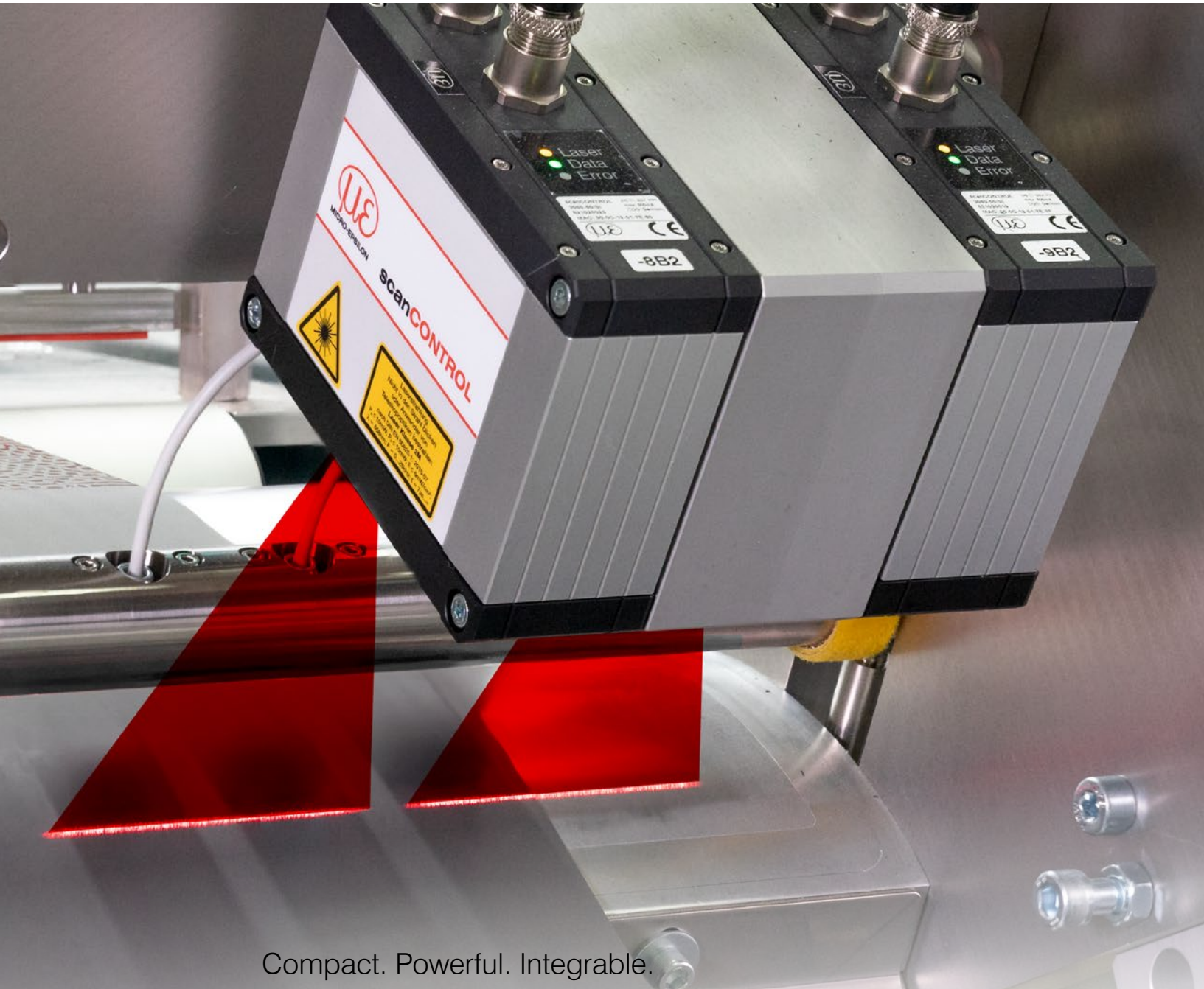
MICRO-EPSILON

More Precision

scanCONTROL // 2D/3D Laser profile sensors



Compact. Powerful. Integrable.

Laser profile scanners from Micro-Epsilon are among the highest performing profile sensors with respect to accuracy and measuring rate. Equipped with powerful processors and highly sensitive optical components, these scanners ensure precise profile measurements on almost any type of surface.

The variety of measurement areas allows, on the one hand, both the acquisition of smallest details and structures, and, on the other hand, the measurement of large objects with a large offset distance.

While they can be integrated in numerous environments, the laser scanners also impress with their compact design which includes an integrated controller.

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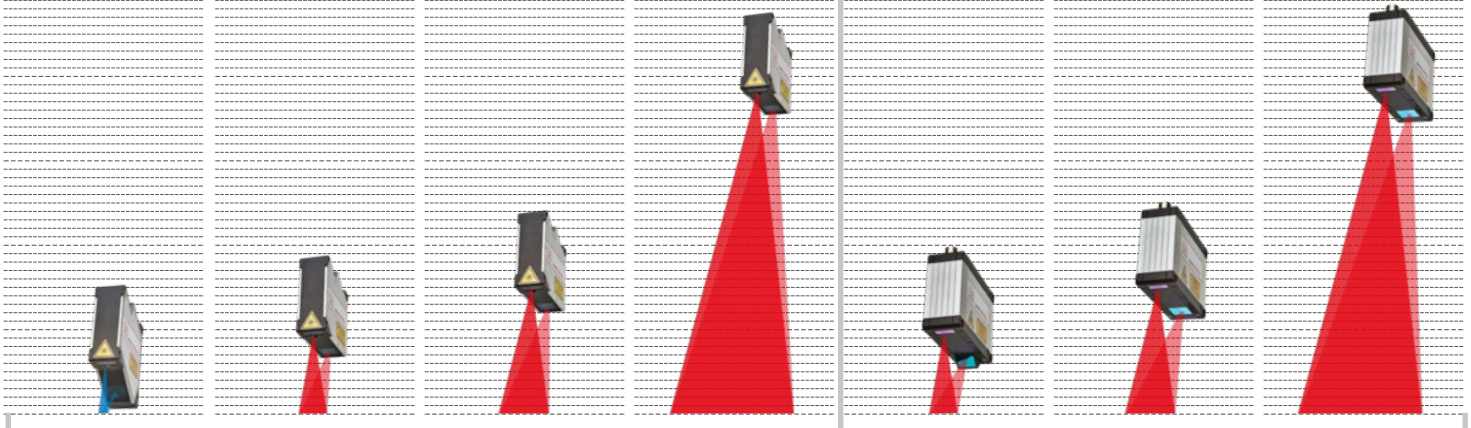
Measurement areas
scanCONTROL

LLT29xx-10 BL	LLT2xxx-25	LLT2xxx-50	LLT2xxx-100	LLT30xx-25	LLT30xx-50	LLT30xx-100
	Red Laser	Red Laser	Red Laser	Red Laser	Red Laser	Red Laser
Blue Laser	Blue Laser	Blue Laser	Blue Laser	Blue Laser	Blue Laser	Blue Laser
Measurement area 10 x 8 mm	Measurement area 25 x 25 mm	Measurement area 50 x 60 mm	Measurement area 100 x 265 mm	Measurement area 25 x 15 mm	Measurement area 50 x 40 mm	Measurement area 100 x 170 mm



Resolution x-axis
640 / 1,280 points

Max. profile frequency
2,000 Hz

SMART PROFILE

Resolution x-axis
1,024 / 2,048 points

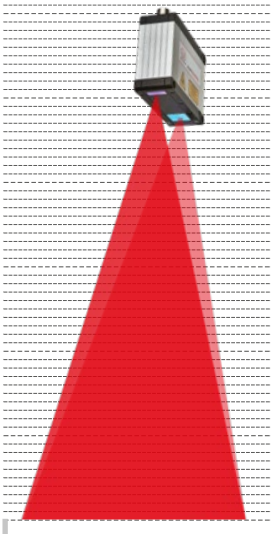
Max. profile frequency
10,000 Hz

SMART PROFILE 3DInspect

LLT30xx-200

Red Laser

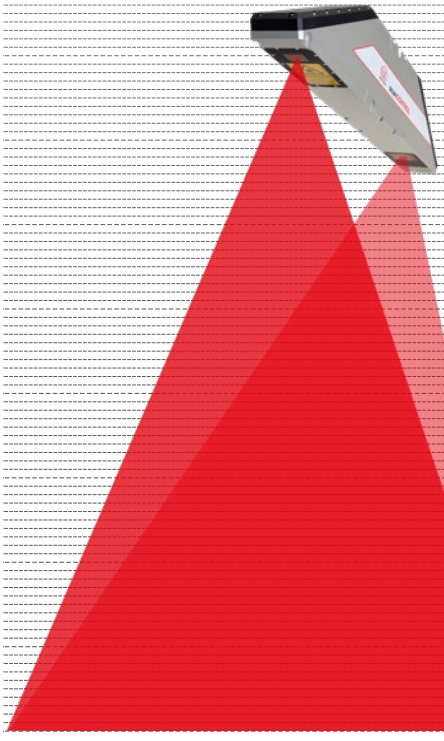
Measurement area
200 x 300 mm



LLT30xx-430

Red Laser

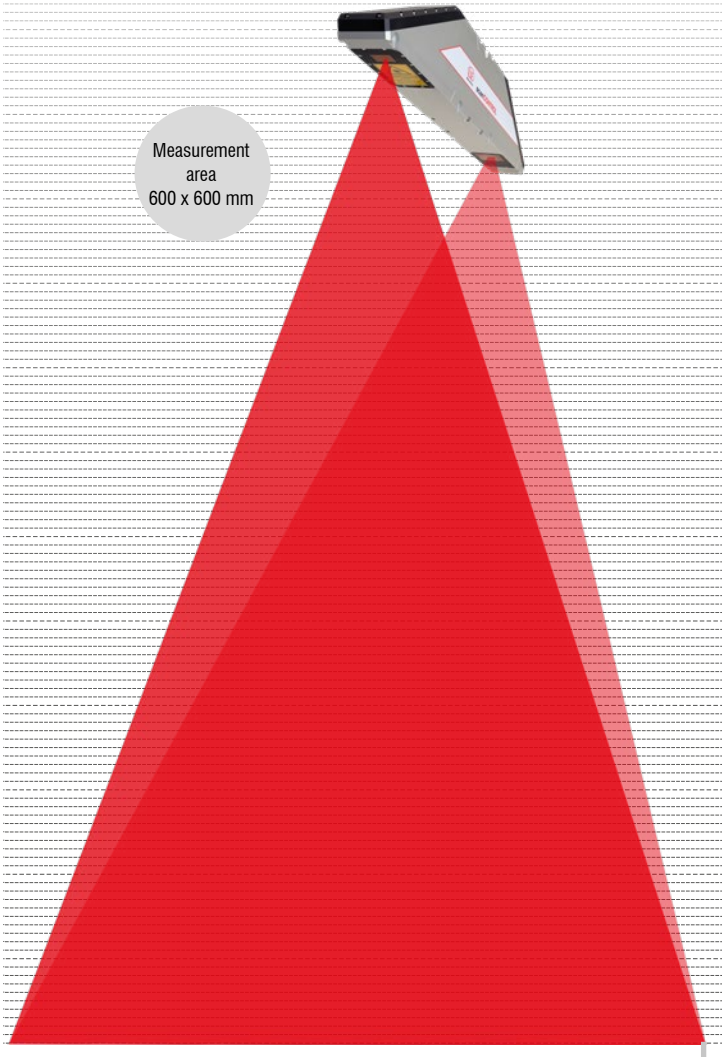
Measurement area
430 x 390 mm



LLT30xx-600

Red Laser

Measurement area
600 x 600 mm

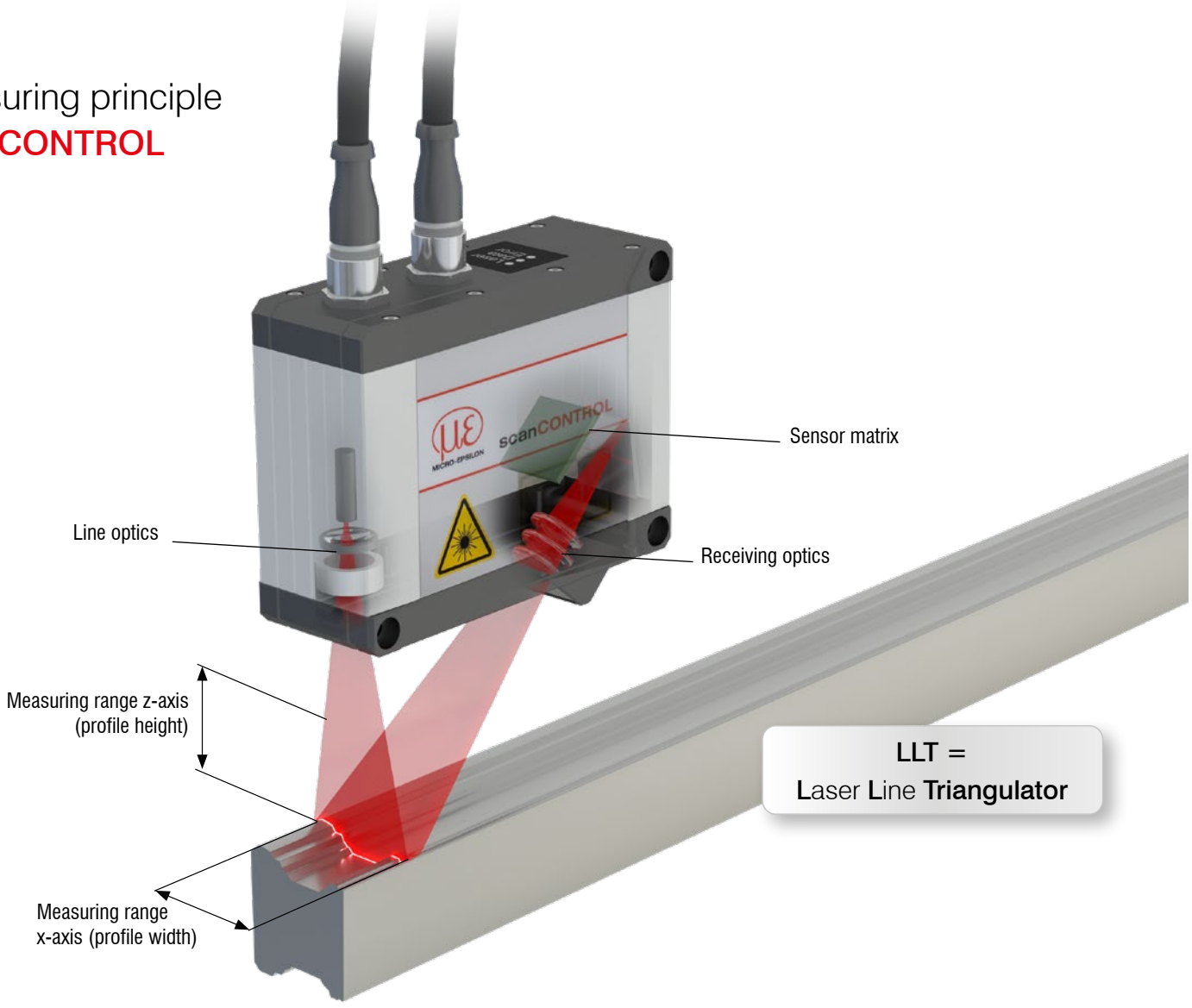


Resolution x-axis
1,024 / 2,048 points

Max. profile frequency
10,000 Hz

SMART PROFILE 3DInspect

Measuring principle
scanCONTROL



Laser line triangulation

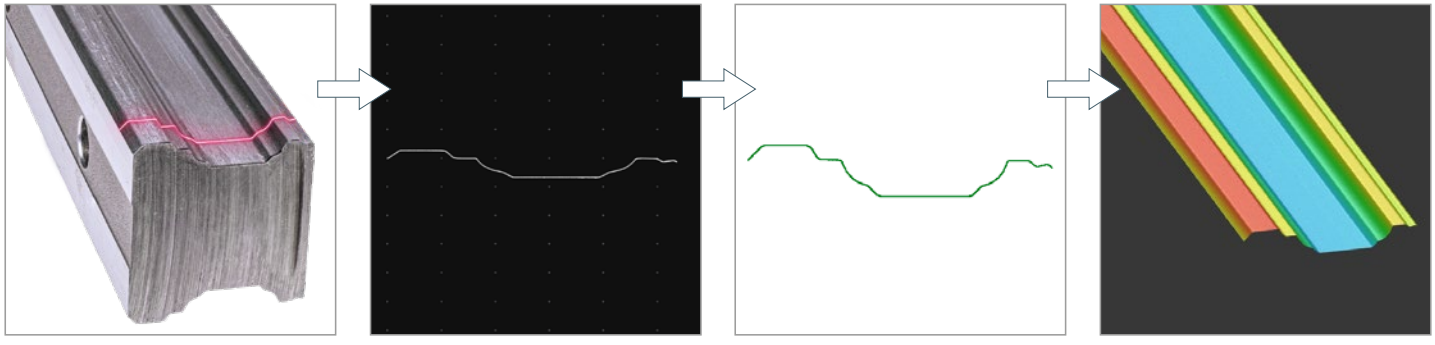
Laser scanners – often referred to as profile sensors – use the laser triangulation principle for two-dimensional profile detection on different target surfaces.

Highly sensitive lens systems

By using highly-sensitive special lenses, a laser beam is enlarged to form a static laser line and is projected onto the target surface. The receiving optics projects the diffusely reflected light of this laser line onto a highly sensitive sensor matrix.

Performance controller

In addition to distance information (z-axis), the controller also uses this camera image to calculate the position along the laser line (x-axis). These measured values are subsequently output in a two-dimensional coordinate system that is fixed with respect to the sensor. In the case of moving objects or a traversing sensor, it is therefore possible to obtain 3D measurement values.



Laser line
Projecting a laser line onto the target surface

Sensor matrix (pixels)
Diffuse reflected light of the laser line is registered by a high quality sensor matrix

Calibrated x/z-measuring points
Calculation of the distance coordinate z and the actual position x along the laser line for each measuring point

3D measurement values

Software features
scanCONTROL

SMART

Integrated evaluation

Profile evaluation directly in the sensor head

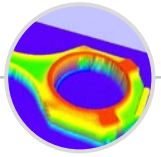
The SMART models provide selected measurement values. The measuring programs are parameterized on the PC and saved directly in the sensor controller. Therefore, no external controller is required.

scanCONTROL Configuration Tools

Software solution for complex 2D measurement tasks

- Measuring programs featuring 94 evaluation variants
- Parameter set freely selectable from over 30 measuring programs
- Inclination correction for obliquely detected profiles
- Easy alignment and adjustment of sensor
- Logical operations for digital outputs
- Configuration of the measurement value transfer and the outputs

PROFILE



Evaluation by customer

Output of high precision 2D profiles and 3D point clouds

The PROFILE models provide calibrated profile data that can be further processed on a PC. These can be used for 2D and 3D measurement tasks.

3DInspect

High-performance software for 3D measurement tasks

- Powerful tool for sensor parameter set up and industrial measurement tasks
- Intuitive user interface
- Real 3D evaluation
- Object extraction in 3D

Software integration SDKs

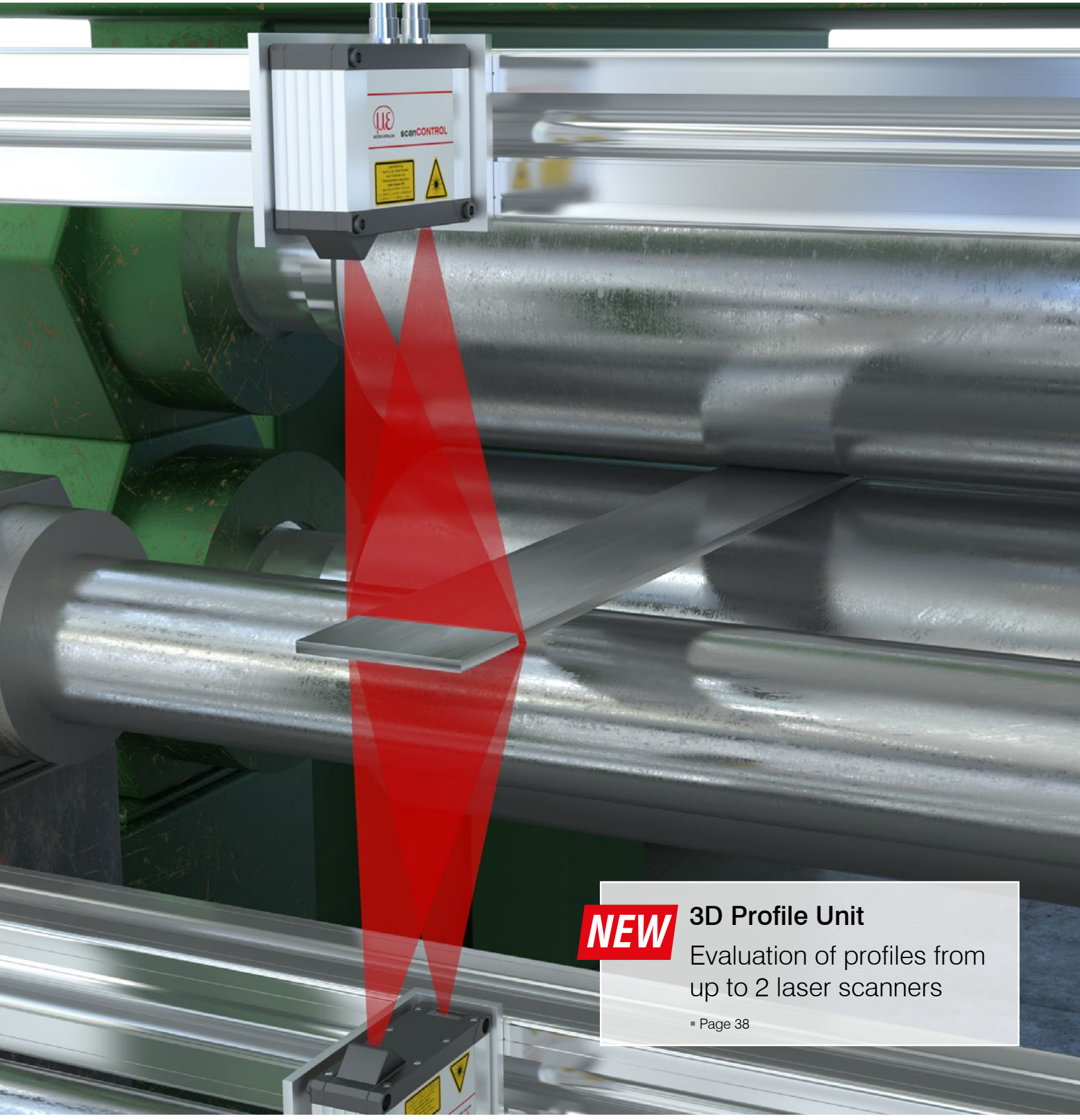
- Powerful SDKs (LLT.DLL) support developers in integrating scanCONTROL sensors into their own environments

COGNEX® VisionPro

Linux LabVIEW C/C++ python

Online tutorials for software features

micro-epsilon.com/service/tutorials/



NEW

3D Profile Unit

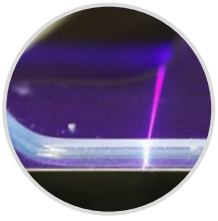
Evaluation of profiles from up to 2 laser scanners

▪ Page 38

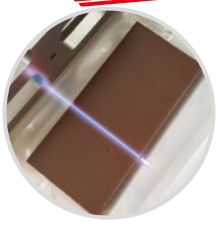
EtherCAT® EtherNet/IP PROFINET® Modbus UDP

PATENTED

Red-hot glowing objects



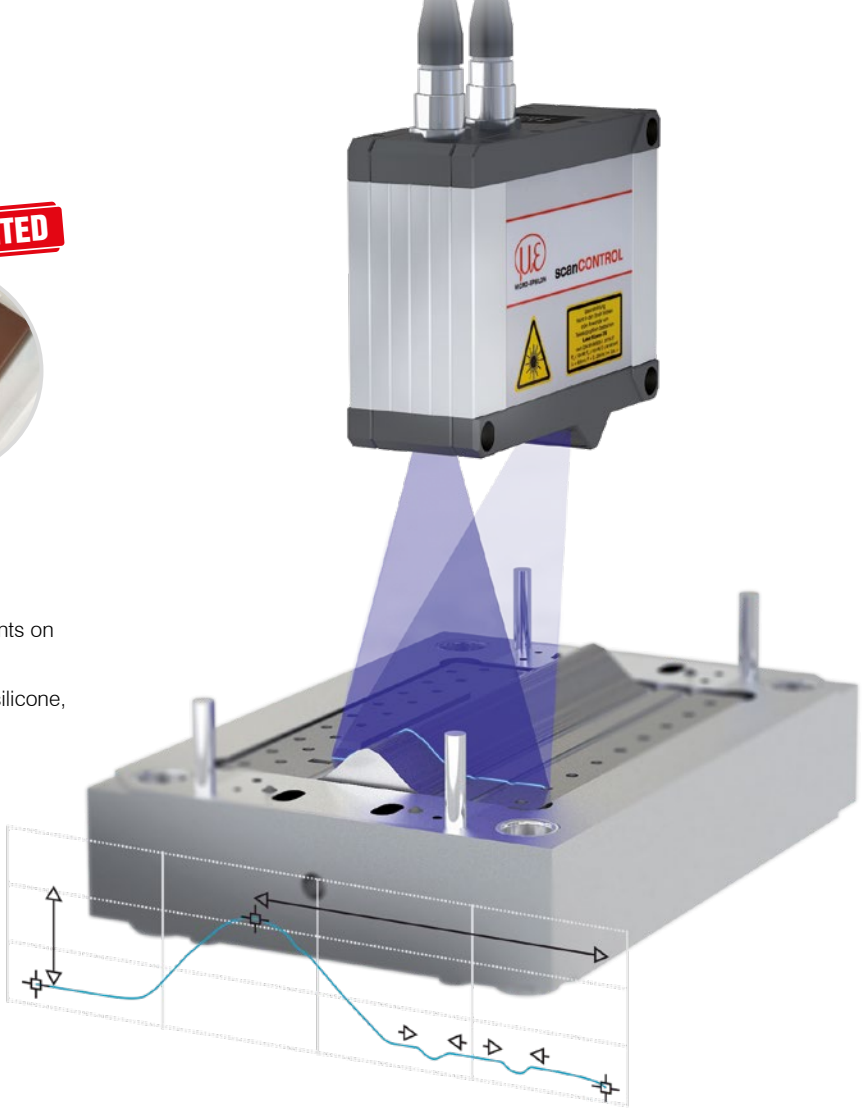
Transparent surfaces



Organic materials

Patented Blue Laser Technology

- Internationally patented measuring method for precise measurements on red-hot glowing objects above 700 °C
- Reliable for transparent objects such as plastic, glass, adhesives, silicone, paints, coatings
- Stable measurements on organic objects



Universal Application

- Comprehensive scanner portfolio for transmission of profiles or measured values in industrial measurement tasks
- 2D inline measurement of different parameters such as gap, step, radius, circle
- 3D data and images for image processing

Ideal for Robots & Multi-Sensor Applications

- Ideal for integration in robot applications
- Evaluation of up to 8 scanners by the 3D Profile Unit
- Low weight, no external controller

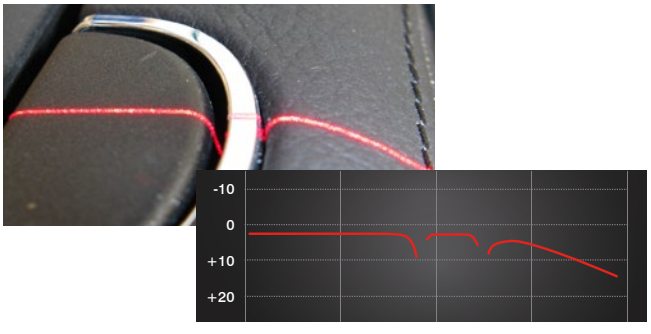
Space-Saving Lateral Cable Outlet

- Reduces the installation height by 47%
- "Rear-tail" version available for all scanCONTROL 3002 and 3000 models (up to 200 mm measuring range)

Real Time Surface Compensation

Dynamic adaption to rapidly changing surfaces

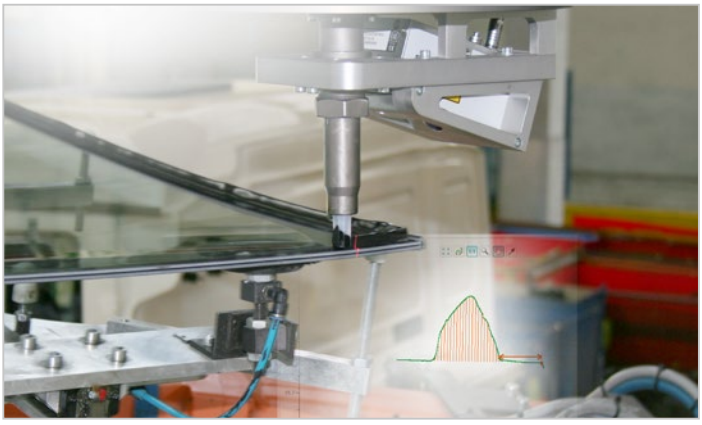
- Real-time detection of reflective surfaces
- Enables stable measurement results
- scanCONTROL 3000 series with additional HDR function



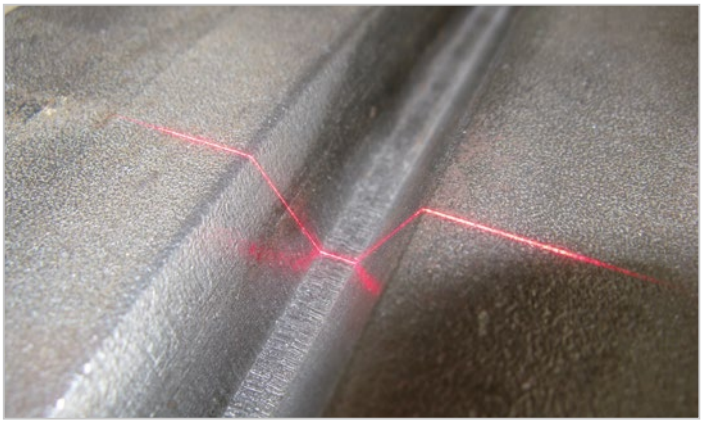
Application examples
scanCONTROL

scanCONTROL Red Laser

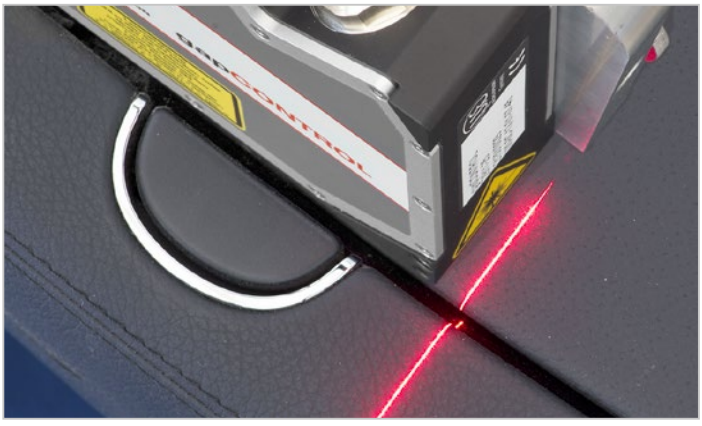
Red laser scanners are ideally suited to numerous measurement tasks. A higher light intensity and better performance on weakly reflective or matt surfaces, especially with fast moving objects, make the red laser scanners ideal for common measurement tasks.



Inspection of the adhesive beading



V-seam measurement on pipes



Distance measurement at the center console

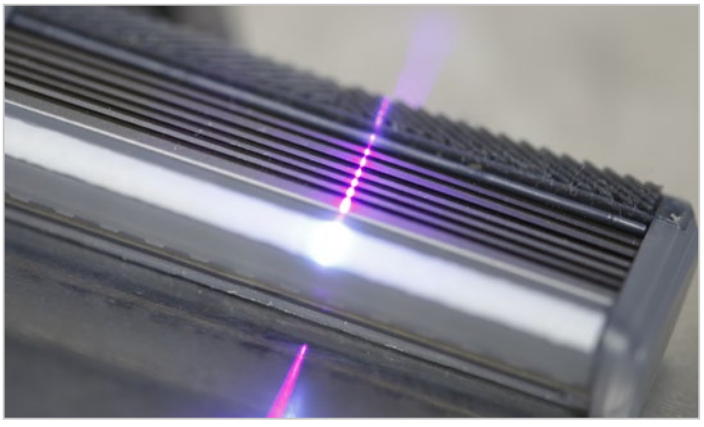
Gap measurement on car bodies

Tire control

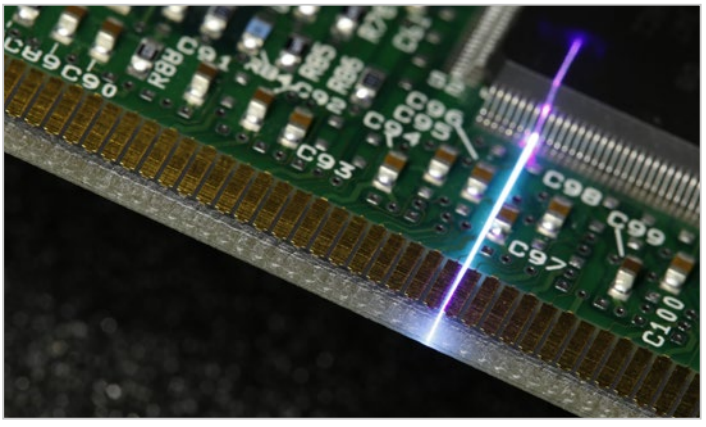
Text recognition on the cast part

scanCONTROL BL Blue Laser

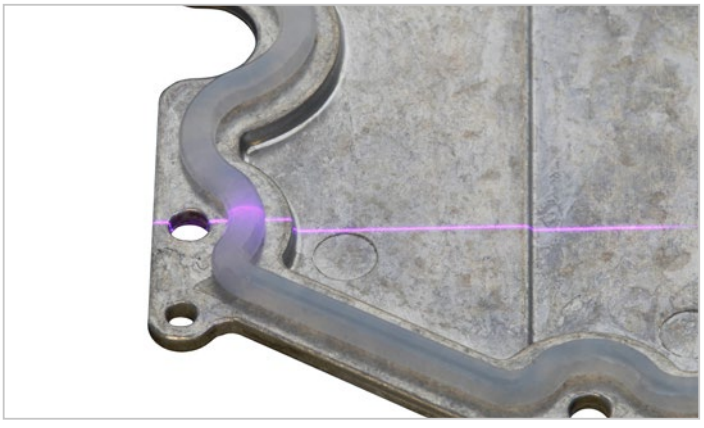
For profile measurements on red-hot glowing metals as well as transparent and organic surfaces, laser scanners with blue laser line are recommended. While allowing higher stability, the blue laser light does not penetrate the measuring object due to the shorter wavelength of the blue-violet laser. This allows incandescent, organic and (semi-)transparent objects to be measured more reliably compared to the red laser.



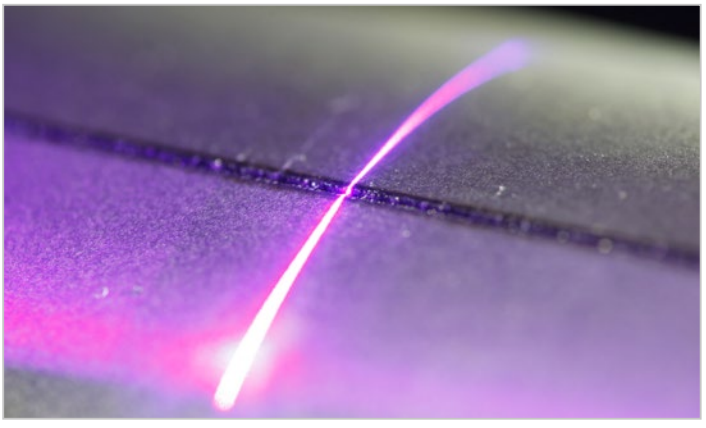
Razor blade angle



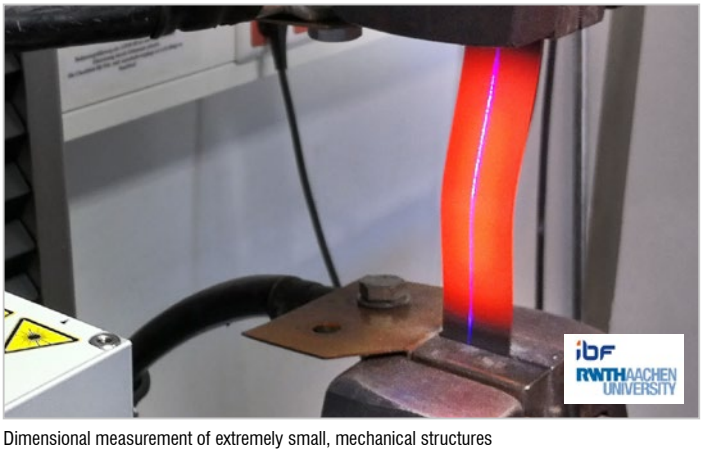
Position of electronic components



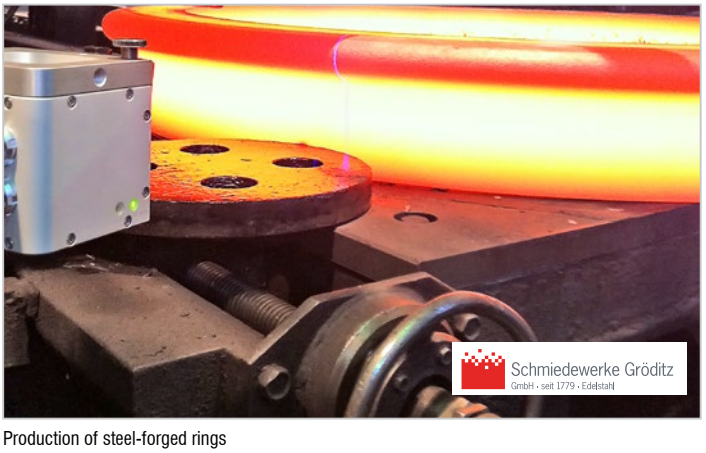
Inspection of silicone beads



Completeness of laser welding seams



Dimensional measurement of extremely small, mechanical structures



Production of steel-forged rings

Laser scanner for industrial series applications
scanCONTROL 25x0

- Ideal for industrial series applications in production line & automation
- Resolution x-axis: 640 points
- High signal stability
- Also available with patented Blue Laser Technology
- Numerous references worldwide
- Compatible with COGNEX® VisionPro

SMART
PROFILE

Ideal for series applications

scanCONTROL 25x0 laser scanners are designed for industrial measurement tasks. Thanks to their high signal stability, versatility and excellent price-performance ratio, the scanners are particularly suitable for measurement tasks involving large quantities. They measure and evaluate, e.g., angles, steps, gaps, distances and extreme values. Due to their compact design and low weight, these scanners are also suitable for applications with high accelerations, such as on robots.

Available as PROFILE and SMART versions

The scanCONTROL 25x0 series is available as PROFILE and SMART versions. As PROFILE scanners, they provide calibrated profile data that can be further processed on a PC using software provided by the customer. The SMART scanners work independently and provide selected measurement values. All sensor parameters and the desired measurement programs are set in the scanCONTROL Configuration Tools software and saved directly in the internal controller.

Ideal for production and machine monitoring

The scanCONTROL 25x0 series scanners are available in three different measuring ranges with a red or blue laser. Optional accessories, cable types and interface modules allow a wide range of applications in the production line and in machine building.

Article designation

LLT	25	00	-25	/PT

Options - see below

Measuring range
25 mm
50 mm
100 mm

Class
00=PROFILE
10=SMART

Series
LLT25x0

Laser options*

/SI	Hardware switch-off of the laser line
/3B	Increased laser power (class 3B, ≤ 20 mW), e.g., for dark surfaces
/BL	Blue laser line (405 nm) for (semi-) transparent, red-hot glowing and organic materials

Cable outlet options*

/PT	Cable directly out of the sensor ("Pigtail") Length 0.3 m

*Options can be combined

Accessories from page 39

Model		LLT25xx-25	LLT25xx-50	LLT25xx-100
Measuring range (z-axis)	Start of measuring range	53.5 mm	70 mm	190 mm
	Mid of measuring range	66 mm	95 mm	240 mm
	End of measuring range	78.5 mm	120 mm	290 mm
	Height of measuring range	25 mm	50 mm	100 mm
Extended measuring range (z-axis)	Start of measuring range	53 mm	65 mm	125 mm
	End of measuring range	79 mm	125 mm	390 mm
Line linearity (z-axis) [1] [2]		2 µm	4 µm	12 µm
		± 0.008 %	± 0.008 %	± 0.012 %
Measuring range (x-axis)	Start of measuring range	23.4 mm	42 mm	83.1 mm
	Mid of measuring range	25 mm	50 mm	100 mm
	End of measuring range	29.1 mm	58 mm	120.8 mm
Extended measuring range (x-axis)	Start of measuring range	23.2 mm	40 mm	58.5 mm
	End of measuring range	29.3 mm	60 mm	143.5 mm
Resolution (x-axis)		640 points/profile		
Profile frequency		up to 2,000 Hz		
Interfaces	Ethernet GigE Vision	Output of measurement values Sensor control Profile data transmission		
	Digital inputs	Mode switching Encoder (counter) Trigger		
	RS422 (half-duplex) [3]	Output of measurement values Sensor control Trigger Synchronization		
Output of measurement values [4] [5]		Ethernet (UDP / Modbus TCP); RS422 (ASCII / Modbus RTU) Analog; switch signal PROFINET; EtherCAT; EtherNet/IP		
Control and indicator elements		3x color LEDs for laser, data and error		
Light source	Red Laser	≤ 8 mW		
		Standard: laser class 2M, semiconductor laser 658 nm		
		≤ 20 mW		
		Option: laser class 3B, semiconductor laser 658 nm		
	Blue laser	≤ 8 mW		
		Standard: laser class 2M, semiconductor laser 405 nm		
Laser switch-off		via software, hardware switch-off with /SI option		
Aperture angle of laser line		20 °	25 °	25 °
Permissible ambient light	(fluorescent light) [1]	10,000 lx		
Protection class (DIN EN 60529)		IP65 (when connected)		
Vibration (DIN EN 60068-2-27)		2g / 20 ... 500 Hz		
Shock (DIN EN 60068-2-6)		15g / 6 ms		
Temperature range	Storage	-20 ... +70 °C		
	Operation	0 ... +45 °C		
Weight		380 g (without cable)		
Supply voltage		11 … 30 VDC, nominal value 24 V, 500 mA, IEEE 802.3af class 2, Power over Ethernet (PoE)		

[1] Based on the measuring range; measuring object: Micro-Epsilon standard object
[2] According to a one-time averaging across the measuring field (640 points)
[3] RS422 interface, programmable either as serial interface or as input for triggering/synchronization
[4] Analog | switching signal: Only in conjunction with 2D/3D output unit
[5] PROFINET | EtherCAT | EtherNet/IP: Only in conjunction with 2D/3D gateway

Compact laser scanner with high precision
scanCONTROL 29x0

- Ideal for precise 2D/3D measurements
- Resolution x-axis: 1,280 points
- High accuracy for the detection of finest details
- Profile frequency up to 2,000 Hz
- Also available with patented Blue Laser Technology
- Compatible with COGNEX® VisionPro

SMART

PROFILE

Compact design for precise measurements

scanCONTROL 29x0 laser scanners are designed for industrial measurement tasks where compact design and high accuracy are required. Thanks to their high resolution, versatility and excellent price-performance ratio, the scanners are particularly suitable for static and dynamic applications, e.g., on robots. They measure and evaluate, e.g., angles, steps, gaps, distances and extreme values.

Available as PROFILE and SMART versions

The scanCONTROL 29x0 series is available as PROFILE and SMART versions. As PROFILE scanners, they provide calibrated profile data that can be further processed on a PC using software provided by the customer. The SMART scanners work independently and provide selected measurement values. All sensor parameters and the desired measurement programs are set in the scanCONTROL Configuration Tools software and saved directly in the internal controller.

Short measuring range with high resolution

With a laser line of just 10 mm, the scanCONTROL 29x0-10/BL models recognize the finest of details and structures. The high profile resolution combined with the blue laser line allow for maximum precision in versatile applications, e.g., monitoring in electronics production.

Article designation

LLT	29	00	-25	/SI

Options - see below

Measuring range
10 mm (only Blue Laser)
25 mm
50 mm
100 mm

Class
00=PROFILE
10=SMART
50=HIGHSPEED
60=HIGHSPEED SMART

Series
LLT29x0

Laser options*

/SI	Hardware switch-off of the laser line
/3B	Increased laser power (class 3B, ≤ 20 mW), e.g., for dark surfaces
/BL	Blue laser line (405 nm) for (semi-) transparent, red-hot glowing and organic materials

Cable outlet options*

/PT	Cable directly out of the sensor ("Pigtail") Length 0.3 m
/VT	Cable directly out of the sensor ("Variable Tail") Length 0.1 ... 1.0 m (freely selectable)

*Options can be combined

Accessories from page 39

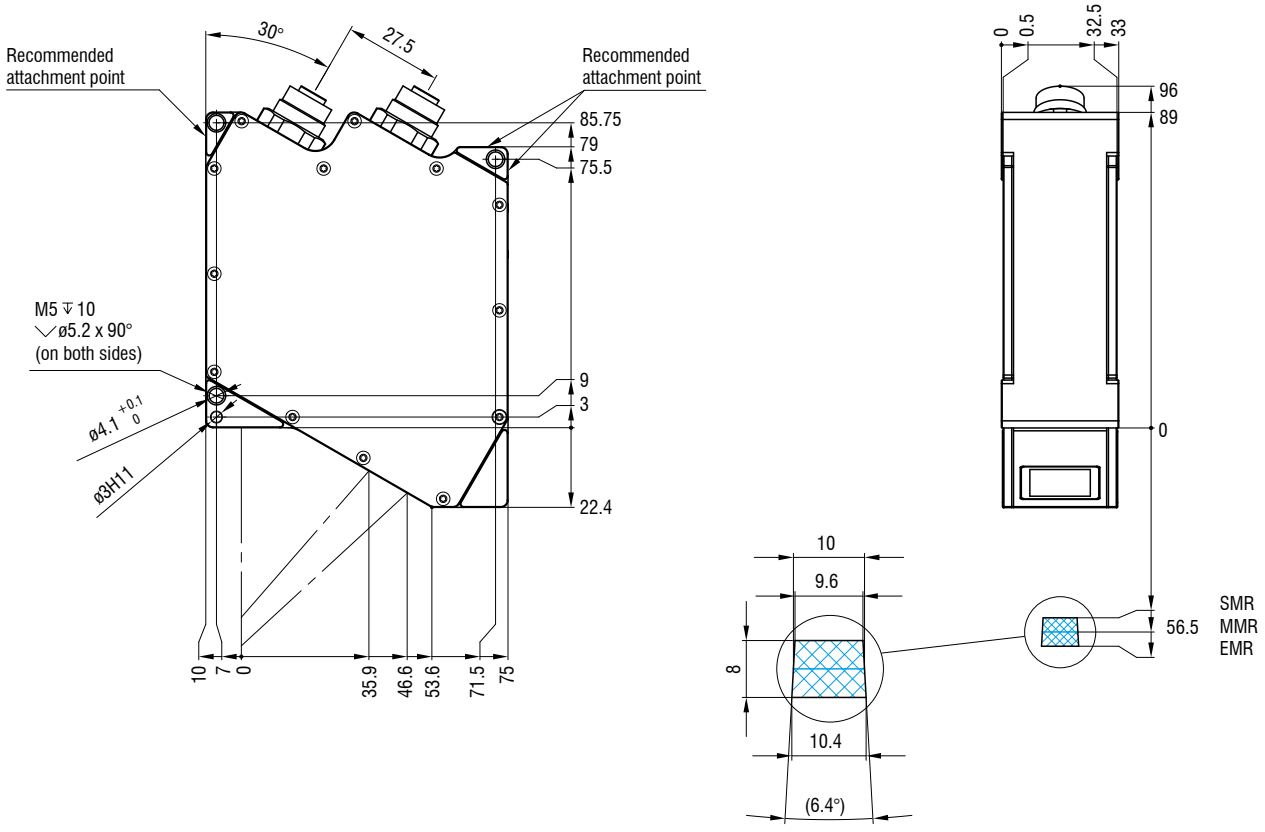
Model		LLT29xx-10/BL	LLT29xx-25	LLT29xx-50	LLT29xx-100
Measuring range (z-axis)	Start of measuring range	52.5 mm	53.5 mm	70 mm	190 mm
	Mid of measuring range	56.5 mm	66 mm	95 mm	240 mm
	End of measuring range	60.5 mm	78.5 mm	120 mm	290 mm
	Height of measuring range	8 mm	25 mm	50 mm	100 mm
Extended measuring range (z-axis)	Start of measuring range	-	53 mm	65 mm	125 mm
	End of measuring range	-	79 mm	125 mm	390 mm
Line linearity (z-axis) [1] [2]		1 µm	2 µm	4 µm	12 µm
		± 0.0125 %	± 0.008 %	± 0.008 %	± 0.012 %
Measuring range (x-axis)	Start of measuring range	9.4 mm	23.4 mm	42 mm	83.1 mm
	Mid of measuring range	10 mm	25 mm	50 mm	100 mm
	End of measuring range	10.7 mm	29.1 mm	58 mm	120.8 mm
Extended measuring range (x-axis)	Start of measuring range	-	23.2 mm	40 mm	58.5 mm
	End of measuring range	-	29.3 mm	60 mm	143.5 mm
Resolution (x-axis)		1,280 points/profile			
Profile frequency	Standard	up to 300 Hz			
	High speed	up to 2,000 Hz			
Interfaces	Ethernet GigE Vision	Output of measurement values Sensor control Profile data transmission			
	Digital inputs	Mode switching Encoder (counter) Trigger			
	RS422 (half-duplex) [3]	Output of measurement values Sensor control Trigger Synchronization			
Output of measurement values [4] [5]		Ethernet (UDP / Modbus TCP); RS422 (ASCII / Modbus RTU) Analog; switch signal PROFINET; EtherCAT; EtherNet/IP			
Control and indicator elements		3x color LEDs for laser, data and error			
Light source	Red Laser	-	≤ 8 mW		
		-	Standard: laser class 2M, semiconductor laser 658 nm		
		-	≤ 20 mW		
		-	Option: laser class 3B, semiconductor laser 658 nm		
	Blue laser	≤ 8 mW			
		Standard: laser class 2M, semiconductor laser 405 nm			
Laser switch-off		via software, hardware switch-off with /SI option			
Aperture angle of laser line		10 °	20 °	25 °	25 °
Permissible ambient light	(fluorescent light) [1]	10,000 lx			
Protection class (DIN EN 60529)		IP65 (when connected)			
Vibration (DIN EN 60068-2-27)		2g / 20 ... 500 Hz			
Shock (DIN EN 60068-2-6)		15g / 6 ms			
Temperature range	Storage	-20 ... +70 °C			
	Operation	0 ... +45 °C			
Weight		440 g (without cable)	380 g (without cable)		
Supply voltage		11 … 30 VDC, nominal value 24 V, 500 mA, IEEE 802.3af class 2, Power over Ethernet (PoE)			

[1] Based on the measuring range; measuring object: Micro-Epsilon standard object
[2] According to a one-time averaging across the measuring field (640 points)
[3] RS422 interface, programmable either as serial interface or as input for triggering/synchronization
[4] Analog | switching signal: Only in conjunction with 2D/3D output unit
[5] PROFINET | EtherCAT | EtherNet/IP: Only in conjunction with 2D/3D gateway

Dimensions and measuring ranges
scanCONTROL

LLT29x0-10/BL

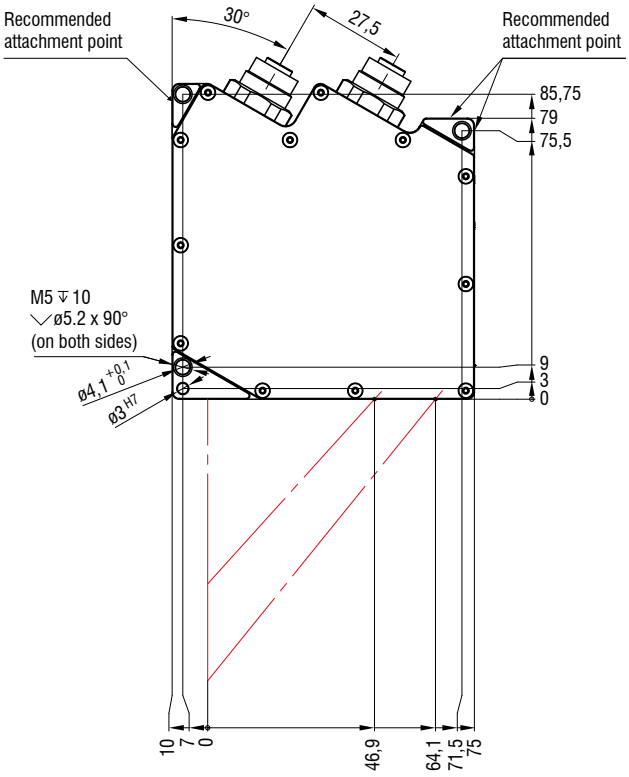
Blue Laser

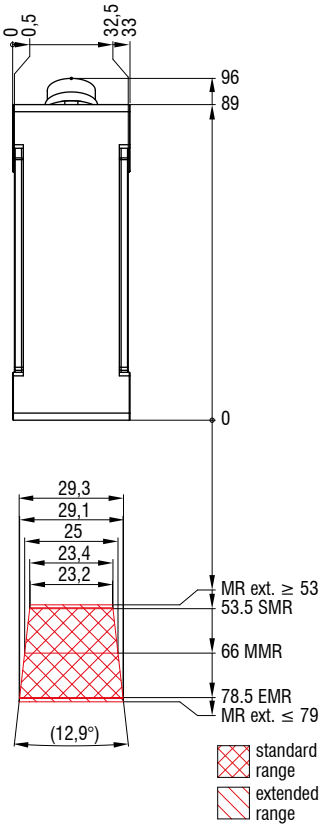


(dimensions in mm, not to scale)

LLT25x0-25 / LLT29x0-25

Red Laser Blue Laser



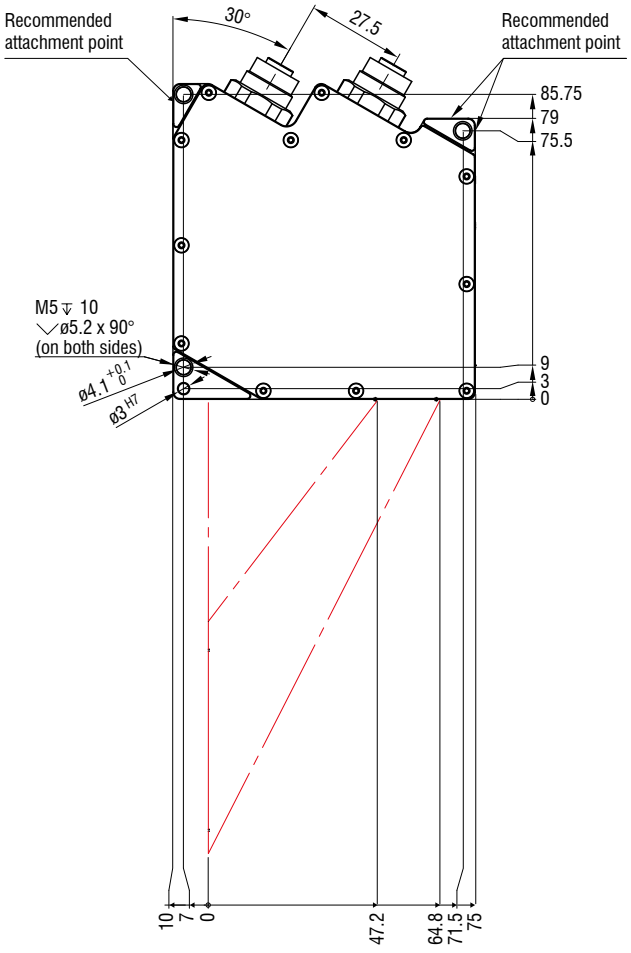


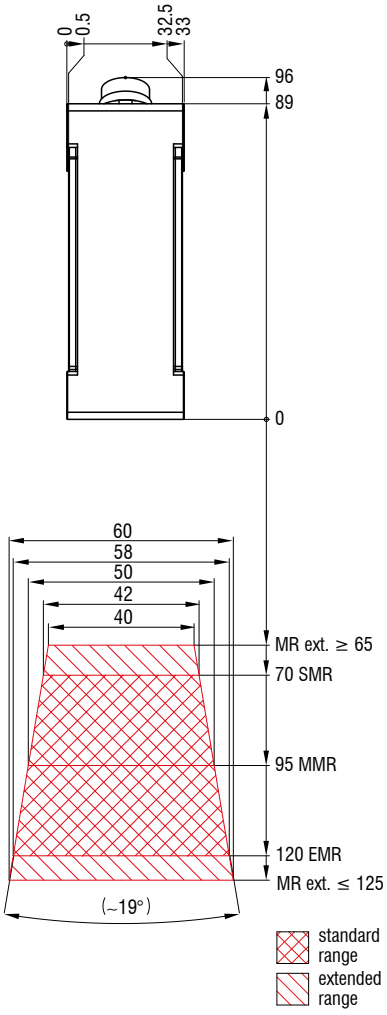
(dimensions in mm, not to scale)

Dimensions and measuring ranges
scanCONTROL

LLT25x0-50 / LLT29x0-50

Red Laser | Blue Laser

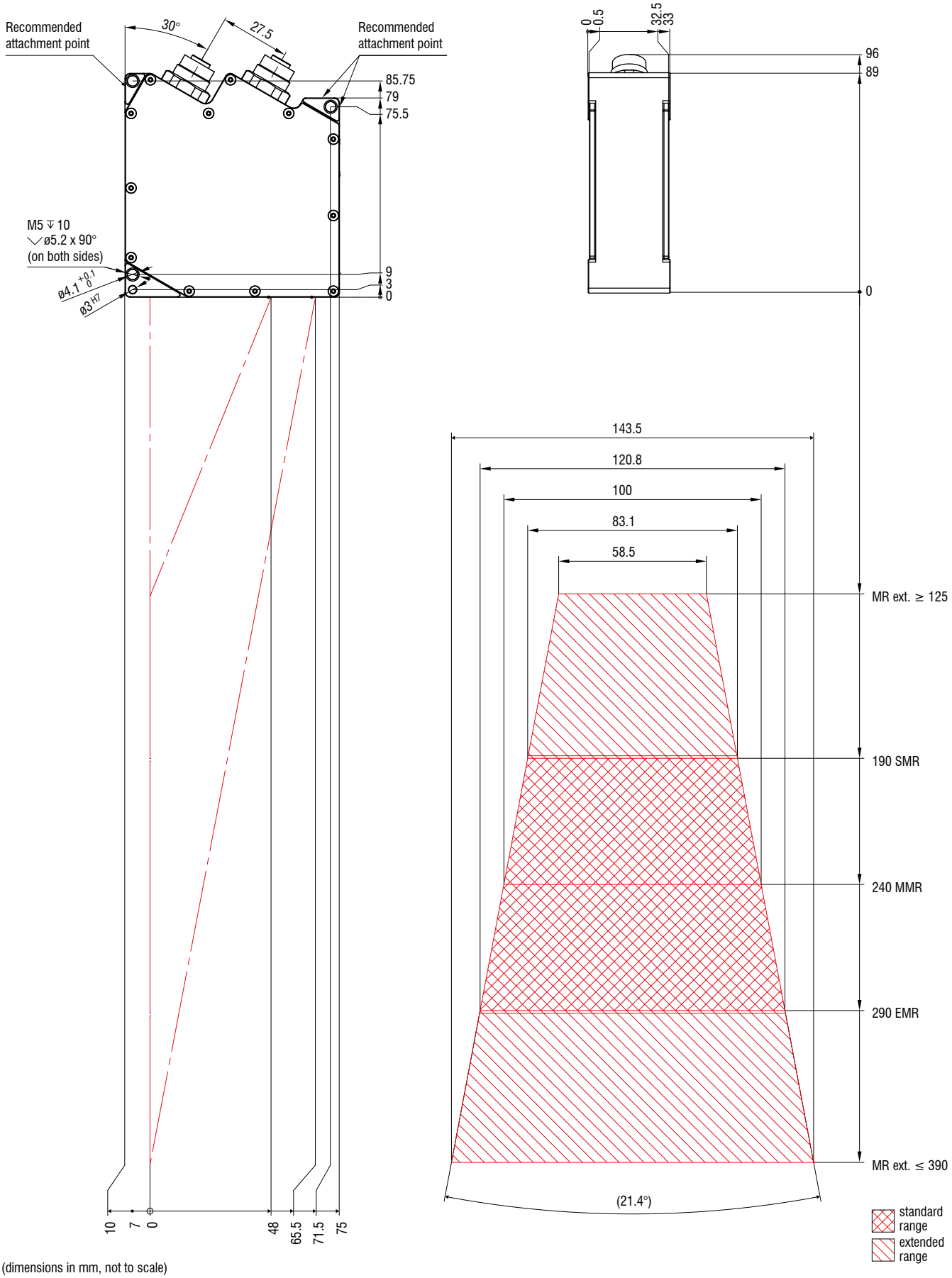




(dimensions in mm, not to scale)

LLT25x0-100 / LLT29x0-100

Red Laser | Blue Laser



(dimensions in mm, not to scale)

Powerful 2D/3D laser scanners
scanCONTROL 30x2

- Precise profile measurements for industrial measurement tasks
- Resolution x-axis: 1,024 points
- Profile frequency up to 10,000 Hz
- For small and large measurement areas
- Also available with patented Blue Laser Technology
- Compatible with COGNEX® VisionPro

Precise 2D/3D profile measurements

The new LLT30x2 laser profile scanners provide calibrated profile data with up to 7.9 million points per second. They allow profile frequencies up to 10 kHz and resolutions up to 1,024 points. Thanks to their high accuracy and versatility, the scanners are particularly suitable for static and dynamic applications as well as robotic applications. They measure and evaluate, e. g., angles, steps, gaps, distances, and circles.

Available as PROFILE and SMART versions

The scanCONTROL 30x2 series is available as PROFILE and SMART versions. PROFILE scanners provide calibrated profile data that can be further processed on a PC using software provided by the customer. With the 3DInspect software, the scanCONTROL sensors can also be used for 3D evaluations. SMART series scanners work independently and provide selected measurement values. The scanCONTROL 30x2 series supports all SMART functions and programs that are set in the scanCONTROL Configuration Tools software and directly stored in the internal controller.

Article designation

LLT	30	x2	-25	/SI

Options - see below

Measuring range
25 mm
50 mm
100 mm
200 mm
430 mm
600 mm

Class
02 = PROFILE
12 = SMART

Series
LLT30xx

Laser options*

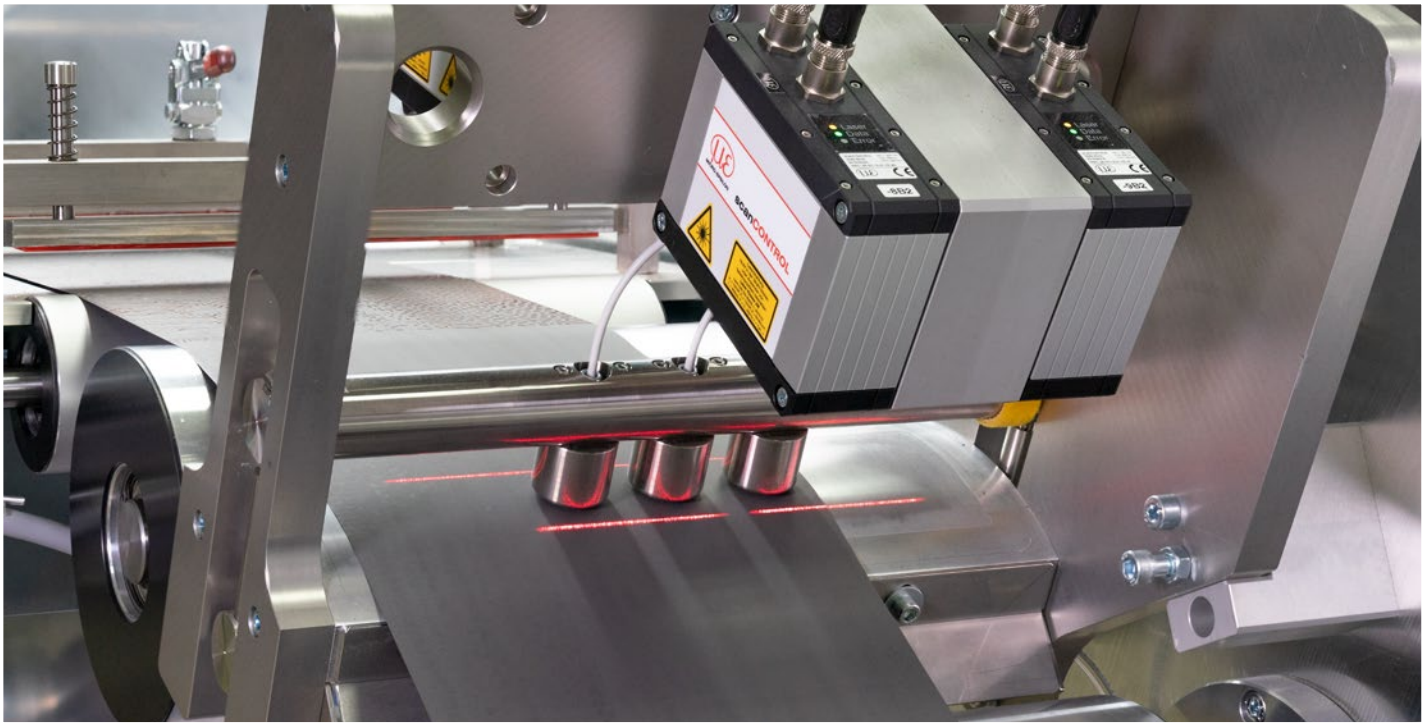
	/SI	Hardware switch-off of the laser line
	/3R	Increased laser power (class 3R) e.g., for dark surfaces
	/BL	Blue laser line (405 nm) for (semi-) transparent, red-hot glowing and organic materials (Measuring ranges 25 - 100 mm)

Cable outlet options*

	/RT	Cable outlet on the rear side ("Rear Tail") for space-saving installation, cable length 0.3 m. Sockets at cable end (Measuring ranges 25 - 200 mm)
	/PT	Cable directly out of the sensor ("Pigtail") Available lengths: 0.3 / 0.6 / 1.00 m

*Options can be combined

Accessories from page 39



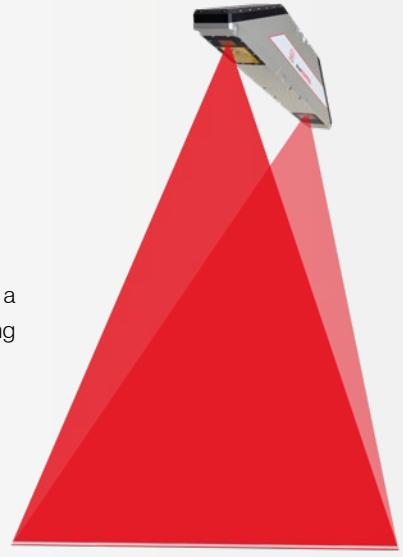
The easy way of machine integration

The design of the LLT30x2 series is compact and lightweight. The controller is integrated in the sensor itself, which simplifies mechanical integration. The measurement data can be output directly.

NEW

Large measurement area up to 600 x 600 mm

The scanCONTROL 30x2 laser scanners are now also available with a large measuring field up to 600 x 600 mm. This allows large measuring objects to be detected with high accuracy.



Application examples

Assembly monitoring of car body shell construction

Detection of the road surface profile

Geometry inspection in metals processing

Powerful 2D/3D laser scanners
scanCONTROL 30x2

Model		LLT30x2-25	LLT30x2-50	LLT30x2-100	LLT30x2-200
Measuring range (z-axis)	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 (z-axis)	Start of measuring range	-	-	190 mm	160 mm
	End of measuring range	-	-	360 mm	460 mm
Line linearity (z-axis) [1] [2]		2 µm	4 µm	10 µm	30 µm
		± 0.013 %	± 0.01 %	± 0.007 %	± 0.014 %
Measuring range (x-axis)	Start of measuring range	23 mm	43.3 mm	75.6 mm	130 mm
	Mid of measuring range	25 mm	50 mm	100 mm	200 mm
	End of measuring range	26.8 mm	56.5 mm	124.4 mm	270 mm
Extended measuring range (x-axis)	Start of measuring range	-	-	72.1 mm	100 mm
	End of measuring range	-	-	131.1 mm	290 mm
Resolution (x-axis)		1,024 points/profile			
Profile frequency		up to 10,000 Hz			
Interfaces	Ethernet GigE Vision	Output of measurement values Sensor control Profile data transmission			
	Digital inputs	Mode switching Encoder (counter) Trigger			
	RS422 (half-duplex) [3]	Output of measurement values Sensor control Trigger Synchronization			
Output of measurement values [4] [5]		Ethernet (UDP / Modbus TCP); RS422 (ASCII / Modbus RTU) Analog; switch signal PROFINET; EtherCAT; EtherNet/IP			
Control and indicator elements		3x color LEDs for laser, data and error			
Light source	Red Laser	≤ 10 mW			≤ 12 mW
		Standard: laser class 2M, semiconductor laser 658 nm			
		≤ 30 mW		≤ 50 mW	
		Option: laser class 3R, semiconductor laser 658 nm			
	Blue laser	≤ 10 mW			-
		Standard: laser class 2M, semiconductor laser 405 nm			-
Laser switch-off		via software, hardware switch-off with /SI option			
Aperture angle of laser line		23 °	28 °	30 °	45 °
Permissible ambient light	(fluorescent light) [1]	10,000 lx			
Protection class (DIN EN 60529)		IP67 (when connected)			
Vibration (DIN EN 60068-2-27)		2g / 20 ... 500 Hz			
Shock (DIN EN 60068-2-6)		15g / 6 ms			
Temperature range	Storage	-20 ... +70 °C			
	Operation	0 ... +45 °C			
Weight		415 g (without cable)			
Supply voltage		11 … 30 VDC, nominal value 24 V, 500 mA, IEEE 802.3af class 2, Power over Ethernet (PoE)			

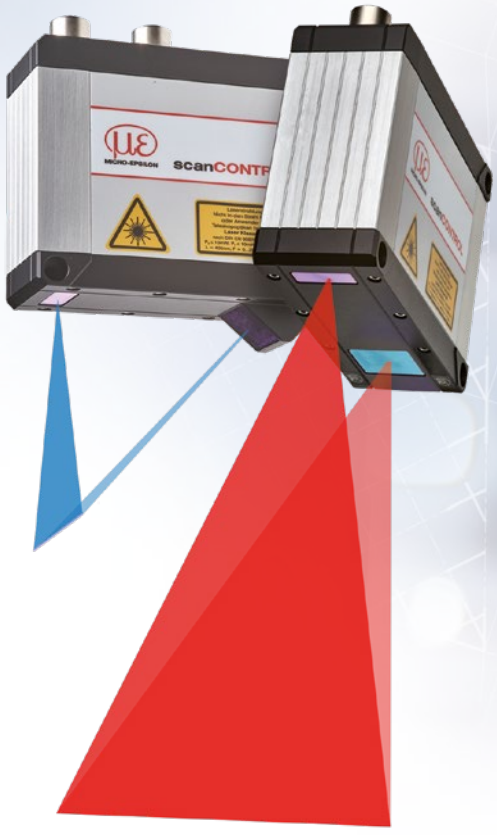
[1] Based on the measuring range; measuring object: Micro-Epsilon standard object
[2] According to a one-time averaging across the measuring field (1,024 points)
[3] RS422 interface, programmable either as serial interface or as input for triggering/synchronization
[4] Analog | switching signal: Only in conjunction with 2D/3D output unit
[5] PROFINET | EtherCAT | EtherNet/IP: Only in conjunction with 2D/3D gateway

Model		LLT30x2-430	LLT30x2-600
Measuring range (z-axis)	Start of measuring range	330 mm	530 mm
	Mid of measuring range	515 mm	770 mm
	End of measuring range	700 mm	1 010 mm
	Height of measuring range	370 mm	480 mm
Extended measuring range (z-axis)	Start of measuring range	330 mm	450 mm
	End of measuring range	720 mm	1 050 mm
Line linearity (z-axis) [1] [2]		15 µm	22 µm
		0.0041 %	0.0045 %
Measuring range (x-axis)	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 (x-axis)	Start of measuring range	324 mm	408 mm
	End of measuring range	560 mm	788 mm
Resolution (x-axis)		1,024 points/profile	
Profile frequency		up to 10,000 Hz	
Interfaces	Ethernet GigE Vision	Output of measurement values Sensor control Profile data transmission	
	Digital inputs	Mode switching Encoder (counter) Trigger	
	RS422 (half-duplex) [3]	Output of measurement values Sensor control Trigger Synchronization	
Output of measurement values [4] [5]		Ethernet (UDP / Modbus TCP); RS422 (ASCII / Modbus RTU) Analog; switch signal PROFINET; EtherCAT; EtherNet/IP	
Control and indicator elements		3x color LEDs for laser, data and error	
Light source	Red Laser	≤ 26 mW	
		Standard: laser class 2M, semiconductor laser 660 nm	
		≤ 100 mW	
		Option: laser class 3B, semiconductor laser 660 nm	
Laser switch-off		via software, hardware switch-off with /SI option	
Aperture angle of laser line		60 °	
Permissible ambient light	(fluorescent light) [1]	5,000 lx	
Protection class (DIN EN 60529)		IP67 (when connected)	
Vibration (DIN EN 60068-2-27)		2g / 20 ... 500 Hz	
Shock (DIN EN 60068-2-6)		15g / 6 ms	
Temperature range	Storage	-20 ... +70 °C	
	Operation	0 ... +45 °C	
Weight		2620 g (without cable)	
Supply voltage		11 … 30 VDC, nominal value 24 V, 500 mA, IEEE 802.3af class 2, Power over Ethernet (PoE)	

[1] Based on the measuring range; measuring object: Micro-Epsilon standard object
[2] According to a one-time averaging across the measuring field (1,024 points)
[3] RS422 interface, programmable either as serial interface or as input for triggering/synchronization
[4] Analog | switching signal: Only in conjunction with 2D/3D output unit
[5] PROFINET | EtherCAT | EtherNet/IP: Only in conjunction with 2D/3D gateway

Powerful 2D/3D laser scanners with highest precision
scanCONTROL 30x0

- High resolution in x- and z-axis for accurate profile measurement
- Profile frequency up to 10 kHz for monitoring of dynamic processes
- Innovative exposure control
- For small and large measurement areas
- Also available with patented Blue Laser Technology
- Compatible with COGNEX® VisionPro



SMART PROFILE

Fast and precise 2D/3D profile measurements

The new LLT30x0 laser profile scanners provide calibrated profile data with up to 9.6 million points per second. Thanks to their high accuracy, high profile frequency and versatility, these powerful scanners are suitable for demanding measurement tasks. They measure and evaluate, e.g., angles, steps, gaps, distances and circles with high precision. These sensors also offer predefined operating modes that enable optimal results for various applications.

Available as PROFILE and SMART versions

The scanCONTROL 30x0 series is available as PROFILE and SMART versions. PROFILE scanners provide calibrated profile data that can be further processed on a PC using software provided by the customer. With the 3DInspect software, the scanCONTROL sensors can also be used for 3D evaluations. SMART series scanners work independently and provide selected measurement values. The scanCONTROL 30x0 series supports all SMART functions and programs that are set in the scanCONTROL Configuration Tools software and directly stored in the internal controller.

Article designation

LLT	30	x0	-25	/SI

Options - see below

Measuring range
25 mm
50 mm
100 mm
200 mm
430 mm
600 mm

Class
00=PROFILE
10=SMART

Series
LLT30xx

Laser options*

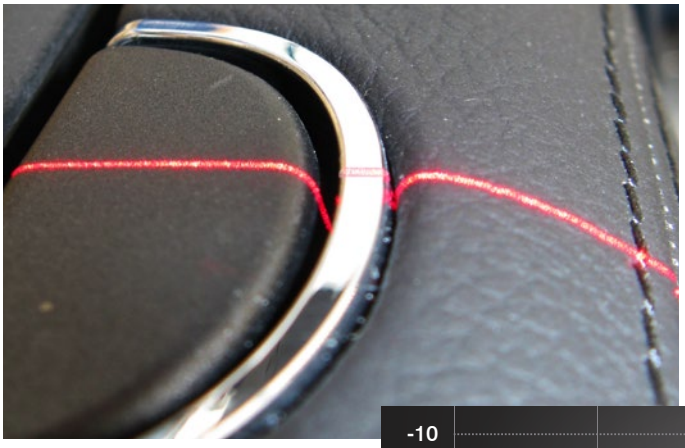
/SI	Hardware switch-off of the laser line
/3R	Increased laser power (class 3R) e.g., for dark surfaces
/BL	Blue laser line (405 nm) for (semi-) transparent, red-hot glowing and organic materials (Measuring ranges 25 - 100 mm)

Cable outlet options*

	/RT	Cable outlet on the rear side ("Rear Tail") for space-saving installation, cable length 0.3 m. Sockets at cable end (Measuring ranges 25 - 200 mm)
	/PT	Cable directly out of the sensor ("Pigtail") Available lengths: 0.3 / 0.6 / 1.00 m

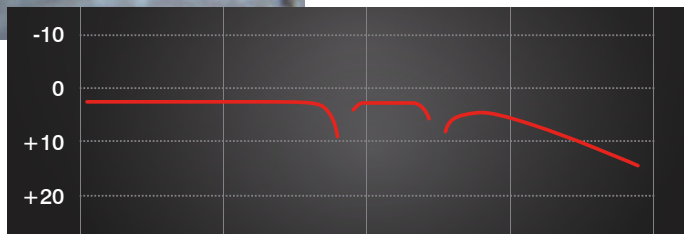
*Options can be combined

Accessories from page 39



Innovative exposure control to master difficult surfaces
On inhomogeneous or dark surfaces, the HDR (High Dynamic Range) data acquisition mode and the improved auto exposure optimizes the measurement results.

In HDR mode, the rows of the sensor matrix are exposed differently but at the same time which avoids time offsets between the recordings. This is how moving objects can be detected reliably. The areas for auto-exposure can also be selected individually.



High resolution

High dynamic range

High speed

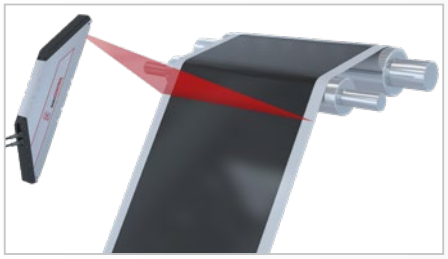
Fast measurement results with operation modes
Choose from three predefined operating modes for your specific measurement task: "High-Resolution" for maximum precision, "High Dynamic Range" for optimal profile detection on difficult surfaces and "High Speed" for ultra-fast measurements.

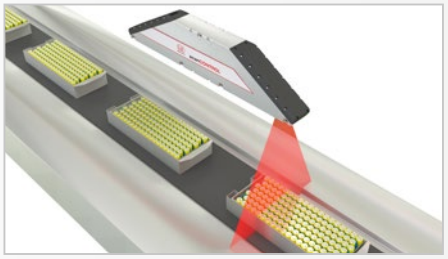
NEW

Large measurement area up to 600 x 600 mm

The scanCONTROL 30x2 laser scanners are now also available with a large measuring field up to 600 x 600 mm. This allows large measuring objects to be detected with high accuracy.

Application examples


Planarity of coated battery film


Assembly monitoring of battery packs


Inline 3D inspection of tire geometry

High performance laser scanner
scanCONTROL 30x0

Model		LLT30x0-25	LLT30x0-50	LLT30x0-100	LLT30x0-200
Measuring range (z-axis)	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 (z-axis)	Start of measuring range	-	-	190 mm	160 mm
	End of measuring range	-	-	360 mm	460 mm
Line linearity (z-axis) [1] [2]		1.5 µm	3 µm	9 µm	26 µm
		± 0.01 %	± 0.0075 %	± 0.006 %	± 0.012 %
Measuring range (x-axis)	Start of measuring range	23 mm	43.3 mm	75.6 mm	130 mm
	Mid of measuring range	25 mm	50 mm	100 mm	200 mm
	End of measuring range	26.8 mm	56.5 mm	124.4 mm	270 mm
Extended measuring range (x-axis)	Start of measuring range	-	-	72.1 mm	100 mm
	End of measuring range	-	-	131.1 mm	290 mm
Resolution (x-axis)		2,048 points/profile			
Profile frequency		up to 10,000 Hz			
Interfaces	Ethernet GigE Vision	Output of measurement values Sensor control Profile data transmission			
	Digital inputs	Mode switching Encoder (counter) Trigger			
	RS422 (half-duplex) [3]	Output of measurement values Sensor control Trigger Synchronization			
Output of measurement values [4] [5]		Ethernet (UDP / Modbus TCP); RS422 (ASCII / Modbus RTU) Analog; switch signal PROFINET; EtherCAT; EtherNet/IP			
Control and indicator elements		3x color LEDs for laser, data and error			
Light source	Red Laser	≤ 10 mW			≤ 12 mW
		Standard: laser class 2M, semiconductor laser 658 nm			
		≤ 30 mW		≤ 50 mW	
		Option: laser class 3R, semiconductor laser 658 nm			
	Blue laser	≤ 10 mW			-
		Standard: laser class 2M, semiconductor laser 405 nm			-
Laser switch-off		via software, hardware switch-off with /SI option			
Aperture angle of laser line		23 °	28 °	30 °	45 °
Permissible ambient light	(fluorescent light) [1]	10,000 lx			
Protection class (DIN EN 60529)		IP67 (when connected)			
Vibration (DIN EN 60068-2-27)		2g / 20 ... 500 Hz			
Shock (DIN EN 60068-2-6)		15g / 6 ms			
Temperature range	Storage	-20 ... +70 °C			
	Operation	0 ... +45 °C			
Weight		415 g (without cable)			
Supply voltage		11 … 30 VDC, nominal value 24 V, 500 mA, IEEE 802.3af class 2, Power over Ethernet (PoE)			

[1] Based on the measuring range; measuring object: Micro-Epsilon standard object
[2] According to a one-time averaging across the measuring field (2,048 points)
[3] RS422 interface, programmable either as serial interface or as input for triggering/synchronization
[4] Analog | switching signal: Only in conjunction with 2D/3D output unit
[5] PROFINET | EtherCAT | EtherNet/IP: Only in conjunction with 2D/3D gateway

Model		LLT30x0-430	LLT30x0-600
Measuring range (z-axis)	Start of measuring range	330 mm	530 mm
	Mid of measuring range	515 mm	770 mm
	End of measuring range	700 mm	1 010 mm
	Height of measuring range	370 mm	480 mm
Extended measuring range (z-axis)	Start of measuring range	330 mm	450 mm
	End of measuring range	720 mm	1 050 mm
Line linearity (z-axis) [1] [2]		12 µm	15 µm
		± 0.0032 %	± 0.0031 %
Measuring range (x-axis)	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 (x-axis)	Start of measuring range	324 mm	408 mm
	End of measuring range	560 mm	788 mm
Resolution (x-axis)		2,048 points/profile	
Profile frequency		up to 10,000 Hz	
Interfaces	Ethernet GigE Vision	Output of measurement values Sensor control Profile data transmission	
	Digital inputs	Mode switching Encoder (counter) Trigger	
	RS422 (half-duplex) [3]	Output of measurement values Sensor control Trigger Synchronization	
Output of measurement values [4] [5]		Ethernet (UDP / Modbus TCP); RS422 (ASCII / Modbus RTU) Analog; switch signal PROFINET; EtherCAT; EtherNet/IP	
Control and indicator elements		3x color LEDs for laser, data and error	
Light source	Red Laser	≤ 26 mW	
		Standard: laser class 2M, semiconductor laser 660 nm	
		≤ 100 mW	
		Option: laser class 3B, semiconductor laser 660 nm	
Laser switch-off		via software, hardware switch-off with /SI option	
Aperture angle of laser line		60 °	
Permissible ambient light	(fluorescent light) [1]	5,000 lx	
Protection class (DIN EN 60529)		IP67 (when connected)	
Vibration (DIN EN 60068-2-27)		2g / 20 ... 500 Hz	
Shock (DIN EN 60068-2-6)		15g / 6 ms	
Temperature range	Storage	-20 ... +70 °C	
	Operation	0 ... +45 °C	
Weight		2630 g (without cable)	
Supply voltage		11 … 30 VDC, nominal value 24 V, 500 mA, IEEE 802.3af class 2, Power over Ethernet (PoE)	

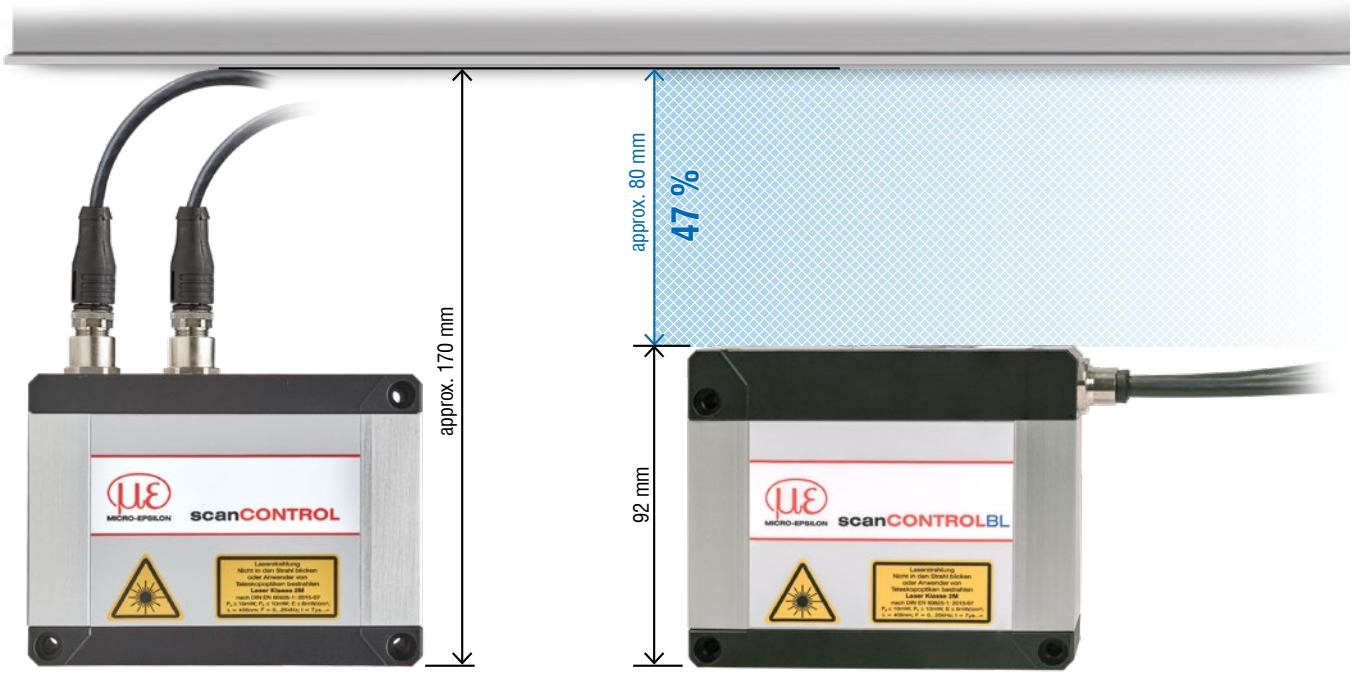
[1] Based on the measuring range; measuring object: Micro-Epsilon standard object
[2] According to a one-time averaging across the measuring field (2,048 points)
[3] RS422 interface, programmable either as serial interface or as input for triggering/synchronization
[4] Analog | switching signal: Only in conjunction with 2D/3D output unit
[5] PROFINET | EtherCAT | EtherNet/IP: Only in conjunction with 2D/3D gateway

Options
scanCONTROL 30xx

Option /RT = "Rear Tail"

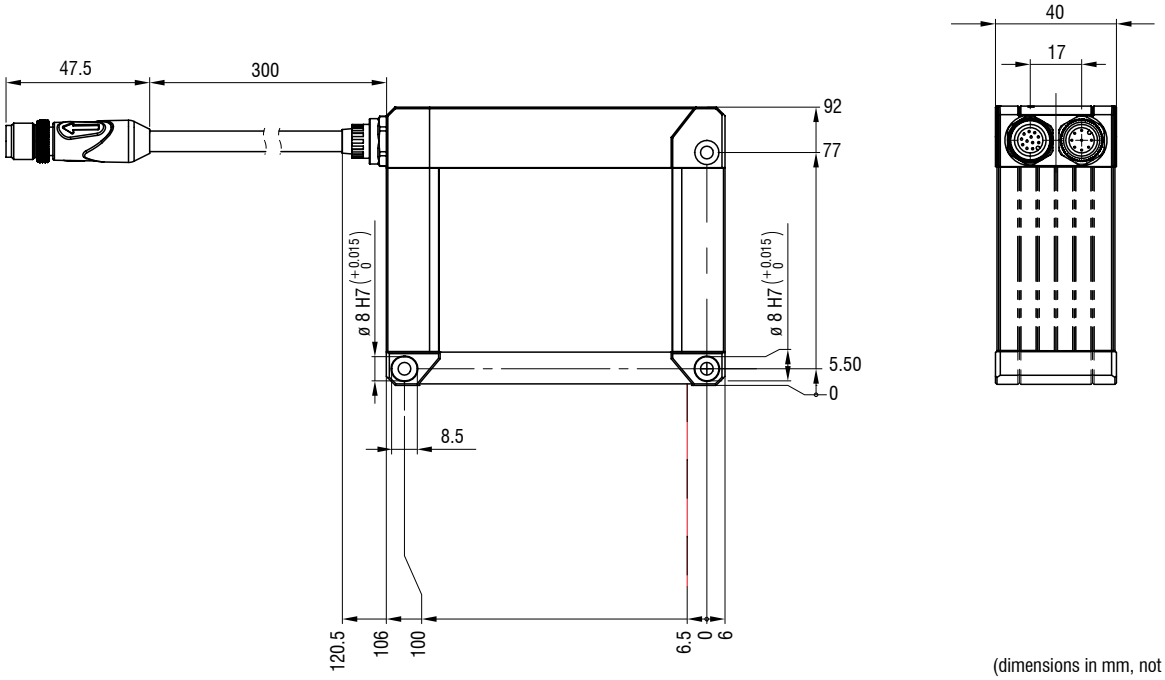
Cable outlet on the rear side ("Rear Tail") for space-saving installation

- Available for the measuring ranges from 25 mm to 200 mm
- 30 cm pigtail
- Reduces the installation height by 47%



Standard

Option /RT

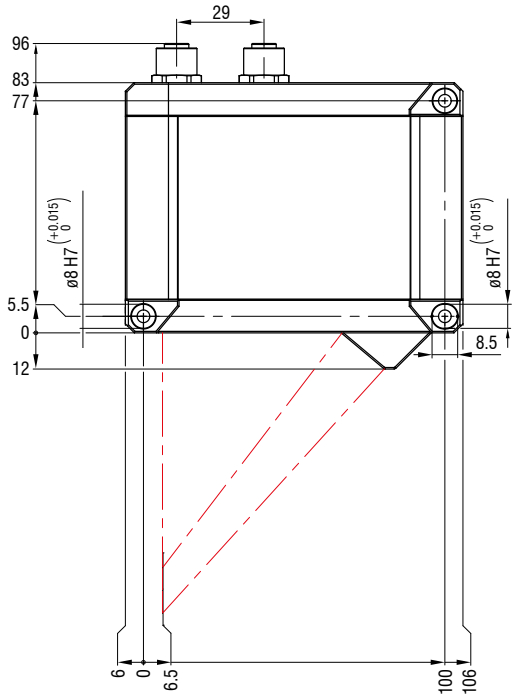


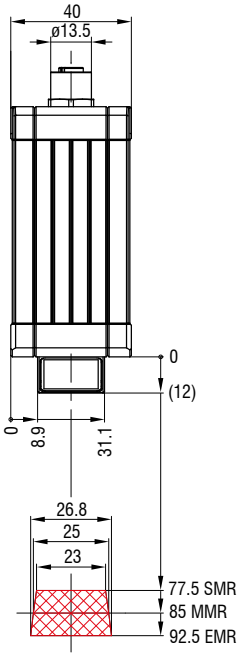
(dimensions in mm, not to scale)

Dimensions and measuring ranges
scanCONTROL 30xx

LLT30x2-25 / LLT30x0-25

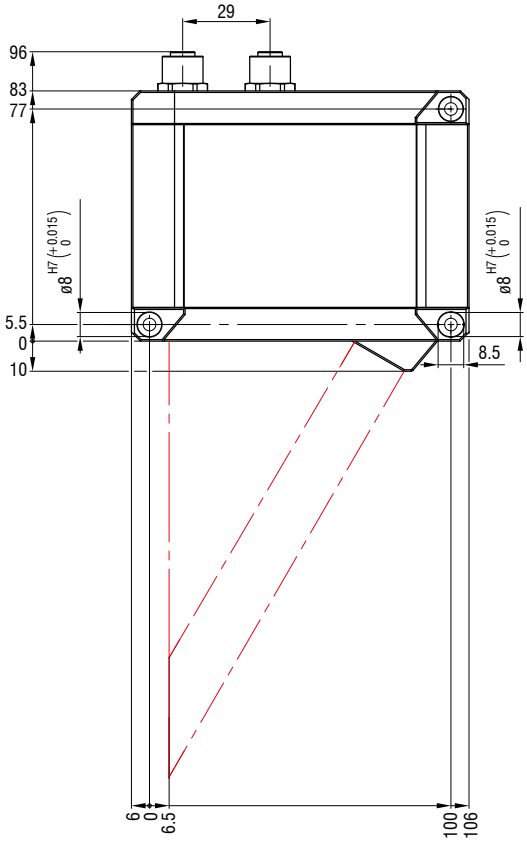
Red Laser | Blue Laser

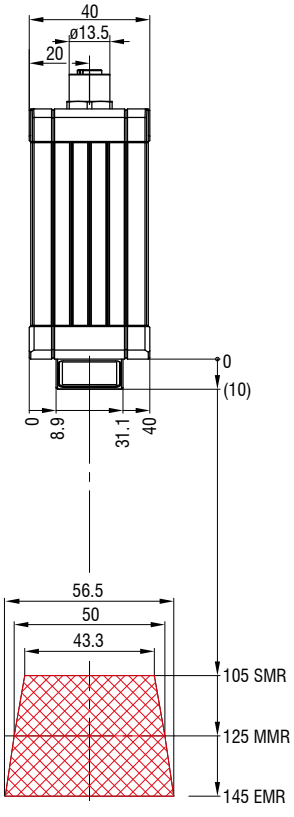




LLT30x2-50 / LLT30x0-50

Red Laser | Blue Laser



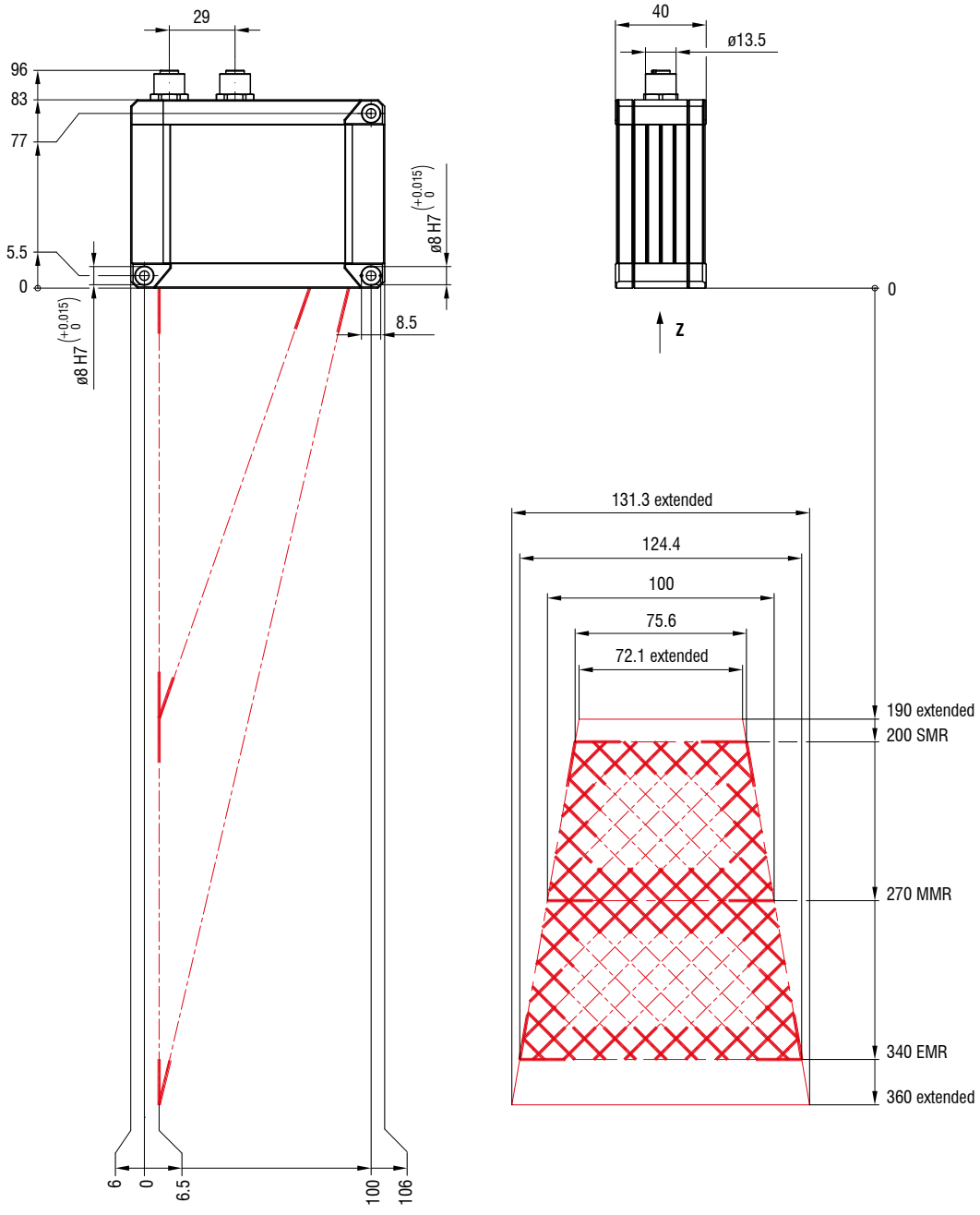


(dimensions in mm, not to scale)

Dimensions and measuring ranges
scanCONTROL 30xx

LLT30x2-100 / LLT30x0-100

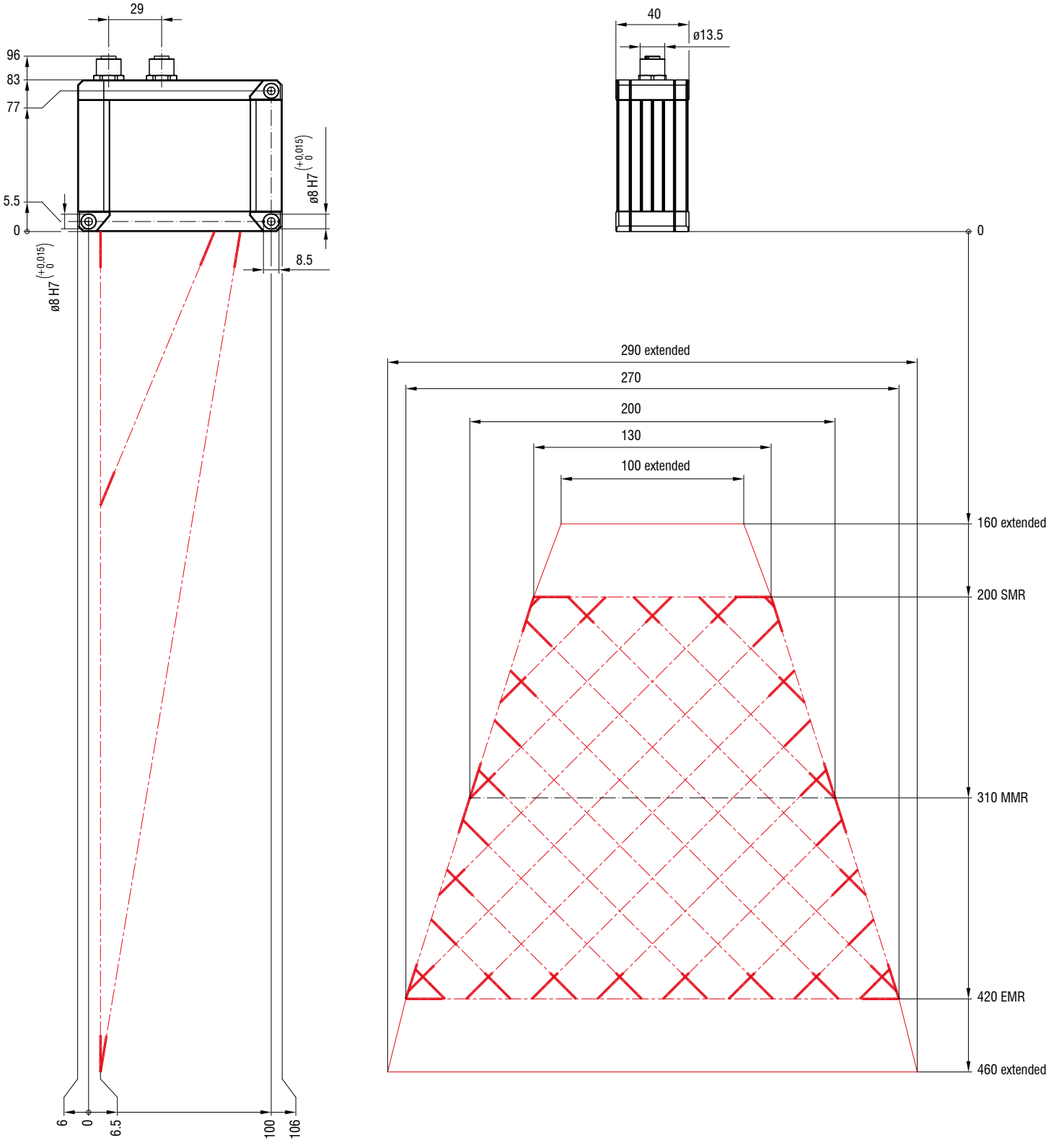
Red Laser | Blue Laser



(dimensions in mm, not to scale)

LLT30x2-200 / LLT30x0-200

Red Laser

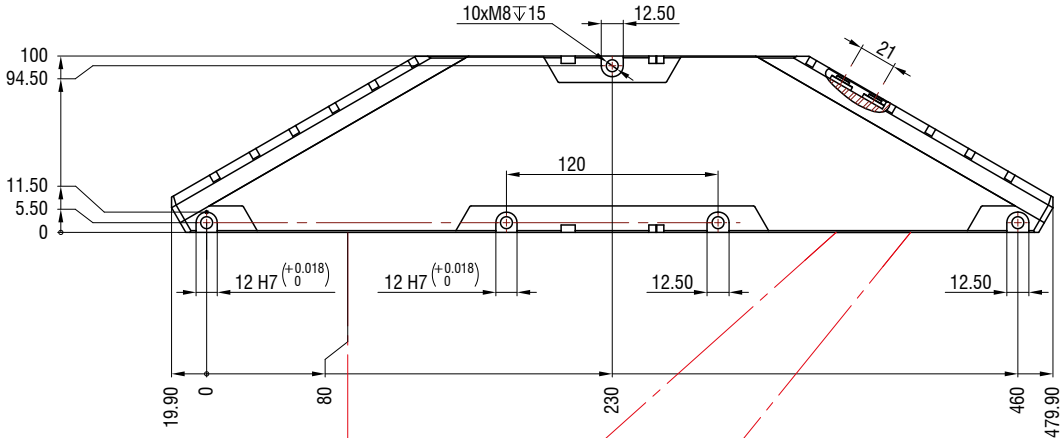


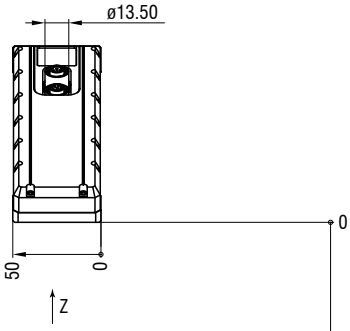
(dimensions in mm, not to scale)

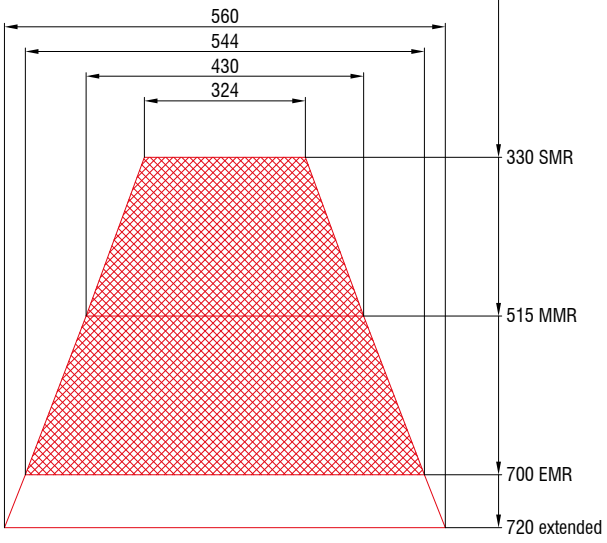
Dimensions and measuring ranges
scanCONTROL 30xx

LLT30x2-430 / LLT30x0-430

Red Laser



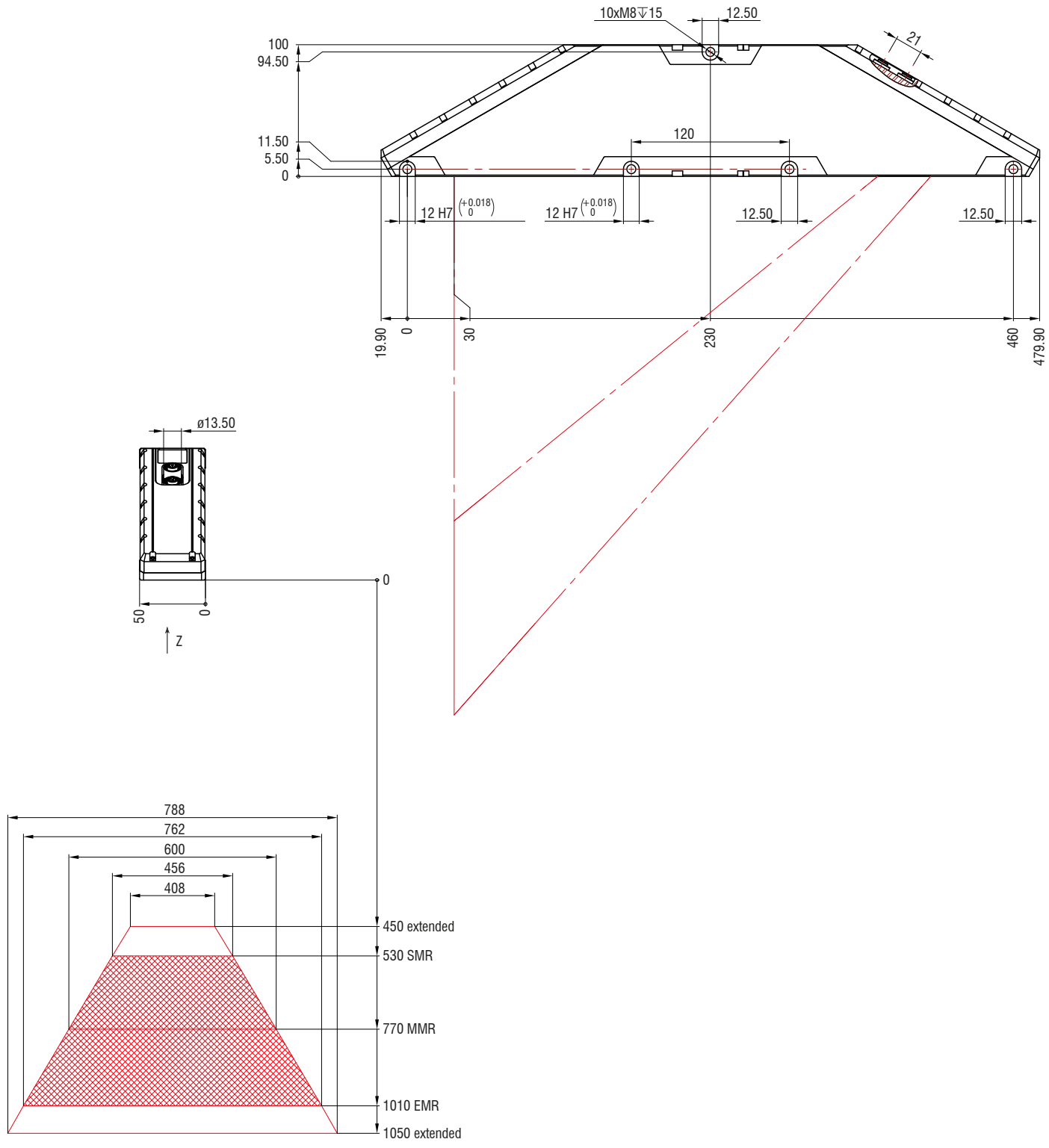




(dimensions in mm, not to scale)

LLT30x2-600 / LLT30x0-600

Red Laser



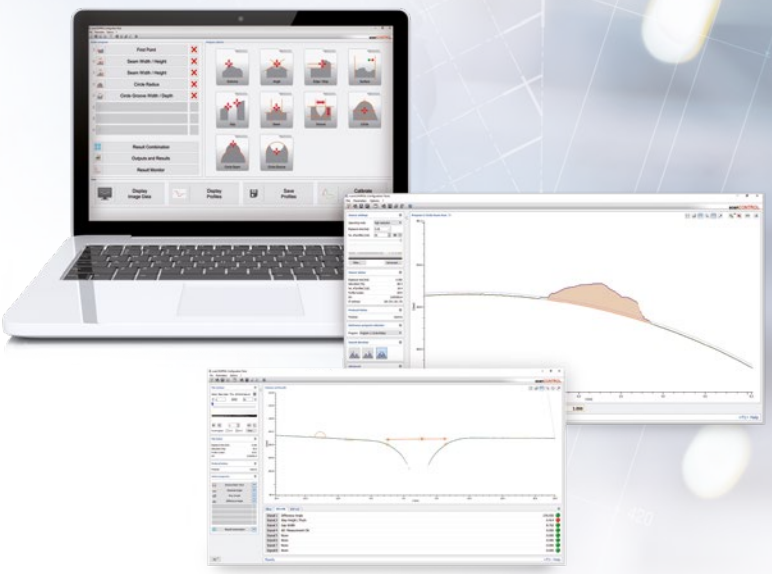
(dimensions in mm, not to scale)

Software and integration
scanCONTROL

micro-epsilon.com/
scanner/download

Software for scanCONTROL SMART sensors

SMART



scanCONTROL Configuration Tools

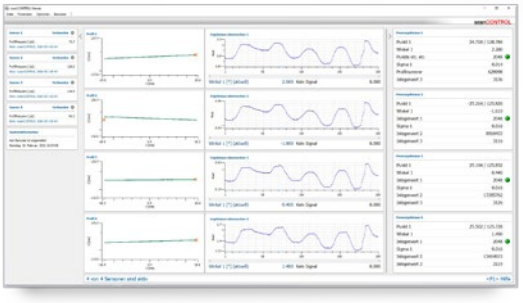
Solution of complex 2D measurement tasks

- Can be used with all SMART sensors
- Sensor alignment and adjustment
- 16 measuring programs x 8 evaluations per parameter set
- 15 independent parameter packages can be stored in the sensor
- Data processing
- Logical operations for digital outputs
- Configuration of the measurement value transfer and the outputs

scanCONTROL Result Monitor

Visualization of measurement sequences

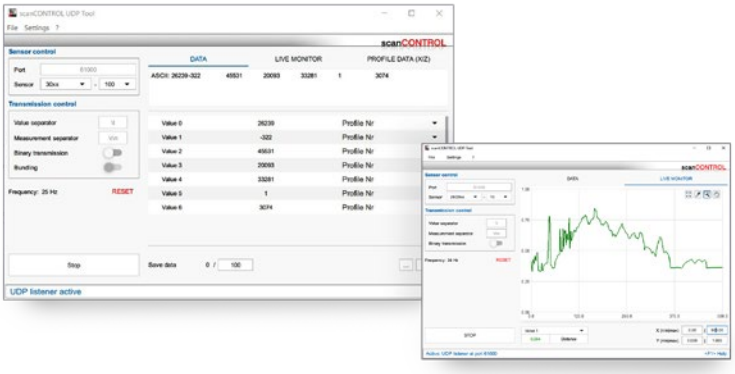
- For up to 4 scanCONTROL SMART sensors
- Display of profile and measured value history during operation
- Adjustable layout (different views, e.g. for workers)
- Parallel transmission of the measured values to the control unit is possible and recommended
- Logging and saving of profiles



scanCONTROL UDP Tool

Testing the UDP output of measured values

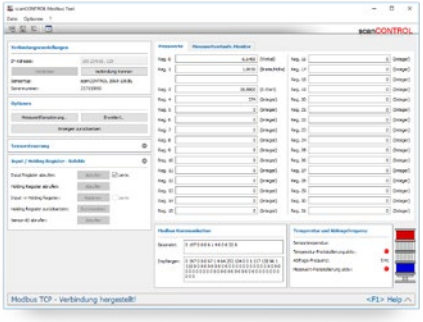
- For all scanCONTROL SMART sensors
- Logging possible up to 1,000 Hz
- Source code available



scanCONTROL Modbus Tool

Testing the Modbus communication

- For all scanCONTROL SMART sensors
- Transfer of measured data
- Sensor control via Modbus TCP (load user modes, laser on/off, change exposure time, ...)



Integration of scanCONTROL sensors

SMART PROFILE

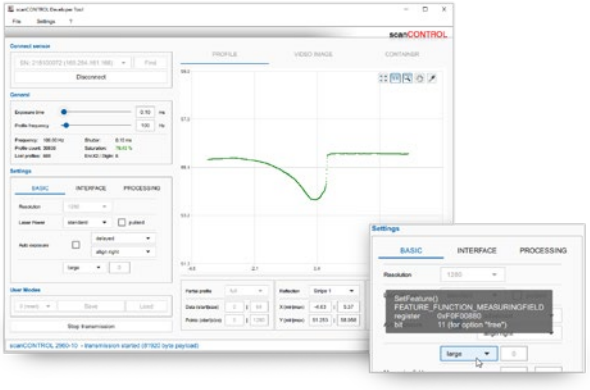
Integration into customer software

- LLT.DLL and SDK for fast integration in /C++ or C# (NET) applications
- LabVIEW device driver
- Various example VIs (profile transmission, container mode, ...)
- Comprehensive documentation
- Linux integration
  - Based on GigE Vision/GenICam API
  - Fast integration via additional C++ library
  - Various sample programs
  - Comprehensive documentation
- Cognex VisionPro
  - AIK adapter for fast integration via Cognex AIK server
  - Cognex Range Images can be generated and processed based on the scanCONTROL measuring points
- Others on request

scanCONTROL Developer Tool

Complete integration example (demo tool)

- Source code available (QML / C++, usable for Windows and Linux)
- Serves as support for the development of own software with scanCONTROL sensors
- MouseOver over the sensor parameters directly displays the corresponding function in the LLT.DLL
- All data transmission options can be set and tested



Integration into image processing software

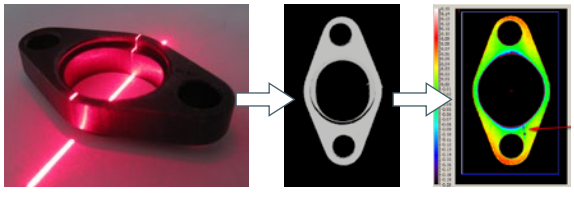
Easy integration due to GenICam/GigE Vision standard

- Direct connection to compatible 3D and image processing software possible
- Sensor is recognized by the standard and parameters are read out directly
- scanCONTROL 25/29xx: output in 2.5D
- scanCONTROL 30xx: output in Valid3D (corresponds to coord3D data formats)

Easy integration due to GigE Vision standard

- 3D comparisons and measurement
- Integration into various software solutions via GigE Vision possible
- Detection of fine surface defects
- OCR/text recognition independent of contrast
- Completeness, position detection, planarity, ... and much more!

GENICAM GIGE VISION



Profile acquisition | Grayscale image | Image processing software

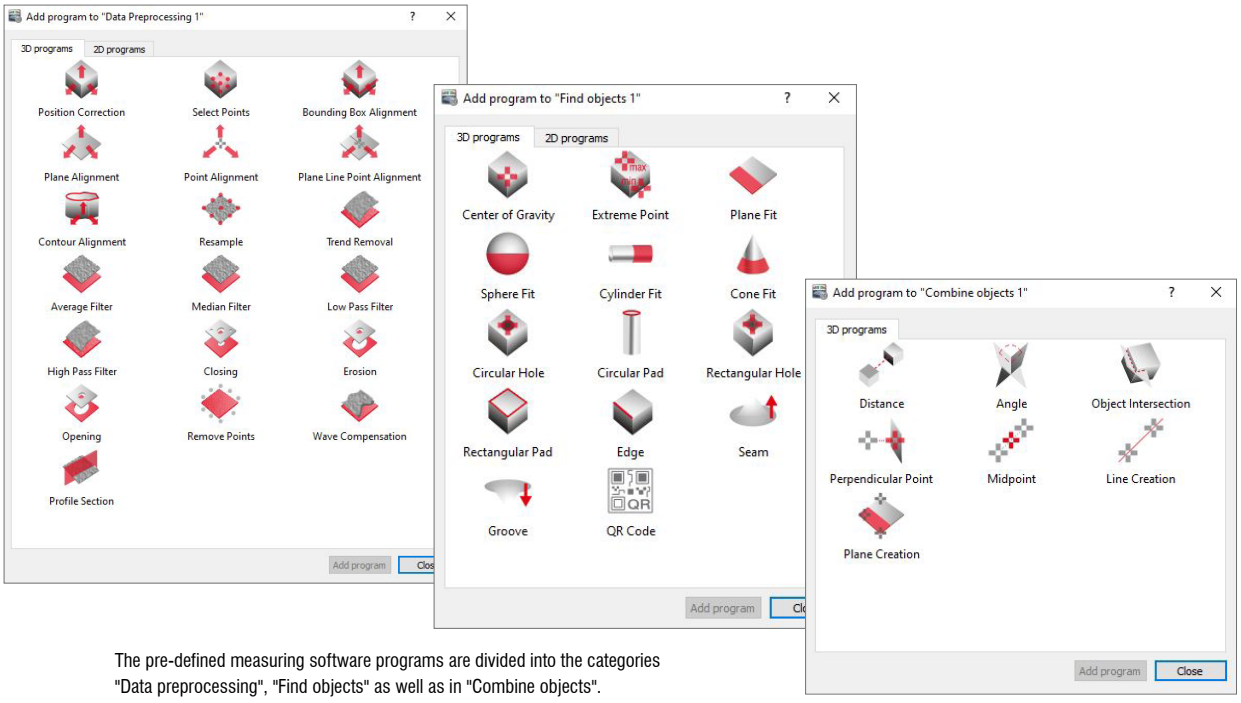
Software
3DInspect

- 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

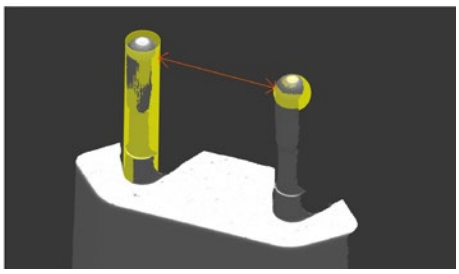
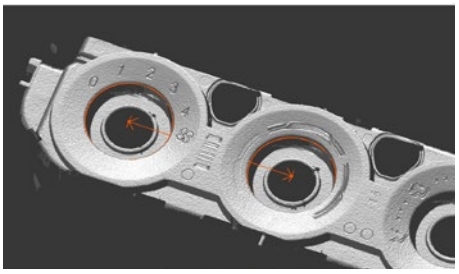
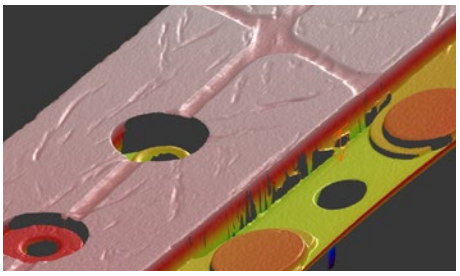
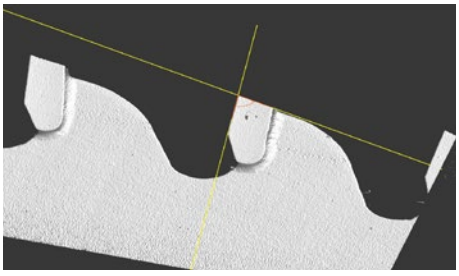
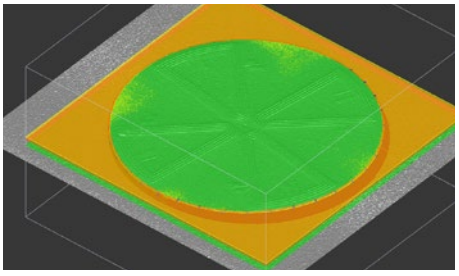
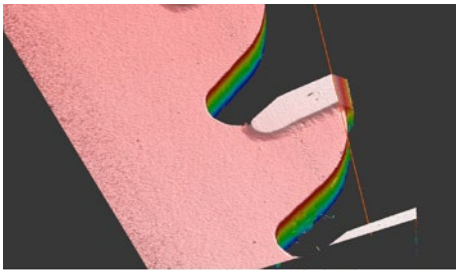
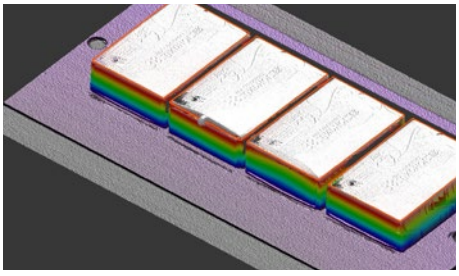
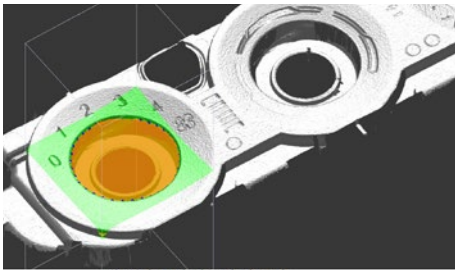
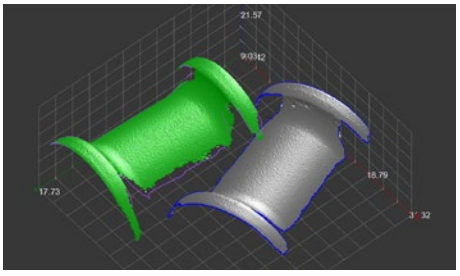
The 3DInspect software is a powerful tool for sensor parameter set up and industrial measurement tasks. This software transmits the measurement data from the sensor via Ethernet and provides the data in three-dimensional form. The 3D data is then further processed on the PC using 3DInspect measurement programs, evaluated, assessed and, if necessary, logged and transmitted to a control unit via Ethernet. The 3D data can also be saved with the software. In addition to the scanCONTROL 30xx models, the 3DInspect software is also supported by the 3D Profile Unit and the surfaceCONTROL and reflectCONTROL sensors.



The pre-defined measuring software programs are divided into the categories "Data preprocessing", "Find objects" as well as in "Combine objects".

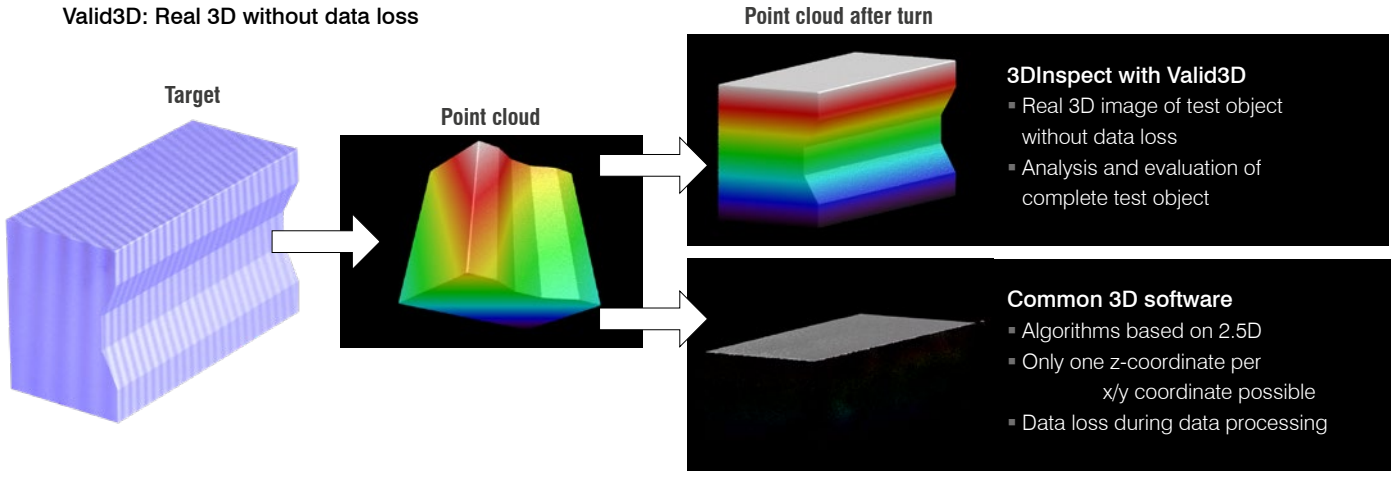
Industrial Performance Unit:
Industrial PC with GigE Vision Sensors

The Industrial Performance Unit is a powerful computing platform for 3D applications. The scanner can be parameterized directly via the 3DInspect software, allowing measurements to be started immediately. Results can be output via the integrated interfaces RPOFINET, EtherCAT and EtherNet/IP.

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.



System for multi-scanner applications

3D Profile Unit

micro-epsilon.com/3DPU

Profile stitching for up to 2 sensors

3D Profile Unit Controller

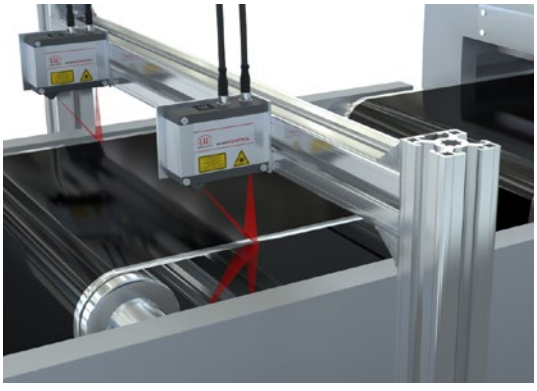
Powerful industrial computer

- Communication with any GigE Vision clients
- Direct integration into image processing software
- Transfer of profile data or 3D point clouds
- Data evaluation and system parameterization is implemented in the 3DInspect software
- Optionally available with Industrial Ethernet:
  - Integrated evaluation
  - Transfer of measured values to PLC
  - Industrial Ethernet interface for control and transfer of measured values

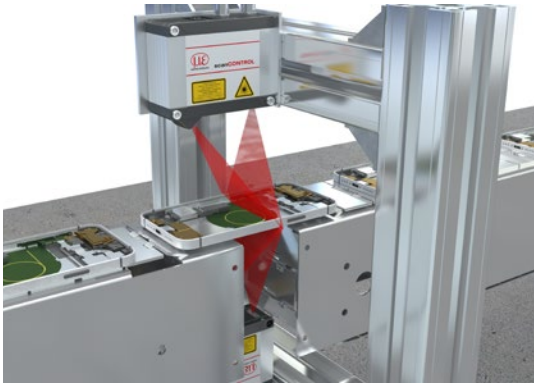
SMART PROFILE

PROFINET EtherCAT EtherNet/IP Modbus

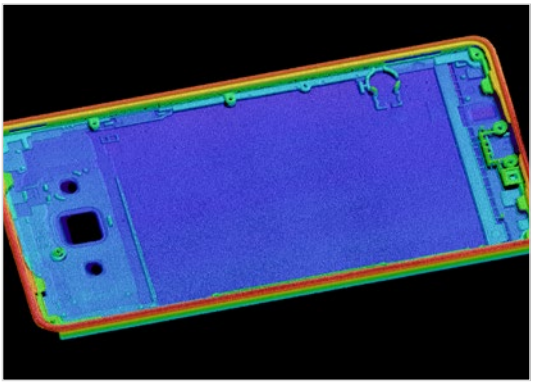
Application examples:



Width, thickness and Heavy Edge of battery film



Thickness of smartphone carrier plates



Stitched 3D point cloud of the smartphone carrier plate in 3DInspect

2D/3D Gateway

PROFINET / EtherCAT / EtherNet/IP for all SMART scanners

One 2D/3D Gateway is connectable with up to 4 sensors. Operation of more than one sensor requires a switch. The 2D/3D Gateway communicates with the scanCONTROL SMART sensor via Ethernet Modbus.

The resultant values are then converted to PROFINET, EtherCAT or EtherNet/IP. The customer carries out the parameter setup with a detailed instruction manual. The gateway can also be parameterized in advance at the factory.

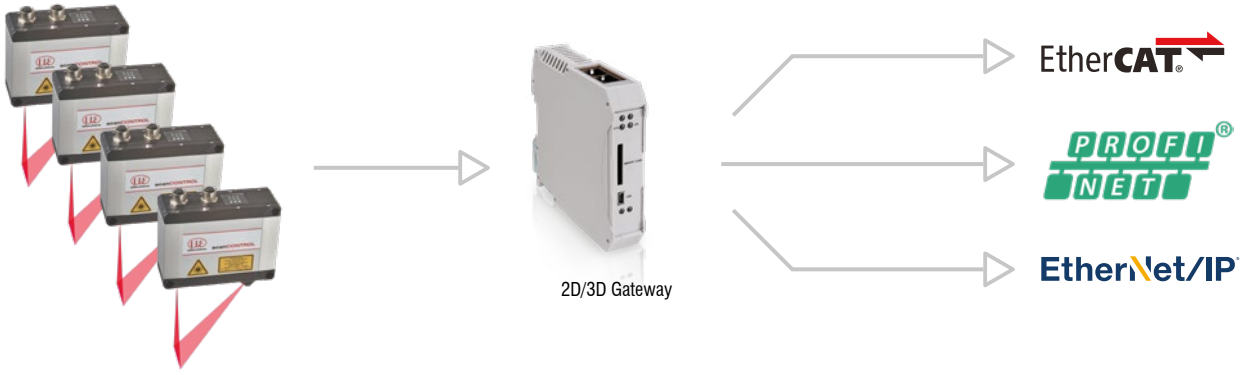
Models

6414142	2D/3D Gateway	Fieldbus coupler, configurable for PROFINET, EtherNet/IP and EtherCAT
6414142.001	2D/3D Gateway, pre-parameterized,	Pre-parameterized to customer log and IP addresses

Number of sensors on the gateway	Maximum measurement frequency
1	500 Hz
2	500 Hz
3	330 Hz
4	250 Hz

NEW

Higher measurement frequencies are also possible with the 30xx series due to the Modbus bundling option.



2D/3D Output Unit

Analog signals / digital switch signals for all SMART scanners

The 2D/3D Output Unit is addressed via Ethernet and outputs analog and digital signals. Different output terminals can be connected to the fieldbus coupler.

Models

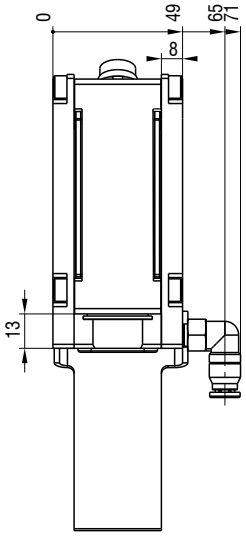
6414073	2D/3D Output Unit Basic/ET	Fieldbus coupler with filter module and bus end terminal
0325131	OU-DigitalOut/8-channel/DC24V/0.5A/negative	8-channel digital output terminal; DC 24 V; 0.5 A; negative switching
0325115	OU-DigitalOut/8-channel/DC24V/0.5A/positive	8-channel digital output terminal; DC 24 V; 0.5 A; positive switching
0325116	OU-AnalogOut/4-channel/±10 V	4-channel analog output terminal; ±10 V
0325135	OU-AnalogOut/4-channel/0-10 V	4-channel analog output terminal; 0-10 V
0325132	OU-AnalogOut/4-channel/0-20 mA	4-channel analog output terminal; 0-20 mA
0325133	OU-AnalogOut/4-channel/4-20 mA	4-channel analog output terminal; 4-20 mA

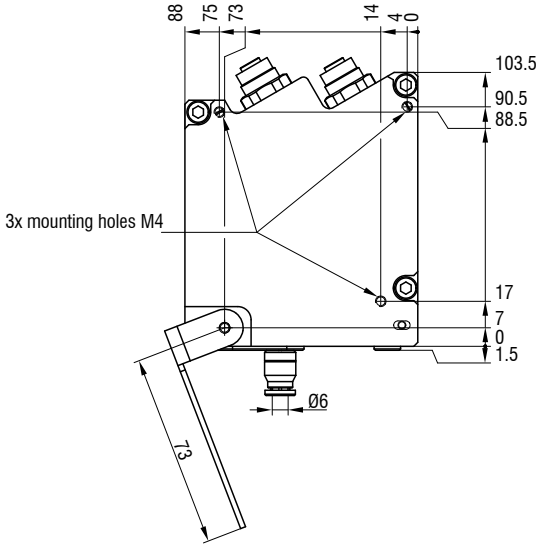
Other terminals available on request.

Housings for protection and cooling for LLT25x0 and 29xx

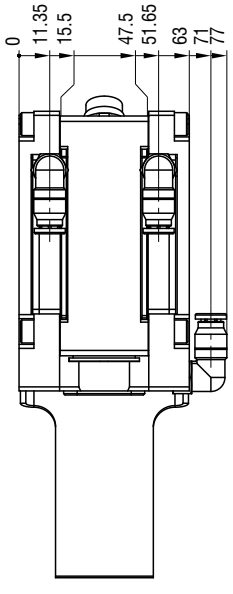
(Not available for scanCONTROL 29xx-10/BL)

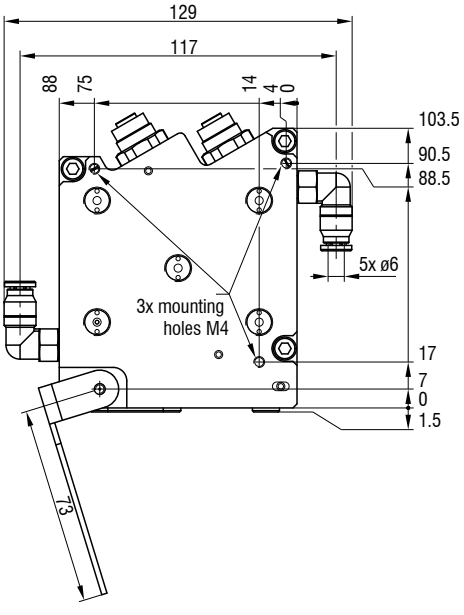
Protective housing with blow-out system

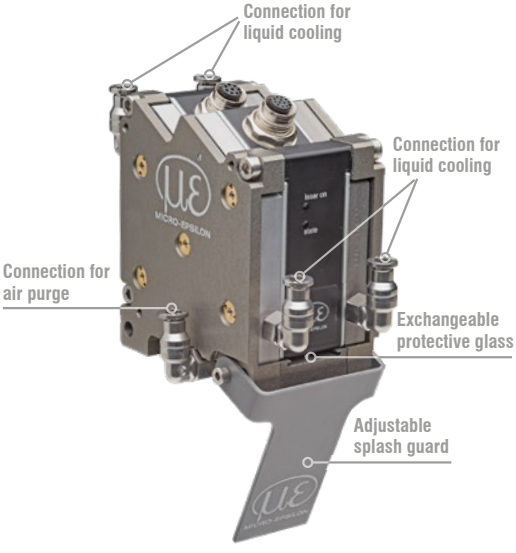




Protective housing with blow-out system and water cooling





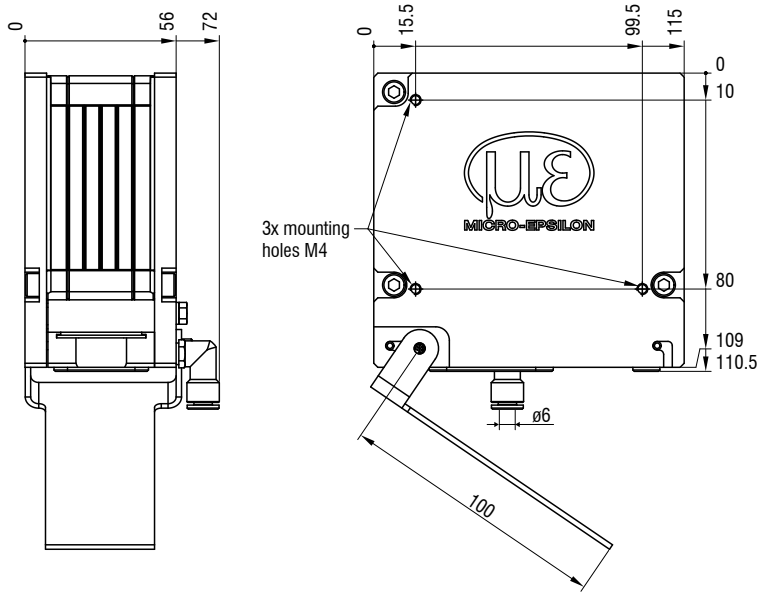


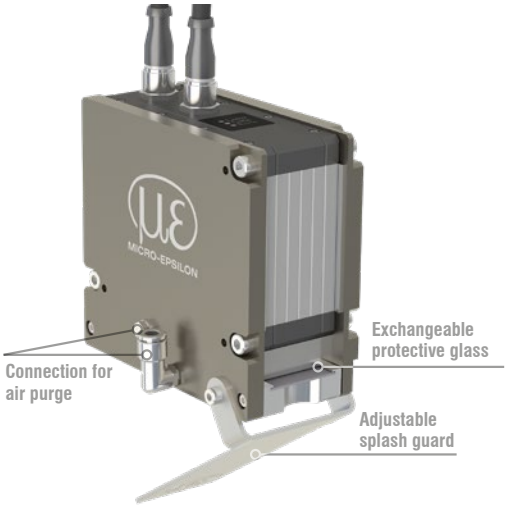
Art. no.	Model	Description
2105058	Protective housing for LLT25/LLT29	Adaptive protective housing for LLT25/LLT29
2105059	Protective cooling housing LLT25/LLT29	Adaptive protective and cooling housing for LLT25/LLT29
0755075	Exchangeable glass for protective housing LLT25/LLT29	Exchangeable glass for protection / cooling concept LLT25/LLT29, pack of 50 pieces

Housings for protection and cooling for LLT30xx

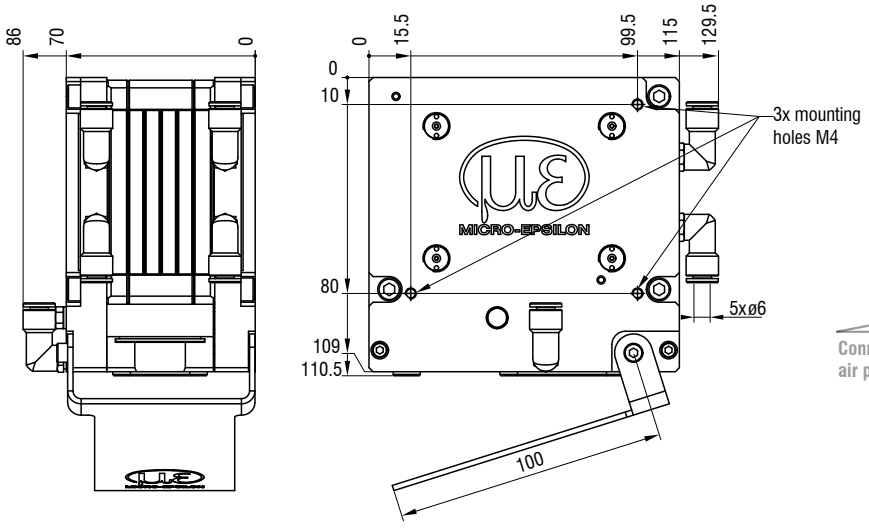
for the measuring ranges 25 - 200 mm

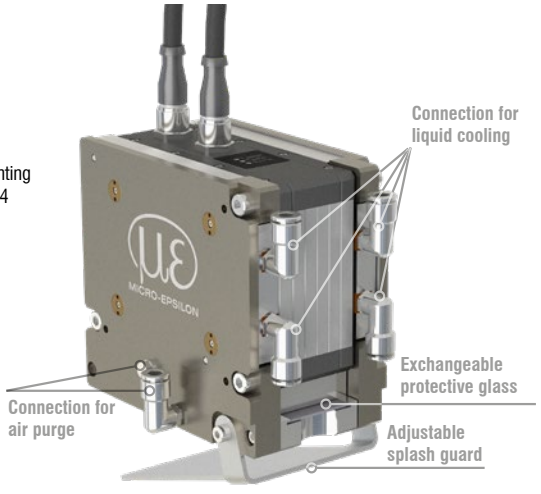
Protective housing with blow-out system





Protective housing with blow-out system and water cooling





Art. no.	Model	Description
2105076	Protective housing for LLT30	Adaptive protective housing for LLT30
2105077	Protective cooling housing for LLT30	Adaptive protective and cooling housing for LLT30
0755083	Exchangeable glass for protective housing LLT30	Exchangeable glass for protective / cooling concept LLT30, pack of 30 pieces

Accessories
scanCONTROL

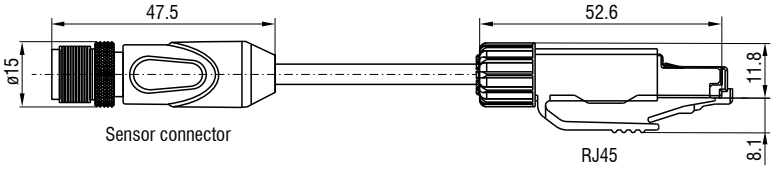
Connection cables

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

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



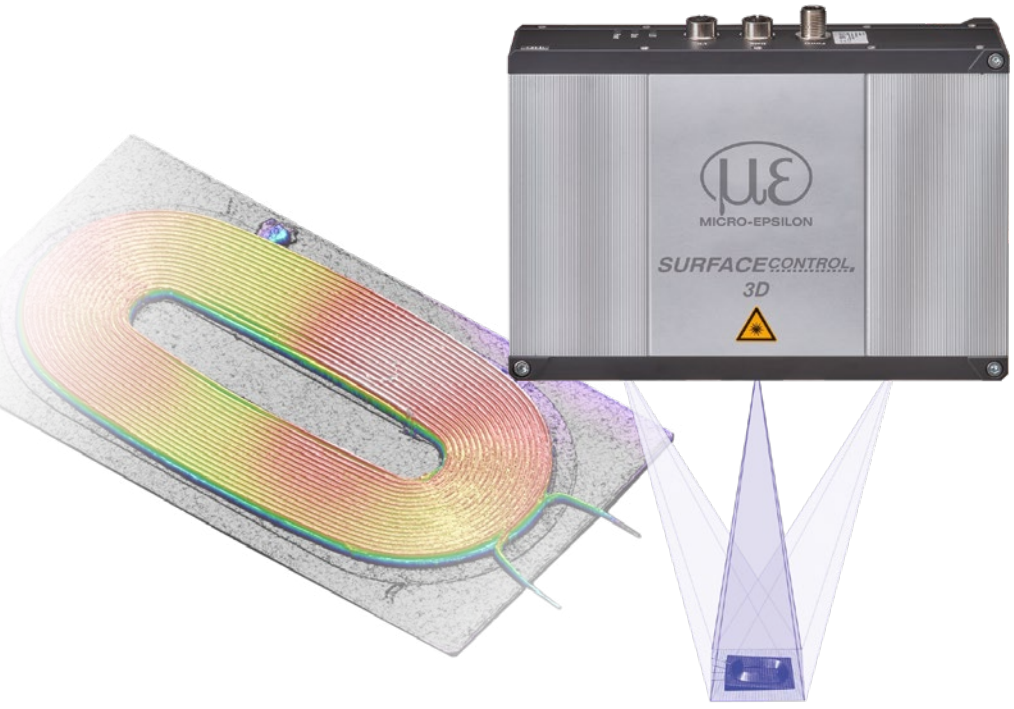
Other accessories

Art. no.	Model	Description
0323478	Connector/12-pin/Multifunction for LLT25/29/30 series	Plug for multifunction port
0323479	Connector/8-pin/Ethernet for LLT25/29/30 series	Plug for Ethernet socket
2420067	PS25/29/30	Power supply unit for scanCONTROL
0254111	Case for LLT25/29/30 (up to MR 200)	Transport case for scanCONTROL sensors incl. measuring stand
0254153	Case for LLT30 series, MR 430/600	Transport case for scanCONTROL sensors incl. measuring stand
2960097	Measuring stand for LLT25/26/29/30 series	Measuring stand with sensor adapter board, flexible rod and clamp base
2960115	Measuring stand for LLT30 series, MR 430/600	Measuring stand with sensor adapter board, flexible rod and clamp base

3D sensors for the inspection of shapes and surfaces

surfaceCONTROL 3D 3500

Innovative 3D snapshot sensor for inline inspection of geometry, shapes and surfaces



3DInspect

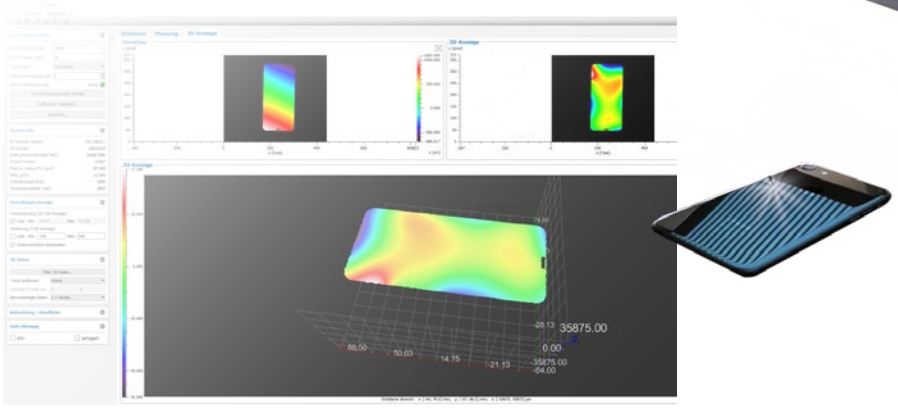
- Highest repeatability up to 0.25 µm
- Best Z-axis resolution from 0.7 µm
- Up to 2.2 million 3D points / second
- Easy integration in all common 3D image processing packets

reflectCONTROL

3D inline inspection of shiny surfaces: flat glass, mirrors and wafers

- Highest repeatability ±1 µm
- Detects minor deviations >10 nm
- 3DInspect: Powerful evaluation software with intuitive operating concept
- Easy integration in all common 3D image processing packets

3DInspect

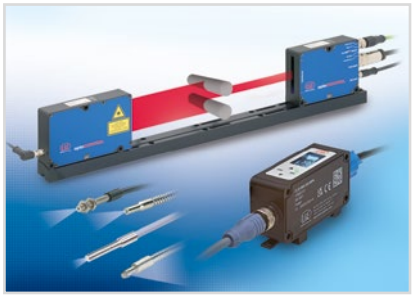


Sensors and Systems from Micro-Epsilon

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

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