MICRO-EPSILON

More Precision

3D sensors for precise inline quality inspection

Precise raw data for integrators

Precise raw data for integrators and image processors

The 3D sensors from Micro-Epsilon are used for a variety of measurement and inspection tasks on both matt and shiny surfaces. The results can be documented and compared. This allows for important conclusions to be drawn for process improvements. All 3D inspection systems from Micro-Epsilon can be used in offline applications as well as in fully automated operation and on the robot.

Software integration via Micro-Epsilon's 3D-SDK

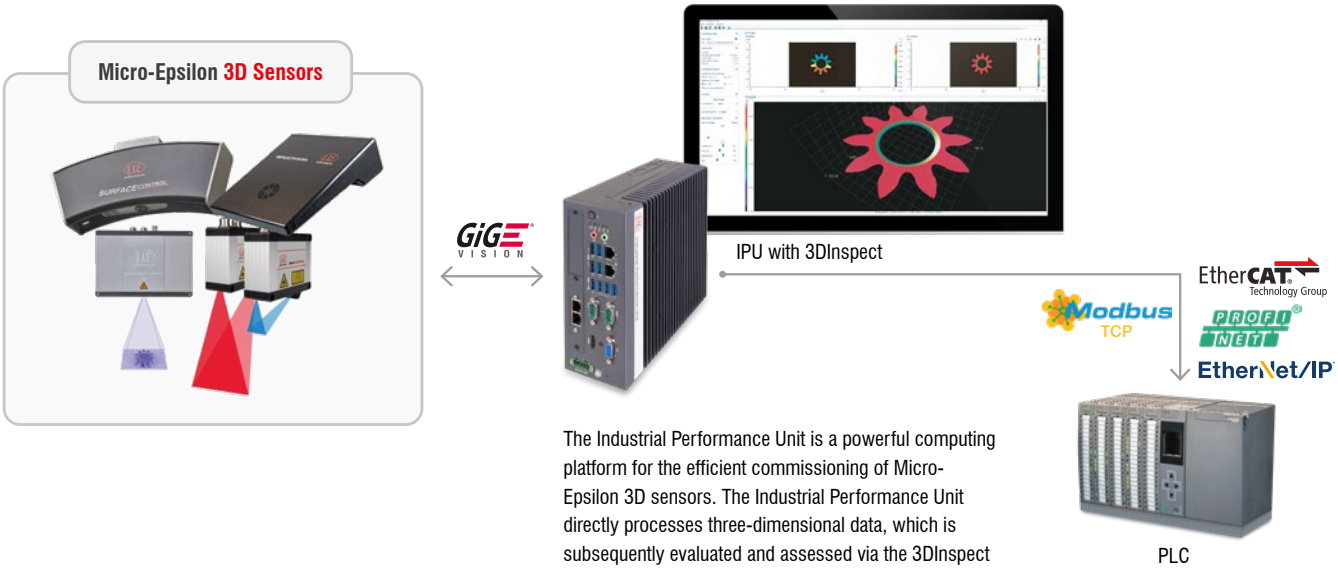
3D sensors from Micro-Epsilon are equipped with a user-friendly SDK (Software Development Kit). The SDK is based on the GigE Vision and GenICam industry standards including the following essential function blocks:

- Network configuration and sensor connection
- Control of data transmission (3D measurement data, video images, profile counters, ...)
- Comprehensive sensor control
- User sets
- Documentation
- C++ example programs
- 3D Viewer

3D SDK at a glance:

- For the integration of all 3D sensors
- GigE Vision / GenICam compatible
- Access to all sensor parameters
- Examples included
- Comprehensive documentation

Powerful software for 3D measurement tasks
3DInspect



The Industrial Performance Unit is a powerful computing platform for the efficient commissioning of Micro-Epsilon 3D sensors. The Industrial Performance Unit directly processes three-dimensional data, which is subsequently evaluated and assessed via the 3DInspect software. Results can be output via the integrated EtherCAT, RPOFINET and EtherNet/IP interfaces.

3DInspect is a uniform and user-friendly software tool for all 3D sensors from Micro-Epsilon. Parameter setting of the 3D sensors and recording of the measurement data are done directly in the 3DInspect software. Powerful tools allow point cloud alignment and filtering, intuitive detection and selection of relevant areas, and program combination. The 3D point clouds can be processed as required and measured values can be output to the controller.

3DInspect at a glance:

- One software for all 3D sensors
- High compatibility
- High flexibility
- Intuitive user interface
- Real 3D evaluation, not just 2.5D
- Object extraction in 3D
- Direct feedback with algorithms

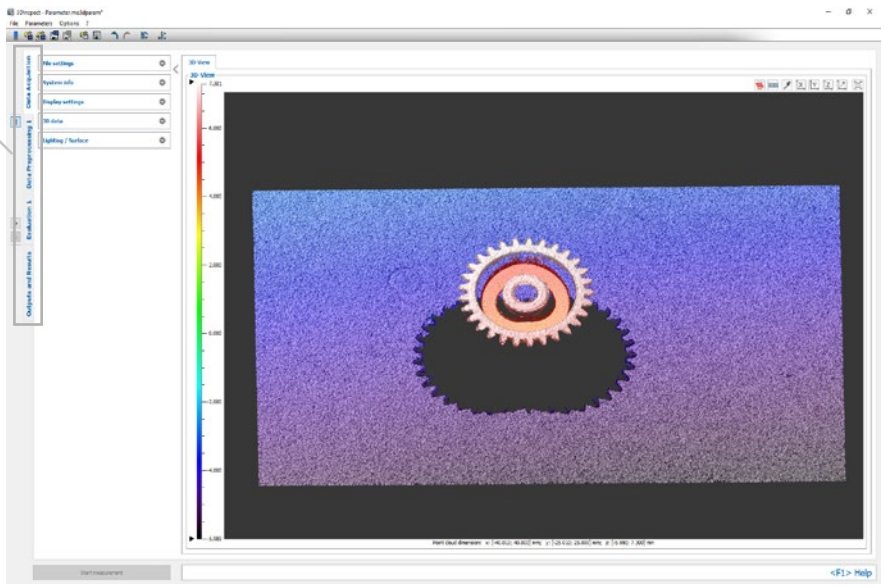
Data acquisition

Data preprocessing

Evaluation

Results

3DInspect uses a logical program structure that proceeds step-by-step from data acquisition through processing to outputs and results.



Software for 3D measurement and inspection tasks
3DInspect

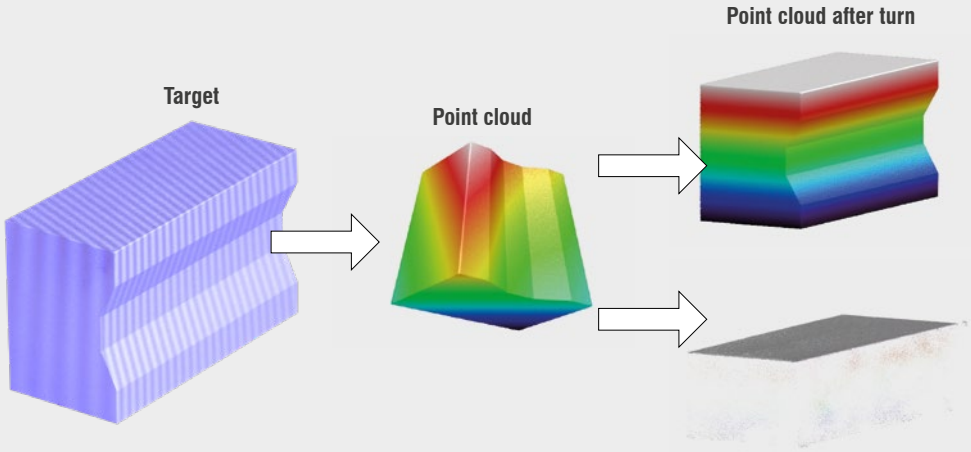
- Intuitive user interface
- Real 3D evaluation, not just 2.5D
- Object extraction in 3D
- Direct feedback with algorithms
- Compatible with all 3D sensors from Micro-Epsilon

The 3DInspect software is a powerful tool for sensor parameter set up and industrial measurement tasks. This software transmits the measurement data from the sensor via Ethernet and provides the data in three-dimensional form. This 3D data is further processed, evaluated and assessed with 3DInspect measuring programs on the PC and, if necessary, logged and transmitted via Ethernet to a control unit. Furthermore, the software enables the storage of 3D data. The 3DInspect software supports the scanCONTROL 30xx models as well as the surfaceCONTROL and reflectCONTROL 3D sensors.

Valid3D technology from Micro-Epsilon vs. conventional 2.5D systems

The unique Valid3D technology enables lossless display and processing of the point clouds. This is how scanned 3D objects can be moved arbitrarily in the coordinate system.

Valid3D: Real 3D without data loss



3DInspect with Valid3D

- Real 3D image of test object without data loss
- Analysis and evaluation of complete test object

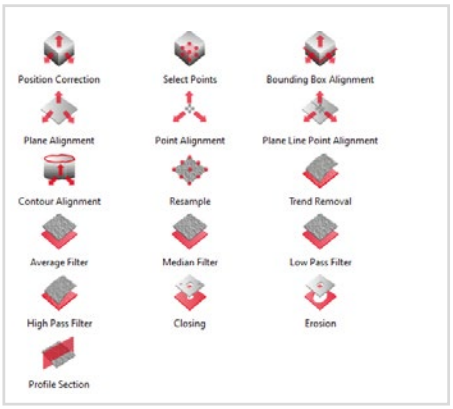
Common 3D software

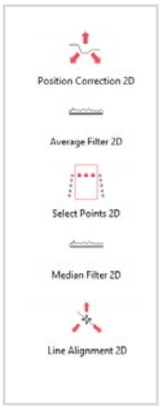
- Algorithms based on 2.5D
- Only one z-coordinate per x/y coordinate possible
- Data loss during data processing

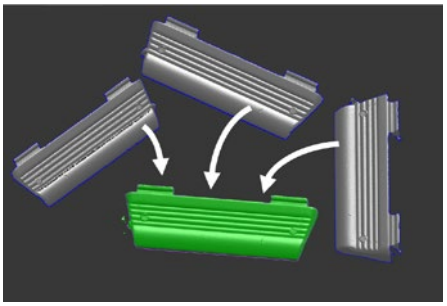
Data preprocessing

With data preprocessing, the point cloud can be adjusted before evaluation. This enables, for example, the correction of moving components, so that the point cloud for the evaluation is always in the same position.

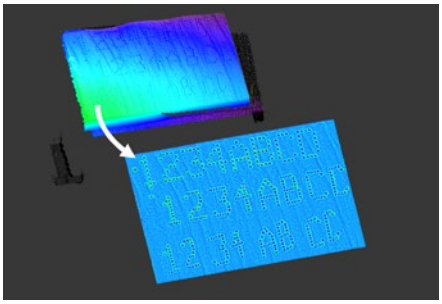
In addition, it is possible to refine the point cloud before evaluation, to apply filters to highlight features, to cut away irrelevant points or to set sections.



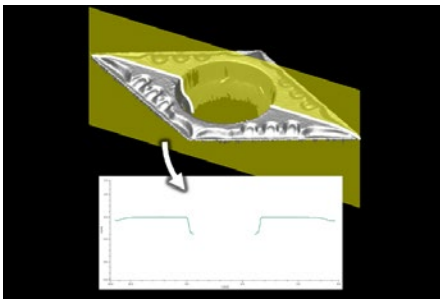




Automatic alignment of the point cloud



Processing of data

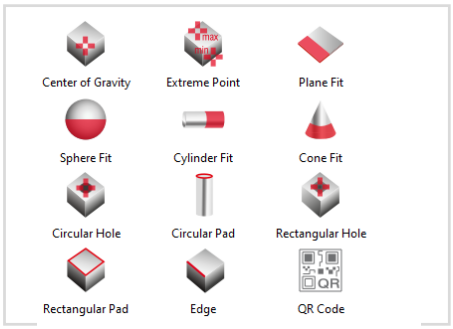


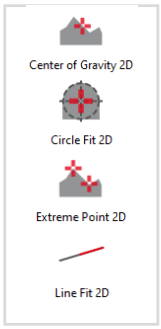
Setting cuts

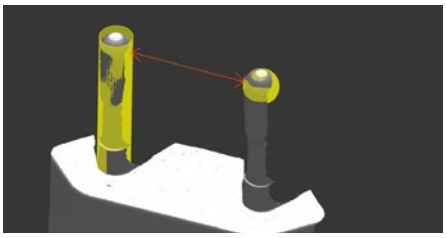
Data evaluation

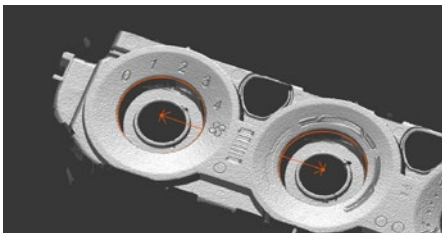
For data analysis, numerous programs are available to locate and measure characteristics. These can be edges, spheres or holes, for example. Both the evaluation of the 3D data, and a measurement or evaluation directly in previously generated sections is possible.

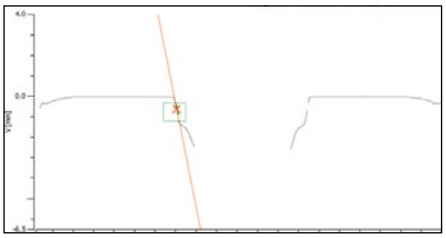
The 2D and 3D objects can also be set in relation to each other using combinations, for example to determine distances between a sphere and a plane or the angle between two edges.

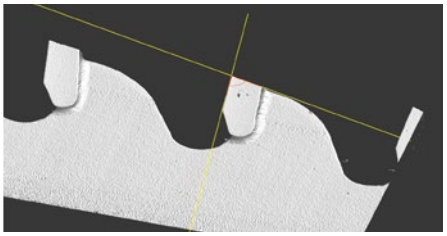


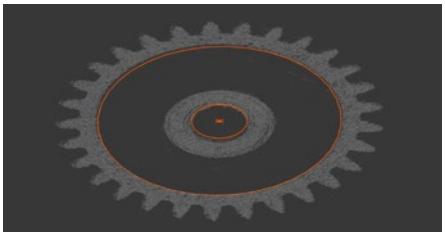


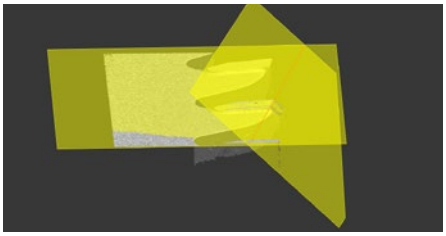


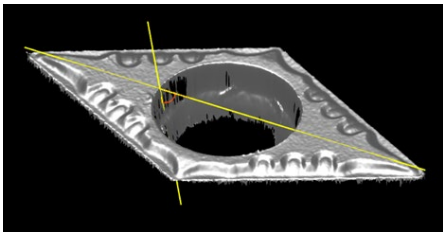


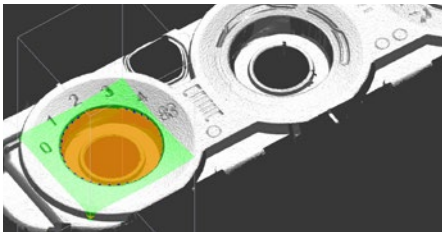


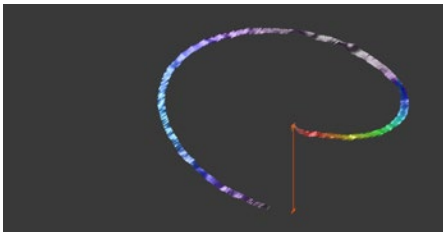






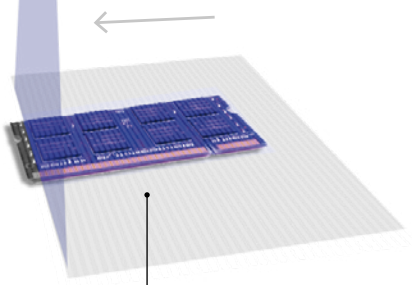






Laser scanners for 3D profile measurement
scanCONTROL

- Up to 2,048 points per profile
- Up to 7,372,800 points per second
- Compact size
- High lateral resolution from 7.8 µm
- Small and compact, ideal for robotic applications
- Available with red and blue laser line
- GigE Vision standard – easy to integrate into common image processing software

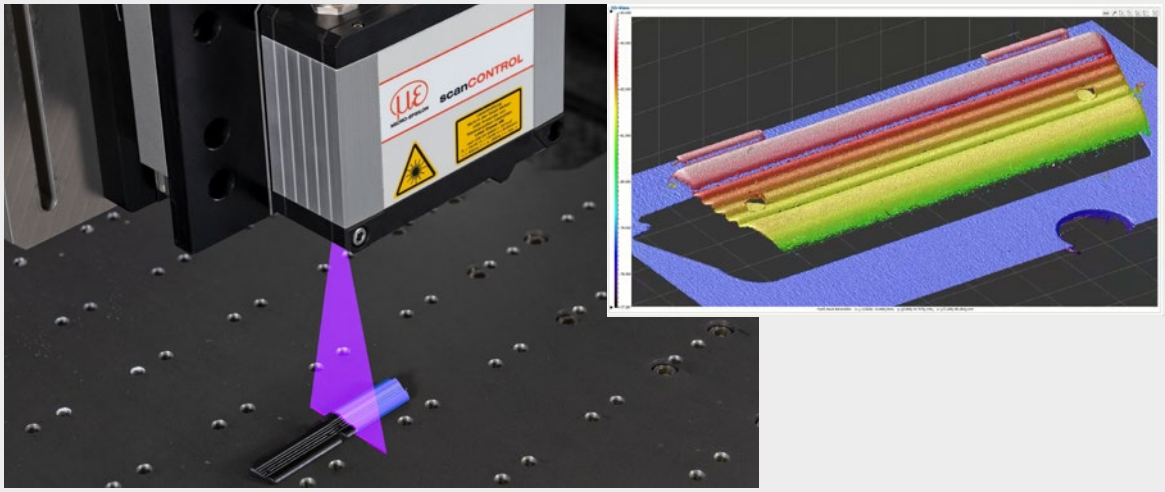


3D scan in motion

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.

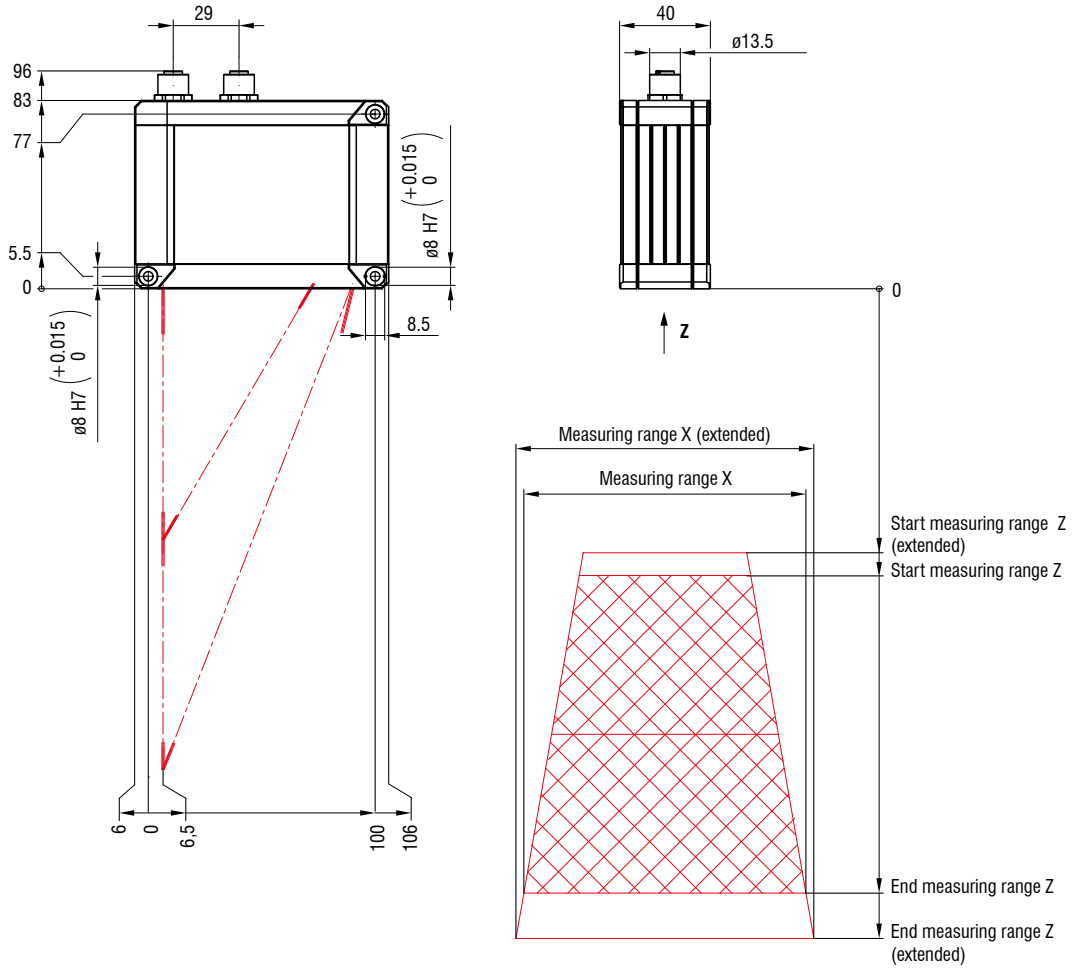
Assignment of the exact position of the sensor relative to the position of the measured object can be carried out via the integrated encoder inputs. The scanCONTROL laser line scanners have an Ethernet/GigE Vision connection and can therefore be integrated into a wide variety of image processing packages up to 3D evaluation. A device driver including sample VIs is available for LabVIEW users. Furthermore, integration into Linux is possible.

High precision 3D scans



	Model		LLT30x0-25	LLT30x0-50	LLT30x0-100	LLT30x0-200
	Available laser type		Red Laser / Blue Laser	Red Laser / Blue Laser	Red Laser / Blue Laser	Red Laser
z-axis	Measuring range	Start of measuring range	77.5 mm	105 mm	200 mm	200 mm
		Mid of measuring range	85 mm	125 mm	270 mm	310 mm
		End of measuring range	92.5 mm	145 mm	340 mm	420 mm
		Height of measuring range	15 mm	40 mm	140 mm	220 mm
	Extended measuring range	Start of measuring range	-	-	190 mm	160 mm
		End of measuring range	-	-	360 mm	460 mm
	Line linearity [1) 2)]		1.5 µm	3 µm	9 µm	26 µm
			±0.01 %	±0.0075 %	±0.006 %	±0.012 %
x-axis	Measuring range	Start of measuring range	23.0 mm	43.3 mm	75.6 mm	130 mm
		Mid of measuring range	25.0 mm	50.0 mm	100 mm	200 mm
		End of measuring range	26.8 mm	56.5 mm	124.4 mm	270 mm
	Extended measuring range	Start of measuring range	-	-	72.1 mm	100 mm
		End of measuring range	-	-	131.1 mm	290 mm
	Resolution		2,048 points/profile			
	Profile frequency		up to 10,000 Hz			
	Interfaces	Ethernet GigE Vison	Sensor control Profile data transmission			
		Digital inputs	Mode switching Encoder (counter) Trigger			
		RS422 (half-duplex) [3)]	Sensor control Trigger Synchronization			

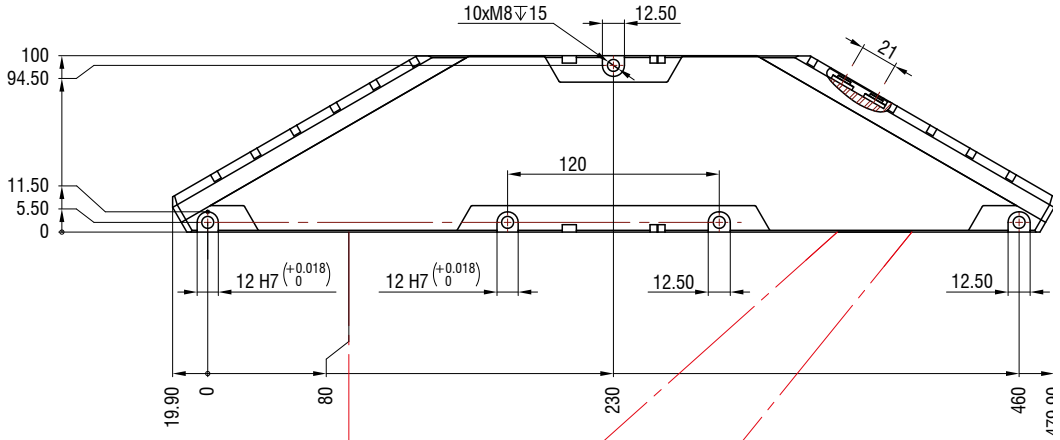
[1)] Based on the measuring range; measuring object: Micro-Epsilon standard object
[2)] According to a one-time averaging over the measuring field (2,048 points)
[3)] RS422 interface, programmable either as serial interface or as input for triggering/synchronization

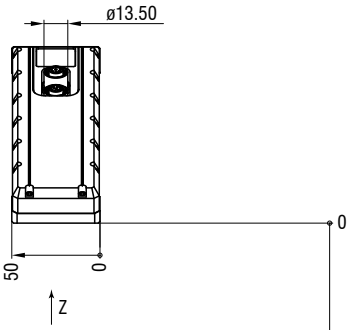


Laser scanners for 3D profile measurement
scanCONTROL

	Model		LLT 30x0-430	LLT 30x0-600
	Available laser type		Red Laser	Red Laser
z-axis	Measuring range	Start of measuring range	330 mm	530 mm
		Mid of measuring range	515 mm	770 mm
		End of measuring range	700 mm	1010 mm
		Height of measuring range	370 mm	480 mm
	Extended measuring range	Start of measuring range	330 mm	450 mm
		End of measuring range	720 mm	1050 mm
	Line linearity [1) 2)]		12 µm	15 µm
			±0.0032 %	±0.0031 %
x-axis	Measuring range	Start of measuring range	324 mm	456 mm
		Mid of measuring range	430 mm	600 mm
		End of measuring range	544 mm	762 mm
	Extended measuring range	Start of measuring range	324 mm	408 mm
		End of measuring range	560 mm	788 mm
	Resolution		2,048 points/profile	
	Profile frequency		up to 10,000 Hz	
	Interfaces	Ethernet GigE Vision	Sensor control Profile data transmission	
		Digital inputs	Mode switching Encoder (counter) Trigger	
		RS422 (half-duplex) [3)]	Sensor control Trigger Synchronization	

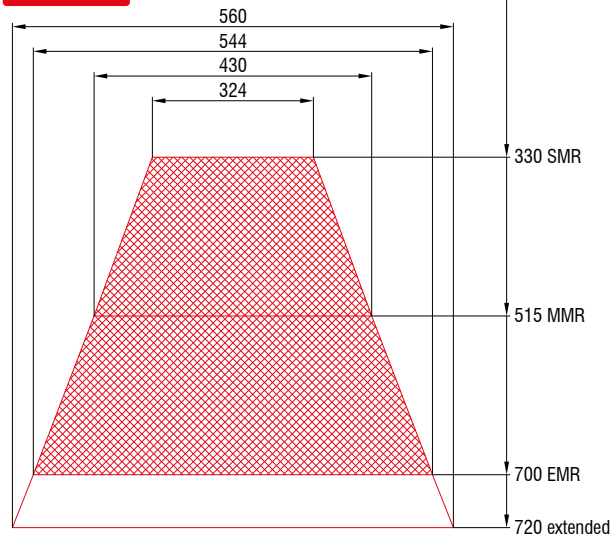
[1)] Based on the measuring range; measuring object: Micro-Epsilon standard object
[2)] According to a one-time averaging over the measuring field (2,048 points)
[3)] RS422 interface, programmable either as serial interface or as input for triggering/synchronization





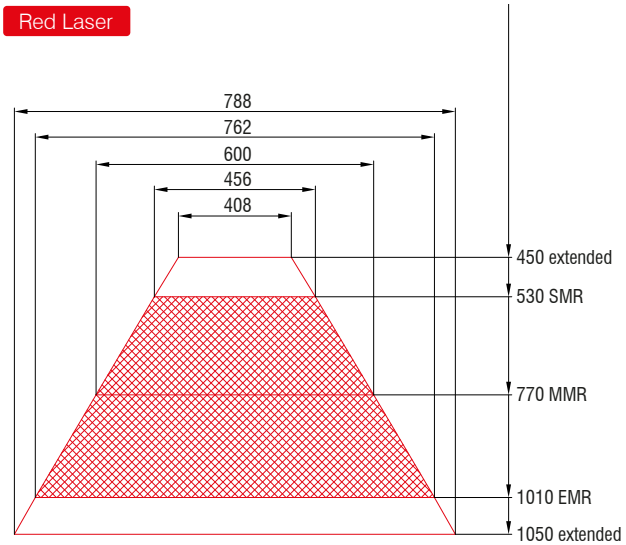
LLT30x2-430 / LLT30x0-430

Red Laser



LLT30x2-600 / LLT30x0-600

Red Laser



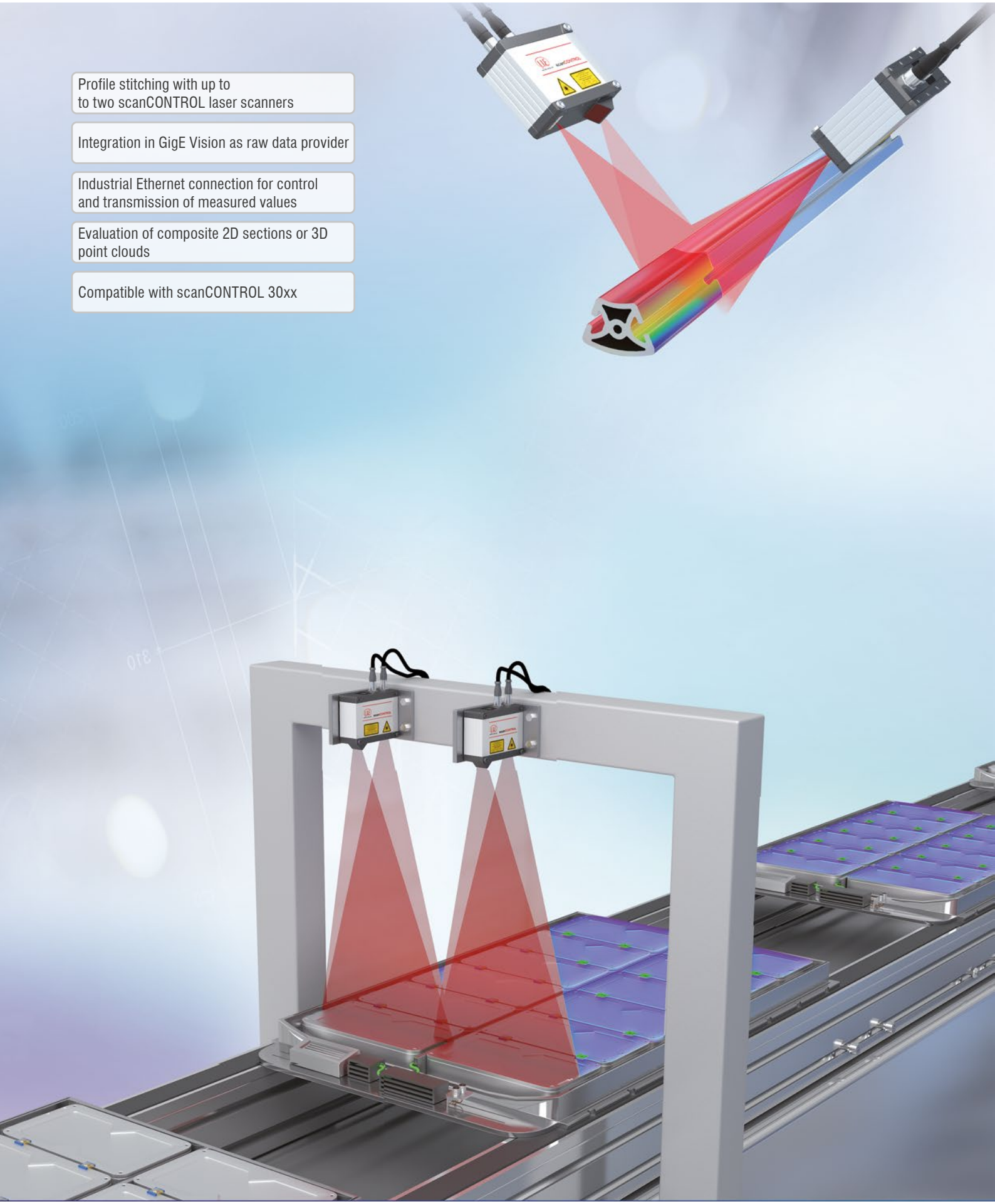
(dimensions in mm, not to scale)

Profile stitching for up to 2 laser scanners

3D Profile Unit

NEW

- Profile stitching with up to to two scanCONTROL laser scanners
- Integration in GigE Vision as raw data provider
- Industrial Ethernet connection for control and transmission of measured values
- Evaluation of composite 2D sections or 3D point clouds
- Compatible with scanCONTROL 30xx



The 3D Profile Unit enables the calculation of several individual profiles of 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 evaluation of the data and the parameterization of the system can be implemented in the 3DInspect software. The 3D Profile Unit controller offers an optional integrated evaluation feature in conjunction with the Industrial Ethernet connection, enabling the application to be controlled and measured values to be output to a PLC.

Alternatively, the 3D Profile Unit controller can also be integrated into common image processing programs via GigE Vision and acts as a raw data provider.

3D Profile Unit Controller

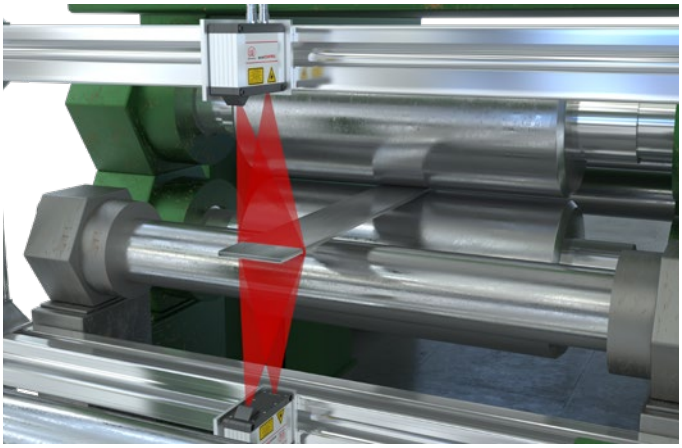
- Communication with any GigE Vision clients
- Direct integration into image processing software
- Transfer of profile data or 3D point clouds

3D Profile Unit Controller with Industrial Ethernet

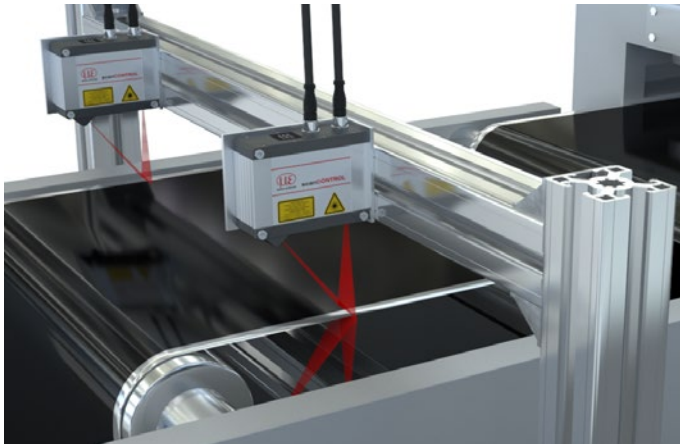
- Integrated evaluation
- Transmission of measured values
- Industrial Ethernet interface for control and transmission of measured values

PROFINET®
EtherCAT®
EtherNet/IP
Modbus

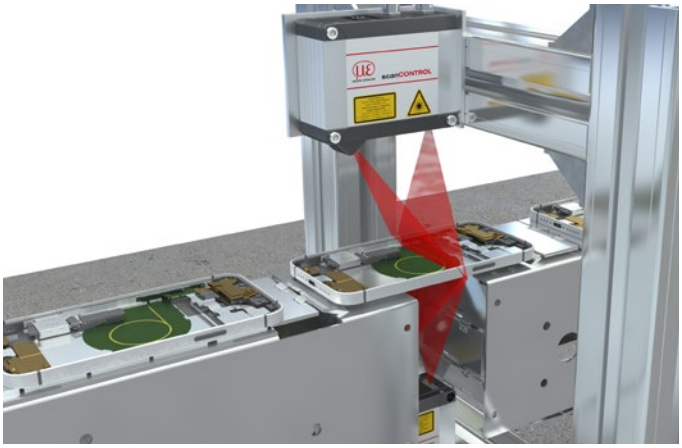
Application examples:



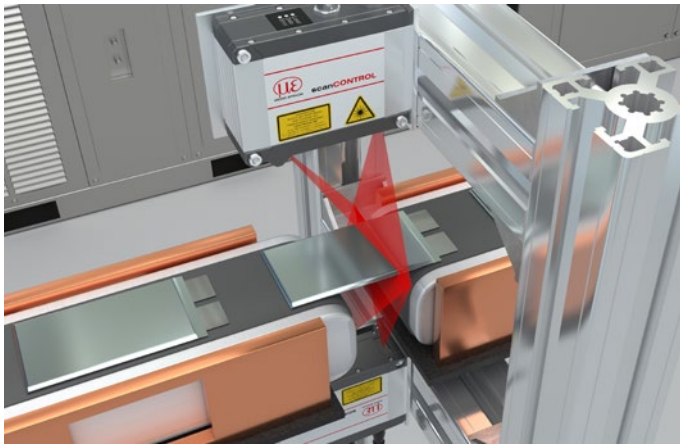
Thickness measurement of cold rolled steel strips



Width, thickness and Heavy Edge of battery film



Thickness of smartphone carrier plates



Inspection of pouch cells

High precision 3D sensors for inline shape and surface inspection
surfaceCONTROL 3D 3500

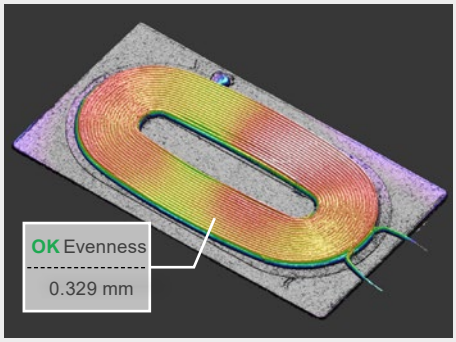
- Highest repeatability up to 0.25 µm
- Best Z-axis resolution from 0.7 µm
- Up to 2.2 million 3D points / second
- Easy integration in all common 3D image processing packets

The new generation of high precision inline 3D measurements

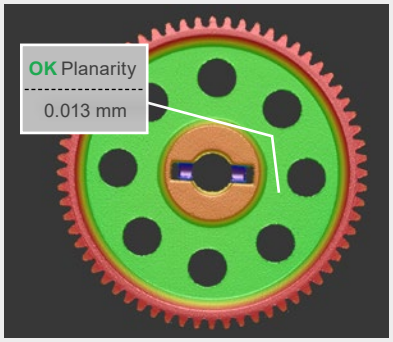
The high precision 3D snapshot sensor surfaceCONTROL 3D 3500 sensor is ideally suited to automated inline inspection of geometry, shapes and surfaces on diffuse reflecting surfaces. The sensor works according to the principle of fringe projection, which allows direct 3D measurement. The surfaceCONTROL 3D 3500 stands out due to its compact design and high measurement accuracy combined with high data processing speed. With a z-axis repeatability of up to 0.25 µm, the sensor sets new standards in high precision 3D metrology. This enables reliable detection of even the smallest deviations in flatness and height. Two models cover different measuring fields.

In addition to the fast data output via Gigabit Ethernet, the sensor offers an additional digital I/O interface. The 2D/3D Gateway II supports EtherNet/IP, PROFINET and EtherCAT connections. Powerful software tools enable precise 3D measurements and surface inspection. GigE Vision compatibility also allows easy integration into third-party image processing software. The comprehensive SDK for customer software integration rounds off the software package.

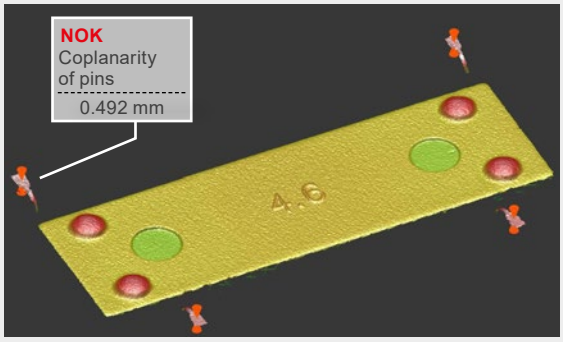
High precision 3D snapshots



Flatness test of the winding on charging coils



Flatness measurement of the flange of a gear wheel

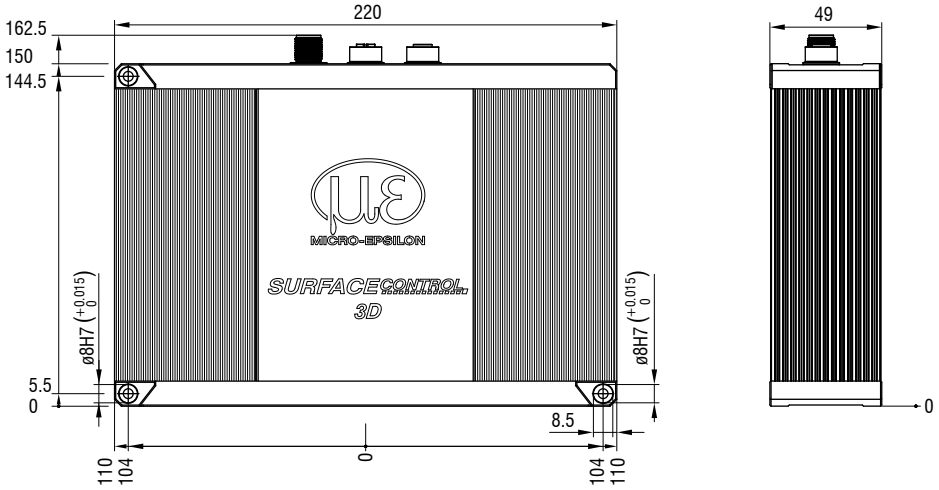


Coplanarity measurement of contacts on electrical components

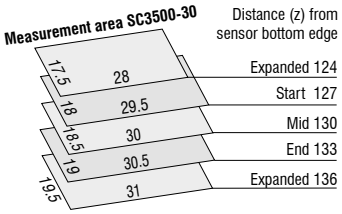
Model		SC3500-30	SC3510-30	SC3500-80	SC3510-80	SC3500-120	SC3510-120	SC3500-240	SC3510-240
Measurement area Length (x) * width (y) at distance (z)	Start of expanded area	28 x 17.5 at 124 mm		55 x 42 at 110 mm		87.5 x 62.5 at 171 mm		145 x 115 at 340 mm	
	Start	29.5 x 18.0 at 127 mm		67.5 x 46 at 120 mm		107.5 x 70 at 191 mm		190 x 130 at 380 mm	
	Mid	30 x 18.5 at 130 mm		80 x 50 at 130 mm		120 x 75 at 206 mm		240 x 150 at 440 mm	
	End	30.5 x 19.0 at 133 mm		77.5 x 52 at 140 mm		123.5 x 80 at 221 mm		245 x 170 at 500 mm	
	End of expanded area	31.0 x 19.5 at 136 mm		75 x 54 at 150 mm		122 x 82.5 at 241 mm		245 x 180 at 540 mm	
Working distance	z	130 ±3 mm		130 ±10 mm		206 ±15 mm		440 ±60 mm	
	extended z	130 ±6 mm		130 ±20 mm		206 ±35 mm		440 ±100 mm	
Resolution	x,y	8 µm		20 µm		30 µm		60 µm	
	z [1]	0.7 µm		1 µm		2 µm		4 µm	
Repeatability	z(σ) [1]	< 0.25 µm		< 0.4 µm		< 0.7 µm		< 1.4 µm	
Acquisition time [2] [3]		0.2 … 0.4 s							
Light source		LED							
Supply voltage		24 VDC ±20 %							
Max. current consumption		0.5 … 2.5 A							
Digital interfaces		Gigabit Ethernet (GigE Vision / GenICam) / PROFINET [4] / EtherCAT [4] / EtherNet/IP [4]							
Digital in-/outputs		4 digital I/Os for which parameters can be set (for external trigger, sensor control, output of sensor states)							
Connection		8-pin M12 socket for Gigabit Ethernet, 12-pin M12 socket for digital I/Os, 4-pin M12 plug for power supply							
Installation		3 mounting holes (installation can be reproduced with centering sleeves)							
Temperature range	Storage	-20 … +70 °C							
	Operation [5]	0 … +45 °C						0 … +40 °C	
Shock (DIN EN 60068-2-27)		15 g / 6 ms in XY axis, 1000 shocks each							
Vibration (DIN EN 60068-2-6)		2 g/20 … 500 Hz on XY axis, 10 cycles each							
Protection class (DIN EN 60529)		IP67							
Material		Aluminum housing, passive cooling; external cooling optionally available (see accessories)							
Weight		1.9 kg						2.3 kg	
Control and indicator elements		3 LEDs (for device status, power, data transmission)							
Sensor SDK		Micro-Epsilon 3D sensor SDK							
3D evaluation software		Micro-Epsilon 3DInspect							
Functional extension		-	3DInspect Automation	-	3DInspect Automation	-	3DInspect Automation	-	3DInspect Automation

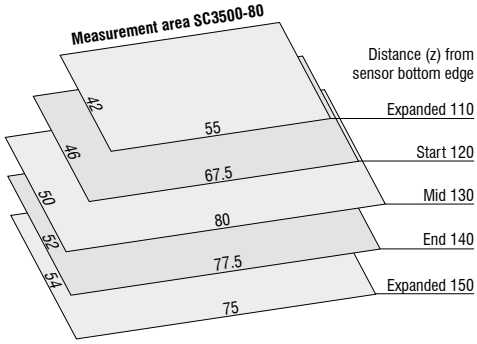
1) Measured on measuring object with cooperative surface in the center of the measurement area while the EnhancedSNR parameter is enabled and a 3x3 mean value filter is used once at a consistent room temperature of (20 ± 1 °C).
2) Duration that the sensor requires for the image acquisition of the pattern projections (without processing and evaluation time).
3) Applies for exposure times < 6,800 µs
4) Connection via 2D/3D gateway interface module
5) Max. permissible operating temperature depends on installation scenario, connection and operating mode.
In combination with a ventilation unit (art. no. 2105079), continuous measurement operation is possible at ambient temperatures of up to 45 °C (valid for measuring ranges 30, 80 and 120 mm)

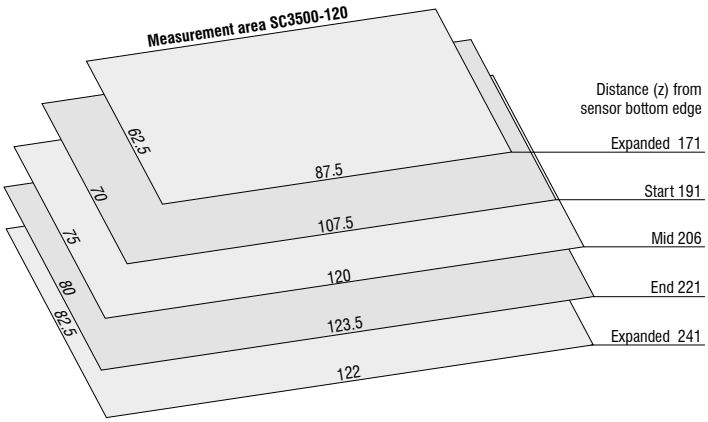
Dimensions and measurement areas
surfaceCONTROL 3D

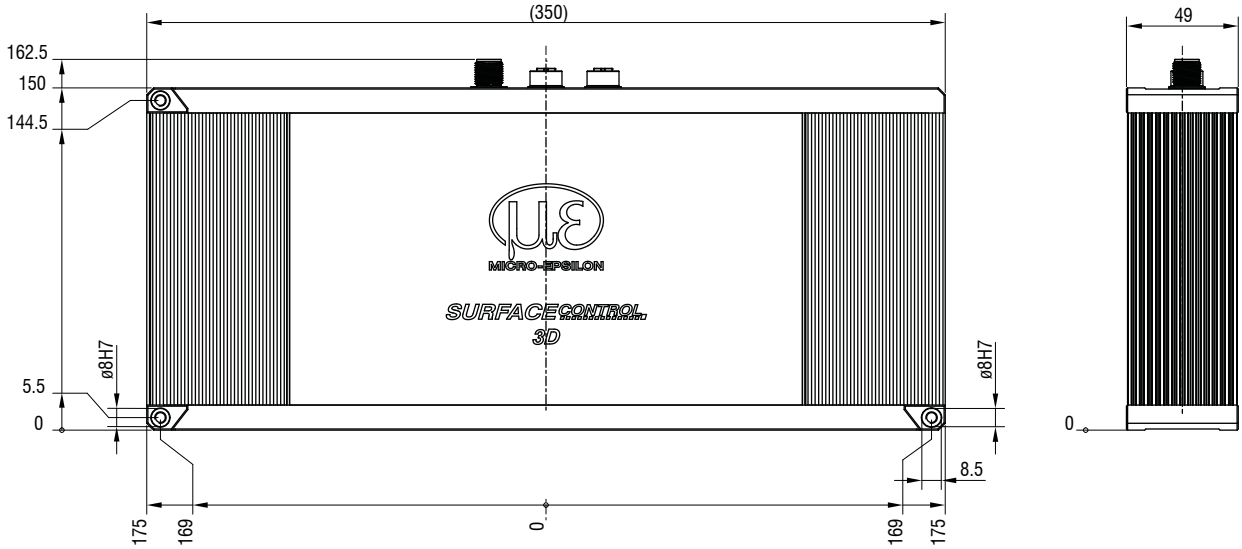


surfaceCONTROL 3D 3500-30 / -80 / -120

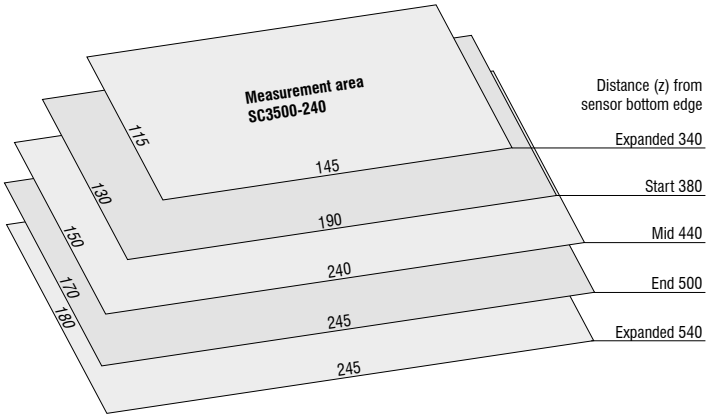






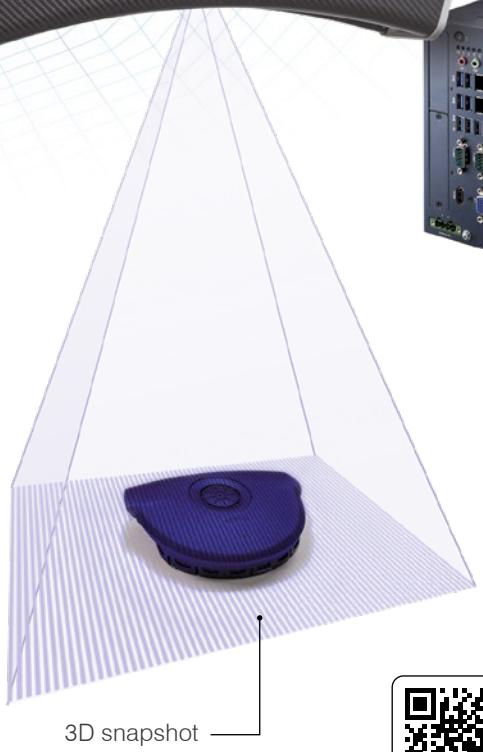


surfaceCONTROL 3D 3500-240



3D sensor for inspection of large surfaces
surfaceCONTROL 3D 2500

- Inspection of large objects
- High measuring range depth up to 300 mm
- Acquisition time from 0.5 seconds
- Z-axis repeatability up to 0.5 µm
- Automated inline 3D measurement for geometry, shape and surface inspections
- Real 3D data via latest 3D GigE Vision standard

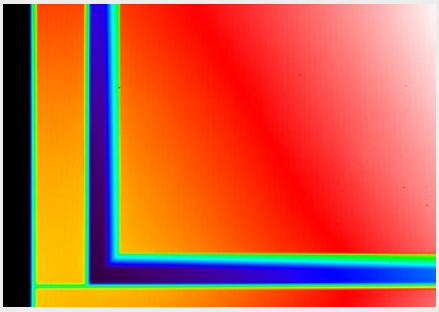


3D snapshot sensor for surface inspection of large objects

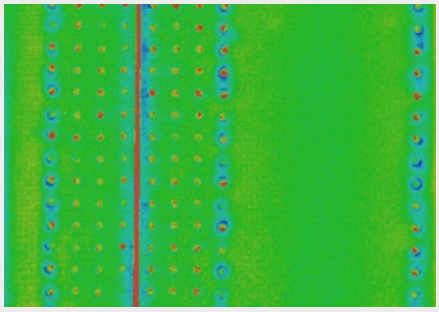
The surfaceCONTROL 3D sensors are ideally suited to automated inline inspection of geometry, shapes and surfaces on diffuse reflecting surfaces. The 3D snapshot sensors work according to the principle of fringe projection, which allows direct 3D measurement of components. The sensor is characterized by a large measuring field as well as a high measuring range depth with a z-axis repeatability of up to 0.5 µm. Three models cover different measuring fields.

The captured images are first transferred to the external controller where they are processed into 3D data. The SC2500 controller offers fast data output via Gigabit Ethernet. The 2D/3D Gateway II supports EtherNet/IP, PROFINET and EtherCAT connections. 3DInspect, DefMap3D and InspectionTools are powerful software tools that enable precise 3D measurements and surface inspection. GigE Vision compatibility also allows easy integration into third-party image processing software. The comprehensive SDK for customer software integration rounds off the software package.

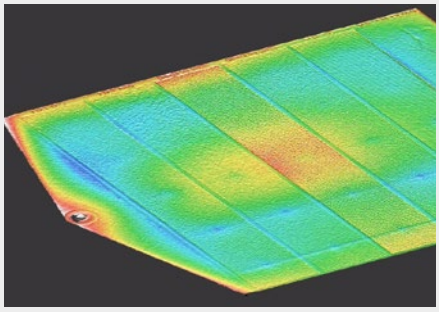
Large-format 3D snapshots with high precision



Shape defects on furniture boards



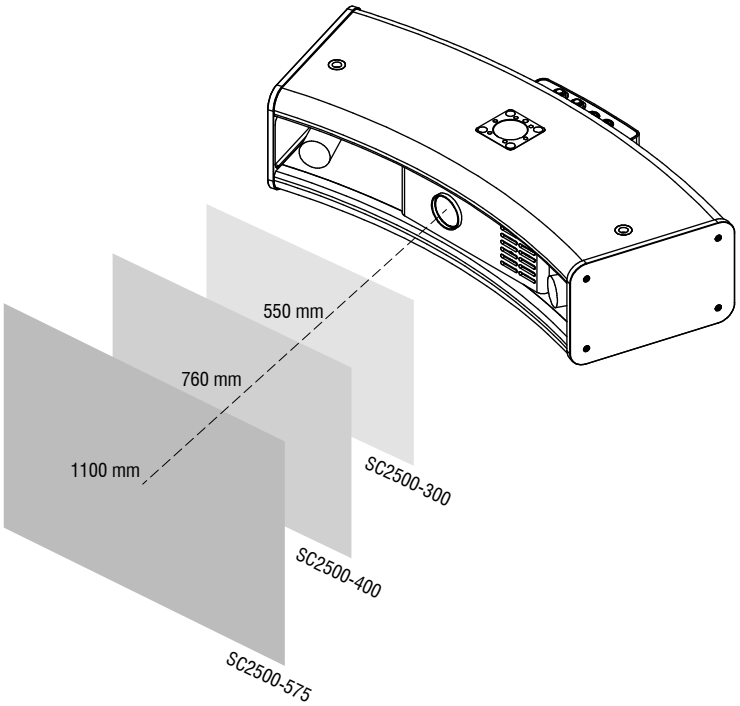
Rivet inspection: deformation, height and position of the rivet

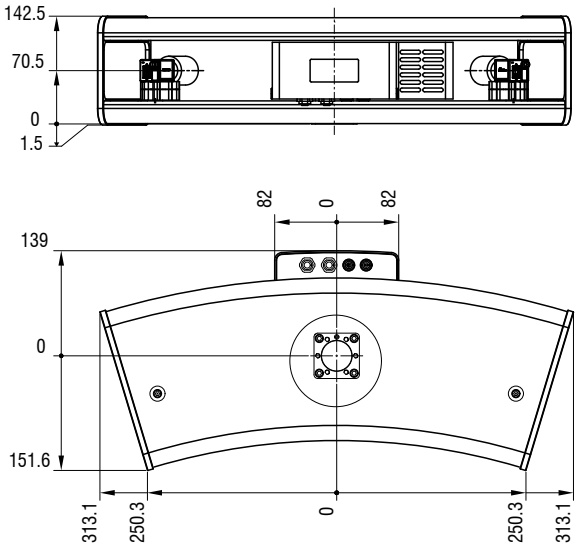


Sink mark on injection molded components

Model	surfaceCONTROL 3D	SC2500-300	SC2510-300	SC2500-400	SC2510-400	SC2500-575	SC2510-575
Measurement area Length (x) * width (y) at distance (z)	Start	260 mm x 190 mm at 475 mm		350 mm x 260 mm at 660 mm		500 mm x 375 mm at 950 mm	
	Mid	300 mm x 220 mm at 550 mm		400 mm x 300 mm at 760 mm		575 mm x 435 mm at 1100 mm	
	End	340 mm x 250 mm at 625 mm		450 mm x 340 mm at 860 mm		650 mm x 495 mm at 1250 mm	
Working distance	z	550 ±75 mm		760 ±100 mm		1100 ±150 mm	
Resolution	x,y	125 µm		150 µm		250 µm	
	z[1]	1.2 µm		3.4 µm		8.5 µm	
Repeatability	$z_{(\sigma)}$[1]	< 0.5 µm		< 1.2 µm		< 3.0 µm	
Acquisition time [2] [3]		0.5 … 1 s					
Light source		LED					
Supply voltage		18 VDC ±33 %					
Max. current consumption		6 … 12.5 A					
Connection		8-pin M12 socket for Gigabit Ethernet camera 1, connection to controller, 8-pin M12 socket for Gigabit Ethernet camera 2, connection to controller, 4-pin LEMO push-pull connector for sensor control (USB), connection to controller, 2-pin LEMO push-pull plug for supply voltage					
Installation		Mounting via flange adapter (see accessories)					
Temperature range [4]	Storage	-10 ... +50 °C, non-condensing					
	Operation	+5 … +40 °C					
Protection class (DIN EN 60529)		IP40					
Material		Carbon, aluminum, plastics					
Weight		7.0 kg (without controller)					
Control and indicator elements		2 LEDs on each camera (for device status, power, data transmission)					
Sensor SDK		Micro-Epsilon 3D Sensor-SDK					
3D evaluation software		Micro-Epsilon 3DInspect					

[1] Measured on measuring object with cooperative surface in the center of the measurement area while the EnhancedSNR parameter is enabled and a 3x3 mean value filter is used once at a consistent room temperature of (20 ± 1 °C).
[2] Duration that the sensor requires for the image acquisition of the pattern projections (without processing and evaluation time).
[3] Applies for exposure times < 25 ms
[4] Projector with active cooling. Air-cooled. Projection area and cooling area are separated.





Sensor for high resolution inspection of shiny surfaces
reflectCONTROL Sensor

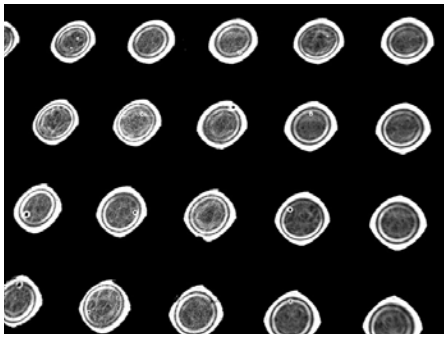
- Reliable detection of the smallest deviations from 10 nm
- Inspection rate from 1 second per measuring position
- Stationary or robot-based inspection
- Software connection via Micro-Epsilon 3D-SDK based on GigE Vision and GenICam

2D surface inspection and 3D measurement

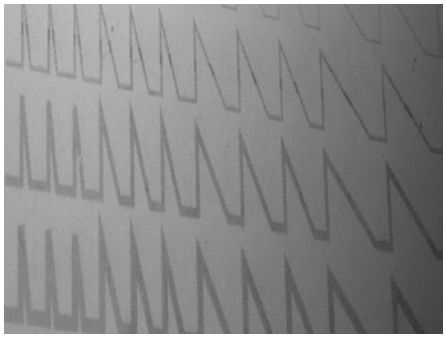
reflectCONTROL is intended for surface inspection of shiny objects. This compact sensor displays a striped pattern which is mirrored by the surface of the measuring object into the sensor cameras. Deviations on the surface will cause deviations from this striped pattern, which are evaluated by software.

The measured data is processed into 2D images that show the structure of the surface. The RCS110-245 2D sensor creates high-resolution 2D images and enables a detailed examination of the surface in two dimensions. In addition to 2D images, the RCS130-160 3D HLP sensor can also calculate a 3D point cloud. This point cloud allows a highly precise analysis of unevenness, scratches and other defects.

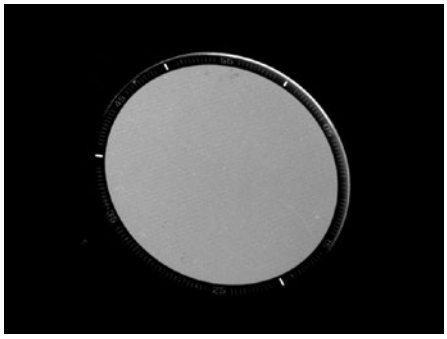
2D surface inspection applications:



Defect detection of painted components

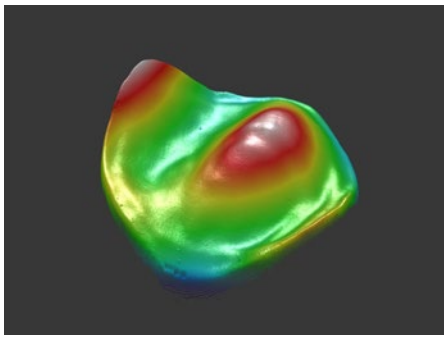


Detection of glass pattern

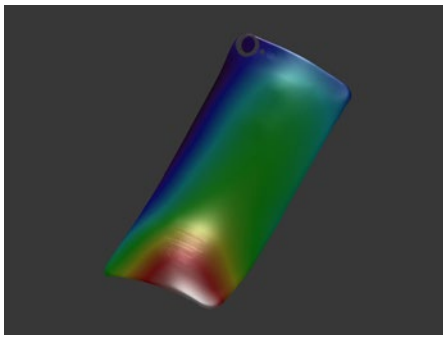


Defect detection on transparent measuring objects

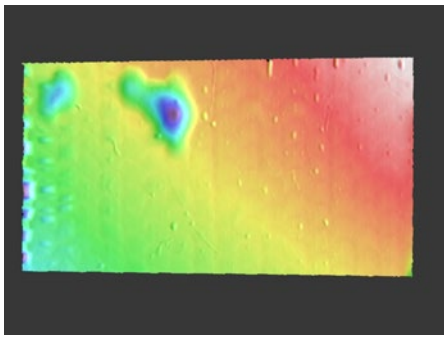
Applications: 3D geometry measurement



Flatness determination of wafers/mirrors/lenses



Shape and dimensional accuracy of smartphone

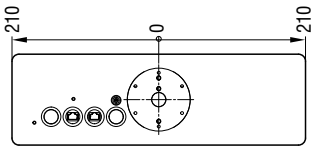


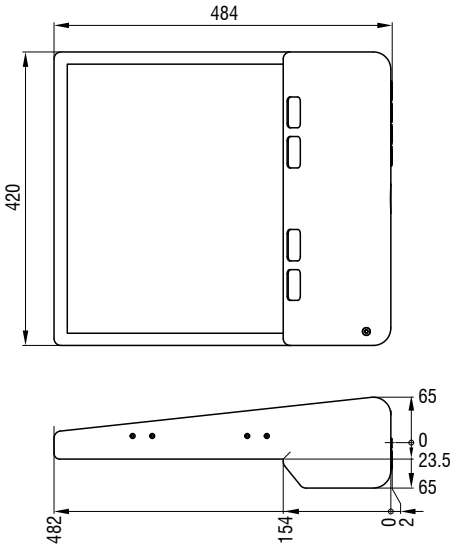
Measuring recesses or elevations

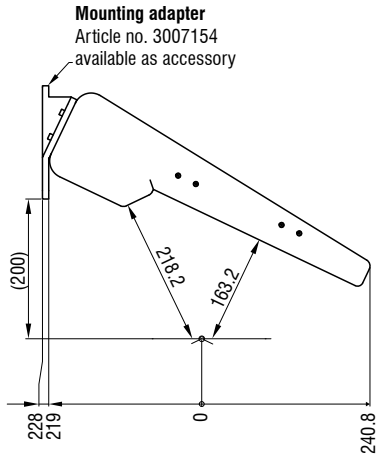
Model		RCS130-160 3D HLP	RCS110-245 2D
Measurement area Length x width (x * y) [1]	in reference plane	170 mm x 160 mm at 200 mm	116 mm x 245 mm
Acquisition of measurement data		approx. 1 s … 2 s	approx. 0.6 s … 2.7 s
Evaluation		approx. 2 s … 3 s	approx. 0.5 s … 2.4 s
Resolution	x, y	100 µm	70 µm
Flatness deviation	z [2]	0.3 µm	-
Supply voltage		24 V DC (must not exceed 26 V)	
Power consumption		< 50 W	
Interfaces and connections		1 x GigE Vision (RJ45), 1 x Ethernet (RJ45), power supply (3-pin Lemo connector)	
Installation		mechanically reproducible adapter flange	
Temperature range	Storage	-10 … +60 °C	
	Operation [2]	0 … +40 °C	
Humidity [2]		10 … 80 %, non-condensing	
Design		carbon housing with controlled fan, design with integrated controller	
Weight		< 7 kg	

[1] Size specifications refer to the reference plane.

[2] Measured after referencing with a plane mirror with ø 300 mm and a flatness of lambda/10.
After referencing, a maximum temperature fluctuation of ± 2 °C and change of humidity of ±2 % are to be complied with.







Industrial PC for GigE Vision Sensors
Industrial Performance Unit

- High-performance solution for 3D measurement tasks
- Full compatibility and inline capability for customer applications
- Intuitive 3DInspect software with Valid3D technology by Micro-Epsilon
- Efficient commissioning of Micro-Epsilon sensors
- Integrated interfaces: Modbus/TCP, EtherCAT, PROFINET, EtherNet/IP
- Industrial-grade hardware with passive cooling

The powerful solution for 3D measurement tasks

The Industrial Performance Unit is a powerful computing platform for the efficient commissioning of Micro-Epsilon sensors and systems, which offers full compatibility for inline processes in customer applications.

You can connect Micro-Epsilon 3D sensors to the Industrial Performance Unit via the GigE Vision standard. The intuitive 3DInspect software with Valid3D technology from Micro-Epsilon enables simple sensor parameter setting, which allows measurements to start immediately. The Industrial Performance Unit directly processes three-dimensional data, which is subsequently evaluated and assessed via the 3DInspect software. The integrated Modbus/TCP, EtherCAT, PROFINET and EtherNet/IP interfaces are available for outputting the results.

The flexible, industrial-grade hardware with passive cooling allows easy and space-saving installation. This makes integration in a control cabinet or directly in the machine very easy. You can easily connect accessories such as monitor, mouse and keyboard.

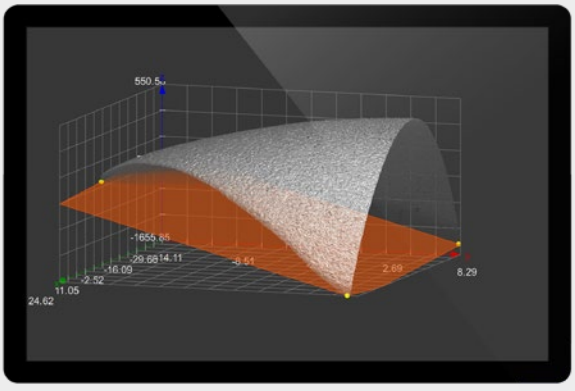
EtherCAT® Technology Group

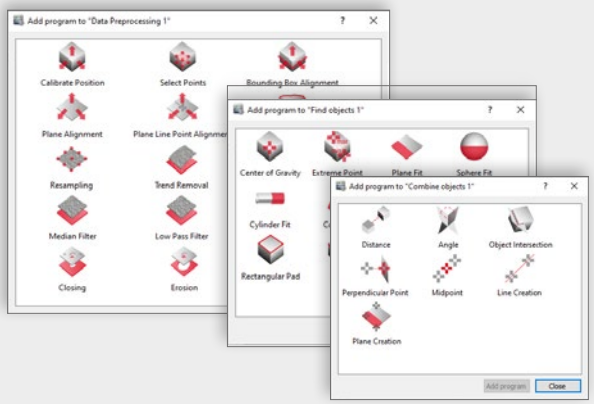
PROFINET®

EtherNet/IP

Modbus TCP

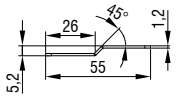
3DInspect: Powerful software for all Micro-Epsilon 3D sensors included in the scope of delivery

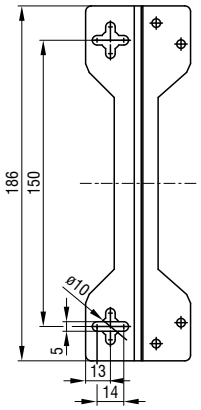




Model		Industrial Performance Unit
RAM		16 GB
Memory		128 GB SSD
Supply voltage		9 ... 36 V DC
Power consumption	typ.	50 W
	max.	112 W
Digital interfaces		Gigabit Ethernet (GigE Vision / GenICam) / PROFINET / EtherCAT / EtherNet/IP
Connection		4-pole supply terminal strip; 2x RJ45 for Gigabit Ethernet, 2x RJ45 for Industrial Ethernet (ProfiNET, EtherCAT or EtherNet/IP); 1x HDMI, 1x VGA, 4x USB3.2 (Gen1); 4x USB2.0
Installation		Mounting holes; accessories for table or wall mounting and DIN rail mounting
Temperature range	Storage	-40 … +85 °C
	Operation [1]	0 ... +50 °C
Shock (DIN EN 60068-2-27)		20 g / 11 ms half-sine
Vibration (DIN EN 60068-2-6)		3 g / 5 ... 500 Hz
Protection class (DIN EN 60529)		IP40
Material		Metal housing
Weight		2.8 kg
Control and indicator elements		2 LEDs for storage and power; 4 LEDs for status display of Ethernet 1 power on/off switch
Special features		Windows 10 IoT Enterprise

[1] Max. permissible operating temperature with 0.7 m/s air blow

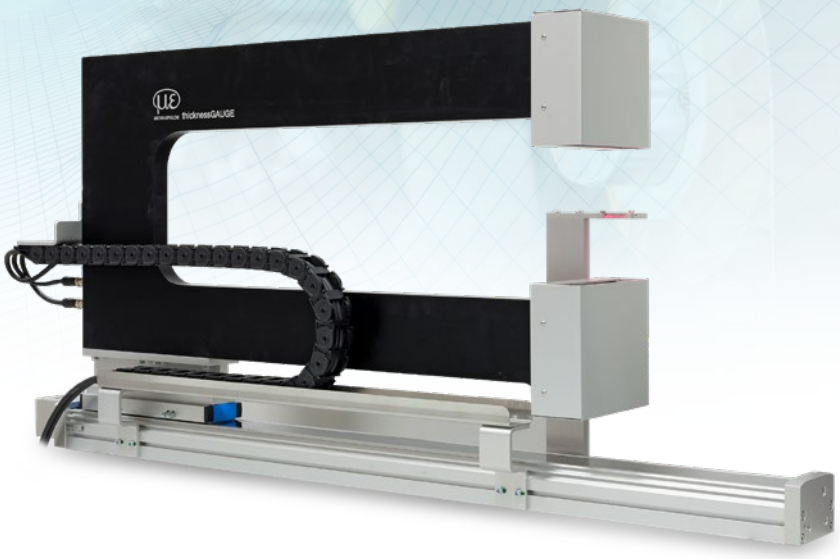




Two mounting rails for table and wall mounting are included in delivery

Sensor system for precise inline thickness and profile measurements
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



Inline thickness and profile measurements
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.

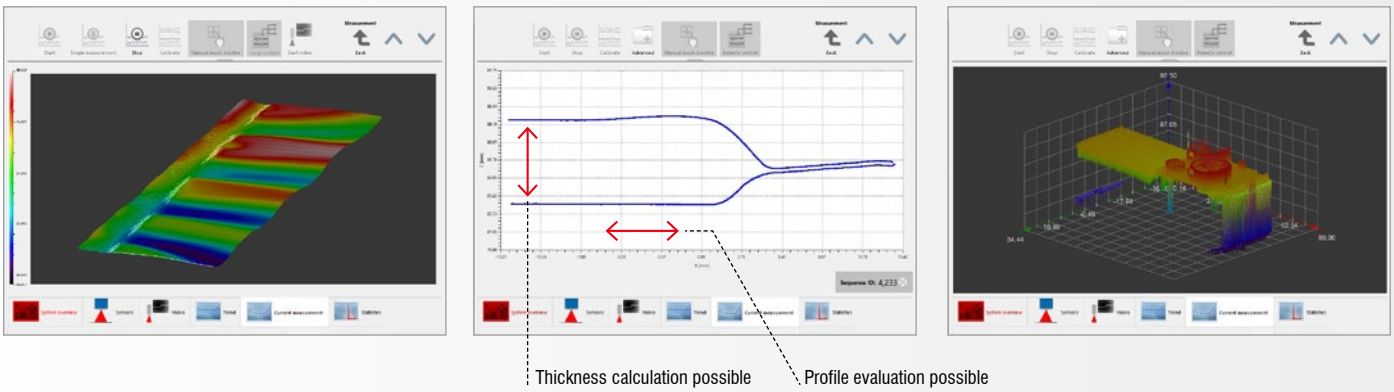
The specific evaluation is parameterized using the 3DInspect software, where the measurement programs and parameters are transferred to the thicknessCONTROL software and processed automatically.

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.

Automatic calibration and temperature compensation
thicknessGAUGE systems are equipped with in-situ calibration in order to compensate, e.g., for the effects of fluctuating temperatures. A linear axis moves the thicknessGAUGE to the parking position. The calibration cycles are individually adjustable. In addition to temperature compensation, in-situ calibration enables proper functioning of the system to be verified cyclically and at any time.

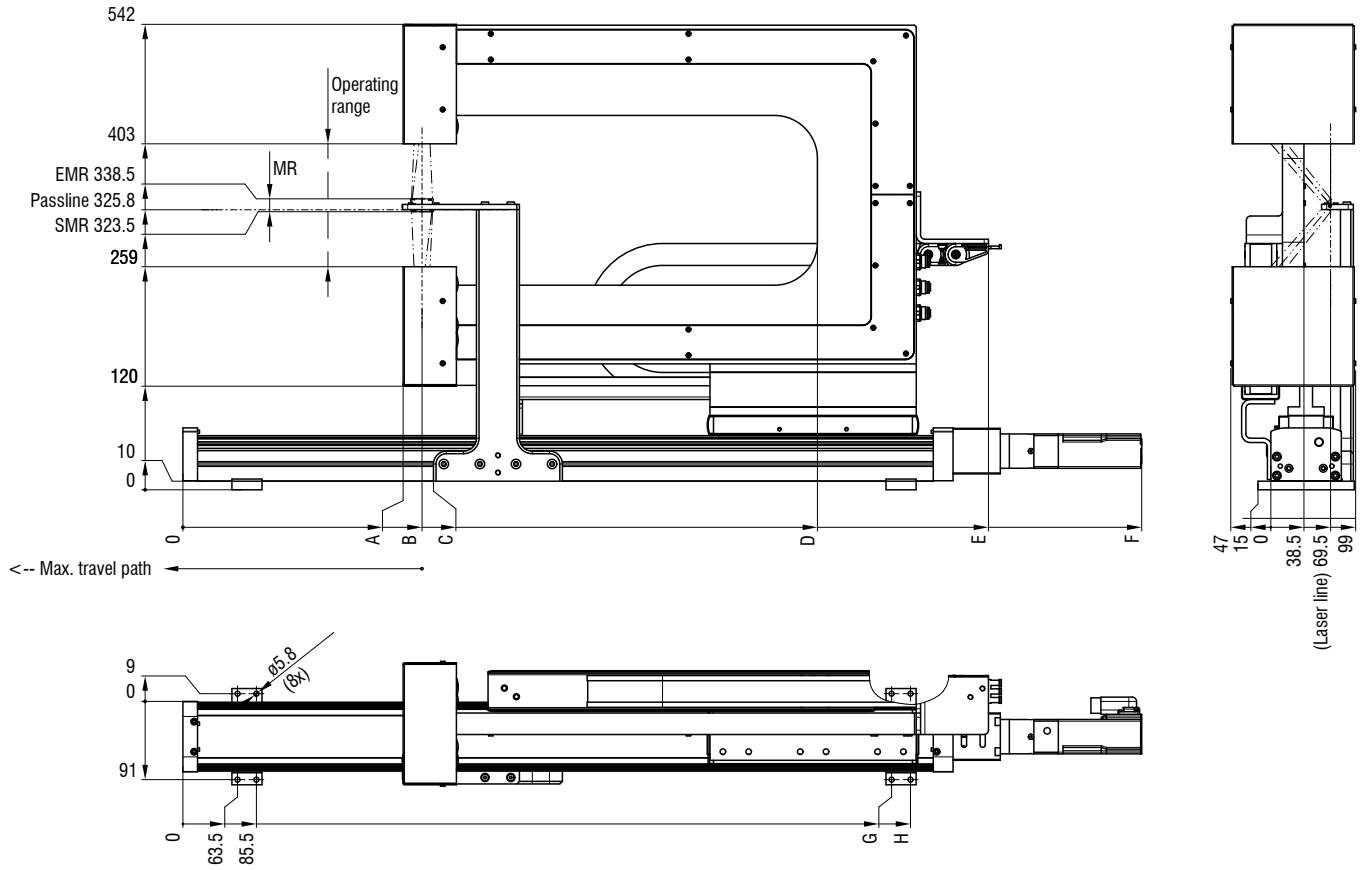
Fully automatic calibration enables reliable measurements

Thickness measurement and 3D profile evaluation



Model		C.LP-3D-15/200	C.LP-3D-15/400	C.LP-3D-15/600
Article number		4350127.730	4350127.731	4350127.732
Measuring width		200 mm	400 mm	600 mm
Operating range		144 mm		
Measuring range [1]	Z-axis (thickness)	15 mm		
	X-axis (3D measurement)	max. 26.8 mm		
Max. travel path [2]		380 mm	580 mm	780 mm
System accuracy [3]		±1.2 µm		
Resolution	Z-axis (thickness)	0.2 µm		
	X-axis (3D measurement) [4]	1,024 points/profile		
Measuring rate [1] [5]		500 Hz		
Calibration		Automatic		
Weight	Axis, motor and C-frame	17.6 kg	22.3 kg	26.8 kg
	Bus terminal box and panel IPC	14.1 kg		
Supply voltage		24 V		
Humidity		5 % RH ... 95 % RH (non-condensing)		
Protection class (DIN EN 60529)		IP40 (bus terminal box IP54)		
Temperature range	Storage	-20 ... 65 °C		
	Operation	5 ... 45 °C		
Control and indicator elements		Panel IPC with software included in the scope of supply		
Special features		Compact bus terminal box measuring just 300 x 300 x 210 mm		

[1] Depending on the measurement task
[2] Other lengths on request
[3] 2 sigma; data valid for diffusely reflecting, metallic measuring standard (DAkkS certified)
[4] 1,024 points/profile (standard); 2,048 points/profile on request
[5] 500 Hz (standard); up to 2000 Hz on request



Model	A	B	C	D	E	F	G	H
C.LP-3D-15/200	271	293.2	307	563	737	916	624.5	646.5
C.LP-3D-15/400	256	278	292	738	937	1115	824.5	846.5
C.LP-3D-15/600	224	245.5	259	916	1140	1316	1024.5	1046.5

MR = Measuring range
SMR = Start of measuring range
EMR = End of measuring range
Dimensions in mm, not to scale.

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

Modifications reserved / Y9761639-D012094LDI

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