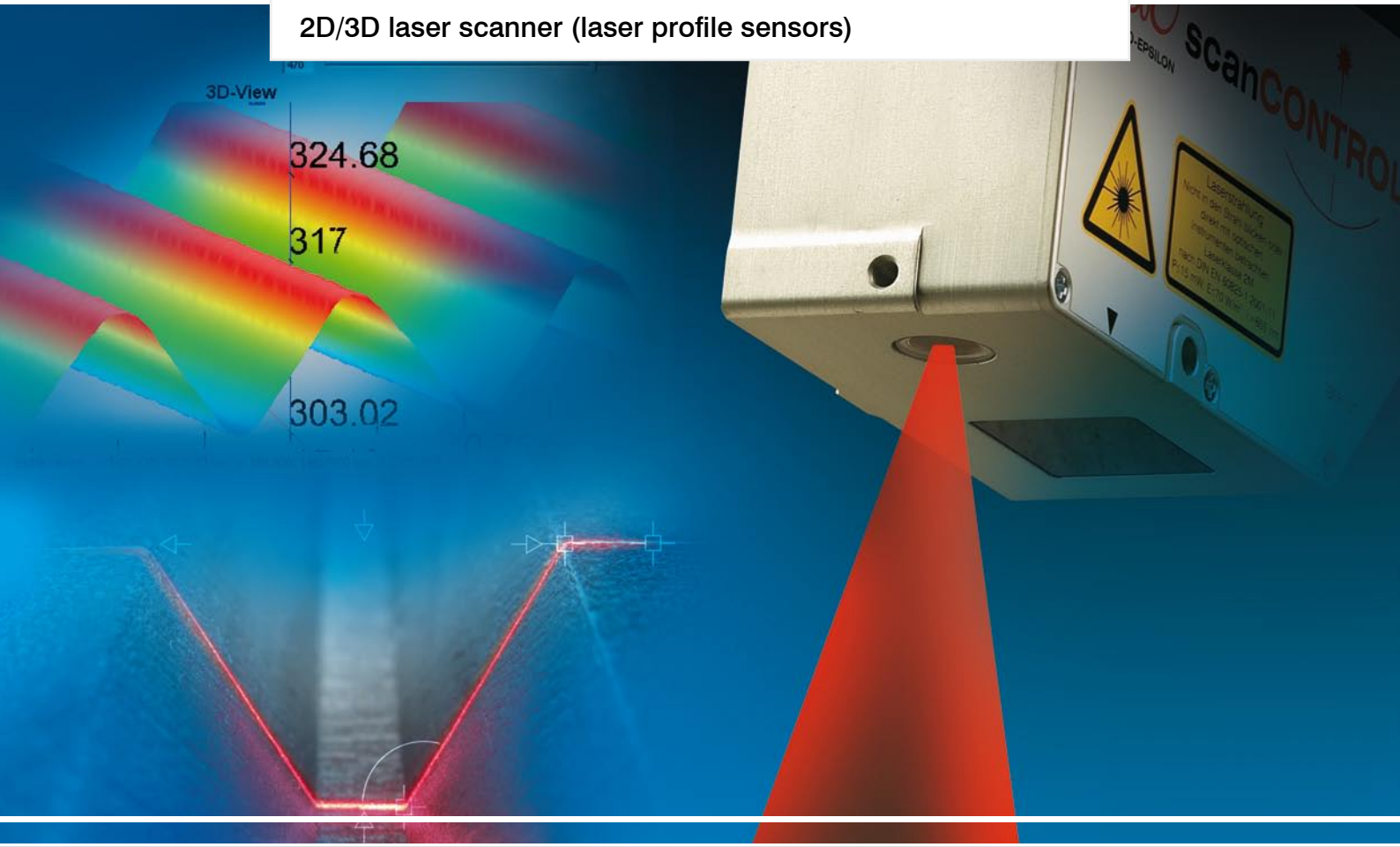
MICRO-EPSILON

More Precision.

scanCONTROL

2D/3D laser scanner (laser profile sensors)

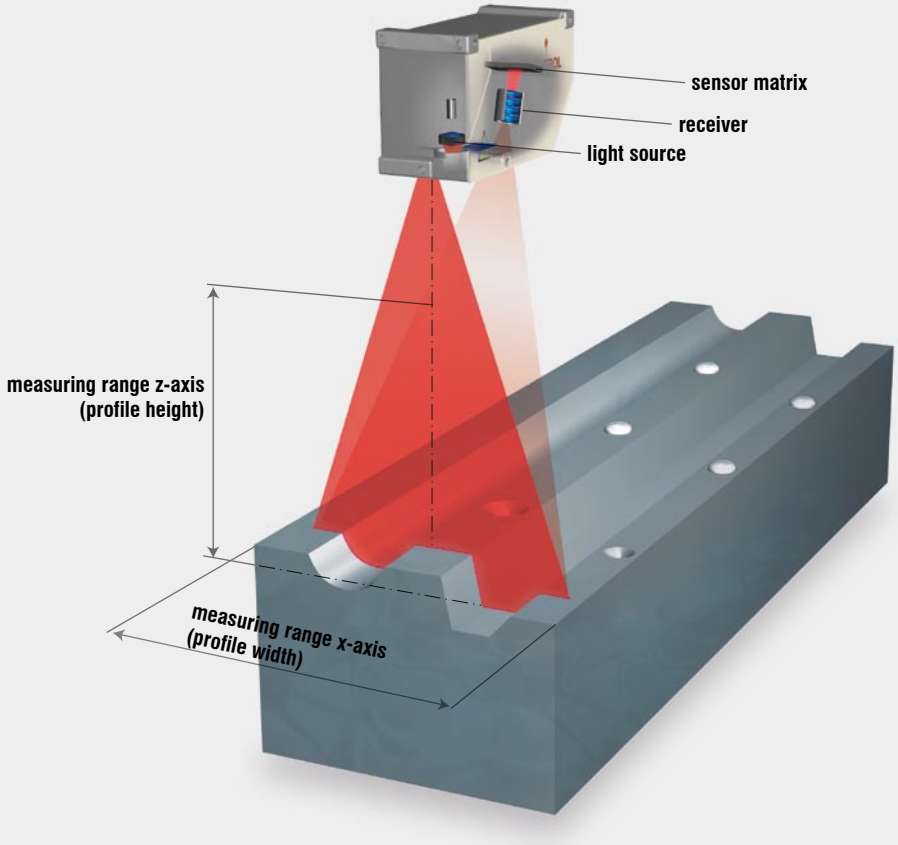


scanCONTROL

Laser scanner for precise profile measurement and evaluation

Measuring principle	3
Overview	4 - 5
Advantages	6 - 7
Applications	8 - 9
scanCONTROL 2700 / 2750 / 2710	10 - 19
scanCONTROL 2800 / 2810	20 - 29
Configuration Tools software	30 - 31
3D-View software	32 - 33
Integrating in application software	34 - 35

Measuring principle: laser line triangulation



What is scanCONTROL?

Laser scanner from the scanCONTROL series record, measure and evaluate profiles on a variety of different target surfaces. With its scanCONTROL series, Micro-Epsilon offers everything from pre-configured sensors to complex measuring systems from a single source.

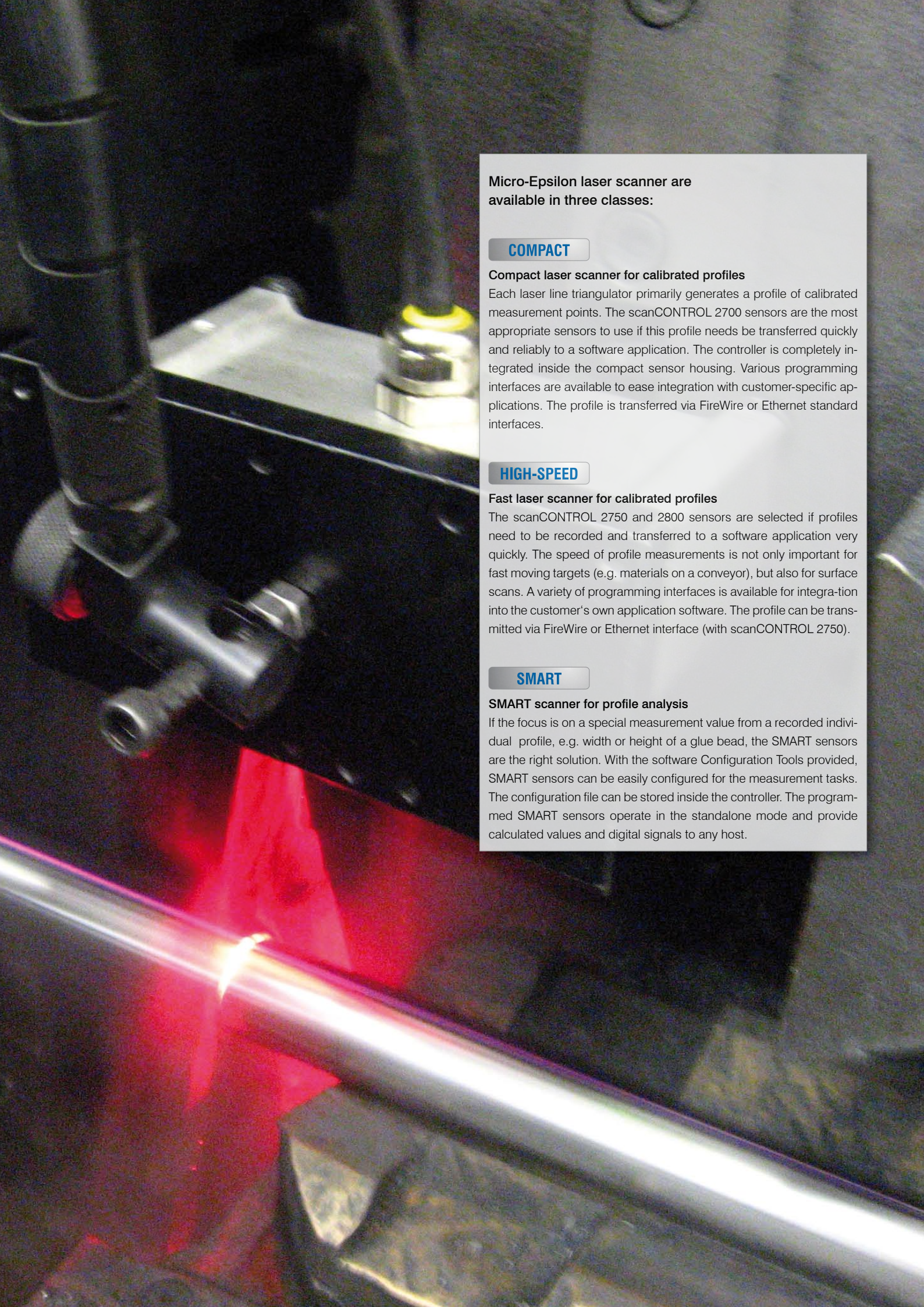
The measuring principle

Laser scanner from Micro-Epsilon - 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. A high quality optical system 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 then 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)
The diffusely reflected light from the laser line is shown on the 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



Micro-Epsilon laser scanner are available in three classes:

COMPACT

Compact laser scanner for calibrated profiles

Each laser line triangulator primarily generates a profile of calibrated measurement points. The scanCONTROL 2700 sensors are the most appropriate sensors to use if this profile needs be transferred quickly and reliably to a software application. The controller is completely integrated inside the compact sensor housing. Various programming interfaces are available to ease integration with customer-specific applications. The profile is transferred via FireWire or Ethernet standard interfaces.

HIGH-SPEED

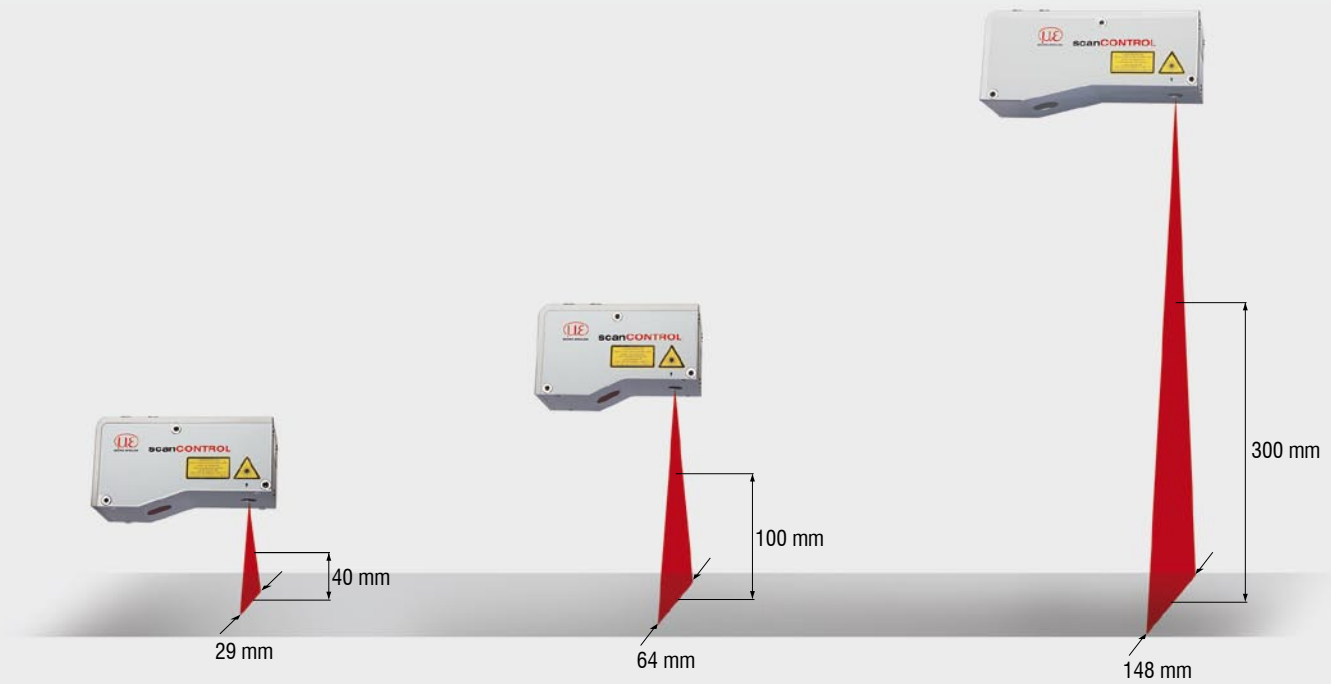
Fast laser scanner for calibrated profiles

The scanCONTROL 2750 and 2800 sensors are selected if profiles need to be recorded and transferred to a software application very quickly. The speed of profile measurements is not only important for fast moving targets (e.g. materials on a conveyor), but also for surface scans. A variety of programming interfaces is available for integra-tion into the customer‘s own application software. The profile can be transmitted via FireWire or Ethernet interface (with scanCONTROL 2750).

SMART

SMART scanner for profile analysis

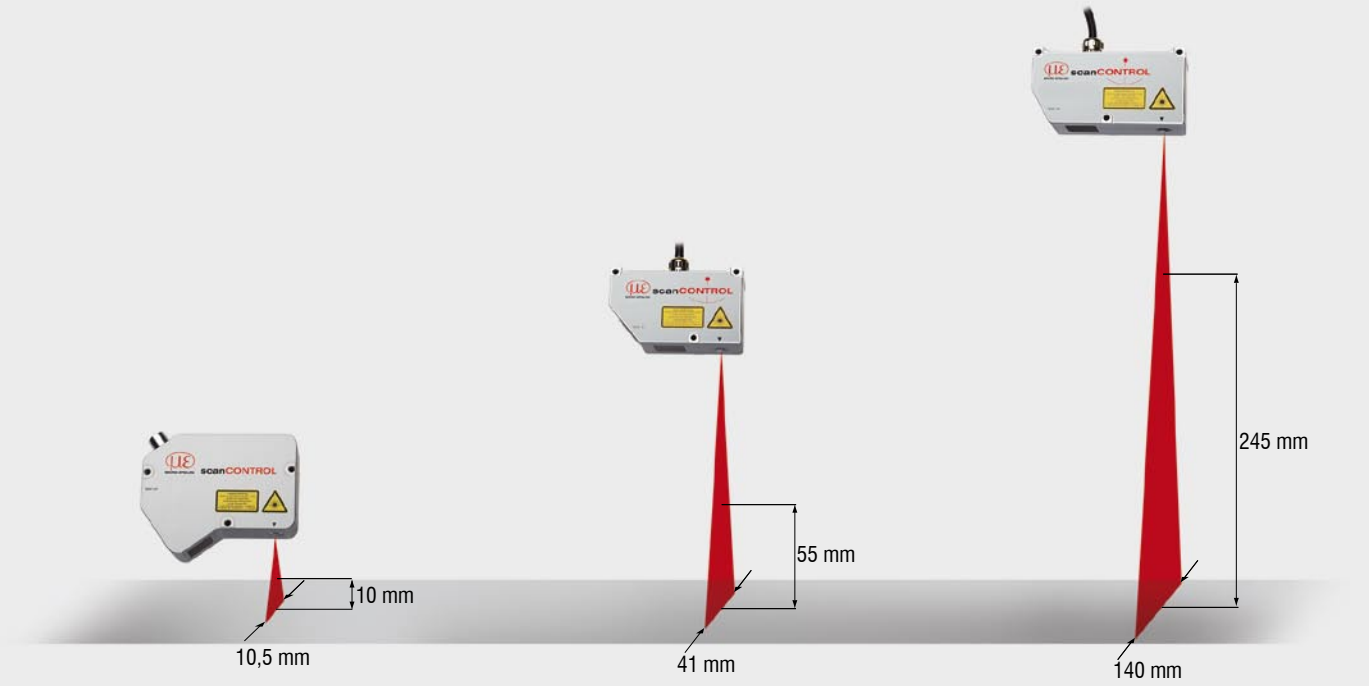
If the focus is on a special measurement value from a recorded individual profile, e.g. width or height of a glue bead, the SMART sensors are the right solution. With the software Configuration Tools provided, SMART sensors can be easily configured for the measurement tasks. The configuration file can be stored inside the controller. The programmed SMART sensors operate in the standalone mode and provide calculated values and digital signals to any host.



COMPACT	scanCONTROL 2700-25
HIGHSPEED	scanCONTROL 2750-25
SMART	scanCONTROL 2710-25
Controller:	integrated
Page	12 - 13

COMPACT	scanCONTROL 2700-50
HIGHSPEED	scanCONTROL 2750-50
SMART	scanCONTROL 2710-50
Controller	integrated
Page	14 - 15

COMPACT	scanCONTROL 2700-100
HIGHSPEED	scanCONTROL 2750-100
SMART	scanCONTROL 2710-100
Controller	integrated
Page	16 - 17



HIGHSPEED	scanCONTROL 2800-10
SMART	scanCONTROL 2810-10
Controller	external
Page	22 - 23

HIGHSPEED	scanCONTROL 2800-25
SMART	scanCONTROL 2810-25
Controller	external
Page	24 - 25

HIGHSPEED	scanCONTROL 2800-100
SMART	scanCONTROL 2810-100
Controller	external
Page	26 - 27

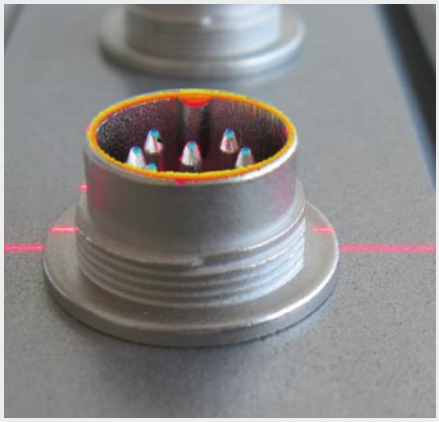
Advantages

Designed for industrial applications

The sensors of the scanCONTROL product range are designed for industrial applications. Due to their design and technical features, the sensors offer precision measurement even in harsh environments. Each series is available in a number of different measuring ranges and so covers almost all common measuring distances.

Use on robots

In many measuring applications, e.g. positioning, tracking and 3D measurement, the sensor needs to be integrated with a robot. For this reason, durable, flexible, robot-compatible cables are available.



High resolution is especially important with small components, such as IC pins.

Improved performance through variable measuring field

With scanCONTROL, depending on the application, either the data processing rate or the pixel resolution (x or z-axis) can be increased by optimising the measurement field. In addition to the processing rate the number of measured points and the height and width of the measuring field can be selected: e.g. 512 points over a narrow measurement strip (for edge detection) or 256 points over a wide strip for high speed applications (e.g. surface measurements). A total of 96 pre-defined measuring fields are available.

Class 2M laser

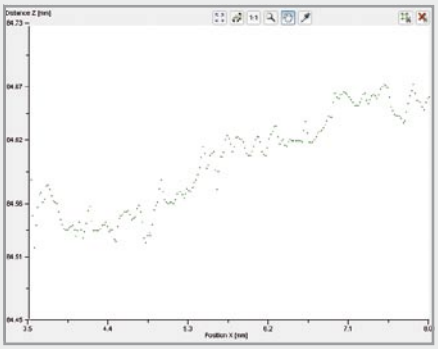
In the standard version, scanCONTROL uses a class 2M laser (visible, red semiconductor laser).

Class 3B laser

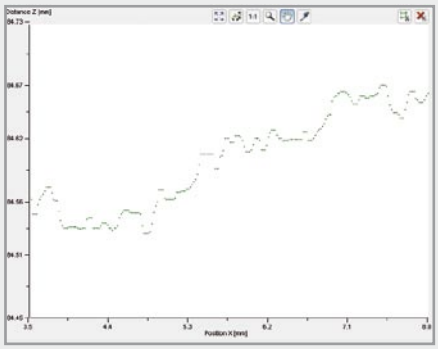
scanCONTROL sensors are also available with a class 3B laser for measuring against poorly reflective surfaces such as black rubber. This requires special safety precautions.

Adjustable profile filter functions

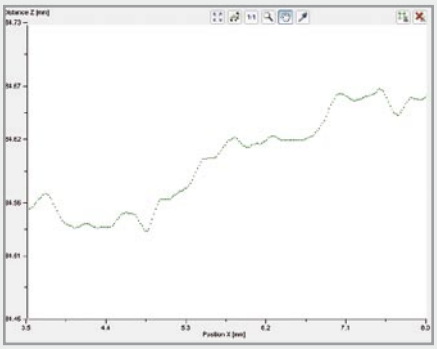
Median filter and average filter features are available in order to achieve optimal results for every application. These filters are applied directly to each profile in real-time inside the controller.
In addition to filters, the profile can also be resampled for equidistant arrangement of the x-z data.



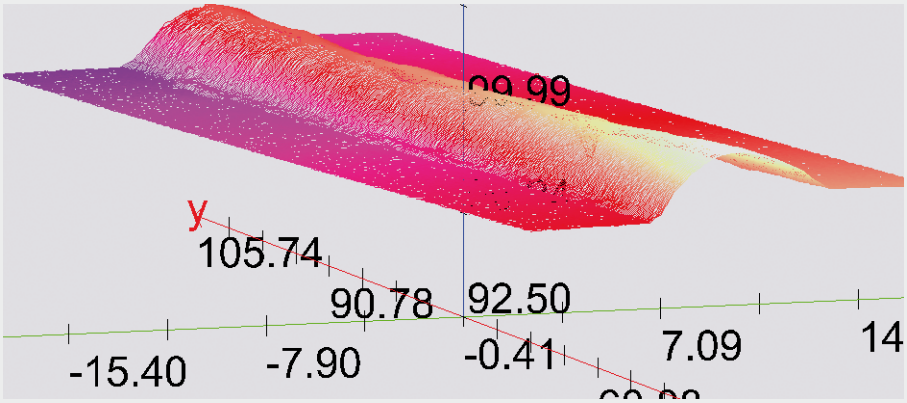
Unfiltered profile



Profile with median filter



Profile with average filter



Trigger for precise synchronized measurements

scanCONTROL sensors can trigger each individual measurement externally. In this way, the data rate can be optimised and measurements can be triggered at a specific event in time. This is particularly beneficial when several systems are operating synchronously. With its combination of a compact design and simple wiring, scanCONTROL is ideally suited for multi scanner applications.

Counter for easy 3D measurement

Sensors which are used for profile transfer offer the option for a counter input. This counter enables the precise mapping of the profile to any external third dimension. For the scanCONTROL 2700 series, the encoder is connected directly via the RS422 interface.

Calibrated measured values

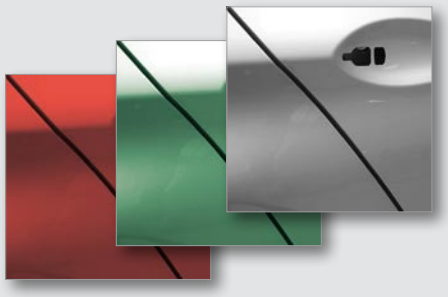
Unlike systems that combine only one camera and one laser line, scanCONTROL sensors deliver not just pixel values, but rather true measurement data with calibrated coordinates. Each sensor is equipped with an individual calibration protocol. This document is included in the scope of delivery and proofs the precision of each individual scanner.

Optimal integration thanks to standard interfaces

The COMPACT and HIGHSPEED sensors use the following interfaces for profile transfer:
- FireWire: IEEE 1394 Bus Digital Camera Specification Version 1.30
- Ethernet: GigE Vision

Auto exposure

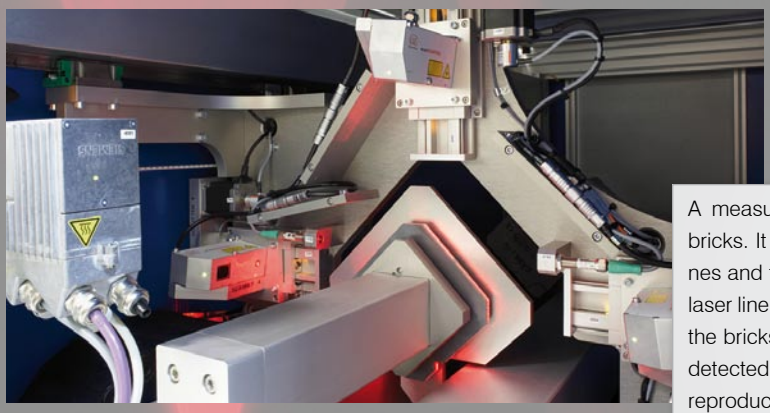
One challenge when using optical measurements is whether the sensor can adapt to changing surfaces of different products during a constant measuring task (for example, the different types of paint applied in gap measurements on passenger cars). For this, scanCONTROL sensors offer an auto-exposure feature. This setting selects the ideal exposure time for each surface colour in order to achieve the best possible measurements.



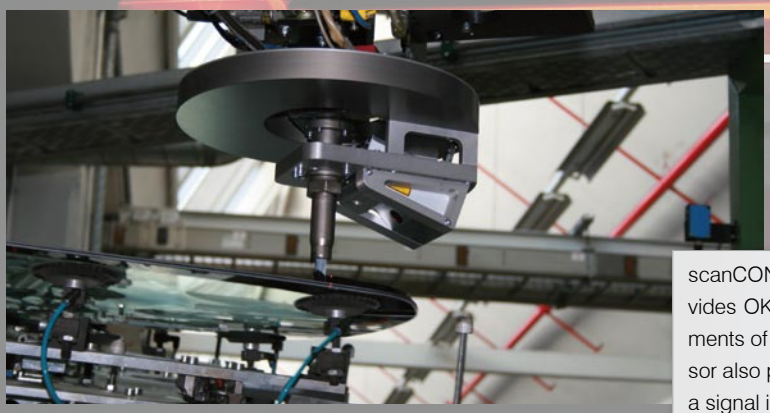
Auto exposure is crucial for measurements with changing surfaces

Sensors, solutions and systems from Micro-Epsilon
With its know-how and expertise in scanner integration Micro-Epsilon also offers turn-key systems for different applications.

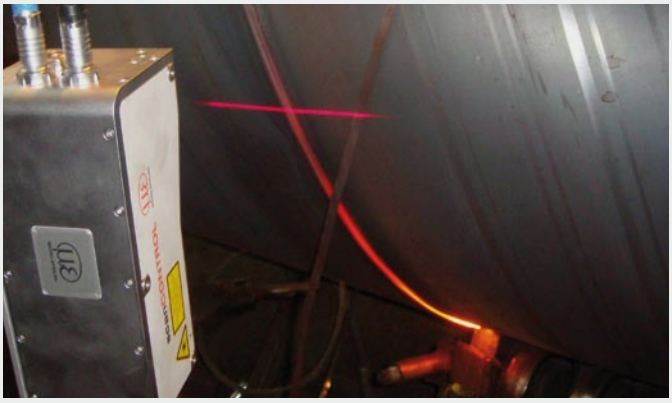
A measurement system developed for the tyre industry visualises the tyre surface, reliably detects bulges and depressions, hides letters, enables data to be filtered, establishes lateral and radial imbalance, performs a vibration control and checks the tyre size.



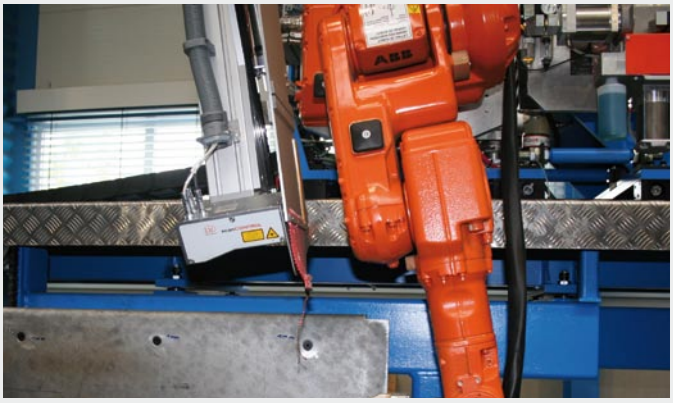
A measurement system has been developed to test the geometry of bricks. It measures the side length, phase lengths, angles, diagonal planes and the planarity of the side surfaces fully automatically with multiple laser line scanner. The system independently calibrates itself to the size of the bricks inserted. Any deviations from the nominal geometry are safely detected and marked up. Compared to manual inspection, the results are reproduceable and can be interfaced to a statistic control system.



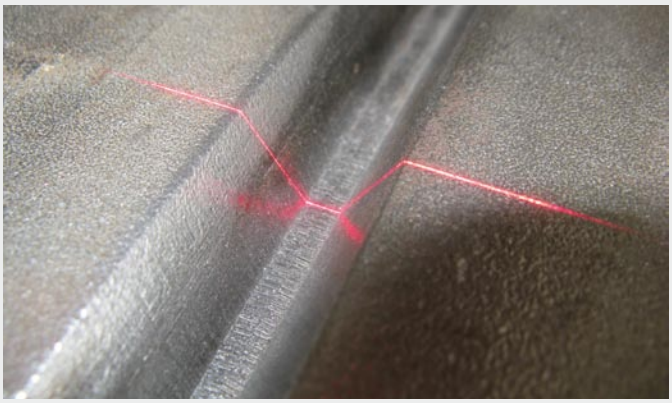
scanCONTROL is used for glue bead inspection. The laser scanner provides OK / NOK signals. Because glue bead is applied by lateral movements of the wind shield and rotational movements of the nozzle, the sensor also performs the appropriate rotational motion. If there is a deviation, a signal is triggered and the wind shield can be reworked manually.



Tracking weld seams



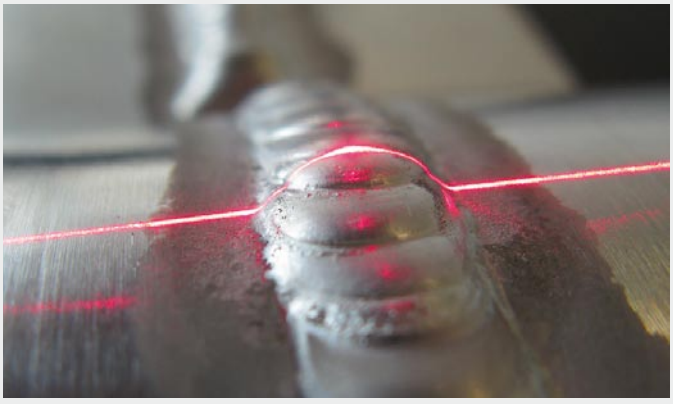
Edge tracking on a robot



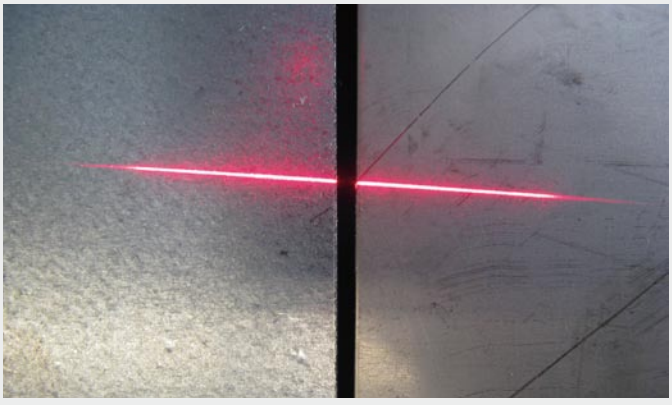
V-seam measurement on pipes

Gap measurement on a car body

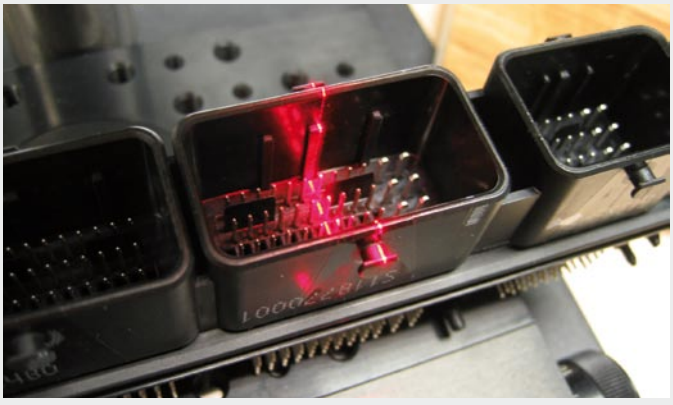
Profile thickness measurements on metal strip



Measuring weld seam profiles



Edge position of strip material (rubber/metal)



Pin alignment

Compact design with integrated controller

scanCONTROL 2700/2710 combines technology and performance in a single device, providing the dual benefits of an integrated controller and compact dimensions.

Multiple scanner applications

For many applications, it is necessary to measure or acquire data simultaneously using multiple sensors. With its combination of compact design, simple wiring and attractive price, scanCONTROL 2700 / 2710 is ideally suited to performing multi scanner applications.

Alternating laser toggle

When using multiple sensors for a measuring task, it is sometimes necessary to work with overlapping laser lines. To rule out optical interference, the scanCONTROL 2700 and 2750 have a special synchronisation feature. This „180° phase shift“ mode provides an alternating laser ON/OFF. The laser beam of one sensor is switched off for a fraction of a second while the other sensor performs measurements. This is done automatically and has no effect on the overall measurement frequency.

Extended measuring ranges for large targets

Extended measuring ranges are available for larger objects. Using software, the user can switch over from the standard range to the extended range. To document the measuring ranges, each sensor is equipped with a calibration protocol.

Protective cover plate for harsh environments

A protective cover plate is available for harsh industrial environments. This plate can be equipped with a purge air system. The cover plate is attached to the sensor and has a protective window, through which the beam passes through.

- z-axis measuring range up to 300mm
- x-axis measuring range up to 148mm
- Profile frequency up to 2,000Hz
- Measuring rate up to 1,280,000 points per second
- z-axis reference resolution <4µm
- Resolution x-axis up to 640 points

scanCONTROL 2700

The scanCONTROL 2700 sensors are the most economic sensors for static and dynamic applications. The sensor provides a profile frequency of 100Hz and up to 64,000 measuring points per second.

scanCONTROL 2750

The scanCONTROL 2750 sensors offer everything you need for advanced high speed 3D applications. Up to 1,280,000 points per second with a profile frequency of up to 2,000Hz are possible using these sensors.

scanCONTROL 2710

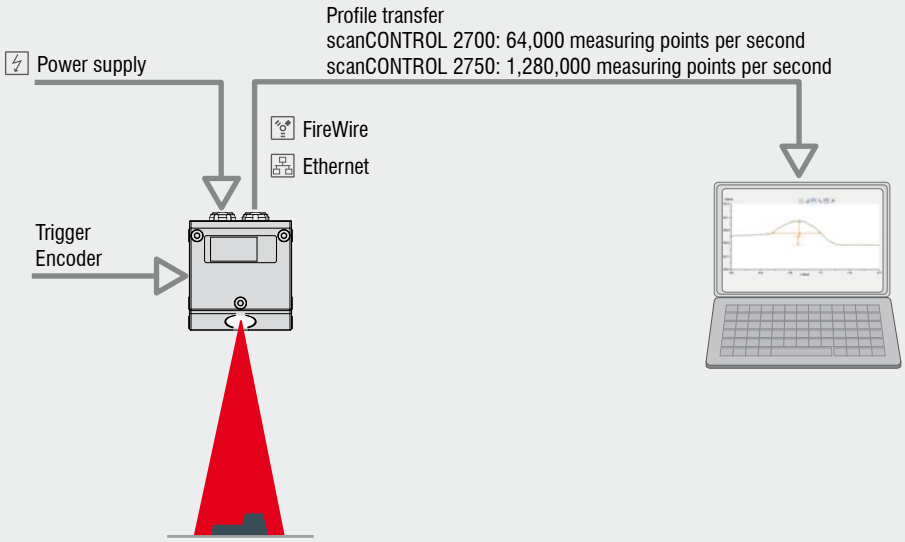
The SMART series scanCONTROL 2710 offers a Plug & Play solution with integrated controller for simple measurement tasks. The sensor design is identical to the 2700 and 2750 series.

COMPACT and HIGHSPEED: **Calibrated profile data**

The scanCONTROL 2700 and 2750 models are used for the transfer of calibrated profile data for external profile analysis, for example in a PC. The sensor can be configured via a FireWire or Ethernet interface. The profile information is also transferred via this same interface. Details of the software interface can be found in the „Integrating scanCONTROL in application software“ chapter.
The programmable RS422 port can be used as a trigger or encoder input.

COMPACT	HIGH-SPEED
scanCONTROL 2700-25	scanCONTROL 2750-25
scanCONTROL 2700-50	scanCONTROL 2750-50
scanCONTROL 2700-100	scanCONTROL 2750-100

Scope of delivery:
Sensor, power supply cable 4.5m, RS422 connector,
Demo-CD, SDK, sensor protocol

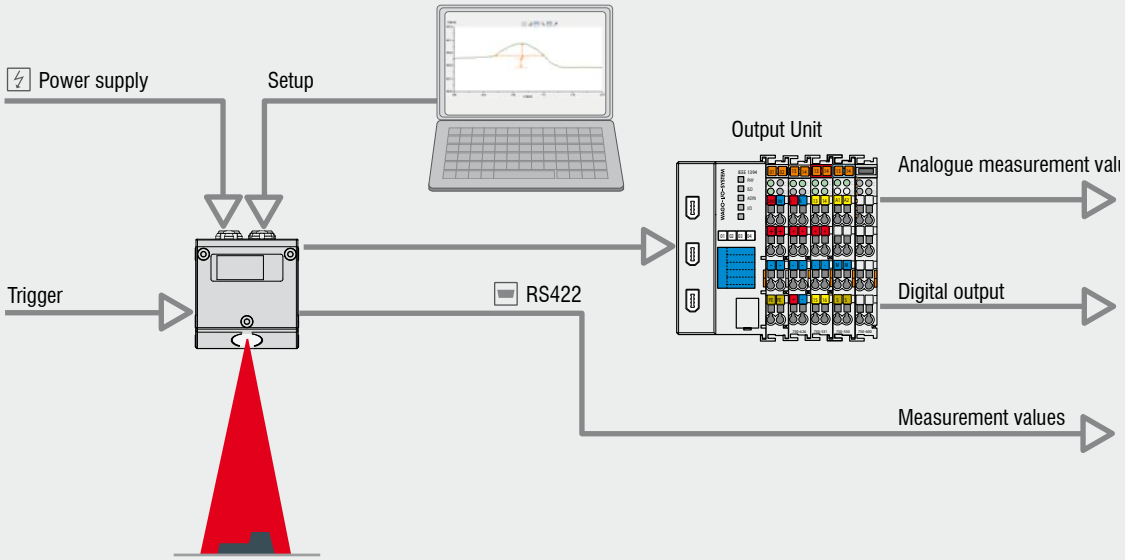


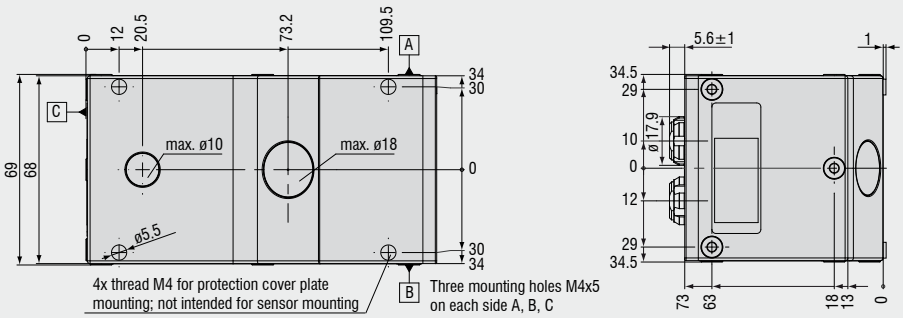
SMART: **Profile analysis**

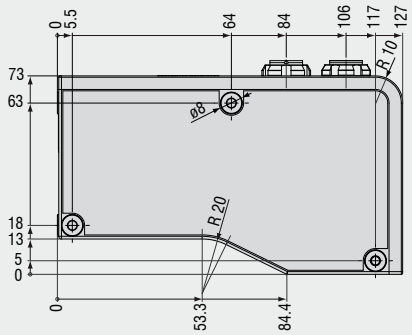
The SMART series scanCONTROL 2710 offers a Plug & Play solution within the integrated controller for simple measurement tasks such as step, angle, seam and groove inspection.
The sensor is programmed via a PC using the scanCONTROL Configuration Tools. This setup is stored inside the integrated controller. The sensor can run in the standalone mode without a PC. In addition to the measurement output via RS422, switch outputs and analogue measuring values are available via the external output unit. The RS422 can be programmed as a serial interface (measurement value output) or as a trigger input.

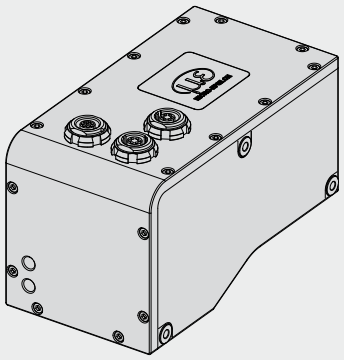
SMART
scanCONTROL 2710-25
scanCONTROL 2710-50
scanCONTROL 2710-100

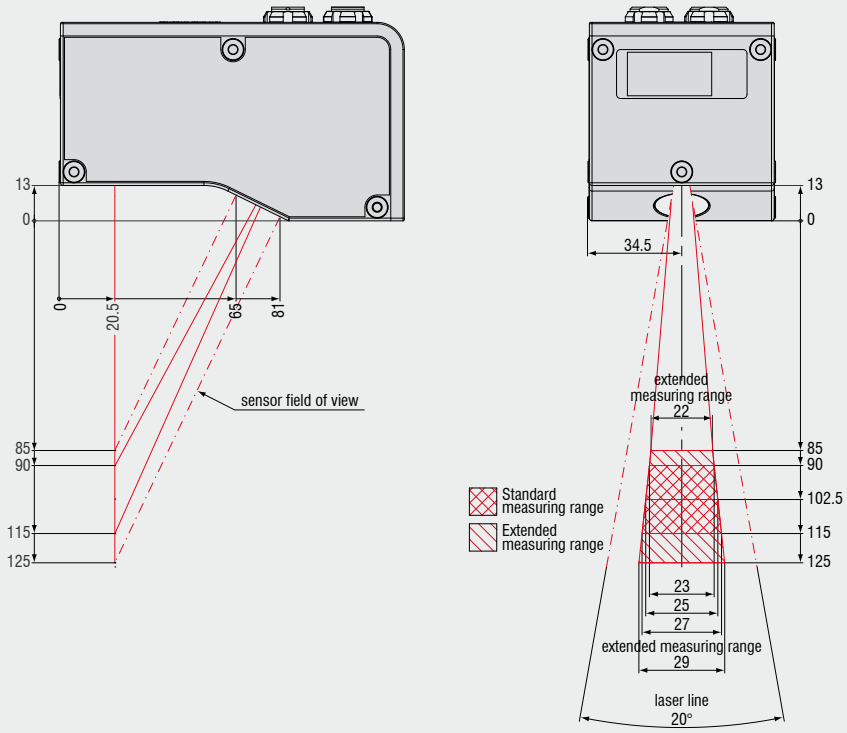
Scope of delivery:
Sensor, power supply cable 4.5m, RS422 connector,
sensor protocol, software Configuration Tools




0
12
20.5
73.2
109.5
A
34
30
C
max. ø10
max. ø18
0
69
68
ø5.5
30
34
4x thread M4 for protection cover plate mounting; not intended for sensor mounting
B
Three mounting holes M4x5 on each side A, B, C
5.6±1
1
34.5
29
10
0
ø17.9
12
29
34.5
73
63
18
13
0

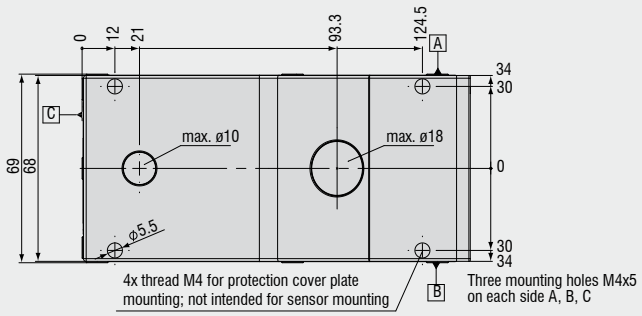

0
5.5
64
84
106
117
127
R 10
73
63
ø8
R 20
18
13
5
0
0
53.3
84.4

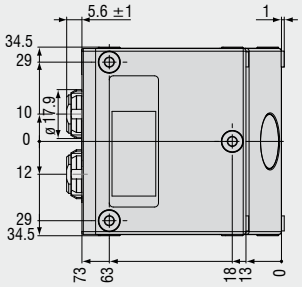


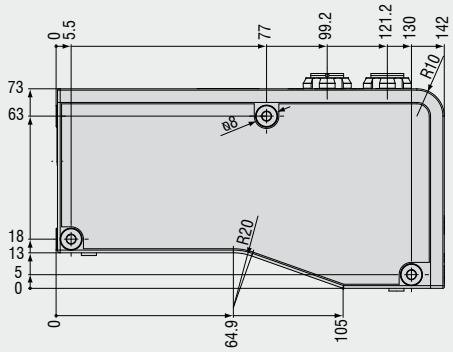

13
0
0
20.5
65
81
sensor field of view
85
90
115
125
13
0
34.5
extended measuring range
22
85
90
102.5
115
125
Standard measuring range
Extended measuring range
23
25
27
extended measuring range
29
laser line
20°

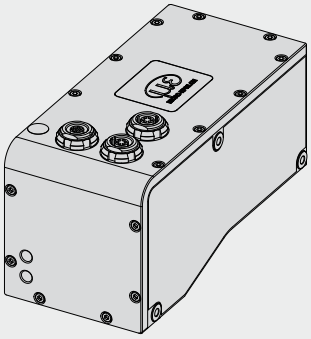
	Model	scanCONTROL	*COMPACT* 2700-25	*HIGHSPEED* 2750-25	*SMART* 2710-25
z-axis (height)	Standard measuring range 25mm	Start of measuring range	90mm		
		Midrange	102.5mm		
		End of measuring range	115mm		
	Extended measuring range 40mm	Start of measuring range	85mm		
		End of measuring range	125mm		
	Linearity [1]	±0.2% FSO (3sigma)	±50µm		
	Resolution	0.04% FSO	10µm		
	Reference resolution [2] [3]		4µm		
x-axis (width)	Standard measuring range	Start of measuring range	23mm		
		Midrange	25mm		
		End of measuring range	27mm		
	Extended measuring range	Start of measuring range	22mm		
		End of measuring range	29mm		
	Point distance	Midrange	40µm		
	Resolution x-axis		640 points/profile		
	Profile frequency		100Hz	2,000Hz	100Hz
	Measurement rate		64,000 points/sec	1,28 mio points/sec	-
	Interfaces profile data	FireWire	■	■	■
		Ethernet	■	■	■
		RS422 [4]	■	■	■
		Trigger [4]	■	■	■
		Counter (encoder) [4]	■	■	
	Signal output SMART	RS422 [4]			■
		Analogue [5]			■
		Switching signal [5]			■
	Display (LED)		1x laser, 1x power/error/status		
	Protection class		IP 64		
	Operating temperature		0°C up to 50°C		
	Storage temperature		-20°C up to 70°C		
	Cable length		up to 20m		
		Ethernet with Switch FireWire with HUB	up to 50m		
	Weight		appr. 700g		
	Galvanic isolation		Only at RS422, no isolation of 24V-supply, internal circuit and FireWire bus. If isolation necessary, external 24V-DC-DC-converter required		
	Vibration		2g / 20 ... 500Hz		
	Shock		15g / 6ms		
	Supply		8-30 VDC, 500mA		
	Light source		semiconductor laser 658nm		
	Aperture angle laser line		20°		
	Laser power	standard	10mW (class 2M)		
		optional	20mW (class 3B)		
	Laser off		via software (standard) / via external contact (optional)		
	Permissible ambient light (fluorescent light) [2]		10,000lx		

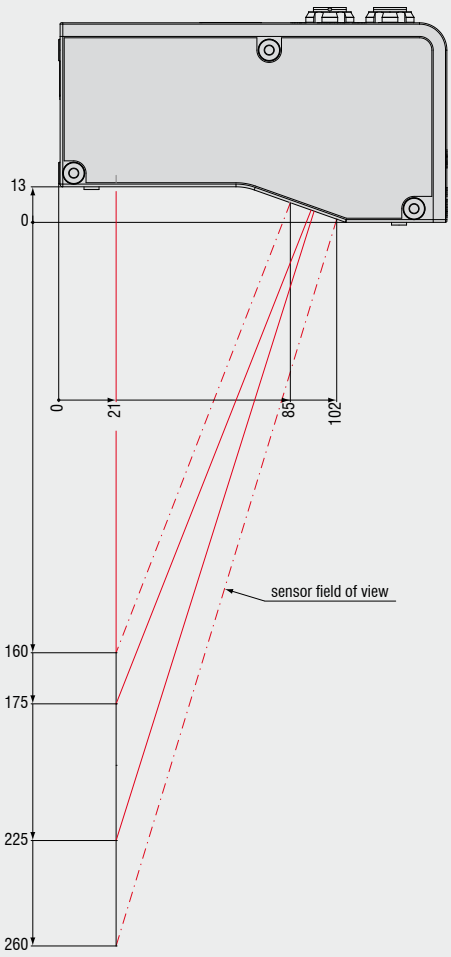
[1] Standard measuring range
[2] Measuring object: Micro-Epsilon standard object (metallic, diffusely reflecting material)
[3] According to a one-time averaging across the measuring field (640 points)
[4] Programmable as serial interface or synchronisation input or encoder input
[5] Only with Output Unit
FSO = Full scale output

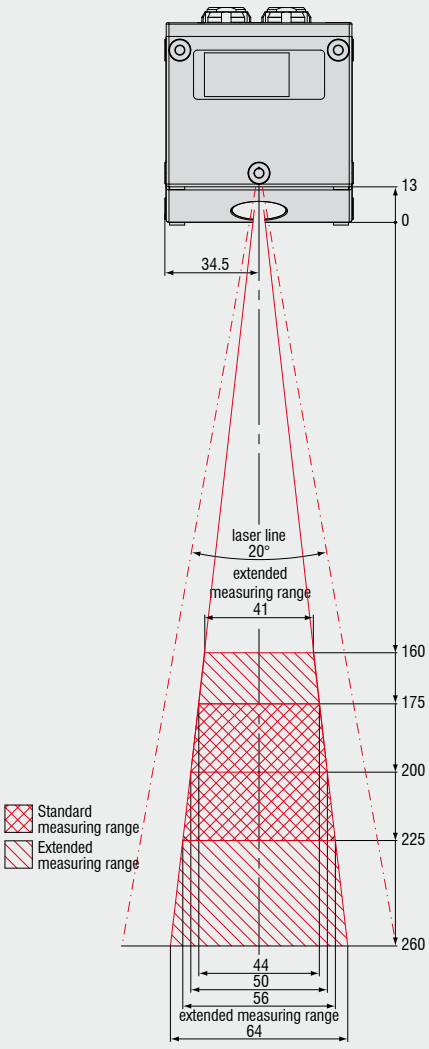

0
12
21
93.3
124.5
A
34
30
0
30
34
C
max. ø10
max. ø18
69
68
ø5.5
4x thread M4 for protection cover plate mounting; not intended for sensor mounting
B
Three mounting holes M4x5 on each side A, B, C


5.6 ±1
1
34.5
29
10
0
12
29
34.5
ø 17.9
73
63
18
13
0


0
5.5
77
99.2
121.2
130
142
R10
73
63
ø8
18
13
5
0
R20
0
64.9
105

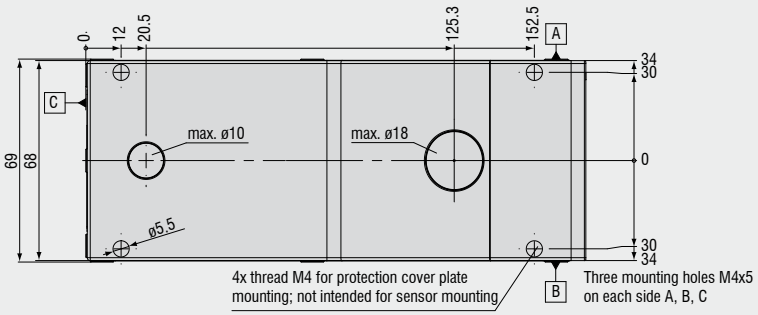


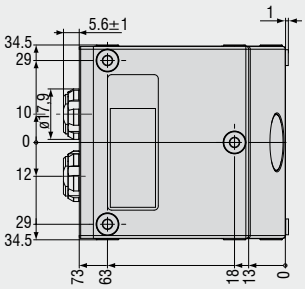

13
0
0
21
85
102
sensor field of view
160
175
225
260

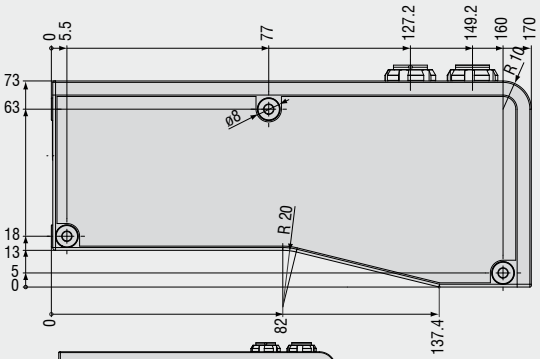

13
0
34.5
laser line
20°
extended measuring range
41
160
175
200
225
260
Standard measuring range
Extended measuring range
44
50
56
extended measuring range
64

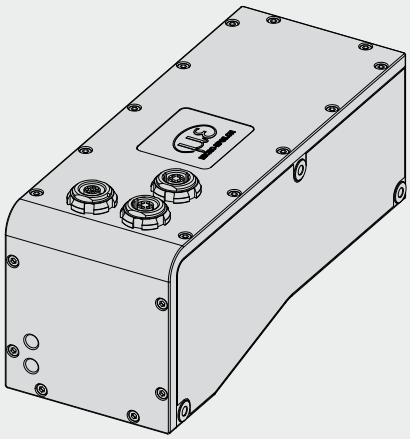
			COMPACT	*HIGHSPEED*	*SMART*
	Model	scanCONTROL	2700-50	2750-50	2710-50
z-axis (height)	Standard measuring range 50mm	Start of measuring range	175mm		
		Midrange	200mm		
		End of measuring range	225mm		
	Extended measuring range 100mm	Start of measuring range	160mm		
		End of measuring range	260mm		
	Linearity [1]	±0.2% FSO (3sigma)	±100µm		
	Resolution	0.04% FSO	20µm		
	Reference resolution [2] [3]		10µm		
x-axis (width)	Standard measuring range	Start of measuring range	44mm		
		Midrange	50mm		
		End of measuring range	56mm		
	Extended measuring range	Start of measuring range	41mm		
		End of measuring range	64mm		
	Point distance	Midrange	80µm		
	Resolution x-axis		640 points/profile		
	Profile frequency		100Hz	2,000Hz	100Hz
	Measurement rate		64,000 points/sec	1,28 mio points/sec	-
	Interfaces profile data	FireWire	■	■	■
		Ethernet	■	■	■
		RS422 [4]	■	■	■
		Trigger [4]	■	■	■
		Counter (encoder) [4]	■	■	
	Signal output SMART	RS422 [4]			■
		Analogue [5]			■
		Switching signal [5]			■
	Display (LED)		1x laser, 1x power/error/status		
	Protection class		IP 64		
	Operating temperature		0°C up to 50°C		
	Storage temperature		-20°C up to 70°C		
	Cable length		up to 20m		
		Ethernet with Switch FireWire with HUB	up to 50m		
	Weight		appr. 800g		
	Galvanic isolation		Only at RS422, no isolation of 24V-supply, internal circuit and FireWire bus. If isolation necessary, external 24V-DC-DC-converter required		
	Vibration		2g / 20 ... 500Hz		
	Shock		15g / 6ms		
	Supply		8-30 VDC, 500mA		
	Light source		semiconductor laser 658nm		
	Aperture angle laser line		20°		
	Laser power	standard	10mW (class 2M)		
		optional	20mW (class 3B)		
	Laser off		via software (standard) / via external contact (optional)		
	Permissible ambient light (fluorescent light) [2]		10,000lx		

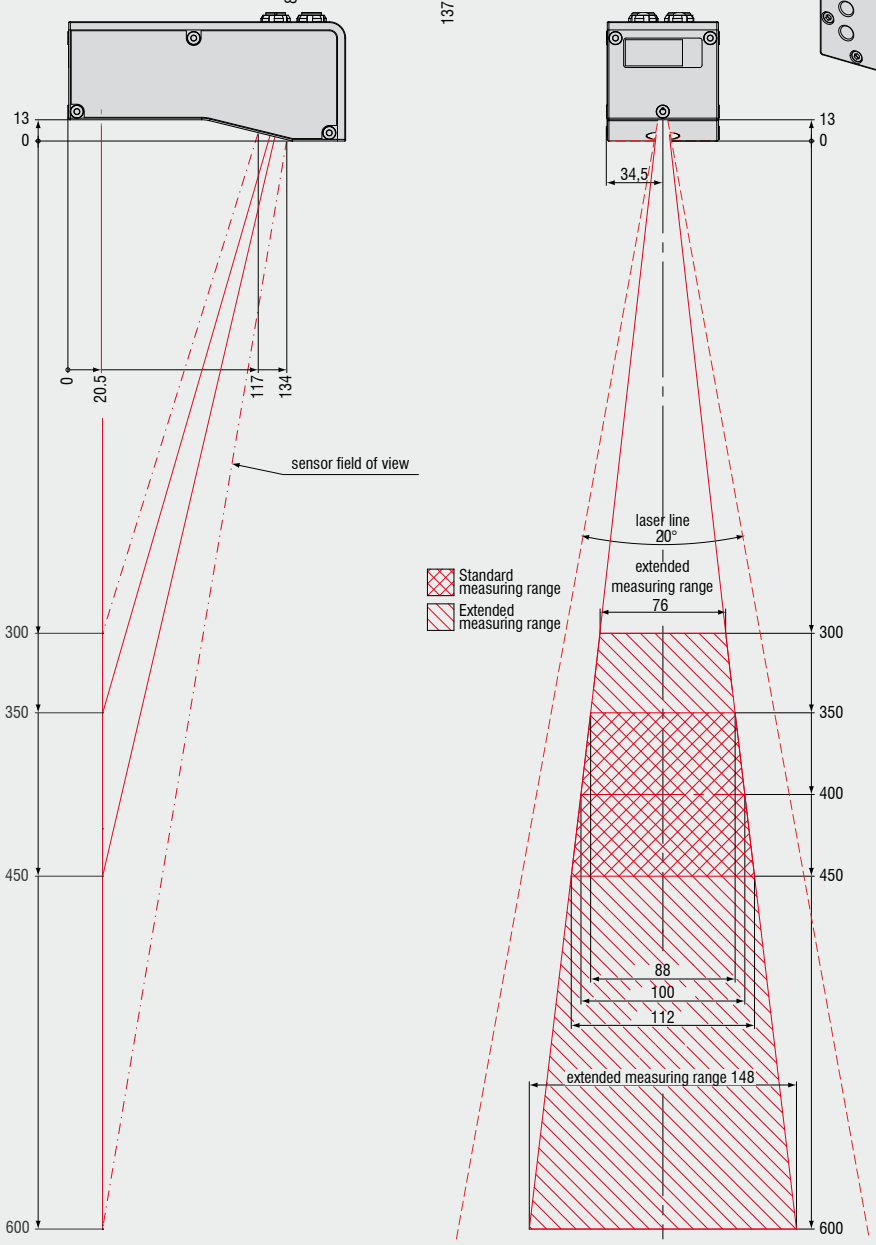
[1] Standard measuring range
[2] Measuring object: Micro-Epsilon standard object (metallic, diffusely reflecting material)
[3] According to a one-time averaging across the measuring field (640 points)
[4] Programmable as serial interface or synchronisation input or encoder input
[5] Only with Output Unit
FSO = Full scale output


0
12
20.5
125.3
152.5
A
C
max. ø10
max. ø18
ø5.5
69
68
34
30
0
30
34
4x thread M4 for protection cover plate
mounting; not intended for sensor mounting
B
Three mounting holes M4x5
on each side A, B, C


5.6±1
1
34.5
29
10
ø17.9
0
12
29
34.5
73
63
18
13
0


0
5.5
77
127.2
149.2
160
170
R 70
73
63
ø8
18
13
5
0
R 20
0
82
137.4



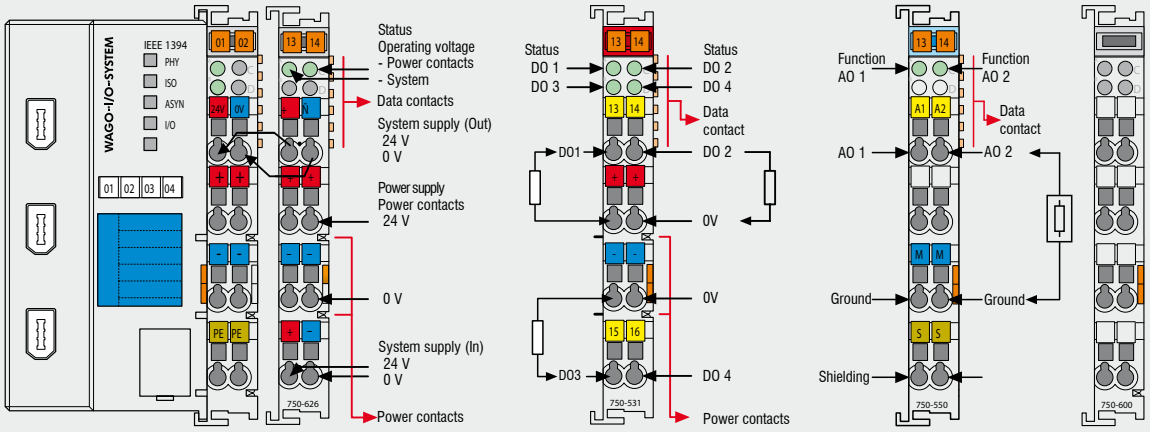

13
0
34.5
13
0
0
20.5
117
134
sensor field of view
laser line
20°
Standard
measuring range
Extended
measuring range
extended
measuring range
76
300
350
400
450
600
88
100
112
extended measuring range 148

	Model	scanCONTROL	*COMPACT* 2700-100	*HIGHSPEED* 2750-100	*SMART* 2710-100
z-axis (height)	Standard measuring range 100mm	Start of measuring range	350mm		
		Midrange	400mm		
		End of measuring range	450mm		
	Extended measuring range 300mm	Start of measuring range	300mm		
		End of measuring range	600mm		
	Linearity [1]	±0.2% FSO (3sigma)	±200µm		
	Resolution	0.04% FSO	40µm		
	Reference resolution [2] [3]		15µm		
x-axis (width)	Standard measuring range	Start of measuring range	88mm		
		Midrange	100mm		
		End of measuring range	112mm		
	Extended measuring range	Start of measuring range	76mm		
		End of measuring range	148mm		
	Point distance	Midrange	160µm		
	Resolution x-axis		640 points/profile		
	Profile frequency		100Hz	2,000Hz	100Hz
	Measurement rate		64,000 points/sec	1,28 mio points/sec	-
	Interfaces profile data	FireWire	■	■	■
		Ethernet	■	■	■
		RS422 [4]	■	■	■
		Trigger [4]	■	■	■
		Counter (encoder) [4]	■	■	
	Signal output SMART	RS422 [4]			■
		Analogue [5]			■
		Switching signal [5]			■
	Display (LED)		1x laser, 1x power/error/status		
	Protection class		IP 64		
	Operating temperature		0°C up to 50°C		
	Storage temperature		-20°C up to 70°C		
	Cable length		up to 20m		
		Ethernet with Switch FireWire with HUB	up to 50m		
	Weight		appr. 850g		
	Galvanic isolation		Only at RS422, no isolation of 24V-supply, internal circuit and FireWire bus. If isolation necessary, external 24V-DC-DC-converter required		
	Vibration		2g / 20 ... 500Hz		
	Shock		15g / 6ms		
	Supply		8-30 VDC, 500mA		
	Light source		semiconductor laser 658nm		
	Aperture angle laser line		20°		
	Laser power	standard	10mW (class 2M)		
		optional	20mW (class 3B)		
	Laser off		via software (standard) / via external contact (optional)		
	Permissible ambient light (fluorescent light) [2]		10,000lx		

[1] Standard measuring range
[2] Measuring object: Micro-Epsilon standard object (metallic, diffusely reflecting material)
[3] According to a one-time averaging across the measuring field (640 points)
[4] Programmable as serial interface or synchronisation input or encoder input
[5] Only with Output Unit
FSO = Full scale output

Output Unit

OU fieldbus coupler | **OU filter module** | **Digital output module** | **Analog output module** | **OU bus termination module**



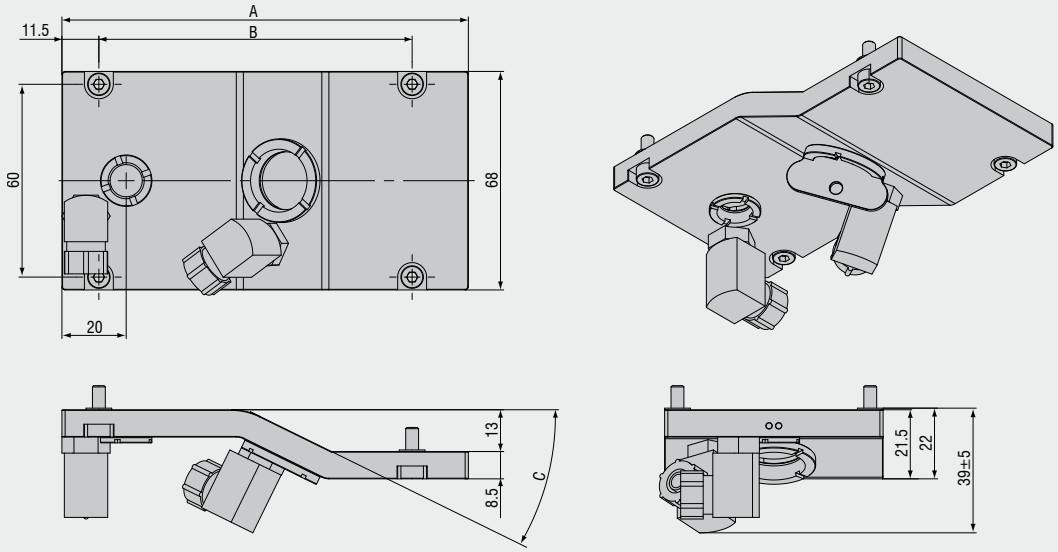
Output modules for Output Unit
digital:
24V positive switching
24V negative switching
5V positive switching

Output modules for Output Unit
analogue:
±10V
0-10V
0-20mA
4-20mA

scanCONTROL 2710 Output Unit

Part. No.	*Model*	*Description*
6414054	Output Unit Basic	Fieldbus coupler with filter module and bus termination
0325124	OU-DigitalOut	DC5V / 20mA; positive switching
0325125	OU-DigitalOut	DC 24V / 0.5A; positive switching
0325122	OU-DigitalOut	DC 24V / 0,5A; positive switching
0325123	OU-DigitalOut	DC 24 V / 0,5A; negative switching
0325128	OU-AnalogOut	4-20 mA
0325127	OU-AnalogOut	0-20 mA
0325126	OU-AnalogOut	0-10 V
0325129	OU-AnalogOut	±10 V; for TS 35

Protective shield, fixed on the sensor (with or without air supply)

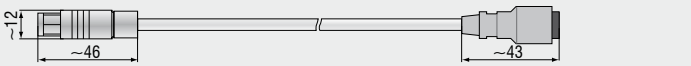


	A	B	C
PS-LLT2700-25	126.5	97.5	26.14°
PS-LLT2700-50	141.5	112.5	19.5°
PS-LLT2700-100	169.5	140.5	13.78°

Part. No.	*Model*	*Description*
2105029	PS-LLT2700-25	protective shield, mounted
2105028	PS-LLT2700-25/AIR	protective shield with air supply, mounted
2105027	PS-LLT2700-50	protective shield, mounted
2105026	PS-LLT2700-50/AIR	protective shield with air supply, mounted
2105025	PS-LLT2700-100	protective shield, mounted
2105024	PS-LLT2700-100/AIR	protective shield with air supply, mounted

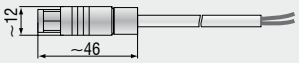
Connecting cables for power supply and interfaces

FireWire connecting cable



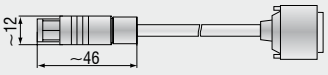
Sensor connector — IEEE1394a FireWire (6-pin)

External power supply cable



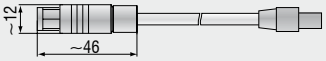
Sensor connector

RS422 interface cable



Sensor connector

Ethernet connecting cable RJ45



Sensor connector

FireWire connecting cables

Part. No.	*Model*	*Description*
2901391	SC2700-1,8	FireWire connecting cable 1.8m
2901392	SC2700-4,5	FireWire connecting cable 4.5m
2901393	SC2700-10	FireWire connecting cable 10m
2901394	SC2700-15	FireWire connecting cable 15m
2901395	SC2700-20	FireWire connecting cable 20m

FireWire connecting cables, permanent flex

Part. No.	*Model*	*Description*
2901400	SCR2700-4,5	FireWire connecting cable 4.5m
2901401	SCR2700-10	FireWire connecting cable 10m
2901402	SCR2700-15	FireWire connecting cable 15m
2901434	SCR2700-20	FireWire connecting cable 20m

Ethernet connecting cables, qualified for drag chain use

Part. No.	Model	*Description*
2901512	SC2700-2/ET	Ethernet connecting cable 2m
2901513	SC2700-5/ET	Ethernet connecting cable 5m
2901514	SC2700-10/ET	Ethernet connecting cable 10m
2901515	SC2700-15/ET	Ethernet connecting cable 15m
2901516	SC2700-20/ET	Ethernet connecting cable 20m

Ethernet connecting cables, qualified for robotic use

Part. No.	*Model*	*Description*
2901542	SCR2700-2/ET	Ethernet connecting cable 2m
2901543	SCR2700-5/ET	Ethernet connecting cable 5m
2901544	SCR2700-10/ET	Ethernet connecting cable 10m
2901545	SCR2700-15/ET	Ethernet connecting cable 15m
2901546	SCR2700-20/ET	Ethernet connecting cable 20m

Other cables

Part. No.	*Model*	*Description*
2901407	PC2700-4,5	Power supply cable, 4.5m
2901406	SC2700-4,5/RS422	RS422 interface cable 4.5m
2901581	SC2700-0,5/SYNC	Synchronisation cable for two scanCONTROL 2700 sensors

Accessories

Part. No.	*Model*	*Description*
0254026	Suitcase	Transport suitcase for scanCONTROL 2700 series
2420019	PS2010	Power supply PS2010, 24V/2.5A

Precise laser scanner for high speed profile acquisition

scanCONTROL 2800 / 2810 consists of a compact sensor and an intelligent controller, which are connected by a cable. The controller outputs both the 2D profile information as well as analysed data.
scanCONTROL has been developed for industrial applications. Using innovative technologies significantly increases the functionality of the system and its flexibility for different applications.
Unlike conventional systems, the scanCONTROL 2800/2810 is not limited to specific applications and is therefore ideal suited for a large variety of industrial fields. The integrated FireWire interface enables both complete control for several scanCONTROL systems via a PC, as well as high data rates.

- z-axis measuring range up to 245mm
- x-axis measuring range up to 140mm
- Profile frequency up to 4,000Hz
- Measuring rate up to 256,000 points per second
- z-axis reference resolution <2µm
- Resolution x-axis up to 1,024 points

High measuring rate

Fast quality testing is guaranteed by the high measuring rate of up to 256,000 measuring points per second. A profile frequency of up to 4,000 profiles per second can be achieved, depending on the resolution and measuring range.

Profile resolution scanCONTROL 2800/2810

A profile consists of a maximum of 1,024 points and a calibrated measurement value each for X and Z. These points are aquired simultaneously across the entire line and made immediately available to a PC for a real time evaluation of the profile.

scanCONTROL 2800

The scanCONTROL 2800 sensors are the industrial standard sensors for high resolution and fast applications. The sensor provides a profile frequency of 4,000Hz and up to 256,000 measuring points per second.

scanCONTROL 2810

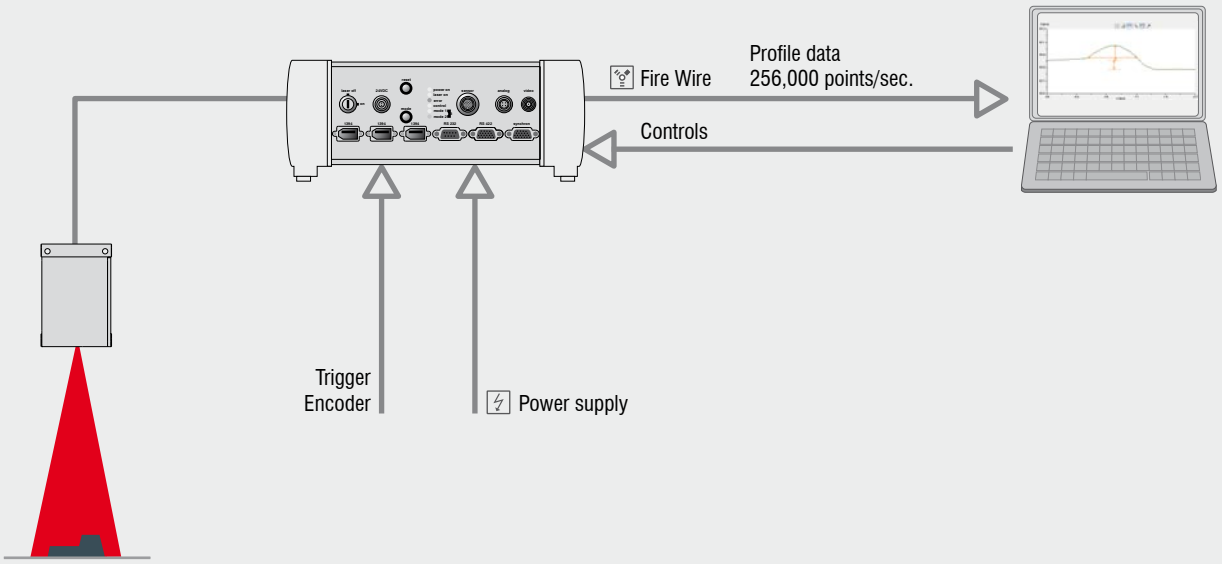
The SMART series scanCONTROL 2810 offers a Plug & Play solution with integrated controller for simple measurement tasks and profile analysis. The sensor design is identical to the 2800 series.

HIGHSPEED: **Calibrated profile data**

The scanCONTROL 2800 models are used for the transfer of calibrated profile data for external profile analysis, for example in a PC. The profile information is also transferred via the same interface. Details of the software interface can be found in the „Integrating scanCONTROL in application software“ chapter.

HIGH-SPEED
scanCONTROL 2800-10
scanCONTROL 2800-25
scanCONTROL 2800-100

Scope of delivery:
Sensor, controller, power supply cable 3m,
FireWire cable 3m, sensor protocol, Demo CD incl. SDK

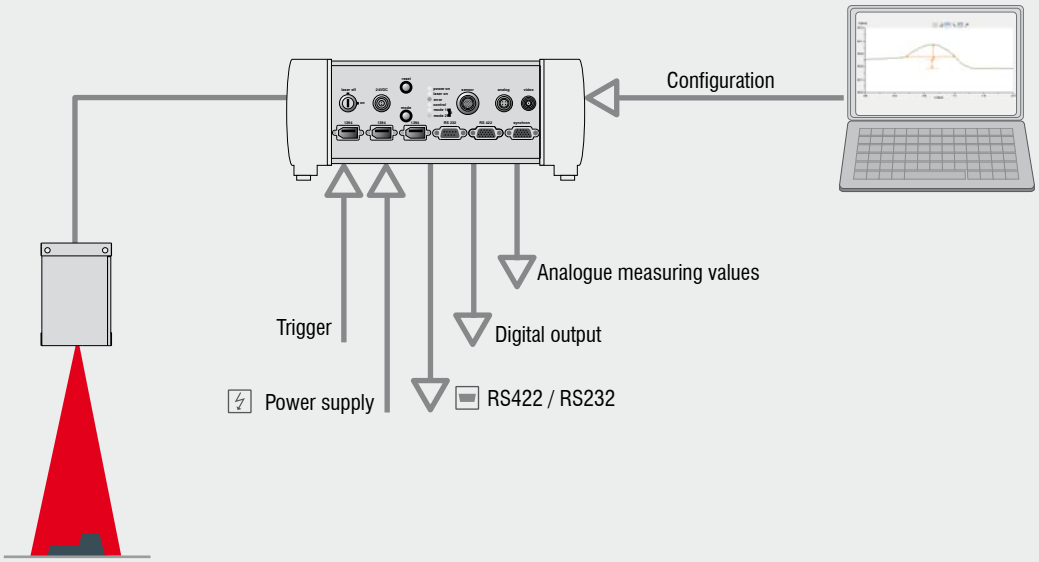


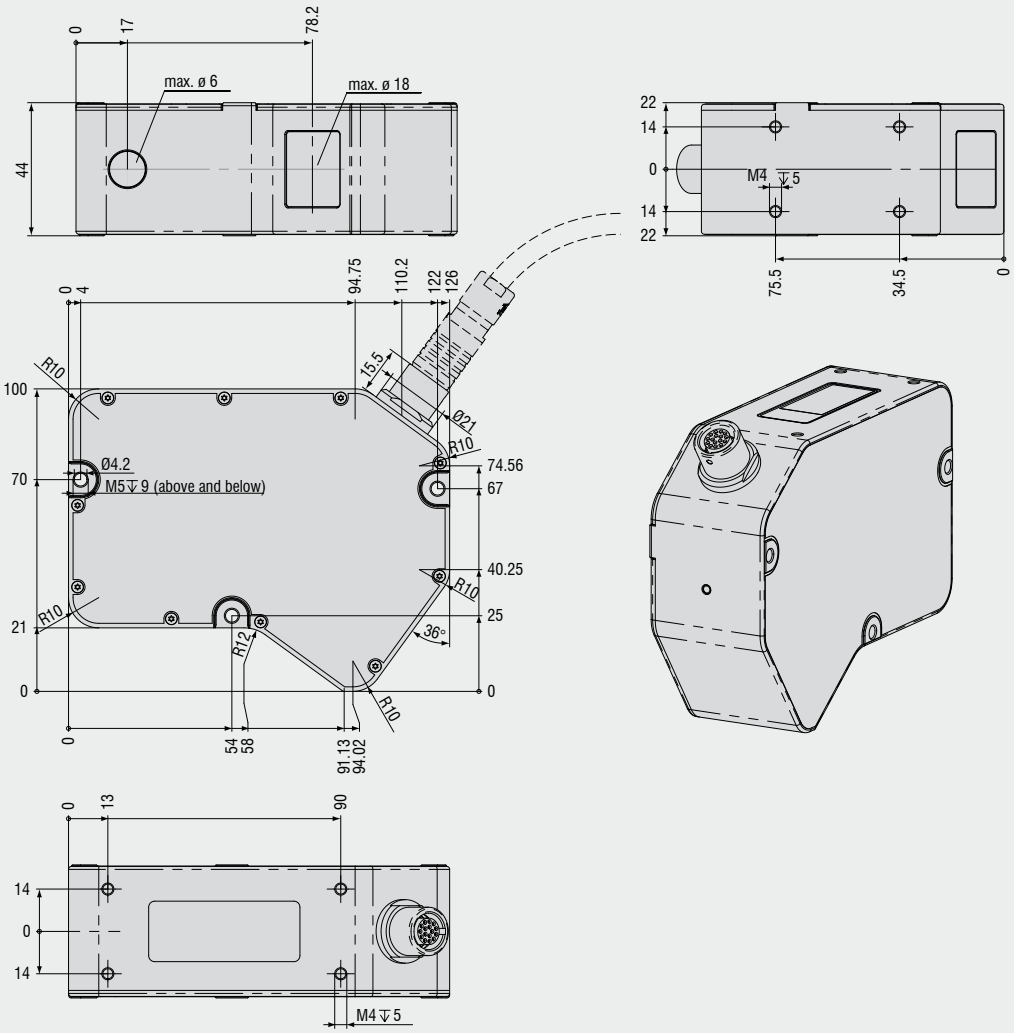
SMART: **Profile analysis**

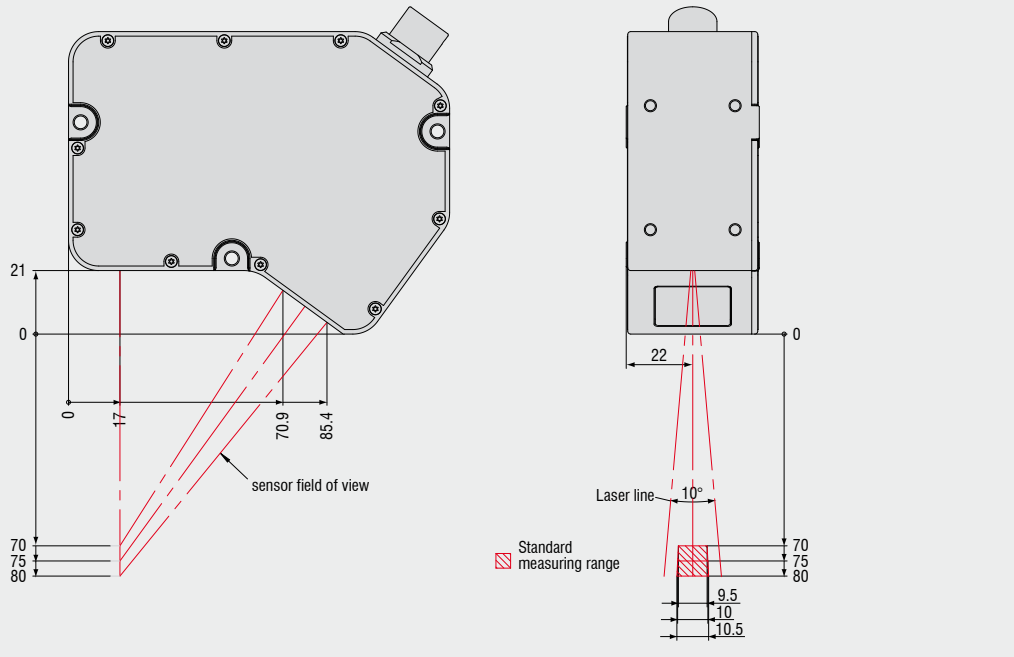
The SMART series scanCONTROL 2810 offers a Plug & Play solution within the integrated controller for simple measurement tasks such as step, angle, seam and groove inspection. The sensor is programmed via a PC using the scanCONTROL Configuration Tools. This setup is stored inside the controller. The sensor can run in the standalone mode without a PC. In addition to the measurement output via RS422, switch outputs and analogue measuring values are available.
The RS422 can be programmed as a serial interface (measurement value output).

SMART
scanCONTROL 2810-10
scanCONTROL 2810-25
scanCONTROL 2810-100

Scope of delivery:
Sensor, controller, power supply cable 3m, FireWire cable 3m,
sensor protocol, Software Configuration Tools

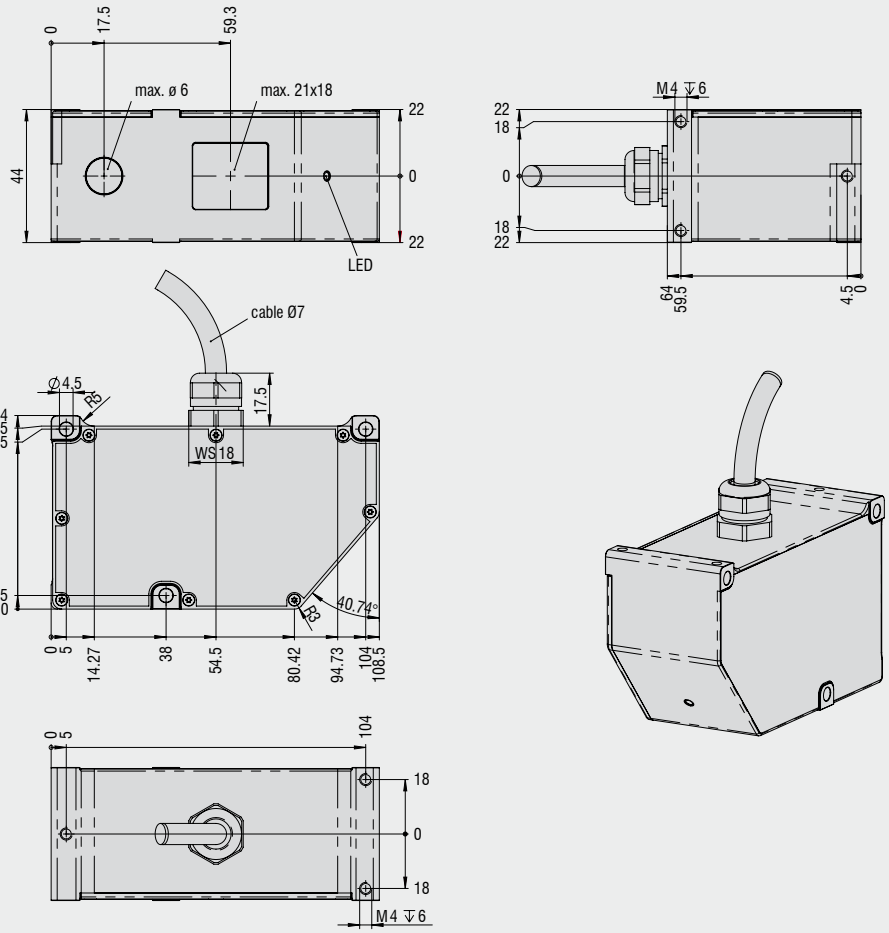


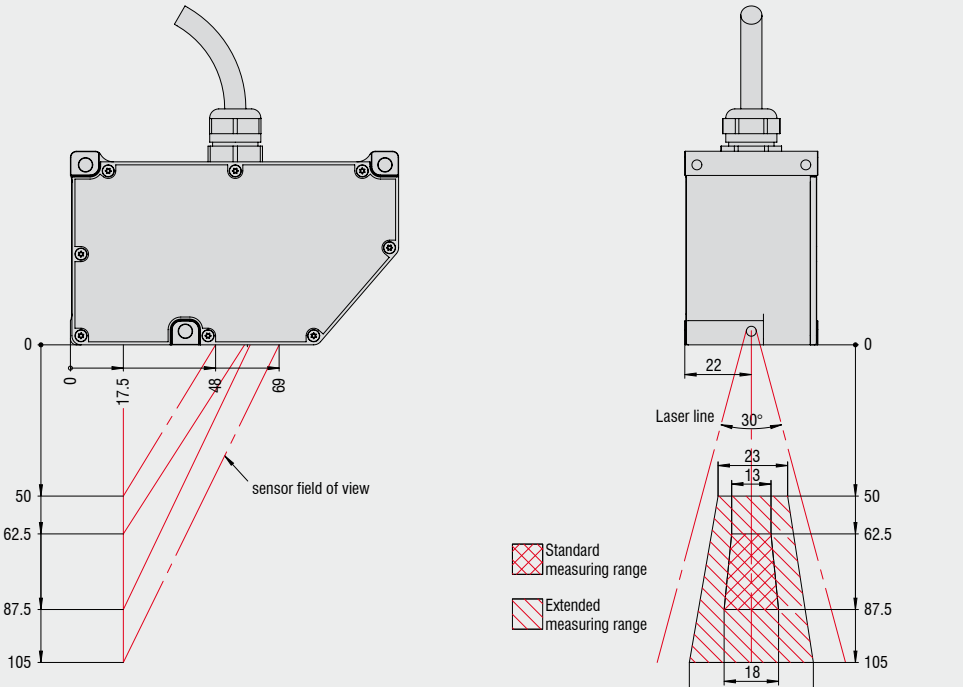

0
17
78.2
max. ø 6
max. ø 18
44
22
14
0
14
22
M4
5
75.5
34.5
0
0
4
94.75
110.2
122
126
R10
15.5
100
Ø21
R10
74.56
67
70
Ø4.2
M5 9 (above and below)
40.25
R10
25
21
R10
R12
36°
0
0
R10
0
54
58
91.13
94.02
0
13
90
14
0
14
M4 5


21
0
0
17
70.9
85.4
sensor field of view
70
75
80
0
22
Laser line
10°
Standard
measuring range
70
75
80
9.5
10
10.5

			HIGHSPEED	*SMART*
	Model	scanCONTROL	2800-10	2810-10
z-axis (height)	Standard measuring range 10mm	Start of measuring range	70mm	
		Midrange	75mm	
		End of measuring range	80mm	
	Linearity [1]	±0.3% FSO (3sigma)	±30µm	
	Resolution	0.04% FSO	10µm	
	Reference resolution [2] [3]		2µm	
x-axis (width)	Standard measuring range	Start of measuring range	9.5mm	
		Midrange	10mm	
		End of measuring range	10.5mm	
	Point distance	Midrange	9.8µm	
	Resolution x-axis		1,024 points/profile	
	Profile frequency		4,000 Hz	
	Measurement rate		256,000 points/sec	
	Interfaces profile data	FireWire	■	■
		RS232	■	■
		RS422	■	■
		Trigger HTL/TTL	■	■
		Counter (encoder)	■	■
	Signal output SMART	RS232		■
		RS422		■
		Analogue		■
		Switching signal		■
	Display (LED)		1x laser, 1x power/error/control, 2x mode	
	Protection class	Sensor	IP 64	
		Controller	IP 40	
	Operating temperature		0°C up to 50°C	
	Storage temperature		-20°C up to 70°C	
	Cable length		up to 10m	
	Weight	Sensor	appr. 560g	
		Controller	appr. 3.5kg	
	Galvanic isolation		All interfaces are galvanically isolated	
	Vibration		2g / 20 ... 500Hz	
	Shock		15g / 6ms	
	Supply		20-27 VDC, 500mA	
	Light source		semiconductor laser 655nm	
	Aperture angle laser line		10°	
	Laser power		7mW (class 2M)	
	Laser off		via software and external contact	
	Permissible ambient light (fluorescent light) [2]		10,000lx	

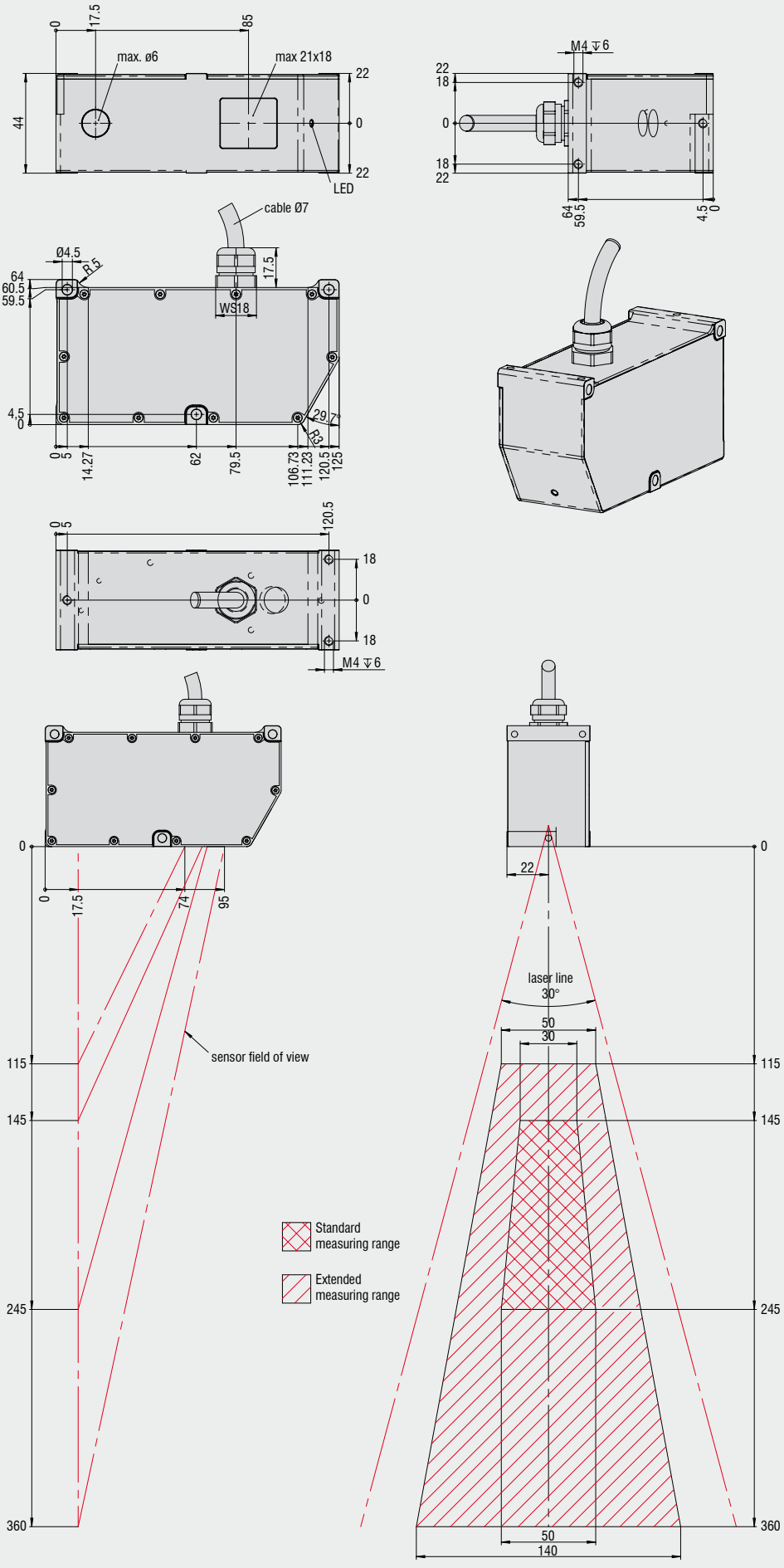
[1] Standard measuring range
[2] Measuring object: Micro-Epsilon standard object (metallic, diffusely reflecting material)
[3] According to a one-time averaging across the measuring field (1024 points)
FSO = Full scale output


0
17.5
59.3
max. ø 6
max. 21x18
22
44
0
22
LED
M4 ↧6
22
18
0
18
22
64
59.5
4.5
0
cable Ø7
Ø4.5
R5
17.5
64
60.5
59.5
WS18
4.5
0
R3
40.74°
0
5
14.27
38
54.5
80.42
94.73
104
108.5
0
5
104
18
0
18
M4 ↧6


0
0
17.5
48
69
sensor field of view
50
62.5
87.5
105
Standard measuring range
Extended measuring range
22
Laser line
30°
23
13
0
50
62.5
87.5
105
18
41

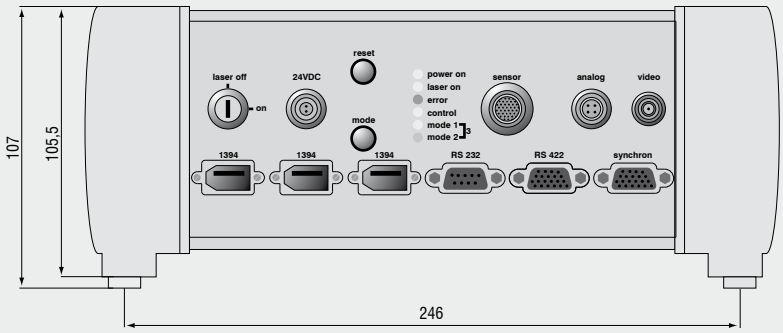
			HIGHSPEED	*SMART*
	Model	scanCONTROL	2800-25	2810-25
z-axis (height)	Standard measuring range 25mm	Start of measuring range	62.5mm	
		Midrange	75mm	
		End of measuring range	87.5mm	
	Extended measuring range 55mm	Start of measuring range	50mm	
		Midrange	82.5mm	
		End of measuring range	105mm	
	Linearity [1]	±0.2% FSO (3sigma)	±50µm	
	Resolution	0.04% FSO	10µm	
	Reference resolution [2] [3]		4µm	
x-axis (width)	Standard measuring range	Start of measuring range	13mm	
		End of measuring range	18mm	
	Extended measuring range	Start of measuring range	23mm	
		End of measuring range	41mm	
	Point distance	Midrange	30µm	
	Resolution x-axis		1,024 points/profile	
	Profile frequency		4,000Hz	
	Measurement rate		256,000 points/sec	
	Interfaces profile data	FireWire	■	■
		RS232	■	■
		RS422	■	■
		Trigger HTL/TTL	■	■
		Counter (encoder)	■	■
	Signal output SMART	RS232		■
		RS422		■
		Analogue		■
		Switching signal		■
	Display (LED)		1x laser, 1x power/error/control, 2x mode	
	Protection class	Sensor	IP 64	
		Controller	IP 40	
	Operating temperature		0°C up to 50°C	
	Storage temperature		-20°C up to 70°C	
	Cable length		up to 10m	
	Weight	Sensor	appr. 350g	
		Controller	appr. 3.5kg	
	Galvanic isolation		All interfaces are galvanically isolated	
	Vibration		2g / 20 ... 500Hz	
	Shock		15g / 6ms	
	Supply		20-27 VDC, 500mA	
	Light source		semiconductor laser 655nm	
	Aperture angle laser line		30°	
	Laser power	standard	15mW (class 2M)	
		optional	50mW (class 3B)	
	Laser off		via software and external contact	
	Permissible ambient light (fluorescent light) [2]		10,000lx	

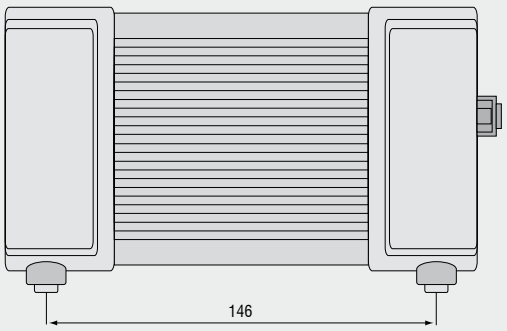
[1] Standard measuring range
[2] Measuring object: Micro-Epsilon standard object (metallic, diffusely reflecting material)
[3] According to a one-time averaging across the measuring field (1024 points)
FSO = Full scale output

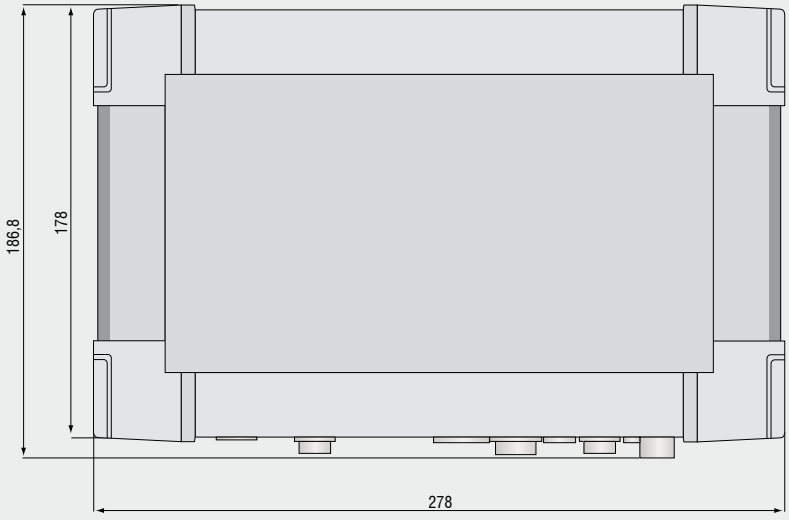

max. ø6
max 21x18
LED
M4 ↧6
cable Ø7
Ø4.5
WS18
laser line
30°
sensor field of view
Standard
measuring range
Extended
measuring range

			HIGHSPEED	*SMART*
	Model	scanCONTROL	2800-100	2810-100
z-axis (height)	Standard measuring range 100mm	Start of measuring range	145mm	
		Midrange	195mm	
		End of measuring range	245mm	
	Extended measuring range 245mm	Start of measuring range	115mm	
		Midrange	235mm	
		End of measuring range	360mm	
	Linearity [1]	±0.2% FSO (3sigma)	±200µm	
	Resolution	0.04% FSO	40µm	
	Reference resolution [2] [3]		10µm	
x-axis (width)	Standard measuring range	Start of measuring range	30mm	
		End of measuring range	50mm	
	Extended measuring range	Start of measuring range	50mm	
		End of measuring range	140mm	
	Point distance	Midrange	80µm	
	Resolution x-axis		1,024 points/profile	
	Profile frequency		4,000Hz	
	Measurement rate		256,000 points/sec	
	Interfaces profile data	FireWire	■	■
		RS232	■	■
		RS422	■	■
		Trigger HTL/TTL	■	■
		Counter (encoder)	■	■
	Signal output SMART	RS232		■
		RS422		■
		Analogue		■
		Switching signal		■
	Display (LED)		1x laser, 1x power/error/control, 2x mode	
	Protection class	Sensor	IP 64	
		Controller	IP 40	
	Operating temperature		0°C up to 50°C	
	Storage temperature		-20°C up to 70°C	
	Cable length		up to 10m	
	Weight	Sensor	appr. 400g	
		Controller	appr. 3.5kg	
	Galvanic isolation		All interfaces are galvanically isolated	
	Vibration		2g / 20 ... 500Hz	
	Shock		15g / 6ms	
	Supply		20-27 VDC, 500mA	
	Light source		semiconductor laser 655nm	
	Aperture angle laser line		30°	
	Laser power	standard	15mW (class 2M)	
		optional	50mW (class 3B)	
	Laser off		via software and external contact	
	Permissible ambient light (fluorescent light) [2]		10,000lx	

[1] Standard measuring range
[2] Measuring object: Micro-Epsilon standard object (metallic, diffusely reflecting material)
[3] According to a one-time averaging across the measuring field (1024 points)
FSO = Full scale output

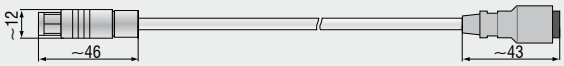

laser off
on
24VDC
reset
mode
power on
laser on
error
control
mode 1
mode 2
sensor
analog
video
1394
1394
1394
RS 232
RS 422
synchron
107
105,5
246


146


186,8
178
278

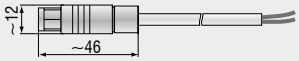
Cables and accessories

FireWire interface cable with integrated power supply



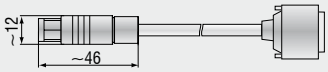
Sensor connector IEEE1394a FireWire (6-pin)

External power supply cable



Sensor connector

RS422 interface cable



Sensor connector

Connecting cables, qualified for drag chain use

Part.-No.	*Model*	*Description*
2901146	CE2800-3-SB	Extension cable for sensor, 3m (female-male)
2901146.01	CE2800-3-SS	Connection cable for sensor, 3m (male-male)
2901219	CE2800-5-SB	Extension cable for sensor, 5m (female-male)
2901219.01	CE2800-5-SS	Connection cable for sensor, 4.75m (male-male)
2901147	CE2800-8-SB	Extension cable for sensor, 8m (female-male)
2901228	CE2800-8-SS	Connection cable for sensor, 7.75m (male-male)
2901167	CE2800-10-SS	Connection cable for sensor, 9.75m (male-male)

Connecting cables, qualified for robotic use

Part.-No.	*Model*	*Description*
2901202	CER2800-5-SS	Connection cable for sensor, 4.75m (male-male)
2901222	CER2800-8-SB	Extension cable for sensor, 8m (female-male)
2901229	CER2800-8-SS	Connection cable for sensor, 7.75m (male-male)
2901164	CER2800-10-SS	Connection cable for sensor, 9.75m (male-male)

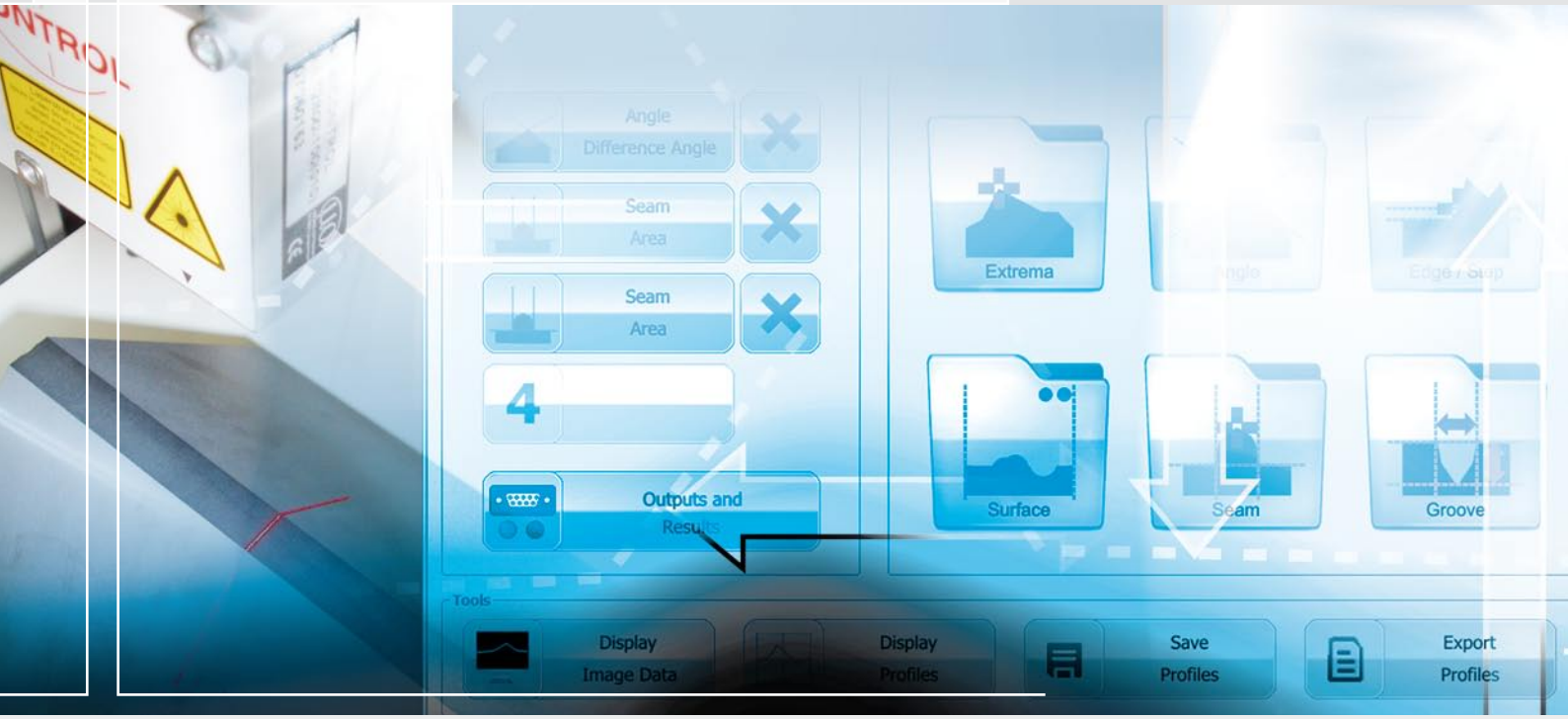
Other cables

Part.-No.	*Model*	*Description*
2901145	PC2800-3	Power supply cable, 3m
2901159	SCD-IEEE-1394-3	FireWire cable, 3m
2901150	SC2800-0,5	Synchronisation cable, 0.5m suitable for controller LLT2800 and LLT2810

Accessories

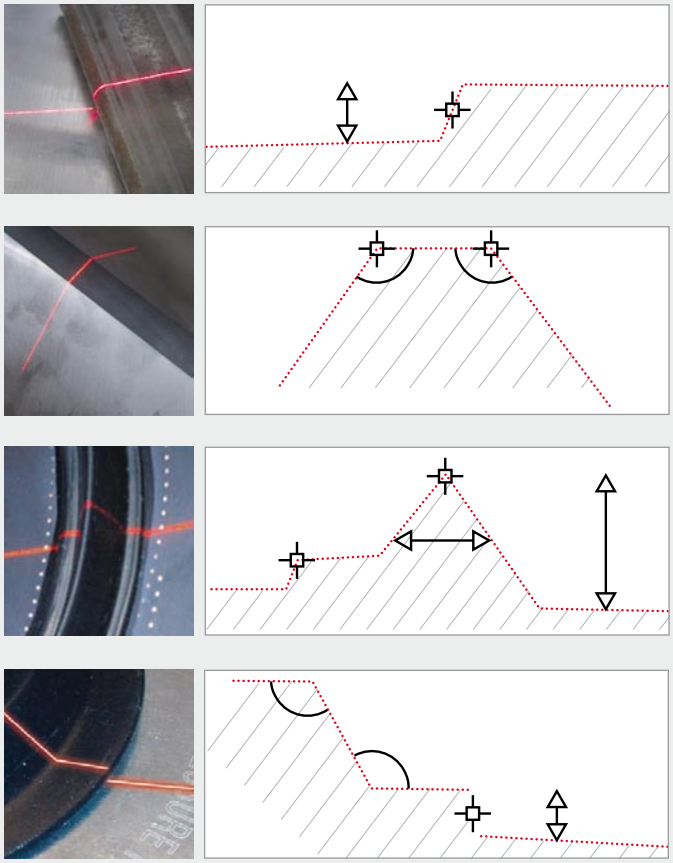
Part.-No.	*Model*	*Description*
2420019	PS2010	Power supply PS2010, input 210 - 240 VAC (or 110 -120 VAC) output 24 VDC
8360006	3D-View	scanCONTROL 3D-View software

Configuration Tools software



- Plug & Play solution for standard measurement tasks
- Real time profile analysis inside the controller
- Load and save parameters
- Data export
- Easy online and offline analysis

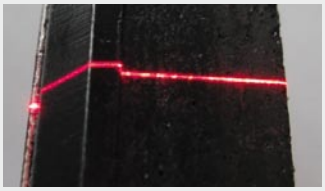
The sensors of the SMART series have an intelligent controller which allows simple profile analysis without an additional PC. The scanCONTROL Configuration Tools software is used for parameter setup of the profile analysis.
For offline testing of very fast processes, the functions of the software also run with recorded profiles without a sensor.
A complete profile analysis task can be programmed in four simple steps. After programming the sensor operates in standalone mode and outputs the analysed measurement results.

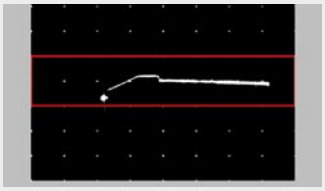


The system is freely configurable and can be quickly and easily adjusted for a variety of tasks

Step 1
Alignment of the sensor

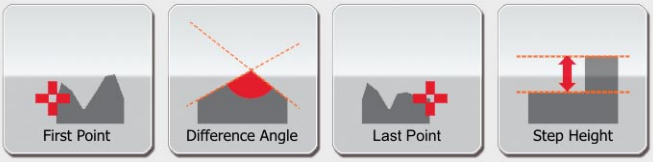
The ‚Display Image Data' module will help you to mount the sensor. This shows a live image of the sensor matrix and the optimum measuring range, as well as the reflection characteristics of the target.





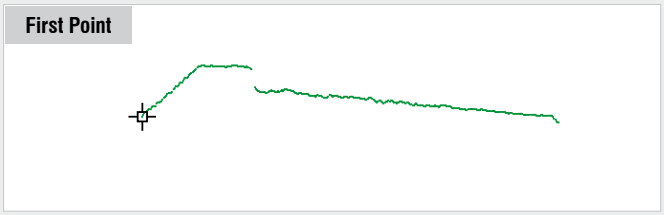
Step 2
Selection of measurement programmes

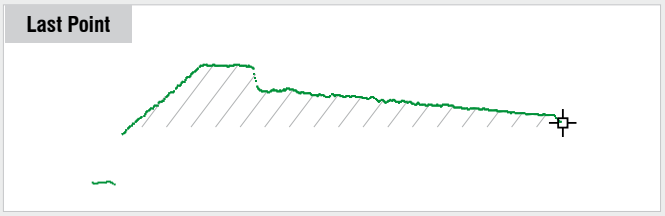
Depending on the measurement task, one or more measurement programmes can be selected with a simple mouse click. More than 25 modules are available. To the right four examples are shown for the profile above.

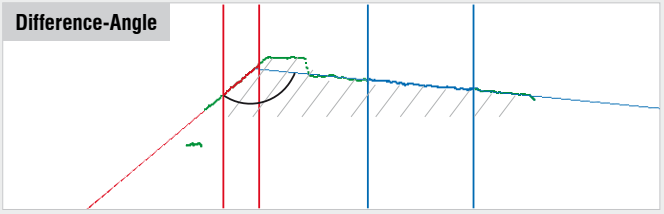


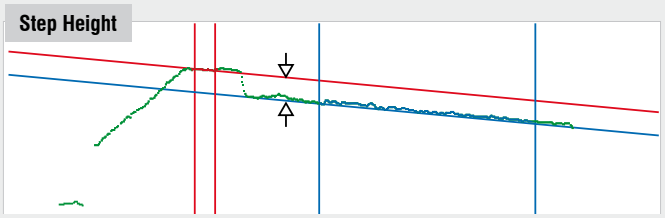
Step 3
Configuration of measurement programmes

Each of these measurement programmes can be individually configured. On a simple interface, different methods of interacting with the live measurement signal are available. Therefore, the relevant areas of the signal, for example, can be cut out and reference points set. The results of the individual measurement packages are displayed directly in the profile.



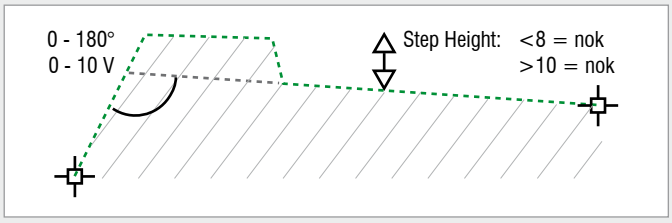






Step 4
Defining the outputs and displaying measured values

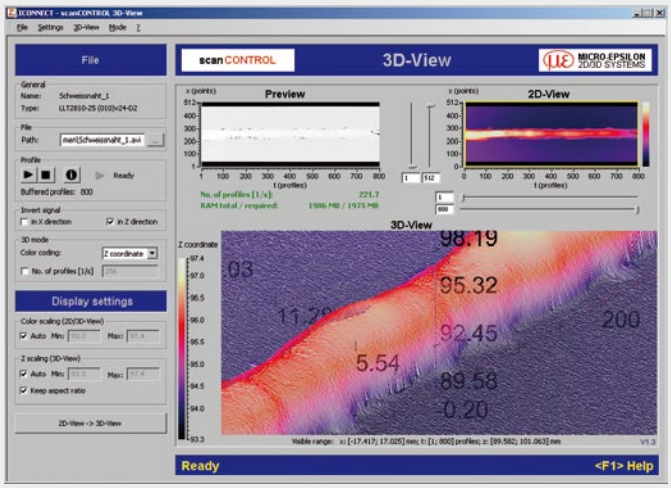
In the final step, all measurement values in the profile are displayed in an online overview, and assigned to the different outputs. Limits and interfaces can therefore be easily configured.

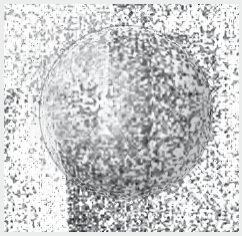


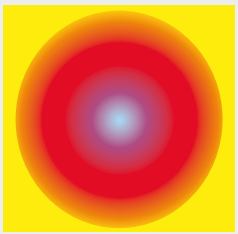
Interactive 3D visualisation for all scanCONTROL models

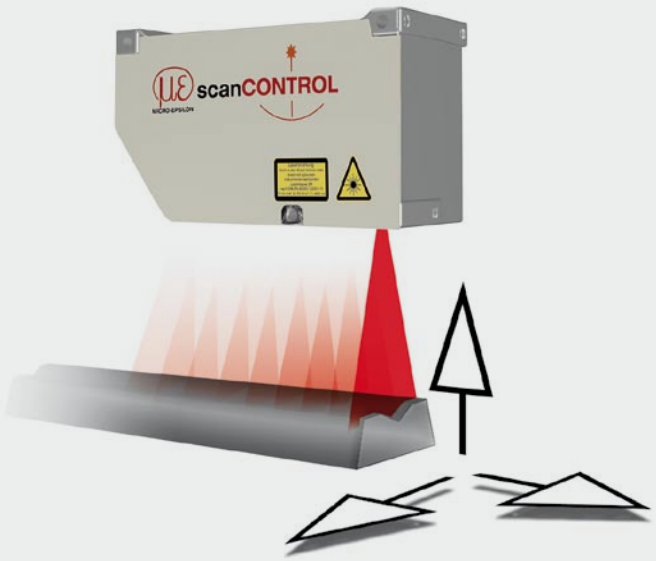
By means of the relative movement between sensor and target, the third dimension for the measurement data is obtained. The y-coordinates are assigned via a trigger or CMM counter.
The scanCONTROL 3D-View software is designed for viewing and exporting this 3D data. In addition, 3D-View also supports the configuration of the scanCONTROL sensor.
The software enables the interactive viewing of 3D data and the export of this measurement data to common data formats (ASCI, STL or PNG). Various display modes, views and colour palettes help in setting up the sensors and analysing the profiles. The software supports the online visualisation of the profiles as well as offline analysis of stored profile sequences.

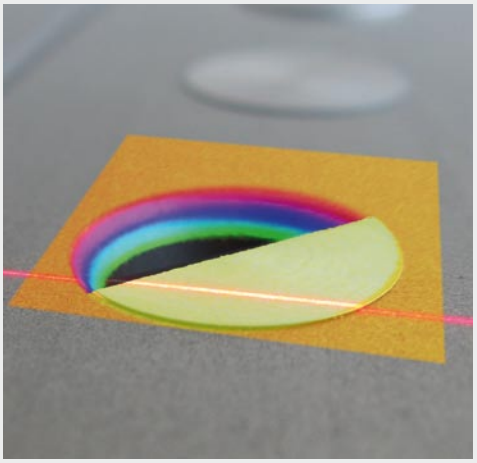
- **Display of profile sequences**
- **Offline or real-time display of 3D profiles**
- **Synchronisation of the direction of travel (e.g. by encoder)**
- **2D Export of the profile sequences (PNG)**
- **3D Export (ASC, STL) for CAD programmes**
- **Intensity per point can be displayed and exported**



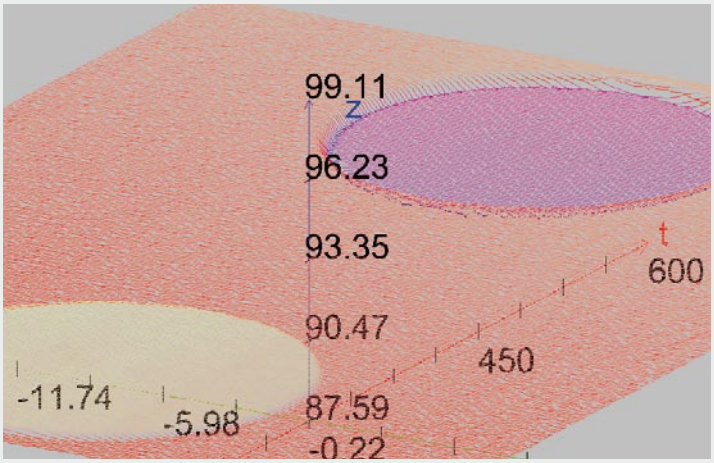

Intensity


Height profile

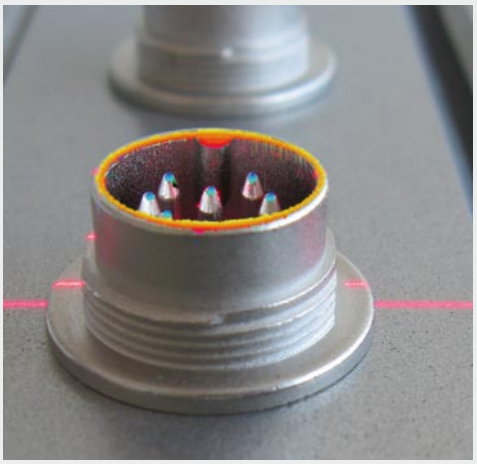




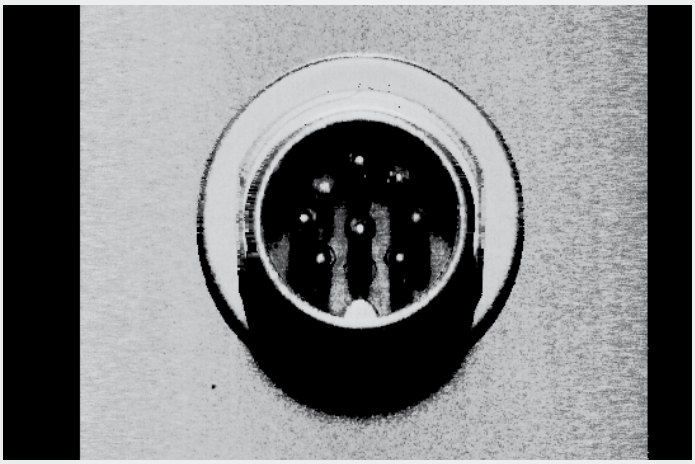
Rivet



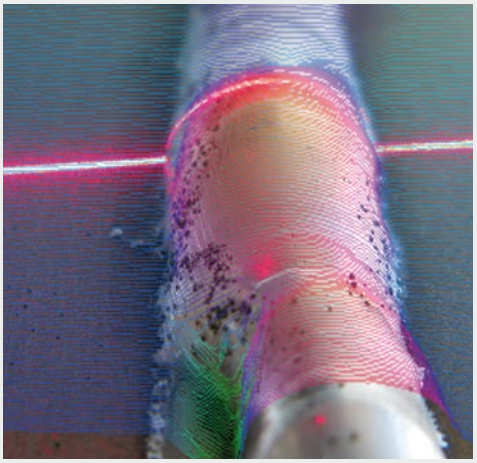
Display mode: "3D view lines"; Colour palette "z-coordinates"



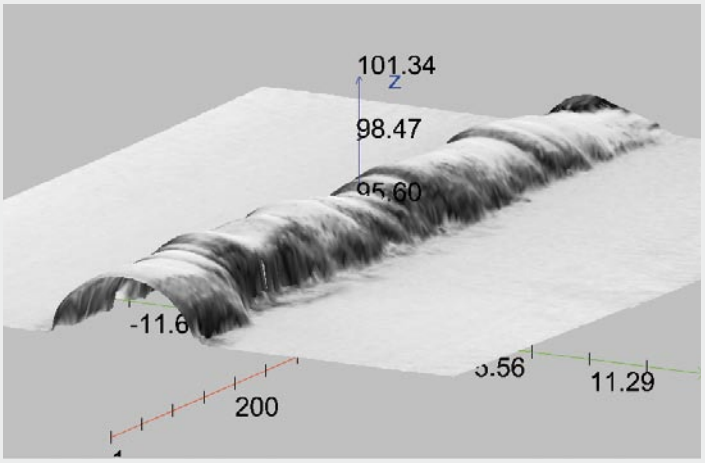
Pin



Display mode: "2D view"; Colour palette "intensity"



Weld seam



Display mode: "3D view triangles"; Colour palette coding "intensity"

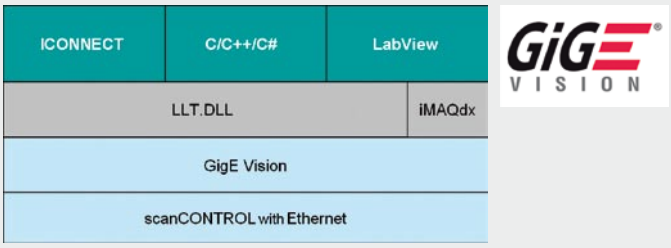
Integrating scanCONTROL in application software

The scanCONTROL 2700 and 2800 sensors record a profile from individual calibrated points for each measurement. These profiles can be used individually or combined in a container set, and transferred to your own applications as an array or matrix. 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 interfaces primarily used by scanCONTROL sensors for communications and profile transfer are FireWire and Ethernet.

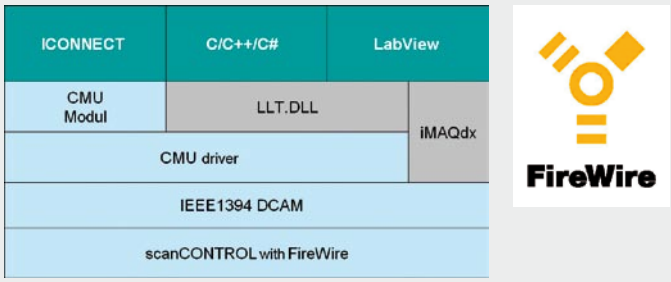
Ethernet and GigE Vision

The scanCONTROL with Ethernet interface complies with the GigE Vision (Gigabit Ethernet for machine vision) standard of the AIA (Automated Imaging Association).
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 of more than 100MB/s. 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 scanCONTROL and a PC. The infrastructure topology provides numerous opportunities for single and multiple scanner applications.



FireWire and DCAM

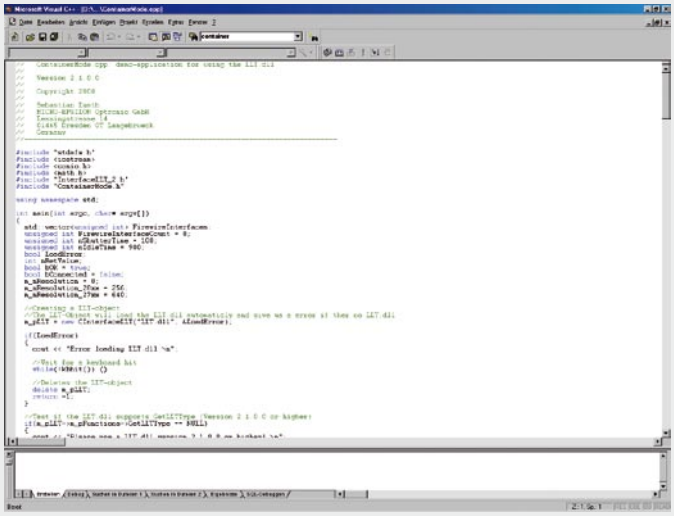
Communication between computers and scanCONTROL by FireWire is based on the widely used DCAM standard protocol. It was defined by the IIDC working group of the 1394 Trade Association and has been evolving constantly since then. IIDC stands for „Instrumentation and Industrial Digital Camera“. DCAM defines the structure of the data stream and the configuration of scanCONTROL (measuring fields, measuring frequency, and exposure time, etc.).
Communication from scanCONTROL sensors that are equipped with an IEEE1394 interface is compatible with the DCAM standard. As an interface, FireWire is either already available on most modern PCs, or is very easy to retrofit. The interface allows a quick and easy „Plug&Play“ connection of scanCONTROL sensors.



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.

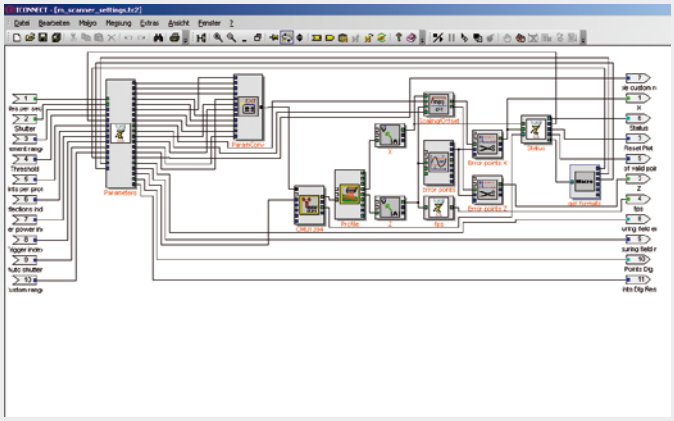
The scanCONTROL C-SDK integration package includes:
- The LLT.DLL library file
- Interfaces and scanCONTROL documentation
- Numerous programming examples for C++, e.g. for trigger and container mode
- Programming example for C # and .NET
- DeveloperDemo.exe demo for quick testing of the sensor configuration



Integration wtth ICONNECT

Even in the standard version supplied, ICONNECT already contains the modules necessary to enable easy and convenient integration of scanCONTROL sensors using Drag&Drop. This ready-made interface allows fast integration and configuration of the scanCONTROL sensors.

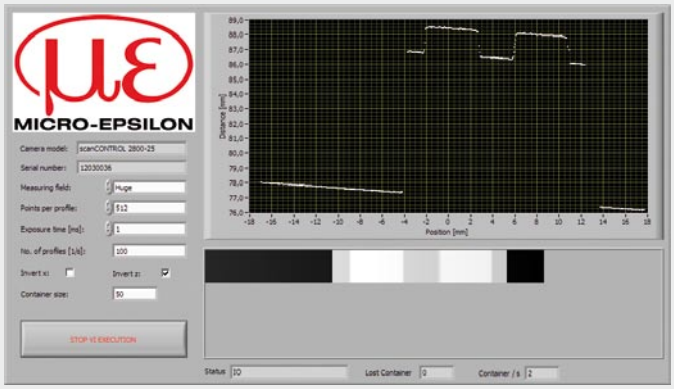
The scanCONTROL Development integration package contains:
- scanCONTROL documentation
- Programming examples for integration and visualisation in ICONNECT



Integration with LabView

The integration of scanCONTROL sensors in the LabView programming environment from National Instruments can be achieved in two ways: with the aid of the C/C++ library LLT.dll from Micro-Epsilon, or by using the IMAQdx driver that comes with the Vision Acquisition software from National Instruments. Both interfaces enable rapid and reliable integration of the scanCONTROL sensors in LabView.

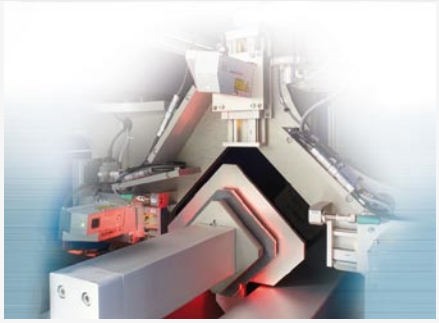
The scanCONTROL LabView-SDK integration package contains:
- Several example VIs (individual profile transfer and container mode)
- Detailed documentation



High performance sensors made by Micro-Epsilon

Sensors and systems for displacement, position and dimension
Eddy current sensors
Optical and laser sensors
Capacitive sensors
Inductive sensors
Draw-wire sensors
Optical micrometers
2D/3D profile sensors
Image processing

Sensors and measurement devices for non-contact temperature sensors
Thermal imager
Online instruments
Handheld devices



Measuring systems for quality control
Plastic and film
Tyre and rubber
Web material
Automotive components
Glass and panes

MICRO-EPSILON

MICRO-EPSILON MESSTECHNIK GmbH & Co. KG
Koenigbacher Str. 15 · 94496 Ortenburg / Germany
Tel. +49 (0) 8542 / 168-0 · Fax +49 (0) 8542 / 168-90
info@micro-epsilon.com · **www.micro-epsilon.com**