MICRO-EPSILON

Operating Instructions

3D Profile Unit

3D Profile Unit - 2
3D Profile Unit - 2 / IE
3D Profile Unit - 4
3D Profile Unit - 4 / IE
3D Profile Unit - 8
3D Profile Unit - 8 / IE

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Contents

1. Safety

System operation assumes knowledge of the operating instructions. The Profile Unit Controller will also be referred to as “controller” in the following.

1.1 Symbols Used

The operating instructions apply to the articles

- 3D Profile Unit - 2
- 3D Profile Unit - 2 / IE
- 3D Profile Unit - 4
- 3D Profile Unit - 4 / IE
- 3D Profile Unit - 8
- 3D Profile Unit - 8 / IE

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

⚠ CAUTION

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

NOTICE

Avoid shocks and impacts to the controller.

> Damage to or destruction of the controller

The supply voltage must not exceed the specified limits.

> Damage to or destruction of the controller

Lay the cables for the power supply according to the provisions for electrical equipment. Protect the cables against damage.

> Failure of the controller

The controller housing may only be opened by authorized persons.

> Damage to or destruction of the controller possible

Only connect or disconnect devices when they are switched off.

Disconnect the controller from the power supply prior to cleaning. Only use a damp cloth for cleaning. Do not use any liquids or sprays.

Protect the controller from moisture.

Place the controller on a stable surface during installation. Dropping the controller could damage it.

The openings on the housing are used for air convection. Protect the controller from overheating. Do not cover the openings.

If the controller is not going to be used for a while, disconnect it from the power supply.

Never pour liquids into the housing openings.

NOTICE

Should one of the following cases arise, have the controller checked by service personnel:

- The cable for the power supply or plugs are damaged.
- Liquid has got into the device.
- The controller was exposed to moisture.
- The controller has malfunctioned and is not working as per the operating instructions.
- The controller was dropped and damaged.
- The controller has obvious signs of damage.

Store the device within the storage temperature limits. The device should be stored in a controlled environment.

CAUTION: Batteries may explode if they have been inserted incorrectly. Only replace with the same or equivalent type, as recommended by the manufacturer. Dispose of used batteries as per the manufacturer's instructions.

The controller should only be installed in an area with restricted access.

Store or save the operating instructions in a secure location.

1.3 Notes on Product Marking

1.3.1 CE Marking

The following apply to the Profile Unit Controller:

- EU Directive 2014/30/EU
- EU Directive 2011/65/EU

Products which carry the CE mark satisfy the requirements of the EU directives cited and the relevant applicable harmonized European standards (EN). The measuring system is designed for use in industrial environments.
The EU Declaration of Conformity and the technical documentation are available to the responsible authorities according to the EU Directives.

1.3.2 Notes on FCC Marking

The device meets the requirements of FCC Part 15 rules.

1.3.3 Notes on UKCA Marking

The following apply to the Profile Unit Controller:

- SI 2016 No. 1091:2016-11-16 The Electromagnetic Compatibility Regulations 2016
- SI 2012 No. 3032:2012-12-07 The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

Products which bear the CE mark meet the requirements of the EU directives cited and the relevant applicable harmonized European standards. The measuring system is designed for use in industrial environments.

The UKCA marking and the technical documentation are available to the responsible authorities according to UKCA directives.

1.4 Intended Use

- The Profile Unit Controller is intended for use in the industrial sector. It is used as a high-performance solution for 3D measuring tasks, with connection to higher-level control units being possible via conventional fieldbuses or Industrial Ethernet.
- The controller must only be operated within the limits specified in the technical data see Chap. 2.5.
- The controller 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 controller.
- Take additional precautions for safety and damage prevention in case of safety-related applications.

1.5 Proper Environment

- Protection class: IP40

IP40 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.

- Temperature range
  - Operation: 0 ... +50 °C [1] (+32 ... +122 °F)
  - Storage: -40 ... +85 °C (-40 ... +185 °F)
- Humidity: 20 ... 95% (non-condensing)
- Ambient pressure: Atmospheric pressure

1) Maximum permissible operating temperature at 0.7 m/s air flow

2. Functional Principle, Technical Data

2.1 Short Description

The Profile Unit Controller is a high-performance computer platform for calculating the profiles of multiple scanCONTROL sensors into an overall profile (2D) or overall point cloud (3D). The Profile Unit Controller offers full compatibility and inline capability for customer applications.

The scanCONTROL sensors by Micro-Epsilon are connected to the Profile Unit Controller via the Ethernet interfaces provided. The controller calculates the individual sensor profiles into an overall profile or a combined 3D point cloud. Then, the profile data or 3D point clouds can be evaluated or forwarded directly to a GigE Vision client. In the Industrial Ethernet option, measurements and OK/NOK assessments can be sent via one of the possible interfaces.

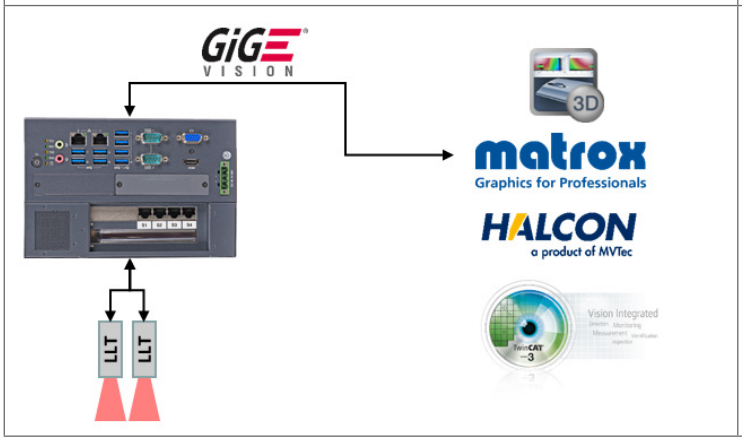
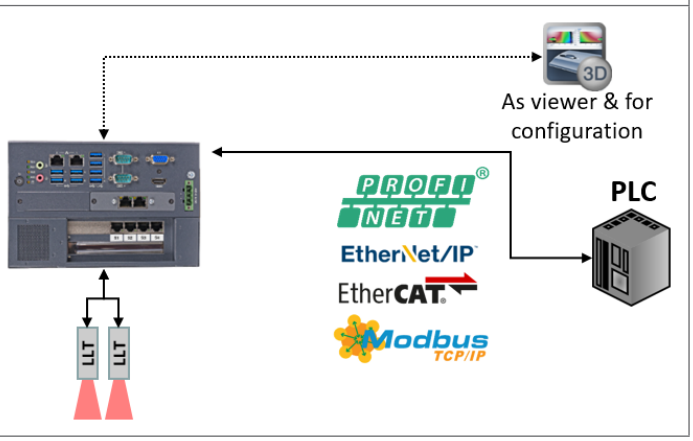
With the registration object optionally available from Micro-Epsilon, the individual sensor profiles can be patched into a common coordinate system.

Thanks to the intuitive 3DInspect software with Valid3D technology by Micro-Epsilon, the individual sensors as well as the overall system can be easily parameterized, meaning that measurements can be started immediately after initial setup of the system.

In the Industrial Ethernet option, results can be output via TCP/IP and UDP. Via PROFINET, Ethernet/IP, EtherCAT and Modbus TCP the results can be output and the system can additionally be controllled.

The hardware with passive cooling offers flexibility for simple and space-saving installation. This means that integration in a control cabinet or mounting directly in the machine is possible without any problems.

2.2 System Variants

Without Industrial Ethernet option (3DPU-X)	With Industrial Ethernet option (3DPU-X/IE)
- Without interfaces for fieldbus - Forwarding of profile data and/or 3D point clouds - Communication with any GigE Vision client	- With interfaces for fieldbus - Forwarding of measurements - Control via Industrial Ethernet
	

2.3 System Design

The Profile Unit Controller is a patching unit for the profile data of multiple sensors of the scanCONTROL 30xx series. The measured profiles are patched by the Profile Unit Controller and either forwarded

- as a data set to a higher-level evaluation computer or
- as evaluated measurements to an PLC, for example.

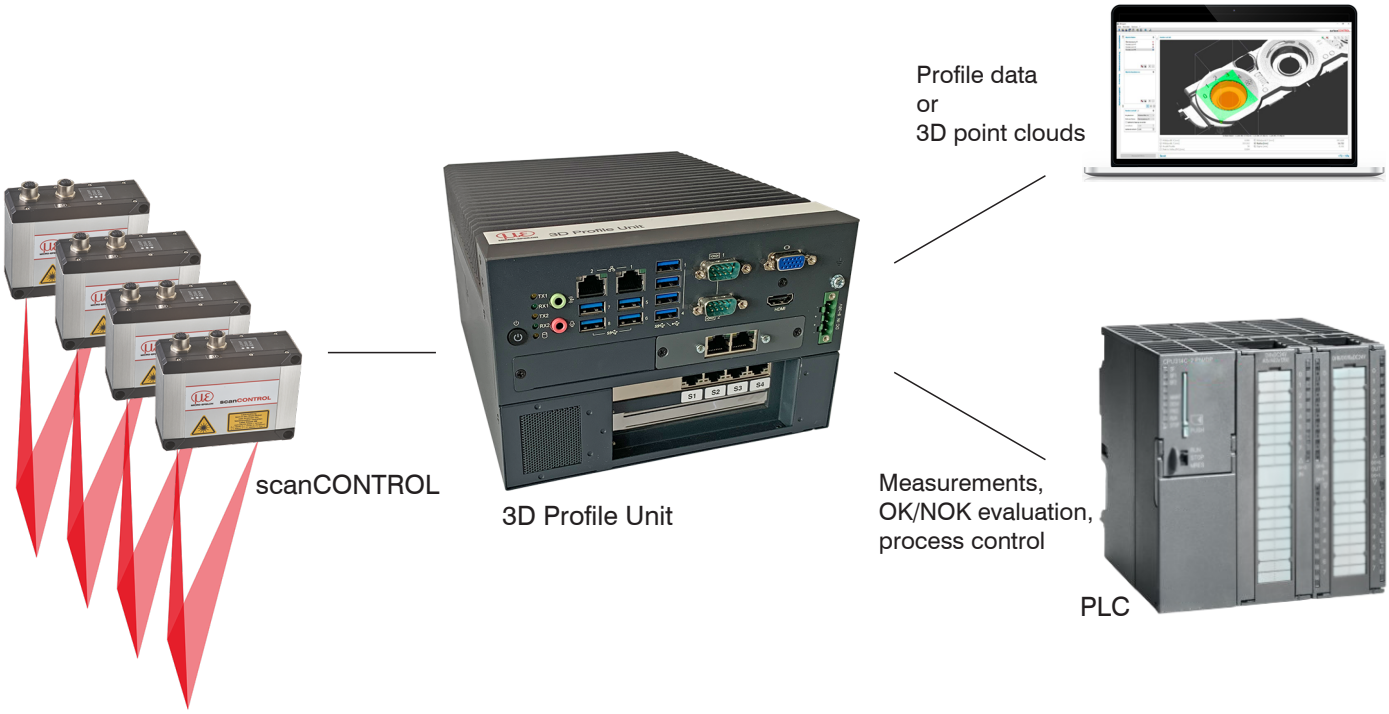


Fig. 1 Typical arrangement of a Micro-Epsilon measurement setup with 3D sensors

2.3.1 Typical Arrangement with 2 Sensors from the scanCONTROL Series

The 3D Profile Unit - 2 is intended for the use of two scanCONTROL sensors.

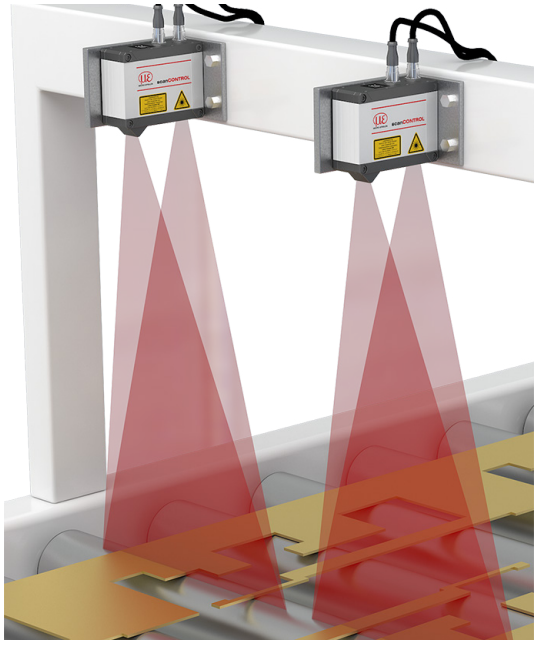


Fig. 2 Linear arrangement (both parallel)

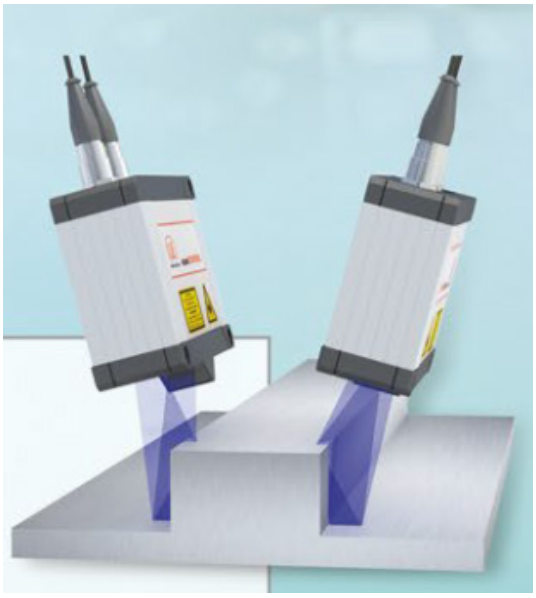


Fig. 3 Linear arrangement (oblique)

Fig. 4 Arrangement for thickness measurement

2.3.2 Typical Arrangement with 4 Sensors from the scanCONTROL Series

The 3D Profile Unit - 4 is intended for the use of up to four scanCONTROL sensors.

- Linear arrangement (all parallel)
- 360° arrangement

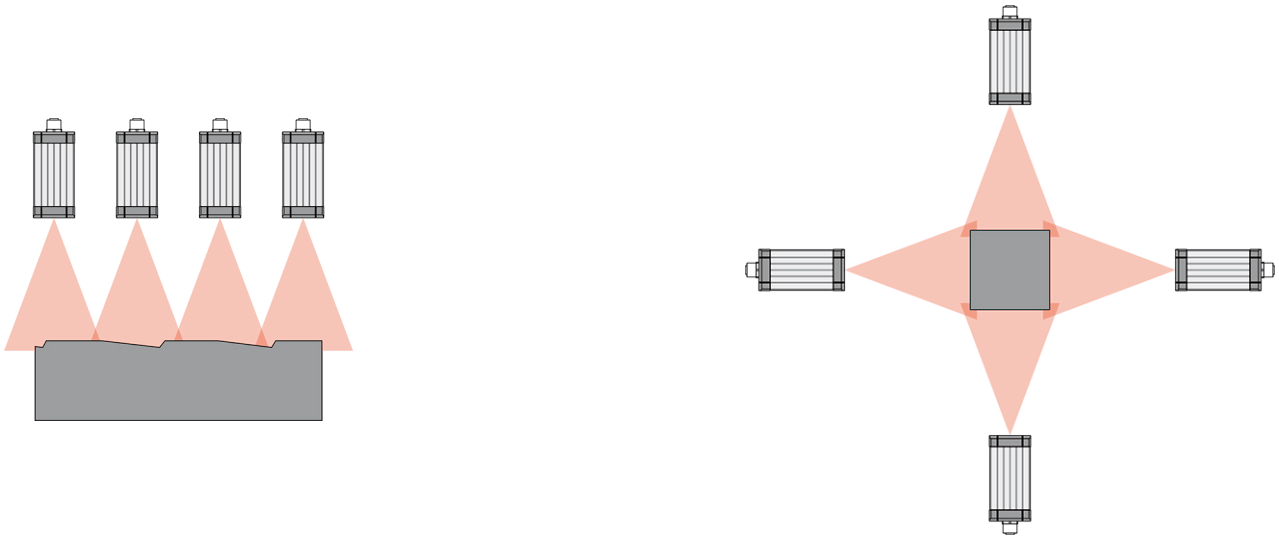


Fig. 5 Typical arrangement with four sensors during an extrusion process

2.3.3 Typical Arrangement with 8 Sensors from the scanCONTROL Series

The 3D Profile Unit - 8 is intended for the use of up to eight 3D scanCONTROL sensors.

- Linear arrangement with 8 sensors
- 360° with 8 sensors

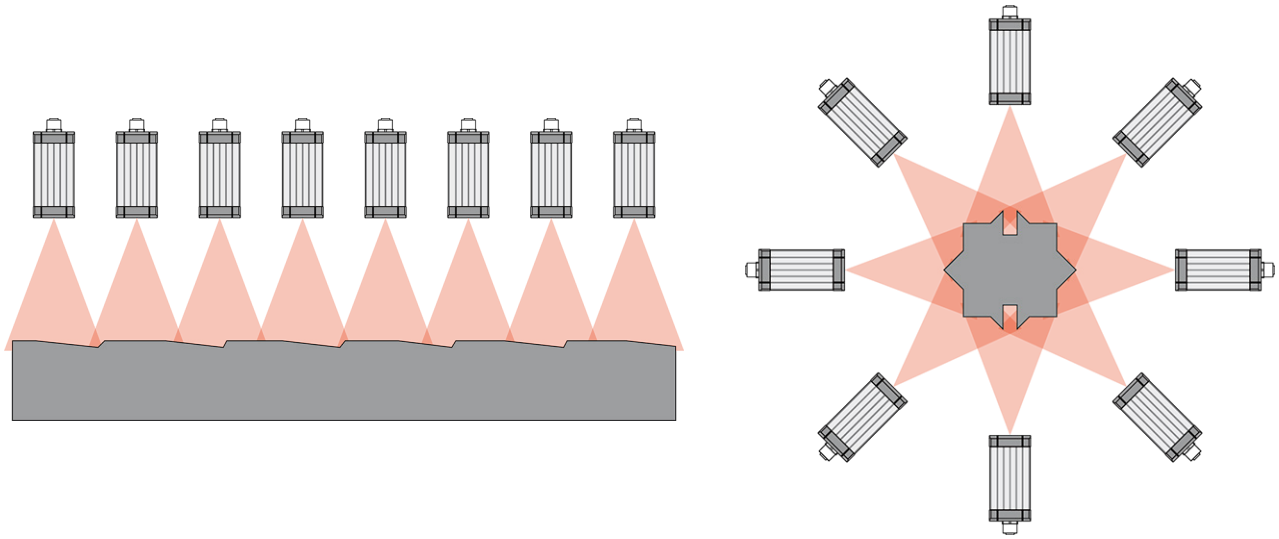


Fig. 6 Typical arrangement with eight sensors

2.4 Special Performance Features

The Profile Unit Controller is characterized by a compact design while at the same time achieving high throughput of 3D points.

- High-performance solution for patching individual profiles of multiple sensors.
- Standardized data transmission via GigE Vision to client evaluation software or integrated evaluation of profile data/3D point clouds possible
- Full compatibility and inline capability for customer applications
- Intuitive 3DInspect software with Valid3D technology by Micro-Epsilon for parameterizing the entire system
- Efficient initial operation of Micro-Epsilon sensors
- Integrated interfaces: PROFINET, EtherNet/IP, EtherCAT and Modbus TCP
- Hardware with passive cooling suitable for industrial use

2.5 Technical Data

Model		3DPU-2	3DPU-4	3DPU-8
Operating mode		2D (profiles) / 3D (point clouds)		
Connectable sensors		2	3 … 4	5 … 8
Output of measurement values		Profile data / point clouds via GigE Vision		
RAM		16 GB		
Memory		128 GB SSD		
Supply voltage		9 ... 36 V DC		
Power consumption	typ.	50 W		
	max.	112 W		
Measuring rate [1]		up to 2.5 kHz		
Digital interface		Gigabit Ethernet (GigE Vision / GenICam)		
Connection		4-pin supply terminal strip; 2x RJ45 for Gigabit Ethernet, 2x RJ45 for connecting sensors 1x HDMI, 4x USB3.2 (Gen1); 4x USB2.0, 1x VGA	4-pin supply terminal strip; 2x RJ45 for Gigabit Ethernet, 4x RJ45 for connecting sensors 1x HDMI, 4x USB3.2 (Gen1); 4x USB2.0, 1x VGA	4-pin supply terminal strip; 2x RJ45 for Gigabit Ethernet, 8x RJ45 for connecting sensors 1x HDMI, 4x USB3.2 (Gen1); 4x USB2.0, 1x VGA
Mounting		Mounting holes; accessories for table or wall mounting; optionally available: Accessories for DIN rail mounting (see accessories)		
Temperature range	Storage	-40 … 85 °C		
	Operation [2]	0 … 50 °C		
Shock (DIN EN 60068-2-27)		20g / 11 ms half-sine		
Vibration (DIN EN 60068-2-6)		3 g / 5 ... 500 Hz		
Protection class (DIN EN 60529)		IP40		
Material		Metal housing		
Dimensions		230 x 192 x 77 mm	230 x 192 x 123 mm	
Weight		3.3 kg	3.8 kg	3.9 kg
Compatibility		scanCONTROL 30xx		
Control and indicator elements		2 LEDs for storage and power; 4 LEDs for Ethernet status display, 1 power on/off switch		
3D evaluation software		Configuration and visualization via Micro-Epsilon 3DInspect		

1 The measuring rate is the frequency at which the detected and calculated measured values (without data evaluation) can be output at the digital interface.
2 Max. permissible operating temperature at 0.7 m/s air blow

Model		3DPU-2/IE	3DPU-4/IE	3DPU-8/IE
Operating mode		2D (profiles) / 3D (point clouds)		
Connectable sensors		2	3 … 4	5 … 8
Output of measurement values		Profile data / point clouds via GigE Vision Integrated evaluation and measured value output to Industrial Ethernet		
RAM		16 GB		
Memory		128 GB SSD		
Supply voltage		9 ... 36 V DC		
Power consumption	typ.	50 W		
	max.	112 W		
Measuring rate [1]		up to 2.5 kHz		
Digital interface		Gigabit Ethernet (GigE Vision / GenICam) / PROFINET / EtherNet/IP / EtherCAT / Modbus TCP		
Connection		4-pin supply terminal strip; 2x RJ45 for Gigabit Ethernet, 2x RJ45 for Industrial Ethernet (ProfiNET, EtherNet/IP, Ether-cat); 2x RJ45 for connecting sensors 1x HDMI, 4x USB3.2 (Gen1); 4x USB2.0, 1x VGA	4-pin supply terminal strip; 2x RJ45 for Gigabit Ethernet, 2x RJ45 for Industrial Ethernet (ProfiNET, EtherNet/IP, Ether-cat); 4x RJ45 for connecting sensors 1x HDMI, 4x USB3.2 (Gen1); 4x USB2.0, 1x VGA	4-pin supply terminal strip; 2x RJ45 for Gigabit Ethernet, 2x RJ45 for Industrial Ethernet (ProfiNET, EtherNet/IP, Ether-cat); 8x RJ45 for connecting sensors 1x HDMI, 4x USB3.2 (Gen1); 4x USB2.0, 1x VGA
Mounting		Mounting holes; accessories for table or wall mounting; optionally available: Accessories for DIN rail mounting (see accessories)		
Temperature range	Storage	-40 … 85 °C		
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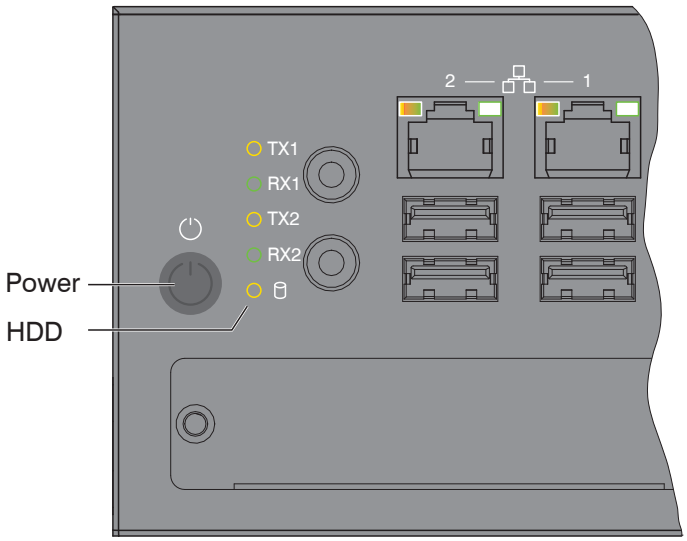
Compatibility		scanCONTROL 30xx		
Control and indicator elements		2 LEDs for storage and power; 4 LEDs for Ethernet status display, 1 power on/off switch		
3D evaluation software		Configuration and visualization via Micro-Epsilon 3DInspect		

1 The measuring rate is the frequency at which the detected and calculated measured values (without data evaluation) can be output at the digital interface.
2 Max. permissible operating temperature at 0.7 m/s air blow

2.6 Control and display elements



Power LED	
Red	Switched off, supply voltage present
Green	Ready to use

HDD LED	Meaning
Off	No access to hard drive
ON	Read/write access to hard drive

LAN 1 / 2 LED	Meaning
Link LED (left):	
Constant orange	Gigabit Ethernet connection established
Constant green	100 Mbit Ethernet connection established
Off	10 Mbit Ethernet connection established
Act LED (right):	
Green	Active data transmission
Off	No data transmission

Power button	Switches the controller on and off

Fig. 7 Controller LEDs, on/off switch

3. Delivery

3.1 Unpacking/Included in Delivery

- 1 Profile Unit Controller
- I/O card / Mini PCI Express / Ethernet CIFX 90E-RE\F/20 / RJ45, already installed (only in Industrial Ethernet option)
- Network interface card(s) for the sensor interfaces, already pre-installed
- Operating Instructions
- 2x mounting adapters for table mounting
- Wall mounting adapter set

➪ 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.

3.2 Storage

Humidity:	20 ... 95 % (non-condensing)
Temperature range for storage:	-40 ... +85 °C (-40 ... +185 °F)

4. Installation and Assembly

4.1 Controller

The mounting adapters included in delivery allow for table or wall mounting of the controller. A mounting adapter for DIN rail installation is available as an optional accessory.

NOTICE

Ensure careful handling during installation and operation. Observe the ambient conditions specified in the technical data, e.g. installation in a control cabinet with appropriate air circulation.
Damage to or destruction of the controller possible.

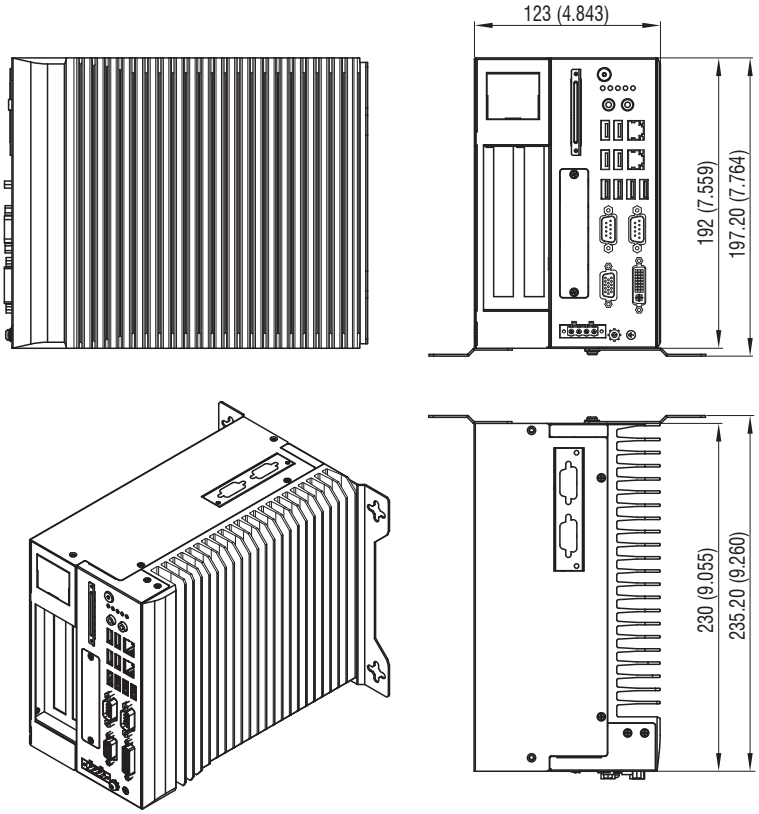
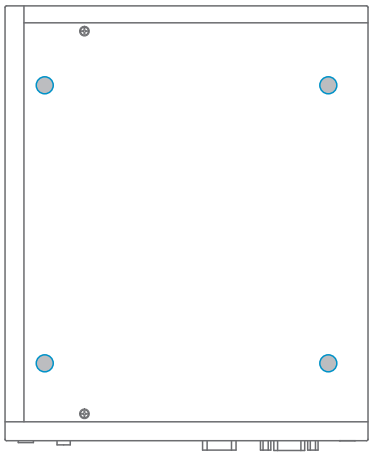


Fig. 8 Dimensional drawing of Profile Unit Controller with mounting adapter, dimensions in mm (inches, rounded off)

4.2 Table Mounting

The adapter plates required for table mounting are included in delivery.

➡ Remove the four plastic covers on the underside of the controller.



M4 mounting hole with cover

Fig. 9 Reference points for wall mounting

➡ Fasten the mounting adapter to the controller using the four screws enclosed.

➡ Fasten the controller on the table via the cross openings of the mounting adapter.

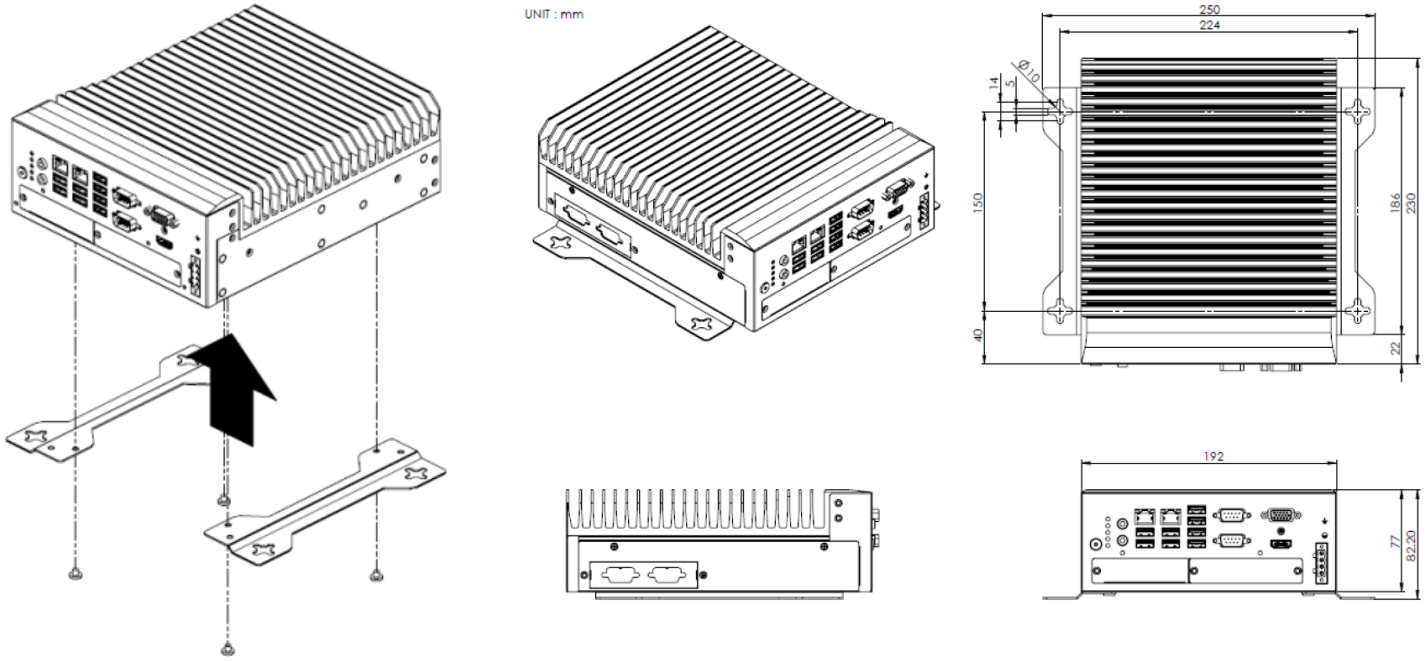


Fig. 10 Table mounting, example of Profile Unit Controller -2

4.3 Wall Mounting

The adapters required for table mounting are included in delivery.

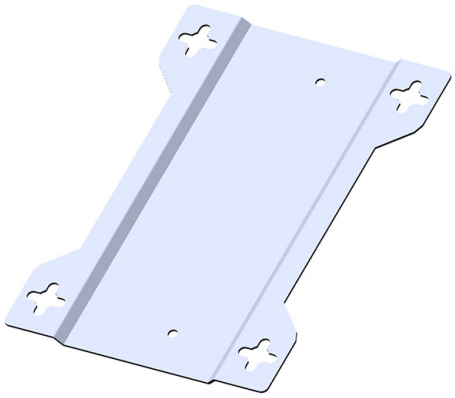


Fig. 11 Adapter plate for wall mounting of a 3D Profile Unit - 2

- Fasten the mounting adapter to the controller using the four screws enclosed.
- Fasten the controller to the wall via the cross openings of the mounting adapter.

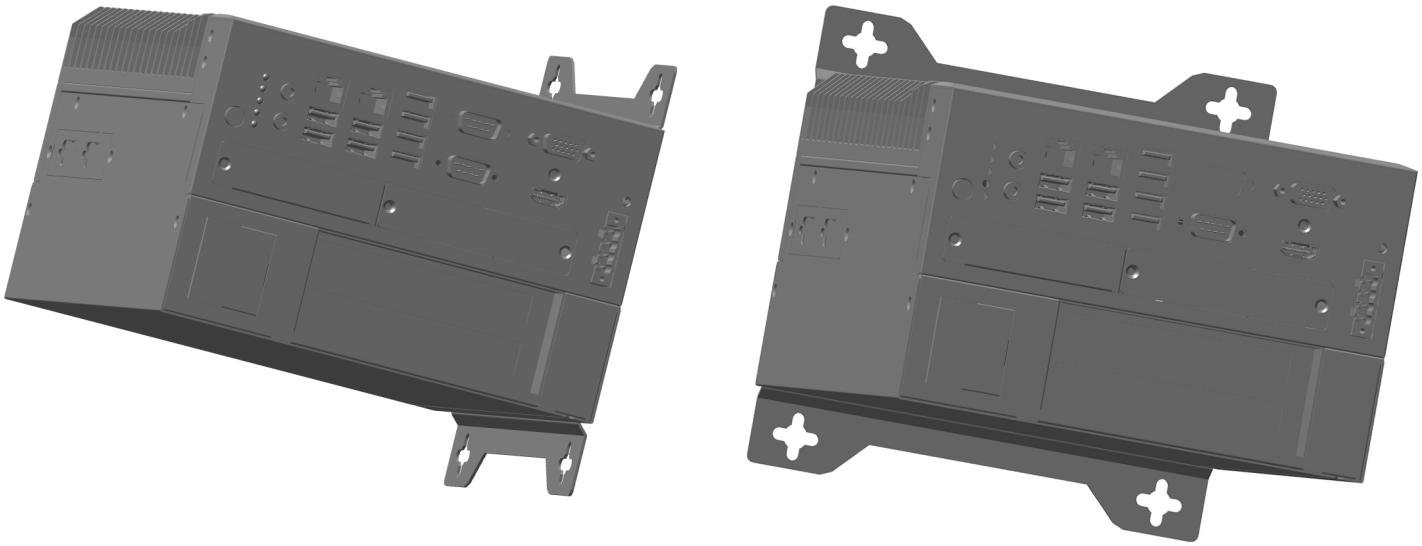


Fig. 12 Wall mounting examples

4.4 scanCONTROL Sensors

4.4.1 Pre-Mounting, Ethernet Cabling

Information on mechanically mounting the sensors can be found in the associated operating instructions or in the fine adjustment section, see Chap. 5.9.

i Any deviation from the documented preconfiguration leads to inconsistencies during initial and further operation of the Profile Unit.

Determination of the circular direction for the setup

To patch the profiles into a common coordinate system it is critical to observe the correct order of the measuring points of the sensors. Depending on the orientation of the sensors (laser/connectors on top or nose/receiving optics on top), the sensors have to be mounted as follows:

Circular direction anti-clockwise

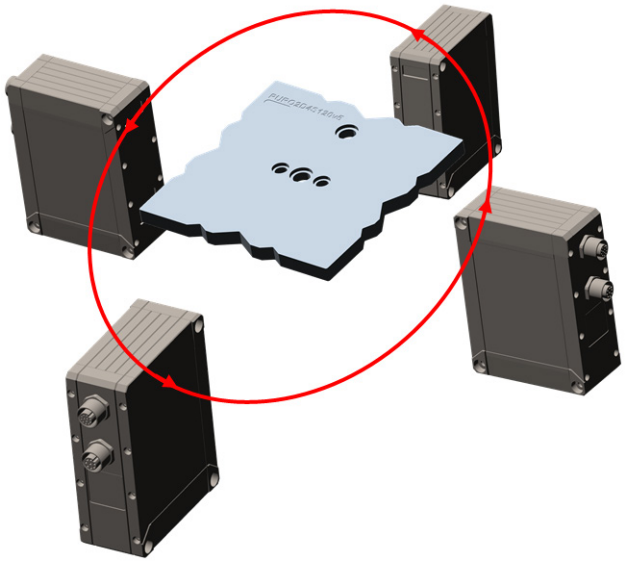


Fig. 13 Sockets/laser on the top of the sensor, Label of the registration object on top side

Circular direction clockwise

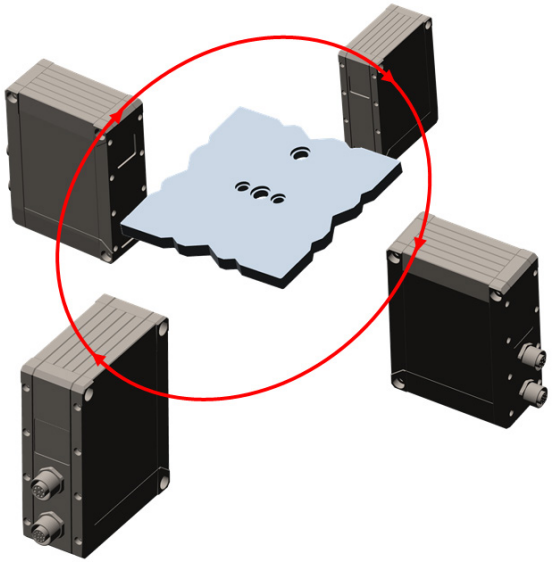


Fig. 14 Sockets/laser of the sensors on bottom, Label of the registration object on bottom

i The following descriptions assume an anti-clockwise circular direction.

Process

- Take the scanCONTROL sensor intended for position 1 out of the packaging and mount it at position 1 in your set-up.
- Assign the correct IP address to the sensor if this has not been done already, see Chap. 5.6.
- Screw the Ethernet cable onto the sensor and connect it to S1 (port 1) on the controller.

- Take the scanCONTROL sensor intended for position 2 out of the packaging and mount it at position 2 in your set-up.
- Assign the correct IP address to the sensor if this has not been done already, see Chap. 5.6.
- Screw the Ethernet cable onto the sensor and connect it to S2 (port 2) on the controller.

i Mount the sensors counterclockwise. In the finished setup, the orientation of the registration object must match the sensor arrangemen, see Fig. 13.

- Mount additional sensors according to the above schema.

4.4.2 Multifunctional Cable Basic Wiring

The following figure shows the basic wiring for a measurement setup with four sensors, in which all wires of the respective multifunctional cables are clamped.

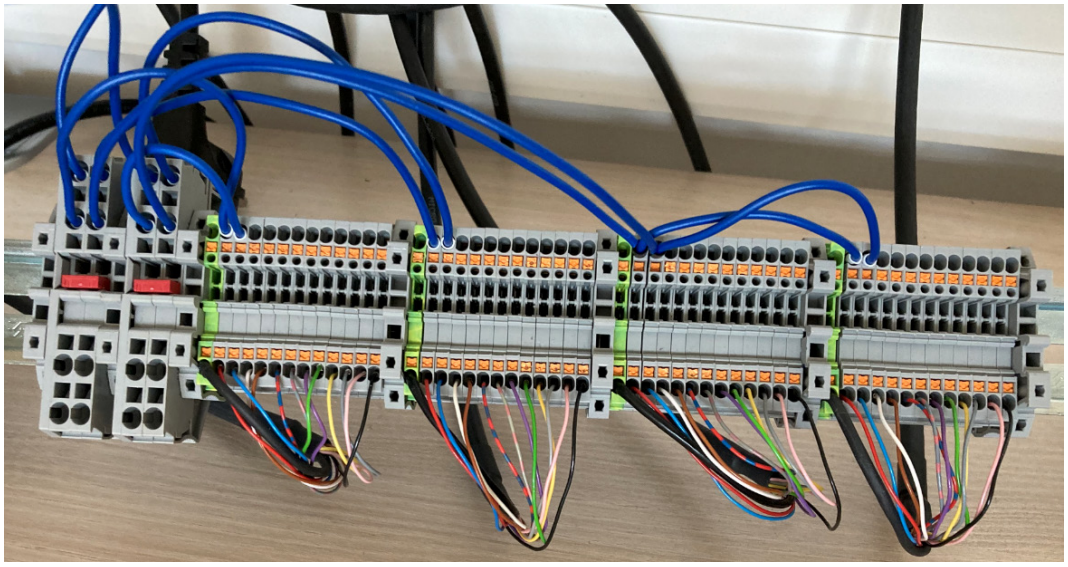


Fig. 15 Basic wiring of the multifunctional cables for four sensors

Only the 24V supply and ground of the sensors are connected. All other wires are not yet connected. These are only connected after the wiring diagram has been determined using the setup wizard in 3DInspect.

4.5 Electrical Connections

4.5.1 Connection Diagram

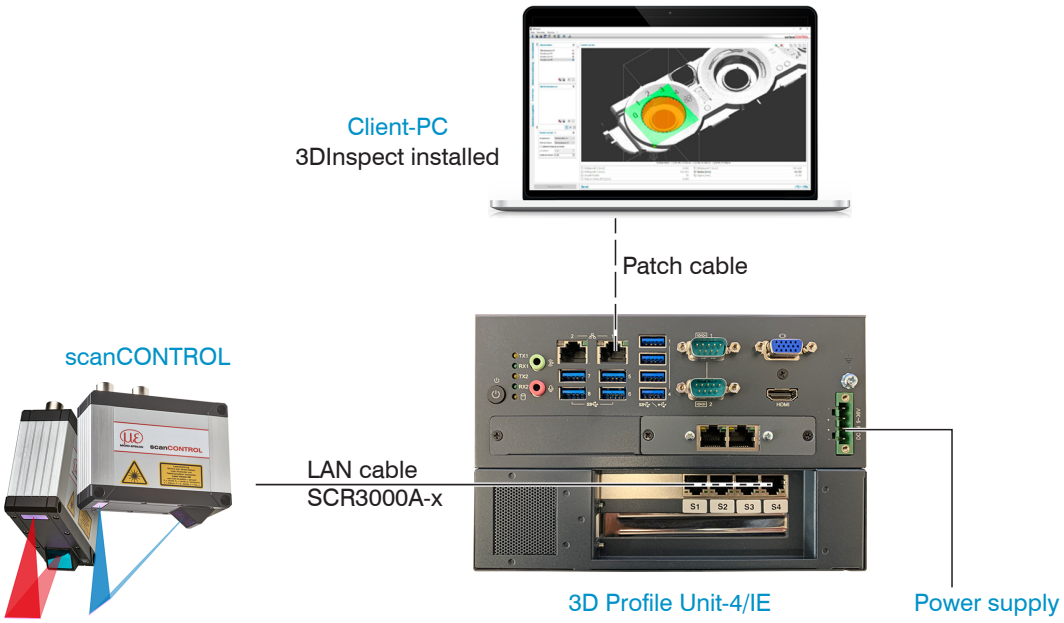


Fig. 16 Connecting scanCONTROL

4.5.2 Profile Unit Controller Interfaces

All connections for the controller are on the front.

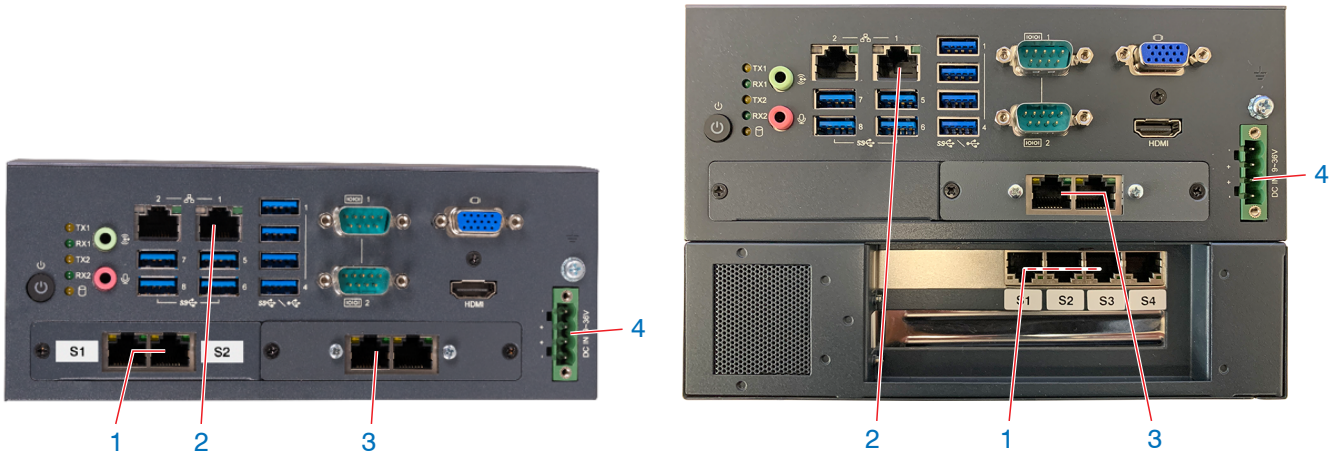


Fig. 17 Controller with connections

1		Ethernet socket, sensors of scanCONTROL series (3D sensor)
2		Ethernet socket, uplink to client PC
3		Industrial Ethernet
4		Power supply

4.5.3 Supply Voltage (Power)

The power supply connection is designed as a 4-pin connector.

Pin/designation	Comments
+	9 V ... 36 V DC (nominal value 24 V, max. power consumption 112 W)
-	0 V

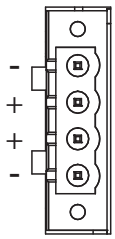


Fig. 18 Power supply connection assignment, view: Plug on housing side

The controller contains a reverse polarity and overvoltage protection.

4.6 Installation instructions

For all connection cables, use only the appropriate cables from the optional accessories.

Lay all connection cables in accordance with the generally applicable measurement technology regulations, i.e. for example not directly next to pulse-carrying lines, preferably in a separate cable duct.

The minimum bending radii are three times the cable diameter; do not bend more tightly than this

- Single bending during laying: 5x cable diameter,
- Minimum bending radius with constant movement: 10x cable diameter.

5. Initial Operation of Profile Unit System

5.1 Overview of Procedure

NOTICE The controller may only be connected to peripherals when it does not carry power, that is, only when the supply voltage has been switched off.

The Profile Unit Controller is prepared for the corresponding sensor arrangement at the factory. Follow the notes and instructions below for setting up the overall Profile Unit system.

Below is an overview of the steps to be taken in order to obtain the overall system:

Controller

- Mounting, see Chap. 4.1
- Electrical wiring, see Chap. 4.5.3

scanCONTROL sensors

- Pre-mounting, Ethernet cabling, see Chap. 4.4.1
- Multifunctional cable basic wiring, see Chap. 4.4.2

Power supply

- Switch on power supply

Client PC

- 3DInspect installation, if not already taken place, see Chap. 5.3
- Network cabling to uplink port 1 of the Profile Unit Controller, see Chap. 5.4
- Launch 3DInspect and establish connection to the Profile Unit Controller, see Chap. 5.5
- Run setup wizard for the trigger settings and wiring diagram, see Chap. 5.7

scanCONTROL sensors

- Switch off power supply
- Final wiring of multifunctional cables as per wiring diagram from setup wizard
- Switch on power supply
- Fine adjustment using the registration object and the switched-on laser lines, see Chap. 5.9

Client PC

- Registration of sensors in a common coordinate system, see Chap. 5.11
- Set up measurement mode, see Chap. 5.12

5.2 Client PC

In order to perform the first steps with the client PC, the scanCONTROL sensors and the Profile Unit Controller must be supplied with power as per the specifications.

5.3 Installing 3DInspect

3DInspect must be installed on the client PC, if this has not already been done. You can get a free version of 3DInspect via the following site: https://www.micro-epsilon.de/2D_3D/3D-sensors/3Dinspect/downloads/.

5.4 Network Cabling to Port 1 of the Profile Unit

➡ Connect a network port of the client PC to uplink port 1 of the Profile Unit Controller via a suitable network cable.

The Profile Unit Controller cannot be operated via port 2.

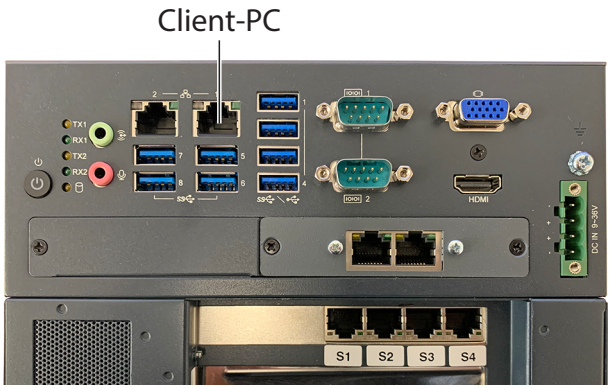


Fig. 19 Connecting client PC to Profile Unit Controller

5.5 Launching 3DInspect and Establishing Connection to Profile Unit Controller

➡ Launch 3DInspect.

If the network card of the client PC and uplink port 1 of the Profile Unit Controller are in the same subnet, 3DInspect should automatically connect to the Profile Unit Controller.

Alternative option: Open the Ethernet configurator, menu item `Options` in 3DInspect. Here, the Profile Unit Controller can be assigned an alternative IP address, such that 3DInspect can connect to the controller.

i If the error `Hardware error` is displayed in the status bar of 3DInspect after connection, the Profile Unit Controller could not connect to one or more sensors. Possible causes for this could be that, for example, sensor 1 is not plugged into sensor port 1, a sensor is not being supplied with power or a sensor has incorrect IP settings.

Please also ensure that the IP addresses are assigned correctly, see Chap. 5.6.

Details on the 3DInspect software can be found in the operating instructions. You can find them online at https://www.micro-epsilon.com/download/manuals/man--3DInspect--en.pdf

5.6 IP Configuration

In order to ensure the functionality of the 3D Profile Unit, the sensors must be assigned the IP addresses below.

Profile Unit Controller		Sensors	
Network interface S1	192.168.201.100	scanCONTROL sensor 1	192.168.201.1
Network interface S2	192.168.202.100	scanCONTROL sensor 2	192.168.202.1
Network interface S3	192.168.203.100	scanCONTROL sensor 3	192.168.203.1
Network interface S4	192.168.204.100	scanCONTROL sensor 4	192.168.204.1
Network interface S5	192.168.205.100	scanCONTROL sensor 5	192.168.205.1
Network interface S6	192.168.206.100	scanCONTROL sensor 6	192.168.206.1
Network interface S7	192.168.207.100	scanCONTROL sensor 7	192.168.207.1
Network interface S8	192.168.208.100	scanCONTROL sensor 8	192.168.208.1

The subnet mask for all interfaces is 255.255.255.0.

The network interfaces of the 3D Profile Unit were already pre-configured at the factory.

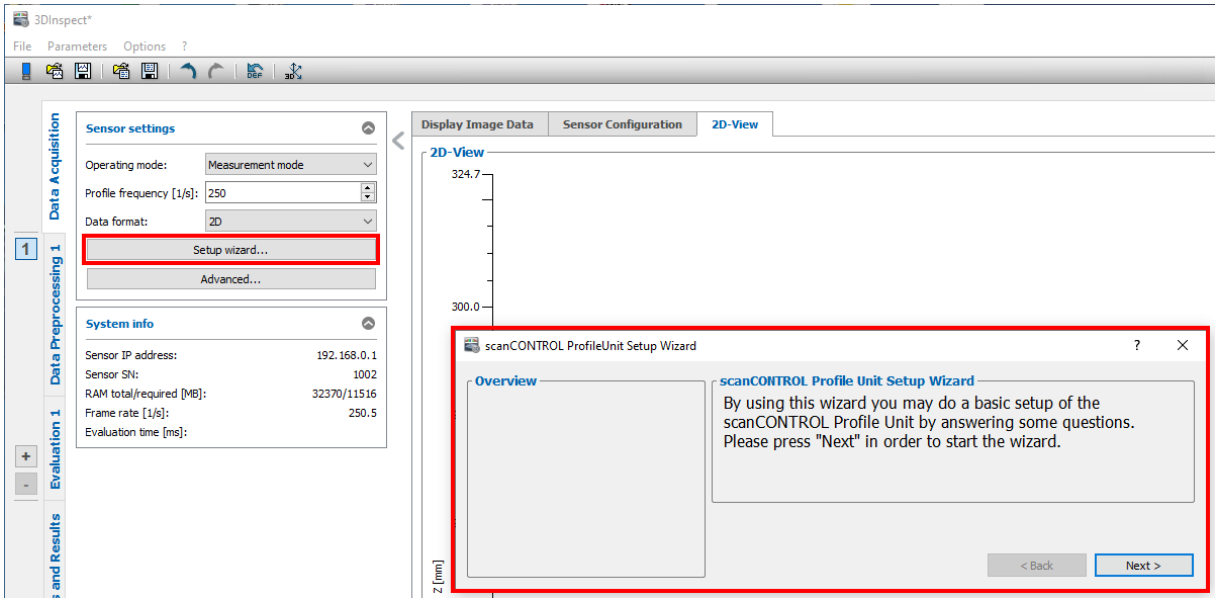
In order to assign an IP address to a sensor, the network cable of the sensor must be directly connected to the PC on which 3DInspect is run. The IP and the subnet mask can then be assigned via the Ethernet configurator of 3DInspect. For this purpose, it is not necessary for the interface used on the PC to first be put in the corresponding subnet.

i A different configuration of the IP addresses is not possible, since they are permanently stored in the factory-created configuration file of the Profile Unit Controller.

5.7 Running the Setup Wizard

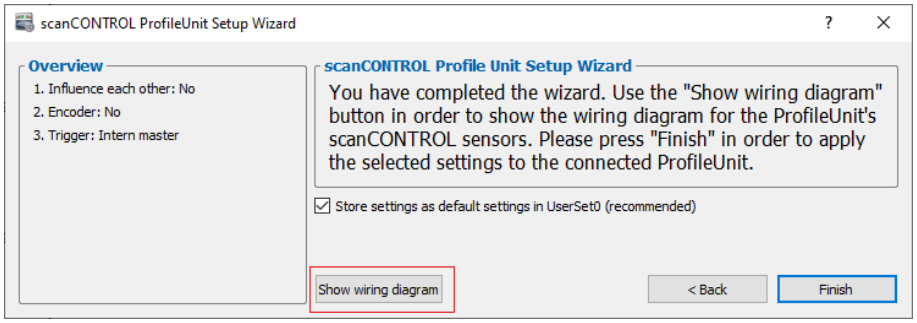
➡ Click on `Setup wizard` in 3DInspect and run through it step-by-step.

The questions from the setup wizard are explained in the appendix.



After the wizard has finished:

- In the final dialog of the setup wizard, you can open the required wiring diagram by clicking on the button `Show wiring diagram`.



- The parameters required for operation are saved and stored as a default recipe in the Profile Unit.

➡ Now close 3DInspect.

➡ Disconnect the power supply of the Profile Unit Controller and of the scanCONTROL sensors in order to make the final touches to the wiring as per the wiring diagram.

5.8 Final Wiring of Sensors

➡ Make the final touches to the wiring. Observe the specifications of the wiring diagram determined by the setup wizard, see Chap. 5.7.

➡ Switch on the power supply of the Profile Unit Controller and the sensors.

5.9 Fine Adjustment of scanCONTROL Sensors

An overall profile of the target is patched from the individual profiles of the sensors. This requires that the sensors are all on the same plane.

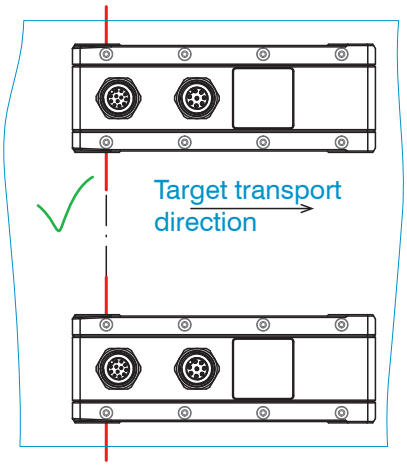


Fig. 20 Sensors on the same plane

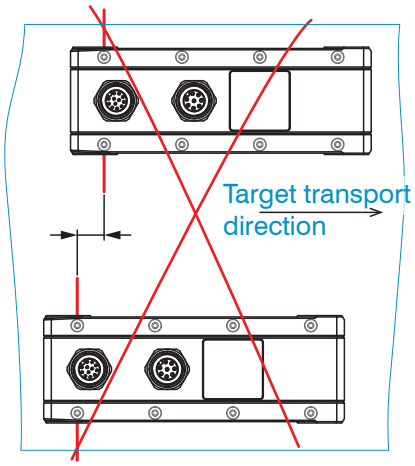


Fig. 21 Sensors offset with respect to one another, overall profile with error

The sensors in the system setup must be positioned precisely. Below are some notes on this:

- The screw connection at the laser outlet with the centering elements supplied with the sensors is the reference for calibrating the sensors.

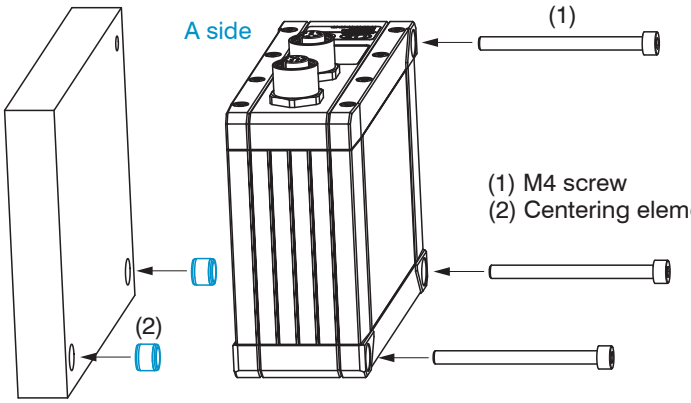


Fig. 22 Mounting example: bolt connection

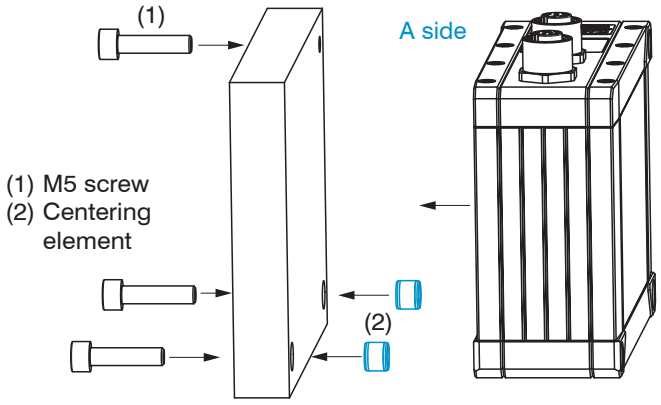


Fig. 23 Mounting example: direct screw connection

Bolt connection:

- 3x M4 threaded holes

with centering element:

- additionally 2x 8H7 counter-bores, depth 1.8 - 2 mm

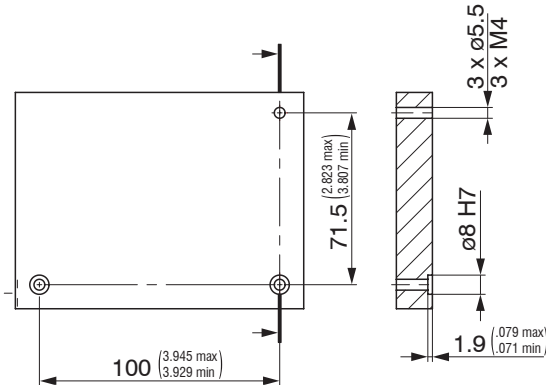


Fig. 24 Dimensional drawing for mounting holes, all dimensions in mm, not to scale

Direct screw connection:

- 3x holes ø 5.5

with centering element:

- additionally 2x 8H7 counter-bores, depth 1.8 - 2 mm

For thermal reasons, the sensor should be mounted on the A side.

Follow the mounting instructions in the operating instructions for the respective sensors. They are available online at: https://www.micro-epsilon.com/service/download/manuals/.

Fine alignment of the sensors

The measuring fields of the sensors should be congruent. This ensures optimum utilization of the measuring range of the 3D Profile Unit.

To align the sensors precisely

- Micro-Epsilon recommends using a sheet of paper and
- moving it in the area where the laser lines cross.

The semi-transparency of the paper makes it easy to recognize inaccurate alignments.

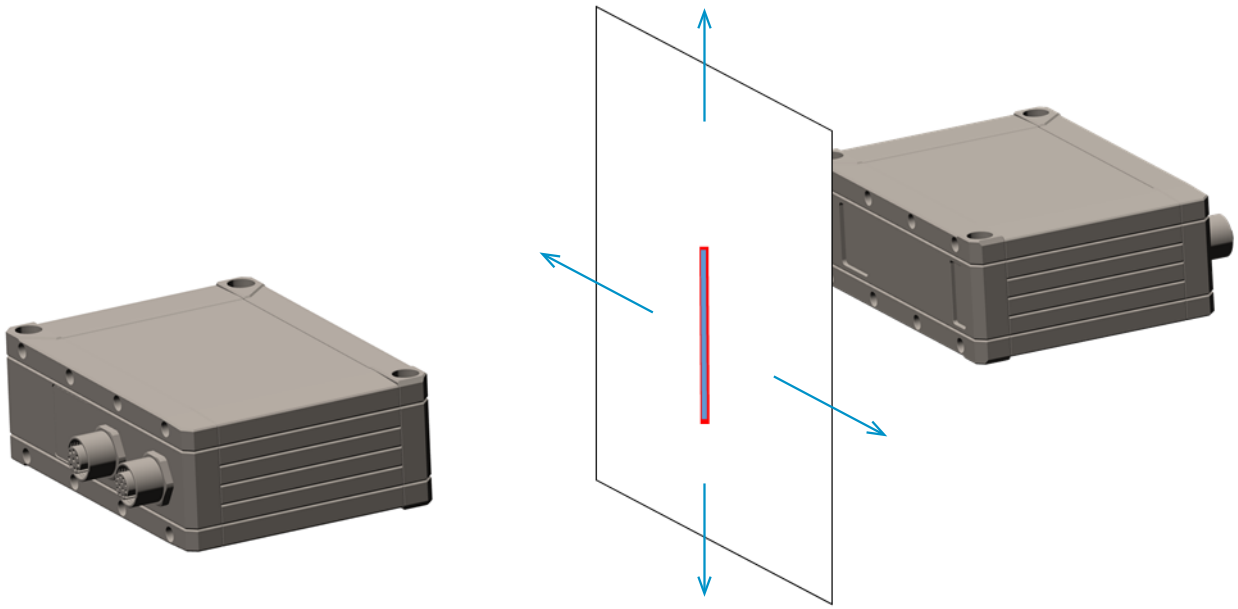


Fig. 25 Example setup for aligning the sensors with paper (3D Profile Unit-2)

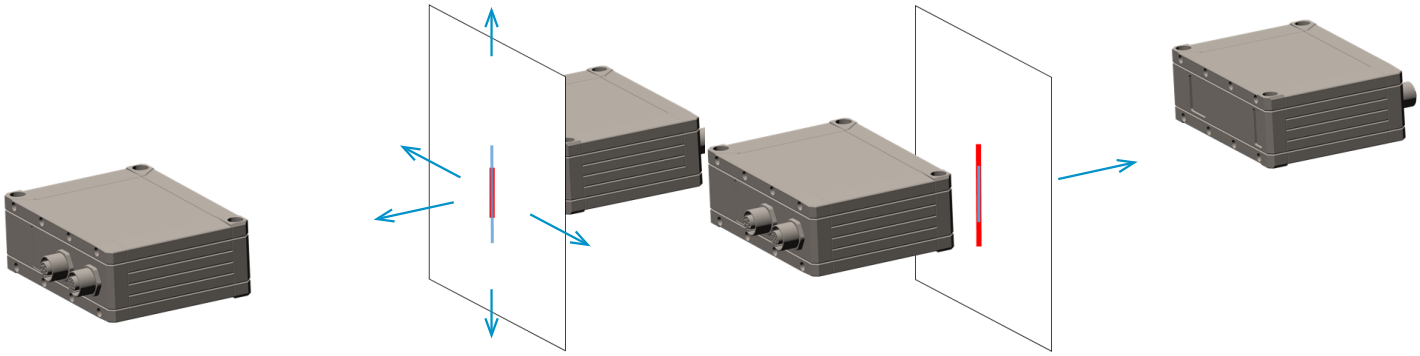


Fig. 26 Moving the paper in the intersection area of the laser lines

i Depending on the setup, another suitable object can also be used for alignment.

An offset of the profiles in the measurement could possibly be caused by:

- imprecise positioning of the sensors,
- alternating measurement of the sensors and transport of the target.

i If the sensors are to be operated synchronously, Micro-Epsilon recommends the best possible overlapping of the laser lines. If the sensors are to perform measurements in an alternating manner, the measuring times between two adjacent sensors are not the same in order to prevent mutual interference; this produces a slight offset of the laser lines.

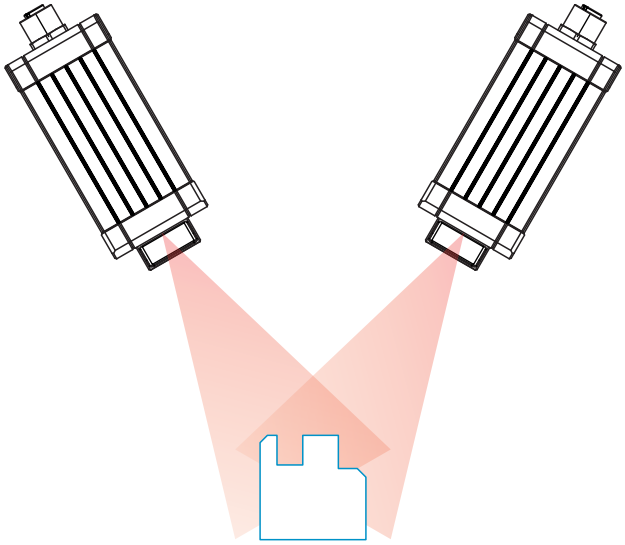


Fig. 27 Sensors measuring simultaneously

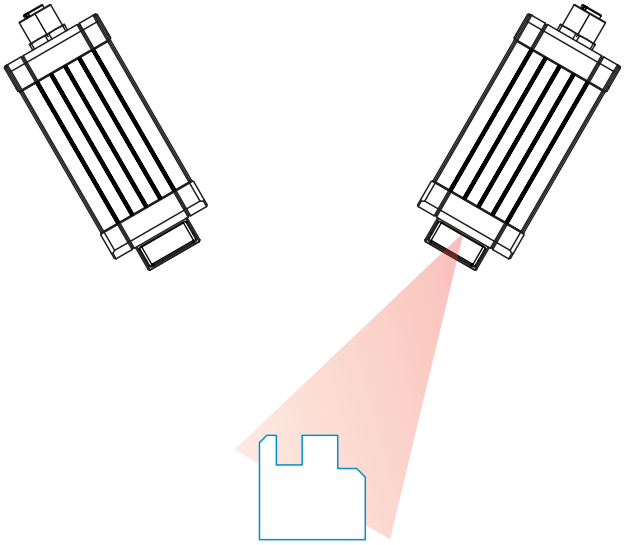


Fig. 28 Sensors measuring alternately

5.10 Placement of Registration Object

The registration object must be placed in the laser curtain of the sensors for correct operation of the Profile Unit.

Laser output/sockets are on the top of the sensors	Engraved identification of the registration object is located on the top, see Fig. 29.
Laser output/sockets are on the bottom of the sensors	Engraved identification of the registration object is on the bottom.

The registration object must be placed in the laser curtain as per the following figure.

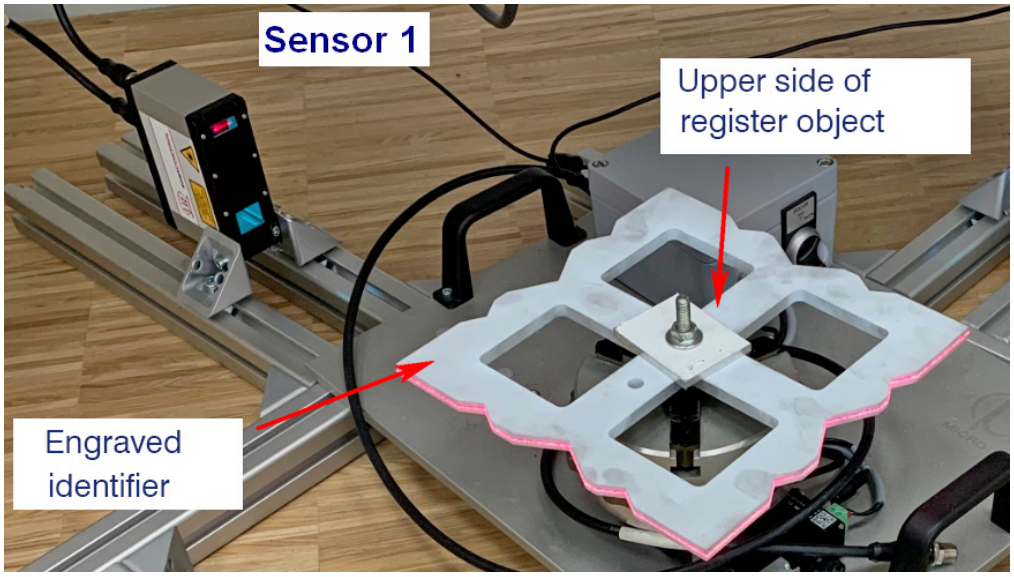


Fig. 29 Assignment of sensor 1

Further details can also be found in the Mounting section, see Chap. 4.4.1.

5.11 Registration of Sensors in 3DInspect

In the context of the Profile Unit, `Registration` means combining the coordinate systems of the individual scanCONTROL sensors into a common coordinate system.

Initially, the sensor profiles are visualized in unregistered form – i.e. the coordinates of the individual measuring points arrive unchanged from the connected scanCONTROL sensors.

Registration can be done either

- using a registration object optionally available from Micro-Epsilon, or
- manually by rotating and translating the profiles, if applicable using a “golden pattern”.

It is always assumed here that the sensors are located within a common laser plane. An offset of the traversing direction – which is caused by staggered mounting of the sensors or by alternating measurements of mutually influencing sensors (“alternating measurement”) – is not taken into account for the composite profile, nor is an inaccurate orientation of the sensors. Therefore, they may not be physically in the same laser plane.

The process of performing a registration in the software is described in the 3DInspect documentation, see Section 4.3.

5.12 Setting up Measurement Mode

5.12.1 Preset to 2D and 3D Mode

In the context of the Profile Unit System, there is a distinction between 2D and 3D mode.

In 2D mode, one measurement profile (X/Z coordinates) of all sensors is transformed into the common coordinate system in each case and evaluated as a composite profile (“Industrial Ethernet” option) or forwarded to the GigE Vision client.

In 3D mode, one measurement profile (X/Z coordinates) of all sensors is again transformed into a common coordinate system as the first step. Then, in consideration of the Y coordinate and from the movement of the object to be measured, the merged profiles are collected and processed further as a 3D point cloud (via Industrial Ethernet option) or forwarded to the GigE Vision client. In order to generate a 3D point cloud, a start signal – e.g. via the fieldbus used – and a defined number of composite profiles in the movement direction are required.

2D or 3D mode is selected in the `Data Acquisition` view, then the `2D-View` or `3D-View` tab via the `Data format` parameter:

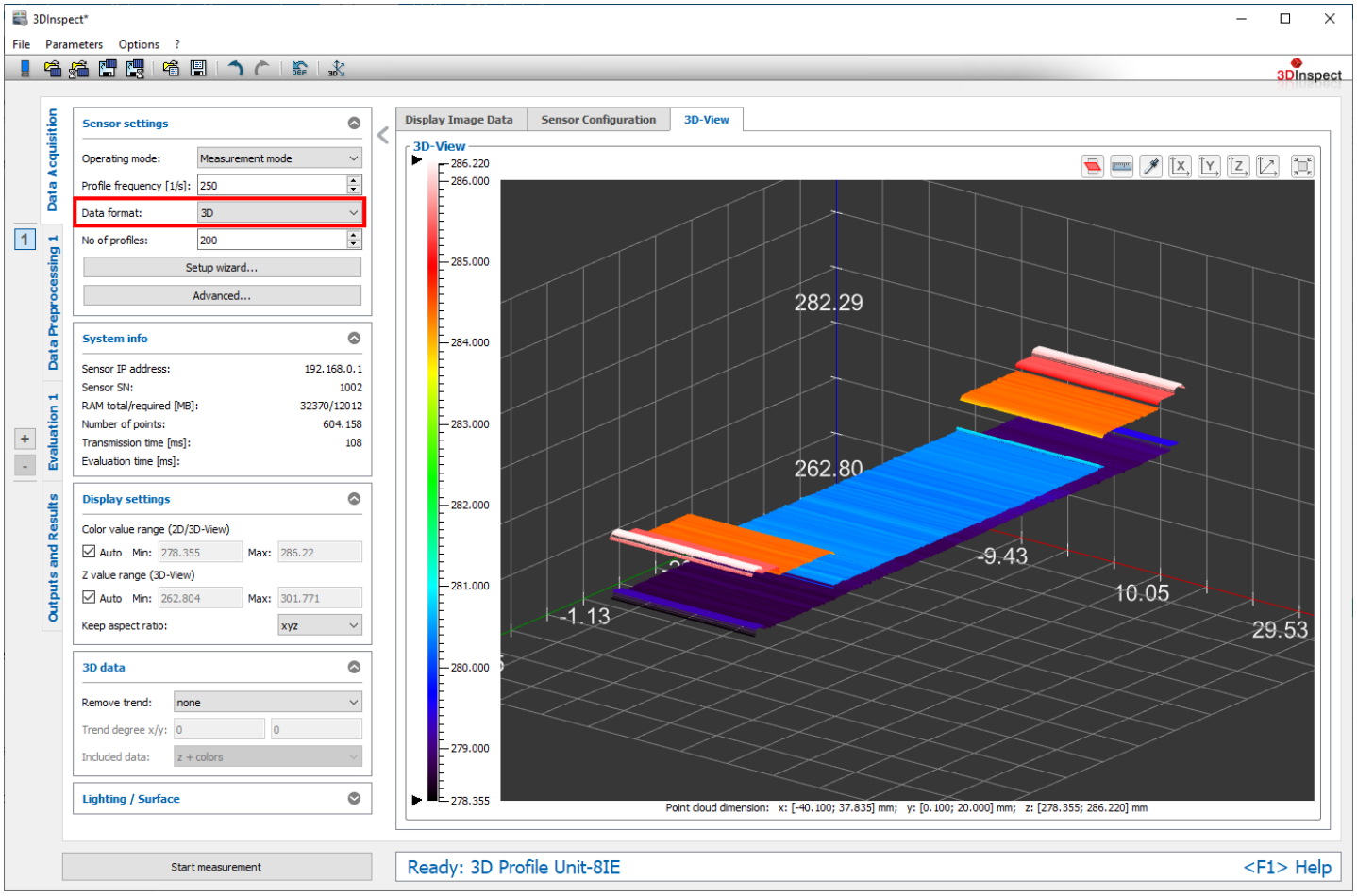
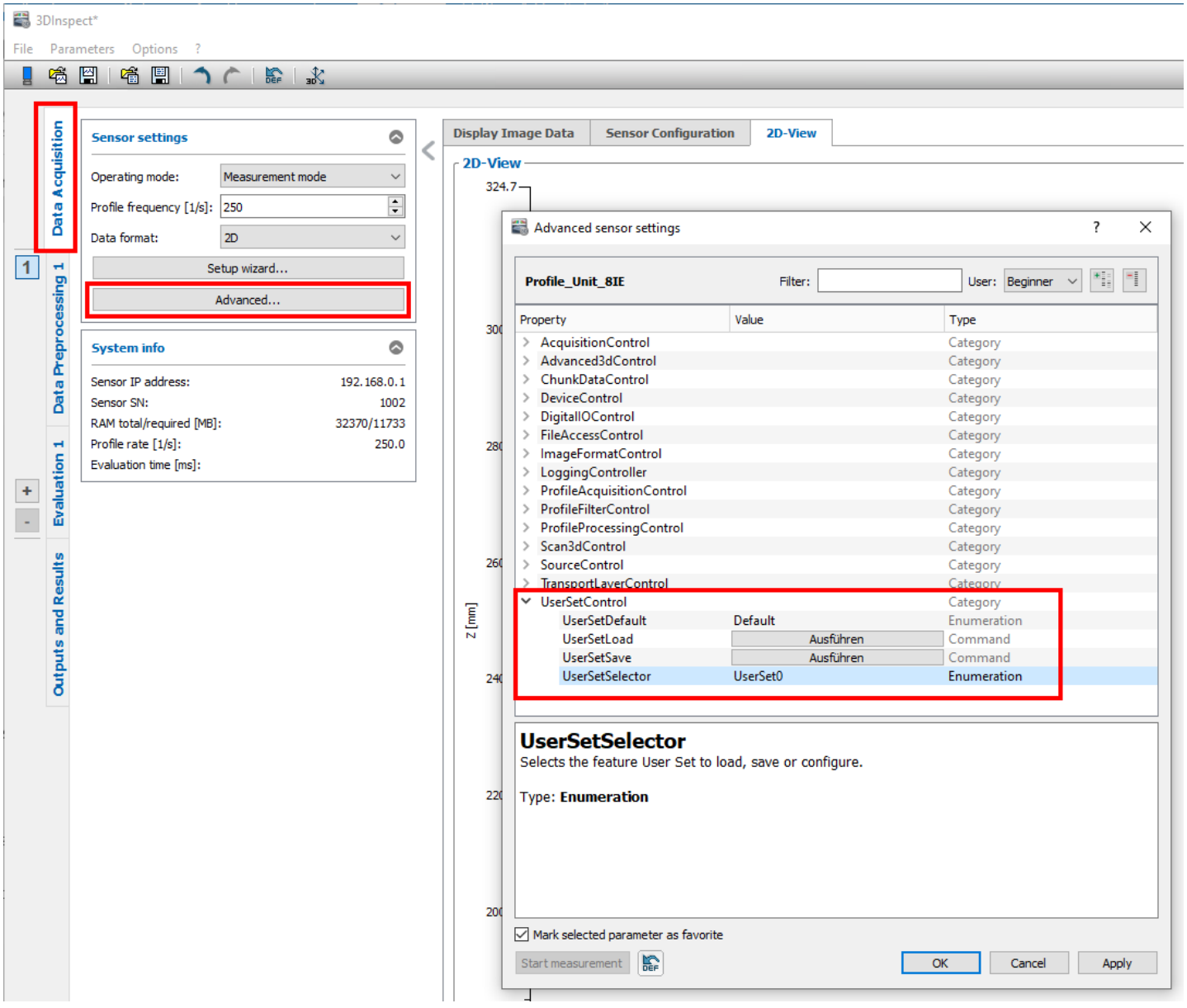


Fig. 30 Selection of operating mode in 3DInspect

5.12.2 Procedure for Forwarding the Patched Profile Data or 3D Point Clouds

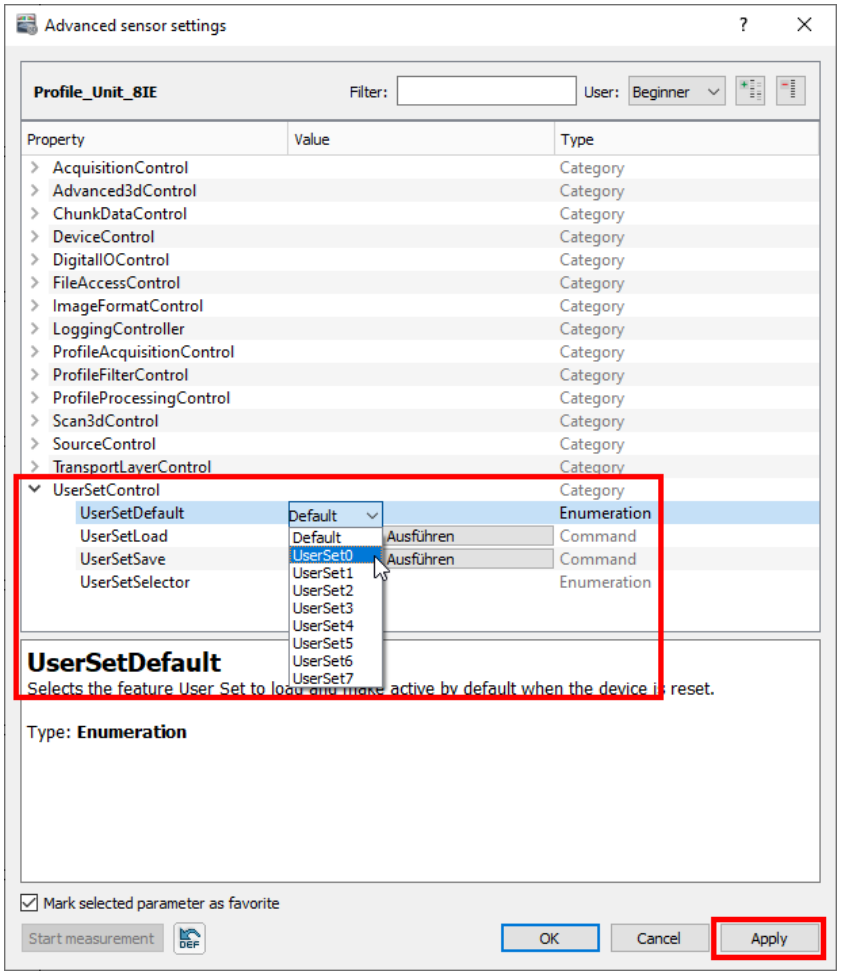
Perform the following steps:

- Parameterize the sensor for optimal acquisition of the measurement data by the scanCONTROL sensors in the `Data Acquisition` view, see `3DInspect` operating instructions, Chapter 4.
- Then save a UserSet on the 3D Profile Unit. This is recommended, since the client software used can load this UserSet later, such that the settings made for registration and sensor parameters are available again.
- For this, go to the `Data Acquisition` tab and click on the button `Advanced...`
- Navigate to `UserSetControl`.
- Select the desired UserSet for UserSetSelector.
- Click on `UserSetSave` to save the UserSet on the 3D Profile Unit.



If the 3D Profile Unit should already boot up with one of the configured UserSets, this can be set as the `Default UserSet`.

- For this, go to the `Data Acquisition` tab and click on the `Advanced...`button.
- Navigate to `UserSetControl`.
- Select the desired UserSet for `UserSetDefault`.
- Press `OK` or `Apply`.



- Save the settings in a file as well; see `3DInspect` operating instructions, Chapter 3.20.1, in order to save the parameters.

5.12.3 Sequence of a Measurement Task in the Industrial Ethernet Option

Perform the following steps:

- Parameterize the sensor for optimal measurement data acquisition by the scanCONTROL sensors in the `Data Acquisition` view, see `3DInspect` operating instructions, Chapter 4.
- Select programs for preprocessing the measurement data and configure the individual programs in the `Data Preprocessing` view, see `3DInspect` operating instructions, Chapter 5.
- Select programs for calculating geometric objects and configure the individual programs in the `Evaluation` view, `Find objects` group, see 3DInspect operating instructions, Chapter 6.1.
- Select programs for combining geometric objects and configure the individual programs in the `Evaluation` view, `Combine objects` group, see 3DInspect operating instructions, Chapter 6.2.
- If applicable, filter measurement results by time in the `Outputs and Results` view, `Filter` tab, see 3DInspect operating instructions, Chapter 7.1.
- If applicable, calculate the results of measuring programs in the `Outputs and Results` view, `Calculation` tab, see 3DInspect operating instructions, Chapter 7.2.
- In the `Outputs and Results` view, `OK/nOK` tab, define limit values for selected measured values in order to evaluate the measurement, see 3DInspect operating instructions, Chapter 7.3.
- In the `Outputs and Results` view, `Input/Output` tab, configure the way in which the measurement is controlled and measured values are output, see 3DInspect operating instructions, Chapter 7.4.
- Once parameterization is complete, save the parameters in a file, see 3DInspect operating instructions, Chapter 3.20.1.

You can reload the saved file at a later time.

- Store the composed parameter sets in the dialog `Parameter file mapping`, see 3DInspect operating instructions, Chapter 7.4.1, in order to load various parameter sets via fieldbus.
- In the `Outputs and Results` view, select the operating mode `Measurement mode`, see 3DInspect operating instructions, Chapter 7.

3DInspect gives you the option of transmitting the parameter sets to the 3D Profile Unit.

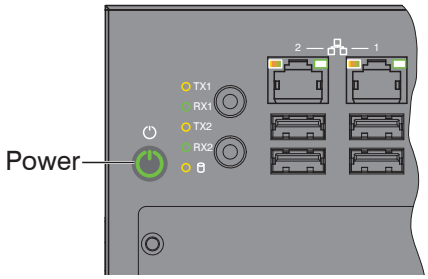
The 3D Profile Unit is now in measurement mode and is controlled via the set fieldbus. 3DInspect is now in viewer mode and merely displays the measurement data and measurement results.

6. Operation

After applying the supply voltage, the controller starts up automatically and goes into measurement mode.

When the 3D Profile Unit starts up, the default user modes are loaded on the sensors. Then, the parameter set stored as default is loaded on the 3D Profile Unit.

➪ Once Windows has been shut down, press the `Power` button on the controller. The controller starts up and goes into measurement mode.



The `Power` LED on the controller lights up red when sufficient voltage is being supplied, and lights up green in measurement mode.

When the supply voltage is applied to the scanCONTROL sensors, these start up.

i Observe the required warm-up times of the scanCONTROL sensors. These are required for precise measurement. You can find details on this in the respective operating and installation instructions.

7. 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/impressum/.

8. Service, Repair

In the event of a controller defect:

- If possible, save the current settings in a parameter set to reload them into the controller 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 MESSTECHNIK
GmbH & Co. KG
Königbacher 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

9. Decommissioning, Disposal

To prevent environmentally harmful substances from being released and to ensure the reuse of valuable raw materials, please note the following rules and obligations:

- All cables must be removed from the sensor and/or controller.
- The sensor and/or controller, its components and the accessories, as well as the packaging materials, are to be disposed of according to the country-specific waste treatment and disposal regulations for the respective area of use.
- You are obligated to observe all relevant national laws and provisions.

The following (disposal) instructions apply in Germany / the EU:

- old devices labeled with a crossed-out garbage can must not be disposed of in normal waste (e.g. garbage can or yellow bin) and must be disposed of separately. This prevents hazards to the environment due to improper disposal and proper further use of the old devices is ensured.

- A list of national legislation and contacts in 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 have the opportunity to learn about the respective national collection and return points.
- Old devices can also be sent back to MICRO-EPSILON for disposal, to the address provided in the Legal Notice at https://www.micro-epsilon.com/impressum/.
- Please note that you yourself are responsible for deleting the measurement-specific and personal data from the old devices being disposed of.
- We are registered as a manufacturer of electrical and/or electronic devices under registration number WEEE-Reg.-Nr. DE28605721 with Stiftung Elektro-Altgeräte Register, Nordostpark 72, 90411 Nuremberg.

Appendix

A 1 Accessories

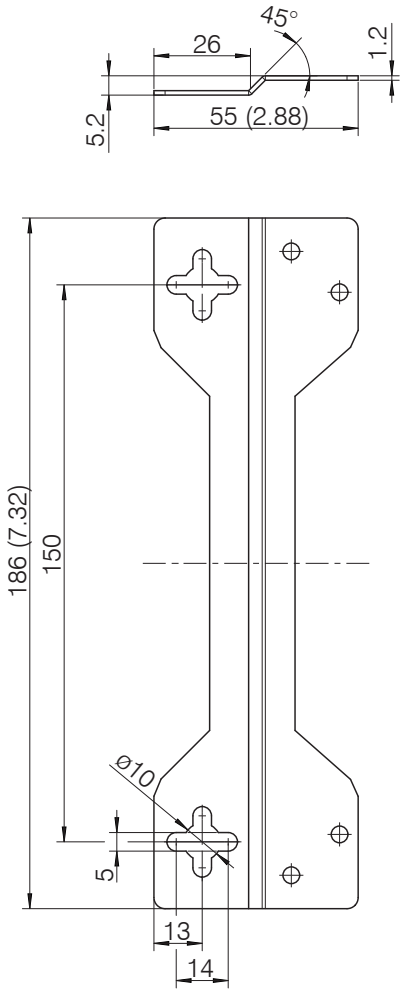


Fig. 31 Dimensional Drawing of Mounting Adapter for table mount, dimensions in mm (inches, rounded off)

A 2 Optional Accessories

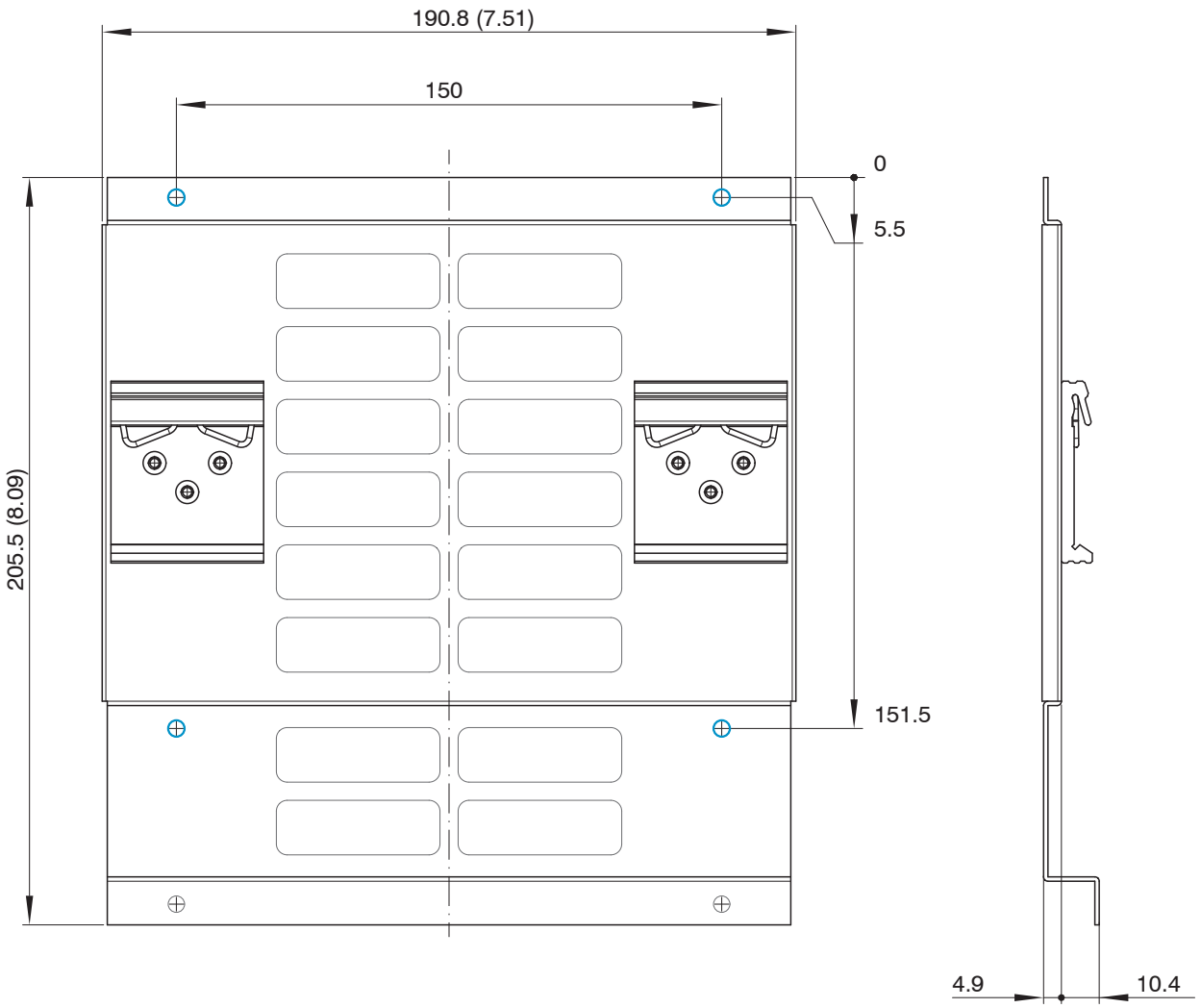


Fig. 32 Dimensional drawing of mounting plate for DIN rail installation, dimensions in mm (inches, rounded off)

- 1 DIN-Rail Mounting Kit for 3D Profile Unit - 2

A 3 Setup Wizard

The graphic below shows the decision tree of the setup wizard.

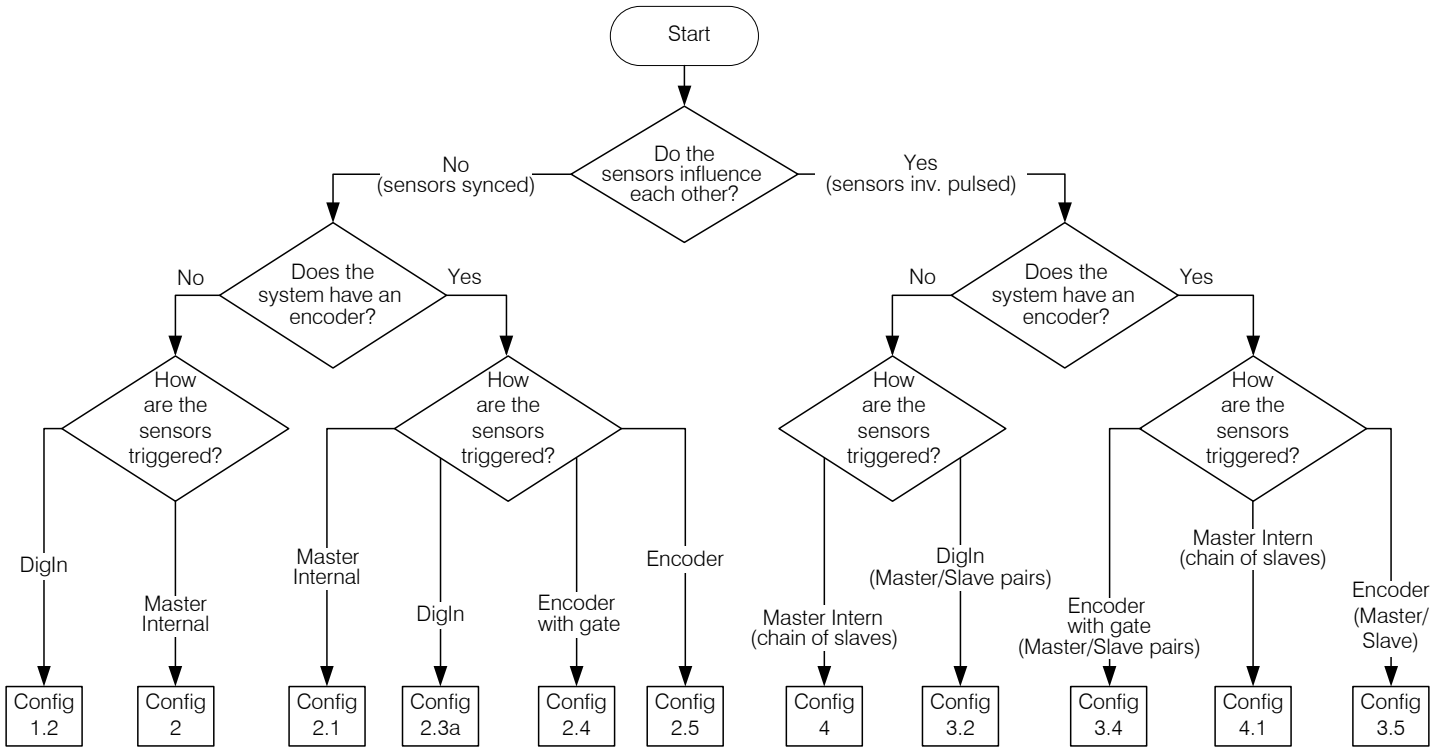


Fig. 33 Decision tree

A 4 Setup Wizard Questions

Do the sensors influence each other?

Depending on the actual system setup, the laser lines of adjacent sensors may also overlap so that one sensor can see the laser line of the other. As the sensors have been calibrated individually, the detection of a second superimposed laser line influences the quality of the measuring points. It is therefore advisable to ensure that a second overlapping laser line is not detected by the sensor. For this case, the sensors provide a functionality which – through inverse pulsing (=alternating measurement) of the laser lines – ensures that the measuring times of adjacent sensors are not the same, meaning that the sensors cannot influence one another.

If the sensors should be synchronized (identical measuring time), because they do not influence one another or because mutual influencing is potentially being taken into account, follow the left-hand side of the decision tree, see Fig. 33.

Does the system have an encoder?

Encoders are typically used to map the traversing direction of the component to be measured. For the Profile Unit, this is typically the Y-direction, which is orthogonal to the X- and Z-axis of a profile.

An encoder signal can be used, for example, to trigger a measurement (e.g. per 50 encoder steps). This ensures that equidistant measurements can be performed with an inconstant traversing speed.

How are the sensors triggered?

“Triggering” means triggering a measurement in order to generate a profile.

- Master internal: The master sensor (sensor 1) runs at a constant profile frequency, the slave sensors are triggered by the master.
- DigIn: The line PLC provides a digital output that triggers profile measurement. If the sensors are to run synchronously, this digital output is applied to all sensors. If the sensors are to be inversely pulsed, this digital output is applied to the master sensors, which in turn trigger the slave sensors.
- Encoder: An encoder signal is used to trigger a measurement (e.g. per 50 encoder steps). If the sensors are to run synchronously, the encoder is applied to all sensors. If the sensors are to be inversely pulsed, the encoder is applied to the master sensors, which in turn trigger the slave sensors.
- Encoder with gate: This functionality is fundamentally the same as for “Encoder”. In addition, the effect of the encoder and thus the triggering of the sensors can be interrupted via a digital input at the sensors (gate).

In addition to the questions above, questions are also asked about the exact wiring of the sensor interfaces:

- Mode of operation of the encoder (if used)
  - Only in forward movement
  - Only in backward movement
- Activation of the trigger (if used)
  - Rising edge
  - Falling edge
- Voltage level of digital inputs/encoder
  - TTL (5 V)
  - HTL (24 V)
- Input resistance of digital inputs/encoder
  - Pull up
  - Pull down

A 5 Standard Registration Objects

The following standard registration objects are available from Micro-Epsilon:

- Linear arrangement for 2, 4 or 8 sensors
- Thickness measuring arrangement for 1x2, 2x2 or 2x4 sensors
- 360° arrangement for 4 or 8 sensors

Fig. 34 Registration object 360° measurement for 4 sensors

A 6 Eplan Components

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