- Pneumatic protection of the sensor optics, optional water cooling
- Flexible interface for communication with production
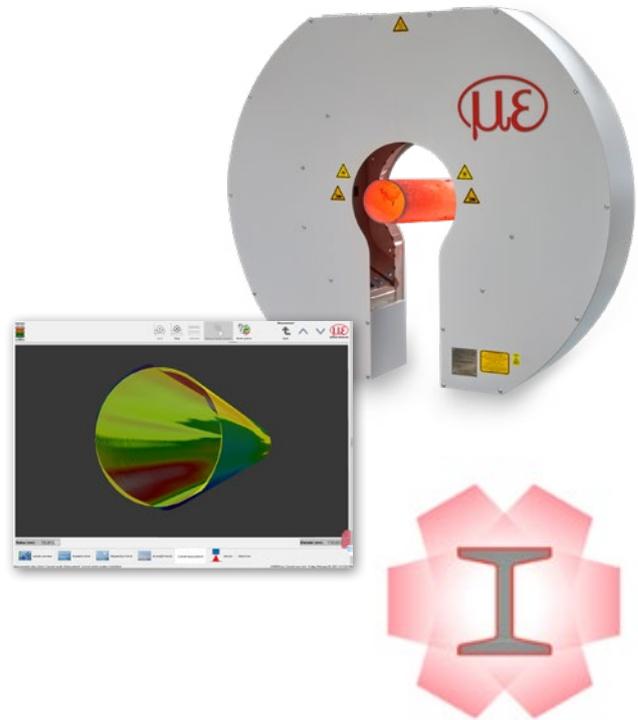
Sensors and Systems from Micro-Epsilon

Sensors and systems for displacement, distance and position

Sensors and measurement devices for non-contact temperature measurement
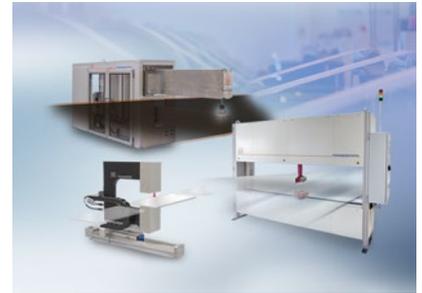
Measuring and inspection systems for metal strips, plastics and rubber

Optical micrometers and fiber optics, measuring and test amplifiers

Color recognition sensors, LED analyzers and inline color spectrometers
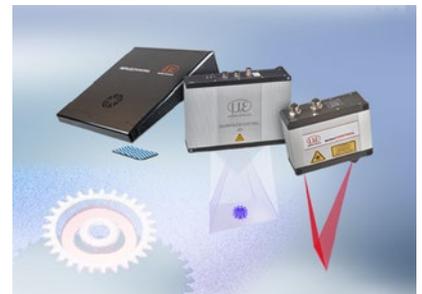
3D measurement technology for dimensional testing and surface inspection