MICRO-EPSILON

More Precision

Maximum Point

Absolute Angle

NEW

High precision laser scanners

The scanCONTROL LLT3000 laser profile scanners impress in 2D/3D measurement tasks with high precision and dynamics. With a high resolution sensor matrix and high profile frequency, the scanners are designed for precise profile measurements in dynamic processes.

- High measurement accuracy and profile frequency
- HDR mode for accurate measurement results on inhomogeneous surfaces
- Compact size and integrated evaluation without external controller or IPC

NEW

Laser scanners for industrial series applications

The scanCONTROL 2500 laser scanners are specially designed for industrial measurement tasks. Compact design, versatility and high signal stability result in an excellent price/performance ratio especially for measurement tasks involving large quantities.

Compactness. Performance. Integration.

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 nearly any type of surface.

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

Direct processing in the integrated controller

The scanCONTROL laser scanners have an integrated controller and therefore do not require any external control unit. This considerably simplifies wiring and the integration into restricted spaces. The available interfaces make it possible to integrate the scanners in industrial environments. For multi-scanner applications, interface modules are available.

Modbus   **EtherCAT**   ●● *digital*
PROFINET   **EtherNet/IP**   *analog*
                                          UDP

Patent protection
for (semi-)transparent surfaces and red-hot glowing objects

Measurement tasks involving blue laser scanners measuring on red-hot glowing measurement objects exceeding 700 °C and transparent objects such as glass and plastics are protected by patent law. With profile measurements on these surfaces, scanCONTROL laser scanners achieve excellent signal stability and precise measurement results. Any questions about Blue Laser scanners? We will be pleased to advise you.

Red and Blue Laser

Laser scanners from Micro-Epsilon are available with red and blue laser. For common measurement tasks, scanCONTROL laser scanners with red laser line are used. With objects into which the laser light penetrates, such as transparent or organic surfaces, blue laser scanners are recommended. Blue Laser scanners are also ideal for red-hot glowing metals.
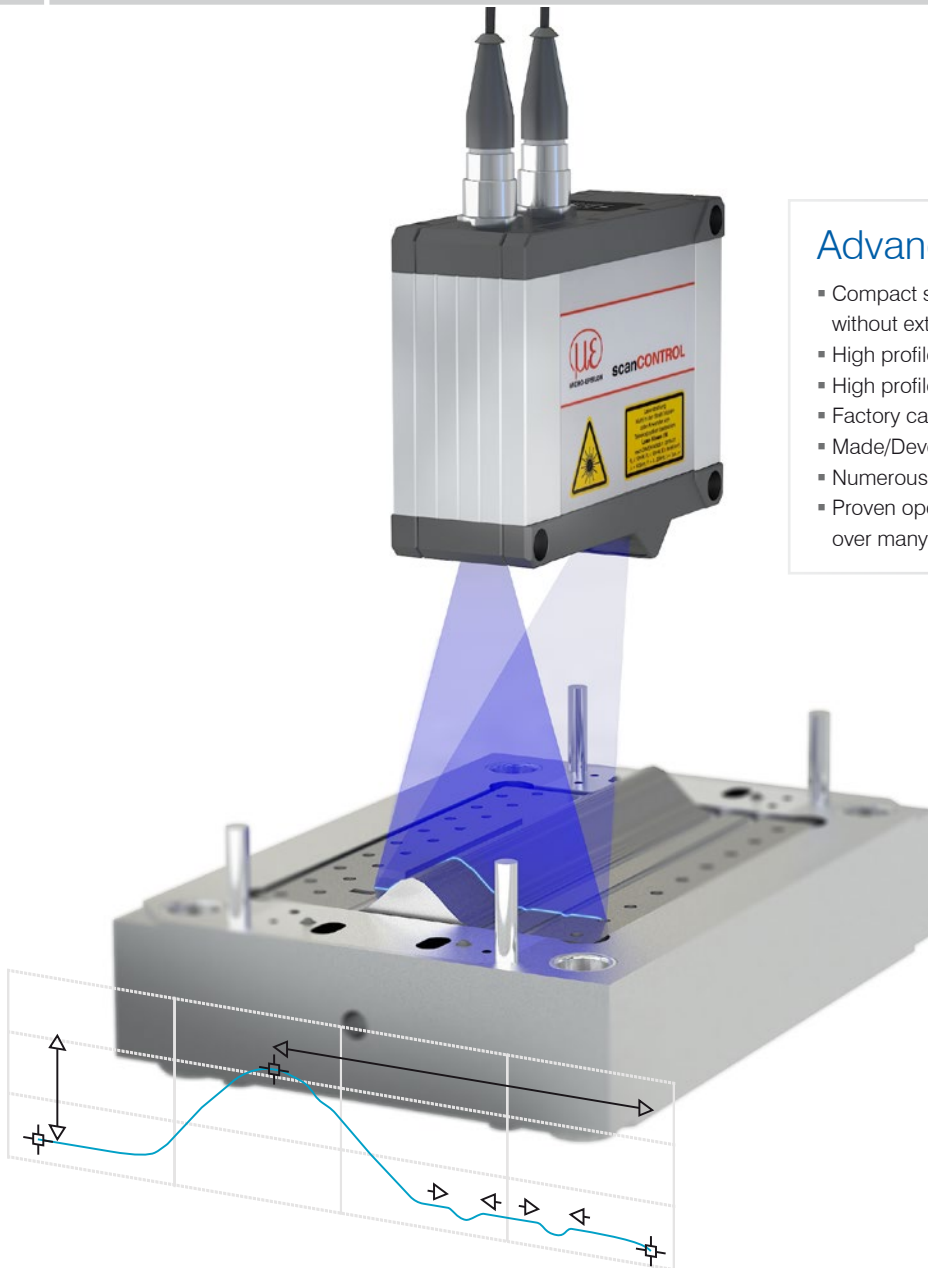
Advanced **Technology**

- Compact size and integrated evaluation without external controller or IPC
- High profile resolution for the detection of finest details
- High profile rate for dynamic measurement tasks
- Factory calibration for metals
- Made/Developed in Germany
- Numerous references worldwide
- Proven operational safety in 24/7 operation over many years

Real Time Surface Compensation:
Dynamic adaption to rapidly changing surfaces

Laser profile scanners use diffusely reflected laser light of which the intensity is highly dependent on the color and how shiny and reflective the respective component is. In order to be able to measure reliably under rapidly changing conditions, scanCONTROL sensors offer the Real-Time-Surface-Compensation feature. Due to this smart feature, the exposure time and the threshold of reflection detection are adapted in real time in order to generate stable measurement results. Moreover, the scanCONTROL 3000 series comes with an HDR function which ensures accurate detection of inhomogeneous surfaces.
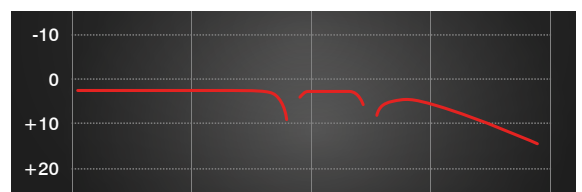
Universal Application

- Transmission of profiles and measurement values
- 3D data and images for image processing
- Inline measurement of different parameters (gap, step, radius, ...)
- Suitable for robotics & multi-sensor applications
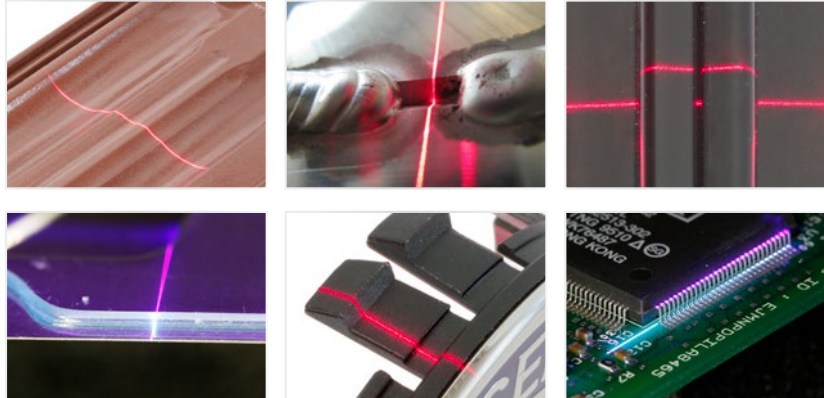
Powerful **Software**

The scanCONTROL Configuration Tools software offers numerous measuring programs with a total of 94 evaluation variants. This is how all important profile measurement tasks can be set up and combined.

- User-friendly parameter software for all scanCONTROL SMART models
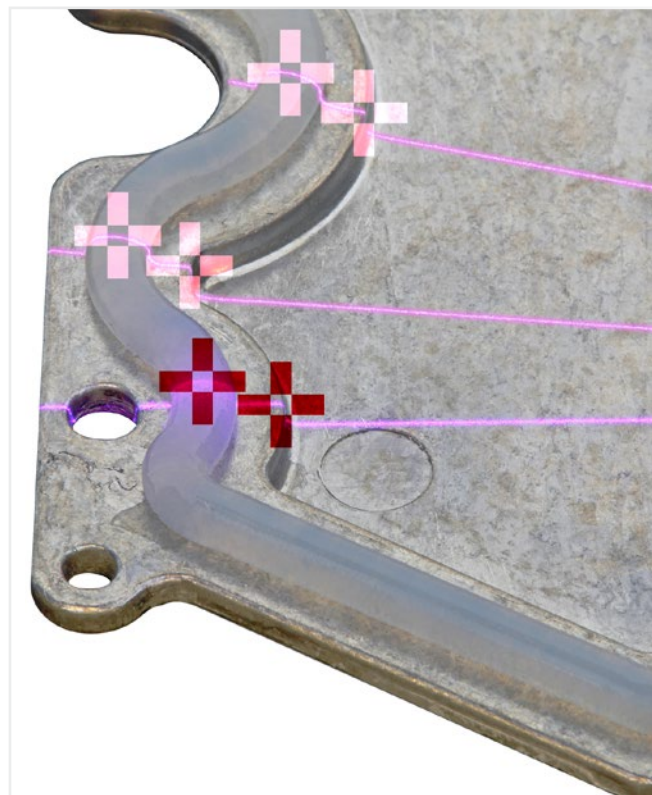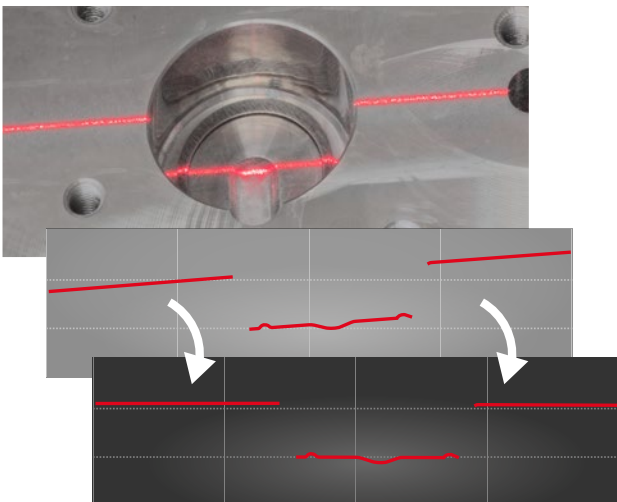- Analysis and evaluation directly in the sensor
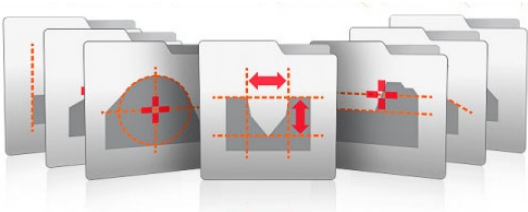
Powerful **SDKs**

- Libraries for C, C++, C# and VB
- LabVIEW driver
- Linux implementation
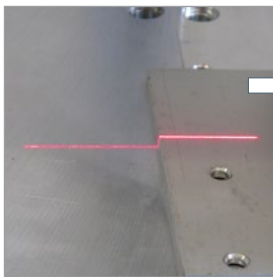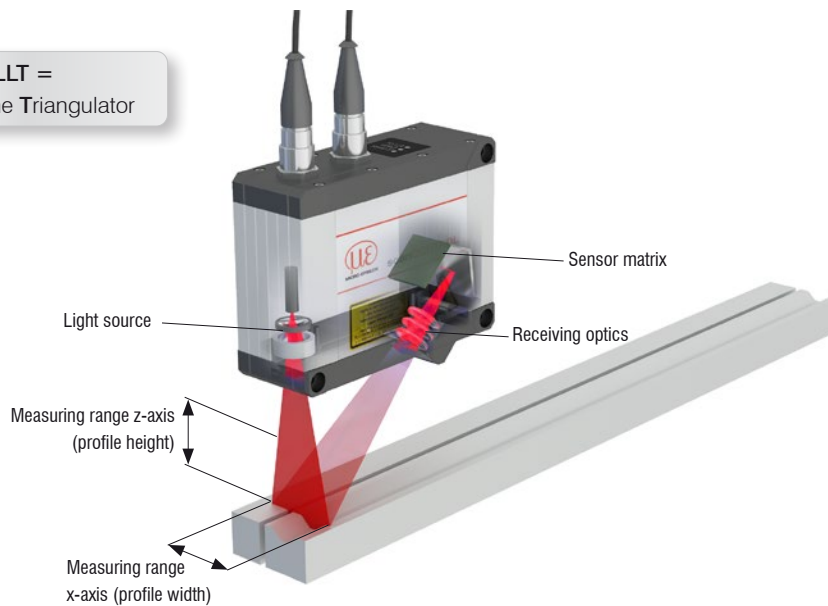
Profile **Correction**

With obliquely detected profiles, the Configuration Tools software corrects the inclination and therefore simplifies the sensor alignment.
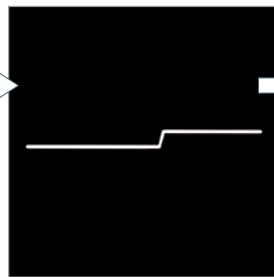
Intelligent **Tracking**

The scanCONTROL SMART sensors can be used to track complex structures and to guide robots. Therefore, anchor points are set in the Configuration Tools software which are used to track and measure the profiles.
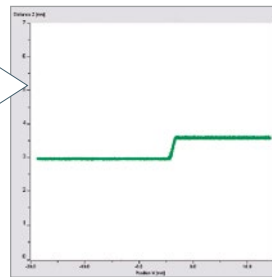
LLT =
Laser **L**ine **T**riangulator

Sensor matrix

Light source

Receiving optics

Measuring range z-axis
(profile height)

Measuring range
x-axis (profile width)

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 array

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

Precise laser scanners for automation, robotics and machine building
The scanCONTROL laser scanners detect, measure and evaluate profiles on various object surfaces with high precision. With different laser types and comprehensive accessories, numerous measurement tasks can be solved in different industries.

The principle of 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. By using 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. 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.

|	**Evaluation** by customer		**Integrated** evaluation	
	These models provide **calibrated profile data** which can be further processed on a PC using a customer software evaluation.		These models provide selected **measurement values**. The parameter setup for the sensors and the measurement programs is stored in the internal controller.	
	COMPACT	HIGH SPEED	SMART	HIGHSPEED & SMART
LLT25xx 640 points/profile Profile frequency Standard up to 300 Hz	scan**CONTROL** **2500** ▸ Page 10 - 11	-	scan**CONTROL** **2510** ▸ Page 10 - 11	-
LLT26xx 640 points/profile Profile frequency Standard up to 300 Hz High speed up to 4000 Hz	scan**CONTROL** **2600** ▸ Page 12 - 13	scan**CONTROL** **2650** ▸ Page 12 - 13	scan**CONTROL** **2610** ▸ Page 12 - 13	scan**CONTROL** **2660** ▸ Page 12 - 13
LLT29xx 1280 points/profile Profile frequency Standard up to 300 Hz High speed up to 2000 Hz Red laser / Blue laser	scan**CONTROL** **2900** ▸ Page 14 - 15	scan**CONTROL** **2950** ▸ Page 14 - 15	scan**CONTROL** **2910** ▸ Page 14 - 15	scan**CONTROL** **2960** ▸ Page 14 - 15
LLT30xx 2048 points/profile Profile frequency up to 300 Hz High speed up to 10,000 Hz Red laser/Blue Laser	scan**CONTROL** **3000** ▸ Page 20 - 23	scan**CONTROL** **3050** ▸ Page 20 - 23	scan**CONTROL** **3010** ▸ Page 20 - 23	scan**CONTROL** **3060** ▸ Page 20 - 23
	Integration: SDK for C/ C++, LabVIEW-VI and examples for C#, Linux and VB are available. ▸ Page 28 - 29		Evaluation: scan**CONTROL** Configuration Tools ▸ Page 24	

scanCONTROL

Red laser scanners are ideally suitable for numerous measurement tasks. Due to higher light intensity and improved performance on poorly reflecting or matt surfaces especially for fast object movements, red laser scanners are perfect for common measurement tasks.
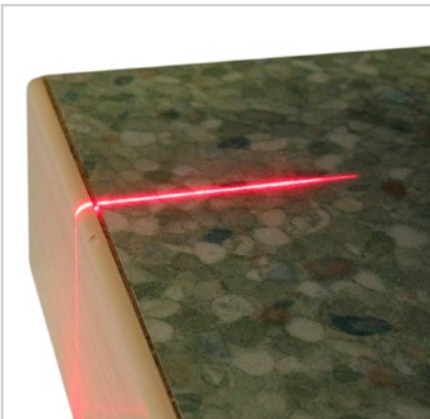
Defect recognition on worktops
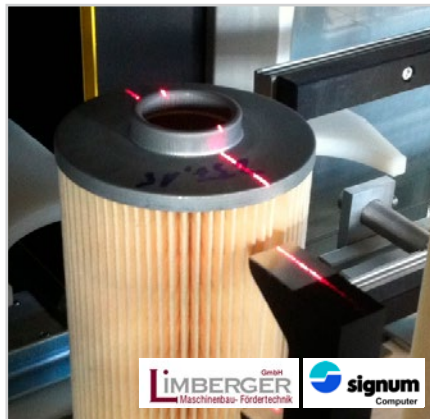
Filter height measurement for the automotive industry

V-gap measurement on pipes

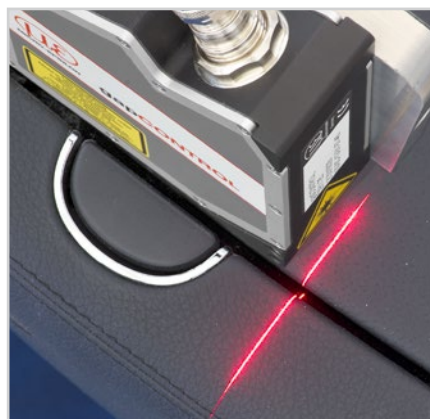Gap measurement on car bodies
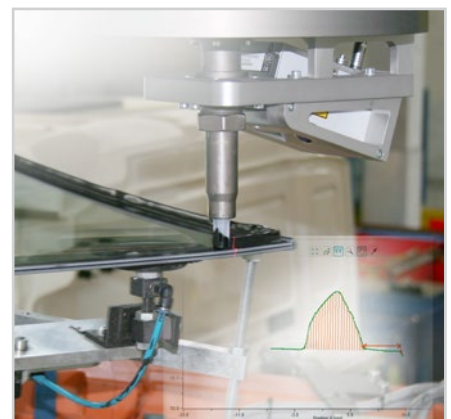

Profile measurement of the brake disc

Text recognition on the cast part

Tire control

Distance measurement at the center console


Inspection of the adhesive beading

scanCONTROL BL

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 measurement object due to the shorter wavelength of the blue-violet laser. Compared to red lasers, blue laser sensors ensure higher reliability with measurements on red-hot glowing, organic and (semi-)transparent objects.
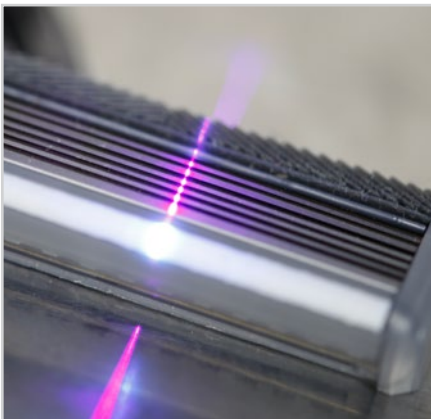
Razor blade angle
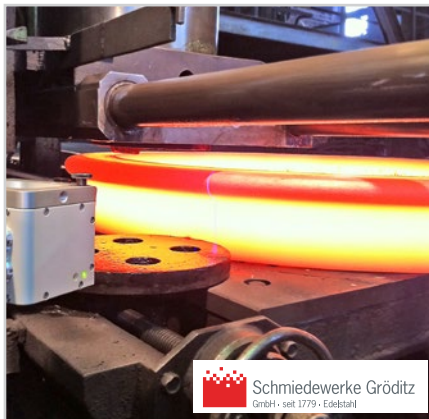
Production of steel-forged rings
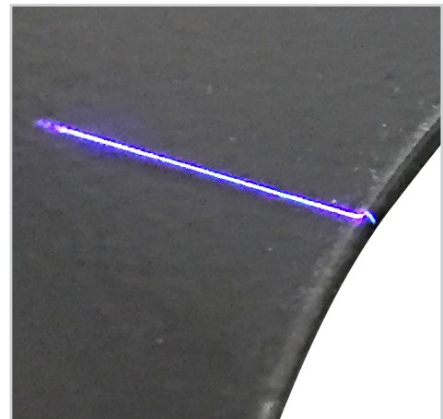
Burr measurement on punching sheets
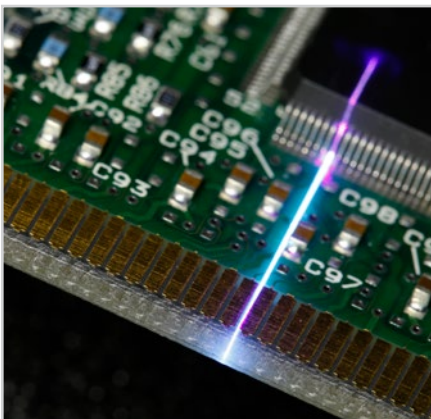
Position of electronic components
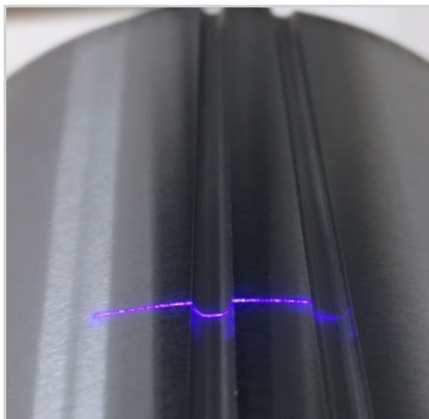
Notch position in silicon ingots
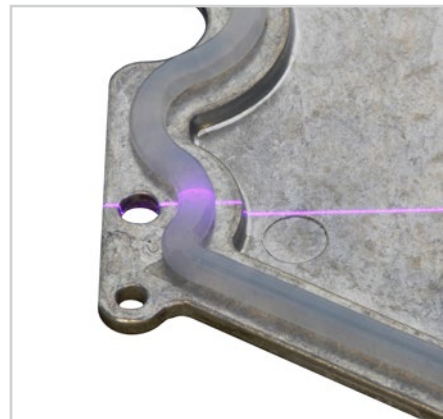
Inspection of silicone beads
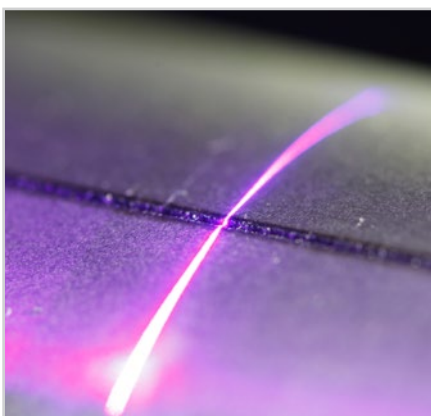
Completeness of laser welding seams

Thermal tests

Blue Laser patent protection with red-hot glowing and transparent surfaces

Measurements involving blue laser scanners on red-hot glowing objects exceeding 700 °C and (semi-)transparent objects are protected by patent law. Transparent objects include plastics, glass, adhesives, silicones, paints, coatings, Plexiglas and seals. Any questions about Blue Laser scanners? We will be pleased to advise you.

- Ideal for industrial series applications in production line & automation

- Resolution (x-axis) up to 640 points

- High reference resolution for the detection of finest details

- High signal stability

Sensor for series applications

scanCONTROL 25xx laser scanners are designed for industrial measurement tasks. The combination of compact design, versatility and signal stability enables an excellent price/performance ratio, especially for measurement tasks involving large quantities.

COMPACT and SMART performance classes for automation

The COMPACT sensors (scanCONTROL 2500) are integrated in the customer software to transmit the raw profiles. Therefore, numerous libraries including detailed documentation are available. In addition, direct integration into industrial image processing systems is possible since the sensors operate according to the international GigE Vision standard which enables individual integration of the scanners.

The SMART sensors (scanCONTROL 2510) are parameterized via the scanCONTROL Configuration Tools software and deliver direct measurement results without requiring any additional computer or controller. The sensor autonomously executes up to 4 measuring programs in parallel while delivering 4 measurement results per profile.

The scanCONTROL 2510 scanners are suitable for versatile profile measurement tasks. They measure and evaluate angles, steps, gaps, distances, extreme values and many more.

Comprehensive accessories for numerous measurement tasks

With three measuring ranges and comprehensive accessories including protective housings, cable types and interface converters, the scanCONTROL 25xx models are ideal for series integration in production lines and machine building.

Article designation

LLT	25	00	-25

Measuring range
25 mm
50 mm
100 mm

Class
00=COMPACT
10=SMART

Series
LLT25xx

No options available for scanCONTROL 25xx.

Model			LLT25xx-25	LLT25xx-50	LLT25xx-100
Z-axis	Standard measuring range	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	Start of measuring range	53 mm	65 mm	125 mm
		End of measuring range	79 mm	125 mm	390 mm
	Linearity [1]	(2 sigma)	±0.10 % FSO	±0.10 % FSO	±0.13 % FSO
	Reference resolution [2] [3]		2 μm	4 μm	12 μm
X-axis	Standard measuring range	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	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 300 Hz		
	Interfaces	Ethernet GigE Vision	Output of measurement values Sensor control Profile data transmission		
		Multi-function port — Digital inputs	Mode switching Encoder (counter) Trigger		
		Multi-function port — RS422 (half-duplex) [4]	Output of measurement values Sensor control Trigger Synchronization		
	Output of measurement values		Ethernet (UDP / Modbus TCP); RS422 (ASCII / Modbus RTU) analog [5]; switch signal [5] PROFINET [6]; EtherCAT [6]; EtherNet/IP [6]		
	Display (LED)		1x laser ON/OFF, 1x power/error/status		
	Light source		Semiconductor laser 658 nm (red)		
	Aperture angle of laser line		20°	25°	25°
	Laser power		≤ 8 mW (laser class 2M)		
	Laser switch-off		via software		
	Permissible ambient light (fluorescent light) [2]		10,000 lx		
	Protection class (sensor)		IP65		
	EMC requirements		according to: EN 61326-1: 2006-10 DIN EN 55011: 2007-11 (group 1, B class) EN 61000-6-2: 2006-03		
	Vibration		2 g / 20 ... 500 Hz		
	Shock		15 g / 6 ms		
	Operating temperature		0 … +45 ℃		
	Storage temperature		-20 … +70 ℃		
	Dimensions		96 x 85 x 33 mm		
	Sensor weight (without cable)		380 g		
	Supply		11 … 30 VDC, nominal value 24 V, 500 mA, IEEE 802.3af class 2, Power over Ethernet		

[1] Measuring range (standard)
[2] Measurement object: Micro-Epsilon standard object (metallic, diffusely reflecting material)
[3] According to a one-time averaging across the measuring field (640 points)
[4] RS422 interface, programmable either as serial interface or as input for triggering/synchronization
[5] Only with Output Unit
[6] Only with scanCONTROL Gateway
FSO = Full Scale Output

- Profile frequency up to 4,000 Hz, ideal for fast 2D/3D measurements

- Resolution (x-axis) up to 640 points

- High reference resolution for the detection of finest details

Compact design for all measurement tasks

The design of the LLT 26xx series is focused on compact size and low weight. The controller is integrated in the housing, simplifying cabling arrangements and mechanical integration. Due to its compact design and the profile frequency of up to 4000 profiles/sec., the 26xx series is especially suitable for dynamic and robotic applications.

Interfaces for universal integration

The multi-function port can be used for power supply, as data output, for switching parameters, as trigger input or for synchronizing several scanCONTROL sensors. During synchronous operation, an integrated mode can be used to operate the sensors alternately compensating for overlapping laser lines. One scanner is measuring whilst the other laser line is switched off.

The scanners can be supplied via Ethernet if necessary. If Industrial Ethernet is used as data output, only one cable will remain that connects the sensor to the periphery.

For all SMART sensors, the measurement data output can be carried out in three different ways, e.g., via Ethernet UDP, Modbus TCP or serial. Micro-Epsilon converters enable data transmission via analog signals, digital switching signals, PROFINET, Ethernet/IP or EtherCAT.

Article designation

LLT	26	00	-25	/SI	

Options - see below

Measuring range
25 mm
50 mm
100 mm

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

Series
LLT26xx

Laser options*

	/SI	Hardware switch-off of the laser line
	/3B	Improved laser power (class 3B, ≤20 mW), e.g., for dark surfaces

Cable output options*

	/PT	Cable directly out of the sensor ("Pigtail» Length 0.25 m
	/VT	Cable directly out of the sensor ("Variable Tail") Length 0.1 ... 1.0 m (freely selectable)
	/ST	1 cable directly out of the sensor ("Single Tail") multi-function port is omitted, Length 0.1 ... 1.0 m (freely selectable)

*Options can be combined

Model		LLT26xx-25	LLT26xx-50	LLT26xx-100
z-axis (height)				
Standard measuring range	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	Start of measuring range	53 mm	65 mm	125 mm
	End of measuring range	79 mm	125 mm	390 mm
Linearity [1]	(2 sigma)	±0.10 % FSO	±0.10 % FSO	±0.13 % FSO
Reference resolution [2] [3]		2 μm	4 μm	12 μm
x-axis (width)				
Standard measuring range	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	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	Standard	up to 300 Hz		
	HIGHSPEED	up to 4,000 Hz		
Interfaces	Ethernet GigE Vision	Output of measurement values Sensor control Profile data transmission		
	Digital inputs	Mode switching Encoder (counter) Trigger		
	RS422 (half-duplex) [4]	Output of measurement values Sensor control Trigger Synchronization		
Output of measurement values		Ethernet (UDP / Modbus TCP); RS422 (ASCII / Modbus RTU) analog [5]; switch signal [5] PROFINET [6]; EtherCAT [6]; EtherNet/IP [6]		
Display (LED)		1x laser ON/OFF, 1x power/error/status		
Light source		Semiconductor laser 658 nm (red)		
Aperture angle of laser line		20°	25°	25°
Laser power	Standard	≤ 8 mW (laser class 2M)		
	optional	≤ 20 mW (laser class 3B)		
Laser switch-off	optional	Hardware safety switch-off		
Permissible ambient light (fluorescent light) [2]		10,000 lx		
Protection class (sensor)		IP65		
EMC requirements		according to: EN 61326-1: 2006-10 DIN EN 55011: 2007-11 (group 1, B class) EN 61000-6-2: 2006-03		
Vibration		2 g / 20 ... 500 Hz		
Shock		15 g / 6 ms		
Operating temperature		0 … +45 °C		
Storage temperature		-20 … +70 °C		
Dimensions		96 x 85 x 33 mm		
Sensor weight (without cable)		380 g		
Supply		11 … 30 VDC, nominal value 24 V, 500 mA, IEEE 802.3af class 2, Power over Ethernet		

In the Interfaces row, "Multi-function port" labels the Digital inputs and RS422 (half-duplex) subsections.

[1] Measuring range (standard)
[2] Measurement object: Micro-Epsilon standard object (metallic, diffusely reflecting material)
[3] According to a one-time averaging across the measuring field (640 points)
[4] RS422 interface, programmable either as serial interface or as input for triggering/synchronization
[5] Only with Output Unit
[6] Only with scanCONTROL Gateway
FSO = Full Scale Output

- **Ideal for precise 2D/3D measurements**

- **Resolution (x-axis) up to 1,280 points**

- **Profile frequency up to 2,000 Hz**

- **Also available with patented Blue Laser Technology**

Compact design for precise measurement tasks

The design of the LLT 29xx series is focused on compact size and low weight. The controller is integrated in the housing, simplifying cabling arrangements and mechanical integration. Due to its compact design and the high profile resolution, the LLT29xx series is especially suitable for static, dynamic and robotic applications.

Interfaces for universal integration

The multi-function port can be used for power supply, as data output, for switching parameters, as trigger input or for synchronizing several scanCONTROL sensors. During synchronous operation, an integrated mode can be used to operate the sensors alternately compensating for overlapping laser lines. One scanner is measuring whilst the other laser line is switched off. The scanners can be supplied via Ethernet if necessary. If Industrial Ethernet is used as data output, only one cable will remain that connects the sensor to the periphery.

For all SMART sensors, the measurement data output can be carried out in three different ways, e.g., via Ethernet UDP, Modbus TCP or serial. Micro-Epsilon converters enable data transmission via analog signals, digital switching signals, PROFINET, Ethernet/IP or EtherCAT.

Small measuring range with high resolution

With a laser line of just 10 mm, the LLT29xx-10/BL models recognize the finest of details and structures. The high profile resolution combined with the blue laser line allow for maximum precision destined for versatile applications, e.g., in the electronics production.

Available with patented Blue Laser Technology

The Blue Laser technology uses a laser diode with a shorter wavelength of 405 nm. The outstanding characteristics of this wavelength range enable measurements on red-hot glowing metals, (semi-)transparent and organic objects.

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=COMPACT
10=SMART
50=HIGHSPEED
60=HIGHSPEED SMART

Series
LLT29xx

Laser options*

	/SI	Hardware switch-off of the laser line
	/3B	Improved 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 output options*

	/PT	Cable directly out of the sensor ("Pigtail» Length 0.25 m
	/VT	Cable directly out of the sensor ("Variable Tail") Length 0.1 ... 1.0 m (freely selectable)
	/ST	1 cable directly out of the sensor ("Single Tail") multi-function port is omitted, Length 0.1 ... 1.0 m (freely selectable)

*Options can be combined

Model	LLT	29xx-10/BL	29xx-25	29xx-50	29xx-100
z-axis (height)					
Standard measuring range	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	Start of measuring range	-	53 mm	65 mm	125 mm
	End of measuring range	-	79 mm	125 mm	390 mm
Linearity [1]	(2 sigma)	±0.17 % FSO	±0.10 % FSO	±0.10 % FSO	±0.10 % FSO
Reference resolution [2] [3]		1 μm	2 μm	4 μm	12 μm
x-axis (width)					
Standard measuring range	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	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
	HIGHSPEED	up to 2,000 Hz

Interfaces		Ethernet GigE Vision	Output of measurement values Sensor control Profile data transmission
	Multi-function port	Digital inputs	Mode switching Encoder (counter) Trigger
		RS422 (half-duplex) [4]	Output of measurement values Sensor control Trigger Synchronization

Output of measurement values	Ethernet (UDP / Modbus TCP); RS422 (ASCII / Modbus RTU) analog [5]; switch signal [5] PROFINET [6]; EtherCAT [6]; EtherNet/IP [6]
Display (LED)	1x laser ON/OFF, 1x power/error/status

Light source	Standard	Semiconductor laser 405 nm (blue)	Semiconductor laser 658 nm (red)		
	optional	-	Semiconductor laser 405 nm (blue)		
Aperture angle of laser line		10°	20°	25°	25°
Laser power	Standard	≤ 8 mW (laser class 2M)			
	optional	-	≤ 20 mW (laser class 3B)		
Laser switch-off	optional	Hardware safety switch-off			

Permissible ambient light (fluorescent light) [2]	10,000 lx
Protection class (sensor)	IP65
EMC requirements	according to: EN 61326-1: 2006-10 DIN EN 55011: 2007-11 (group 1, B class) EN 61000-6-2: 2006-03
Vibration	2 g / 20 ... 500 Hz
Shock	15 g / 6 ms
Operating temperature	0 … +45 °C
Storage temperature	-20 … +70 °C
Dimensions	96 x 118.5 x 33 mm 96 x 85 x 33 mm
Sensor weight (without cable)	440 g 380 g
Supply	11 … 30 VDC, nominal value 24 V, 500 mA, IEEE 802.3af class 2, Power over Ethernet

[1] Measuring range (standard)
[2] Measurement object: Micro-Epsilon standard object (metallic, diffusely reflecting material)
[3] According to a one-time averaging across the measuring field (640 points)
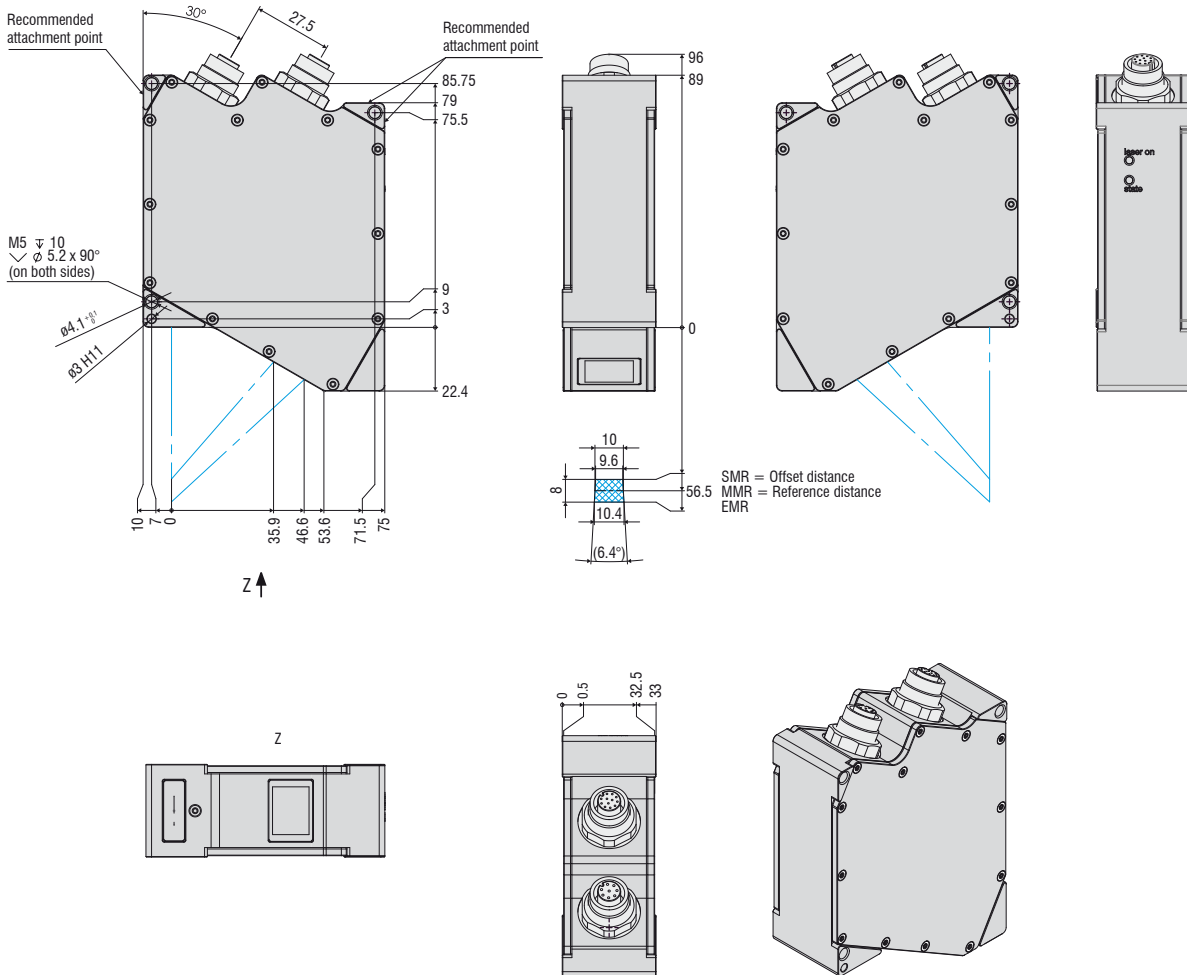[4] RS422 interface, programmable either as serial interface or as input for triggering/synchronization
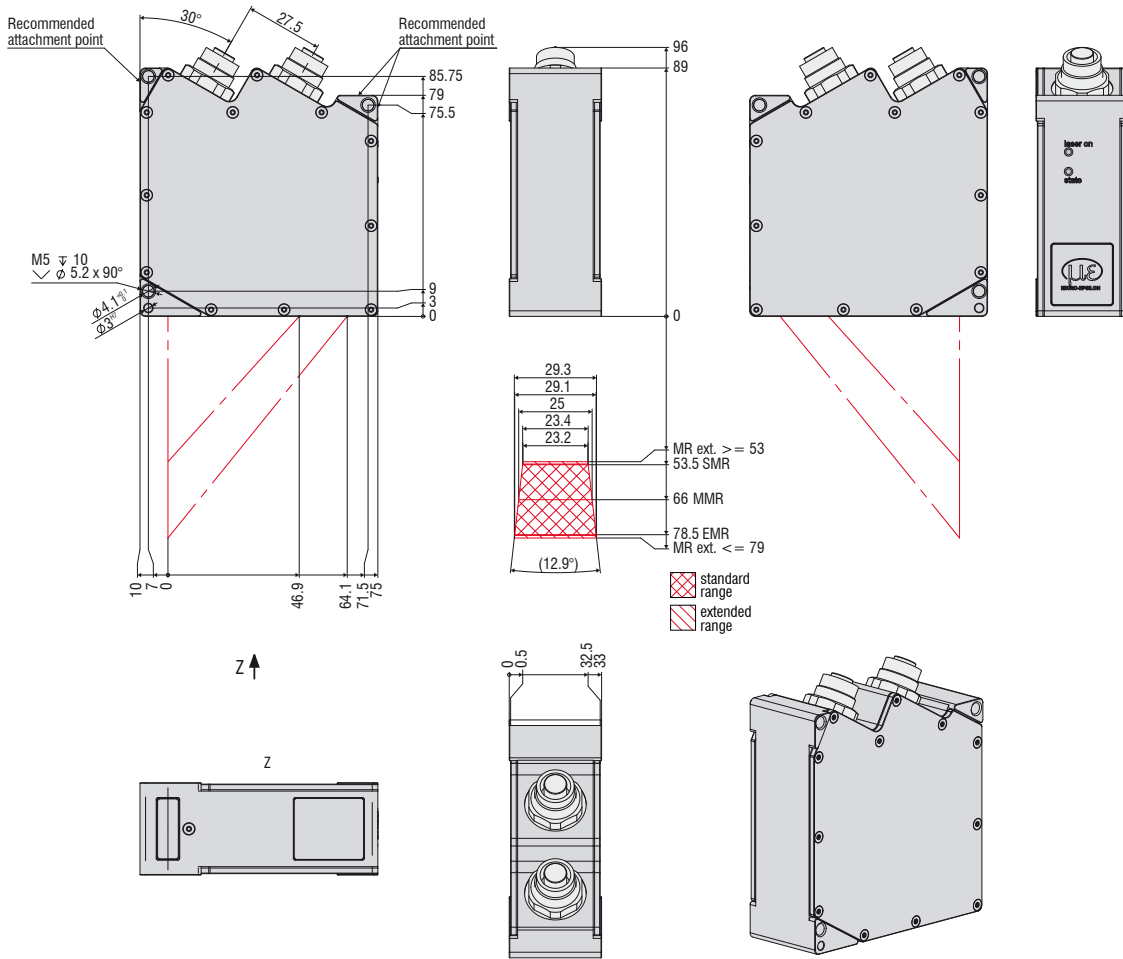[5] Only with Output Unit
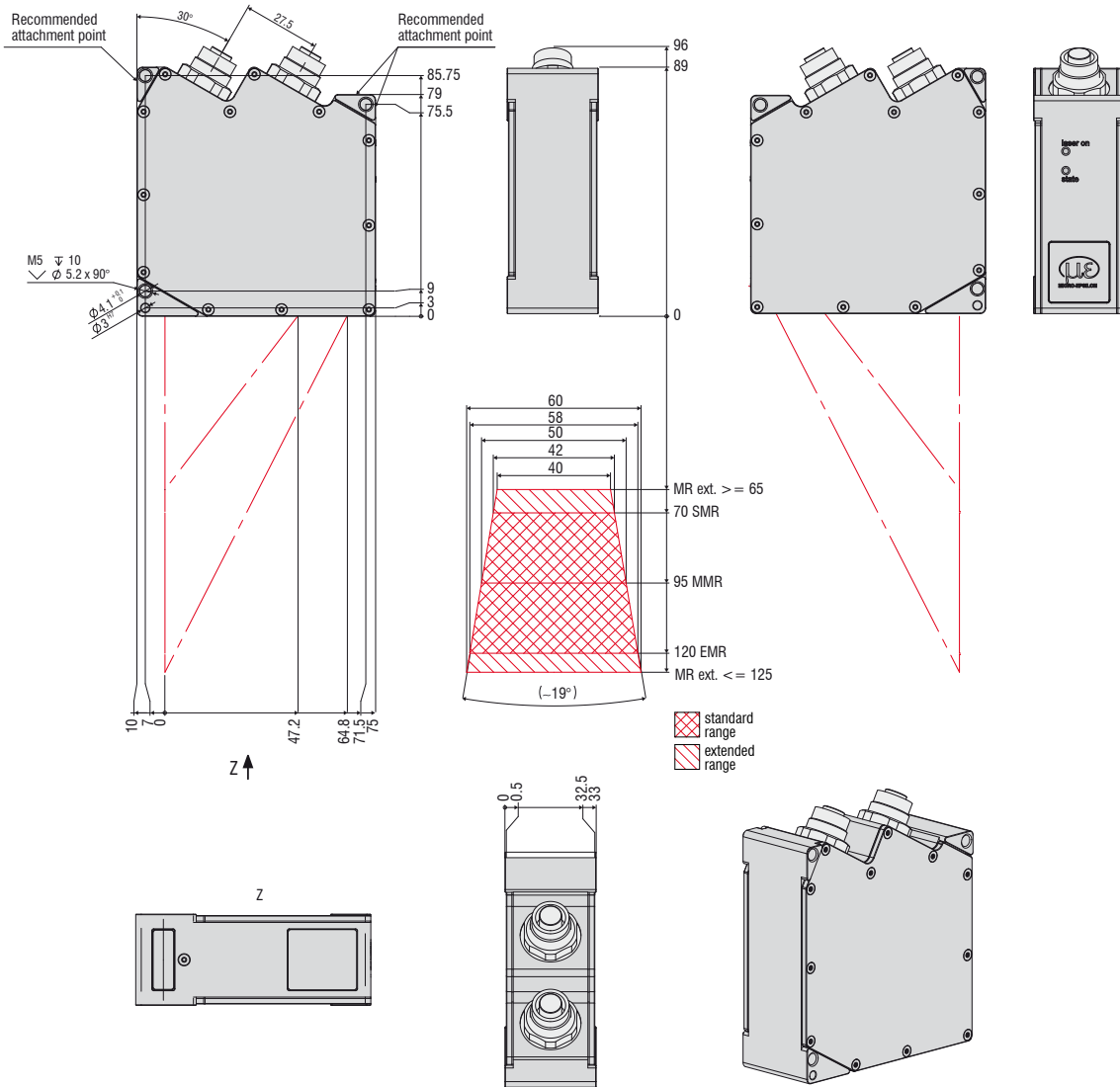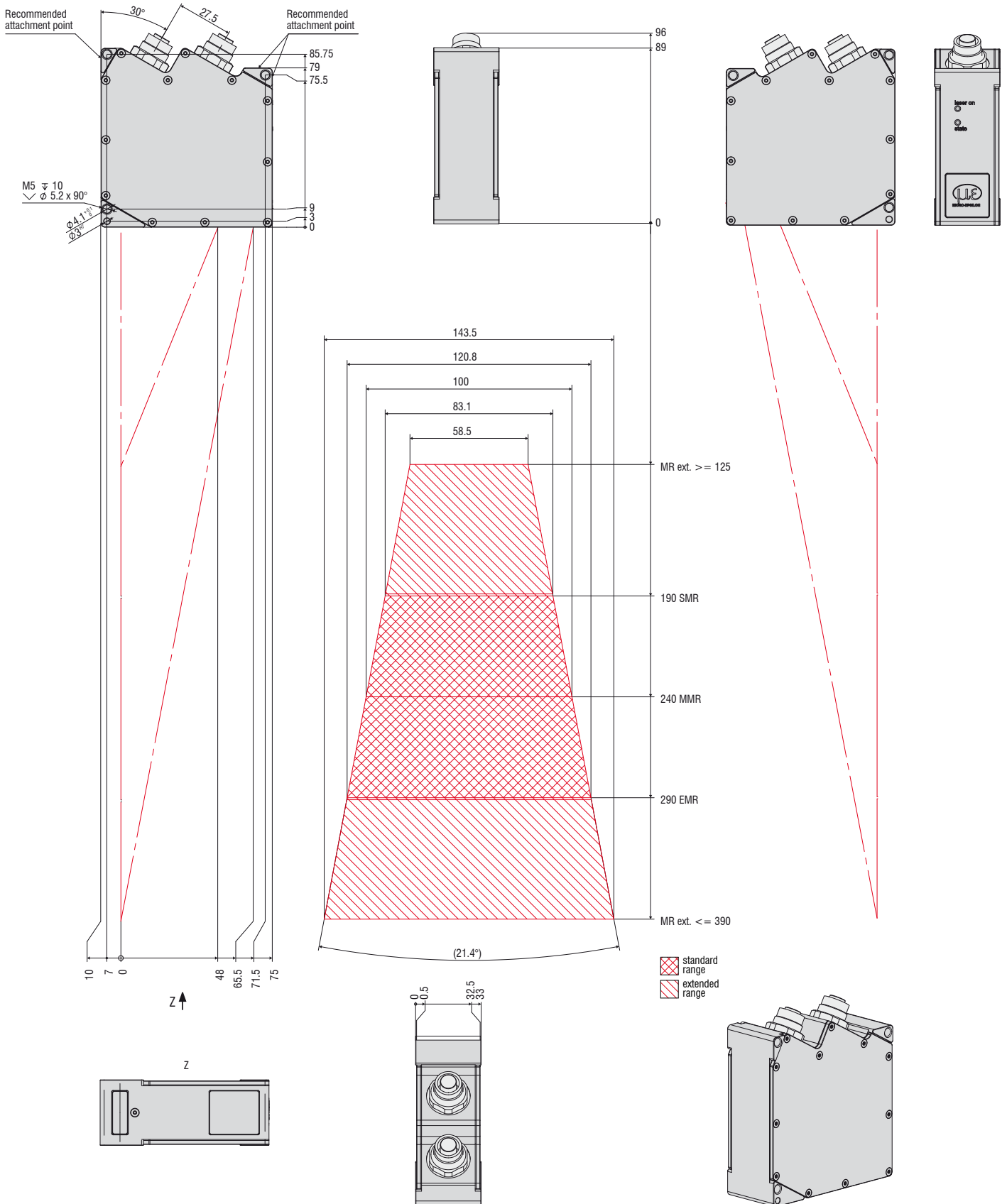[6] Only with scanCONTROL Gateway
FSO = Full Scale Output

LLT29x0-10/BL

Recommended attachment point

Recommended attachment point

30°   27.5

85.75
79
75.5

M5 ⊽ 10
⌵ ⌀ 5.2 x 90°
(on both sides)

9
3

ø4.1 +0.1

ø3 H11

22.4

10
7
0   35.9 46.6 53.6 71.5 75

Z

96
89

0

10
9.6
8
10.4
(6.4°)

56.5

SMR = Offset distance
MMR = Reference distance
EMR

laser on

state

Z

0 0.5   32.5 33

LLT25x0/LLT26x0/29x0-25

Recommended attachment point
30°   27.5   Recommended attachment point

85.75
79
75.5

M5 ▽ 10
▽ ⌀ 5.2 x 90°
⌀4.1
⌀3

9
3
0

10
7
0
46.9
64.1
71.5
75

Z↑

Z

96
89

0

29.3
29.1
25
23.4
23.2

MR ext. >= 53
53.5 SMR
66 MMR
78.5 EMR
MR ext. <= 79
(12.9°)

standard range
extended range

0
0.5
32.5
33

laser on
state

LLT25x0/LLT26x0/29x0-50

Recommended attachment point

Recommended attachment point

30°   27.5

85.75
79
75.5

M5 ⊽ 10
⌵ ∅ 5.2 x 90°

∅ 4.1
∅ 3

9
3
0

96
89

0

60
58
50
42
40

MR ext. > = 65
70 SMR

95 MMR

120 EMR
MR ext. < = 125

(−19°)

standard range
extended range

10
7
0

47.2

64.8
71.5
75

Z

Z

0
0.5

32.5
33

laser on

state

LLT25x0/LLT26x0/29x0-100

Recommended attachment point

30°   27.5

Recommended attachment point

85.75
79
75.5

M5 ▽ 10
⌀ 5.2 x 90°
⌀4.1
⌀3°

9
3
0

96
89

0

143.5
120.8
100
83.1
58.5

MR ext. >= 125

190 SMR

240 MMR

290 EMR

MR ext. <= 390

(21.4°)

standard range
extended range

laser on
state

10
7
0

48
65.5
71.5
75

Z

z

0
0.5

32.5
33

scanCONTROL 30xx

- *High resolution in x- and z-axis*

- *Profile frequency up to 10 kHz for monitoring of dynamic processes*

- *Innovative exposure control*

- *Available with patented Blue Laser Technology*

Fast and precise 2D/3D profile measurements

The latest LLT30xx laser profile scanners provide calibrated 2D profile data with up to 5.5 million points per second. Enabling profile frequency of 10 kHz, the HIGHSPEED models are used for monitoring tasks in dynamic processes. The high-resolution sensor matrix with 2,048 points achieves a point distance of just 12 μm (LLT30xx-25).

Available with patented Blue Laser Technology

The scanCONTROL 30xx/BL laser profile scanners are equipped with a blue-violet laser diode. Particularly with semi-transparent measurement objects, the blue laser offers high signal stability.

The easy way of machine integration

The design of the LLT30xx series is compact and lightweight. The controller is integrated in the sensor itself, which simplifies mechanical integration. Numerous interfaces such as digital switch signals, Ethernet, PROFINET, EtherNet/IP or EtherCAT allow for measured data to be output directly.

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 auto exposure feature enables to individually select the areas to be exposed.

Top performances with selectable operating 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.

Article designation

LLT	30	00	-25	/SI	

Options - see below

Measuring range
25 mm
50 mm

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

Series
LLT30xx

Laser options*

/SI	Hardware switch-off of the laser line
/3R	Increased laser power (class 3R, $\leq$ 30 mW), e.g., for dark surfaces
/BL	Blue laser line (405 nm) for (semi-) transparent, red-hot glowing and organic materials

Cable output options*

/PT	Cable directly out of the sensor ("Pigtail"), Length 0.3 m
/VT	Cable directly out of the sensor ("Variable Tail") with a length of 0.6 or 1.0 m
/ST	1 cable directly out of the sensor ("Single Tail"), multi-function port is omitted, with a length of 0.6 or 1.0 m

*Options can be combined

Model		LLT30xx-25	LLT30xx-25/BL	LLT 30xx-50	LLT 30xx-50/BL
Z-axis Standard measuring range	Start of measuring range	77.5 mm		105 mm	
	Mid of measuring range	85 mm		125 mm	
	End of measuring range	92.5 mm		145 mm	
	Height of measuring range	15 mm		40 mm	
Linearity [1]	(2 sigma)	±0.08 % FSO	±0.06 % FSO	±0.08 % FSO	±0.06 % FSO
Reference resolution [2] [3]		1.5 μm		3 μm	
X-axis Standard measuring range	Start of measuring range	22.9 mm		43 mm	
	Mid of measuring range	25 mm		50 mm	
	End of measuring range	26.8 mm		57 mm	
Resolution (x-axis)		2,048 points/profile			
Profile frequency	Standard	up to 300 Hz			
	HIGHSPEED	up to 10,000 Hz			
Interfaces	Ethernet GigE Vison	Output of measurement values Sensor control Profile data transmission			
	Digital inputs	Mode switching Encoder (counter) Trigger			
	RS422 (half-duplex) [4]	Output of measurement values Sensor control Trigger Synchronization			
Output of measurement values		Ethernet (UDP / Modbus TCP); RS422 (ASCII / Modbus RTU) analog [5]; switch signal [5] PROFINET [6]; EtherCAT [6]; EtherNet/IP [6]			
Display (LED)		1 x Laser ON/OFF, 1 x Data, 1 x Error			
Light source		Semiconductor laser 658 nm (red)	Semiconductor laser 405 nm (blue)	Semiconductor laser 658 nm (red)	Semiconductor laser 405 nm (blue)
Aperture angle of laser line		23°		28°	
Laser power	Standard	≤ 10 mW (laser class 2M)			
	optional	≤ 30 mW (laser class 3R)	-	≤ 30 mW (laser class 3R)	-
Laser switch-off		via software, hardware switch-off with /SI option			
Permissible ambient light (fluorescent light) [2]		10,000 lx			
Protection class (sensor)		IP67 (when connected)			
EMC requirements		according to DIN EN 61000-6-2: 2005, DIN EN61000-6-3: 2007, DIN EN61326-1:2013 and DIN EN50581:2012			
Vibration		2 g / 20 … 500 Hz			
Shock		15 g / 6 ms			
Operating temperature		0 … +45 °C			
Storage temperature		-20 … +70 °C			
Dimensions		96 x 112 x 40 mm			
Sensor weight (without cable)		415 g			
Supply		11 … 30 VDC, nominal value 24 V, 500 mA, IEEE 802.3af class 2, Power over Ethernet			

FSO = Full Scale Output
[1] Measuring range (standard)
[2] Measurement object: Micro-Epsilon standard object
[3] According to a one-time averaging across the measuring field (2,048 points)
[4] RS422 interface, programmable either as serial interface or as input for triggering/synchronization
[5] Only with Output Unit
[6] Only with scanCONTROL Gateway

LLT30xx-25
LLT30xx-25/BL

77.5 SMR	
85 MMR	
92.5 EMR	

LLT 30xx-50
LLT 30xx-50/BL

29

96
83
77

ø8 H7 $\left(\begin{smallmatrix} +0.015 \\ 0 \end{smallmatrix}\right)$

ø8 H7 $\left(\begin{smallmatrix} +0.015 \\ 0 \end{smallmatrix}\right)$

5.5
0
10

8.5

6
0
6.5
100
106

40
ø13.5
20

0
8.9
31.1
40

0
(10)

57
50
43

105 SMR
125 MMR
145 EMR
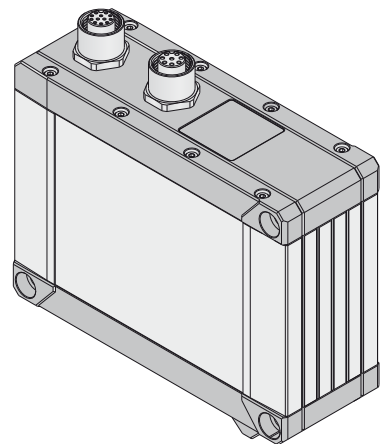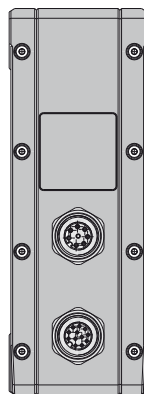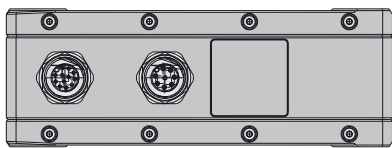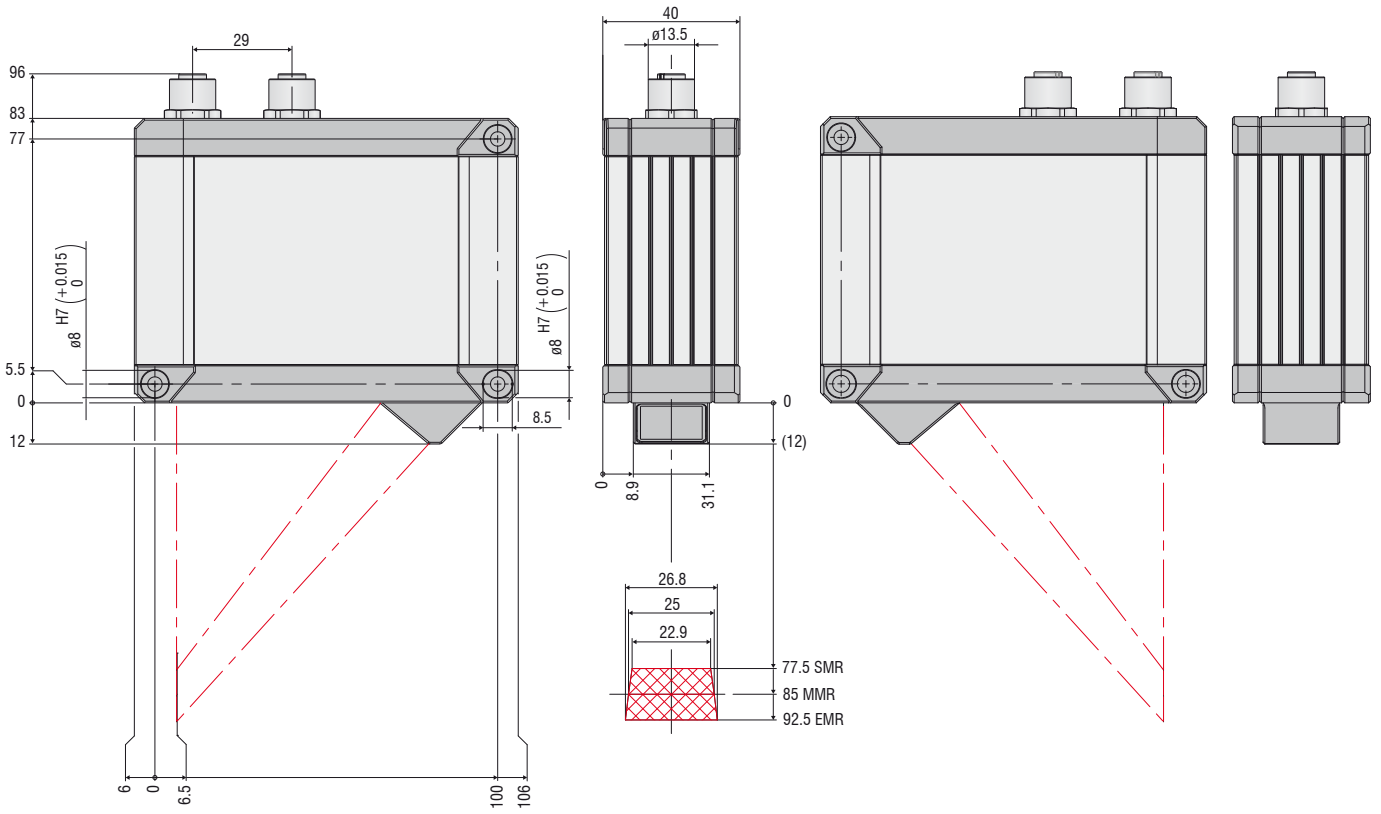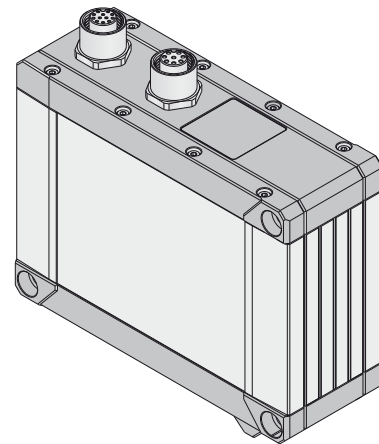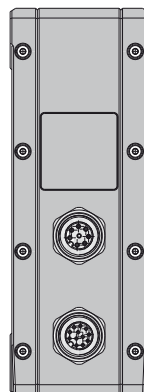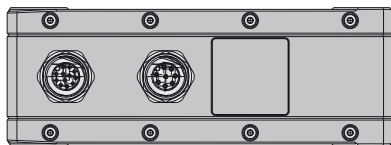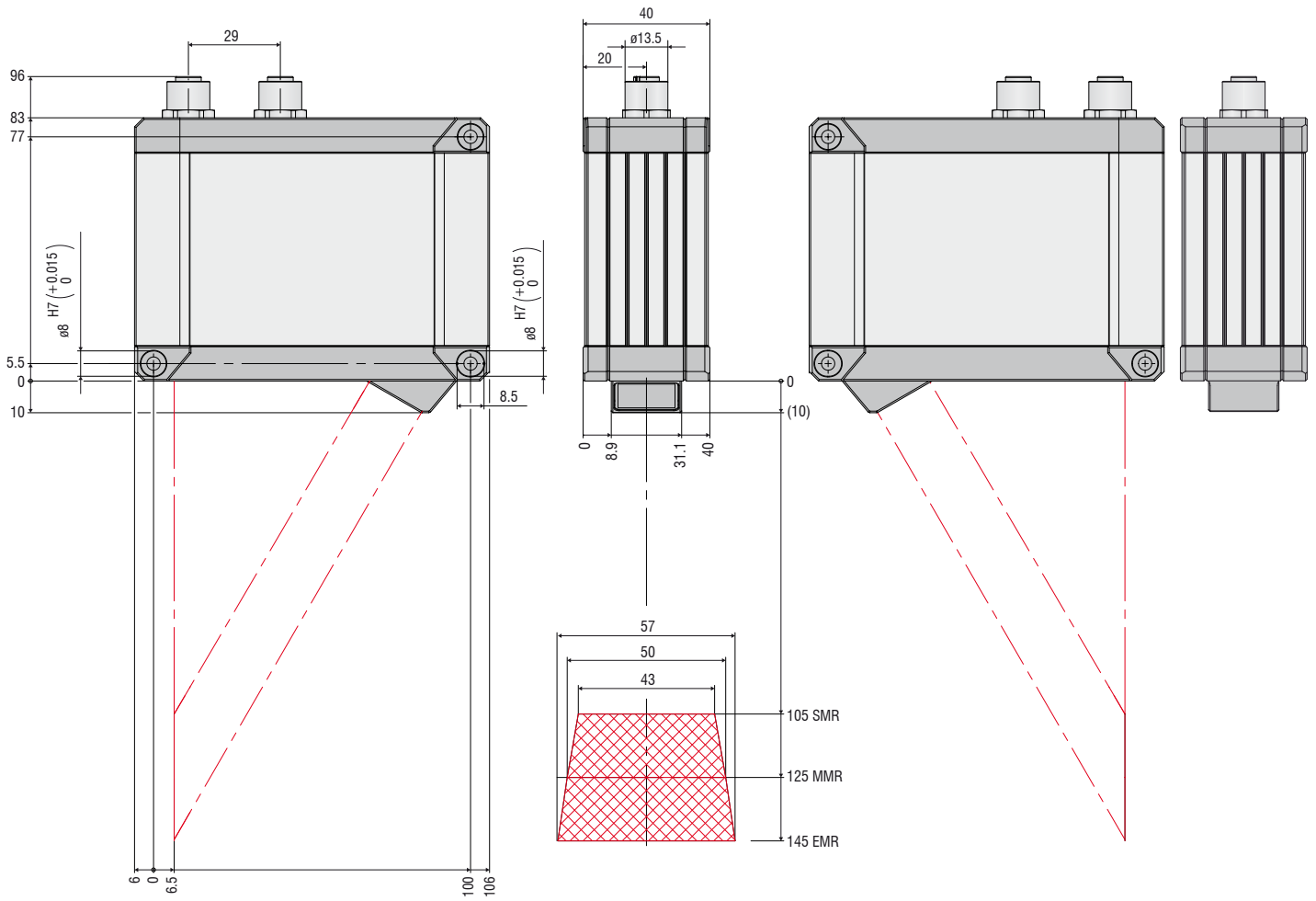
- *Plug & Play solution for complex measurement tasks*

- *Evaluation directly in the sensor without external controller*

- *Parallel execution of different measurement tasks and multiple evaluation*

- *Easy online and offline analysis*

The sensors of the Smart series have an integrated intelligent controller for easy profile evaluation without additional PC. Configuration and parameter setup of the sensor is via the scanCONTROL Configuration Tools software. It helps you to set up the sensor, view profiles, save/load and export profiles. All software functions can also be executed without a sensor in order to test the measurement task offline for very fast processes.

Download:
www.micro-epsilon.com/configurationtools

Easy **5-Step Configuration**

1.
Alignment of the sensor

2.
Sensor setting
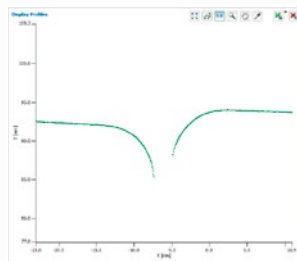
The software enables the user to completely configure the scanner in just five simple steps. After configuration, the scanner is in standalone mode and transmits the measured values to a PLC.

3.
Selection of measurement programs

4.
Configuration of measurement programs
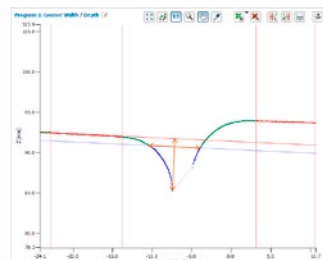
5.
Output and display of measured values

Numerous **Setting Options**

- 8 measuring programs x 8 evaluations per parameter set
- 15 independent parameter packages can be stored in the sensor
- Unlimited memory for parameter sets on the computer
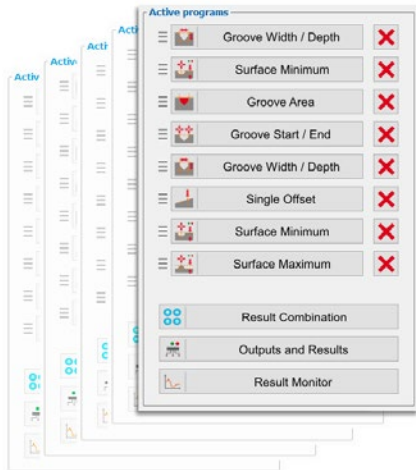
Wide Range of **Measurement Tools**
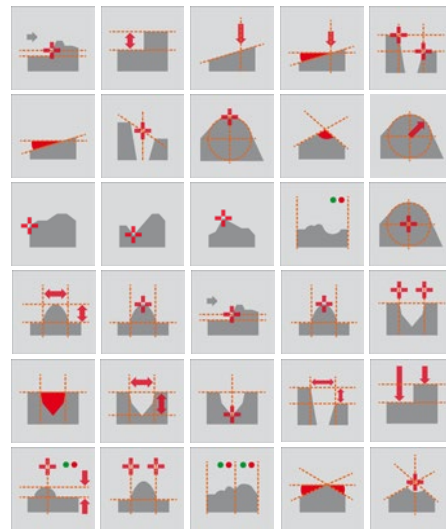
Logical **Links**

- Combined query of different conditions
- Summarized result evaluation in the sensor as OK/NOK
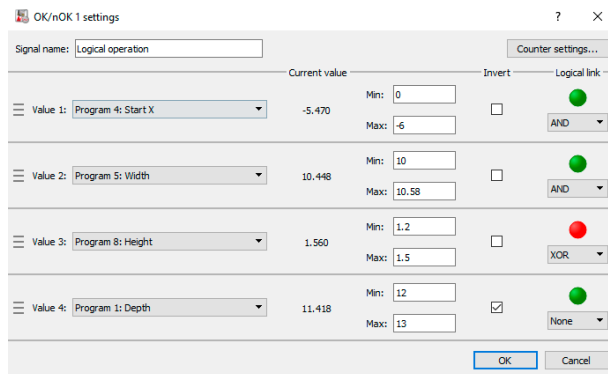
Full Control over **the Sensor State**
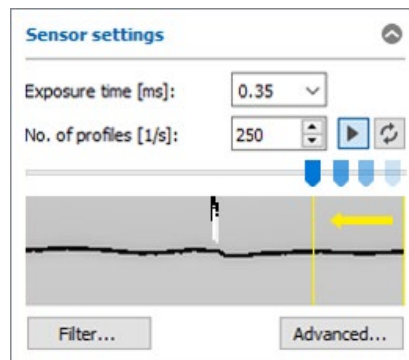
Active **Ring Buffer**

Allows, for example, the user to rewind live measurements without previous data recording.

- *Display of profile sequences*

- *Offline or real-time display of 3D profiles*

- *Synchronization of the direction of travel (e.g. using an encoder)*

- *2D export of the profile sequences (PNG)*

- *3D export (asc, stl, csv, ply) for CAD programs*

- *Intensity per point can be displayed and exported*

3D visualization for all scanCONTROL models
A third dimension of the measured data is obtained by a relative movement between sensor and target. The y-coordinates are assigned via a trigger or CMM counter.

The scanCONTROL 3D-View software is designed for viewing and exporting this 3D data. In addition, 3D-View also supports the configuration of the sensor.

The software enables the interactive viewing of 3D data and the export of this measurement data to common data formats. Various display modes, views and color palettes help in setting up the sensors and analyzing the profiles. The software supports the online visualization of the profiles as well as offline analysis of stored profile sequences.

Download:
www.micro-epsilon.com/3d-view

Different visualization options for better visibility of characteristics:

Color visualization: intensity

Color visualization: reflection width

Color visualization: moment 0

Color visualization: z coordinate
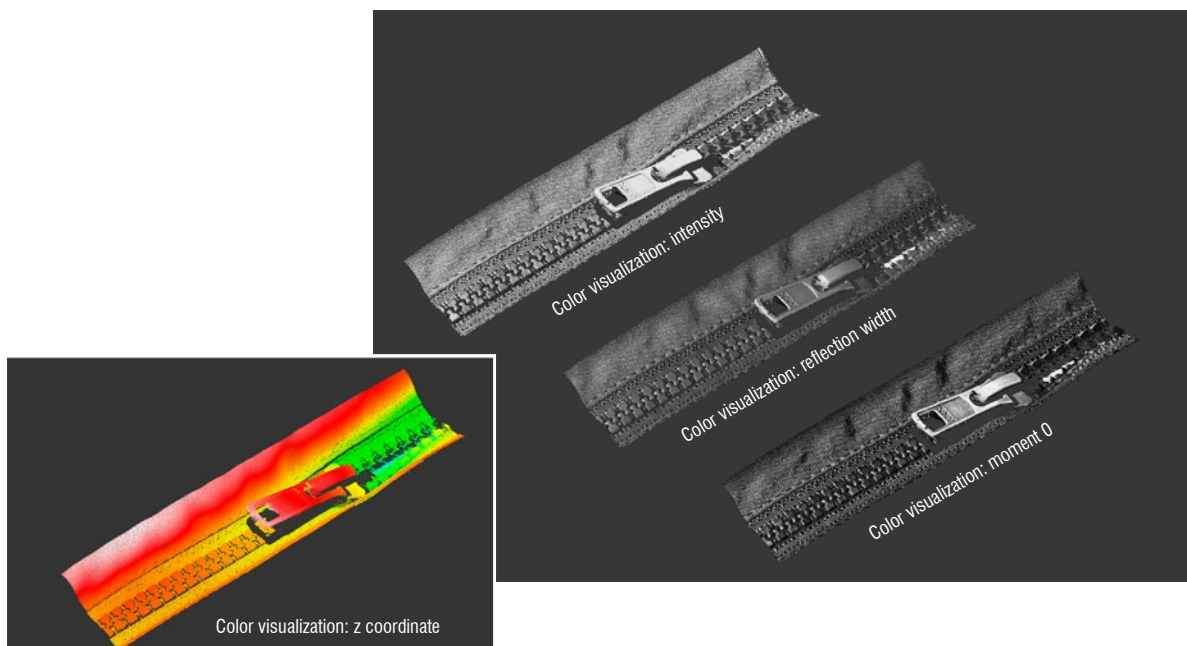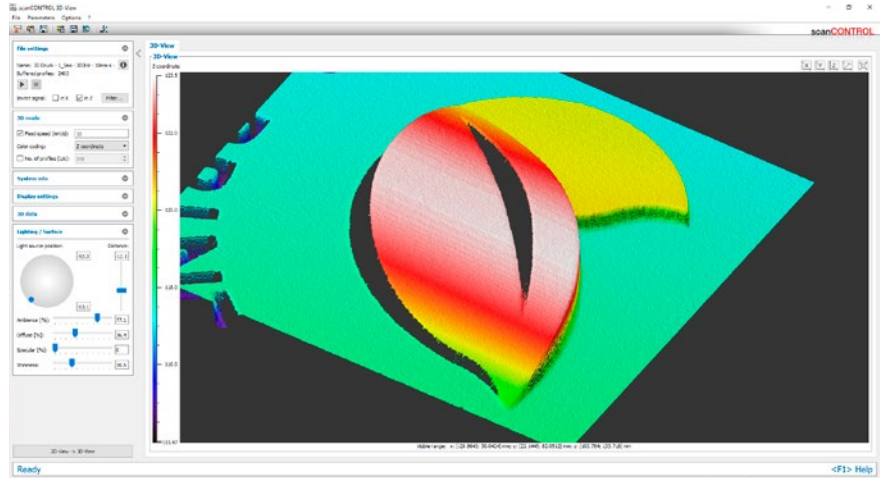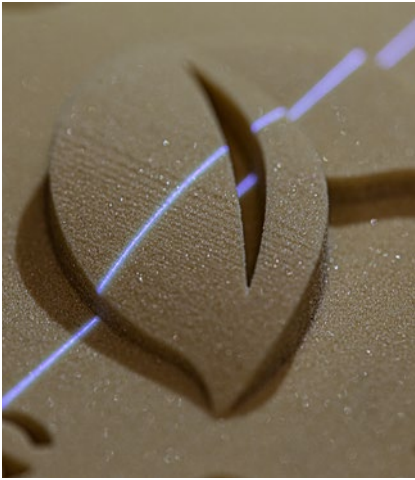
Scan (left) and 3D image of the object scanned (right)
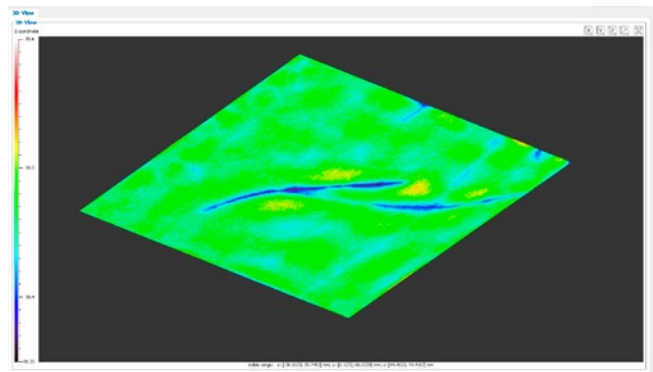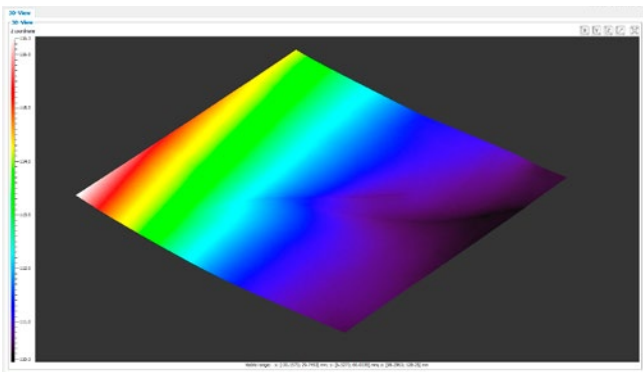
Fitting of a plane to make even the slightest unevenness on multiple-bent components visible.
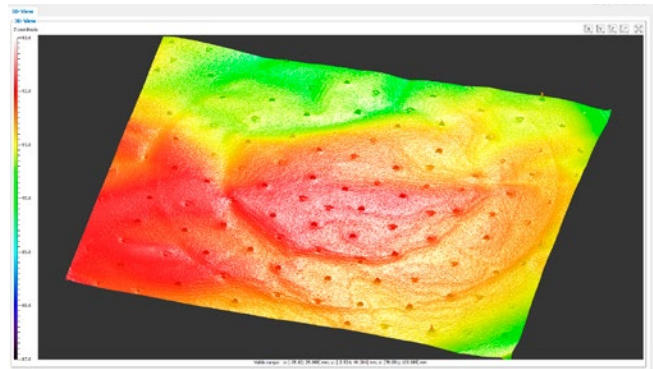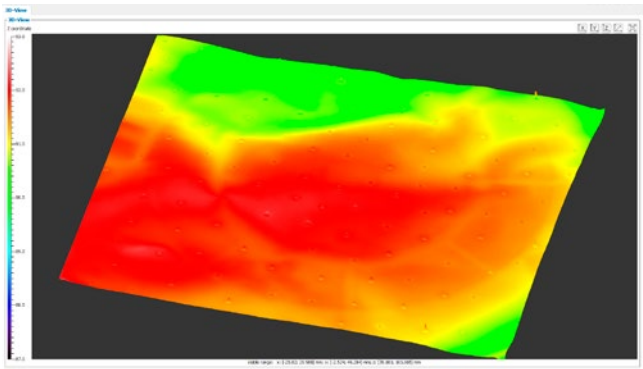
Different illumination options to highlight surface structures. With (left) and without illumination (right).

The COMPACT and HIGHSPEED sensors detect one profile per measurement from individual, calibrated points. Users can transfer these profiles to their own applications either individually or combined as an array/matrix in a container set. In addition to the data transfer of individual measuring points and their additional information (e.g. intensity, counter reading) the entire configuration of the sensor can also be controlled from its own application software.

Micro-Epsilon provides a number of interfaces to access the parameter and data transfer functions. The transmission interface primarily used by scanCONTROL sensors for communications and profile transfer is Ethernet.

Ethernet and GigE Vision
Each scanCONTROL sensor complies with the GigE Vision Standard (Gigabit Ethernet for Machine Vision) of the AIA (Automated Imaging Association).

The standard is widely used in the image processing industry and is therefore supported by all conventional computer vision tools, ensuring fast and smooth integration into different image processing software packages – also for 3D evaluation.

GigE Vision ensures optimum data security, perfect performance and short design-in times during implementation. GigE Vision is based on Gigabit Ethernet and offers a maximum transfer rate. Ethernet technology offers advantages such as long cable lengths without using repeaters/ hubs, and it permits the use of inexpensive network components. The GigE Vision standard provides an open framework for data transmission (e.g. profiles, data sets) and control signals between the laser scanner and a PC. The infrastructure topology provides numerous opportunities for single and multiple scanner applications.

Profile recording   Grayscale image   Image processing software
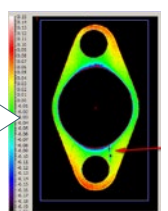
Integration with the C/C++ library

The C/C++ library for scanCONTROL supports both static and dynamic loading. Both stdcall and cdecl are supported as calling conventions. The individual functions of the library are clearly documented in the interface description and explained using examples.

The scanCONTROL SDK integration package includes:
- LLT.DLL library file
- Interfaces and scanCONTROL documentation
- Numerous programming examples for C++, Python, C# and Visual Basic (e.g. trigger, container mode)

The scanCONTROL Developer Tool demo program offers a complete integration example based on C++ for quick testing of the sensor configuration.

Integration with LabVIEW

The LabVIEW scanCONTROL instrument driver supports fast integration of scanCONTROL sensors into the LabVIEW application environment. For accessing a scanCONTROL sensor and its basic settings, users can drag-and-drop modules directly from the function palette into their VIs. Example VIs illustrating the scanCONTROL integration are also part of this package.

The integration of scanCONTROL sensors into the LabVIEW environment is based on the C/C++ library (LLT.DLL) of Micro-Epsilon. Detailed documentation also shows how to set up additional special sensor parameters.

Integration with Linux

The integration into Linux is performed using an Open Source C library which has been extended by some important control features for scanCONTROL. An additional C++ library enables fast sensor integration of the entire functionality into a user-friendly API.

This library is based on the GeniCam standard which is why the sensor can be controlled either via GeniCam commands or directly via the control parameters listed in the documentation. For integration support (e.g. trigger, container mode), also some example programs are available.

Use on ARM embedded PCs (e.g. Raspberry Pi) is possible with restrictions.

- *Measurement value evaluation of up to 8 laser scanners*

- *Transmission of measured values to higher-level system control*

- *Digital and analog IN/OUT*

- *Integrated web server for display of results*

- *Numerous possibilities for recording measurement values*

Many applications require several scanners, e.g., for contour measurement or when detecting large components. The scanCONTROL Smart PLC Unit is an industrial control unit incl. tailor-made application software for measurement value calculation intended for laser scanners of the scanCONTROL SMART product classes.
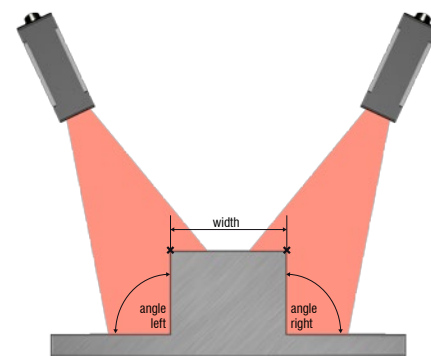
The scanned measurement values are evaluated, displayed, recorded and transmitted to higher-level control systems using analog and digital interfaces as well as numerous fieldbus connections (e.g., Profinet, Ethernet IP, EtherCAT, etc.). The modular design of the Smart PLC Unit enables the user to connect up to 8 laser scanners.
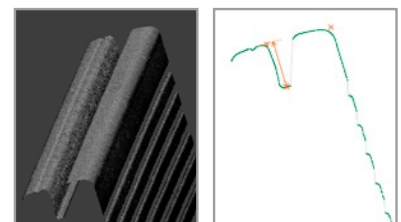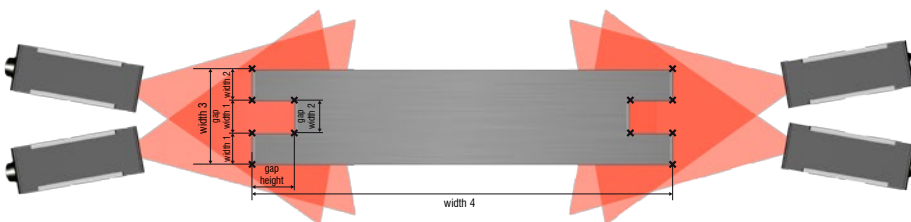
Application examples:

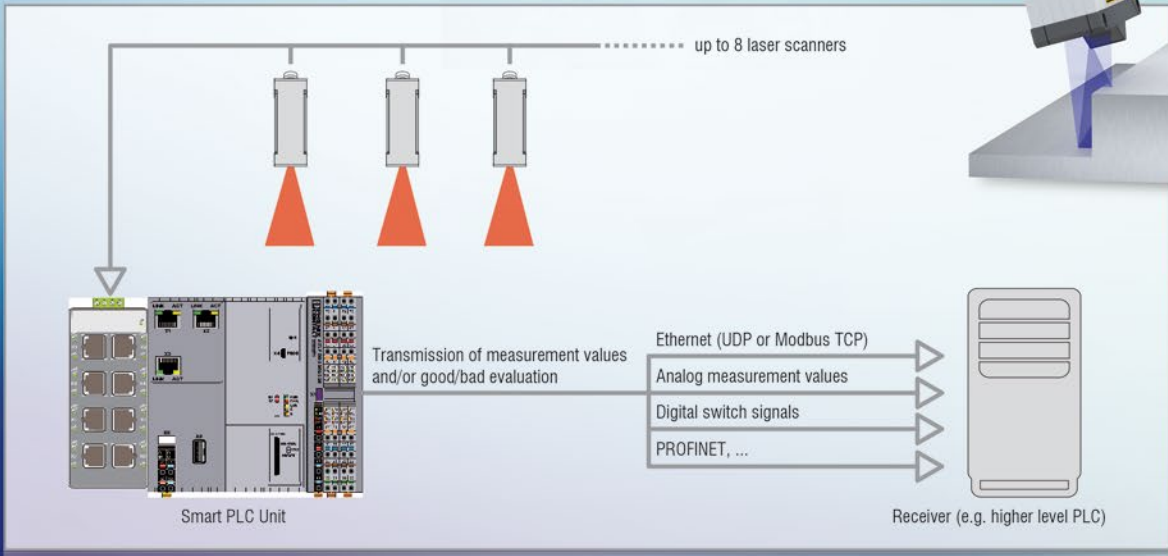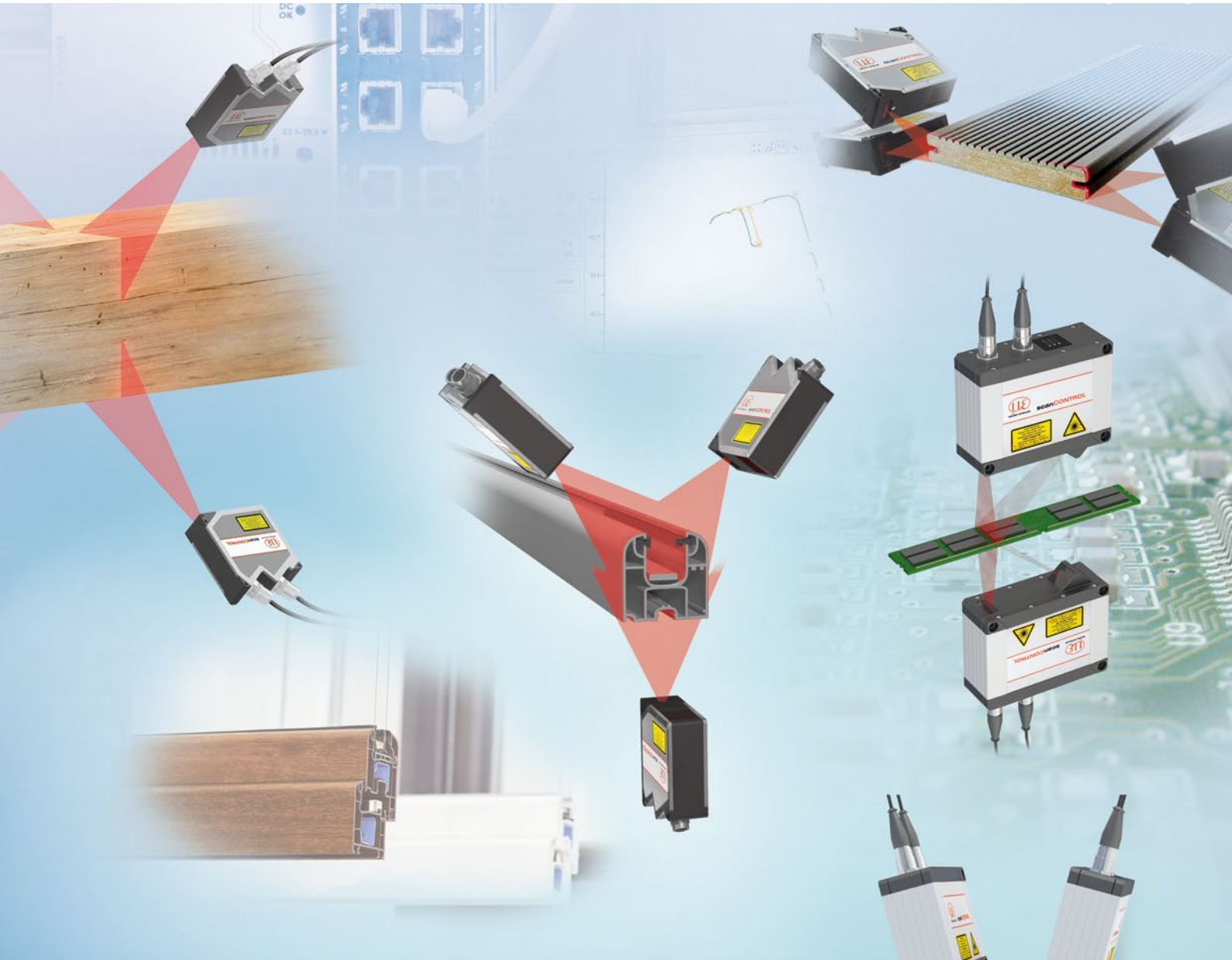**Determination of cross-section in the extrusion process**
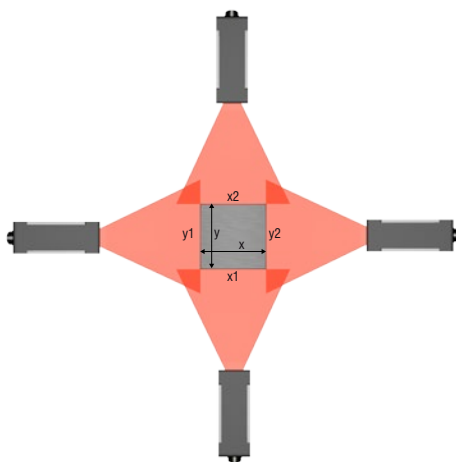
Contour measurement of a land

Profile control (profile width, land width, groove width, groove depth)

up to 8 laser scanners

Transmission of measurement values and/or good/bad evaluation

Ethernet (UDP or Modbus TCP)

Analog measurement values

Digital switch signals

PROFINET, ...

Smart PLC Unit

Receiver (e.g. higher level PLC)

PROFINET / EtherCAT / EtherNet/IP – for all SMART scanners

Each scanCONTROL Gateway can be connected with up to 4 sensors.* It 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.

Alternatively, the gateway can also be parameterized in advance at the factory.

* operating more than one sensor requires a switch.

scanCONTROL Gateway II
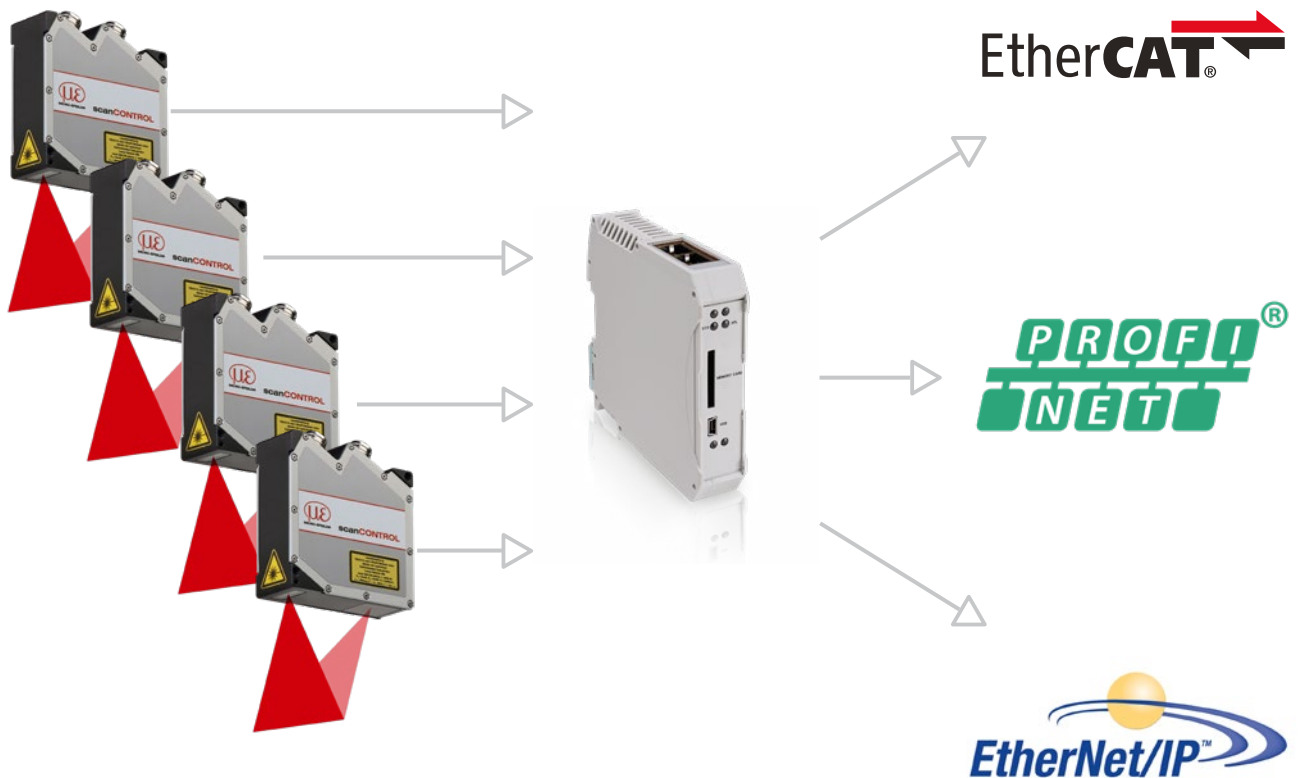
Gateway

6414142	scanCONTROL Gateway II	Fieldbus coupler, configurable for PROFINET, EtherNet/IP and EtherCAT
6414142.001	scanCONTROL Gateway II, pre-parameterized	Pre-parameterized to customer log and IP addresses
6411168	scanCONTROL SPU Switch, 5 ports	Industrial Ethernet Switch (unmanaged) for DIN rail, 10/100/1000 Mbit/s, 5 ports
6411167	scanCONTROL SPU Switch, 8 ports	Industrial Ethernet Switch (unmanaged) for DIN rail, 10/100/1000 Mbit/s, 8 ports

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

Analog signals / digital switch signals - for all SMART scanners
The scanCONTROL Output Unit is addressed via Ethernet and outputs analog and digital
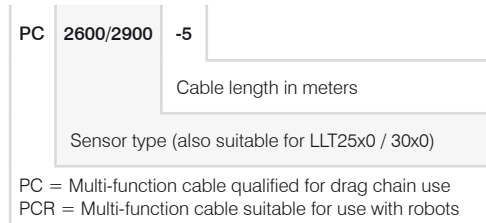signals. Different output terminals can be connected to the fieldbus coupler.

scanCONTROL Output Unit

Analog signals

Digital signals
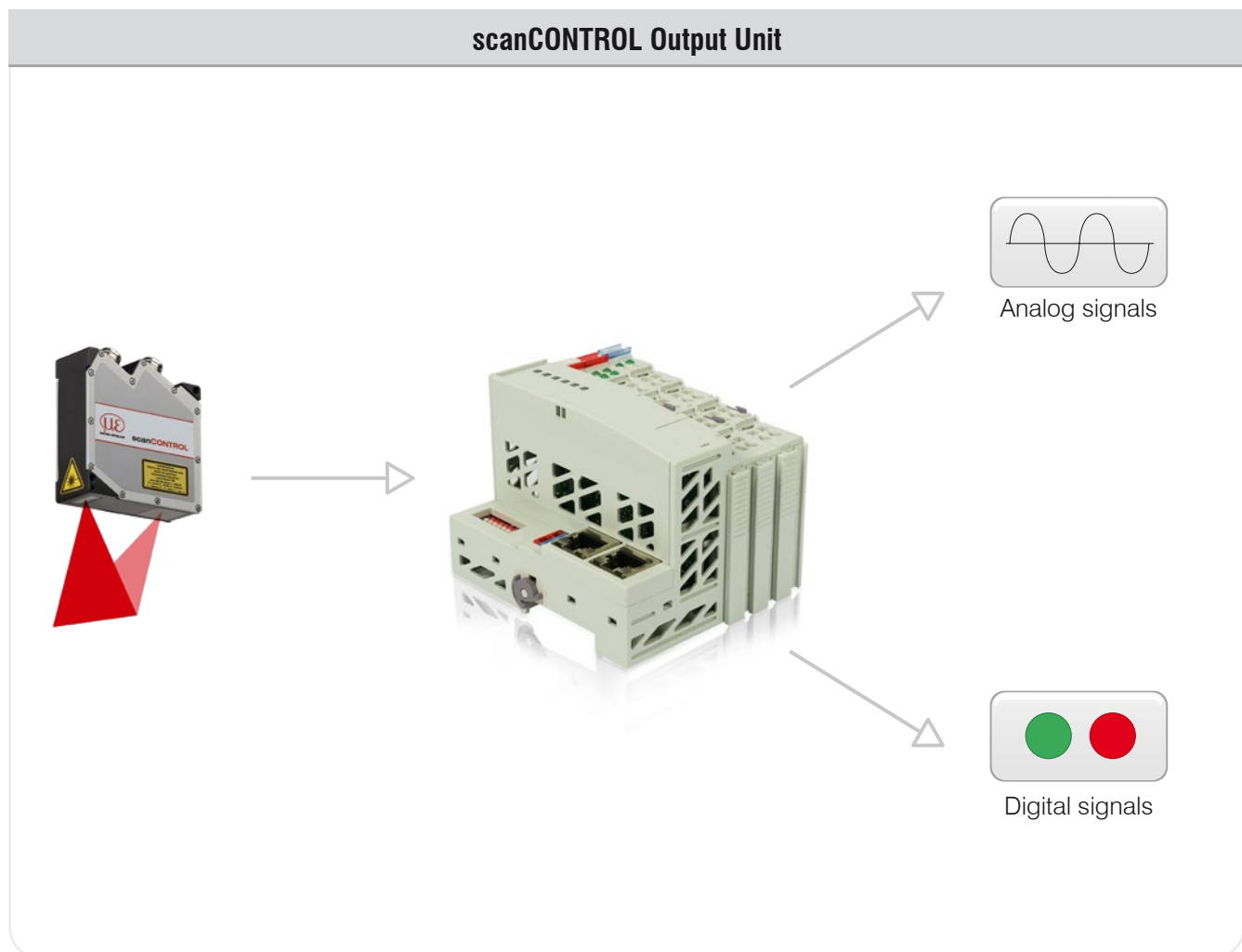
Output Unit

6414073	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/±10V	4-channel analog output terminal; ±10 V
0325135	OU-AnalogOut/4-channel/0-10V	4-channel analog output terminal; 0-10V
0325132	OU-AnalogOut/4-channel/0-20mA	4-channel analog output terminal; 0-20 mA
0325133	OU-AnalogOut/4-channel/4-20mA	4-channel analog output terminal; 4-20 mA

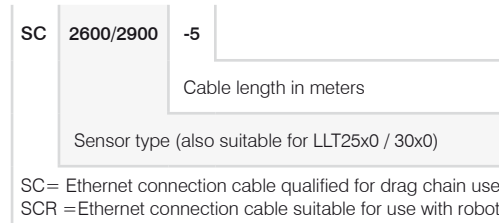Other terminals available on request.

Connection cable

Multi-function cable
For power supply, digital inputs
(TTL or HTL), RS422 (half-duplex)

PC	2600/2900	-5	
		Cable length in meters	
	Sensor type (also suitable for LLT25x0 / 30x0)		

PC = Multi-function cable qualified for drag chain use
PCR = Multi-function cable suitable for use with robots

Ethernet connection cable
For parameter setup, value and profile transmission

SC	2600/2900	-5	
		Cable length in meters	
	Sensor type (also suitable for LLT25x0 / 30x0)		

SC = Ethernet connection cable qualified for drag chain use
SCR = Ethernet connection cable suitable for use with robots

Accessories

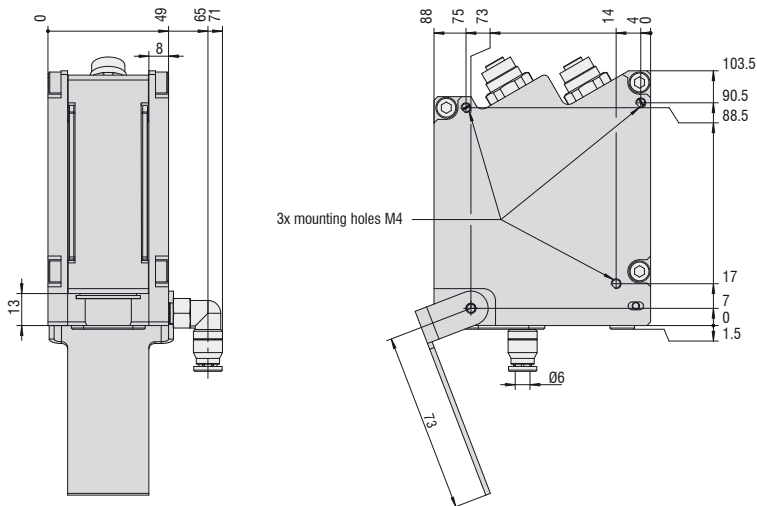| Art. no.	Model	Description
0323478	Connector/12-pin/Multifunction for LLT25/26/29/30 series	Plug for multifunction port
0323479	Connector/8-pin/Ethernet for LLT25/26/29/30 series	Plug for Ethernet socket
2420067	PS25/26/29/30	Power supply unit for scanCONTROL
0254111	Case for LLT25/26/29/30 series	Transport case for scanCONTROL sensors incl. measuring stand
2960097	Measuring stand for LLT26/29/30	Measuring stand with sensor adapter board, flexible rod and clamp base
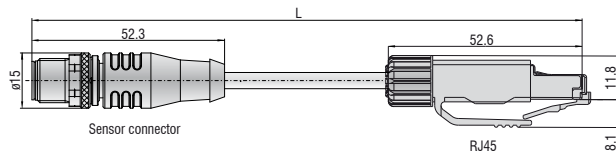
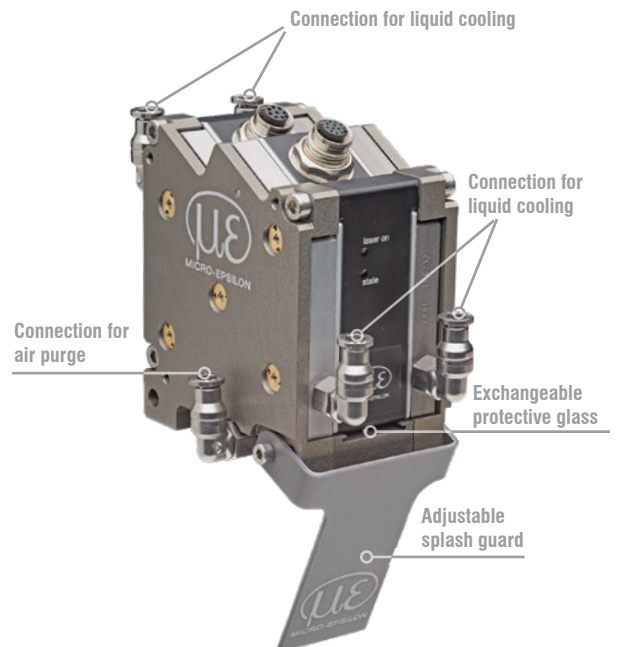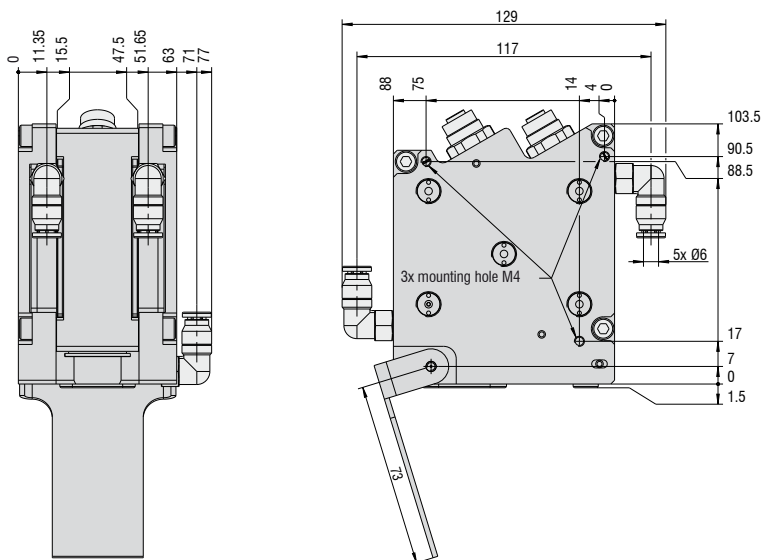
Ethernet connection cable
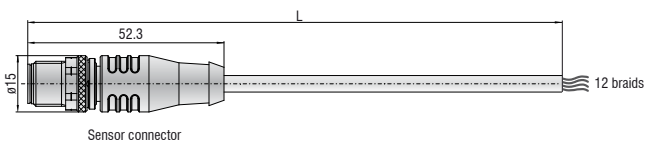
Multi-function cable

Protection and cooling housing for LLT25xx, LLT26xx and 29xx

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

Protection housing with blow-out system

Protection housing with blow-out system and water cooling

Art. no.	Model	Description
2105058	Protection housing for LLT25/26/29 series	Adaptive protection housing for LLT25xx/26xx/29xx
2105059	Protective cooling housing for LLT25/26/29 series	Adaptive protection and cooling housing for LLT25xx/26xx/29xx
0755075	Exchangeable glass of protection housing for LLT25/26/29	Exchangeable glass for protection/cooling concept LLT25/26/29, 50 pcs.

Sensors and Systems from Micro-Epsilon

Sensors and systems for displacement, distance and position

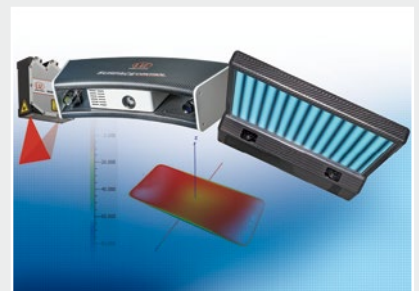Sensors and measurement devices for non-contact temperature measurement

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