



Operating Instructions
scanCONTROL LLT8x00

LLT8200-25 LLT8500-25
LLT8200-50 LLT8500-50
LLT8200-100 LLT8500-100

Laser scanner

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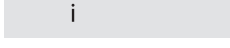
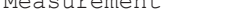
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1 Safety

1.1 Symbols used

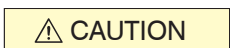

System operation assumes knowledge of the operating instructions.

The following symbols are used in these operating instructions:

 CAUTION	Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.
 NOTICE	Indicates a situation that may result in property damage if not avoided.
	Indicates a user action.
 i	Indicates a tip for users.
 Measurement	Indicates hardware or a software button/menu.

1.2 Warnings

Do not expose yourself to unnecessary laser radiation.

 CAUTION	<p>Connect the power supply according to the regulations for electrical equipment.</p> <ul style="list-style-type: none"> • Risk of injury • Damage to or destruction of the sensor
 NOTICE	<p>The supply voltage must not exceed the specified limits.</p> <ul style="list-style-type: none"> • Damage to or destruction of the sensor <p>Avoid constant exposure of the sensor to dust or splashes of water by taking suitable measures such as blowing off or using a protective housing.</p> <ul style="list-style-type: none"> • Damage to or destruction of the sensor <p>Avoid exposure of sensor to aggressive media (detergents, cooling emulsions).</p> <ul style="list-style-type: none"> • Damage to or destruction of the sensor <p>Protect the cables against damage.</p> <ul style="list-style-type: none"> • Failure of the measuring device <p>Only plug in or disconnect devices when disconnected from the power supply.</p>

1.3 Notes on product marking

1.3.1 CE marking

The following apply to the product:

- Directive 2014/30/EU ("EMC")
- Directive 2011/65/EU ("RoHS")

Products which carry the CE marking satisfy the requirements of the EU Directives cited and the relevant applicable harmonized European standards (EN).

The product is designed for use in industrial and laboratory environments.

The EU Declaration of Conformity and the technical documentation are available to the responsible authorities according to the EU Directives.

1.3.2 UKCA marking

The following apply to the product:

- SI 2016 No. 1091 ("EMC")
- SI 2012 No. 3032 ("RoHS")

Products which carry the UKCA marking satisfy the requirements of the directives cited and the relevant applicable harmonized standards.

The product is designed for use in industrial and laboratory environments.

The UKCA Declaration of Conformity and the technical documentation are available to the responsible authorities according to the UKCA Directives.

1.4 Intended use

The sensor is designed for use in industrial and laboratory environments.

It is used for

- Profile measurement, length measurement
- Monitoring Quality and Checking Dimensions

The sensor must only be operated within the values specified in the technical data.

The sensor must be used in such a way that no persons are endangered and no machines or other physical items of property are damaged in the event of malfunction or total failure of the sensor.

Take additional precautions for safety and damage prevention in case of safety-related applications.

1.5 Proper environment

Protection class:	IP67 ^[1]
Temperature range:	
- Operation:	0 ... +35 °C (without heat sink) 0 ... +45 °C (with optionally available passive heat sink) Other application-specific cooling concepts must be evaluated individually.
- Storage:	-20 ... +70 °C
Humidity:	5 ... 95 % RH (non-condensing)
Ambient pressure:	Atmospheric pressure
Installation altitude:	max. 2000 m above sea level

The protection class does not apply to optical paths during operation, as contamination of these paths will impair or prevent their function.

Use only shielded lines or the original cable from the accessories program for the power supply connection or the outputs.

Please also observe the notes on mounting and installation.

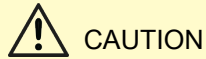
The sensor is dust-tight and protected against temporary immersion in water under consideration of protection class IP67. The IP67 protection class specifies protection against dust and water only. Exposure to oil, vapor, and emulsions is not covered by this protection class and must be evaluated separately.

[1] When an optional cooling solution with fan is installed, the IP rating is reduced to IP40.

2 Laser safety

The sensor works with a semiconductor laser at a wavelength of 520 nm (visible/green).

The sensors fall within laser class 2M. The laser is operated in pulsed mode, the maximum optical power is ≤ 20 mW. The pulse frequency depends on the measuring rate set (0 ... 20 kHz). The pulse duration of the peaks is controlled depending on the measuring rate and the reflectivity of the object being measured and can be 1 ... ∞ μ s.



CAUTION

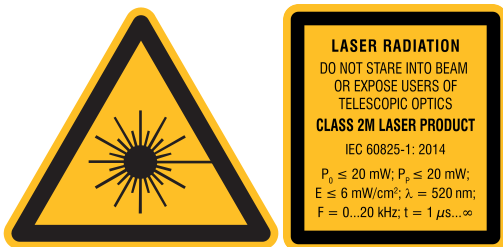
Laser radiation. Eyes could become irritated or damaged. Close your eyes, or immediately turn away if the laser beam hits the eye.

- i Observe the national laser protection regulations.

Relevant regulations must be observed when operating the sensors. The following apply accordingly:

- Class 2M laser devices may be used without further protective measures if you do not intentionally look into the laser beam or into specular-reflected radiation for more than 0.25 s.
- Directly looking into the beam can be dangerous, if the eye-closure reflex is consciously suppressed, e.g., during adjustment.
- Directly looking into the beam with optical devices, such as magnifying glasses, is dangerous.
- Because the presence of the eyelid protective reflex should not normally be assumed, one should deliberately close the eyes or turn away immediately if the laser beam hits the eye.

Class 2M laser devices are not subject to notification and a laser protection officer is not required.



Laser warning signs for Germany have already been printed on the device. The warning signs for the EU and US are included and must be attached for the appropriate region by the user prior to initial operation.

- i If both information signs are covered when the unit is installed, the user must ensure that supplementary information signs are attached at the installation location.

Laser areas must be marked permanently and clearly if the laser beam runs through a work or traffic area.

Operation of the laser is indicated visually by the Status LED on the sensor,.

The housings of the optical sensors may only be opened by the manufacturer, [see Chap. 8](#).

For repair and service purposes, the sensors must always be sent to the manufacturer.

Observe national regulations, e.g., the German Occupational Health and Safety Ordinance on Artificial Optical Radiation (OStrV).

Recommendations for the operation of sensors that emit laser radiation in the visible or non-visible range can be found in DIN EN 60825-1 (from 07/2022), among others.

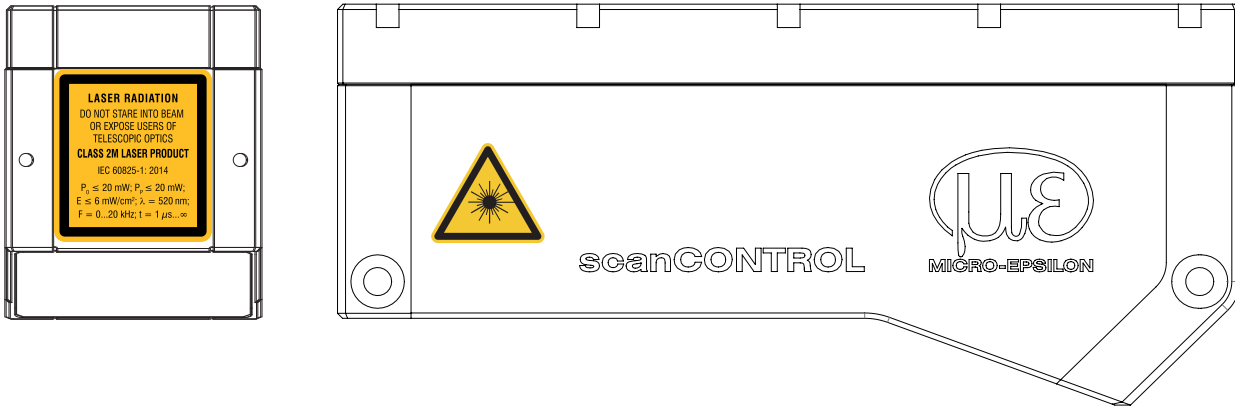


Fig. 2.1: Laser information and laser warning label on the sensor housing

3 Functional principle, technical data

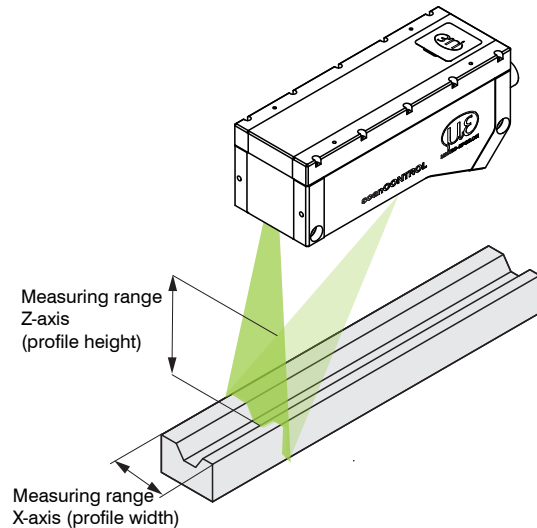
3.1 Short description

3.1.1 Measuring principle

The scanCONTROL 8x00 is a measuring system for measuring distances, profiles, and surfaces.

2D profile data and 3D point clouds are generated and transferred to a GigE Vision client (data supplier).

More information on evaluating the generated data, [see Chap. 7.8](#)



The sensor operates on the principle of optical triangulation (light section):

The laser line is projected onto the target surface using a line optics.

The diffusely reflected light from this laser line is projected onto a sensor matrix via high-quality optical system and evaluated in two dimensions.

In addition to the distance information (Z-axis), the exact position of each point on the laser line (X-axis) is also detected and output by the system.

3.1.2 Special performance features

- The sensor is characterized by its compact design and high speed combined with high measurement accuracy. A special line optics ensures uniform illumination of the measuring field.
- The optical components and the matrix are arranged in the sensor according to the Scheimpflug condition, which enables consistent image sharpness over the entire depth measuring range (Z-axis).
- The scanCONTROL 8x00 series with integrated profile evaluation can be operated without a PC in conjunction with stored configurations. The sensor performs the profile measurement internally and uses it to calculate specified measured values, such as angles or edge positions. In addition to outputting measured values via Ethernet (Modbus TCP protocol, UDP protocol) and differential outputs, switching signals (results of limit value determination) and analog measurement values can also be output. An optional 2D/3D output unit is used to convert the measured signals into switching and analog signals for further processing in a PLC.

3.1.3 System design

The measuring system is a compact sensor with an integrated controller. All necessary components are combined in one housing.

3.1.4 Advantages of the sensor matrix used (difference to conventional line scanners)

A global shutter (high-speed shutter) for the entire profile ensures high profile accuracy for fast-moving objects without "skew".

The matrix enables simultaneous exposure and readout of the previous image. This allows for longer exposure times at the same profile frequency, enabling even dark objects to be measured at high speeds.

3.1.5 Other advantages

- Synchronized/staggered triggering of multiple sensors
- External triggering
- GigE Vision/GenICam interface for simple parameterization and transmission of measured values
- Connection to PLC via various fieldbuses, Modbus TCP and digital/differential interfaces
- Digital switch inputs, either TTL or HTL (either pull-up or pull-down behavior).
- Automatic exposure time regulation ensures consistent measurement results on varying surfaces. It can be turned off if necessary.
- Ethernet 100/1000 Mbit as a fast standard connection to the PC.

3.2 Technical data

Model		LLT8200-25	LLT8200-50	LLT8200-100
Measuring range (z-axis)	Start of measuring range	74.5 mm	80 mm	110 mm
	Mid of measuring range	82.5 mm	97 mm	157 mm
	End of measuring range	90.5 mm	115 mm	205 mm
	Height of measuring range	16 mm	35 mm	95 mm
Linearity (z-axis) ^[2] ^[3]		0.005%	0.005%	0.005%
Measuring range (x-axis)	Start of measuring range	24.2 mm	46.2 mm	84 mm
	Mid of measuring range	25 mm	50 mm	100 mm
	End of measuring range	25.8 mm	53 mm	115 mm
Resolution (x-axis)		12 µm	24 µm	48 µm
Profile frequency		2,112 points/profile		
Profile frequency		up to 10,000 Hz		
Interfaces	Ethernet GigE Vision	Output of measurement values Sensor control		
	Digital inputs	Trigger Encoder Mode switching		
	Differential inputs/ outputs (I/O; sync)	Trigger Encoder Switch output Synchronization		
Output of measurement values		Ethernet (UDP / Modbus TCP); switch signal; PROFINET; EtherCAT; EtherNet/IP		
Control and indicator elements		3x color LEDs for laser, data and error		

[2] Based on the measuring range; measuring object: Micro-Epsilon standard object

[3] According to a one-time averaging across the measuring field (2,112 points)

Model		LLT8200-25	LLT8200-50	LLT8200-100
Light source	Green laser	≤ 20 mW	≤ 20 mW	≤ 20 mW
		Standard: Laser class 2M, semiconductor laser 520 nm		
Laser switch-off		via software and hardware switch-off		
Aperture angle of laser line		24 °	29 °	42 °
Protection class (DIN EN 60529)		IP67 ^[4]		
Vibration (DIN EN 60068-2-6)		2g / 20 ... 500 Hz		
Shock (DIN EN 60068-2-27)		15g / 6 ms		
Temperature range	Storage	-20 ... +70 °C		
	Operation	0 ... +45 °C ^[5]		
Weight		approx. 560 g / 720 g (with passive cooling unit)		
Supply voltage		11 ... 30 VDC, nominal value 24 V, 15 W Power over Ethernet (PoE) available		

Model		LLT8500-25	LLT8500-50	LLT8500-100
Measuring range (z-axis)	Start of measuring range	74.5 mm	80 mm	110 mm
	Mid of measuring range	82.5 mm	97 mm	157 mm
	End of measuring range	90.5 mm	115 mm	205 mm
	Height of measuring range	16 mm	35 mm	95 mm
Linearity (z-axis) ^{[2] [6]}		0.005 %	0.005%	0.005%
Measuring range (x-axis)	Start of measuring range	24.2 mm	46.2 mm	84 mm
	Mid of measuring range	25 mm	50 mm	100 mm
	End of measuring range	25.8 mm	53 mm	115 mm
Resolution (x-axis)		6 μm	12 μm	24 μm
Profile frequency		4,224 points/profile		
Profile frequency		up to 10,000 Hz		
Interfaces	Ethernet GigE Vision	Output of measurement values Sensor control		
	Digital inputs	Trigger Encoder Mode switching		
	Differential inputs/ outputs (I/O; sync)	Trigger Encoder Switch output Synchronization		
Output of measurement values		Ethernet (UDP / Modbus TCP); PROFINET; EtherCAT; EtherNet/IP; switch signal		
Control and indicator elements		3x color LEDs for laser, data and error, 2x fieldbus		
Light source	Green laser	≤ 20 mW	≤ 20 mW	≤ 20 mW
		Standard: Laser class 2M, semiconductor laser 520 nm		
Laser switch-off		via software and hardware switch-off		

[4] When an optional active cooling unit is installed, the IP rating is reduced to IP40.

[5] Applies when using a passive cooling solution. Without a cooling unit and thermal connection, the operating temperature is reduced to 0 ... +35 °C

[2] Based on the measuring range; measuring object: Micro-Epsilon standard object

[6] According to a one-time averaging across the measuring field (4,224 points)

Model	LLT8500-25	LLT8500-50	LLT8500-100
Aperture angle of laser line	24 °	29 °	42 °
Protection class (DIN EN 60529)	IP67 ^[4]		
Vibration (DIN EN 60068-2-6)	2g / 20 ... 500 Hz		
Shock (DIN EN 60068-2-27)	15g / 6 ms		
Temperature range	Storage	-20 ... +70 °C	
	Operation	0 ... +45 °C ^[5]	
Weight	approx. 560 g / 720 g (with passive cooling unit)		
Supply voltage	11 ... 30 VDC, nominal value 24 V, 15 W Power over Ethernet (PoE) available		

3.3 LED indicators

LED Laser	Meaning
Yellow	Laser on
LED Data	Meaning
Green	Measurement is active
Green, flashing slowly	Data transmission running
Green, flashing briefly	Controller access
LED Error	Meaning
Red, flashing	Error code



[4] When an optional active cooling unit is installed, the IP rating is reduced to IP40.

[5] Applies when using a passive cooling solution. Without a cooling unit and thermal connection, the operating temperature is reduced to 0 ... +35 °C

4 Delivery

4.1 Unpacking, included in delivery

- 1 sensor with integrated controller
 - Blind plug with integrated safety interlock bridge (for PoE operation)
 - Calibration protocol / Quick Manual
 - 1 protective cap
 - 2 mounting sleeves
 - IEC laser warning labels
- ▶ Carefully remove the components of the sensor from the packaging, handling them in such a way that no damage can occur.

i Do not touch the optical windows. Soiling of the optical windows will impair the functionality.

- ▶ Check the delivery for completeness and shipping damage immediately after unpacking.
- ▶ If there is damage or parts are missing, immediately contact the manufacturer or supplier.

Return of packaging

Micro-Epsilon Messtechnik GmbH & Co. KG offers customers the opportunity to return the packaging of products purchased from Micro-Epsilon by prior arrangement so that it can be reused or recycled.

To arrange the return of packaging, for questions about the costs and / or the exact return procedure, please contact us directly at

info@micro-epsilon.de

4.2 Storage

Temperature range: -20... +70 °C
Humidity: 5 ... 95 % RH (non-condensing)

5 Installation

5.1 Installation and mounting

Depending on the installation position, it is recommended to define the sensor position using centering elements and fitting bores.

- Refer to the dimensional drawings for the mounting dimensions.

NOTICE

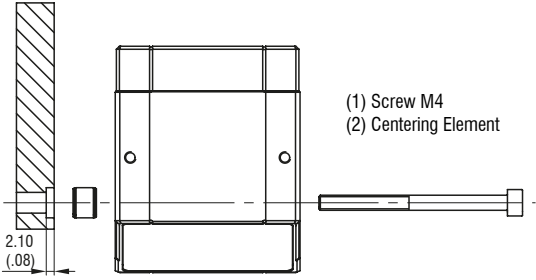
Material damage. Damage to or destruction of the sensor. Inaccurate or incorrect measurements

- ▶ The bearing surfaces surrounding the fastening holes (through-holes) are slightly raised. Mount the sensor only to the existing through-bores on a flat surface.
- ▶ Any type of clamping is not permitted.
- ▶ Do not exceed torques.

The laser beam must strike the target surface at a right angle. Otherwise, measurements might be inaccurate.

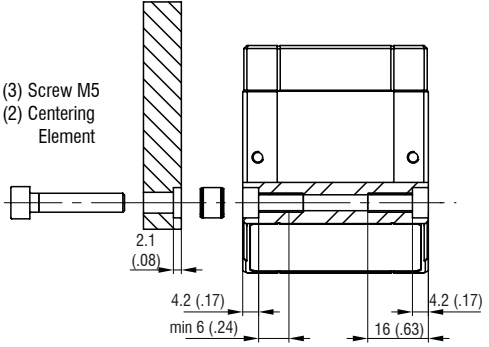
Through-bolt connection

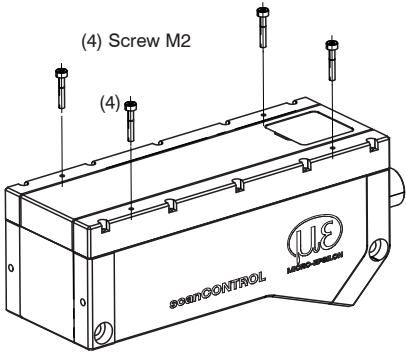
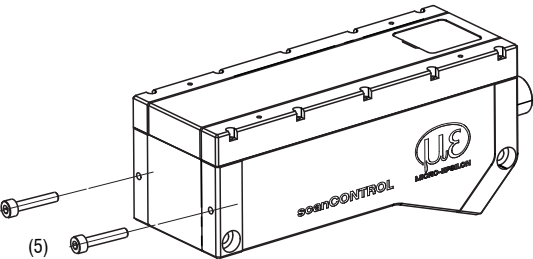
2 threaded holes with centering element, plus 2 cylindrical counterbores 8H7, depth 2 - 2.2 mm

 <p>(1) Screw M4 (2) Centering Element</p>	Through-bolt length	Socket head cap screws	Torque
	44.8 mm	2xISO 4762-A2-70 M4	2 N·m

Direct fastening

2 threaded holes \varnothing 5.5 with centering element, plus 2 cylindrical counterbores 8H7, depth 2 - 2.2 mm

 <p>(3) Screw M5 (2) Centering Element</p>	Screw-in depth	Socket head cap screws	Torque
	14 mm	2xISO 4762-A2-70 M5	3.5 N·m

Direct fastening			
	Screw-in depth	Socket head cap screws	Torque
 <p>(4) Screw M2</p>	max. 3.0 mm	4xISO 4762-A2-70 M2	0.4 N·m
 <p>(5)</p>	max. 5.5 mm	2xISO 4762-A2-70 M3	1.0 N·m

5.2 Dimensional drawings for mounting

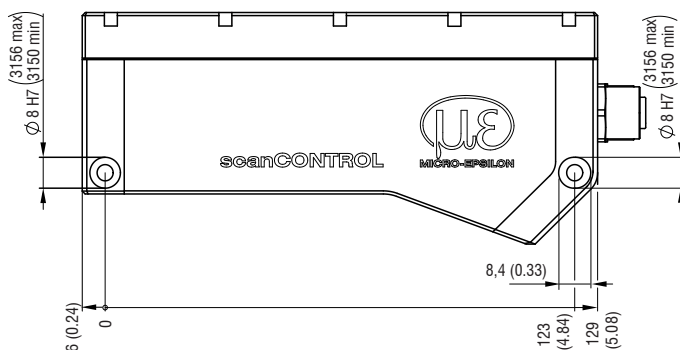


Fig. 5.1: Dimensional drawing of mounting hole

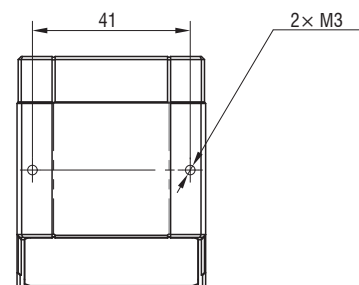


Fig. 5.2: Additional M3 thread (laser beam exit)

The cylindrical counterbore $\varnothing 8H7$ is intended for the position-defining centering elements. This allows for the sensor to be mounted in a reproducible and exchangeable way.

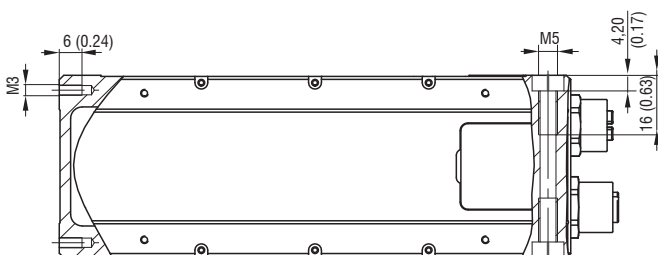


Fig. 5.3: Dimensional drawing of mounting hole top view

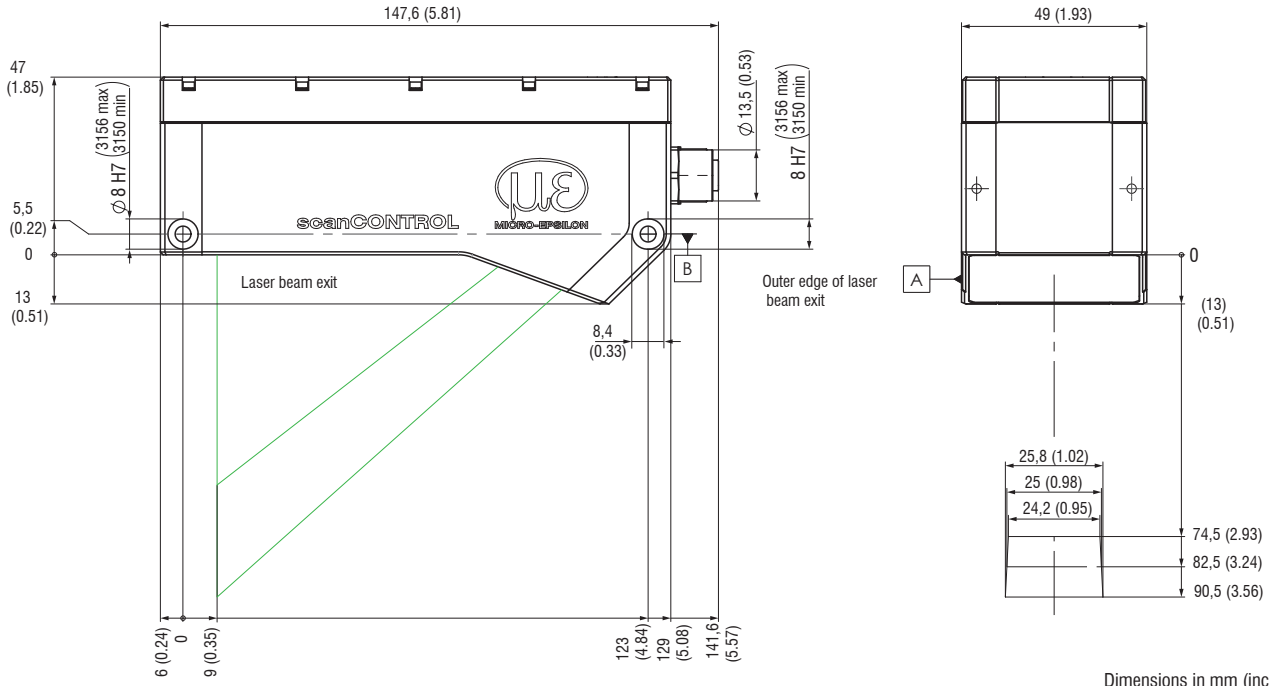


Fig. 5.4: Dimensional drawing of scanCONTROL 8xxx-25 sensor

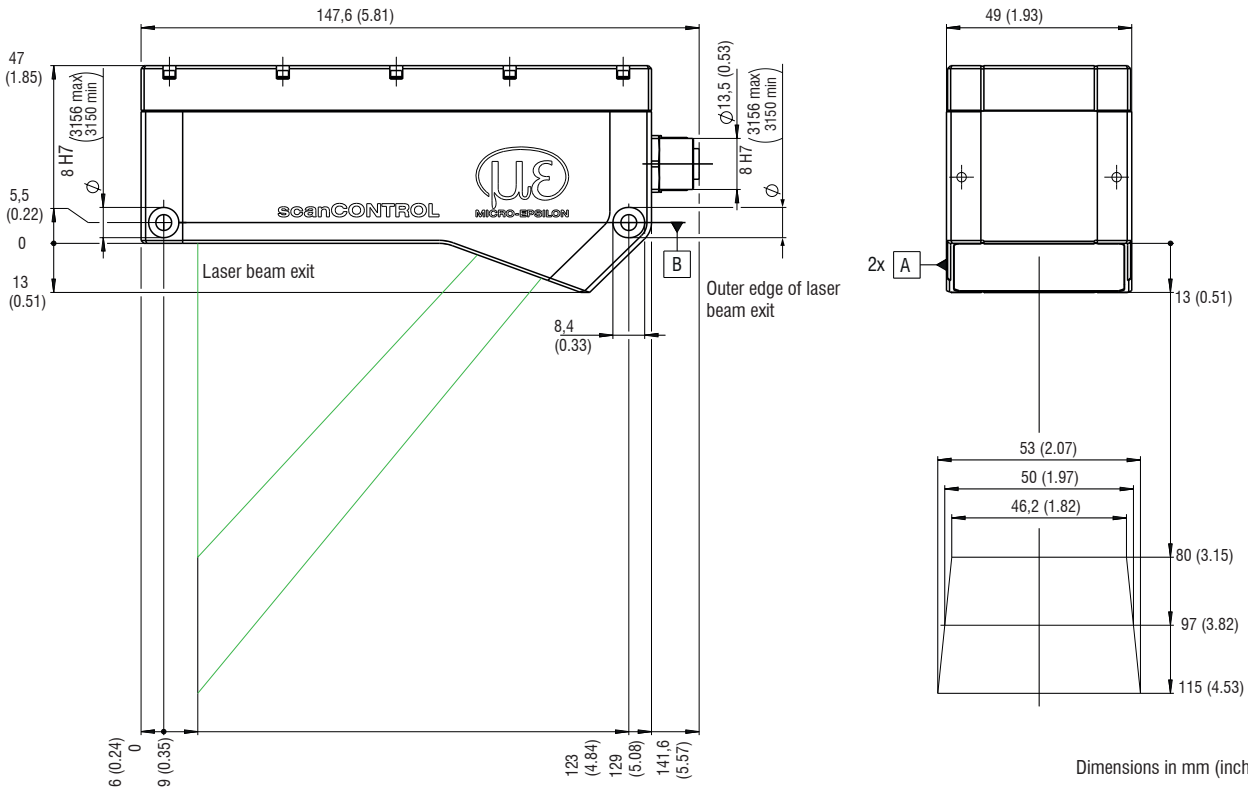


Fig. 5.5: Dimensional drawing of scanCONTROL 8xxx-50 sensor

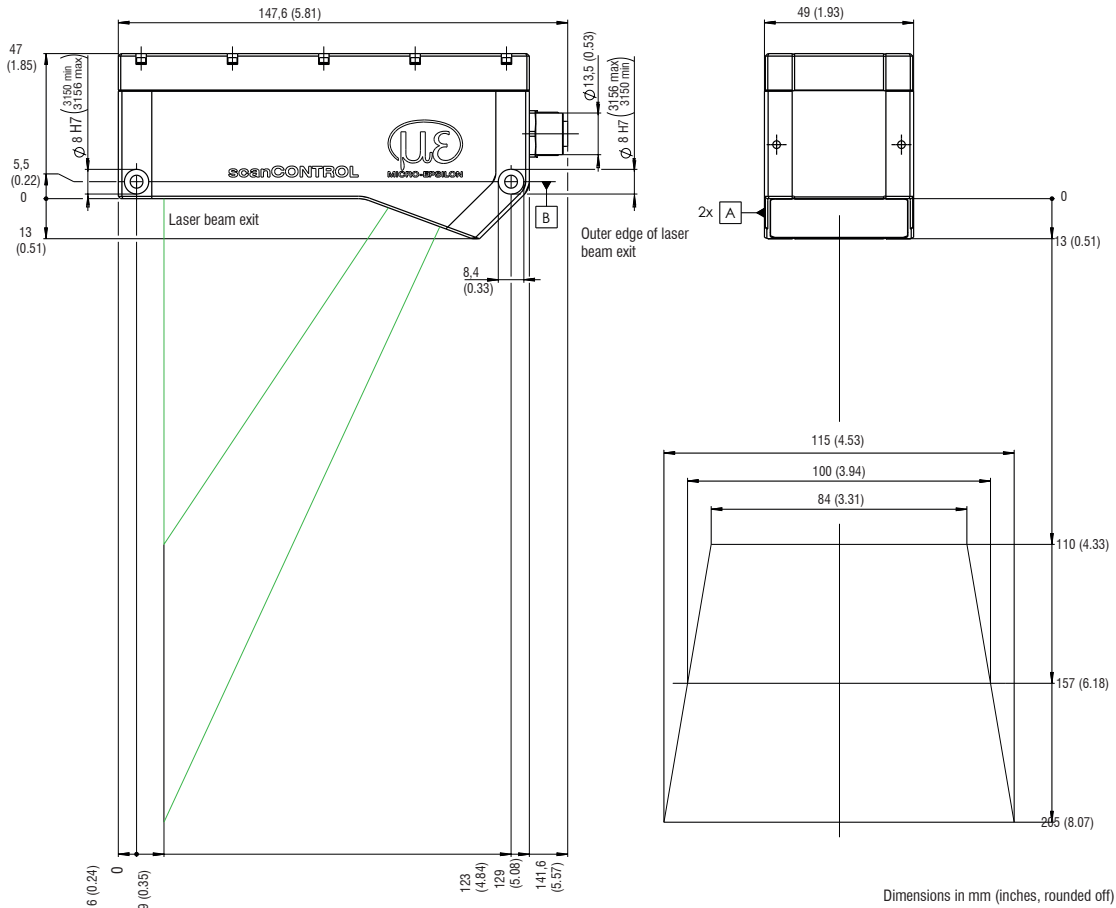
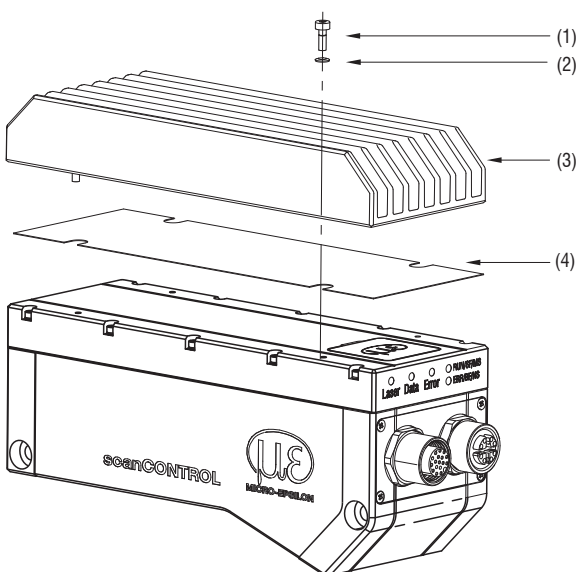


Fig. 5.6: Dimensional drawing of scanCONTROL 8xxx-100 sensor

5.3 Cooling concept in relation to the operating environment

	Ambient temperature
Operation without cooling concept	0° to 35 °C
Use of heat-conducting pads for thermal coupling	
Operation with passive cooling via heat sink ^[1]	0° to 45 °C
Operation with active cooling via heat sink with fan	0° to 50 °C



- (1) 4x M2x6
- (2) 4x M2 lock washers
- (3) 1x heat sink
- (4) 1x heat-conducting pad



Fig. 5.7: Cooling concept structure

[1] When an optional cooling solution with fan is installed, the IP rating is reduced to IP40.

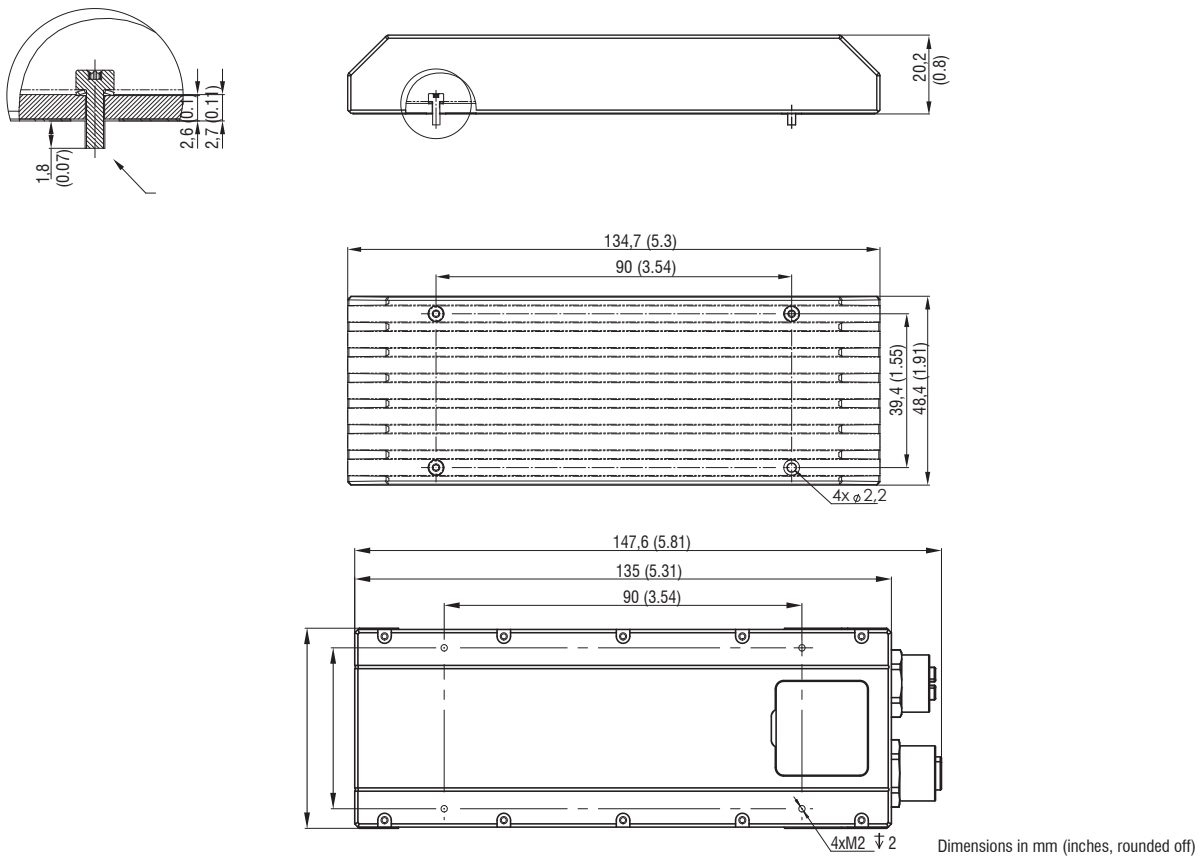


Fig. 5.8: Dimensional drawing of heat sink mounting

5.4 Electrical connections

5.4.1 Connection of Native Ethernet, PoE

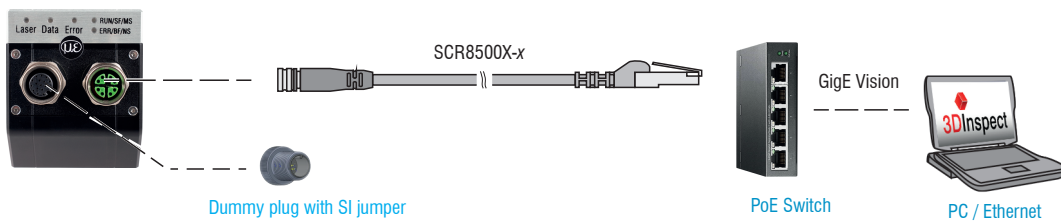


Fig. 5.9: Connection example for Laser On/Off via software and SI bridge

5.4.2 Connection of Industrial Ethernet and IO

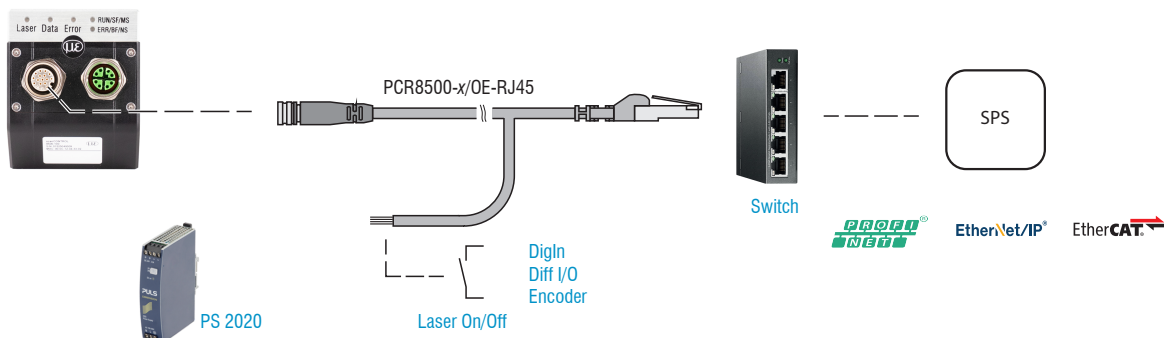


Fig. 5.10: Connection example for supply with optional power supply unit, Laser On/Off via hardware

5.4.3 Connection of Native Ethernet and Industrial Ethernet, IO

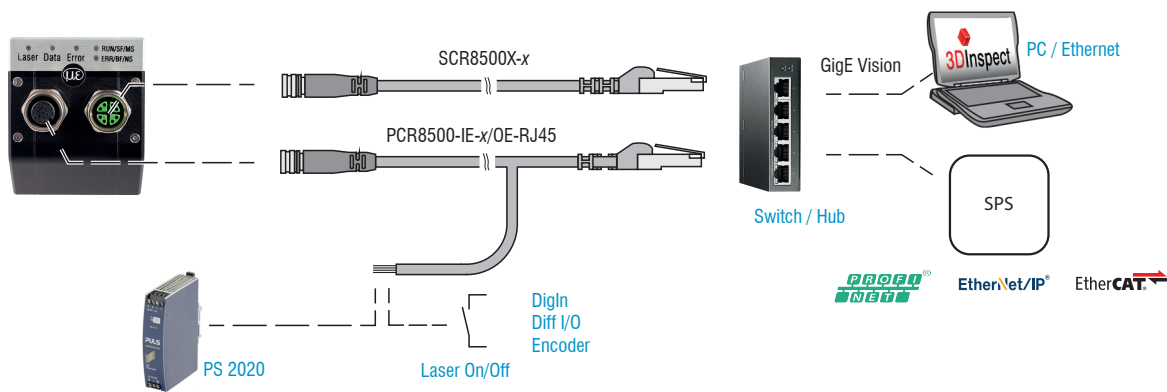


Fig. 5.11: Connection example for Industrial Ethernet and Native Ethernet

5.4.4 Connections, pin assignment

1 multifunction port

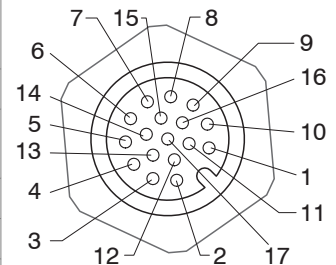
for PCR8500-x/OE-RJ45 multifunction cable
(power supply, digital I/Os, sync, Industrial Ethernet)

2 Ethernet ports

for SCR8500X-x Ethernet interface cable



Pin	Designation	Wire color PCR8500-x/OE-RJ45	Remarks
1	GND	Blue	Power supply ground
2	V ₊	Red	+ 11 V ...+ 30 V DC (nominal value 24 V); max. 15 W
5	Diff I/O 1+	White	Differential input/output 1
6	Diff I/O 1-	Brown	Differential input/output 1
4	Laser_on/off	Violet	
7	Diff I/O 2+	Gray-pink	Differential input/output 2
8	Diff I/O 2-	Red-blue	Differential input/output 2
9	Dig In1	Green-black	Switching input 1 (single-ended)
10	Dig In2	Yellow-black	Switching input 2 (single-ended)
11	Dig In3	Gray-black	Switching input 3 (single-ended)
12	Dig In4	Pink-black	Switching input 4 (single-ended)
3	GND-In	Black	Ground Dig In
15	RX Ethernet	White-green	Industrial Ethernet
14	/RX Ethernet	Green	Industrial Ethernet
17	TX Ethernet	White-orange	Industrial Ethernet
16	/TX Ethernet	Orange	Industrial Ethernet
13	Ethernet shield	Eth shield	Industrial Ethernet
Housing	Shield	Black	No galvanic connection to GND



Tab. 5.1: Pin assignment of multifunction port

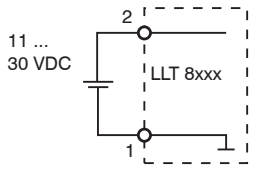
5.4.5 Grounding and shielding concept

All inputs/outputs are electrically connected to the supply voltage ground (GND). Only the Ethernet/EtherCAT ports are electrically isolated. The ground connections (GND und GND_in) are galvanically interconnected through a choke.

- i Only use screened cables shorter than 30 m and connect the cable screen to the connector housings (M12).

5.4.6 Supply voltage (power)

11 ... 30 VDC, nominal 24 V, 500 mA

with PoE	without PoE	Sensor pin	PCR8500-x/OE-RJ45	Power supply
Sensor supply is via a PoE-capable switch. Phantom powering (PoE) is possible via the SCR8500X-x possible		1	Blue	GND
		2	Red	V ₊
<p>As an alternative to PoE, the sensor can be supplied with the external power supply unit. Voltage supply only for measuring devices, not to be used for drives or similar sources of impulse interference at the same time. MICRO-EPSILON recommends using the optionally available PS2020 power supply unit for the sensor.</p> <ul style="list-style-type: none"> • Connect the inputs Pin 1 and Pin 2 at the sensor with a 24V power supply. • Only turn on the power supply after wiring has been completed. 				

NOTICE

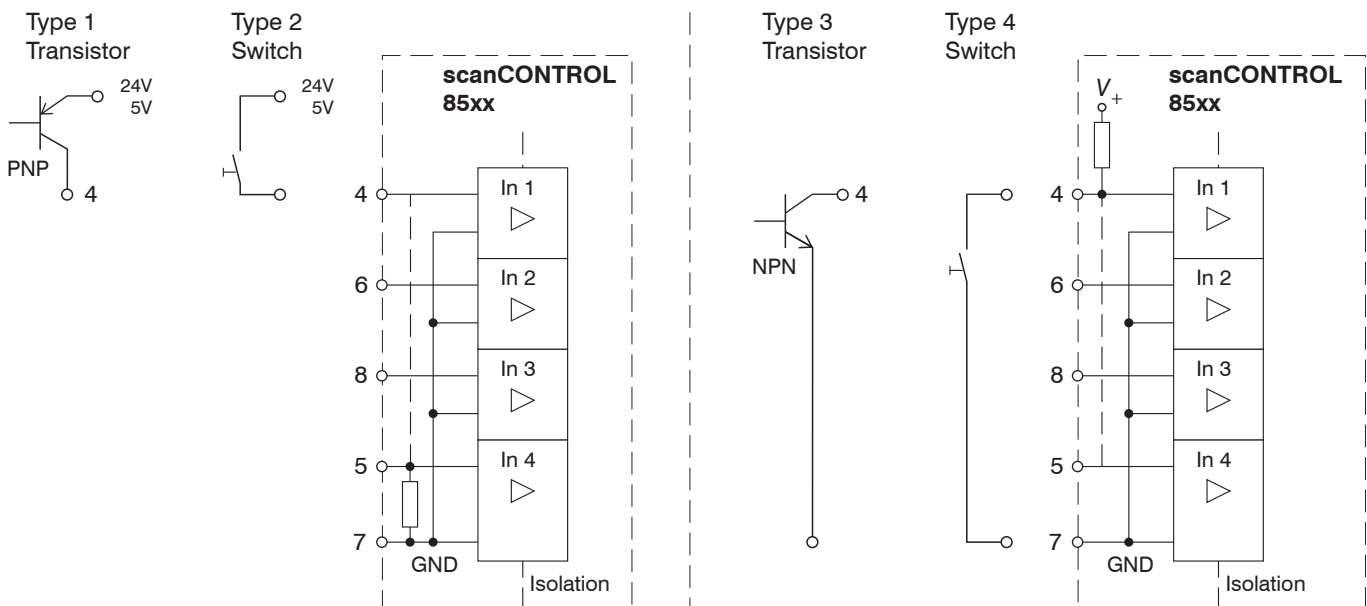
Damage to the sensor

- ▶ A secure sensor function via PoE or 24-volt power supply can only be guaranteed if the PoE port is also reinitialized when the 24-volt power supply is disconnected. Depending on the PoE hardware used, this can be done by communicating with the PoE switch or by disconnecting and reconnecting the Ethernet connection.

Use a galvanically isolated power supply in accordance with LPS or NEC Class 2.

5.4.7 Switching inputs

The switching inputs In1 to In4 can be used for triggering, changing the operating mode, or setting the encoder.



All switching inputs have the same structure and a common ground connection (GND-In), which must be connected to the external ground (synchronization or trigger source or other device).

The multifunction socket can be operated with one of the following configurations:

	Configuration	In1	In2	In3	In4
0	Encoder with index; the index responds to the positive edge 1		A	B	N
1	Encoder with external trigger input 1	Trigger	A	B	N
2	External trigger input	Trigger	ppc 1 2	ppc 2	ppc 3
3	Transfer to time stamp	ppc 0	ppc 1	ppc 2	ppc 3
4	Frame trigger and encoder	Start container	A	B	Fill container
5	Frame trigger and encoder line A	Start container	A		Fill container
6	Encoder with gate	Gate	A	B	N
7	Trigger, loading of up to 4 user modes and 1 time stamp	Trigger	Bit 0	Bit 1	ppc 3

Signal level (switching level)

The signal levels for all switching inputs can be switched between LLL (low voltage, TTL logic) and HLL (high voltage, HTL logic) via software:

- LLL level: Low 0 V ... 0.8 V, High 2.4 V ... 5 V, internal pull-up/down 10 kOhm against 5 V/GND
- HLL level: Low 0 V ... 3 V, High 11 V ... 24 V (up to 30 V permissible), internal pull-up/down 10 kOhm against 24 V/GND
- Pulse duration: ≥ 5 μs

i Use a shielded cable with twisted strands, preferably the recommended PCR8500-x/OE-RJ45 connection cable from the accessories.

Connect the cable shield to the PE equipotential bonding or the plug housing.

- The encoder counts configured edges, [see Chap. 7.4](#)

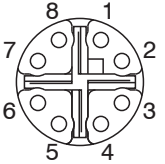
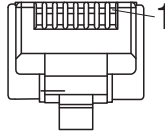
5.4.8 Ethernet connection



Industrial Ethernet implements protocols that are optimized for real-time requirements, such as EtherCAT, PROFINET and Ethernet/IP. These enable faster communication between real-time capable machines and controllers compared to standard Ethernet protocols.

Native Ethernet is the standard connection to the PC and offers a high data transfer rate for powerful applications.

The sensor supports transmission at both 100 Mbit and 1 Gbit per second.

8-pin Ethernet port (sensor side)			8RJ45 plug	
Pin	Color	1000BaseT	Pin	Color of stranded wire SCR3000X-x
1	White - orange	D1+	1	White - orange
2	Orange	D1-	2	Orange
3	White - green	D2+	3	White - green
4	Green	D2-	4	Blue
5	White - brown	D3+	5	White - blue
6	Brown	D3-	6	Green
7	White - blue	D4+	7	White - brown
8	Blue	D4-	8	Brown
 <p>View: Solder side (cable) Screw connector (X-coded)</p>				

For use with an Ethernet connection, we recommend the SCR8500X-x Gigabit Ethernet connection cable; cable length x in meters. Characteristics: 4 x 2 x 0.14 mm²; shielded.

Due to the high data rate, we recommend a high-quality Ethernet PC plug-in card, for example, Intel-Pro/1000 PT. Preferably the sensors should be connected directly to the network connection or using a high-quality switch. A hub would cause massive data collisions and may not be used. On the PC, one or more network cards should always be intended solely for the sensors.

Operating the sensors via Ethernet requires no additional driver installation. However, the network settings must be specified correctly:

- If multiple network cards are used, they must belong to different networks, for example, different Class C subnets, but they must not belong to the same Class B subnet.
- The sensor supports an automatic, sensor-specific IP address in the link-local network (169.254.x.x). No collision check is performed.
- The sensor supports DHCP. This setting is enabled by default and takes precedence over searching the link-local network.
- The scanCONTROL 8x00 sensor supports Power over Ethernet.
- A fixed IP address can be assigned. Use the optional SCR8500X cable for this purpose.
- Various network settings (e.g., firewall or packet filters) can interfere with communications with the sensor.
- A packet size of 1024 bytes/packet (payload) should always be used because network components support such packets by default. The sensor supports jumbo frames up to 3824 bytes/packet (payload); but all network components must also support jumbo frames of this size. The uncompressed matrix view can only be operated with active jumbo frames.

Use the 3DInspect program or sensorTOOL for network configuration.

You can find this program online at:

<https://www.micro-epsilon.de/2d-3d-messtechnik/3d-sensoren/software-3dinspect/>

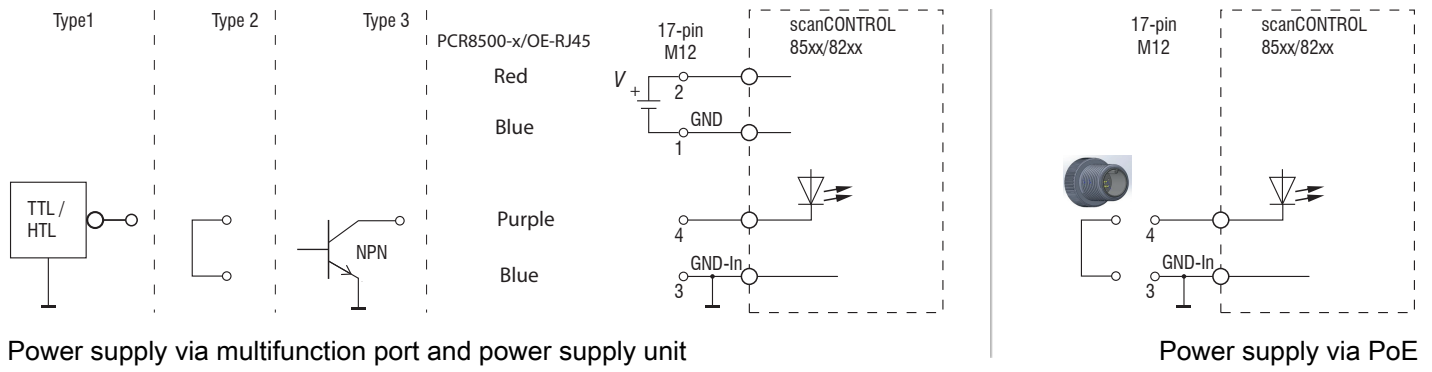
5.4.9 Laser activation

The measuring laser on the sensor is activated via a switching input. This is advantageous when it comes to switching the sensor off for maintenance work or the like.

The external laser shutdown (laser activation) is implemented as a hardware solution. The laser can also be switched off using software.

A switching transistor with an open collector (e.g., in an optocoupler), a wire bridge or a digital TTL or HTL signal are suitable for switching.

i The laser light source remains off as long as Pin 4 is not electrically connected to Pin 1.



This function is integrated into all sensors.

In the event that no multifunction cable is connected in PoE mode, a dummy plug for bridging the laser activation on the 17-pin M12 socket is included in the scope of delivery. You can then switch the laser light source on/off via command.

Details on pin assignment can be found here, [see Chap. 5.4.4](#)

6 Operation of the measuring system with a PC

6.1 LEDs

- After getting ready for operation, switch on the external direct current power supply (24 VDC) or PoE.

The Error LED indicates various error states by flashing, see Chap. 3.3. If several errors occur simultaneously, it indicates two of them alternately. Therefore, the LED may continue to flash for some time after an error has been rectified. No flashing for a few seconds means that no error has occurred.

i The measuring system is ready for operation approx. 20 to 30 s after the supply voltage is applied. To ensure highly precise measurements, let the measuring system warm up for approx. 30 minutes.

6.2 Operating and demo program

3DInspect is available for operating the sensor. You can find the program online on the sensor's product page or in the download section: https://www.micro-epsilon.de/2D_3D/laser-scanner/Software/downloads/

In the demonstration programs, some of the measuring fields, see Chap. 6.4.1 are used.

Additional software tools for configuring and controlling the sensor:

- Pleora eBus Player <https://www.pleora.com/machine-vision-connectivity/ebus-player/>
- Modbus Tool <https://www.micro-epsilon.de/2d-3d-messtechnik/laser-profil-scanner/software/weitere-tools/#c7673>

6.3 Installation

6.3.1 Requirement

The following minimum system requirements are necessary for the operation of 3DInspect:

- Windows 8 or 8.1 (64-bit), Windows 10 (64-bit), Windows 11 (64-bit)
- 1 GHz processor (64-bit) or higher
- 4 GB RAM
- Screen resolution: 1280 x 1024
- Graphics card / GPU with OpenGL 3.1 or higher

The following system requirements are recommended:

- Windows 10 (64-bit)
- 3 GHz processor (64-bit) or higher
- 16 GB RAM
- Screen resolution: 1920 x 1080
- Dedicated graphics card

i Connect the sensor directly to the PC. Do not use hubs or switches. If your network card supports the "VLAN" option, this option must be disabled. To be able to operate the sensor, the PC and the sensor must be located in the same subnet.

The following procedure is necessary in order to install the software:

1. Install the hardware of the Ethernet interface if not present.
2. Install 3DInspect
3. Connect the sensor to the PC via Ethernet.

6.3.2 Connecting scanCONTROL8x00 to the PC

- Complete the installation of the software.
- Connect scanCONTROL 8x00 via the Ethernet interface to the PC and switch on the power supply.

- Please wait until the sensor is recognized by the PC.

This may take a few seconds.

Now you can operate the measuring system with 3DInspect.

6.3.3 Basic functions 3DInspect

- ▶ Open the 3DInspect program.
- ▶ If the sensor is not detected automatically, click `Options > Ethernet Configurator > Scan > Suggest a configuration` or `Apply` to a selected device.

The 2D-View appears.

- ▶ Choose 2D as Data format.

The first view is displayed.

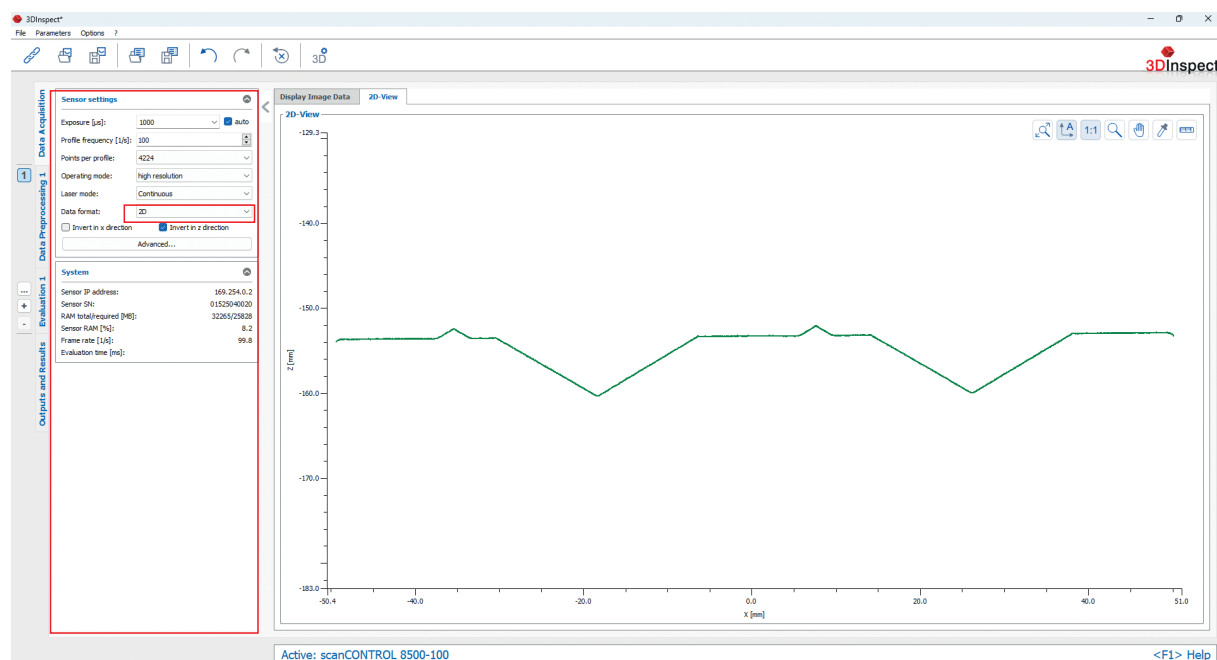


Fig. 6.1: First view 2D-View of the 3DInspect program

Basic sensor parameters can be adjusted as quick settings on the left side/column of the program.

Display Image Data shows the matrix image. A graphical selection area can also be set here. This allows the profile and data rate to be increased and interference to be suppressed.



Fig. 6.2: Display Image Data view of the 3DInspect program

Further settings can be configured under *Advanced...*. A comprehensive explanation of the adjustable parameters can be found online at [Powerful software for all Micro-Epsilon 3D sensors](#).

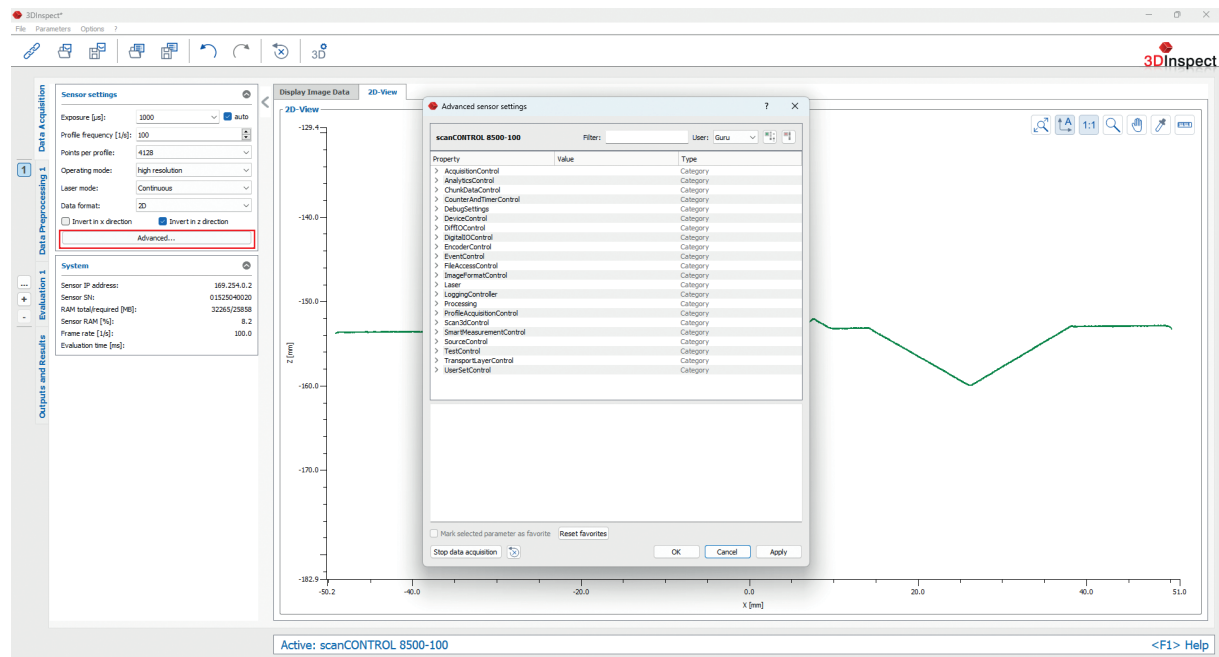


Fig. 6.3: View 2D-View > Advanced... of the 3DInspect program

6.4 Notes on operation

6.4.1 Measurement speed depending on the measuring field selection

The sensor's optical system follows the so-called "Scheimpflug condition," ensuring optimal imaging across the entire measuring range. The measuring range is mapped onto a rectangular sensor matrix.

Please refer to the calibration protocol for your sensor for the exact values of the standard measuring range. A slight shift of the measuring field is possible and depends on the sensor

The sensor matrix used in the scanCONTROL 8x00 supports the reading of a limited measuring field. scanCONTROL 8x00 sensors capture up to 10,000 profiles per second.

The achievable profile rates are limited by various parameters. The following table provides examples of upper limits for the achievable profile rate depending on the rows read out on the image matrix and depending on whether subsampling (`DecimationVertical`) is enabled or disabled.

Number of lines	2160	1620	1080	540	270	135	67	42
Matrix coverage [%] without subsampling	100	75	50	24	12.5	6.3	3.1	1.9
Matrix coverage [%] with subsampling			100	50	25	12.5	6.2	3.9
Max. profile detection rate [Hz]	289	384	573	1125	2169	4046 ^[7]	7170 ^[7]	10012 ^[7]

The measuring field can be restricted by omitting entire matrix areas in order to suppress interfering image areas.

The two do not have to match due to optical imaging and definitions.

Characteristics of scanCONTROL 8x00:

- The receiver has a smaller aperture angle (viewing angle) than the laser line.
- Centered measuring field (symmetrical to the center axis).
- The high-resolution sensor image matrix has 2112x2160 pixels (LLT82xx) or 4224x2160 pixels (LLT85xx) with the same measuring field size. The measuring field geometry is fixed.
- The reference for the distance (z-axis) is the body edge at the laser beam exit of the sensor, [see Chap. 5.2](#)
- Use of the GigE Vision standard. Standard GigE Vision implementation from various manufacturers can be used.

6.4.2 Calibration

The calibration is performed across the entire sensor array and does not depend on the selected measuring field.

The trapezoidal shape of the measuring range results from the projection of the rectangular matrix into the measuring space. In the middle, a frame outlines the standard measuring range.

A calibration protocol is included with each sensor. The calibration report includes three graphs for linearity measurement, which are briefly explained in the report. See again the key diagram in Fig. 6.4.

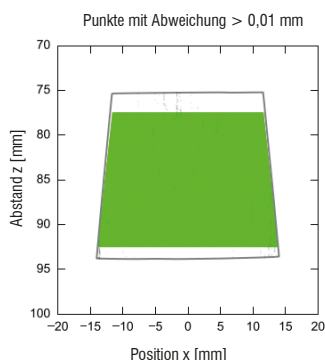


Fig. 6.4: Linearity deviation, example of a scanCONTROL 85xx

The black dots indicate the points where the measurement error exceeds the linearity limit of 0.01 mm (depending on the sensor type). The measurement error increases at both ends of the depth range and especially in the distant corners. These areas should therefore be avoided when taking measurements.

6.4.3 Operating modes

The scanCONTROL 8x00 series provides two different operating modes:

[7] Reduction in the number of profile points per profile required and/or only achievable with limited output format (AC32F, AC16)

1. High Resolution The High Resolution Mode provides the best measurement data with respect to linearity and resolution.
2. High Speed The High Speed Mode provides high profile frequencies for profile acquisition.

6.4.4 Automatic exposure time regulation

The automatic exposure time regulation feature facilitates the profile detection of changing target surfaces. Therefore, a "Region of Interest" (ROI) can be set on the sensor matrix so that the automatic exposure control only uses a certain matrix area to determine the optimum exposure time, [see Chap. 7.6.2](#)

The exposure time preset by the user is used as the starting value for automatic exposure control and as the exposure time when there is no object in the area. The preset exposure time must be selected so that at least some of the profile points can be captured. These can be used as basis for the control algorithm.

The exposure time used is limited by the profile frequency (e.g., at 100 Hz, it must not exceed 10 ms) and by the set control limits.

Further information can be found in the 3DInspect or the 3DSensorSDK documentation.

6.5 Error influences

6.5.1 Reflectance of the measuring object surface

In principle, the sensor evaluates the diffuse portion of the reflections from the laser points. A statement about the measured value quality and measured value availability as a function of the reflectance of the target surface is only possible to a limited extent.

A preliminary examination is necessary to use the sensor on transparent or reflective objects.

The method of direct reflection on mirrored surfaces, as successfully used in point triangulation, cannot be applied in line triangulation due to the fan shape of the laser line (central projection). Only a narrow area near the center would be reflected back to the receiver. As profile measurements are usually performed on curved surfaces, this area is narrowed even further.

6.5.2 Color differences

Color differences of the measured objects affect measurement accuracy. However, such color differences often occur in relation with different penetration depths of the laser light into the material. Different penetration depths, in turn, cause apparent changes in line thickness. Therefore, changes in color associated with varying penetration depths may result in inaccurate measurements.

As the exposure parameters can only be changed for a complete profile (and not for individual points within the profile), careful adjustment of the exposure to the measuring object surface is recommended, [see Chap. 7.6.2](#)

As the exposure parameters for a profile can only be changed as a whole, careful matching of the exposure to the target surface is recommended.

6.5.3 Thermal influences

When the sensor is commissioned, a warm-up time of at least 20 minutes is required to achieve reliable heat distribution in the sensor.

When measuring in the μm accuracy range, the effect of fluctuating temperatures of the sensor holder and of possible expansion effects must also be taken into account.

Rapid temperature changes are not immediately reflected in the temperature measurement values due to the damping effect of the sensor's heat capacity.

6.5.4 Ambient light

The sensor provides an optical interference filter to suppress ambient light. Furthermore, the sensor supports several settings to provide reliable measurement values under difficult lighting and reflectivity conditions, [see Chap. 7.6.4](#)

In general, shielding must be provided to prevent ambient light shining directly onto the object being measured or reflected into the sensor, for example by means of protective covers or similar devices.

Pay particular attention to unwanted reflections of laser light outside the target area (background, object holder or similar) which can be reflected back again into the view area of the receiver.

Matt black surface coatings are recommended for all objects outside the measuring range (object holders, transport equipment, grippers or similar).

6.5.5 Mechanical vibrations

If high resolutions in the μm range are to be achieved with the sensor, particular attention must be paid to stable or vibration-damped sensor and target mounting.

6.5.6 Surface roughness

Due to laser light inferences, surface roughnesses of the order of $5\ \mu\text{m}$ and more cause "surface noise".

In addition, even the finest grooves (e.g., grinding marks on the surface) can cause direct reflections of the laser light toward the receiver, especially if they run in the direction of the line. This may cause faulty measurement values. Remedy can possibly be provided by adjusting the exposure or by other sensor settings, e.g., filter.

6.5.7 Shadowing effects

Matrix sensor: Behind steep edges, the laser line may disappear completely or partially. The receiver then does not "see" these areas.

Laser line: The fan shape of the laser line inevitably leads to partial shadowing on vertical edges. The only way to make these areas visible is to change the position of the sensor or object.

In general, measuring objects with steep edges cannot be captured 100% accurately using laser triangulation. The missing areas can only be supplemented or interpolated using suitable software and multiple sensors.

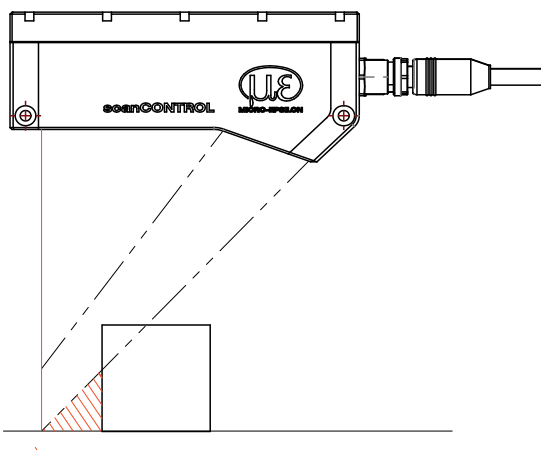


Fig. 6.5: Shadowed receiver

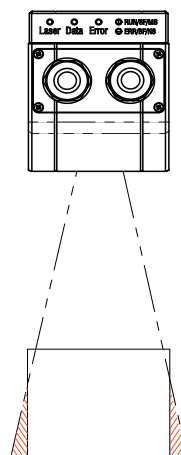
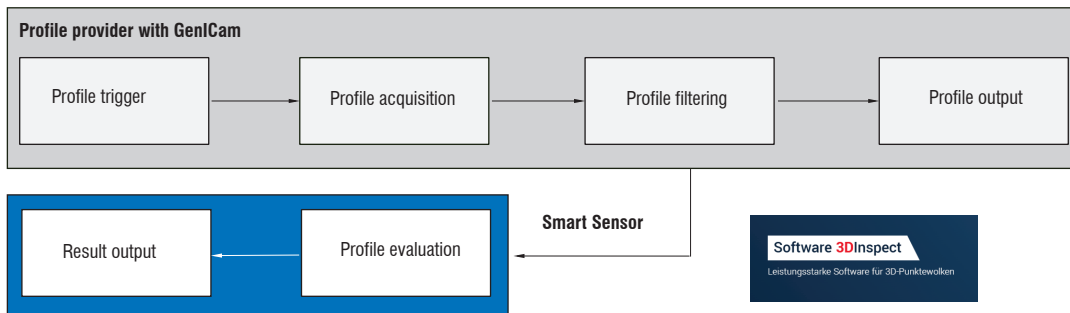


Fig. 6.6: Shadowed laser line

7 Set sensor parameters

7.1 General



Additional information		
Profile supplier	Profile triggering	, see Chap. 7.5
	Profile acquisition	, see Chap. 7.6
	Profile filtering	, see Chap. 7.7.5
	Profile output	, see Chap. 7.9
Smart Sensor	Profile evaluation	, see Chap. 7.8
	Result output	

7.2 Commands overview GenICam

Group	Command	Brief description
Profile triggering		
	TriggerMode	Controls whether the selected trigger is active.
	LineStart	Trigger profile acquisition
	FrameStart	Trigger profile stack
	AcquisitionLineRate	Internal trigger
	TriggerSource	Specifies the internal signal or the physical input line to be used as the trigger source.
	TriggerSoftware	Creates an internal trigger.
	EncoderDivider	Defines how many encoder increments/decrements are required to generate an encoder trigger
	EncoderResetValue	The value that is loaded during an encoder reset
	EncoderResetActivation="RisingEdge"	The activation mode of the encoder reset source signal.
	EncoderResetSource="Line3	The signals that serve as the source for resetting the encoder
	EncoderReset	Resets the selected encoder
	EncoderOutputMode="Motion"	The conditions for the encoder interface to respond to the encoder signal
	EncoderMaxValue	Maximum value after which the value jumps back to zero
	EncoderMode	Selects whether the encoder counter uses the FourPhase mode with jitter filtering or the HighResolution mode without jitter filtering.
	AcquisitionStart	Starts data acquisition by the sensor.
	ExposureTime	Sets the exposure time [us] if >ExposureAuto=Off. It must be adjusted so that the acquired profile is just correctly illuminated. If the lighting is insufficient, the peaks are not recognized correctly. With overexposure, the center of a peak cannot be found precisely.
Profile acquisition		
	LaserMode"Standard"	The activation mode of the laser
	LaserPower="Reduced"	Detection of highly reflective objects
	LaserPower="Off"	Deactivate light source
	LaserMode="Continuous"	Standard setting with visible laser line
	LaserMode="Pulsed"	Laser temporarily visible
	ExposureAuto	Sets the automatic exposure mode
	PixelGain	Controls the amplification of the acquired image signal and influences the image brightness and noise level.
	PeakSelection	The peak selection strategy. This function is relevant if more than one peak is measured.
	BinningHorizontal	Number of horizontal light-sensitive cells to be combined. This reduces the horizontal resolution (width) of the image by the set amount.
	DistanceStart	Limitation of the image area used
	DistanceSize	Limitation of the image area used
	PositionStart	Limitation of the image area used
	PositionSize	Limitation of the image area used
	Scan3dCoordinateSource(= Encoder1 or Encoder2)	Selects the source to be used to calculate the coordinate.
	Scan3dCoordinateScale[Scan3dExtraction0][CoordB]	Scaling factor applied to supplied point data to obtain world coordinates. Value is only applied if PixelFormat Coord3D_AC16 is used.

Group	Command	Brief description
Profile filtering		
	<code>EncoderExposureSamplePoint</code>	Alignment of the encoder value to the exposure
	<code>FlipPosition</code>	Mirrors the position coordinate (X/A) of the point data.
	<code>FlipDistance</code>	Mirrors the distance coordinate (Z/C) of the point data.
	<code>ResamplingEnable=True</code>	Regular grid spacing in x-direction
	<code>Scan3dInvalidDataValue</code>	Marking invalid values
	<code>ResamplingStart</code>	Activates resampling.
	<code>ResamplingLength</code>	Length of the resampling region.
	<code>FilterMedianEnable</code>	Filter to improve the profile data
	<code>FilterMedianSize</code>	Defines the size used by the algorithm.
	<code>FilterAverageEnable</code>	Activates the average filtering.
	<code>FilterAverageSize</code>	Defines the size used by the algorithm.
	<code>Height[Scan3dExtraction0]=N</code>	Height of the image provided by the device (in pixels).
	<code>TriggerSelector="FrameStart"</code>	Selects the type of trigger to be configured.
Profile output		
	<code>ComponentEnable[Scan3dExtraction0][Range] = True</code>	Controls whether the selected component defined by >SourceSelector, >RegionSelector and >ComponentSelector is active and streaming. This switch is used to distinguish between setup mode (live mode) and measurement mode. Not all combinations are possible for the selectors.
	<code>ComponentEnable[Scan3dExtraction0][Intensity] = True</code>	additional output of intensity values
	<code>Pixelformat[Scan3dExtraction0][Range]</code>	Selection of point data format
	<code>AcquisitionStart</code>	Starts data acquisition by the sensor.
	<code>FrameFlush</code>	Output of the profile stack before the end of acquisition
	<code>AcquisitionMode=Continuous)</code>	Continuous acquisition of profile stacks
	<code>AcquisitionStop</code>	Stops data acquisition by the sensor. Mainly used when >AcquisitionMode is set to Continuous, but can be used in any acquisition mode.
	<code>ChunkEnable[Chunkselector]</code>	Activates the transmission of the selected chunk data together with the point data/image data.
	<code>Scan3dCoordinateSource="Profile-Counter"</code>	Profile counter
	<code>ComponentEnable[Region0][Intensity] = True</code>	Controls whether the selected component defined by >SourceSelector, >RegionSelector and >ComponentSelector is active and streaming. This switch is used to distinguish between setup mode (live mode) and measurement mode. Not all combinations are possible for the selectors.

Further information, see [Chap. 13](#)

7.3 Basic functionality

The sensor has a laser source which projects a laser line onto the object to be measured. The light intensity reflected by the laser line is detected by a matrix sensor and stored in a matrix image. The positions of the laser line in each image column are determined from the matrix image by peak detection and converted into a profile.

Profiles can be acquired individually or as a point cloud. Point clouds consist of a defined number of individual profiles that are acquired one after the other.

Profiles and point clouds can be further processed (transformed, filtered) in the sensor and output via the GenICam interface, see [Chap. 7.9](#), see [Chap. 7.11](#)

If the sensor has a "Smart" license, profiles and point clouds can be evaluated in the sensor, and the results output via the GenICam interface, see [Chap. 7.8](#). In this case, the sensor can also be configured and controlled via the fieldbus interface and provide evaluation results. (see 3DInspect user manual)

7.4 Encoder

The two encoder functions (Encoder1 and Encoder2) of the sensor each use an encoder counter, which is fed by the A and B tracks of the connected encoder, to track the position of the object in both positive and negative directions of movement.

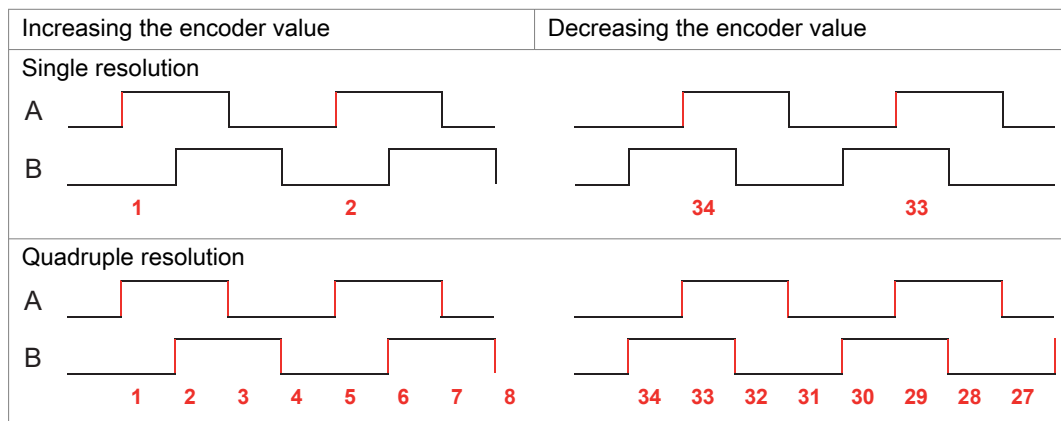
Triggers can be triggered on the basis of the encoder counter reading and the B or y coordinate of profile points can also be generated.

Resetting the encoder counter to the value set in `EncoderResetValue` can be triggered via the reference track or the `EncoderReset` command. The reference track of the encoder can be connected to the digital input Line4 and configured using `EncoderResetSource="Line4"`. The signal edge that triggers an increase in the encoder counter is permanently set to rising edge via (`EncoderResetActivation="RisingEdge"`).

The sensor only supports the `EncoderOutputModes`

`EncoderOutputMode="Motion"` and `EncoderOutputMode="Off"`. With `EncoderOutputMode="Motion"`, an output pulse is generated each time the encoder counter changes.

The encoder counter can be reset via the `EncoderMaxValue` parameter. If this value is exceeded, the counter reading is reset to 0. If the value falls below 0, the encoder counter continues to count down from `EncoderMaxValue`. The sensor supports two operating modes for the connected encoders via `EncoderMode` (`"FourPhase"` or `"HighResolution"`): In `"FourPhase"` mode, the encoder counter is incremented or decremented by 1 after a pulse on each of the two encoder tracks A and B (4 ticks). In the `"HighResolution"` operating mode, the encoder counter is increased or decreased by 1 each time one of the two input signals A or B changes, taking the direction into account.



Tab. 7.1: Impulse image of encoder signals

7.5 Profile triggering

Profiles are acquired after a corresponding configuration and the subsequent start of profile acquisition (`AcquisitionStart`).

7.5.1 Configuration

The acquisition of a profile can be triggered via various signal sources.

The signal source is configured via the `TriggerMode` and `TriggerSource` parameters. The function to be triggered is selected via the `>TriggerSelector` parameter. To trigger the profile acquisition, `TriggerSelector="LineStart"` is set. If a point cloud is to be acquired, the above settings must also be parameterized for `TriggerSelector="FrameStart"`.

- i The time interval between two triggers must be greater than $1/(\text{maximum profile frequency})$ with the current settings (ROI, binning).

7.5.2 Internal trigger

With internal triggering, the profile is triggered at a constant rate (`AcquisitionLineRate`). The setting is made using `TriggerMode\[LineStart\]=Off`. Internal triggering is the default setting.

7.5.3 External trigger

With external triggering, the profile is triggered via an external signal on the digital or differential interface.

The specific input is selected by setting `TriggerSource` to "Line1" to "Line4", as well as "DiffIO1" and "DiffIO2". `TriggerMode` must also be set to "On".

7.5.3.1 Trigger activation

If an external trigger source is used, the mode for activating a profile triggering can be set as follows via `TriggerActivation`:

Setting	Description
RisingEdge	The profile is triggered by ^[8] an increasing edge at the input
FallingEdge	The profile is triggered by ^[8] a falling edge at the input
LevelHigh	Gate trigger, the profile is triggered by an internal trigger (<code>AcquisitionLineRate</code>) or one of the encoders as long as a high signal ^[8] is present at the input
LevelLow	The profile is triggered by an internal trigger (<code>AcquisitionLineRate</code>) or one of the encoders as long as a low signal ^[8] is present at the input

7.5.4 Encoder trigger

The profile recording can be adapted to the movement of an object via one of the connected encoders, so that a profile is recorded on the object in 1 mm increments, for example.

To do this, "Encoder1" and "Encoder2" can be selected via `TriggerSource`. In addition, `TriggerMode` must be set to "On". The `EncoderDivider` can be used to set a division value for generating the trigger signal.

7.5.5 Software trigger

A software trigger can be activated by setting `TriggerSource="Software"` and `TriggerMode="On"`. A profile is then triggered via the `TriggerSoftware` command.

7.6 Profile acquisition

7.6.1 Laser

The sensor has an integrated laser light source for projecting a laser line onto the object to be detected. The operating mode and power of the laser can be set via the `LaserMode` and `LaserPower` parameters.

7.6.1.1 Power levels

`LaserPower="Standard"` can be selected for the detection of objects that reflect little diffuse light (e.g. glass or black rubber) or if only a short exposure time can be used (high profile rates). `LaserPower="Reduced"` can be selected for the detection of highly reflective objects. The laser light source is deactivated with `LaserPower="Off"`.

7.6.1.2 Operating modes

By default, the laser is always switched on by `LaserMode="Continuous"` when the sensor is in operation. In this operating mode, the laser line is permanently visible on the object. This is recommended for adjustment work, for example. Alternatively, the laser can also be switched on only during the exposure time of a profile (`LaserMode="Pulsed"`). In this operating mode, the laser line is only visible on the object for a short time. This is recommended, for example, if several sensors are operated synchronously and one sensor could detect the laser line of another sensor, see chapter "Synchronization of several sensors".

[8] It is assumed that the additionally adjustable input signal inversion (`LineInverter`) is not active

7.6.2 Exposure

The exposure time for acquiring a profile can be set via the `ExposureTime` parameter. The exposure time should be selected so that the acquired profile is well illuminated. If the profile is insufficiently illuminated, peaks may no longer be detected. In this case, the exposure time can be increased or the laser power can be set to "Standard" via `LaserPower`. If the profile is overexposed, the center of the peak can no longer be found precisely, which impairs the measurement accuracy. In this case, the exposure time can be shortened or the laser power can be set to "Reduced".

Further options for improving peak detection can be found at, [see Chap. 7.6.4](#).

7.6.2.1 Automatic exposure time

The exposure time can be automatically adjusted on the basis of previous profile shots. To do this, `ExposureAuto="Continuous"` must be set.

In this case, all image pixels in the `AutoExposureRegion` are evaluated to determine the optimum exposure value.

The upper limit of the controlled exposure time is determined by the set frame rate (`AcquisitionLineRate`).

In this mode, the value set via `ExposureTime` is used as the starting value for automatically determining an optimum exposure value. If this starting value is set so that no or only a very small number of valid points are found, it is possible that no optimum exposure value can be determined automatically. The `ExposureTime` parameter must therefore be set so that a good number of valid points are found with this exposure value.

Subsequently changing the `ExposureTime` parameter to an unfavorable value when an optimum exposure time has already been determined can also have a negative effect on the applied exposure time.

7.6.3 Signal gain

The sensor has an adjustable pixel gain (`PixelGain` = minimum, low, medium, high, maximum) to amplify the acquired image signal.

A higher pixel gain improves the illumination of the acquired profile, but can also lead to greater noise.

The pixel gain should be selected so that the acquired profile is well illuminated. If the illumination of the profile is insufficient, the pixel gain can be increased or the exposure time extended. If the profile is overexposed, the pixel gain can be reduced or the exposure time shortened.

7.6.4 Peak detection

Peak detection in the acquired matrix image takes place in several steps.

7.6.4.1 Peak threshold value

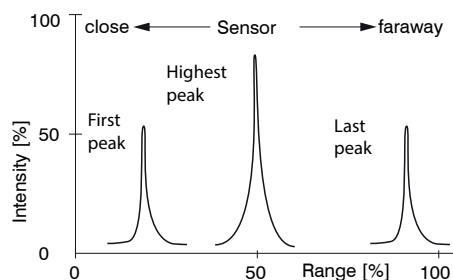
`PeakThresholdMode` can be used to select different methods for detecting peaks in the matrix image.

Setting <code>PeakThresholdMode</code>	Description
Fixed	Use of a fixed threshold value for all peaks. The threshold value is specified via <code>PeakThreshold</code>
AmbientLightSuppression	Use of a common threshold value for all peaks. In addition to the specified threshold value (<code>PeakThreshold</code>), an ambient light component is taken into account, which is determined dynamically.
FullDynamic	Automatic determination and application of a separate threshold value for each matrix column, based on the actual illumination of the column

7.6.4.2 Peak selection

If there are several peaks per column in the matrix image (e.g. due to multiple reflections of the laser line on the measuring object or due to partial reflections on semi-transparent layers), a decision must be made as to which peak is to be used for profiling. The peak selection strategy can be set via `PeakSelection`.

Setting	Description
First	The peak that corresponds to an object point closest to the sensor is processed further
Last	The peak that corresponds to an object point furthest away from the sensor is processed. A maximum of 3 peaks are taken into account
HighestMaximumIntensity	The peak with the highest maximum intensity (brightest pixel) is selected
HighestIntegralIntensity	The peak with the highest total brightness of all pixels belonging to the peak is processed
OneValid	If exactly one peak is present, this one is processed. If several peaks are present, none of them are processed.



7.6.5 Subsampling (HighSpeed mode)

By default, the sensor uses all image lines of the matrix for profiling. If subsampling is activated (`DecimationVertical=2`), only every second image line is used for profiling. This means that the profiling detection rate can be almost doubled while the z-detection range remains the same.

7.6.6 Binning

Binning can be used to combine several neighboring image pixels into one profile point. This reduces the x-resolution of the profile while the x-detection range remains the same. The binning factor (`BinningHorizontal`) specifies how many image columns are combined into one profile point.

7.6.7 Masking the region of interest (ROI)

The sensor supports the flexible limitation of the image area used for profiling. All regions of interest can be positioned using the parameters `DistanceStart`, `DistanceSize`, `PositionStart`, `PositionSize`. All ROIs except ROI1 can be activated/deactivated via `Enable`. ROI1 is always enabled.

Region type	Description
Region of interest (ROI1, ROI2)	Image areas within ROIs are used for profile generation. Image areas outside ROIs are ignored.
Region of no interest (RONI)	Image areas within RONIs are ignored for profile generation. RONI is applied after ROI.
Region of AutoExposure (ROAutoExposure)	Image areas within the Auto Exposure Region are used for automatic exposure time control. ROAutoExposure is applied after ROI and RONI.

The restriction of the image area in height (z-measuring range) enables the read-out time of the matrix to be shortened and thus higher profile rates for image acquisition. Restricting the width of the image area (x measuring range) allows the transmitted profile rate to be increased via GenICam or GigE Vision by reducing the number of points per profile.

7.6.8 Generation of the y-coordinate

7.6.8.1 Depending on the encoder value

The y-coordinate of a profile point can be generated from the current encoder counter of the connected encoder.

The desired encoder must be selected for `Scan3dCoordinateSource(=Encoder1 or Encoder2)` and the encoder resolution (distance per increment) must be set in `Scan3dCoordinateScale[Scan3dExtraction0][CoordB]`.

- i If the `EncoderMode` setting is switched between "FourPhase" and "HighResolution" for a connected encoder with A and B track, the effective resolution of the encoder also changes as more or fewer increments are generated for the same distance moved.

With longer exposure times, the encoder counter of the encoder may change over the duration of the exposure time due to object movements. The selection of "Start", "Middle" or "End" for the `EncoderExposureSamplePoint` parameter determines exactly when the encoder counter is sampled in relation to the exposure interval.

The `Scan3dCoordinateMode` parameter can be used to set whether recorded profile stacks always start at a y-value of 0 mm ("Relative") or contain the actual distance value based on the encoder value ("Absolute").

7.6.8.2 Depending on the profile counter

The y-coordinate of a profile point can also be generated from the profile counter reading. To do this, the "ProfileCounter" setting must be selected for `Scan3dCoordinateSource`. The profile counter is incremented by 1 each time a profile is acquired. The scaling of the y-coordinate can be set via the setting of `Scan3dCoordinateScale[Scan3dExtraction0][CoordB]`.

For a recorded profile stack, the profile counter reading of the first profile in the profile stack is subtracted from the profile counter readings of the subsequent profiles so that the y-coordinate in the profile stack always starts with a y-value of 0 mm.

7.7 Profile transformation and filtering

7.7.1 Installation position transformation

Rotation (`Scan3dTransformValue\[RotationY\]`) perpendicular to the laser plane and translation (`Scan3dTransformValue\[TranslationX\]`, `Scan3dTransformValue\[TranslationZ\]`) within the laser plane can be used to adapt the profile points to a shifted or rotated installation position of the sensor. A scaling of the z-coordinate, e.g. if a mounting position twisted around the x-axis is to be compensated for by profile compression without additionally using a y-coordinate, can be carried out via `Scan3dTransformValue\[ShearZ\]`.

7.7.2 Profile inversion

The x and z coordinate values of the profiles can be inverted using `FlipPosition` or `FlipDistance` on the coordinate axes. This allows the profile data to be adapted to different installation positions of the sensor.

7.7.3 Marking invalid values

Positions in the profile where no distance could be determined (e.g. because no peak was detected) are marked with a special value in the profile. This value can be set via `Scan3dInvalidDataValue`. This enables downstream processing of the profile data to identify that no valid measured value is present at this position.

7.7.4 Rasterization and interpolation

The profile data can be scanned at regular grid intervals in the x-direction. To do this, `ResampleEnable="True"` is set and the start and end positions within the profile are defined in the x-direction in `ResampleStartPosition` and `ResampleRangeLength`. The number of grid positions is defined via `Width`. This results in the grid spacing in the x-direction:

$$\text{Grid spacing} = \text{ResamplingLength} / (\text{Width} - 1)$$

If the input profile data contains intensity values, these are also interpolated linearly.

Interpolation across invalid points is possible.

The `ResampleMaxInvalidGapLength` parameter defines the maximum permissible distance between two neighboring valid input points, within which invalid points in between are interpolated and gaps are thus closed.

There is no extrapolation beyond the boundary points of the profile.

The `ResampleWinStrategy` parameter is used to specify whether the minimum or maximum z-value is selected for multiple interpolated z-values for a grid position.

This setting is particularly relevant for the treatment of undercuts.

7.7.5 Profile filtering

The **Median** (`FilterMedianEnable`, `FilterMedianSize`) and **Average** (`FilterAverageEnable`, `FilterAverageSize`) filters are available for filtering and improving the profile data. They should preferably only be used on gridded profile points as otherwise the filtering is carried out across profile points that may be located at different distances from each other.

7.8 Profile evaluation

Individual profiles as well as point clouds can be evaluated if a license is available in the sensor. The evaluation results (e.g. step heights, diameters or gap widths) are calculated in the sensor and can be output via the fieldbus interface.

For details on defining evaluation concepts, configuring evaluation functions, and setting up the output of evaluation results, please refer to the 3DInspect operating instructions. [The powerful software for 3D evaluation | Micro-Epsilon](#)

7.9 Profile output

Acquired profiles and point clouds can be output via the sensor's GenICam interface. If point data is to be output, `ComponentEnable[Scan3dExtraction0][Range] = True` must be set. If intensity values are to be output in addition to the point data, `ComponentEnable[Scan3dExtraction0][Intensity] = True` must be set.

The intensity values range from 0 for minimum intensity to 1023 for maximum intensity.

7.9.1 Point formats

The sensor supports the output of point data in 2D (AC16, AC32F) and 3D (ABC32F) format. The format is selected via `Pixel format[Scan3dExtraction0][Range]`.

7.9.2 Point intensity

The intensity of a profile point corresponds to the intensity value of the brightest pixel of the associated peak in the matrix image. The output can be activated by setting `ComponentEnable\[Scan3dExtraction0]\[Intensity] = True`. The intensity values are between 0 for no intensity and 1023 for maximum intensity.

7.10 Profile metadata

Profile metadata is available for each profile or point cloud. They contain information about the acquisition conditions of the profile, the sensor status and other useful information. The output of metadata must be activated for each desired data field via `ChunkEnable[Chunkselector]`.

Data field	Description
<code>ChunkEncoder1</code>	Position counter encoder 1
<code>ChunkEncoder2</code>	Position counter encoder 2
<code>ChunkProfileCounter</code>	Profile counter
<code>ChunkFrameID</code>	Consecutive number of the point clouds
<code>ChunkExposureTime</code>	actual exposure time (e.g. determined dynamically by exposure control)
<code>ChunkTemperatureMatrix</code>	Temperature of the matrix
<code>ChunkTemperatureCPU</code>	Temperature of the CPU
<code>ChunkCounter1</code>	Value of counter 1
<code>ChunkCounter2</code>	Value of counter 2
<code>ChunkMeasurementResults</code>	Measurement results of the measurement
<code>ChunkMeasurementObjects</code>	Data objects of the measurement
<code>ChunkEvaluationResults</code>	Evaluation results of the measurement
<code>ChunkEvaluationTime</code>	Evaluation time of the measurement
<code>ChunkEvaluationErrorCode</code>	Error code of the evaluation in case of failed evaluation
<code>ChunkEvaluationErrorMessage</code>	Name of the first module that had an error during the evaluation

7.11 Profile stack

Point clouds consist of a defined number of individual profiles. The number of profiles per stack is set via `Height[Scan3dExtraction0]`. Individual profiles of the point cloud are acquired according to the settings for profile triggering. See, [see Chap. 7.5](#) and profile acquisition, [see Chap. 7.6](#).

Point clouds are not output as individual profiles via the GenICam interface but as 3D point clouds. To do this, `ComponentEnable[Scan3dExtraction0][Range] = True` must be set. If intensity values are to be output in addition to the point data, `ComponentEnable[Scan3dExtraction0][Intensity] = True` must be set.

7.11.1 Triggering and stopping

With internal triggering, the acquisition of a point cloud is triggered with `AcquisitionStart`. As soon as sufficient triggers have been received and processed, the point cloud is transmitted via the GenICam interface. If `AcquisitionMode=Continuous` is set, new point clouds are acquired and output without gaps. The acquisition ends with `AcquisitionStop`. The `FrameFlush` command can be used to output a point cloud that has been started before it is completed.

To trigger the acquisition of a point cloud via an external signal, the point cloud configuration is selected by setting `TriggerSelector=FrameStart`. `TriggerSource[FrameStart]` and `TriggerMode[FrameStart]` are configured in the same way as profile triggering.

To trigger the output of a point cloud started in `TriggerSource\[FrameStart]` via an external signal before it is completed, `FrameTriggerCancelSource=Line4` can be set. Then, when a rising edge is received, the current point cloud is output before it is completed.

The first profile in the point cloud is acquired when a rising edge is received on the signal configured in `TriggerSource[FrameStart]`. Each additional profile of the point cloud is acquired according to the trigger configuration for individual profiles.

7.11.2 Point cloud metadata

If point clouds are output, metadata for the profile stack can also be output. The output of metadata must be activated for each desired data field via `ChunkEnable[Chunkselector]`. Metadata for the individual profiles in the point cloud is not output.

The metadata is the same as for individual profiles, [see Chap. 7.10](#).

Deviating from this, the `ChunkProfileCounter` for point clouds contains the profile counter of the first profile in the point cloud and the `ChunkFrameID` contains the consecutive number of the point cloud.

7.12 Special output formats

7.12.1 AC16

The output in AC16 format contains a 16-bit integer for the x and z coordinates for each profile point. If necessary, the y-coordinate must be derived from the position in the profile and the profile counter or encoder counter.

In `Scan3dCoordinateScale[CoordinateC\]` and `Scan3dCoordinateOffset[CoordinateC\]`, the sensor specifies the scaling and offset values to be used for the z-coordinate, which are necessary to calculate the actual coordinates from the 16-bit values.

7.13 Profile image output

Setting `ComponentEnable[Region0][Intensity] = True` activates the output of the acquired matrix image. The matrix image is output in Mono8 format via the GenICam interface. The matrix image cannot be output at the same time as profiles or point clouds.

7.14 Profile evaluation/signal processing

7.14.1 Operation with 3DInspect

3DInspect has a setup wizard that can be used to configure the interfaces.

For operation with other software tools, it is advisable to use the 3DInspect setup wizard to configure the interfaces and to save the settings made as a DefaultUserSet.

- Click on the setup wizard button in 3DInspect and follow the instructions step by step.

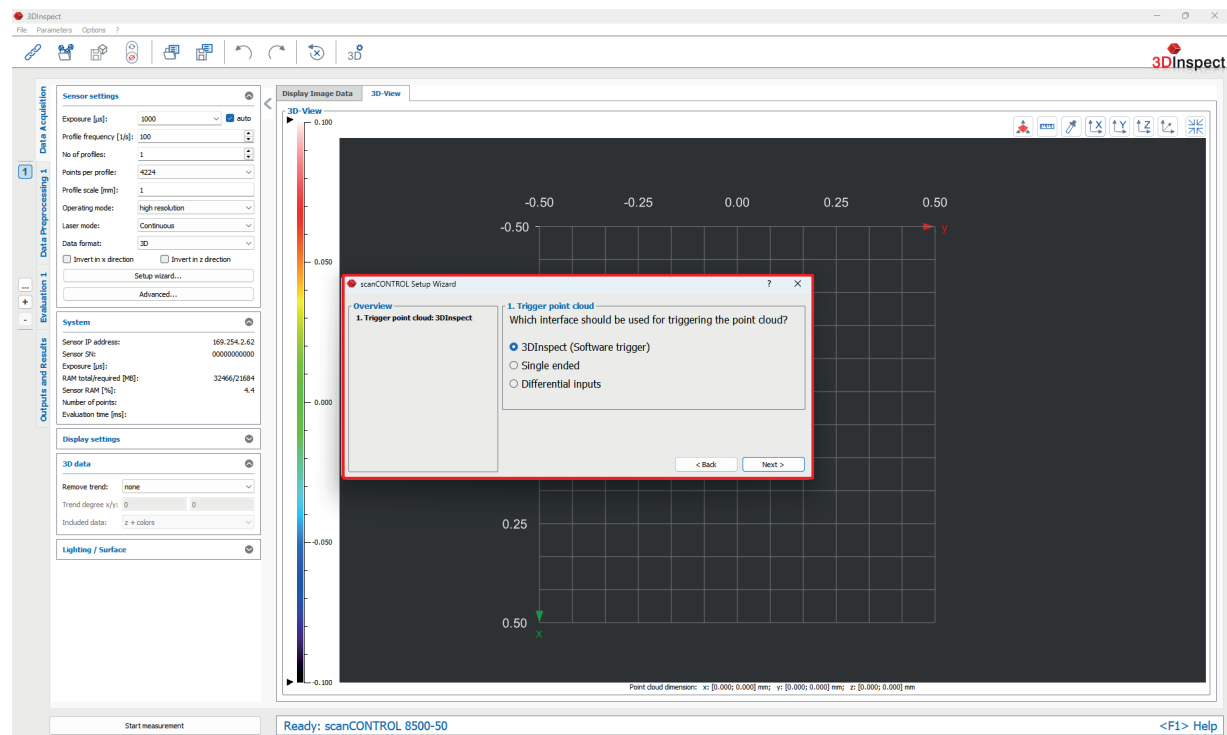
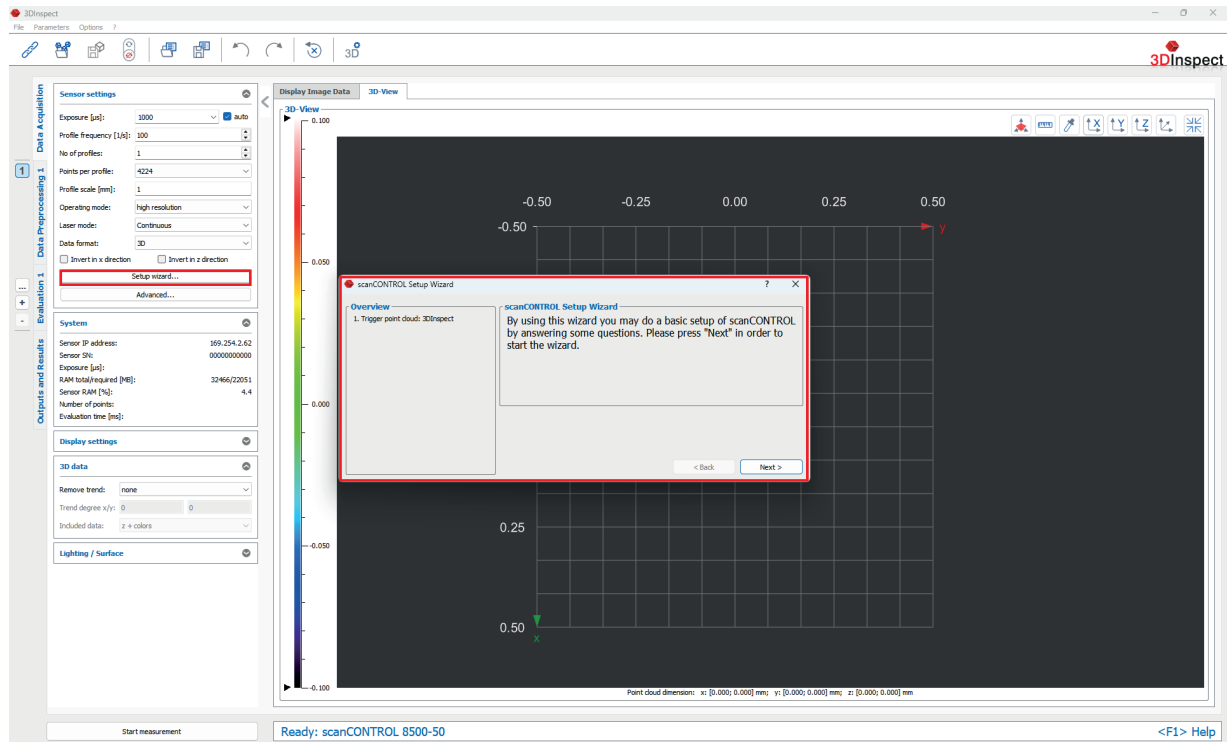


Fig. 7.1: Set interface for triggering 3D point clouds

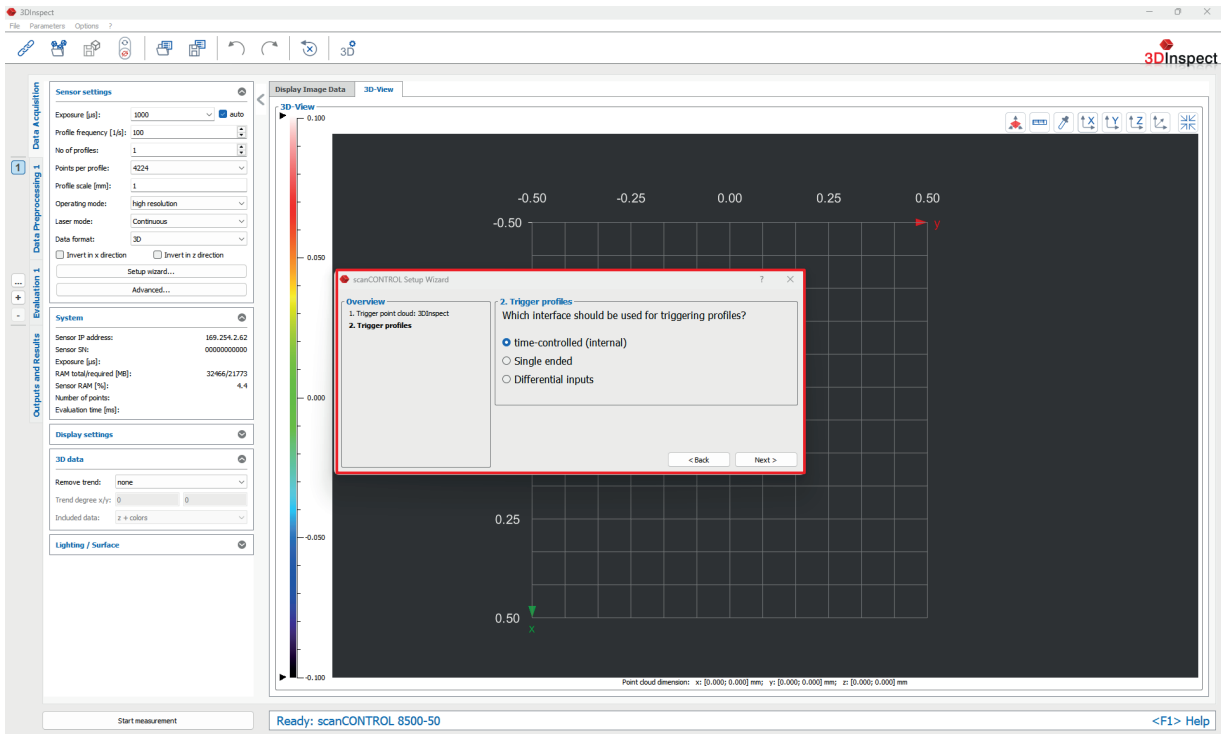


Fig. 7.2: Set interface for triggering profiles

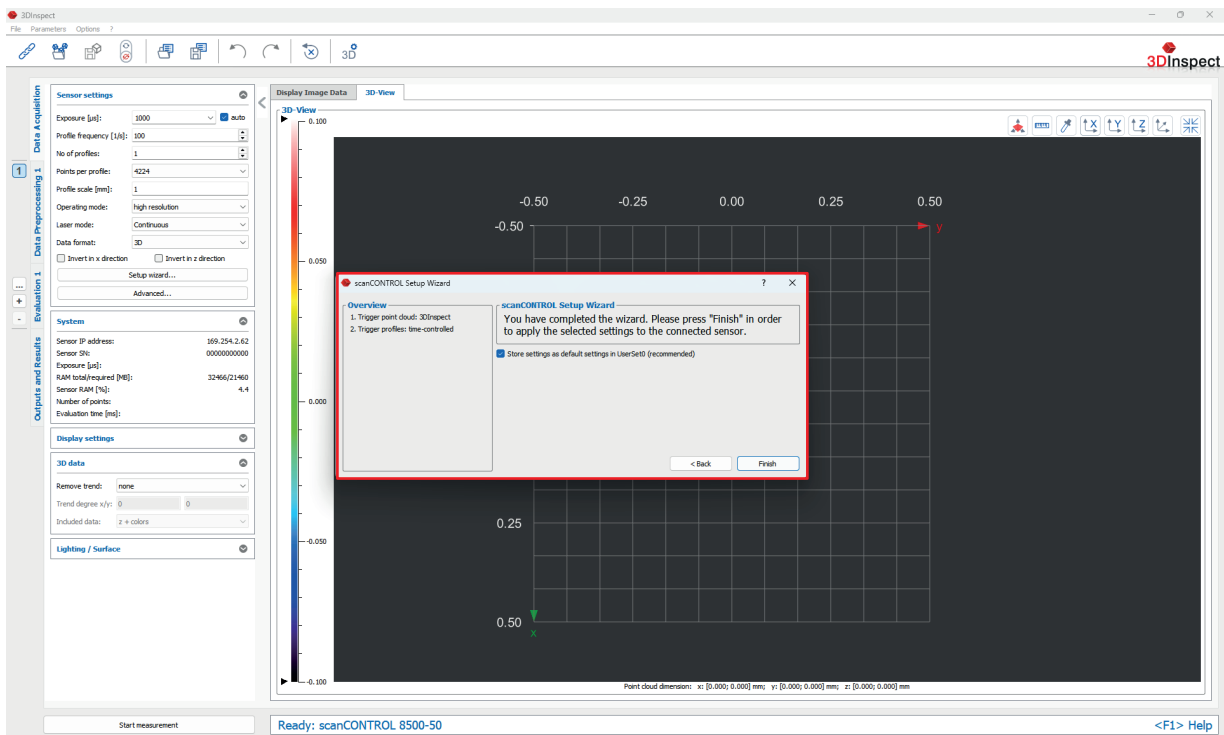
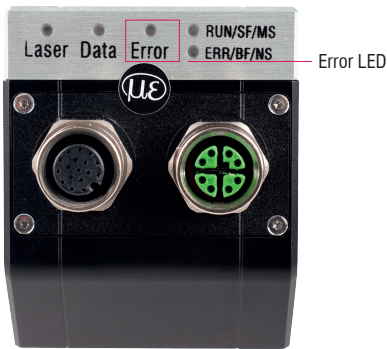


Fig. 7.3: Complete setup

Further information can be found in the [3DInspect](#) operating instructions

7.15 Diagnosis

7.15.1 Flashing pattern of the Error LED



Red blocks

LED is ON for the specified duration

Gray blocks

LED is OFF for the specified duration

smallest flashing unit, 125 ms



medium flashing unit, 250 ms



longest flashing unit, 500 ms



For easier recognition, all flashing codes begin with the following start marker



Flashing pattern	Category
	Configuration error
	Temperature warning
	Critical temperature
	Operating error
	Internal error

Detailed information on the specific errors that have occurred and how to remedy them can be found in the EventError in the GenICam interface of the sensor.

8 Disclaimer

All components of the device have been checked and tested for functionality in the factory. However, should any defects occur despite careful quality control, these shall be reported immediately to Micro-Epsilon or to your distributor / retailer.

Micro-Epsilon undertakes no liability whatsoever for damage, loss or costs caused by or related in any way to the product, in particular consequential damage, e.g., due to

- non-observance of these instructions/this manual,
- improper use or improper handling (in particular due to improper installation, commissioning, operation and maintenance) of the product,
- repairs or modifications by third parties,
- the use of force or other handling by unqualified persons.

This limitation of liability also applies to defects resulting from normal wear and tear (e.g., to wearing parts) and in the event of non-compliance with the specified maintenance intervals (if applicable).

Micro-Epsilon is exclusively responsible for repairs. It is not permitted to make unauthorized structural and / or technical modifications or alterations to the product. In the interest of further development, Micro-Epsilon reserves the right to modify the design or the firmware.

In addition, the General Terms of Business of Micro-Epsilon shall apply, which can be accessed under Legal details | Micro-Epsilon <https://www.micro-epsilon.com/legal-details/>.

9 Service, repair

If the sensor or sensor cable is defective:

- If possible, save the current sensor settings in a parameter set, see Configuration Tools, Parameters > Save parameters to file..., to reload them into the sensor after the repair.
- Please send us the affected parts for repair or exchange.

If the cause of a fault cannot be clearly identified, please send the entire measuring system to:

MICRO-EPSILON
Optronic GmbH
Lessingstrasse 21
01465 Dresden-Langebrück / Germany

Tel: +49 (0) 35201 729-0
Fax: +49 (0) 35201 729 -90
optronic@micro-epsilon.de
www.micro-epsilon.com/contact/worldwide/
<https://www.micro-optronic.de/>

10 Decommissioning, disposal

In order to avoid the release of environmentally harmful substances and to ensure the reuse of valuable raw materials, we draw your attention to the following regulations and obligations:

- Remove all cables from the sensor and/or controller.
- Dispose of the sensor and/or the controller, its components and accessories, as well as the packaging materials in compliance with the applicable country-specific waste treatment and disposal regulations of the region of use.
- You are obliged to comply with all relevant national laws and regulations.

For Germany / the EU, the following (disposal) instructions apply in particular:

- Waste equipment marked with a crossed garbage can must not be disposed of with normal industrial waste (e.g. residual waste can or the yellow recycling bin) and must be disposed of separately. This avoids hazards to the environment due to incorrect disposal and ensures proper recycling of the old appliances.



- A list of national laws and contacts in the EU member states can be found at https://ec.europa.eu/environment/topics/waste-and-recycling/waste-electrical-and-electronic-equipment-weee_en. Here you can inform yourself about the respective national collection and return points.

- Old devices can also be returned for disposal to Micro-Epsilon at the address given in the legal details at <https://www.micro-epsilon.com/legal-details>.

- We would like to point out that you are responsible for deleting the measurement-specific and personal data on the old devices to be disposed of.

- Under the registration number WEEE-Reg.-Nr. DE28605721, we are registered at the foundation Elektro-Altgeräte Register, Nordostpark 72, 90411 Nuremberg, as a manufacturer of electrical and/or electronic equipment.

11 Error coding

Limitations

The flashing sequences during the start-up process are defined by the CM4 module used and cannot be influenced.

(— Error LED lights up for a long time, • Error LED lights up briefly)

Group: Load/save configurations			
•• 2x briefly	Mode not found.	Select different one.	Only previously saved modes can be retrieved.
••- 2x briefly, 1x long	Flash memory write error	Contact the manufacturer and send in the device.	Should not occur during normal operation.
••• 3x briefly	Flash memory full	None, contact manufacturer.	Should not occur during normal operation.
•••• 4x briefly	Loading suppressed due to active data transmission.	Stop active data transmission.	Prevents PC software crashes.
	Faulty configuration	Check configuration	
	Faulty factory data		

Group: Data processing and transmission			
••••• 2x long	Data overflow in the sensor	Choose a smaller measuring field, reduce the profile frequency, select a less complex measuring program.	Possible data error; exposure time may be longer than expected.
•••• 2x long, 1x short	Data overflow when receiving data from the sensor	Choose a smaller measuring field, reduce the profile frequency, select a less complex measuring program.	Data may be incorrect.
•••• 2x long, 2x short	Data overflow on RS422 serial interface	Reduce the profile frequency, select a less complex measuring program.	Data may be incorrect.
••••• 2x long, 3x short	Data overflow when sending data via Ethernet	Reduce profile frequency.	Data may be incorrect.
•••••• 2x long, 5x short	Calculation error	Reduce profile frequency, use faster calculation mode.	Data may be incorrect.
••••••• 2x long, 6x short	Ethernet transmission error	Reduce profile frequency.	Data may be incorrect.
	Error in laser power setting	Sensor reboot	
	General error	Sensor reboot	

Group: Output Unit			
••••• 3x long	2D/3D Output Unit not found	Connect the sensor to the 2D/3D Output Unit.	•••••
••••• 3x long, 1x short	Connected modules of the 2D/3D Output Unit are not supported.	Only use the supported modules, see 7.4.2.	•••••
••••• 3x long, 2x short	Communication error (2D/3D Output Unit)	Reduce the profile frequency.	•••••
•••••• 3x long, 3x short	Overflow during output (2D/3D Output Unit)	Reduce the profile frequency.	•••••

Group: Ethernet interface			
---- 4x long	IP address conflict	Check the Ethernet configuration of the sensor and the PC. Choose a different IP address for the sensor.	If the problem persists, contact the manufacturer.

The `Data` LED flashes green, for a long time during active data transmission and briefly for control accesses. Control access can cause various data overflows, especially when the measurement frequency is close to its maximum.

12 Optional accessories

PS2020	Power supply unit for DIN rail mounting, input 230 VAC, output 24 VDC/2.5 A, LPS or NEC Class 2 compliant, for a maximum of 2 scanCONTROL 8xxx sensors simultaneously.
PS2401	Universal plug-in power supply unit with open ends, input 100-240 V AC, ~1.0 A
PCR8500-x/OE-RJ45	Multifunctional cable, suitable for drag chains and robots, length x = 2, 5, 10, 15, 25, 35 m Power supply, digital inputs (TTL or HTL), RS422 (half-duplex). 12-pin M12 plug to open ends. Cable diameter: approx. 7 mm
SCR8500X-x	Ethernet connection cable, suitable for drag chains and robots, length x = 0.5, 2, 5, 10, 15, 25, 35 m, cable 4x2x0.14; shielded; with molded 8-pin M12x1 screw connector and 8-pin Ethernet cable connector RJ45
Connector/17-pin/multi-function	Connector for the multifunction socket for making a custom cable; shielded; solder termination, A-coded
Heat sink	Passive cooling for operation at ambient temperatures up to 45 °C

13 Parameters GenICam

name	name_with_selectors	description
AcquisitionControl		
AcquisitionMode	AcquisitionMode[SourceSelector]	Sets the acquisition mode of the device.
AcquisitionStart	AcquisitionStart[SourceSelector]	Starts the Acquisition of the device. The number of frames captured is specified by AcquisitionMode.
AcquisitionStop	AcquisitionStop[SourceSelector]	Stops the Acquisition of the device at the end of the current Frame. It is mainly used when AcquisitionMode is Continuous but can be used in any acquisition mode.
TriggerSelector	TriggerSelector	Selects the type of trigger to configure.
TriggerMode	TriggerMode[TriggerSelector][SourceSelector]	Controls if the selected trigger is active.
TriggerSource	TriggerSource[TriggerSelector][SourceSelector]	Specifies the internal signal or physical input Line to use as the trigger source.
TriggerSoftware	TriggerSoftware[TriggerSelector][SourceSelector]	Generates an internal trigger.
ExposureTime	ExposureTime	Sets the exposure time [us] if ExposureAuto is set to Off or the start value for finding a good exposure time automatically if ExposureAuto is set to Continuous. It must be adjusted so the pixel data for the captured profile is saturated just right. With an insufficient exposure/pixel saturation the peaks are not recognized properly. With an overexposure/pixel oversaturation, the middle of a peak can not be found accurately.
ExposureAuto	ExposureAuto	Sets the automatic exposure mode. If set to Off, exposure time is fully controlled by ExposureTime. If set to Continuous, exposure time is constantly adapted by the device to maximize the dynamic range, where ExposureTime is used as the start value for finding a good exposure time automatically.
AcquisitionLineRate	AcquisitionLineRate	Controls the rate (in Hertz) at which the Lines in a Frame are captured.
TriggerActivation	TriggerActivation	Specifies the activation mode of the trigger. Only available for TriggerSelector LineStart.
FrameTriggerCancelSource	FrameTriggerCancelSource	Enable a signal source to cause a frame trigger cancel.
PixelGain	PixelGain	Controls the amplification of the captured image signal, affecting image brightness and noise level.
ChunkDataControl		
ChunkEnable	ChunkEnable[ChunkSelector][SourceSelector]	Enables the inclusion of the selected Chunk data in the payload of the image.
ChunkProfileCounter	ChunkProfileCounter	Number of profiles received since the start of the device.
ChunkEncoder1	ChunkEncoder1	Encoder1 Value
ChunkEncoder2	ChunkEncoder2	Encoder2 Value
ChunkExposureTime	ChunkExposureTime	Actual duration during the matrix was exposed [us]
ChunkTemperatureCPU	ChunkTemperatureCPU	CPU temperature [degree Celsius] (-1000.0 is indicating an error)
ChunkTemperatureMatrix	ChunkTemperatureMatrix	PCB Matrix temperature [degree Celsius] (-1000.0 is indicating an error)
ChunkCounter1	ChunkCounter1	Value of Counter1
ChunkCounter2	ChunkCounter2	Value of Counter2

ChunkFrameID	ChunkFrameID	Returns the unique Identifier of the frame included in the payload. Initial value at sensor power on is zero. Increments on each frame acquired. Wraps around at range end
ChunkMeasurementResults	ChunkMeasurementResults	The ok/nok of the evaluation as byte array.
ChunkMeasurementObjects	ChunkMeasurementObjects	The objects of the evaluation as byte array.
ChunkEvaluationResults	ChunkEvaluationResults	The evaluation results as byte array.
ChunkEvaluationTime	ChunkEvaluationTime	The evaluation time in micro seconds.
ChunkEvaluationErrorCode	ChunkEvaluationErrorCode	Error code of the evaluation.
ChunkEvaluationErrorModuleName	ChunkEvaluationErrorModuleName	If error in evaluation occurred, the name of the first module.
DigitalIOControl		
LineInverter	LineInverter[LineSelector]	Controls the inversion of the signal of the selected input or output Line.
EncoderControl		
EncoderResolution	EncoderResolution[EncoderSelector]	Defines the resolution of an encoder step [mm].
EncoderMaxValue	EncoderMaxValue[EncoderSelector]	Maximum value after which the value wraps around to zero
EncoderMode	EncoderMode[EncoderSelector]	Selects if the counter of the encoder uses FourPhase mode with jitter filtering or the HighResolution mode without jitter filtering.
EncoderOutputMode	EncoderOutputMode[EncoderSelector]	The conditions for the encoder interface to operate on the encoder signal
EncoderExposureSamplePoint	EncoderExposureSamplePoint	Alignment of the encoder value to the Exposure
EncoderDivider	EncoderDivider	Sets how many encoder increments/decrements are needed to generate an encoder Trigger
EncoderResetSource	EncoderResetSource[EncoderSelector]	The signals that will be the source to reset the encoder
EncoderResetValue	EncoderResetValue[EncoderSelector]	The value, that is loaded at an encoder Reset
EncoderResetActivation	EncoderResetActivation[EncoderSelector]	The activation mode of the encoder Reset Source signal.
EncoderReset	EncoderReset[EncoderSelector]	Resets the selected encoder
EventErrorData		
EventError	EventError	Event is generated when an error has occurred while executing a measurement
ImageFormatControl		
Width	Width[RegionSelector][SourceSelector]	Width of the image provided by the device (in pixels).
Height	Height[RegionSelector][SourceSelector]	Height of the image provided by the device (in pixels).
ComponentEnable	ComponentEnable[RegionSelector] [ComponentSelector][SourceSelector]	Controls if the selected component, which is defined by SourceSelector, RegionSelector and ComponentSelector, is active and streaming. This switch is used to distinguish between setup mode (live mode) and measuring mode. Not all combinations are possible for the selectors.
DecimationVertical	DecimationVertical	Vertical sub-sampling of the image. This reduces the vertical resolution read from the matrix by the set amount.
BinningHorizontal	BinningHorizontal	Number of horizontal photo-sensitive cells to combine together. This reduces the horizontal resolution (width) of the image by the set amount.
FlipDistance	FlipDistance	Flips the Distance (Z/C) coordinate of ScanExtraction point clouds.

FlipPosition	FlipPosition	Flips the Position (X/A) coordinate of ScanExtraction point clouds.
Laser		
LaserPower	LaserPower	The power of the internal laser
LaserEnable	LaserEnable	Enables laser activation according to the LaserMode.
LaserMode	LaserMode	The operation mode of the laser
Processing		
FilterMedianEnable	FilterMedianEnable	Enables the Median filtering.
FilterMedianSize	FilterMedianSize	Sets the total number of points used by the algorithm.
FilterAverageEnable	FilterAverageEnable	Enables the Average filtering.
FilterAverageSize	FilterAverageSize	Sets the total number of points used by the algorithm.
ResampleEnable	ResampleEnable	Enables Resampling.
ResampleStartPosition	ResampleStartPosition	Start of the resampling region (min X).
ResampleRangeLength	ResampleRangeLength	Length of the resampling region.
ResampleMaxInvalidGapLength	ResampleMaxInvalidGapLength	Maximum length of gaps with invalid points that should be interpolated. Set to 0 to fill no gaps.
ResampleWinStrategy	ResampleWinStrategy	Select the strategy which is used to select points based on their CoordC value. Use Max to prefer high CoordC values and Min to prefer low CoordC values for an interpolation segment.
ProfileAcquisitionControl		
PeakSelection	PeakSelection	The peak selection strategy. This feature is relevant if more than one peak is measured.
PeakThreshold	PeakThreshold	The threshold for the peak detection.
PeakThresholdMode	PeakThresholdMode	The peak detection threshold algorithm.
Scan3dControl		
Scan3dCoordinateSelector	Scan3dCoordinateSelector[Scan3dExtractionSelector]	Selects the individual coordinates in the vectors for 3D information.
Scan3dCoordinateScale	Scan3dCoordinateScale[Scan3dExtractionSelector] [Scan3dCoordinateSelector]	Scale factor when transforming a pixel from relative coordinates to world coordinates. Value is only applied when PixelFormat Coord3D_AC16 is used.
Scan3dCoordinateOffset	Scan3dCoordinateOffset[Scan3dExtractionSelector] [Scan3dCoordinateSelector]	Offset when transforming a pixel from relative coordinates to world coordinates. Value is only applied when PixelFormat Coord3D_AC16 is used.
Scan3dInvalidDataValue	Scan3dInvalidDataValue	Value which identifies a non-valid pixel if Scan3dInvalidDataFlag is enabled.
Scan3dCoordinateSource	Scan3dCoordinateSource[Scan3dExtractionSelector] [Scan3dCoordinateSelector]	Select the source to be used to calculate the coordinate from.
Scan3dCoordinateMode	Scan3dCoordinateMode[Scan3dExtractionSelector] [Scan3dCoordinateSelector]	Select the mode to be used to calculate the coordinate from
ProfileCounterResolution	ProfileCounterResolution	The resolution of a profile counter step [mm].
Scan3dTransformValue	Scan3dTransformValue[Scan3dCoordinateTransformSelector]	The X offset applied to points to account for how the sensor is installed.

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