



## Operating Instructions **scanCONTROL 29xx**

Laser scanner

MICRO-EPSILON  
MESSTECHNIK  
GmbH & Co. KG  
Koenigbacher Str. 15

94496 Ortenburg / Germany

Tel. +49 (0) 8542 / 168-0  
Fax +49 (0) 8542 / 168-90  
[info@micro-epsilon.com](mailto:info@micro-epsilon.com)  
[www.micro-epsilon.com](http://www.micro-epsilon.com)

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## 1. Safety

### 1.1 Symbols

System operation assumes knowledge of the operating instructions.

The following symbols are used in these operating instructions.



Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.



Indicates a situation that may result in property damage if not avoided.



Indicates a user action.



Indicates a tip for users.

Measure

Indicates hardware or a software button/menu.

### 1.2 Warnings



Connect the power supply and the display-/output device according to the safety regulations for electrical equipment

> Risk of injury

> Damage to or destruction of the sensor



Avoid shocks and impacts to the sensor.

> Damage to or destruction of the sensor

The supply voltage must not exceed the specified limits.

> Damage to or destruction of the sensor

Avoid continuous exposure to dust and spray on the sensor by appropriate methods such as blowing or using a protective housing.

> Damage to or destruction of the sensor

Do not touch the protective windows of the optics with the fingers. Wipe off any fingerprints immediately with pure alcohol and a clean cotton cloth with no streaks.

Protect the cable against damage.

> Failure of the measuring device

Only plug in or disconnect attached devices when disconnected from the power supply.

## **1.3 Notes on Product Marking**

### **1.3.1 CE Marking**

The following applies 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 applies 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 scanCONTROL 29xx measuring system is designed for use in industrial and laboratory areas.
- It is used for
  - Profile measurement
  - Length measurement
  - Quality monitoring and inspection of dimensions
- The sensor must only be operated within the limits specified in the technical data, [see 3.2](#).
- The sensor must be used in such a way that no persons are endangered or machines and other material goods 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 for sensors: IP65 (only applies in the case of connected output connectors or installed protective caps)
- Temperature range:
  - Operation: 0 ... +45 °C (+32 ... +113 °F) (with free air circulation)
  - Storage: -20 ... +70 °C (-4 ... +158 °F)
- Ambient pressure: Atmospheric pressure
- Humidity: 5 ... 95 % RH (non condensing)

Optical paths during operation are excluded from the protection class. Contamination of the paths causes impairment or failure of the function.

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

Also observe the assembly and installation instructions, [see 5](#).

The IP 65 protection class is a specification that is limited to protection from dust and water.

Oil, steam and emulsion effects are not included in this protection class and must be evaluated separately.

## 2. Laser Safety

### 2.1 General

The scanCONTROL 29xx operates with a semiconductor laser with a wavelength of 658 nm (visible/red) respectively 405 nm (visible/blue).

- **i** If the warning labels are covered over when the unit is installed, the user must ensure that supplementary labels are applied.

Operation of the laser is indicated visually by the LED on the sensor, [see 3.3](#).

The housing of the optical sensors may only be opened by the manufacturer, [see 9](#).

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

Please observe national regulations, e. g., Laser Notice No. 56 for the USA.

### 2.2 Laser Class 2M

The sensors fall within laser class 2M. The laser is operated on a pulsed mode, the maximum optical power is  $\leq 8$  mW (scanCONTROL 29xx-10/BL  $\leq 7$  mW). The pulse frequency depends on the adjusted measuring rate (0 ... 4 kHz). The pulse duration of the peaks is regulated depending on the measuring rate and reflectivity of the target and can be 1 ...  $\infty$   $\mu$ s.



Laser radiation. Irritation or injury of the eyes possible.  
Close your eyes or immediately turn away if the laser beam hits the eye.

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- **i** Observe the national laser protection regulations.

When operating the sensors, the relevant regulations according to IEC 60825, Part 1 of 05/2014 and the applicable accident prevention regulations must be followed.

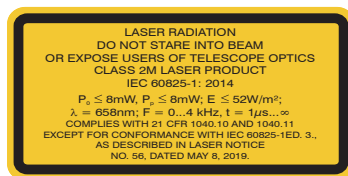
Accordingly, the following applies:

- Laser equipment of the Class 2M can be employed without further protective measures, when deliberate viewing into the laser beam or into a beam reflected by mirrors is not longer than 0.25 s.

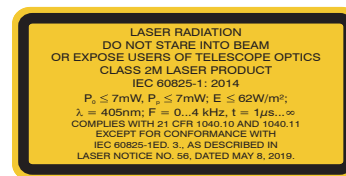
- Directly looking into the beam can be dangerous, if the eye-closure reflex is consciously suppressed, e.g., during adjusting.
- Directly looking into the beam with optical devices, such as magnifying glasses, is dangerous.
- Since generally the presence of the eye-closure reflex should not be assumed, one should close the eyes or immediately turn away if the laser radiation impinges on the eye.

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

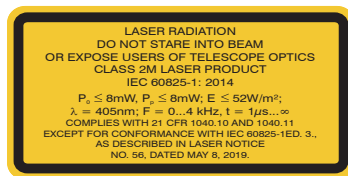
The laser warning labels for Germany have already been attached. For other non German speaking countries, an IEC standard label is included in delivery and the versions valid for the user's country must be attached before the device is put into operation for the first time.



*Fig. 1 Laser warning sign and laser label, scanCONTROL 29xx-25, 29xx-50, 29xx-100*



*Fig. 2 Laser warning sign and laser label, scanCONTROL 29xx/10BL*



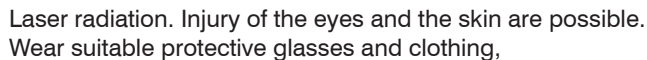
*Fig. 3 Laser warning sign and laser label, scanCONTROL 29xx-25/BL, 29xx-50/BL, 29xx-100/BL*

**i** If both warning labels are covered over when the unit is installed, the user must ensure that supplementary labels are applied.



Mark the laser area recognizable and everlasting.

The sensors fall within laser class 3B. The laser is operated on a pulsed mode, the maximum optical power is  $\leq 50$  mW. The pulse frequency depends on the adjusted measuring rate (0 ... 4 kHz). The pulse duration of the peaks is regulated depending on the measuring rate and reflectivity of the target and can be 1 ...  $\infty$   $\mu$ s.



- i Observe the national laser protection regulations.
- i With laser class 3B sensors, the customer is required to provide an external key switch for laser switch-off. [see 5.2.6.](#)

When operating the sensors, the relevant regulations according to IEC 60825, Part 1 of 05/2014 and the applicable accident prevention regulations must be followed.

Accordingly, the following applies:

- The accessible laser radiation is harmful to the eyes, and often also for the skin.
- Looking directly into the laser beam is harmful to the eyes. Reflections of shiny or mirroring surfaces are also harmful to the eyes.
- The accessible laser radiation is harmful to the skin with laser class 3B devices if the values of the maximum permissible exposure are exceeded.

Class 3B laser sensors are notifiable and a laser protection officer is required.

Mark the laser area recognizable and everlasting. During operation the laser area has to be restricted and marked.

The laser warning labels for Germany have already been attached. For other non German speaking countries, an IEC standard label is included in delivery and the versions valid for the user's country must be attached before the device is put into operation for the first time.



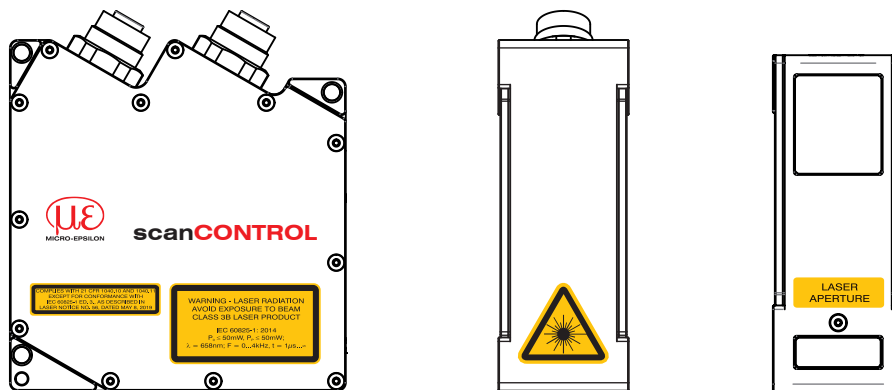
Fig. 5 Laser warning sign and laser label, scanCONTROL 29xx

Fig. 6 Only for USA

**i** If both warning labels are covered over when the unit is installed, the user must ensure that supplementary labels are applied.

In addition, the following information label must be attached to the laser output on the sensor housing:





*Fig. 7 Sensor with laser labels*

If the sensor is on the laser output can be reduced to 8 mW with the software.

Reducing the laser output to 1 mW is not possible. Reducing the laser output from 20 mW to 8 mW with a software affects not the laser class!

## Beam attenuator



*Fig. 8 Sensor with closed beam attenuator*



*Fig. 9 Sensor with open beam attenuator for measurements*

Laser products certified as Class 3B products (EN 60825-1) require a beam attenuator, [see Fig. 8](#), [see Fig. 9](#), other than the key-operated control. The beam attenuator prevents access to all laser and collateral radiation.

To open or close the aperture please follow the steps below:

- ➡ Loosen the knurled screw.
- ➡ Change the attenuator position and tighten the knurled screw.

The laser aperture must be open during measurement. Please observe the notes on external laser switching, [see 5.2.6](#).

### **3. Functional Principle, Technical Data**

#### **3.1 Short Description**

##### **3.1.1 Measuring Principle**

The scanCONTROL 29xx sensor operates according to the principle of optical triangulation (light intersection method):

- A laser line is projected onto the target surface via a linear optical system.
- The diffusely reflected light from the laser line is replicated on a sensor array by a high quality optical system and evaluated in two dimensions.

The laser line triangulation corresponds in principle to the triangulation of a laser point. However, during the measurement a row of lines are simultaneously illuminated by the laser line. Apart from 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 System Setup**

The scanCONTROL 29xx sensor is a compact sensor with an integrated controller. All necessary integral parts are combined in one housing.

##### **3.1.3 Special Performance Features**

- scanCONTROL 29xx is characterized by its compact design and high speed along with high measuring accuracy. A special line-scanning optical system ensures uniform exposure of the measuring field.
- The sensor array is arranged in the sensor head according to the Scheimpflug condition which enables uniform image focusing over the whole depth of the measuring range (Z-axis).
- The scanCONTROL 2910/2960 series with integrated profile evaluation works even without a PC in conjunction with saved configurations. The sensor performs the profile measurement internally and calculates default measured values such as angle or edge position.

Besides measurement value output via Ethernet (Modbus TCP protocol, UDP protocol) and RS422 (Modbus RTU protocol or ASCII format), additional switching signals (results of the determination of limit values) and analog measurement values can be output. This is done by an optional scanCONTROL Output Unit, which transforms the determined measurement signals in switching and analog signals for further processing in a PLC.

- 2D/3D Gateway allows for scanCONTROL SMART sensors to be integrated into various fieldbus systems (PROFINET, EtherNet/IP, EtherCAT).



#### **3.1.4 Advantages of the Used Sensor Array (Difference to Conventional Video Arrays)**

- A global shutter (high speed shutter) for the whole profile enables a high profile accuracy for fast moving objects without "tilting".
- The array enables the simultaneous exposure and reading of the previous image. Thus, the exposed time can be longer with the same profile frequency, and therefore dark objects can be measured at high speed.

#### **3.1.5 Further Advantages**

- External synchronization and triggering
- Serial interface (RS422) for communication with PLC or PC
- Digital switching inputs, TTL or HTL
- The automatic control of the exposure time enables consistent measurement results with changing surfaces. It can be switched off on request.
- Ethernet 100/1000 Mbit as fast standard connection to PC

### 3.2 Technical Data

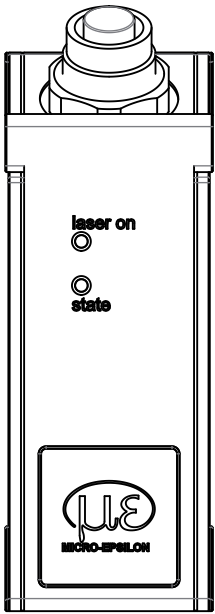
| Model                                  | scanCONTROL               | 29xx-10/BL          | 29xx-25       | 29xx-50       | 29xx-100      |
|--|---------------------------|---------------------|---------------|---------------|---------------|
| Measuring range (Z-axis)               | Start of measuring range  | 52.5 mm             | 53.5 mm       | 70 mm         | 190 mm        |
|  | Mid of measuring range    | 56.5 mm             | 66 mm         | 95 mm         | 240 mm        |
|  | End of measuring range    | 60.5 mm             | 78.5 mm       | 120 mm        | 290 mm        |
|  | Height of measuring range | 8 mm                | 25 mm         | 50 mm         | 100 mm        |
| Extended measuring range (Z-axis)      | Start of measuring range  | -                   | 53 mm         | 65 mm         | 125 mm        |
|  | End of measuring range    | -                   | 79 mm         | 125 mm        | 390 mm        |
| Line linearity (Z-axis) <sup>1 2</sup> |                           | 1 $\mu$ m           | 2 $\mu$ m     | 4 $\mu$ m     | 12 $\mu$ m    |
|  |                           | $\pm 0.0125$ %      | $\pm 0.008$ % | $\pm 0.008$ % | $\pm 0.012$ % |
| Measuring range (X-axis)               | Start of measuring range  | 9.4 mm              | 23.4 mm       | 42 mm         | 83.1 mm       |
|  | Mid of measuring range    | 10 mm               | 25 mm         | 50 mm         | 100 mm        |
|  | End of measuring range    | 10.7 mm             | 29.1 mm       | 58 mm         | 120.8 mm      |
| Extended measuring range (X-axis)      | Start of measuring range  | -                   | 23.2 mm       | 40 mm         | 58.5 mm       |
|  | End of measuring range    | -                   | 29.3 mm       | 60 mm         | 143.5 mm      |
| Resolution                             |                           | 1280 points/profile |               |               |               |
| Profile frequency                      | Standard                  | Up to 300 Hz        |               |               |               |
|  | Highspeed                 | Up to 2000 HZ       |               |               |               |

| Model  | scanCONTROL                      | 29xx-10/BL   | 29xx-25   | 29xx-50 | 29xx-100 |
|--|----------------------------------|--|---|---------|----------|
| Interfaces   | Ethernet GigE Vision             | Output of measurement values   |   |         |          |
|  |                                  | Sensor control   |   |         |          |
|  |                                  | Profile data transmission  |   |         |          |
|  | Digital inputs                   | Mode switching   |   |         |          |
|  |                                  | Encoder (counter)  |   |         |          |
|  |                                  | Trigger  |   |         |          |
|  | RS422 (half-duplex) <sup>3</sup> | Output of measurement values   |   |         |          |
|  |                                  | Sensor control   |   |         |          |
|  |                                  | Trigger  |   |         |          |
|  |                                  | Synchronization  |   |         |          |
| Output of measurement values <sup>4 5</sup>                |                                  | Ethernet (UDP / Modbus TCP); RS422 (ASCII / Modbus RTU) analog;<br>switch signal PROFINET; EtherCAT; EtherNet/IP |   |         |          |
| Control and display elements                               |                                  | 3 x color LED for laser, data and error  |   |         |          |
| Light source   | Red Laser                        |  | ≤ 8 mW  |         |          |
|  |                                  | -  | Standard: laser class 2M,<br>semiconductor laser 658 nm |         |          |
|  |                                  | -  | ≤ 20 mW   |         |          |
|  |                                  | -  | Option: laser class 3B, semiconductor 658 nm            |         |          |
|  | Blue Laser                       |  | ≤ 8 mW  |         |          |
|  |                                  | Standard: laser class 2M, semiconductor 405 nm   |   |         |          |
| Laser switch-off   |                                  | via software, hardware switch-off with /SI option  |   |         |          |
| Aperture angle of laser line                               |                                  | 10°  | 20°   | 25°     | 25°      |
| Permissible ambient light (fluorescent light) <sup>1</sup> |                                  | 10.000 lx  |   |         |          |
| Protection class (DIN EN 60529)                            |                                  | IP65 (when connected)  |   |         |          |
| Vibration (DIN EN 60068-2-27)                              |                                  | 2g / 20 ... 500 Hz   |   |         |          |
| Shock (DIN EN 60068-2-6)                                   |                                  | 15g/ 6 ms  |   |         |          |

| Model             | scanCONTROL | 29xx-10/BL  | 29xx-25               | 29xx-50 | 29xx-100 |
|-------------------|-------------|---|-----------------------|---------|----------|
| Temperature range | Storage     | 0 ... +45 °C (+32 ... +113 °F)  |                       |         |          |
|                   | Operation   | -20 ... +70 °C (-4 ... +158 °F)   |                       |         |          |
| Weight            |             | 440 g<br>(without cable)  | 380 g (without cable) |         |          |
| Supply voltage    |             | 11 ... 30 VDC, nominal value 24 V, 500 mA,<br>IEEE 802.3af class 2, Power over Ethernet (PoE) |                       |         |          |

- 1) According to measuring range; Measuring object: Micro-Epsilon standard object
- 2) According to a one-time averaging over the width of the measuring field (640 points)
- 3) RS422 interface, programmable either as serial interface or as input for triggering/synchronization
- 4) Analog / switch signal : Only with 2D/3D Output Unit
- 5) PROFINET / EtherCAT / EtherNet/IP: Only with 2D/3D Gateway

3.3 LED Indication

|   |   |  |
|---|---|--|
|  | LED laser on                              | Green: Laser on  |
|   | LED state:<br>Two-color LED (red / green) | Green: Measurement<br>Green flashing: Data transmission<br>Red flashing: error code, <a href="#">see 12.</a> |

Note:  
The LED `state` flashes green, long during active data transmission and short for controller accesses.

## 4. Delivery

### 4.1 Unpacking, Included in Delivery

- 1 scanCONTROL 29xx sensor
- 1 Assembly instructions
- 1 Sensor acceptance report
- 2 Protective caps
- 1 PCR3000-5 Multifunction cable; 5 m long; for power supply, trigger and RS422; M12x1 screw connector and free cable ends

- ➡ Carefully remove the components of the measuring system from the packaging and ensure that the goods are forwarded in such a way that no damage can occur.
- ➡ 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.

You will find recommended and optional accessories in appendix, [see A 1.1](#), [see A 1.2](#).

### 4.2 Storage

Temperature range: -20 ... +70 °C (-4 ... +158 °F)

Humidity: 5 ... 95 % RH (non condensing)

## 5. Mounting and Installation

### 5.1 Attachment and Mounting

- using 2 or 3 screws M5, screwed directly
- using 2 or 3 screws M4, screwed pushed through

Depending on the installation position it is recommended to determine the position of the sensor for example by adjusting screws on the specially marked attachment points.

The pin hole  $\varnothing 3H11$  is intended for a position locking pin. The sensor can be mounted reproducibly and replaceably together with an attachment point, [see Fig. 12](#), [see Fig. 13](#), [see Fig. 14](#).

➡ The mounting dimensions refer to the dimensional drawings.

#### NOTICE

Pay attention to careful handling during mounting and operation.

> Damage to or destruction of the sensor

The laser beam should strike the target surface at right angles. Otherwise, inaccurate measurements cannot be excluded.

➡ Mount the sensor by means of screws type M5 or by means of through bores for M4 with the screws from the accessories.

| Bolt connection |                  |                   |                       |
|-----------------|------------------|-------------------|-----------------------|
| Bolt length     | Screw            | Washer            | Torque                |
| 33 mm           | M4 x ISO 4762-A2 | A 4.3 ISO 7089-A2 | 2 Nm ( $\mu = 0,12$ ) |

| Direct fastening    |                  |                         |
|---------------------|------------------|-------------------------|
| Screwing depth      | Screw            | Torque                  |
| min 8 mm, max 10 mm | M5 x ISO 4762-A2 | 3.5 Nm ( $\mu = 0.12$ ) |

*Fig. 10 Mounting conditions*

The bearing surfaces surrounding the fastening holes (through-holes) are slightly raised.

Mount the sensor only to the existing through-holes on a flat surface. Clamps of any kind are not permitted. Do not exceed torques.

> Inaccurate, erroneous measuring values

#### NOTICE

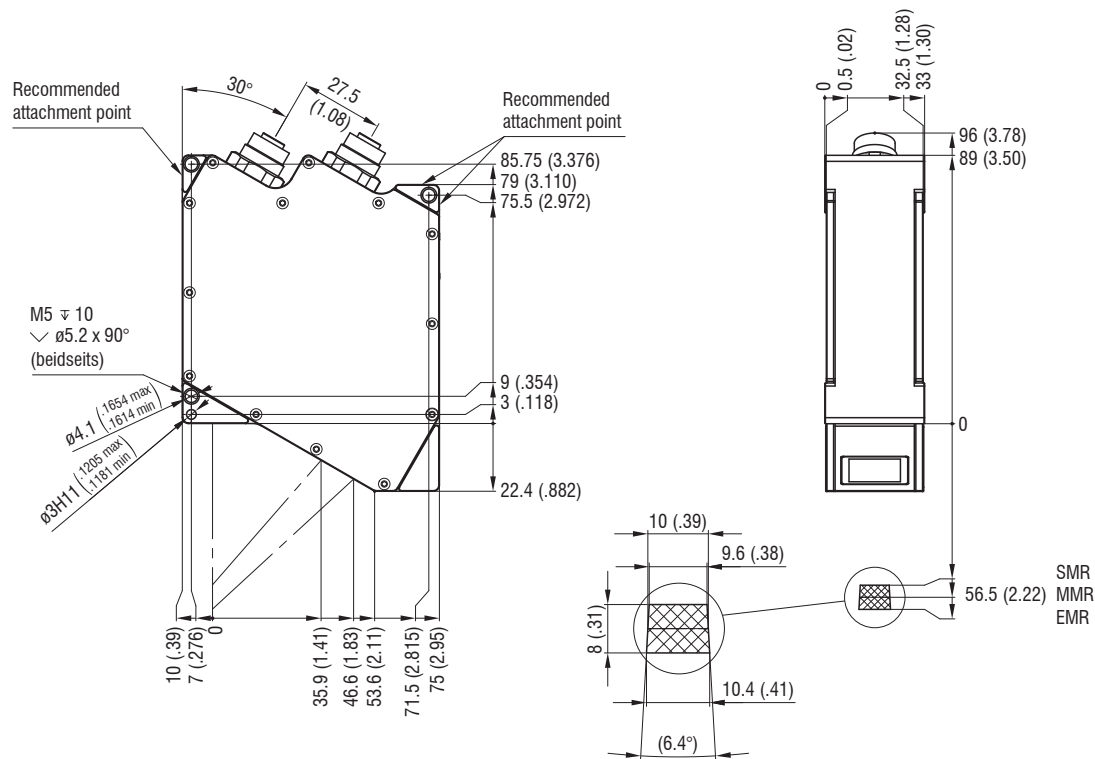


Fig. 11 Dimensional drawing scanCONTROL 29xx-10/BL sensor, dimensions in mm (inches, rounded off)

SMR = Start of measuring range

MMR = Mid of measuring range

EMR = End of measuring range



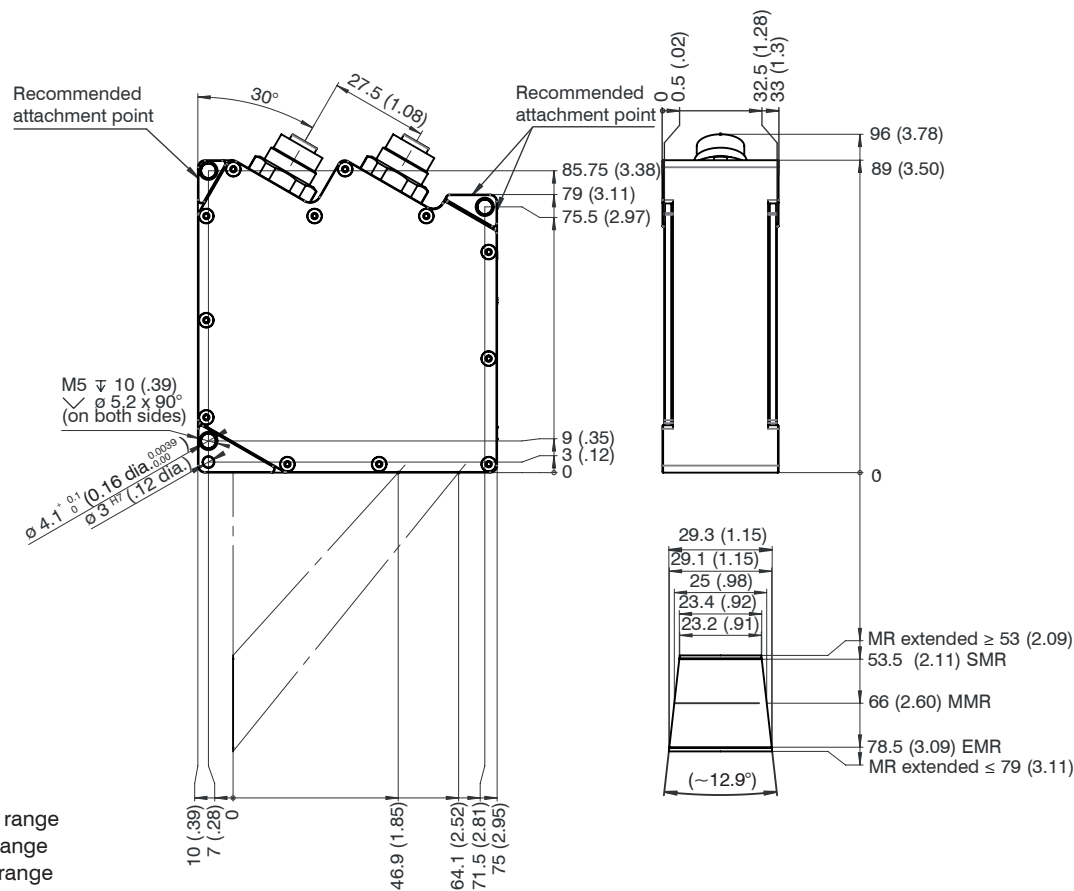
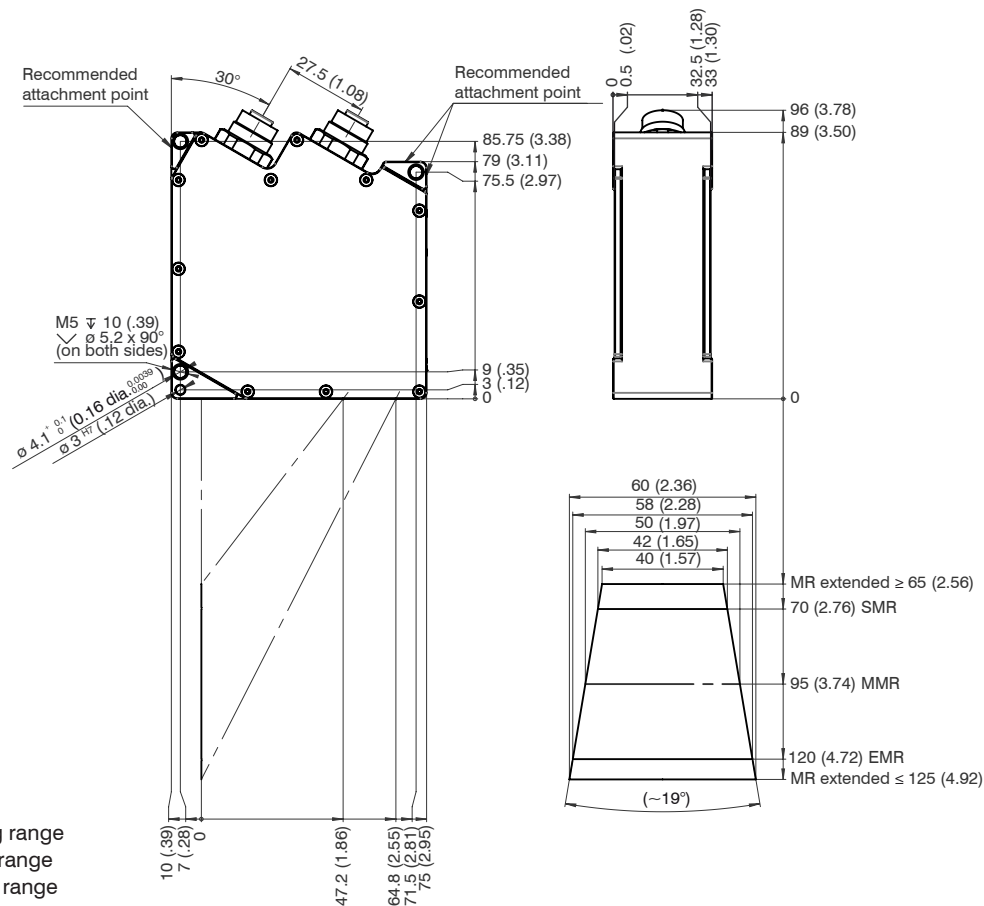
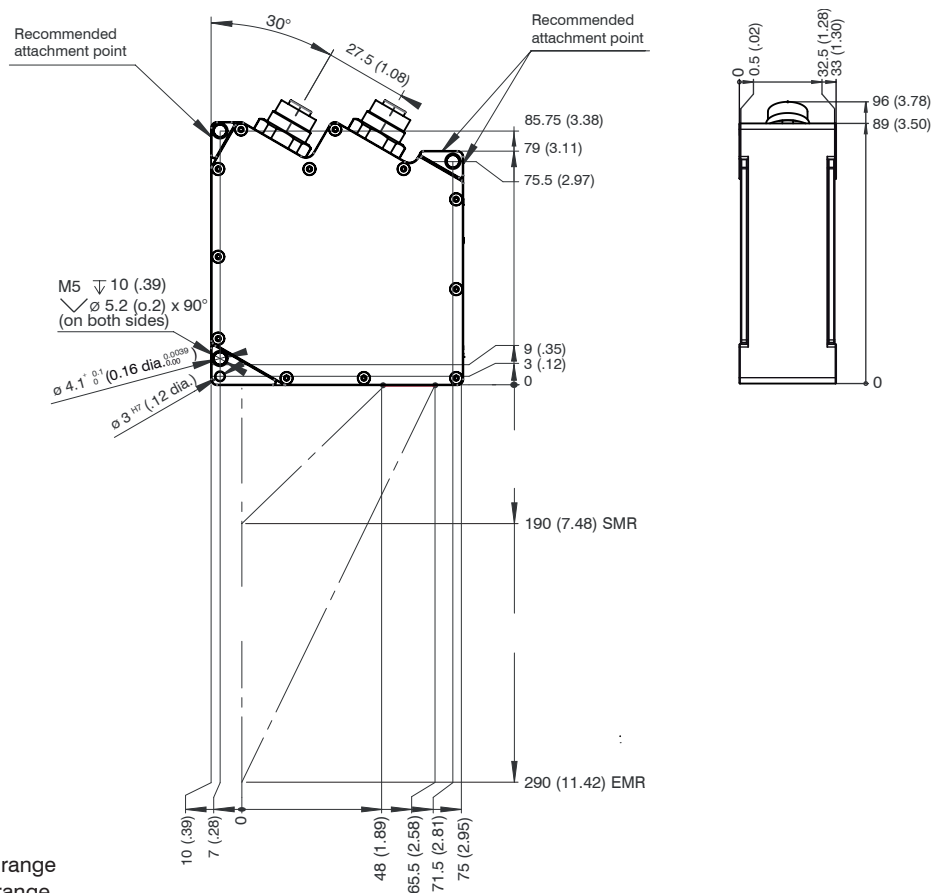


Fig. 12 Dimensional drawing scanCONTROL 29xx-25 sensor, dimensions in mm (inches, rounded off)



MR = Measuring range  
 SMR = Start of measuring range  
 MMR = Mid of measuring range  
 EMR = End of measuring range

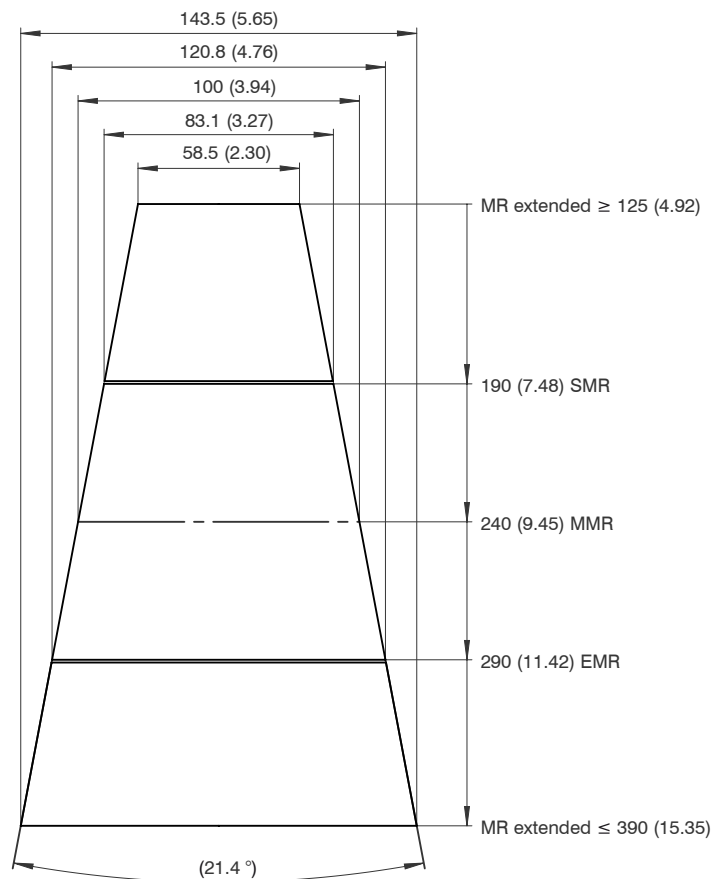
Fig. 13 Dimensional drawing scanCONTROL 29xx50 sensor, dimensions in mm (inches, rounded off)



SMR = Start of measuring range

EMR = End of measuring range

Fig. 14 Dimensional drawing scanCONTROL 29xx-100 sensor, dimensions in mm (inches, rounded off)

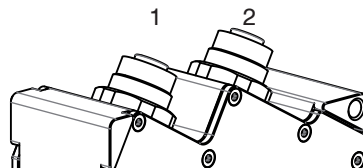


MR = Measuring range  
 SMR = Start of measuring range  
 MMR = Mid of measuring range  
 EMR = End of measuring range

Fig. 15 Measuring field scanCONTROL 29xx-100 sensor, dimensions in mm (inches, rounded off)

## 5.2 Connections

### 5.2.1 General



1 Ethernet socket

2 Multifunction socket (Power supply, IO)

Fig. 16 Output sockets arrangement

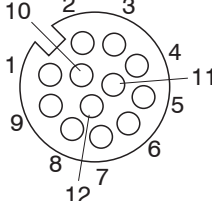
| Designation   | Sensor connector Pin | Cable color PCR3000-x | Notes  | Connection view   |
|---------------|----------------------|-----------------------|--|---|
| +Ub           | 9                    | Red                   | + 11 V - 30 V DC (rated value 24 V); max. 500 mA |  |
| GND           | 2                    | Blue                  | 0 V  |   |
| +Laser on/off | 3                    | White                 | Optional   |   |
| -Laser on/off | 1                    | Brown                 |  |   |
| RS422         | 12                   | Red-blue              | RS422 input or output                            |   |
| /RS422        | 11                   | Gray-pink             |  |   |
| In1           | 6                    | Yellow                | Switching input In1                              |   |
| GND-In1       | 4                    | Green                 | Ground connection In1                            |   |
| In2           | 5                    | Pink                  | Switching input In2                              |   |
| GND-In2       | 8                    | Gray                  | Ground connection In2                            |   |
| In3           | 10                   | Purple                | Switching input In3                              |   |
| GND-In3       | 7                    | Black                 | Ground connection In3                            |   |
| Shield        | Housing              | Black                 | DC-insulated from GND                            |   |

Fig. 17 Assignment of the multifunction socket on scanCONTROL 29xx

GND: Galvanically isolated from In1, In2, In3, RS422, Laser on/off

Laser on/off: Input galvanically isolated from GND, In1, In2, In3, RS422

In1, In2, In3, RS422: Inputs galvanically isolated from GND and Laser on/off

**NOTICE**

The multifunction socket must only be connected when the power supply is switched off.

- > Damage to or destruction of the sensor

### 5.2.2 Power Supply

Connector multifunction socket, see Fig. 16, pin assignment, see Fig. 17.

Range: 11 V – 30 V (nominal value 24 V) DC; load maximal 500 mA

The supply voltage is protected against reverse polarity.

The cable shield is connected with the connector housing and should be connected to the protective conductor PE of the power supply.

The shielded multifunction cable PCR3000-x is recommended.

The supply voltage for the scanCONTROL 29xx measuring device should come from a 24 V power supply, which is only used for measuring equipment and not simultaneously for drives, contactors or similar pulse interference sources. Use a power supply with galvanic isolation.

**NOTICE**

scanCONTROL 29xx supports Power over Ethernet. If the sensor is connected to a network adapter/switch that is capable of POE and if you also use the power supply of the multifunction port, these two power supplies have to be galvanically isolated.

**5.2.3 RS422, Synchronization**

Connector multifunction socket, see Fig. 16, pin assignment, see Fig. 17.

The scanCONTROL 29xx sensor has a RS422 port according to EIA standards, which can be parameterized as input or output via software.

The RS422 port can be used to synchronize several sensors with each other, triggering or measurement value output (for example Modbus).

The internal terminating resistor (termination  $R_T = 120 \text{ Ohm}$ , see Fig. 18) can be activated or switched off via software. The signals must be operated symmetrically, according to the RS422 standard, i.e. preferably with RS422 driver circuits or converters. Alternatively use devices with RS422 connectors, e.g. sensors or PLC's.

The RS422 port is galvanically isolated from GND and Laser on/off, but not from GND-In1, -In2, -In3. When used one of the GND-In1, -In2, -In3 should be connected to the GND of the remote station in order to avoid potential differences.

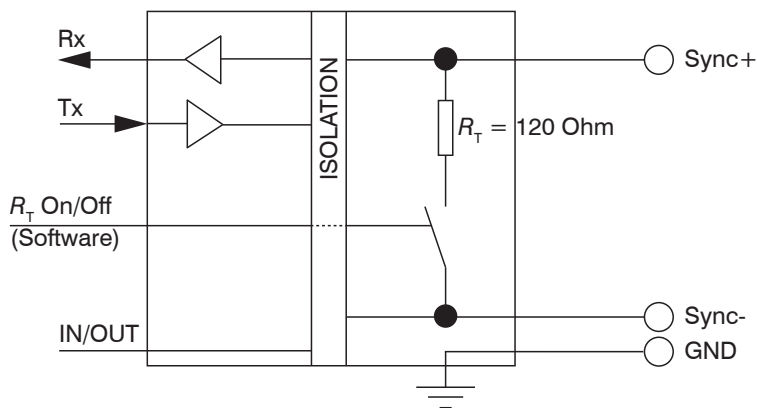


Fig. 18 RS422 synchronization internal circuitry

The multifunction socket can be used with either of the following configurations:

|   | Configuration                                      | Direction    | Standard setting for terminating resistor $R_T$ |
|---|--|--------------|---|
| 0 | Half-duplex, serial communication with 115200 Baud | input/output | On  |
| 1 | Half-duplex, serial communication with 57600 Baud  | input/output |   |
| 2 | Half-duplex, serial communication with 38400 Baud  | input/output |   |
| 3 | Half-duplex, serial communication with 19200 Baud  | input/output |   |
| 4 | Half-duplex, serial communication with 9600 Baud   | input/output |   |
| 5 | External trigger input                             | input        | On  |
| 6 | External trigger output                            | output       | Off   |
| 7 | CMM trigger output                                 | output       | Off   |

Synchronizing several sensors with each other:

- ➡ Connect the output RS422+ (Pin 12) of sensor 1 with the input RS422+ (Pin 12) of sensor 2.
- ➡ Connect the output RS422- (Pin 11) of sensor 1 with the input RS422- (Pin 11) of sensor 2.
- ➡ Also connect both the GND-In1 - pins (Pin 4) of the sensors to each other.

Software settings:

| Setting              | Sensor 1                             | Sensor 2                              | Sensor 3                         |
|----------------------|--------------------------------------|---------------------------------------|----------------------------------|
| RS422 mode           | External trigger output              | External trigger input                | External trigger input           |
| No RS422 termination | No (terminating resistor not active) | Yes (terminating resistor not active) | No (terminating resistor active) |

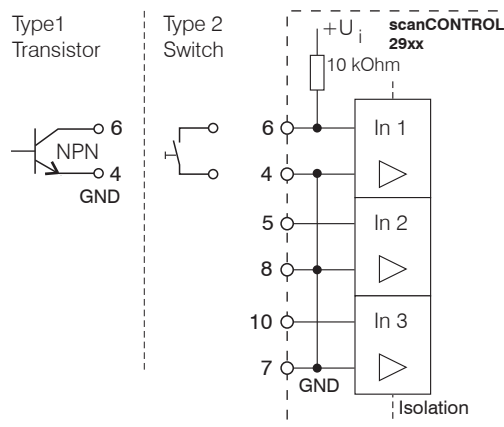
*Fig. 19 External synchronization settings*

The sensor 1 then synchronizes the sensor 2 and further sensors as master.



### 5.2.4 Switching Inputs

Connector multifunction socket, see Fig. 16, pin assignment, see Fig. 17.



TTL or 5 V (High)

HTL or 24 V (High)

*Fig. 20 Switching Inputs*

The switching inputs In1 up to In3 can be used for triggering or for connecting an encoder. The structure of all switching inputs is identical. The used circuits have an internal electrical isolation. The inputs are galvanically isolated from the GND and Laser on/off.

Each switching input has its own ground connection (Gnd-In1, -In2, -In3), which has to be connected with the external ground (synchronization/trigger source or another device).

The multifunction socket can be used with either of the following configurations:

|   | Configuration  | In1             | In2        | In3        |
|---|--|-----------------|------------|------------|
| 0 | Encoder with index, positive edge takes effect with the index <sup>1</sup> | N               | A          | B          |
| 1 | Encoder without index, additionally external trigger possible <sup>1</sup> | Trigger         | A          | B          |
| 2 | External trigger   | Trigger         |            |            |
| 3 | External trigger, loading up to 4 user modes                               | Trigger         | Mode Bit 0 | Mode Bit 1 |
| 4 | Loading up to 8 user modes   | Mode Bit 0      | Mode Bit 1 | Mode Bit 2 |
| 5 | Transmit in time stamp, (only 2910/2960)                                   | ppc 0           | ppc 1      | ppc 3      |
| 6 | Frame trigger and encoder  | Start container | A          | B          |
| 7 | Frame trigger and encoder line A   | Start container | A          |            |
| 8 | Encoder with gate  | Gate            | A          | B          |

Signal level (switching level):

The signal levels are switchable for all switching inputs together via software between LLL (low-voltage-, TTL logic) and HLL (high-voltage-, HTL logic):

- LLL level: Low 0 V... 0.8 V, High 2.4 V... 5 V, internal pull-up 10 kOhm to 5 V
- HLL level: Low 0 V... 3 V, High 11 V... 24 V (permitted up to 30 V), internal pull-up 10 kOhm to 24 V
- Pulse duration:  $\geq 5 \mu\text{s}$

**i** Use a shielded cable with twisted wires, preferably the recommended connection cable PCR3000-x from the accessories, [see A 1.2](#).

 Connect the cable shield with the potential equalization PE or the connector housing.

1) The encoder input counts each edge. Encoders typically output 4 edges per encoder step.

5.2.5 Ethernet Connection

Connector “Ethernet”, see Fig. 16.

The Ethernet connection is the standard connection to the PC.

The sensor supports the transmission with 100 Mbit and 1 Gbit.

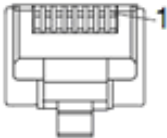
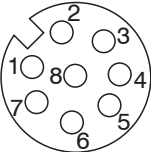
| RJ45 connector  |  | 8-pin. screw connector (sensor side)   |           |           |
|---|--|--|-----------|-----------|
| Pin no.   | Color stranded hook-up wire SCR3000A-x | Pin no.  | 100BaseTX | 1000BaseT |
| 1   | white (orange)                         | 5  | Tx+       | D1 +      |
| 2   | orange                                 | 6  | Tx-       | D1-       |
| 3   | white (green)                          | 8  | Rx+       | D2 +      |
| 4   | blue                                   | 1  |           | D3 +      |
| 5   | white (blue)                           | 2  |           | D3-       |
| 6   | green                                  | 7  | Rx-       | D2-       |
| 7   | white (brown)                          | 3  |           | D4 +      |
| 8   | brown                                  | 4  |           | D4-       |
|  |  |  |           |           |
| View on pin side male, cable connector  |  | View on solder pin side, screw connector   |           |           |

Fig. 21 Pin assignment Ethernet connection

We recommend the Gigabit-Ethernet connection cable SCR3000A-x for the Ethernet connection; cable length x in meters. Characteristics: 4 x 2 x 0.14 mm<sup>2</sup>; shielded.

### **NOTICE**

scanCONTROL 29xx supports Power over Ethernet. If the sensor is connected to a network adapter/switch that is capable of POE and if you also use the power supply of the multifunction port, these two power supplies have to be galvanically isolated.

Due to the high data rate, we recommend using a high-quality Ethernet PC plug-in card, for example Intel-Pro/1000 PT. The sensors are to be preferably connected directly to the network connection or by means of a high-quality switch. A hub would result in a massive data collision and cannot be used. The PC should have one or more network cards only for the sensors.

The operation of the sensor via Ethernet does not require any additional driver installation. However, the network settings have to be done correctly:

- If several network cards are used, they have to belong to different networks, for example different Class-C-sub networks, however they may not belong to the same Class-B sub network.
- The sensor supports an automatically, sensor-adapted IP address in the link-local-net (169.254.x.x). No collision check is performed.
- The sensor supports the DHCP protocol. This setting is activated by default and has priority over the retrieval in the link-local-net.
- A fixed IP address can be assigned.
- Various network settings (e.g. firewall or packet filters) can interfere with communications with the sensor.
- We recommend using a packet size of 1024 bytes/packet (payload), because network components support such packages by default. The sensor supports jumbo frames up to 4096 bytes/packet (payload), but then all the network components must also support jumbo frames of this size.

Use the program `sensorTOOL` for network configuration. This program is available online at <https://www.micro-epsilon.com/service/download/software-and-drivers/>.

### 5.2.6 External Laser Switch-Off (Optional)

Connector multifunction socket, see Fig. 16, pin assignment, see Fig. 17.

Function

- Laser on: Voltage between +laser on/off and -laser on/off 2.8 V... 31 V,  $I < 5 \text{ mA}$
- Laser off: Voltage between +laser on/off and -laser on/off  $< 0.8 \text{ V}$  or open

**I** Sensors of laser class 3B (IIIB) need an external key switch to switch off the laser.

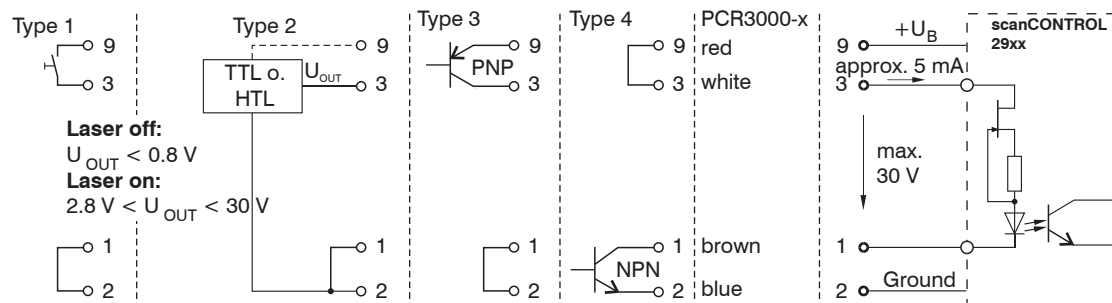


Fig. 22 Options for external laser switch-off

➡ Use a serial key switch inside the control circuit to switch off the laser.

If the voltages between pin 3 and pin 1 are  $< 0.8 \text{ V}$ , the laser is off. No external resistor is necessary for the current limitation. Connect pin 1 with 2 and pin 3 with 9 for permanent "laser on".

The external laser switching-off is implemented as a hardware solution and has a top priority. The laser can be switched off, in addition, also by software.

### **NOTICE**

The sensor must only be connected to the peripheral equipment when disconnected from the power supply, i.e. only when the supply voltage is switched off.

## **5.3 Installation Instructions**

- Only use shielded cables from the accessories for all connection cables, [see A 1.2](#).
- Connect the cable shields to the potential equalization PE on the evaluation unit (control cabinet, PC housing, connector housing) and avoid ground loops.
- Lay all connection cables in accordance with the generally applicable measuring technology regulations, i.e. for example not directly next to pulse-carrying lines, preferably in a separate cable duct.
- The minimum bending radii of the recommended cables for flexible laying must not be less 80 mm.
- Micro-Epsilon recommends the use of the optionally available power supply PS2020, DIN rail mounting, input 230 VAC, output 24 VDC/2.5 A.

## **5.4 Getting Ready for Operation, Commissioning**

- ➡ Mount the sensor according to the installation instructions, [see 5.1](#).
- ➡ Connect the sensor to the Ethernet cable.
- ➡ Connect the sensor to downstream display or monitoring units and to the power supply.
- ➡ Switch on the power supply.

## 6. Operation of the Sensor with a PC

### 6.1 LEDs

➡ After getting ready for operation, switch on the external DC power supply (24 VDC).

The `state` LED indicates different error states by flashing, see 12. If several errors occur at the same time, it indicates two of them alternately. Therefore, after the elimination of an error, the LED may continue flashing for some time. If no flashing occurs for several seconds, no error has occurred.

•  
i The scanCONTROL 29xx sensor requires a running-in time of typically 20 minutes for high precision measurements.

### 6.2 Operating and Demonstration Programs

For sensor operation, several programs are available. You will find them online on the sensor product website or in the Download area: [https://www.micro-epsilon.com/2D\\_3D/laser-scanner/Software/downloads/](https://www.micro-epsilon.com/2D_3D/laser-scanner/Software/downloads/)

- The scanCONTROL Developer Tool program supports scanner parameterization and user-friendly visualization of profile data.
- scanCONTROL Configuration Tools is used to analyze typical measurement tasks for scanCONTROL 29xx.
- scanCONTROL 3D-View visualizes three dimensional point data, which are recorded with scanCONTROL 29xx.
- scanCONTROL Result Monitor is used to visualize the profile data and measured values of up to four Smart sensors.

The measuring fields are partially used in the demonstration programs, see Chap. 6.4.1.

## 6.3 Installation

### 6.3.1 Requirements

The following minimum system specification is necessary for the operation of the scanCONTROL software packages:

#### **scanCONTROL Configuration Tools**

- Windows 7, Windows 8 or 8.1, Windows 10 (each 32 bit and 64 bit)
- 1-GHz or faster (32 bit and 64 bit) / min. 1 GB RAM
- Screen resolution: 1024 x 768

#### **scanCONTROL 3D-View**

- Windows 8 or 8.1, Windows 10 (each 64 bit)
- 1-GHz or faster prozessor (64 bit) / min. 1 GB RAM
- Screen resolution: 1024 x 768
- Graphic card / GPU with OpenGL 3.1 or higher

---

|               |
|---------------|
| <b>NOTICE</b> |
|---------------|

Connect the sensor directly to the PC. Please do not use any hubs or switches. If your network card supports "VLAN" option, please deactivate it.  
To operate the sensor, the PC and the sensor must be in the same subnet.

---

To be able to use the software the following steps must be followed:

1. Install the Ethernet interface hardware, if not already installed.
2. Install the software.
3. Connect the scanCONTROL 29xx measuring system to the PC via Ethernet.



### 6.3.2 Connecting scanCONTROL 29xx to the PC

Proceed as follows in order to connect scanCONTROL 29xx via Ethernet with the PC.

- ➡ Finish the installation of the software completely.
- ➡ Connect scanCONTROL 29xx via the Ethernet interface to the PC and switch on the power supply.
- ➡ Please wait until the scanCONTROL 29xx device is recognized by the PC.

This may take a few seconds.

The system is now ready to operate the scanCONTROL 29xx measuring system with the scanCONTROL software packages.

## 6.4 Instructions for Operation

### 6.4.1 Measuring Field Selection

The optical design of the sensor satisfies the so-called “Scheimpflug condition” which ensures optimum mapping over the complete measuring range. In doing so, the measuring range is mapped on a rectangular matrix. The distortions resulting from this are shown, [see Fig. 23](#). The usable measuring range is always trapezoidal.

The assigned maximum x-values for the z-coordinates can be found, [see Fig. 13](#), [see Fig. 14](#), [see Fig. 15](#).

Please refer to the sensor acceptance report of your sensor. A slight range shifting of a measuring field is possible and depends on the sensor.

The top edge corresponds to the start of the measuring range and the bottom edge to the end of the measuring range. The corners of the predefined measuring fields are on a grid with grid spacing of 1/8 of the matrix. The sensor matrix used in the scanCONTROL 29xx supports the reading of a restricted measuring field. The following picture, [see Fig. 23](#), shows the predefined view areas and the associated measuring fields.

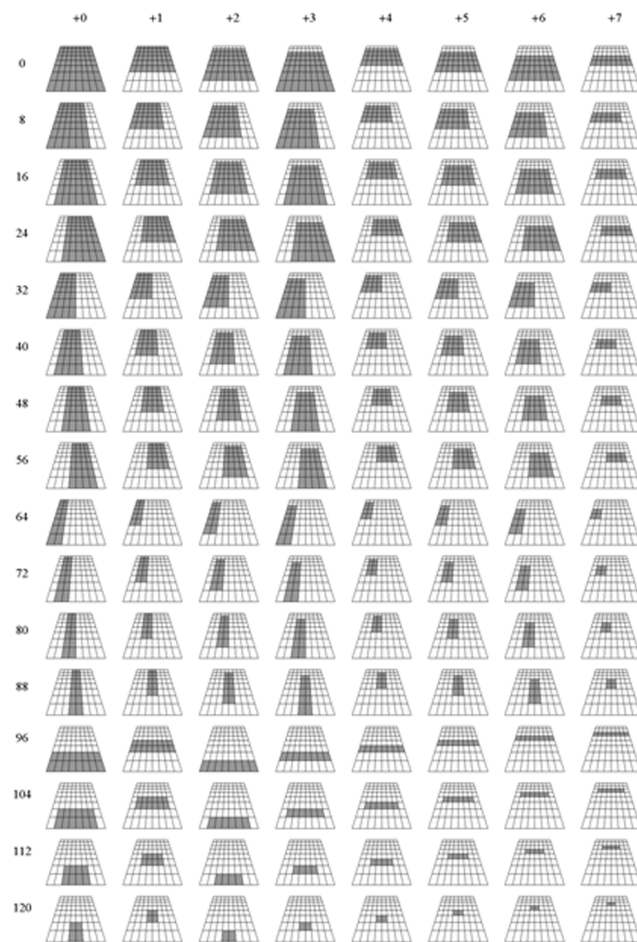


Fig. 23 Predefined measuring fields

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

The following measuring fields are used in the demonstration program, see Chap. 6.2.

| Name     | Index |
|----------|-------|
| Large    | 0     |
| Standard | 2     |
| Small    | 7     |

*Fig. 24 Measuring fields used*

**i** The maximum achievable measuring speed for the freely definable measuring field is shown in the matrix view of the of the respective software tool.

Measuring field and measuring range must be clearly differentiated in practical use. The measuring field is related to the matrix and the measuring range is related to the measuring object (the object space).

Both do not have to match on account of the optical mapping and the definitions.

**i** The „Standard“ measuring range and the „Standard“ measuring field are not congruent. The minimum dimensions can be found in the dimensional drawings, [see 5.1](#).

Characteristics of the sensors:

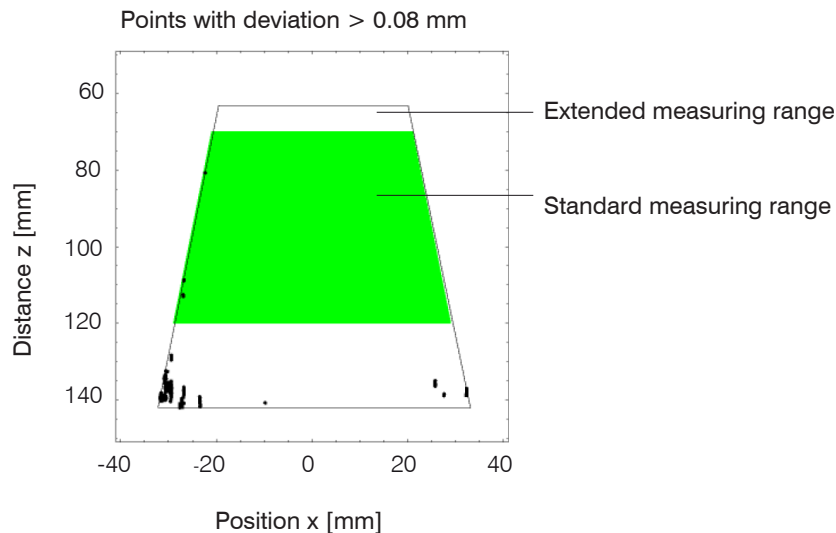
- a laser line with 20° aperture angle (measuring range 25 mm) or 25° ope aperture angle (measuring ranges 50 mm and 100 mm).
- The receiver has a smaller aperture angle (view angle) than the laser line.
- Centered measuring field (symmetrical to the center axis).
- The high resolution sensor image matrix evaluates 1280 x 1024 pixels. The measuring field geometry is fixed.
- Reference for the distance (Z-axis) is the lowest body edge of the sensor, [see 5.1](#).
- Use of the GigE-Vision standard. The description is included in the documentation of the scanCONTROL-Configuration Tools.

### 6.4.2 Calibration

The calibration of the sensor is performed using the entire matrix and is independent from the selected measuring field.

The trapezoidal shape of the measuring field results from the projection onto the sensor matrix. The standard measuring range is framed in the center.

A sensor acceptance report is enclosed for each sensor. Three diagrams for the linearity measurement which are briefly explained in the report are included in the sensor acceptance report. The key diagram in the sensor acceptance report is shown again below, [see Fig. 25](#).



*Fig. 25 Linearity deviation, example of an scanCONTROL 29xx-50*

The black points show the places where the measurement error exceeds the linearity limit of 0.08 mm (depending on sensor model). The measurement error increases at both ends of the depth range and particularly in the remote corners. These areas should therefore be avoided for the measurement.

### 6.4.3 Automatic Exposure Time Regulation

The automatic exposure time regulation facilitates the recording of the profile with optimum exposure time (shutter time).

The `Exposure time` preset by the user is used as the starting value for the automatic exposure time regulation. It should be selected so large that still valid measured values can be output at the darkest place of the profile. The scanCONTROL Configuration Tools program can be used to determine it. The automatic exposure time regulation can also be deactivated if required.

If there is no object in the measuring range, the `Exposure time` stored in the shutter register of the sensor will be used as exposure time. This value must also ensure reliable recognition of the darkest measurement object.

A previous test is recommended if the target is very dark or has very high contrast. The various demonstration programs are suitable for adjusting and testing the exposure time. In doing so, it is by all means sensible to work with several different exposure times and to observe the effect in the diagrams.

The current exposure time can be calculated from the timestamps of the measured values. It is displayed as `Exposure time`, see [Fig. 26](#).

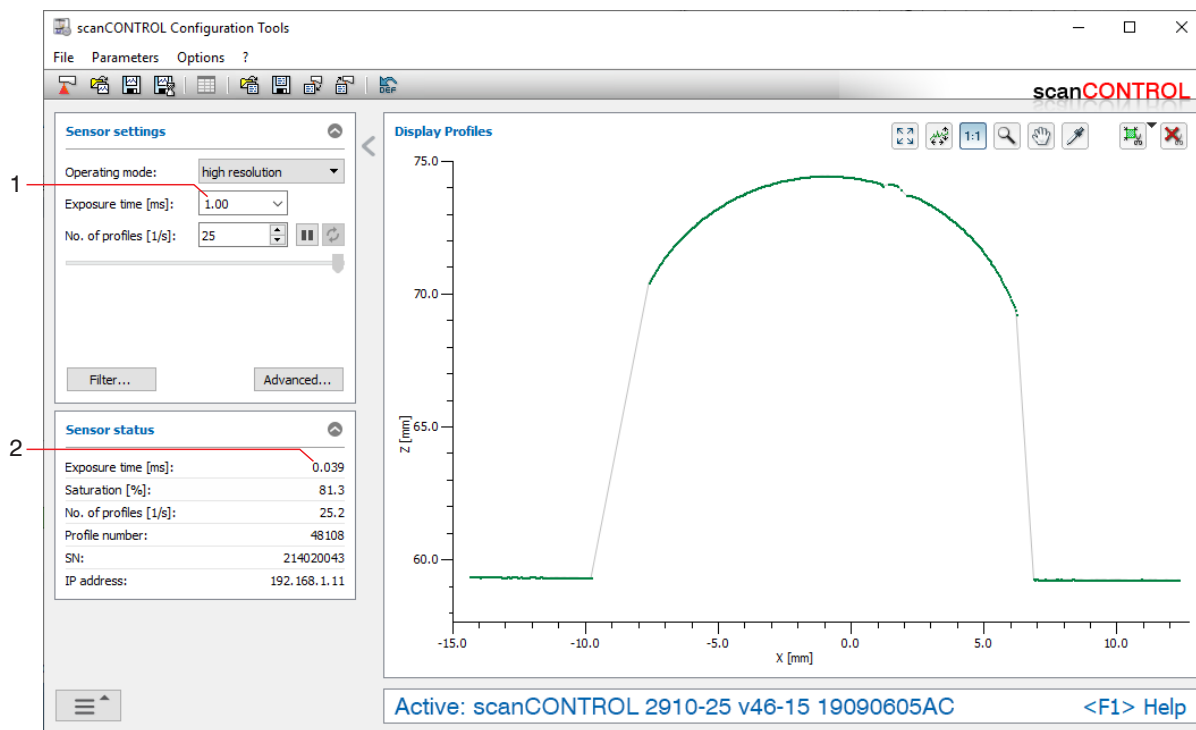


Fig. 26 Screenshot of scanCONTROL Configuration Tools with automatic exposure

- 1 Exposure time preset by the user
- 2 Result of auto exposure

## **6.5 Error Influences**

### **6.5.1 Reflection of the Target Surface**

The sensor basically evaluates the diffuse portion of the laser line reflections. Any statement about a minimum reflection factor is only possible with reservations.

A preliminary examination is necessary for using the sensor on transparent or reflecting objects.

The method of direct reflection on reflecting surfaces as it is successfully applied for the point triangulation cannot be used for the line triangulation on account of the fan-shaped form of the laser line (central projection). Here, the receiving lens would only be able to reach a narrow area near the center. As usually curved surfaces should also be measured for the profile measurement, this range will be further narrowed.

### **6.5.2 Color Differences**

Color differences of measurement objects have effects. However, these color differences are often also combined with different penetration depths of the laser light into the material. Different penetration depths in turn result in apparent changes of the line thickness. Therefore, color changes, combined with penetration depth changes, can result in inaccurate measurements.

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

### **6.5.3 Temperature Influences**

A running-in time of at least 20 minutes during start-up is required in order to achieve a uniform temperature spread in the sensor.

If measurements with accuracy in the  $\mu\text{m}$  range are made, the effect of temperature fluctuations on the mounting must also be observed by the user.

Due to the damping effect of the thermal capacity of the sensor, fast temperature changes are only measured after a delay.

#### **6.5.4 External Light**

An interference filter in the sensor is present for suppression of external light.

In general, the shielding of external light directly emitted on the target or reflected in the sensor must be ensured using protective covers or similar.

Pay particular attention to unwanted reflections of the laser line outside the measuring object range (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 apparatus, grippers or similar).

#### **6.5.5 Mechanical Vibrations**

If high resolutions in the  $\mu\text{m}$  range should be achieved with the sensor, particular attention must be paid to stable or vibration-damped sensor and measuring object mounting.

#### **6.5.6 Surface Roughness**

Surface roughness of  $5\ \mu\text{m}$  and more results in “surface noises” due to interference of the laser light.

Direct reflections of the laser light to the receiver can also occur at the finest grooves (e.g. abrasion marks on the surface) particularly if these run in the line direction. This can result in inaccurate measured values. Prevention of this effect might be possible by adjusting several sensor settings e.g. filters.



### 6.5.7 Shadowing Effects

- Receiver: The laser line can disappear completely or partially behind steep edges. The receiver then does not „see“ these areas.
- Laser line: The fan-shaped form of the laser line inevitably results in partial shadowing at vertical edges. In order to make these areas visible, only changing the sensor or object position helps.

As a general rule, measuring objects with steep edges cannot be one hundred percent measured using laser triangulation. The missing areas can only be supplemented or interpolated using suitable software.

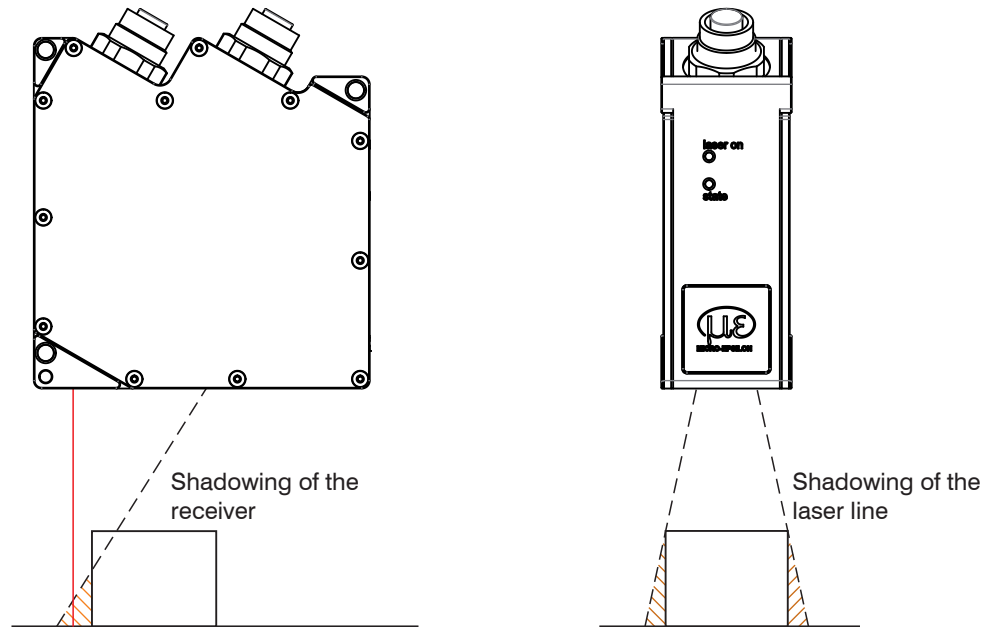


Fig. 27 Shadowings

## 6.6 Cleaning

We recommend cleaning the protective windows at regular intervals.

### **Dry cleaning**

This can be accomplished with an anti-static lens brush or by blowing off the windows with dehumidified, clean, oil-free compressed air.

### **Moist cleaning**

Use a clean, soft, lint-free cloth or lens cleaning paper and pure alcohol (isopropyl alcohol) to clean the protective window.

Never use commercially available glass cleaner or other cleaning agents.

## 7. 2D/3D Output Unit

The measuring system scanCONTROL 2910/2960 measures and evaluates 2D profile data of a surface and supplies analog and digital control signals. The 2D/3D Output Unit

- outputs digital and analog signals,
- is based on the WAGO®-I/O-System 750,
- uses Ethernet.

Setup and operation of 2D/3D Output Unit are exemplarily described below.

## 7.1 2D/3D Output Unit - Components

- Output Unit Basic, consisting of:
  - Ethernet Fieldbus Coupler with system supply unit (OU-Fieldbus Coupler/Ethernet)
  - 24V DC power supply filter (OU-Filter module) and buss end terminal (OU-Bus termination end terminal)
- Digital output terminal
- Analog output terminal

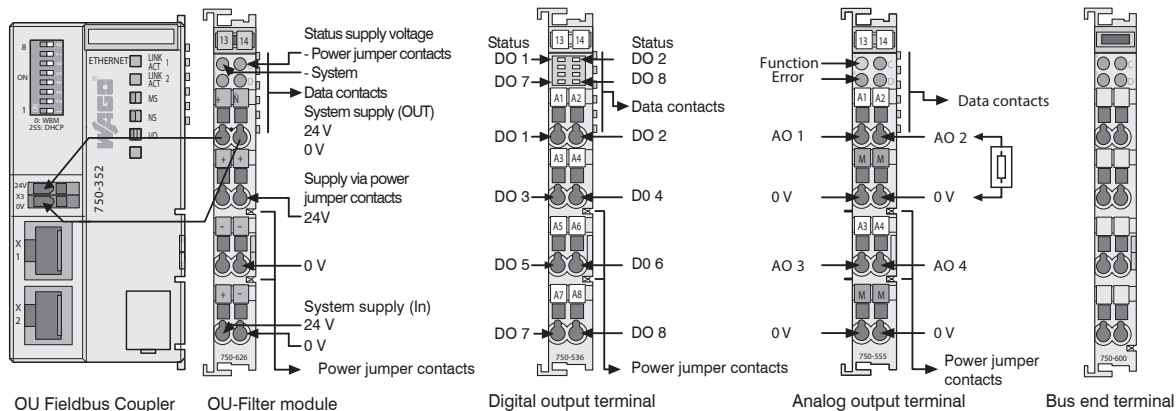


Fig. 28 Example configuration Ethernet with analog and digital output terminal

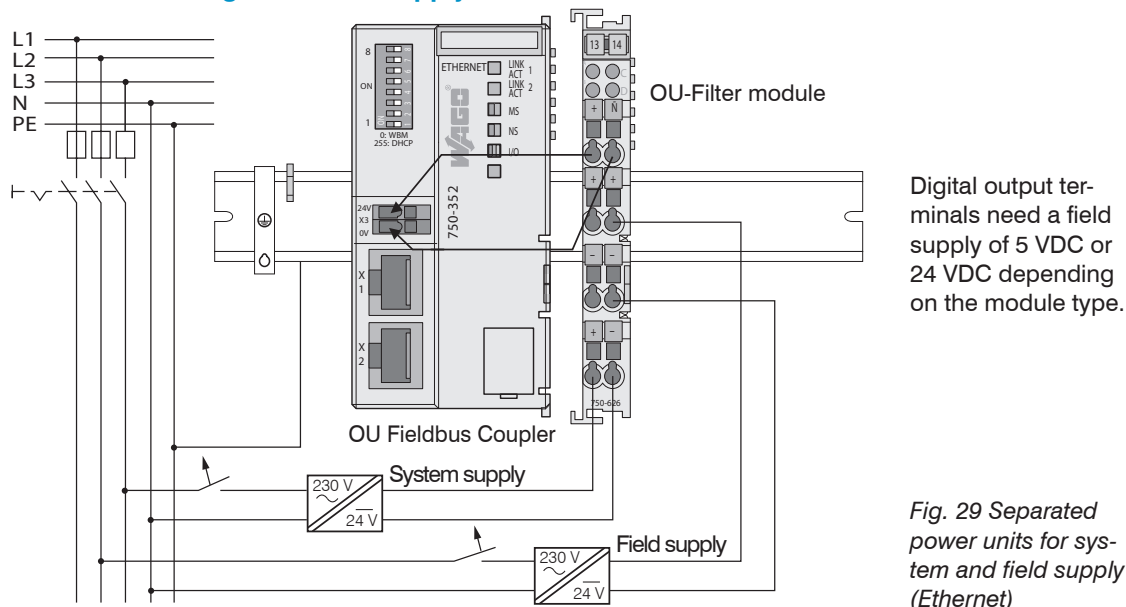
➡ Mount the individual terminals on a DIN rail (TS35) in the described order.

Without DIN rail robust installation cannot be guaranteed. Ensure that each module is locked securely on the DIN rail.

➡ Terminate the bus with the bus end terminal, see Fig. 28.

For a description of the individual components of the 2D/3D Output Unit please refer to, see 7.4, and the respective data sheets and the manuals for scanCONTROL Configurations Tools.

## 7.2 Connecting the Power Supply



After mounting of the modules, the required wiring has to be installed.

- ➡ Connect the “System supply (out)” contacts of the OU-Filter module to the “System supply (in)” contacts of the OU-Fieldbus Coupler (0 V and 24 V, see Fig. 29).
- ➡ Connect the system supply (in) of the OU-Filter module to the power supply (0 V and 24 V, see Fig. 29).
- ➡ Connect the field supply (in) of the OU-Filter module to the power supply (0 V and 5 V/24 V, see Fig. 29).



The system supply and field supply should be separated to ensure the bus operation and electrical isolation in case of a short-circuit of an actuator.

### 7.3 Commissioning 2D/3D Output Unit

After having installed the required wiring of the ports of the 2D/3D Output Unit, you have to parameterize the measuring system according to your measurement task to get the desired signals at the digital and analog output ports.

➡ Connect the sensor to the PC using the Ethernet cable.

Alternatively 2D/3D Output Unit can be connected simultaneously to the PC and to the sensor.

➡ Parameterize the measuring system using scanCONTROL Configuration Tools and assign the desired signals to the digital and analog output ports.

When the parameterization is finished, save the settings to a user mode of the sensor.

scanCONTROL Configuration Tools > Menu Parameters > Save parameters to scanCONTROL...

Refer to scanCONTROL Configuration Tools, Chapter 3.14.4.

➡ Exit scanCONTROL Configuration Tools and disconnect scanCONTROL 2910/2960, PC and if necessary the 2D/3D Output Unit.

➡ Connect the scanCONTROL 2910/2960 sensor to the Output Unit by using the Ethernet cable.

scanCONTROL 2910/2960 and the output unit operate now as an independent measuring system and the signals set are output via the ports.

### 7.4 Specification of the Components

#### 7.4.1 Output Unit Basic

Micro-Epsilon art. no. 6414073

Consists of

- OU-Fieldbus Coupler/Ethernet
- OU-Filter module
- OU-Bus end terminal



- Ports: 2x Ethernet to connect scanCONTROL 2910/2960 sensors.
- Indicators (Status LED's, for detailed description refer to the manual of the OU-Fieldbus Coupler/Ethernet)
- The system supply is already mounted to the Fieldbus Coupler.

*Fig. 30 OU-Fieldbus Coupler/Ethernet with system supply terminal*

| <b>System data</b>              |                                   |
|---------------------------------|-----------------------------------|
| Max. number of bus participants | Limited by Ethernet specification |
| Max. length of segment          | 100 m                             |
| Transmission rate               | 10/100 Mbit/s                     |
| <b>Technical Data</b>           |                                   |
| Number of bus terminals         | 64                                |
| With bus extension              | 250                               |
| Power supply                    | DC 24 V (-25 % ... +30 %)         |
| Max. input current              | 280 mA at 24 V                    |
| Internal current consumption    | 450 mA at 5 V                     |
| Total current for bus terminals | 700 mA at 5 V                     |
| Voltage drop at $I_{max.}$      | < 1 V at 64 I/O bus terminals     |

*Fig. 31 Technical data Fieldbus Coupler/Ethernet*

### 7.4.2 Supported Output Terminals

- 8-Channel digital output terminal; DC 24 V; 0.5 A; high-side switching; 8 actuators; short-circuit proof; Micro-Epsilon art. no. 0325115, see Chap. [7.4.3](#); power supply through power jumper contacts
- 8-Channel digital output terminal; DC 24 V; 0.5 A; low-side switching; 8 actors; short circuit proof; Micro-Epsilon art. no. 0325131; power supply through power jumper contacts
- 4-Channel analog output terminal; 0 - 10 V; Micro-Epsilon art. no. 0325135, see Chap. [7.4.4](#)
- 4-Channel analog output terminal;  $\pm 10$  V; Micro-Epsilon art. no. 0325116
- 4-Channel analog output terminal; 0 – 20 mA; Micro-Epsilon art. no. 0325132
- 4-Channel analog output terminal; 4 – 20 mA; Micro-Epsilon art. no. 0325133

### 7.4.3 OU-DigitalOut/8-Channel/DC24 V/0.5 A/High-side Switching/8 Actuators



- Micro-Epsilon art. no. 0325115
- The 8-Channel digital output terminal DC 24V 0.5 A is short-circuit-proof, high-side switching, for TS35, CAGE CLAMP® connections, 8 actuators.
- The field level is galvanically isolated from the system level.
- The indicators (Status LED's) additionally show the status of the digital outputs (IO/NIO), for detailed description refer to manual of the 8-Channel digital output modules DC 24 V 0.5A, 8 actuators, high-side switching
- Actuators can be operated at all digital outputs and be wired directly via DO 1/2/3/4/5/6/7/8.
- scanCONTROL 2910/2960 supports eight digital outputs.

Fig. 32 8-Channel DigitalOut-Module

|   |  |
|---|--|
| Number of outputs   | 8                                      |
| Current consumption (internal)  | 25 mA                                  |
| Voltage via power jumper contacts   | DC 24 V (-25 % / +30 %)                |
| Type of load  | resistive, inductive, lamp load        |
| Switching rate <sub>max.</sub>  | 2 kHz                                  |
| Output current  | 0.5 A short-circuit proof              |
| Absorbable energy dissipation W <sub>max.</sub><br>(unique switching off) | 0.9 J<br>$L_{max.} = 2 W_{max.} / I^2$ |
| Current consumption typ. (field side)                                     | 15 mA (per module) + load              |

Fig. 33 Technical data of the digital output module



#### 7.4.4 OU-AnalogOut/4-Channel/0-10 V



- Micro-Epsilon art. no. 0325135
- 4-Channel analog output terminal DC 0-10 V
- Indicators (Status-LED's, for detailed description refer to manual of the 4-Channel analog output module DC 0-10 V)
- Voltage range is terminal-related 0 to +10 V and can not be extended by changing the appropriate setting in scanCONTROL Configuration Tools.
- The output signal is galvanically isolated output from the system level.
- The resolution is limited to 12 bits.
- scanCONTROL 2910/2960 supports four analog outputs.

*Fig. 34 4-Channel-AnalogOut-Modul*

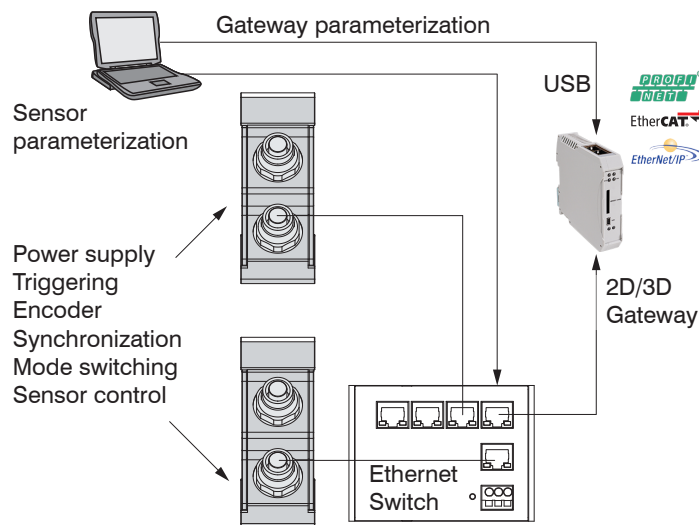
|                            |                                      |
|----------------------------|--------------------------------------|
| Number of outputs          | 4                                    |
| Power supply               | via system voltage DC/DC             |
| Signal voltage             | 0 V ... 10 V                         |
| Load                       | > 5 k $\Omega$                       |
| Resolution                 | 12 bit                               |
| Conversion time            | typ. 10 ms                           |
| Settling time              | typ. 100 $\mu$ s                     |
| Measurement error at 25 °C | < $\pm$ 0.1 % of full scale (FS)     |
| Temperature coefficient    | < $\pm$ 0.01 % /K of full scale (FS) |

*Fig. 35 Technical data of analog output module*

## 8. 2D/3D Gateway

2D/3D Gateway allows for scanCONTROL SMART sensors to be integrated into various fieldbus systems:

- PROFINET
- EtherNet/IP
- EtherCAT



All measurement results obtained from the profile evaluation carried out of a scanCONTROL SMART sensor can be transmitted to a PLC via one of these fieldbus systems. Furthermore, all scanCONTROL sensor settings can be set via 2D/3D Gateway (e.g. Laser on/off or load User Mode).

*Fig. 36 Network layout for using 2D/3D Gateway*

The 2D/3D Gateway can connect up to four scanCONTROL SMART sensors to the fieldbus. Measurement values are transmitted at up to 500 Hz. Please refer to the Connection Instructions for more details.

<https://www.micro-epsilon.com/download/manuals/mav--2D3D-Gateway-II-scanCONTROL-PROFINET--en.pdf>

<https://www.micro-epsilon.com/download/manuals/mav--2D3D-Gateway-II-scanCONTROL-EtherNetIP--en.pdf>

<https://www.micro-epsilon.com/download/manuals/mav--2D3D-Gateway-II-scanCONTROL-EtherCAT--en.pdf>

## 9. 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.

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/>.

## 10. Service, Repair

If the scanCONTROL 29xx is defective:

- If possible, create a backup of the sensor parameter, see Configuration Tools, `Parameters > Backup user modes to file` menu, to be able to restore the settings in the sensor after the repair.
- Please send us the effected parts for repair or exchange.

In the case of faults the cause of which is not clearly identifiable, the whole measuring system must be sent back to:

MICRO-EPSILON Optronic GmbH  
Lessingstraße 14  
01465 Dresden - Langebrück /  
Germany  
Tel. +49 (0) 35201 / 729-0  
Fax +49 (0) 35201 / 729-90  
[optronic@micro-epsilon.com](mailto:optronic@micro-epsilon.com)  
[www.micro-epsilon.com](http://www.micro-epsilon.com)

## 11. 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](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.



## 12. Error Codes

(— LED state lights for a long time lang, • LED state lights briefly)

| Flashing sequence                              | Cause   | Remedy   | Notes  |
|--|---|--|--|
| <b>Group: Loading / saving configuration</b>   |   |  |  |
| ••<br>2x short                                 | Mode not found.   | Select different one.  | Only previously stored modes can be called up.                 |
| ••—<br>2x short, 1x long                       | White error flash   | Contact manufacturer, return device.   | Should not occur in normal operation.                          |
| •••<br>3x short                                | Flash full  | None, contact manufacturer.  | Should not occur in normal operation.                          |
| ••••<br>4x short                               | Loading suppressed due to active data transmission.       | Stop active data transmission.   | Prevents PC software crashes.                                  |
| <b>Group: Data processing and transmission</b> |   |  |  |
| —<br>2x long                                   | Data overflow in the sensor                               | Select smaller measuring field, reduce profile frequency, select less complex measuring program. | Data can be faulty. Exposure time can be longer than expected. |
| —•<br>2x long, 1x short                        | Data overflow during receipt of the data from the sensor. | Select smaller measuring field, reduce profile frequency, select less complex measuring program. | Data can be faulty.  |
| —••<br>2x long, 2x short                       | Data overflow for serial port RS422                       | Reduce profile frequency, select less complex measuring program.                                 | Data can be faulty.  |


| Flashing sequence                | Cause  | Remedy   | Notes   |
|----------------------------------|--|--|---|
| --..<br>2x long, 3x short        | Data overflow during transmission of the data via Ethernet | Reduce profile frequency, increase packet size.  | Data can be faulty.                                       |
| --.....<br>2x long, 5x short     | Error during calculation                                   | Reduce profile frequency, select faster calculation mode.  | Data can be faulty.                                       |
| --.....<br>2x long, 6x short     | Error during Ethernet transmission                         | Reduce profile frequency.  | Data can be faulty.                                       |
| <b>Group: Output Unit</b>        |  |  |   |
| ---<br>3x long                   | 2D/3D Output Unit not found.                               | Connect the sensor with the 2D/3D Output Unit.   | ---   |
| ---.<br>3x long, 1x short        | Connected modules of 2D/3D Output Unit are not supported.  | Use the supported modules only, see Chap. 7.4.2.   | ---   |
| ---..<br>3x long, 2x short       | Communication error (2D/3D Output Unit)                    | Reduce profile frequency.  | ---   |
| ---...<br>3x long, 3x short      | Output overflow (2D/3D Output Unit)                        | Reduce profile frequency.  | ---   |
| <b>Group: Ethernet interface</b> |  |  |   |
| ----<br>4x long                  | IP address conflict  | Check the Ethernet configuration of sensor and the host PC.<br>Choose another IP address for the sensor. | If the problem persists, please contact the manufacturer. |

The state LED flashes green; long during active data transmission and short for controller accesses. A controller access can cause various data overflows particularly when the measuring frequency is near its maximum.

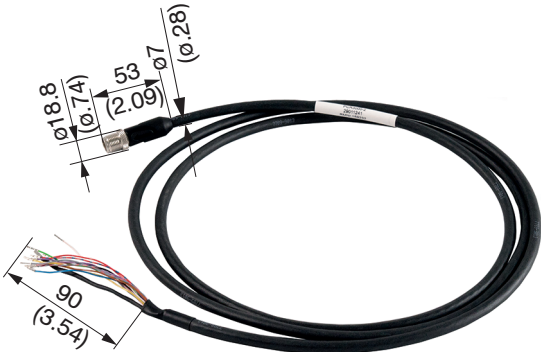

## Appendix

### A 1 Accessories

#### A 1.1 Recommended Accessories

|               |   |   |
|---------------|---|---|
| PS2020        |  | Power supply for DIN rail mounting, input 230 VAC, output 24 VDC/2.5 A for maximum 2 sensors scanCONTROL 29xx at the same time. |
| PS25/26/29/30 |  | Wall power supply, input 100-240 VAC, ~1.0 A, max 50 ... 60 Hz, Output 24 VDC/1.0 A (24 W max)                                  |

## A 1.2 Optional Accessories



|                                    |  |  |
|------------------------------------|--|--|
| PCR3000-x                          |  | <p>Multifunction cable, suitable for use with drag chains and robots</p> <p>length x = 2, 5, 10, 15, 20, 25, 35 m</p> <p>cable 6x2x0.14 shielded, with integrally cast</p> <p>12-pole M12x1 screw connector and free cable ends</p>                          |
| SCR3000A-x                         |  | <p>Ethernet connection cable, suitable for use with drag chains and robots</p> <p>length x = 0.5, 2, 5, 10, 15, 20, 25, 35 m</p> <p>cable 4x2x0.14; shielded, with integrally cast 8-pole M12x1 screw connector and 8-pole Ethernet cable connector RJ45</p> |
| Connector/8-pin/<br>Ethernet       |  | <p>Plug for the Ethernet socket, shielded, cutting-terminal connector, A-coded</p>   |
| Connector/12-pin/<br>Multifunction |  | <p>Plug for multifunction port, shielded, solder connection, A-coded</p>   |




Protective housing  
(for LLT29xx)



Protective housing for use of the  
scanner in dirty environments.  
With air purge of the optical path.

|   |  |   |
|---|--|---|
| <p>Protective cooling housing<br/>(for LLT29xx)</p> |  <p>A black, industrial-grade protective housing for a Micro-Epsilon LLT29xx scanner. It features a robust metal construction with various ports and connectors. The Micro-Epsilon logo is visible on the front panel, along with a 'laser on' indicator and a 'status' label. A grey handle with the Micro-Epsilon logo is attached to the bottom.</p> | <p>Protective housing for use of the scanner in dirty environments or with increased ambient temperatures. With air purge of the optical path and water cooling circuit for sensor cooling.</p> |
| <p>2D/3D Output Unit</p>                            |  <p>A light green, modular output unit with multiple ports and connectors. It has a series of RJ45 ports on the front, indicating Ethernet connectivity. The unit is designed for industrial environments and is used for outputting data from the scanner.</p>   | <p>The 2D/3D Output Unit is addressed via Ethernet and outputs analog and digital signals. Different output terminals can be connected to the fieldbus coupler.</p>                             |

|               |  |  |
|---------------|--|--|
| 2D/3D Gateway |  | <p>The 2D/3D Gateway communicates with the scanCONTROL SMART sensor via Ethernet Modbus. The resultant values are then converted to the PROFINET, EtherCAT or EtherNet/IP fieldbus systems. The gateway can also be parameterized in advance at the factory.</p> |
|---------------|--|--|



MICRO-EPSILON MESSTECHNIK GmbH & Co. KG  
Koenigbacher Str. 15 · 94496 Ortenburg / Germany  
Tel. +49 (0) 8542 / 168-0 · Fax +49 (0) 8542 / 168-90  
info@micro-epsilon.com · www.micro-epsilon.com  
Your local contact: [www.micro-epsilon.com/contact/worldwide/](http://www.micro-epsilon.com/contact/worldwide/)

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