SENSORS & SYSTEMS

By far the better solution





High accuracy and very high frame frequency thanks to

- innovative
- CMOS-technology - high-performance
- signal processing unit
- flexible field of view

scanCONTROL 2800

2D/3D Laser-Line Triangulation

Measuring principle

The laser-line profile sensor scanCONTROL 2800 makes use of the triangulation principle for two-dimensional acquisition of profiles on the most varied target surfaces.

In contrast to familiar point laser sensors, a line optical system projects a laser line onto the surface of the object to be measured. The back scattered light from the laser line is registered on a CMOS array by a high quality optical system. Along with distance information (z-axis), the controller also computes the true position along the laser line (x-axis) from the camera image and outputs both values in the sensor two-dimensional coordinate system.

A moving object or a scanning sensor will genera-te threedimensional representation of the object.

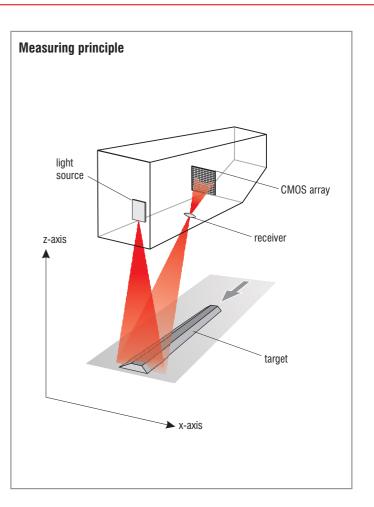
System configuration

scanCONTROL consists of a compact sensor and an intelligent controller connected together via cable of variable length. The controller outputs measurement raw data computed from both axes (standard) as well as related values of geometrical features (optional).

Thanks to its exceptional speed of measuring and real time data output synchronisation scanCONTROL is not limited in its applications and is ideally suited for industrial in line inspection. The integrated FireWire interface enables scanCONTROL to be fully controlled from a PC, while insuring high data output rates and simultaneously preserving the bandwidth. Integrated via a PCI card in the bus system, FireWire also facilitates control of several scanCON-TROL systems from one PC.

Three ways of creating the application:

- PC solutions with the customer's own software
- (C++ library included in supplied items).
- PC solutions with the ICONNECT modular software with ready-made standard modules for control and evaluation.
- Integrated software packages (optional) in the digital signal processor (DSP) of the controller.







Controller LLT 2800



Special performance features

scanCONTROL has been developed for industrial applications. In this respect, innovative technologies are employed through which the functionality of the system and adaptability to different applications are substantially increased.

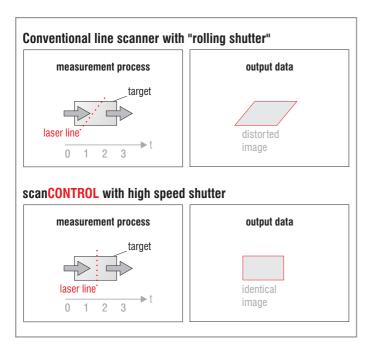
Synchronous measurement through synchronous illumination

scanCONTROL uses an innovative CMOS array with a global, electronic shutter (high speed shutter) instead of a "rolling shutter" used in conventional scanners.

Measurement therefore occurs synchronously along the laser line, thus eliminating any distortion of the measurement image due to scanning.

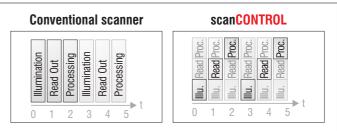
The shutter can in addition be controlled in real time via an external trigger input (on the controller). The additional trigger input eases synchronizing several scanCONTROL systems together.

The real time shutter renders the measurement system nearly independent of scanning or object displacement speed and acceleration. This is an important advantage in achieving short throughput times, particularly in automation where varying acceleration levels often occur in processes.



Innovative high performance CMOS array

A specially developed high performance CMOS array supports the illumination of the next image while the current image is still being read out. This means that for the same laser class higher measuring frequencies are achieved even with shiny or strongly absorbing surfaces.

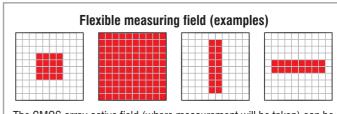


Conventional scanners only execute one processing step per unit of time.

With scanCONTROL the innovative CMOS array ensures, in conjunction with specially optimized hardware, time-synchronous processing of individual steps. This enables a substantially higher data acquisition and processing rate than with normal scanners.

Flexible measuring field

According to application, user may parameter the sensor privileging either data acquisition speed or width and/or depth of measuring field. The sole limit is acquisition of a max. of 256,000 points/sec eg.: user can elect to measure **256 points/profile:** at profile frequency of **1000 profiles/sec 512 points/profile:** at profile frequency of **500 profiles/sec 1024 points/profile:** at profile frequency of **250 profiles/sec 0**n top of speed and number of points selection, user can also decide width of profile line and depth of measuring field eg.: 512 points over a narrow profile thus increasing lateral resolution (for edge detection) or 256 points over a large profile to increase digitising speed (typical for large surface inspection) or any other combination among 96 possible.



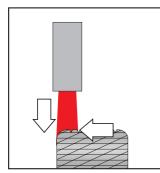
The CMOS array active field (where measurement will be taken) can be programmed according to 96 predefined possibilities, eg. using only a portion of the array increases data aquisition speed, selecting the central area increases accuracy.

scanCONTROL 2800

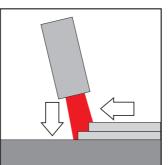
Typical Applications

Applications

scanCONTROL 2800 is designed for applications in industrial environments. High measuring rate and accuracy make the system ideally suited for applications requiring highest precision with short cycle times.



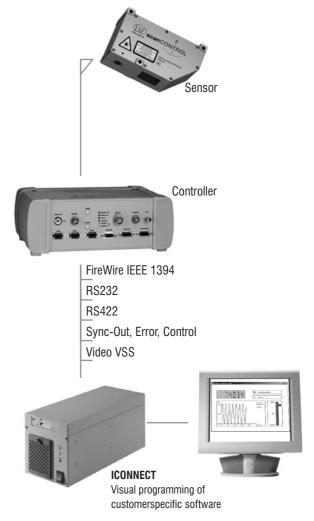
Tire profile Tire roundness Tire deformation

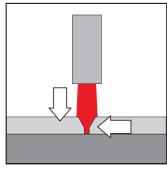


Edge detection Positioning Height profile

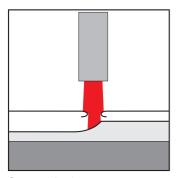
scanCONTROL and ICONNECT

The link between the FireWire high speed interface and the MICRO-EPSILON real-time software ICONNECT opens up an unlimited number of possible applications for scanCONTROL. Using the graphic user interface in ICONNECT, it is very easy for user to generate applications of their own. The modular programming principle allows complex links to be produced with just a mouse click. The real-time capability and high data throughput of ICONNECT supplement and support the high processing speed of scanCONTROL. Data are recorded, processed and visually displayed in real time, even at the highest scanning rate. ICONNECT can also be used as the real time control software and then acts as a line PLC.

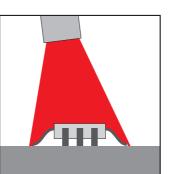




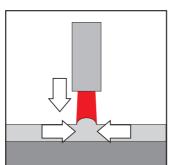
Groove width and depth Robot guidance



Gap and flush Door edges



Coplanarity Deformation Lead position



Welding seam inspection Glue bead inspection Profile monitoring

Technical data



Standard ranges, extended range in brackets (±5%) Measuring range z-axis 25 (55) mm 0.98° (2.17°) 100 (245 Start of measuring range (SMR) 62.5 (50) mm 2.46° (1.96°) 145 (115 Reference distance, midrange (MMR) 75 (82.5) mm 2.95° (3.25°) 195 (235 End of measuring range (EMR) 87.5 (105) mm 3.44° (4.13°) 245 (360 Resolution z-axis * 0.04% 0.04% Linearity z-axis, ±3σσ* ±0.2 % ±50 µm 30 (50) Measuring range x-axis SMR 13 (23) mm 0.51° (0.91°) 30 (50) Laser aperture angle 30 ° 30 ° 30 ° 30 ° 30 ° Resolution x-axis 256 / 512 points/profile (1024 points/profi	LLT2800-25 LLT2800-100			
Measuring range z-axis 25 (55) mm 0.98° (2.17") 100 (245 Start of measuring range (SMR) 62.5 (50) mm 2.46° (1.96") 145 (115 Reference distance, midrange (MMR) 75 (82.5) mm 2.95° (3.25") 195 (235 End of measuring range (EMR) 87.5 (105) mm 3.44" (4.13") 245 (360 Resolution z-axis * 0.04% 10 µm 10 µm 10 µm 10 0.25% Linearity z-axis, ±3σđ* ±0.2 % ±50 µm 0.51" (0.91") 30 (50) Laser aperture angle 30 ° 87.6 (152) points/profile (10224 poi 50 (140) Linearity x-axis, ±3σđ* 256 / 512 points/profile (10224 poi 50 (140) Linearity x-axis, ±3σđ* 256 / 512 points/profile (10224 poi 50 (140) Linearity x-axis, ±3σđ* 256 / 512 points/profile (10224 poi 50 (140) Laser aperture angle 30 ° 87.8 (13 (23) mm 50 (160) Resolution x-axis 256 / 512 points/profile (10224 poi 50 (140) 50 (100) Linearity x-axis, ±3σđ* ±0.4 % SMR 60 µm / EMR 80 µm SMR 13 (23) mm 50 (160) Profile frequency <th>-</th> <th></th>	-			
Start of measuring range (SMR) 62.5 (50) mm 2.46" (1.96") 145 (115) Reference distance, midrange (MMR) 75 (82.5) mm 2.95" (3.25") 195 (235) End of measuring range (EMR) 87.5 (105) mm 3.44" (4.13") 245 (360) Resolution z-axis * 0.04% 10 µm	15) mm	3.94" (9.65")		
Reference distance, midrange (MMR) 75 (82.5) mm 2.95" (3.25") 195 (235 End of measuring range (EMR) 87.5 (105) mm 3.44" (4.13") 245 (360 Resolution z-axis * 0.04% 10 µm		5.71" (4.53")		
End of measuring range (EMR) 87.5 (105) mm 3.44" (4.13") 245 (360 Resolution z-axis * 0.04% Linearity z-axis, ±3σ ±0.µm ±0.2 % Measuring range x-axis SMR 13 (23) mm 0.51" (0.91") 30 (50) Laser aperture angle 30 ° EMR 18 (41) mm 0.70" (1.61") 50 (140) Linearity x-axis, ±3σ SMR 18 (41) mm 0.70" (1.61") 50 (140) 30 ° Resolution x-axis 256 / 512 points/profile (1024 points/pro		7.68" (9.25")		
Resolution z-axis * 0.04% Linearity z-axis, $\pm 3\sigma\sigma^*$ $\pm 0.2 \%$ Measuring range x-axis SMR 13 (23) mm 0.51" (0.91") 30 (50) Linearity z-axis, $\pm 3\sigma\sigma^*$ EMR 18 (41) mm 0.70" (1.61") 50 (140) Laser aperture angle 30 ° Resolution x-axis 256 / 512 points/profile (1024 points/prot (1026 points/prot (1026 points/prot (1026		9.65" (14.17")		
Hesolution Z-axis * 10 μ m Linearity z-axis, $\pm 3\sigma\sigma$ $\pm 0.2 \%$ Measuring range x-axis SMR 13 (23) mm 0.51" (0.91") 30 (50) Laser aperture angle 30 ° 80° 80° 10 μ m				
Linearity z-axis, $\pm 3\sigma\sigma$ $\pm 0.2 \%$ Linearity z-axis, $\pm 3\sigma\sigma$ SMR 13 (23) mm0.51" (0.91")30 (50)Resolution x-axis $256 / 512 \text{ points/profile (1024 points/profile (1024 points/profile frequencyLinearity x-axis, \pm 3\sigma\sigma256 / 512 \text{ points/profile (1024 points/profile frequencyLinearity x-axis, \pm 3\sigma\sigma256 / 512 \text{ points/profile (1024 points/profile frequencyLinearity x-axis, \pm 3\sigma\sigma256 / 512 \text{ points/profile (1024 points/profile frequencyLinearity x-axis, \pm 3\sigma\sigma256 / 512 \text{ points/profile (1024 points/profile frequencyMeasuring rate256 / 512 \text{ points/profile frequencyMeasuring rate256 / 512 \text{ points/profile frequencyMeasuring rate256 / 512 \text{ points/points/s}Light sourceIllow on the found for the found for the found foun$	40 μm			
Linearity 2-axis, $\pm 3\sigma\sigma$ $\pm 50 \ \mu m$ Measuring range x-axisSMR13 (23) mm0.51" (0.91")30 (50)EMR18 (41) mm0.70" (1.61")50 (140)Linearity x-axis 256 / 512 points/profile (1024 points/profile profile profile points/profile (1024 points/profile parameter **Profile parameterSummary and points/profile (1024 points/				
Measuring range x-axis SMR 13 (23) mm 0.51" (0.91") 30 (50) EMR 18 (41) mm 0.70" (1.61") 50 (140) Laser aperture angle 30 ° Resolution x-axis 256 / 512 points/profile (1024 points/profile points/profile (1024 points/profile (1024 points/profile (1024 points/profile points/profile points/profile (1024 points/profile points/profile (1024 points/profile (1024 points/profile points/profile (1024 points/profile (1024 points/profile points/profile points/profile (1024 points/profile points/profile (1024 points/profile (1024 points/profile (1024 points/profile (1024 points/profile (1024 points/profile points/profile points/profile points/profile points/profile points/profile (1024 points/profile points/profile points/profile (1024 points/profile (1024 points/profile points/profile points/profile points/profile (1024 points/profile (1024 points/profile points/profile points/profile points/profile points/prof	axis +3md			
Measuring range x-axisEMR18 (41) mm 0.70° (1.61") 50 (140Laser aperture angle 30° Resolution x-axis $256 / 512$ points/profile (1024 points/profile points/profile (1024 points/profile (1024 points/profile points/profile (1024 points/profile points/profile (1024 points/profile (1024 points/profile points/profile (1024 points/profile points/profile (1024 points/profile (1024 points/profile points/profile (1024 points/profile (1024 points/profile (1024 points/profile points/profile points/profile points/profile (1024 points/profile (1024 points/profile points/p		1.18" (1.97")		
Laser aperture angle 30° Resolution x-axis 256 / 512 points/profile (1024 points/profile frequency Profile frequency ±0.4 % SMR 60 µm / EMR 80 µm SMR 1 Profile frequency to 1000 profiles/s Measuring rate 256,000 points/s Light source laser diode 655 nm, 15 Laser class class 2M Laser off remote - input and key s Permissible ambient light (fluorescent light) 10,000 lx Protection class sensor IP 64 Coperating temperature 050 °C / 32122 ° Storage temperature -2070 °C / -4158 ° Weight sensor 350 g Veight sensor 350 g Dutput analog preprogrammed x- and z-axis, alternative profile parameter ** ±10 V (16 bit, up to 150 °C / 32125 ° Output/Input digital 3x IEEE 1394 ("FireWire"), 400 MBit/s (115200 Baints) 1x RS232 (115200 Baints)	/	1.97" (5.51")		
Resolution x-axis 256 / 512 points/profile (1024 points/profile (1024 points/profile (1024 points/profile (1024 points/profile (1024 points/profile x = 0.4 % SMR 60 µm / EMR 80 µm) Linearity x-axis, ±3σở SMR 60 µm / EMR 80 µm) SMR 1 Profile frequency to 1000 profiles/s Measuring rate 256,000 points/s Light source laser diode 655 nm, 15 Laser class class 2M Laser off remote - input and key s Permissible ambient light (fluorescent light) 10,000 lx Protection class sensor IP 64 Operating temperature 050 °C / 32122 ° Storage temperature -2070 °C / -4158 Weight sensor 350 g Controller 3.5 kg Sensor cable standard length 2 m Output analog ±10 V (16 bit, up to 150 preprogrammed x- and z-axis, alternative profile parameter ** ±10 V (16 bit, up to 150 Output/Input digital 3x IEEE 1394 ("FireWire"), 400 MBit/s (Interface (measurement data and control commands)				
Linearity x-axis, $\pm 3\sigma\sigma$ $\pm 0.4\%$ IntegrationSMR 60 μ m / EMR 80 μ mSMR 1Profile frequencyto 1000 profiles/sMeasuring rate256,000 points/sLight sourcelaser diode 655 nm, 15Laser classclass 2MLaser offremote - input and key sPermissible ambient light (fluorescent light)10,000 lxProtection classsensorIP 64Coperating temperature050 °C / 32122 °Storage temperature350 gWeightsensorSensor cable standard length2 mOutput analogpreprogrammed x- and z-axis, alternative profile parameter ** $\pm 10 V$ (16 bit, up to 150Output/Input digital3x IEEE 1394 ("FireWire"), 400 MBit/s (Interface (measurement data and control commands)	256 / 512 points/profile (1024 points/profile)****			
Linearity x-axis, ±356 SMR 60 µm / EMR 80 µm SMR 1 Profile frequency to 1000 profiles/s Measuring rate 256,000 points/s Light source laser diode 655 nm, 15 Laser class class 2M Laser class class 2M Laser off remote - input and key s Permissible ambient light (fluorescent light) 10,000 lx Protection class sensor Meight 050 °C / 32122 ° Storage temperature -2070 °C / -4158 Weight sensor 350 g Output analog preprogrammed x- and z-axis, alternative profile parameter ** ±10 V (16 bit, up to 150 Output/Input digital 3x IEEE 1394 ("FireWire"), 400 MBit/s (Interface (measurement data and control commands) 1x RS232 (115200 Bat				
Profile frequency to 1000 profiles/s Measuring rate 256,000 points/s Light source laser diode 655 nm, 15 Laser class class 2M Laser off remote - input and key s Permissible ambient light (fluorescent light) 10,000 lx Protection class sensor Meight controller Operating temperature 050 °C / 32122 ° Storage temperature -2070 °C / -4158 ° Weight sensor 350 g Output analog preprogrammed x- and z-axis, alternative profile parameter ** ±10 V (16 bit, up to 150 Output/Input digital 3x IEEE 1394 ("FireWire"), 400 MBit/s (Interface (measurement data and control commands) 1x RS232 (115200 Bat	120 <i>µ</i> m	/ EMR 200 μm		
Measuring rate 256,000 points/s Light source laser diode 655 nm, 15 Laser class class 2M Laser off remote - input and key s Permissible ambient light (fluorescent light) 10,000 lx Protection class sensor Operating temperature 050 °C / 32122 ° Storage temperature -2070 °C / -4158 Weight sensor Sensor cable standard length 2 m Output analog preprogrammed x- and z-axis, alternative profile parameter ** Output/Input digital 3x IEEE 1394 ("FireWire"), 400 MBit/s (Interface (measurement data and control commands)	· · · · · · · · · · · ·			
Light source laser diode 655 nm, 15 Laser class class 2M Laser off remote - input and key s Permissible ambient light (fluorescent light) 10,000 lx Protection class sensor Operating temperature 050 °C / 32122 ° Storage temperature -2070 °C / -4158 ° Weight sensor 350 g Output analog controller 10 V (16 bit, up to 150 alternative profile parameter ** Output/Input digital 3x IEEE 1394 ("FireWire"), 400 MBit/s (Interface (measurement data and control commands)	· ·			
Laser class class 2M Laser off remote - input and key s Permissible ambient light (fluorescent light) 10,000 lx Protection class sensor IP 64 controller Operating temperature 050 °C / 32122 ° Storage temperature -2070 °C / -4158 ° Weight sensor Sensor cable standard length 2 m Output analog preprogrammed x- and z-axis, alternative profile parameter ** Output/Input digital 3x IEEE 1394 ("FireWire"), 400 MBit/s (Interface (measurement data and control commands)	laser diode 655 nm, 15 mW			
Permissible ambient light (fluorescent light) 10,000 lx Protection class IP 64 Controller IP 40 Operating temperature 050 °C / 32122 ° Storage temperature -2070 °C / -4158 ° Weight sensor Sensor cable standard length 2 m Output analog preprogrammed x- and z-axis, alternative profile parameter ** Output/Input digital 3x IEEE 1394 ("FireWire"), 400 MBit/s (Interface (measurement data and control commands)	class 2M			
Permissible ambient light (fluorescent light) 10,000 lx Protection class IP 64 Controller IP 40 Operating temperature 050 °C / 32122 ° Storage temperature -2070 °C / -4158 ° Weight sensor Sensor cable standard length 2 m Output analog preprogrammed x- and z-axis, alternative profile parameter ** Output/Input digital 3x IEEE 1394 ("FireWire"), 400 MBit/s (Interface (measurement data and control commands)	remote - input and key switch			
Protection class IP 40 Operating temperature 050 °C / 32122 ° Storage temperature -2070 °C / -4158 ° Weight sensor Sensor cable standard length 2 m Output analog preprogrammed x- and z-axis, alternative profile parameter ** Output/Input digital 3x IEEE 1394 ("FireWire"), 400 MBit/s (Interface (measurement data and control commands)	10,000 lx			
controller IP 40 Operating temperature 050 °C / 32122 ° Storage temperature -2070 °C / -4158 ° Weight sensor Sensor cable standard length 2 m Output analog preprogrammed x- and z-axis, alternative profile parameter ** Output/Input digital 3x IEEE 1394 ("FireWire"), 400 MBit/s (Interface (measurement data and control commands)	r IP 64			
Storage temperature -2070 °C / -4158 Weight sensor 350 g Weight controller 3.5 kg Sensor cable standard length 2 m Output analog preprogrammed x- and z-axis, alternative profile parameter ** ±10 V (16 bit, up to 150 Output/Input digital 3x IEEE 1394 ("FireWire"), 400 MBit/s (Interface (measurement data and control commands)	² 40			
Storage temperature -2070 °C / -4158 ° Weight sensor 350 g Sensor cable standard length 2 m Output analog 2 m preprogrammed x- and z-axis, alternative profile parameter ** ±10 V (16 bit, up to 150 Output/Input digital 3x IEEE 1394 ("FireWire"), 400 MBit/s (1x RS232 (115200 Bar	050 °C / 32122 °F			
weight controller 3.5 kg Sensor cable standard length 2 m Output analog 2 m preprogrammed x- and z-axis, alternative profile parameter ** ±10 V (16 bit, up to 150 Output/Input digital 3x IEEE 1394 ("FireWire"), 400 MBit/s (Interface (measurement data and control commands) Interface (measurement data and control commands) 1x RS232 (115200 Bar	-2070 °C / -4158 °F			
Controller 3.5 kg Sensor cable standard length 2 m Output analog 2 m preprogrammed x- and z-axis, alternative profile parameter ** ±10 V (16 bit, up to 150 Output/Input digital 3x IEEE 1394 ("FireWire"), 400 MBit/s (1x RS232 (115200 Bar	350 g 400 g			
Output analog preprogrammed x- and z-axis, alternative profile parameter ** Output/Input digital Interface (measurement data and control commands) 1x RS232 (115200 Bar				
preprogrammed x- and z-axis, ±10 V (16 bit, up to 150 alternative profile parameter ** ±10 V (16 bit, up to 150 Output/Input digital 3x IEEE 1394 ("FireWire"), 400 MBit/s (Interface (measurement data and control commands) 1x RS232 (115200 Bar	2 m			
alternative profile parameter ** ± 10 V (16 bit, up to 150 Output/Input digital 3x IEEE 1394 ("FireWire"), 400 MBit/s (Interface (measurement data and control commands) 1x RS232 (115200 Bar				
alternative profile parameter ** Output/Input digital Interface (measurement data and control commands) 1x RS232 (115200 Bar	$\pm 10 \text{ V}$ (16 bit up to 150 kHz)			
3x IEEE 1394 ("FireWire"), 400 MBit/s (Interface (measurement data and control commands) 1x RS232 (115200 Bar	0 КП <i>2)</i>			
Interface (measurement data and control commands) 1x RS232 (115200 Ba				
	(similar	DCAM 1.30)		
1, 00 400 (115000 0-	1x RS232 (115200 Baud) 1x RS422 (115200 Baud)			
IX R5422 (115200 Bal				
Synchron-connector, input *** sync-in, remote laser ON/OF	sync-in, remote laser ON/OFF, mode			
Synchron-connector, output *** sync-out, error, user moc	sync-out, error, user mode (2x)			
Video signal (test and set up mode) 1 V _{SS} (BAS-signal, 8-bit-	1 V _{SS} (BAS-signal, 8-bit-grey)			
Supply 24 VDC (±15 %) / 0.5	24 VDC (±15 %) / 0.5 A			

Il specifications apply for a diffusely reflecting matt white ceramic target - marginal position tolerance of the measuring-field is possible (sensor depending) SMR = Start Measuring Range EMR = End of Measuring Range

* for standard measuring ranges (512 points/profile preprogrammed)

** only for preprogrammed data, e.g. gap edge position, gap width, step heigth, angle

*** preprogrammed, other function possible

**** optional 1024 points/profile only in extended range



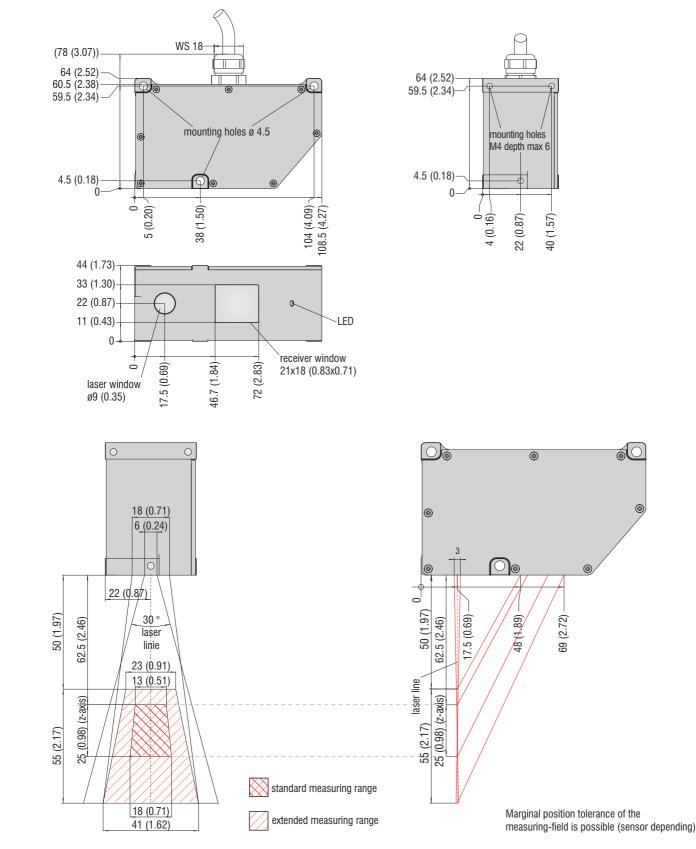
LASER RADIATION CLASS II LASER P≤15 mW; E≤70 W/m²; λ=655 nm DO NOT STARE INTO BEAM

The laser unit of scanCONTROL 2800 uses a semiconductor laser with a wavelengh of 655 nm (visible/red) and 15 mW optical output (class 2M). The sensor is classified as laser class 2M. A warning sign is attached to the sensor housing.

scanCONTROL 2800

Sensor dimensions

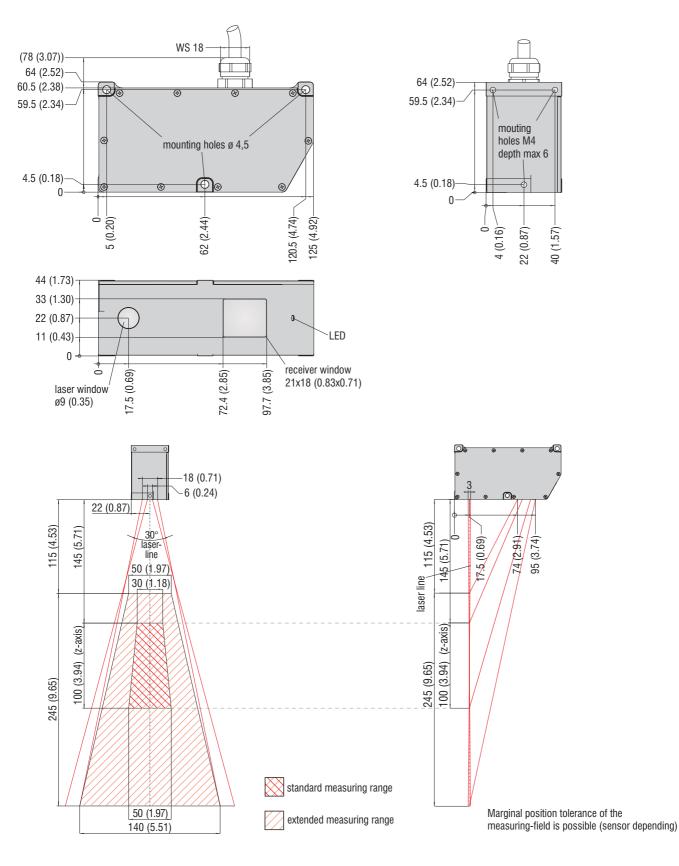
scanCONTROL 2800-25 Dimensions in mm (inch), not to scale

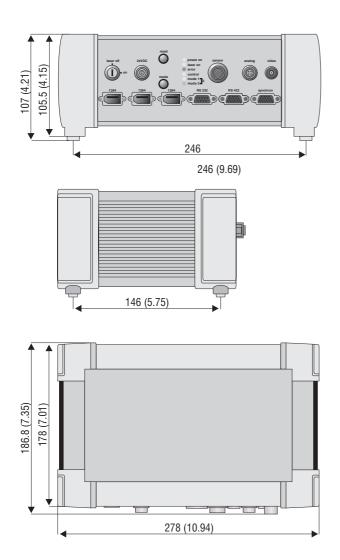


۲



scanCONTROL 2800-100 Dimensions in mm (inch), not to scale





Typical system includes (standard)

- ICONNECT-demonstration software (FireWire interface)
- Stand alone demo-software (standard FireWire or serial interface RS232)
- C++ library for customer-specific application
- IEEE 1394 cable
- Calibration certificate

Accessories (optional)

- Sensor extension cable 3 m or 8 m
- Cable analog output
- Interface card IEEE 1394
- ICONNECT modular software

MICRO-EPSILON

info@micro-epsilon.com www.micro-epsilon.com

info@micro-epsilon.co.uk www.micro-epsilon.co.uk info@micro-epsilon.us www.micro-epsilon.us