MICRO-EPSILON

Instruction Manual

eddyNCDT 3100/3100-SM

EPU05
EPS08
EPU1
EPS2
EPU3
EPU6
EPU15

Eddy current displacement measuring system

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Build 2592

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Appendix

1. Safety

Knowledge of the operating instructions is a prerequisite for equipment operation.

1.1 Symbols Used

The following symbols are used in this instruction manual:

⚠ CAUTION	Indicates a hazardous situation which, if not avoided, may result in minor or moderate injuries.
NOTICE	Indicates a situation which, if not avoided, may lead to property damage.
➡	Indicates a user action.
i	Indicates a user tip.

1.2 Warnings

⚠ CAUTION

Connect the power supply and the display-/output device in accordance with the safety regulations for electrical equipment.

> Danger of injury by electric shock

> Damage to or destruction of the sensor and/or the controller

NOTICE

The power supply may not exceed the specified limits.

> Damage to or destruction of the sensor and/or the controller

Avoid banging and knocking the sensor and the controller.

> Damage to or destruction of the sensor and/or the controller

Protect the cable against damage.

> Failure of the measuring device

1.3 Notes on CE Identification

The following applies to eddyNCDT series 3100/3100-SM:
- EU directive 2004/108/EC
- EU directive 2011/65/EC

Products which carry the CE mark satisfy the requirements of the quoted EU directives and the European standards (EN) listed therein. The EC declaration of conformity is kept available according to EC regulation, article 10, by the authorities responsible at

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The system is designed for use in industry and satisfies the requirements of the standards.

1.4 Proper Use

The eddyNCDT series 3100/3100-SM is designed for use in industrial areas. It is used for
- ▪ Displacement, distance, thickness measurement
- ▪ Position measurement of components and machine parts

- The system may only be operated within the limits specified in the technical data, see Chap. 2.5.
- Use the eddyNCDT series 3100/3100-SM only in such a way, that persons were not be endangered or machines were not be damaged due to malfunctions or total failure of the system.
- Take additional precautions for safety and damage prevention at safety-related applications.

1.5 Proper Environment

- Protection class:
  - Sensor: IP 67
  - Controller: IP 65
- Operating temperature:
  - Sensor and cable: -30 ... +100 °C (-22 ... +212 °F)
  - Controller: +10 ... +50 °C (+50 ... +122 °F)
- Humidity: 5 - 95 % (no condensation)
- Ambient pressure: Atmospheric pressure
- Storage temperature:
  - Sensor and cable: -55 ... +100 °C (-67 ... +212 °F)
  - Controller: -25 ... +75 °C (-13 ... +167 °F)

2. System Description

2.1 Measuring Principle

The eddyNCDT 3100/3100-SM (Non-Contacting Displacement Transducers) measurement system operates on the basis of eddy currents without making physical contact. It is used for measurements on objects consisting of electrically conducting materials which can have ferromagnetic or non-ferromagnetic properties.

High frequency alternating currents flow through a coil cast in a sensor housing. The electromagnetic field from the coil induces eddy currents in the electrically conducting measurement object, causing the alternating current resistance of the coil to change. This change of impedance delivers an electrical signal, which is proportional to the distance of the measurement object from the sensor.

The controller conditions the sensor signals ready for the user. The local linearization is simplified with an integrated micro-controller. Optimum accuracy is achieved for each metal measurement object and each mounting environment.

The measuring values are output both as a voltage and a current. A graphical representation and saving of measurement values in metric units is possible via the Ethernet interface.

i The eddy current measurement principle is suitable both for ferromagnetic and non-ferromagnetic materials.

Fig. 1 Single-channel measurement system eddyNCDT 3100-SM

2.2 Structure of the Measurement System

The non-contact single-channel displacement measurement system consists of:
- Sensor inclusive sensor cable
- Controller [1]
- Signal cable
- Power supply

The sensors have an integrated EEPROM memory, which contains the characteristics of the sensor. The sensors can be changed without recalibration. Also the change from ferromagnetic to non-ferromagnetic materials is possible without a new linearization. The sensors are adjusted ex factory to the materials aluminum (not ferromagnetic) or steel St 37, DIN 1.0037. The controller automatically get all the basic data by the sensor.

The housing of the controller is made from solid extruded aluminum and designed in IP 65. The mounting is alternatively possible on nuts, mounting holes or DIN rail. Each controller has a default IP at delivery, on which it can be activated and configured using a web browser.

The sensors are connected with a 3 m respectively 9 m long highly flexible cable. The connection to the controller is comfortable using a push-pull connector.

Advantages:
- Sensor change without renewed adjustment by integrated EEPROM
- Standard adjustment to ferromagnetic and non-ferromagnetic materials
- DIN rail mounting
- Highly flexible cable
- Pressure-proof sensors
- Cable lengths 3 m or 9 m
- Interfaces
  - Ethernet
  - 4 - 20 mA
  - 0 - 10 V, -5 ... +5 V (switchable in the controller)
- Measuring ranges 0.5 mm - 15 mm
- Configuration via web browser

1) Built into a compact aluminum housing.

2.3 Front View Controller, LED

Fig. 2 Front of the controller and functionality of LEDs

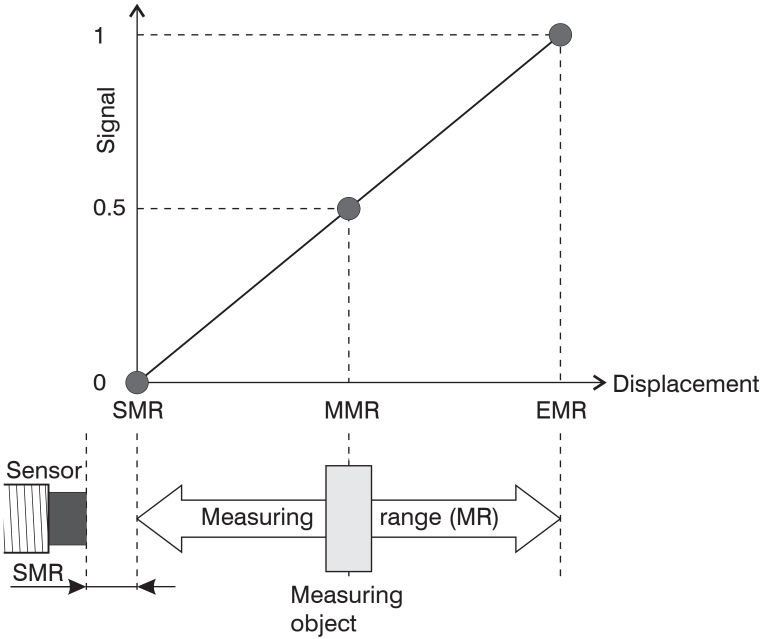
	Error		Calibration Status			Power	
	off	red	off	orange	green	off	green
During start, no sensor connected,		●	○				●
Controller in operation, measurement runs	○				●		●
Controller in operation, factory calibration	○			●			●
Calibration runs				☼			●
Calibration failed		●		●			●
No power supply	○		○			○	
Software update	-	☼	-	-	-		●
Sensor not compatible with controller		☼		☼			●

Legend LED

- ○ off
- ☼ flashes
- ● on

2.4 Glossary

SMR	Start of measuring range. Minimum distance between sensor front and measuring object, see Chap. 4.2.1
MMR	Midrange
EMR	End of measuring range (Start of measuring range + measuring range). Maximum distance between sensor front and measuring object.
MR	Measuring range



2.5 Technical Data

Sensor		EPU05	EPS08	EPU1	EPS2	EPU3	EPU6	EPU15
Screened			•		•			
Unscreened		•		•		•	•	•
Measuring range	mm	0.5	0.8	1	2	3	6	15
Cable length	3 m	•	•	•	•	•	•	•
	9 m			•	•	•	•	•
SMR	mm	0.05	0.08	0.1	0.2	0.3	0.6	1.5
Linearity		< ± 0.25 % FSO						
Repeatability	µm	< 0.5	< 0.5	< 1	< 2	< 2	< 5	< 15
Resolution [1]	µm	0.05	0.08	0.05	0.1	0.15	0.3	0.75
		0.01 % FSO		0.005 % FSO				
Frequency response/ sampling rate		Voltage output: 25 kHz (-3 dB)						
		Digital (Ethernet): 14.4 kHz; 7.2 kHz; 3.6 kHz (respectively 16 bit)						
Temperature compensation range		Standard: 10 up to 65 °C (+50 up to +149 °F)						
Temperature range	Controller	Operation: 10 up to 50 °C (+50 up to +122 °F)						
	Sensors	-30 up to 100 °C (-22 up to +212 °F)						
Temperature stability	Sensors (MMR)	± 0.025 % FSO / °C						
	Controller (MMR)	0.05 % FSO / °C						
Outputs		Voltage, current / and Ethernet						
Voltage output		0 ... 10 V, -5 ... +5 V, R_i max. 10 Ohm, max. 1 mA						
Current output		4 ... 20 mA, load max. 200 Ohm						
Supply		24 VDC (11 ... 30 V) / approx. 5 W						
Weight controller		640 g						
Synchronization	only DT3100-SM	via cable SC 3100-0.3 (accessory)						
Protection class	Controller	IP 65 (only at connected plug-in connectors/ cover)						
	Sensors	IP 67						

1) Static resolution, relates to midrange

FSO = Full Scale Output   SMR = Start of measuring range   MMR = Midrange

FSO =
Full scale output

MMR =
Midrange

3. Delivery

3.1 Supplied Item, Unpacking

1 Controller

1 Instruction Manual

1 Network cable SCD2/4/RJ45 (-25 ... +80 °C (-13 ... +176 ° F) fixed installation, -5 ... +60 °C (+23 ... +140 °F) flexible)

1 6-pin male connector for supply/output

1 Blank plug for Ethernet female connector

2 Slot nuts

Separately packed:

1 Sensor inclusive sensor cable

For eddyNCDT3100-SM:

1 Synchronization cable SC3100-0.3

2 Blank plug for unused synchronization sockets

➡ Check for completeness and any signs of transport damage immediately after unpacking.

➡ In case of damage or missing parts, please contact the manufacturer or supplier immediately.

3.2 Storage

- Storage temperature:
  - Sensor and cable: -55 ... +100 °C (-66 ... +212 °F)
  - Controller: -25 ... +75 °C (-13 ... +167 °F)
- Humidity: 5 - 95 % (non condensing)

4. Installation and Assembly

4.1 Precautions

No sharp or heavy objects should be allowed to affect the cable sheath of the sensor cable, the supply cable and the output cable.

➡ Check all plug-in connections for firm seating before starting operation.

4.2 Sensor

Unscreened sensors, see Fig. 3

- Type designation: EPUx..
- Construction: The front part of the sensor with encapsulated coil consists of electrically non-conducting materials.

i In the radial direction metal parts in the vicinity may behave similar to the measuring object, rendering the measurement result inaccurate. Please note this by selection of material for sensor mounting and their setup.

Screened sensors, see Fig. 4

- Type designation: EPSx..
- Construction: The sensor enclosed up to its front face with a steel housing with a mounting thread. With it the sensor is screened from interference through radially near located metal parts.

Fig. 3 Unscreened sensor

Fig. 4 Screened sensor

4.2.1 Start of Measuring Range

For each sensor a minimum distance to the measuring object must be maintained. This avoids a measurement uncertainty due to the sensor pressing on the measuring object and mechanical damage to the sensor/measuring object.

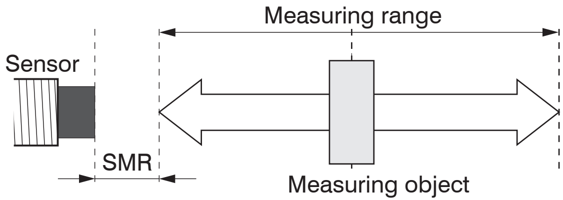
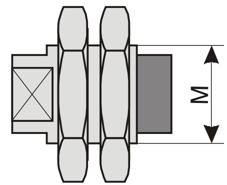
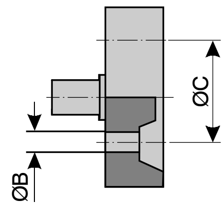


Fig. 5 Start of measuring range (MBA), the smallest distance between sensor face and measuring object

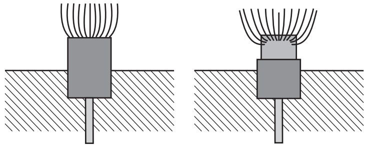
Sensor	Start of measuring range	Measuring range	Mounting thread M	
EPU05	0.05 mm	0.5 mm	M3x0.35	
EPS08	0.08 mm	0.8 mm	M5x0.5	
EPU1	0.1 mm	1 mm	M6x0.5	
EPS2	0.2 mm	2 mm	M12x1	
EPU3	0.3 mm	3 mm	M12x1	
EPU6	0.6 mm	6 mm	M18x1	

Sensor	Start of measuring range	Measuring range	Mounting hole B	Bolt circle C	
EPU15	1.5 mm	15 mm	ø 4.2 mm	ø 20 mm	

Eddy-current displacement sensors can be affected in their measurement properties by a metallic holder. Depending on the sensor type, the following sensor mounting should be preferred:
- unscreened sensors: Standard mounting
- screened sensors: Flush mounting

4.2.2 Standard Mounting

The sensors protrude beyond the metal holder.



Sensors with a thread

- Insert the sensor through the hole in the sensor holder.
- Screw the sensor tight.
- Turn the mounting nuts on both sides on the thread protruding from the holder.
- Tighten the mounting nuts carefully to avoid damage, particularly to smaller sensors.

i Prefer the standard mounting of the sensor, because the optimum measurement results can be achieved with this method!

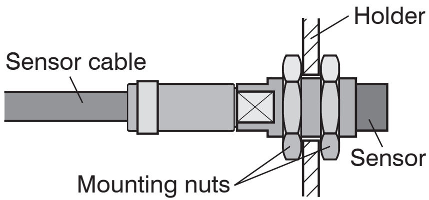


Fig. 6 Unscreened sensor with thread in standard mounting

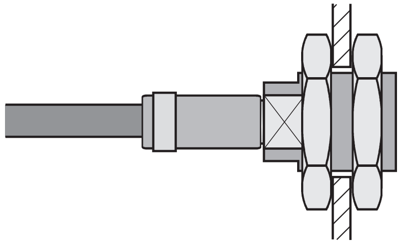


Fig. 7 Screened sensor with thread in standard mounting

i During calibration maintain the same relative position of the sensor to the holder as for the measurement!

Sensors without metallic housing

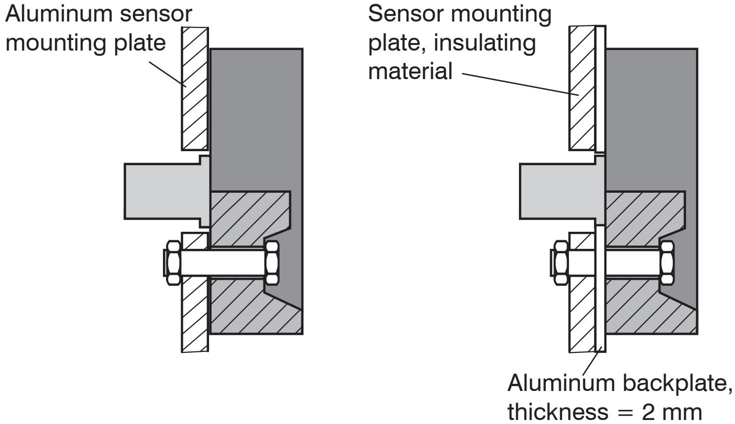


Fig. 8 Sensor EPU15 without a metallic housing in standard mounting

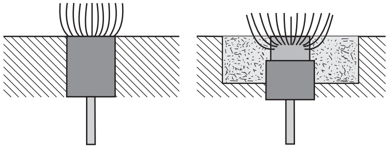
Diameter of the metallic sensor mounting plate respectively metallic backplate:

Sensor dia. ≤ DIA ≤ 3x Sensor dia. or more. Optimum: Diameter of the sensor holding plate = 1.3 x sensor diameter.

➡ Fix the sensor using the threaded pins on the metal sensor mounting plate or fix the sensor using the threaded pins and metallic backplate (included in the delivery) on the sensor mounting plate.

➡ Carefully tighten the mounting nuts on the threaded pins to avoid damage to the sensor.

4.2.3 Flush Mounting



Sensors with a thread

- Mount screened or unscreened sensors flush in a sensor holder of insulating material (plastic, ceramic, et cetera).
- Mount the screened sensors flush in a metal sensor holder.
- Mount the unscreened sensors flush in a metal sensor holder. Make sure that a recess of a size three times the sensor diameter is used, see Fig. 10.
- In all mounting cases screw the sensor into the threaded hole and lock it with the mounting nut.
- Tighten carefully to avoid damage, particularly to smaller sensors.

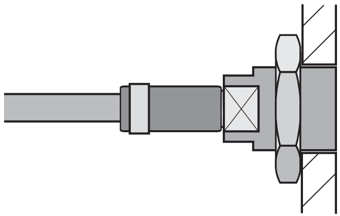


Fig. 9 Flush mounting of a screened sensor in a metal holder

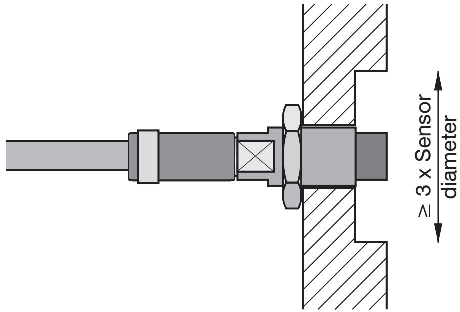


Fig. 10 Flush mounting of an unscreened sensor in a metal holder.

Calibrate the measurement system in the measurement arrangement with the original mounted sensor!

4.2.4 Measuring Object Size

The relative size of the measuring object to the sensor has effects on the linearity deviation for eddy current sensors. Ideally, the measuring object size
- for shielded sensors is at least 1.5 times the sensor diameter,
- for unshielded sensors at least 3 times the sensor diameter.

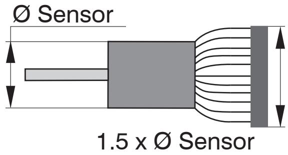


Fig. 11 Minimum object size for shielded sensors, type EPS

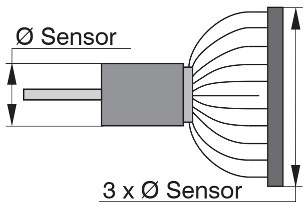


Fig. 12 Minimum object size for unshielded sensors, type EPU

If the required object minimum size can not be complied with, the following aspects must be taken into account for a sufficiently high linearity:
- The size of the measuring object must not change.
- The measuring object must not be moved laterally to the sensor face.

A successful calibration is a prerequisite to minimise linearity errors, see Chap. 5.3.1.

A linearity calibration on the corresponding measuring object must be performed without fail. A change of the measuring object size has significant effects on the measurement results.

4.2.5 Dimensional Drawings

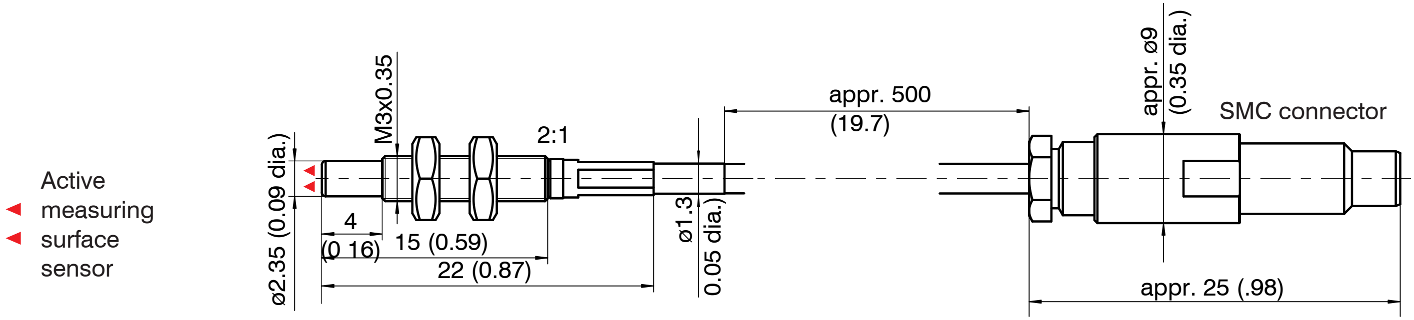


Fig. 13 Dimensions EPU05 without cable extension, dimensions in mm (inches), not to scale

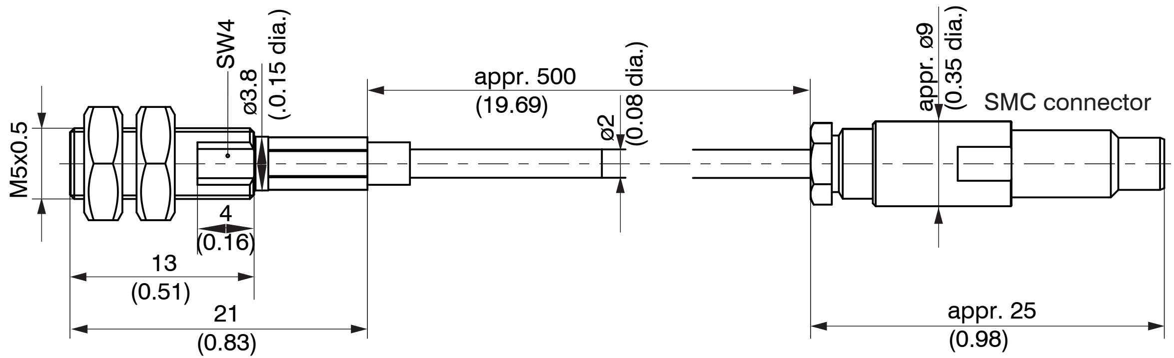


Fig. 14 Dimensions EPS08 without cable extension, dimensions in mm (inches), not to scale

The sensor EPU05 respectively EPS08 forms a unit together with the cable extension. With a sensor exchange, the sensor extension cable must also be changed.

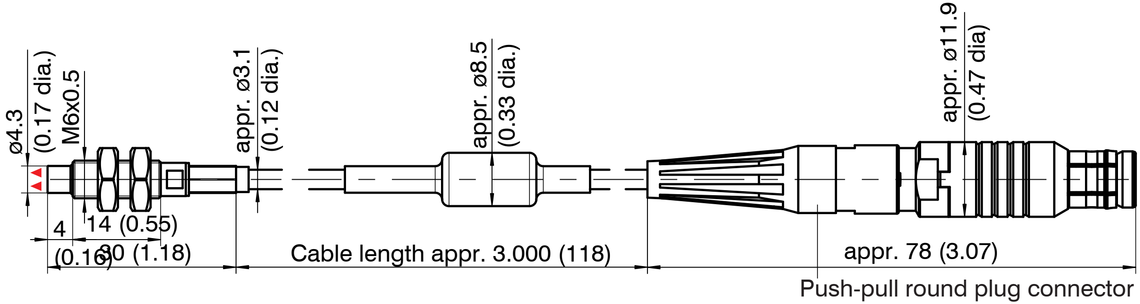


Fig. 15 Dimensions EPU1, dimensions in mm (inches), not to scale

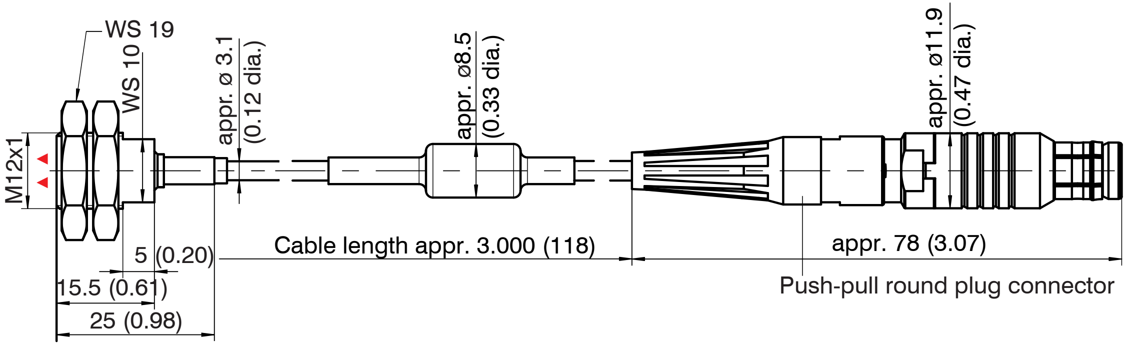


Fig. 16 Dimensions EPS2, dimensions in mm (inches), not to scale

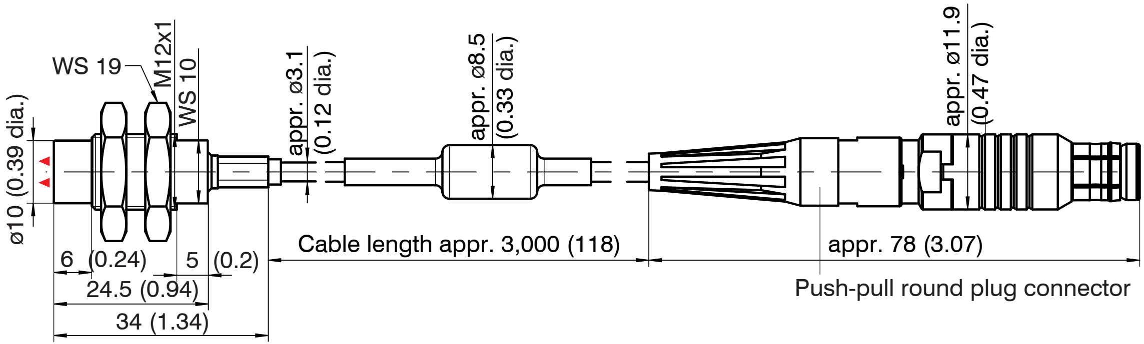


Fig. 17 Dimensions EPU3, dimensions in mm (inches), not to scale

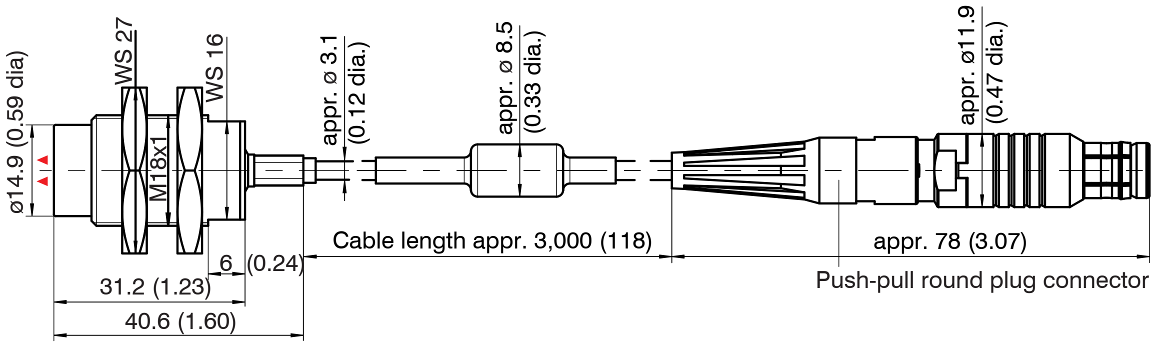


Fig. 18 Dimensions EPU6, dimensions in mm (inches), not to scale

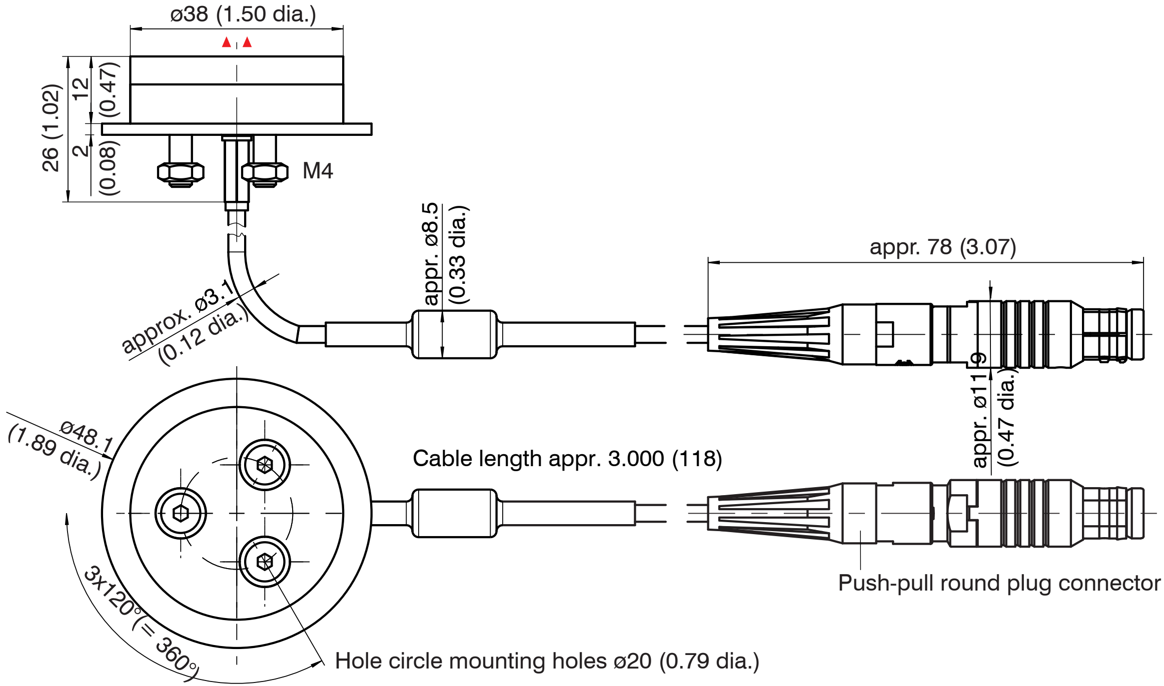


Fig. 19 Dimensions EPU15, dimensions in mm (inches), not to scale

4.3 Sensor Cable

- Do not kink the cable - the minimum bending radius is 7 mm (static) respectively 16 mm (moved).
- Lay the cable such that no sharp-edged or heavy objects can affect the cable sheath.
- Make the connection between the sensor and controller.
- Connect the sensor cable to the front side of the controller, see Fig. 20.

Guiding grooves on the connectors prevent a false connecting. To release the connector the connectors are to grip at the handle pieces (outer sleeves) and are just to pull them apart. Pulling on the cable and the clamping nut locks the connector and does not release the connection. Avoid the excessive pulling on the cables.

- Check the plugged connections for firm seating.

Fig. 20 Front view controller, connector sensor

i In pressurized areas protect the cable from pressurization!

4.4 Ethernet Connection

The Ethernet connection is via an M12 screw connection, encoding D. The network cable SCD2/4/RJ45 has a round connector and a RJ45 connector.

4.5 Controller

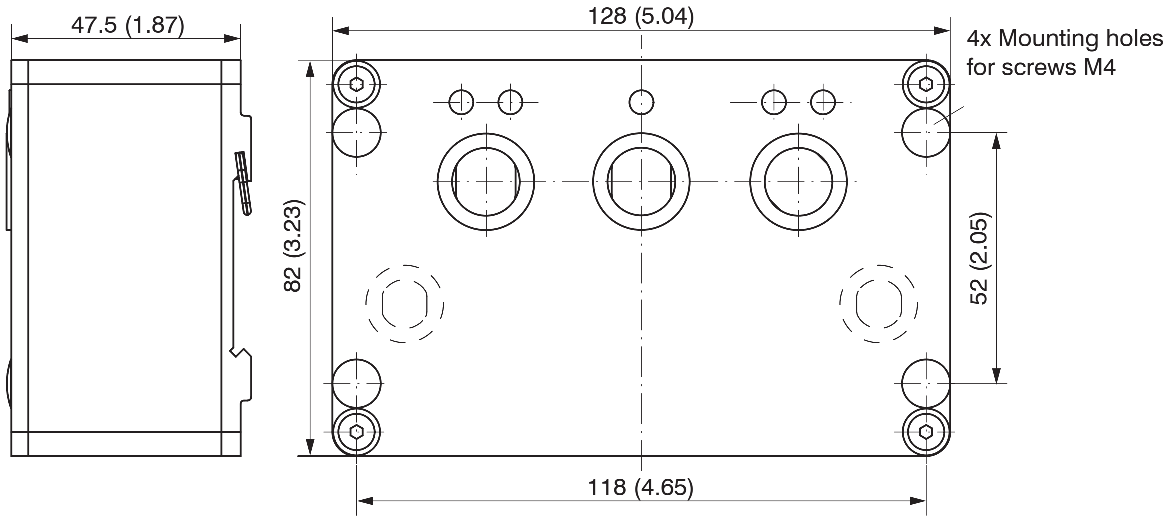


Fig. 21 Dimensional drawing and mounting method for controller, dimensions in mm (inches), not to scale

Mounting methods for controller:
- With four M4 screws on the mounting holes
- DIN rail, 35 mm
- With two slot nuts, included in the delivery. The housing cover does not have to remove for the insertion of slot nuts.

4.6 Connecting the Measurement System

4.6.1 eddyNCDT 3100

Provide the power supply for the controller.

➡ Connect the supply / output cable PC3100-3/6, available as an accessory, or a cable made up by the user.

- to the 6-pin female connector (Supply/Output, see Fig. 22) on the controller.
- to a power supply +24 VDC.

➡ Connect the measurement signal displays and recording devices to the controller.

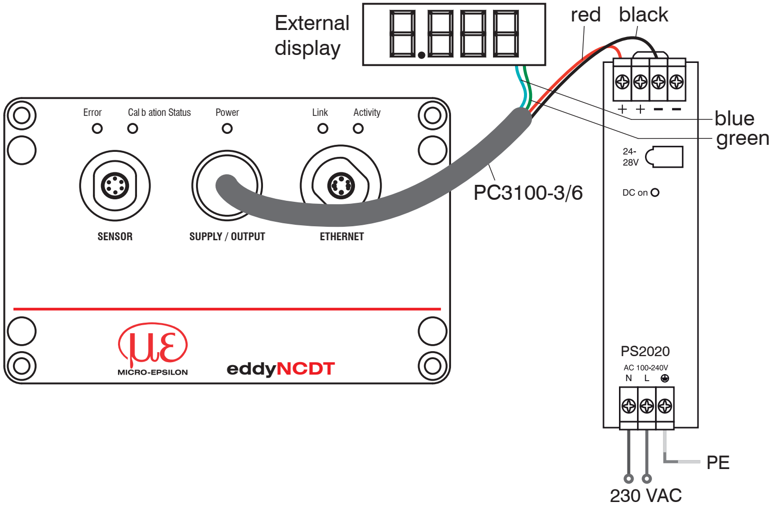


Fig. 22 Supply of a controller DT 3100 using a PS2020

4.6.2 eddyNCDT 3100-SM

Provide the power supply for the controller.

➡ Connect the supply / output cable PC3100-3/6 or a cable made up by the user.

- to the 6-pin female connector (Supply/Output, see Fig. 23) on the controller.
- to a power supply ± 24 VDC.

➡ Connect the measurement signal displays and recording devices to the controller.

➡ Connect the synchronization cable SC3100-0.3 to output SYNC OUT of controller 1 and to input SYNC In of controller 2. Sync-In and Sync-Out on cable are encoded differently.

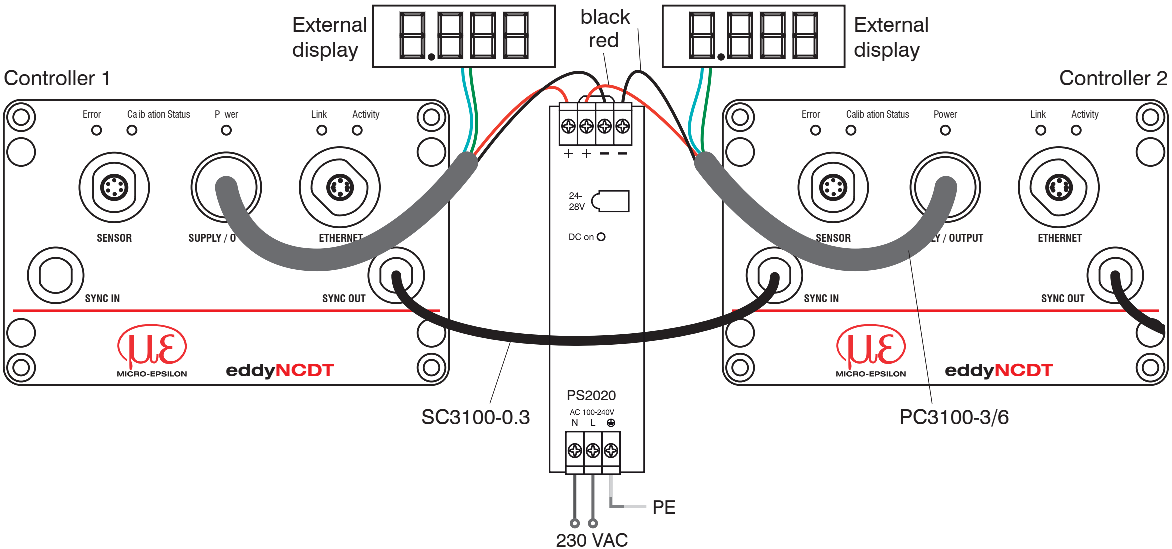
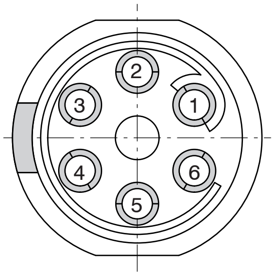


Fig. 23 Measurement setup and synchronization of two or more controllers DT 3100-SM

Note also the information to the synchronization, see Chap. 4.7.

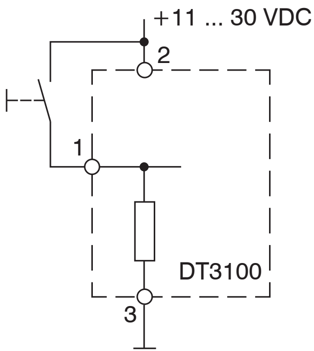
4.6.3 Inputs and Outputs Supply/OUTPUT

The two analog outputs (voltage or current) are both together DC isolated from the power supply.



Signal Designation	Controller Pin	Cable PC3100-x/6	Cable PC3100-x/6/BNC
Trigger In	1	grey	grey
+ 24 VDC	2	red	Power supply unit Input 100-240 V Output 24 V / 1 A
Ground supply	3	black	
Voltage output	4	green	BNC-connector
Current output	5	yellow	yellow
Ground analog output	6	blue	blue
Main screen	Housing	black	black

Fig. 24 6-pin round connector for supply/analog output, view on solder pin side

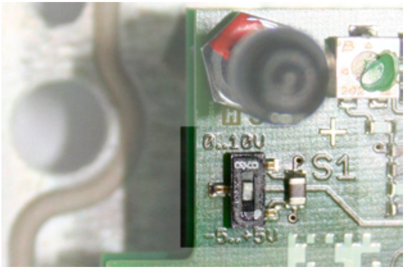


The input is high active and connected with the supply ground to high impedance. The input is used to receive specific measuring values, see Chap. 5.4.

The trigger input indicates in response to a range of +5 ... +30 V, so also with TTL level.

Fig. 25 Wiring trigger respectively gate input

4.6.4 Voltage Output



The voltage output provides either an analog signal in the range of 0 ... 10 V (factory setting) or -5 ... +5 V.

➡ Open the cover on the controller, in order to change the range of the voltage output.

Fig. 26 Sliding switch for the range selection voltage output

4.6.5 Cable Screening, Grounds

The screening of sensor cable, of current and voltage output and of the synchronization cable is connected to the ground analog output. The main screen of cable for Supply/Output and Ethernet is connected to the housing ground. Housing ground and ground supply are connected to each other with a capacity of 12 nF.

4.7 Synchronization

If a number of measurement channels of the Series DT 3100-SM are operated with the sensors in close proximity or low sensor cable distance to one another, then mutual influencing is possible due to slightly different oscillator frequencies. This can be avoided by synchronizing the oscillators. To do this the controller must be connected together with the 30 cm long synchronization cable SC3100-0.3. When connected, the oscillator of the controller 2 (Slave) switches automatically to synchronization mode and operates in dependence of the controller 1 (Master).

Up to ten systems can be synchronized to one another by cascading in this way, see Chap. Fig. 23. Controller with different sensor frequencies can be synchronized.

i When the controller are synchronized, the ground analog output of each controller is connected to each other.

i In the current operation no synchronization cables are plugged in/unplugged or controller switched on/switched off. This leads to a restart of individual controllers.

5. Operation

5.1 Commissioning

- Connect the controller with a voltage supply, see Chap. 4.6.
- Connect the sensor and controller with a sensor cable, see Chap. 4.3.

After switching on the controller follows the initialization. The measuring system is ready for use after approximately 5 s. Let the measuring system warming-up about 30 minutes for exact measurements. The configuration is possible via the controller integrated in the web pages.

5.2 Operation Using Ethernet

The controller generates dynamic web pages, that contain the current settings of the controller and the peripherals. The operation is only possible as long as there is an Ethernet connection to the controller.

5.2.1 Requirements

You need a web browser (for example Mozilla Firefox ≥ 3 or Internet Explorer 7) on a PC with network connection. Decide if the controller is connected to a network or directly to a PC. A dynamic IP address (DHCP) doesn’t work at the local network connection of PC or laptop.

Ex factory the controller works with a static IP address.

If you have set the browser, so that it accesses the internet via a proxy server, please add the IP address of the controller in the settings of the browser to the IP addresses, that should not be routed through the proxy server. You will find the MAC address of measuring device on the info-tab of the web-site of the controller.

“Javascript“ must be activated for controller configuration and graphical description of the measuring results. Further the PC needs Java Runtime Environment (JRE). For security reasons, the latest version of the Java Runtime Environment, should be installed, but at least version 6, update 12, should be installed.
Source of supply: www.java.com

5.2.2 Access via Ethernet

Direct PC connection	Network
Static IP address, factory setting	Dynamic IP address (DHCP) [1]
➡ Connect the controller to a PC using a direct Ethernet connection (LAN). Use the network cable included in the delivery.	➡ Connect the controller with a switch (intranet). Use the network cable included in the delivery.
The controller needs a fixed IP address to establish a direct connection. Ex factory the IP address is: 169.254.3.100. This assumes, that the LAN connection on the PC uses for example the following IP address: 169.254.3.1. Change the IP settings on your PC (IP address ranges must fit together). ➡ Start a web browser on your PC. Enter the IP address of the controller in the address bar of the web browser.	➡ Start a web browser on your PC. Enter the `DHCP Host Name` in the address bar of the web browser. Some networks also need a `MAC address`. To do this, contact your network administrator.

1) Assumes, that the controller has been addressed unique via the static IP address (direct connection) and the automatic address assignment (DHCP) has been activated.

In your web browser a web page appears, that allows to download the software for programming the controller.

Fig. 27 First interactive web page for downloading and starting the software

- Click image of eddyNCDT 3100 controller and save the file „DT3100Software_V<version number>_<IP address>.jnlp“ on the local hard drive.
- Double click on the downloaded .jnlp file.

If Java is installed correctly, the .jnlp file should be executed automatically with Java Web Start.

- If .jnlp file does not start, open the `Run` window by pressing the `WIN` button + `R` and type `cmd`.
- Confirm with `OK`.

The Windows command prompt appears.

➡ Write “javaws <path to .jnlp file>“ (for example „javaws C:\Downloads \DT3100Software_V6793_169.254.3.100.jnlp“)

➡ Confirm with `Return` button.

The software for programming the controller is running with Java Web Start.

i Running the jnlp file directly from the web browser is usually not supported by the web browser.

➡ Change the IP address according to your requirements (Menu `Configuration > IP Configuration`), especially for a use of more than one controller in the same network. Click on the `Apply settings` button. Alternatively you may change to `Obtain IP address automatically`, if you want to use the controller in a network. ➡ Give the controller a `DHCP Host Name`. ➡ Note the `DHCP Host Name`. ➡ Click on the `Apply settings` button.	For more information to the IP configuration, see Chap. 5.3.2 (IP configuration).

Fig. 28 User interface after starting the downloaded jnlp file

Use the upper navigation bar to access additional features (settings, informations etc.)

➡ Press the button `Save settings` to store the settings permanently. Otherwise, settings are lost when the power supply is interrupted to the controller.

All settings in the website are immediately executed in the controller.

5.3 Settings

5.3.1 Calibration

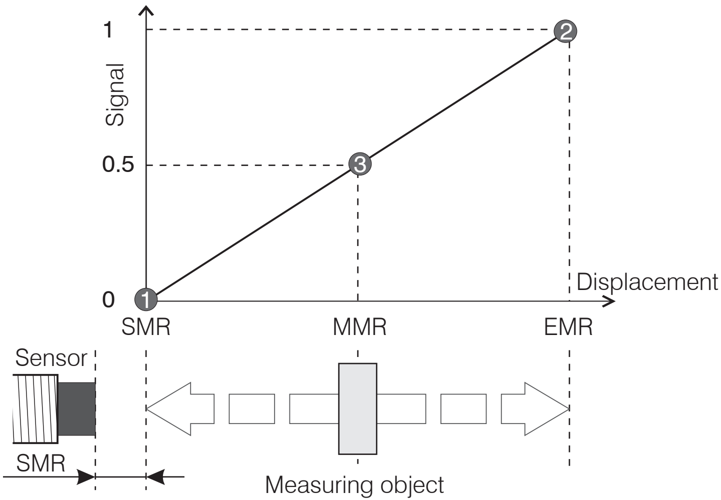
5.3.1.1 General

Measurement systems of the series eddyNCDT 3100 are supplied with a factory calibration. Each sensor is calibrated ex factory to the materials aluminum and St37. Customized measuring object materials are possible. In case of changing the installation situation of the sensor, the measuring object material or the measuring object geometry by the user, Micro-Epsilon recommends a calibration before measuring.

Use, besides, as far as possible the original sensor mounting and the original measuring object.

The adjustment occurs via 3 distance points, which are determined by a reference standard.

i If the original measuring object should not be used, you may simulate the measuring environment as exactly as possible.



3 reference points:

Start of measuring range SMR (1)

End of measuring range EMR (2)

Midrange MMR (3)

Calibration tools:

- Special micrometer calibration appliance with non-rotating micrometer spindle, see Fig. 30 (available as accessory), or
- distance disk from ceramics (easy handling)

Fig. 29 Linearization of one eddyNCDT 3100 on three reference points

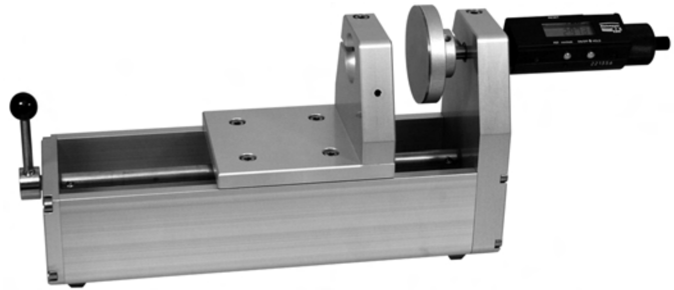


Fig. 30 Micrometer calibration appliance

Each measuring channel is tested before delivery.

Procedure

i Before a measurement or a calibration is performed, the measuring device should warm up for about 30 minutes.

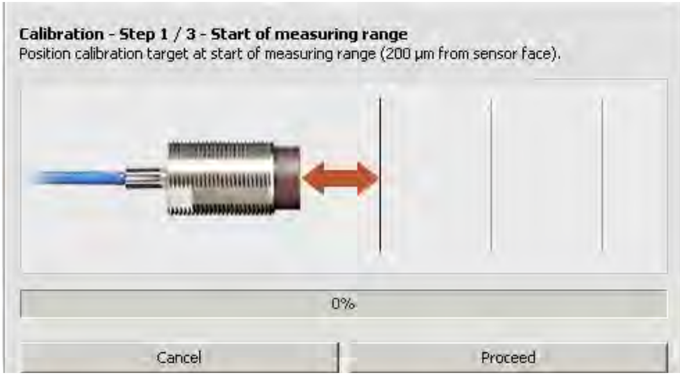
i Do not use the analog output during the calibration; disconnect downstream control systems from the analog output.

i The calibration data are saved in the controller. The factory calibration is saved in the sensor.

5.3.1.2 Standard Calibration

The standard calibration use the exact positions SMR, EMR and MMR for calibration.

- Change to the menu `Configuration > Calibration`.
- Choose the material of the used measuring object or a customized material.
- Click on the `Start calibration` button .

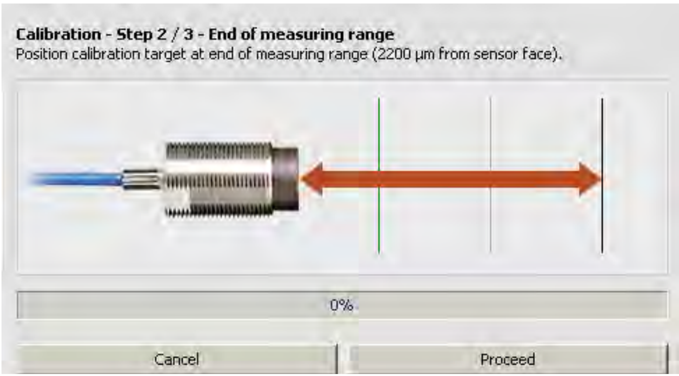


- Position the measuring object to the reference point start of measuring range (SMR). The start of measuring range is 10 % of the sensor measuring range.

The software displays you the distance. The start of measuring range is assigned to the sensor type, see Chap. 4.2.1.

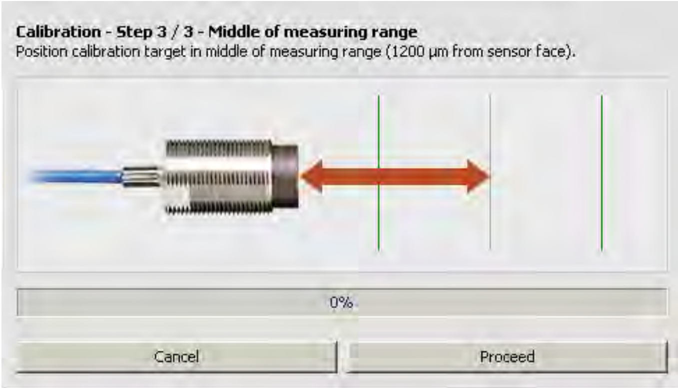
- Click on the `Proceed` button.

The controller takes over the current sensor value as the start value for the calibration.



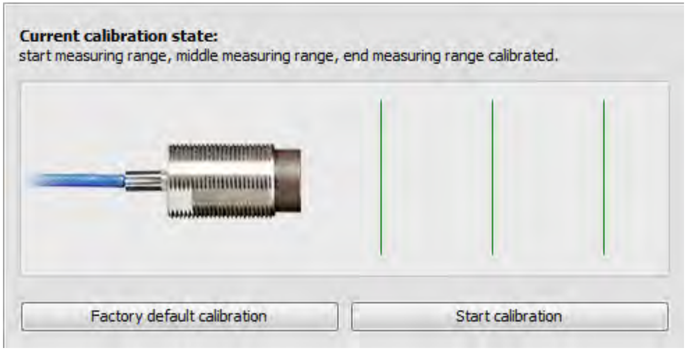
- Position the measuring object to the reference point end of measuring range (EMR), so including SMR, see Figure.
- Click on the `Proceed` button.

The controller takes over the current sensor value as end value for the calibration.



- Position the measuring object to the reference point midrange (MMR), so start of measuring range plus half measuring range.
- Click on the `Proceed` button.

The controller takes over the current sensor value as a reference value for the calibration and does the linearization.



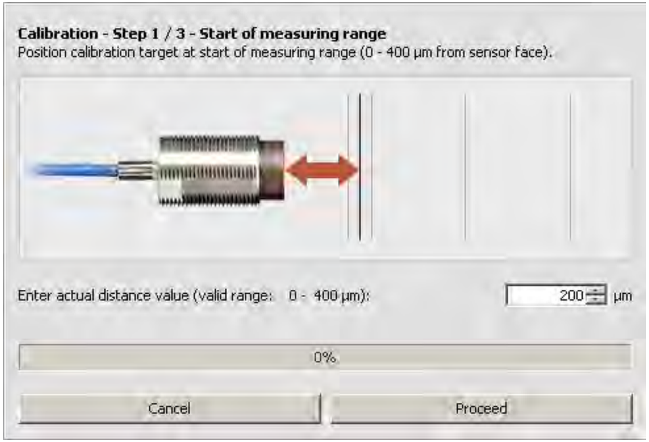
The system notifies the completion of the calibration.

The LED Calibration Status changes to green.

5.3.1.3 Extended Calibration

The extended calibration is suitable for applications, in which the positions SMR, EMR and MMR are defined by a calibration tool, for example by distance disks from ceramics.

- Change to the `Info` menu and click on the checkbox `Enable advanced calibration`.
- Change to the menu `Configuration > Calibration`.
- Click on the `Start calibration` button.



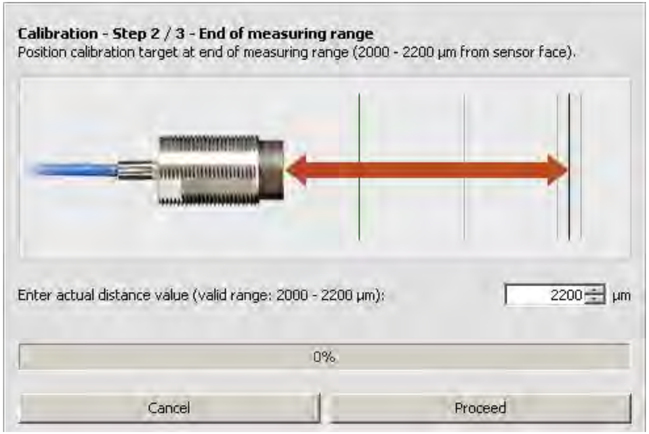
- Place the calibration tool for the start value between the sensor face and the measuring object.

The distance between sensor face and measuring object is max. ±10 % of measuring range.

- Input the actual thickness of the calibration tool.
- Click on the `Proceed` button.

The controller takes over the current sensor value as start value for the calibration.

i The difference from the end of measuring range position and the start of measuring range position should not exceed 100 %.



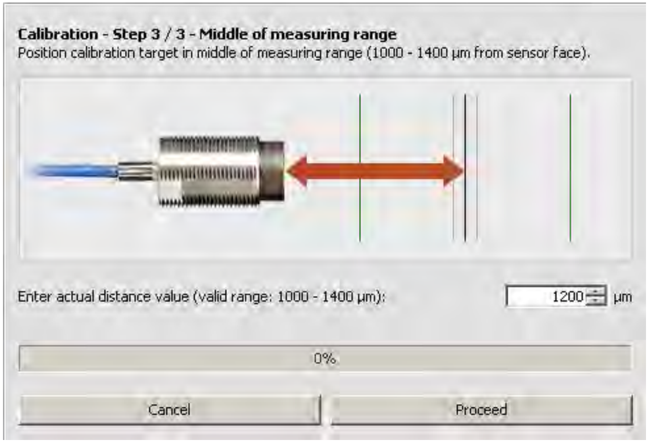
➡ Place the calibration tool for the end value between the sensor face and the measuring object.

The distance between sensor face and measuring object is min. 90 % and max. 110 % of the measuring range.

➡ Input the actual thickness of the calibration tool.

➡ Click on the `Proceed` button.

The controller takes over the current sensor value as end value for the calibration.



➡ Place the calibration tool for the mid-range between the sensor face and the measuring object.

The distance between sensor face and measuring object is min. 40 % and max. 60 % of the measuring range.

➡ Input the actual thickness of the calibration tool.

➡ Click on the `Proceed` button.

The controller takes over the current sensor value as the reference value for the calibration and performs the linearization.

5.3.1.4 Possible Causes for a Failed Calibration

- Pre-attenuation sensor due to insufficient sensor mounting situation
- Distances sensor face to measuring object were set incorrectly or moved during the calibration.
- Measuring object material chosen incorrectly
- Measuring object too small or unusual design
- Sensor face contaminated by cuttings
- Sensor or sensor cable damaged

5.3.1.5 Call Factory Calibration

Measuring systems of the eddyNCDT series are delivered with a factory calibration. You can restore the factory calibration as follows.

➡ Change to the `Configuration` menu and click on the `Factory default calibration` button.

The color of the LED Calibration Status changes to orange.

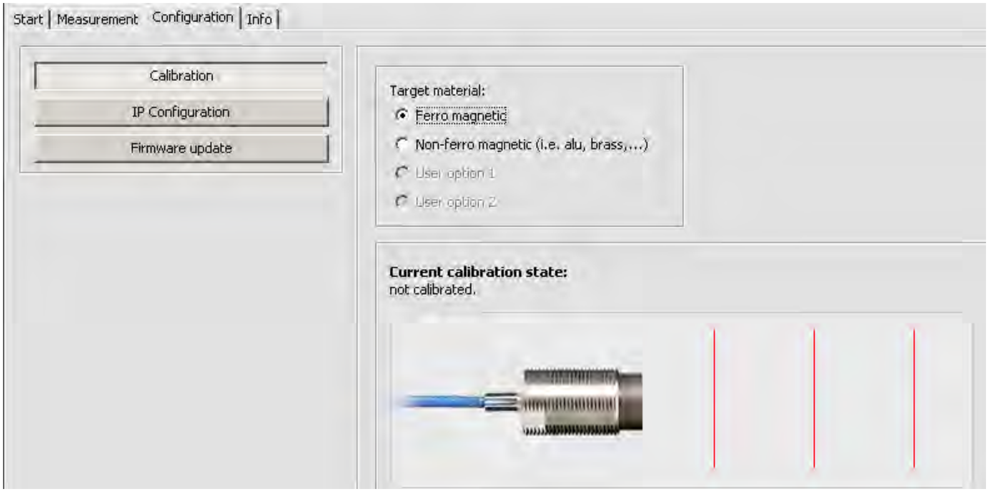
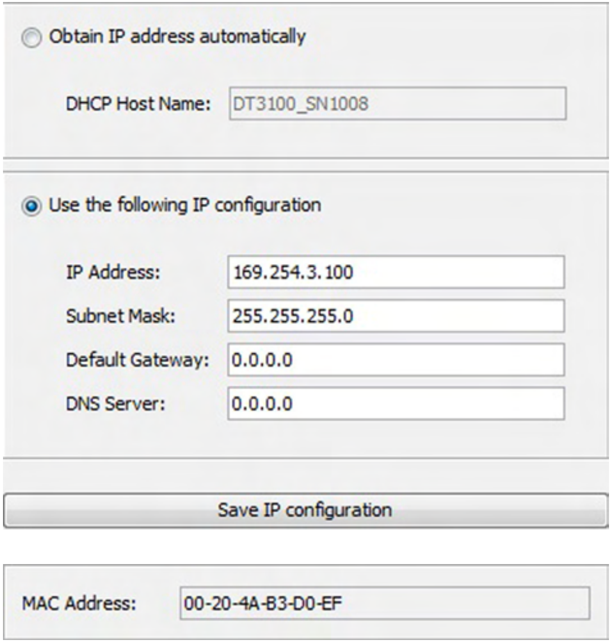


Fig. 31 Surface for the calibration

5.3.2 IP Configuration



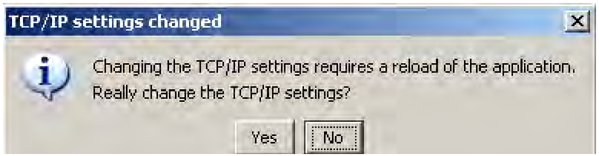
The controller operates optionally with a static IP address or with an IP address (DHCP), assigned by a server. Per default the controller is provided with a static IP address. The IP address is: 169.254.3.100. The IP address is listed on the type label.

With an IP address (DHCP), assigned by a server, the controller can also be addressed via the host name. The `DHCP Host Name` can be assigned individually itself.

The `MAC Address` (Media-Access-Control-Address) is stored in the hardware for each controller. Each controller can thus be identified uniquely in a network. In some networks the MAC address must be known for operation with DHCP. Ask your network administrator in case of difficulties during the connection.

You will find further details in the Chapter Access via Ethernet, see Chap. 5.2.2.

Fig. 32 Menu Configuration > IP Configuration



If the `Apply settings` button is clicked, a confirmation message follows in order to avoid the IP settings changing inadvertently.

5.3.3 Firmware Update

i By updating the calibration is not affected. Newly added parameters are set to their default values.

The controller stores the calibration for a sensor, regardless of a ferromagnetic, non-ferromagnetic or both materials. The controller needn’t to be calibrated, if the firmware update has been done.

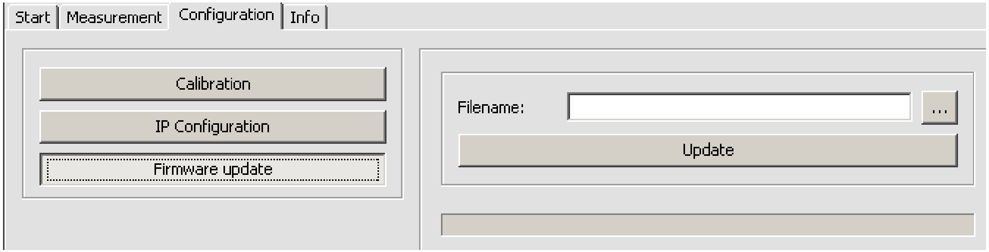


Fig. 33 Menu Configuration > Firmware update

- Select with … the file to be installed.
- Click on the `Update` button.

The update takes about 3 minutes. The LED Error flashes. During this time network and the supply voltage at the controller haven’t to be interrupted.

- Restart the browser after the update.

After the update, the updated software must be reloaded from the controller, see Chap. 5.2.2.

It is recommended to remove the old jnlp file and remove the software from the “Java application cache”.

- Click to `Control panel` > `Java` > `General` > `View`.
- Delete all instances of eddyNCDT 3100 software.

5.4 Measuring Value Presentation with Ethernet

5.4.1 Web Interface

➡ Start the measuring value display (`Measurement`)in the horizontal navigation bar.

i The diagram control and display is loaded in the browser as a Java program and continues to run independently from the controller (which will also continue to operate separately) and outputs analog measuring values to current and voltage output.

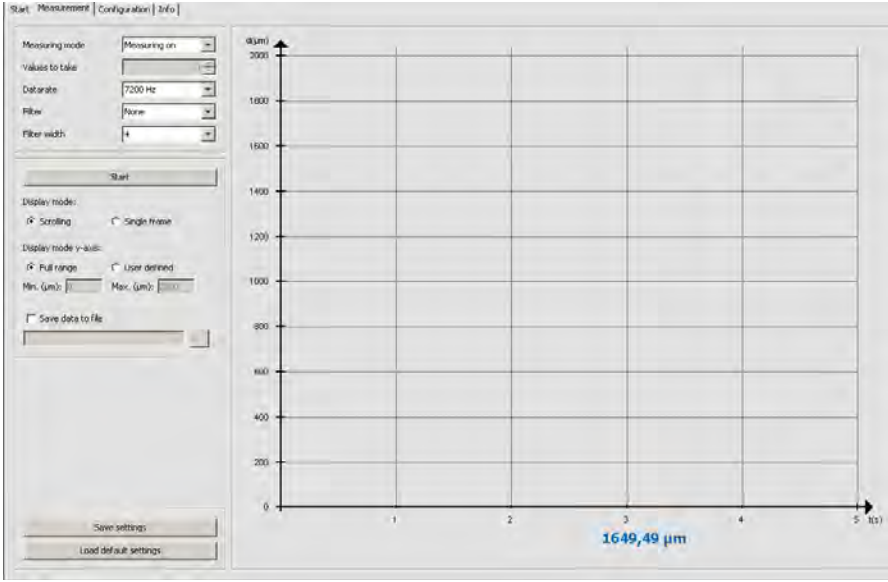


Fig. 34 Web page `Measurement` *(Distance measurement)*

➡ Click on the `Start` button for starting the display of the measurement results.

Measuring mode	*Measuring on / Measuring off*		*Measuring values are transmit continuously in the background with the parameter* `Measurement`*. The graphical description of measuring values is activated with the* `Start` *button and stoped with the* `Stop` *button.*
	Trigger: rising edge / Trigger: falling edge /		*The trigger function accesses a limited number of measuring values (Parameter* `Values to take`*), when the condition is fulfilled at the external trigger input. The trigger function ends either the trigger function is no longer true or* `Measuring off` *is selected as measuring mode.*
	Gate: high level / Gate: low level I		*The gate function accesses an unlimited number of measuring values, when the condition is fulfilled. The gate function ends either the gate function is no longer true or* `Measuring off` *is selected as measuring mode.*
Value to take	*Value*	1 ... 9999	*Determines the number of measuring values, which are output during the trigger function.*
Data rate	*3600 / 7200 / 14400 Hz*		*Specifies the output frequency of measuring values.*
Filter	*Sliding mean / Recursive mean / Median / None*		*The filtering in measuring mode* `Measuring` *and the* `Gate` *function is possible.*
Filter width	*Value*	4, 8 ,16, 32	*Number of measuring values at moving and recursive average.*
	Value	3, 5, 7, 9	*Number of measuring values at median.*
Display mode	*Scrolling / Single frame*		*Scrolling: displays continuously the measuring values on a running timeline.* *Single frame: If the measuring window is full, the timeline jumps to the next measuring window area.*
Display mode Y-axis	*Full range*		*Scaling of Y-axis from 0 up to end measuring range.*
	User defined		*Value* *Values for minimum and maximum measuring value to be displayed. Message to overrun or lower deviation.*
Save data to file	*Value*	path	*Saves the measuring values in an ASCII file. Values in micrometer, inclusive two decimal places. It is possible for each measuring mode.*

Selection required

Value Specification of a value required

5.4.2 Triggering and Gate Function

5.4.2.1 Basics

The Ethernet measuring value output on eddyNCDT 3100 can be controlled by an external signal (electrical signal). Only the digital output is affected. The trigger or gate function has no effect on the analog outputs. Pin 1 on the connector Supply/Output is used an external input, see Chap. 4.6.3. Referring potential is ground supply.

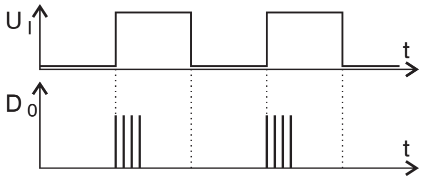
5.4.2.2 Types

The Ethernet measuring value output in trigger mode or gate function can be controlled over the edge as well as via the level of the signal. As conditions are implemented:

- Rising edge (edge positive),
- Falling edge (edge negative),
- Level high (level H) or
- Level low (level L).

You can specify the conditions (edge or level) via the web interface, see Fig. 34, or by command, see Chap. A 2.

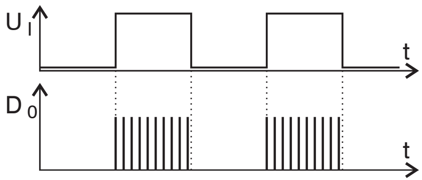
Edge triggering



The previously set number of measuring values is transmitted via the Ethernet interface after the trigger edge. The edge triggering does not support an averaging function.

Fig. 35 Trigger edge LH (above) and output signal (below)

Gate function, level



So long measuring values are transmitted via the Ethernet interface („gate“), as the level condition is fulfilled.

Fig. 36 Trigger edge LH (above) and output signal (below)

5.4.3 Averaging

The web interface is programmed ex factory with the default “no averaging”, i.e, without averaging. Averaging has no effect on linearity.

Averaging methods in web interface are:
- Moving average,
- Recursive average and
- Median

implemented.

The purpose af averaging is to:
- Improve the resolution
- Eliminate signal spikes
- “Smooth out” the signal.

i The set averaging method and the averaging number can be saved in the web interface.

You can specify the conditions (averaging method and averaging number) via the web interface, see Fig. 34, or by command, see Chap. A 2.

5.4.3.1 Averaging Number

The averaging number indicates on how many successive measuring values is averaged, before the measuring values are output. The averaging does not affect the data rate.

5.4.3.2 Moving Average

The selected number N of successive measuring values (window width) is used to generate the arithmetic average value M_{gl} on the basis of the following formula:

$$M_{gl} = \frac{\sum_{k=1}^{N} MV\ (k)}{N}$$

MV = Measuring value
N = Averaging number
k = Running index (in window)
M_{gl} = Averaging value respectively output value

Each new measuring value is added and the first (oldest) measuring value from the averaging process (from fhe window) taken out again. This results in short transient recovery times for jumps in measurement values.

Example: N = 4

	... 0, 1, 2, 2, 1, 3	... 1, 2, 2, 1, 3, 4	Measuring values
	↓	↓	
	$\frac{2+2+1+3}{4} = M_{gl}(n)$	$\frac{2+1+3+4}{4} = M_{gl}(n+1)$	Output value

The output of the first averaging value is effected, if N measuring values are available. The data rate remains. Standard values for N: 4, 8, 16, 32 measuring values (window width).

5.4.3.3 Recursive Averaging Value

Each new measuring value MV(n) is added, as a weighted value, to the sum of the previous averaging values M_{rek} (n-1)

$$M_{rek}(n) = \frac{MV(n) + (N-1) \times M_{rek}(n-1)}{N}$$

MV = Measuring value
N = Averaging number
n = Measuring value index
M_{rek} = Averaging value respectively output value

The recursive average permits a high degree of smoothing of the measurement values. However, it requires extremely long transient recovery times for steps in measurement values. The recursive average shows low-pass behavior. The data rate remains. Standard values for N: 4, 8, 16, 32 measuring values (window width).

5.4.3.4 Median

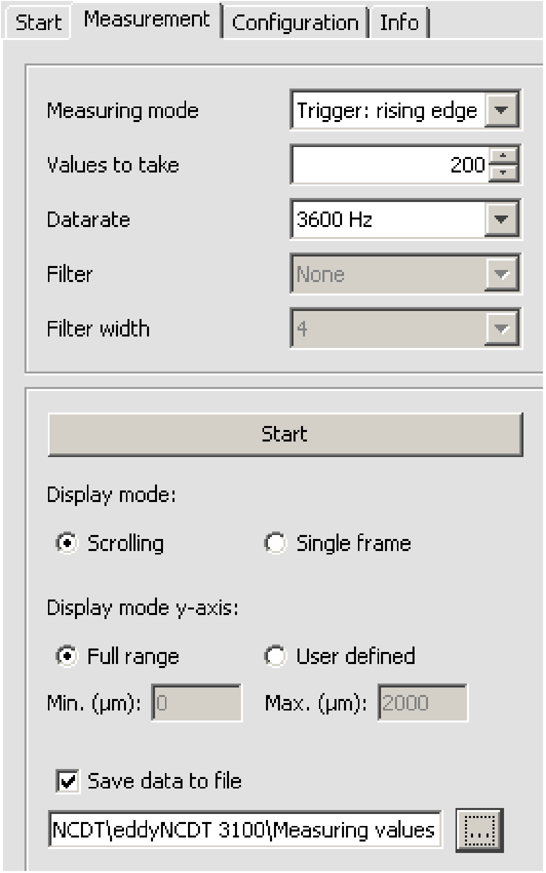
A median value is formed from a preselected number of measurements. The incoming measuring values (3, 5, 7 or 9) are sorted after each measurement as well. Then, the average value is provided as the median value. When creating a median in the web interface, 3, 5, 7 or 9 measuring values are taken into account, which means there is no Median 1. This means that individual interference pulses can be suppressed. However, smoothing of the measurement curves is not very strong.

Example from five measuring values

... 0 1 2 4 5 1 3 ⟶ Sorted measuring values: 1 2 3 4 5 $\text{Median}_n = 3$

... 1 2 4 5 1 3 5 ⟶ Sorted measuring values: 1 3 4 5 5 $\text{Median}_{n+1} = 4$

5.4.4 Saving Measuring Values



The controller can save the measuring values for all measuring types in an ASCII file.

Format: Values in micrometer inclusive two decimal places.

- Set the checkbox in `Save data to file.`
- Select the location for the file with ... .
- Click on the `Start/Stop` button, in order to start or to stop recording.

File size: Depending on the data rate and the time, in which the measuring values are recorded.

Example:

Data rate = 3600 values/sec, time = 10 sec, Number of characters = max. 10 per value (inclusive comma, CR and LF)

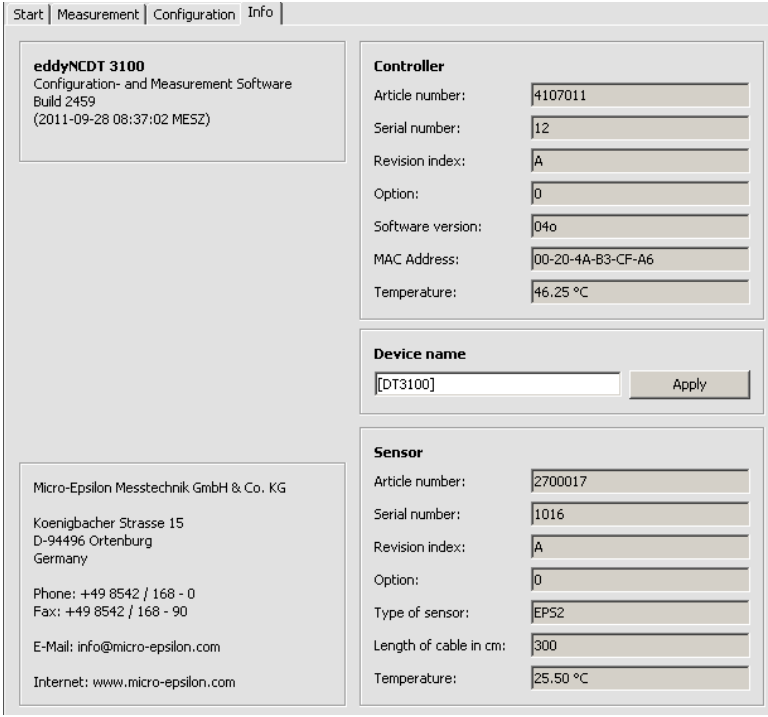
Calculation:

3600 values/sec * 10 sec = 36.000 values

File size:

36.000 values * 10 characters/value * 8 Bit/characters = 360 kbyte

5.5 Info



The Info menu contains information about the controller and the connected sensor such as the software version or the sensors operating temperature.

The values of the fields are determined when calling the function and not updated continuously.

The `Device name` can be assigned individually and can contain max. 32 characters.
The `Device name` is saved in the EEPROM of the controller.

6. Warranty

All components of the device have been checked and tested for perfect function in the factory. In the unlikely event that errors should occur despite our thorough quality control, this should be reported immediately to MICRO-EPSILON.

The warranty period lasts 12 months following the day of shipment. Defective parts, except wear parts, will be repaired or replaced free of charge within this period if you return the device free of cost to MICRO-EPSILON. This warranty does not apply to damage resulting from abuse of the equipment and devices, from forceful handling or installation of the devices or from repair or modifications performed by third parties.

No other claims, except as warranted, are accepted. The terms of the purchasing contract apply in full. MICRO-EPSILON will specifically not be responsible for eventual consequential damages. MICRO-EPSILON always strives to supply the customers with the finest and most advanced equipment. Development and refinement is therefore performed continuously and the right to design changes without prior notice is accordingly reserved. For translations in other languages, the data and statements in the German language operation manual are to be taken as authoritative.

7. Service, Repair

In the event of a defect on the controller, sensor or sensor cable, the parts concerned must be sent back for repair or replacement. In the case of faults the cause of which is not clearly identifiable, the whole measuring system must be sent back to

MICRO-EPSILON MESSTECHNIK
GmbH & Co. KG
Königbacher Strasse 15
94496 Ortenburg / Germany

Tel. +49 (0) 8542 / 168-0
Fax +49 (0) 8542 / 168-90
e-mail info@micro-epsilon.de
www.micro-epsilon.com

8. Decommissioning, Disposal

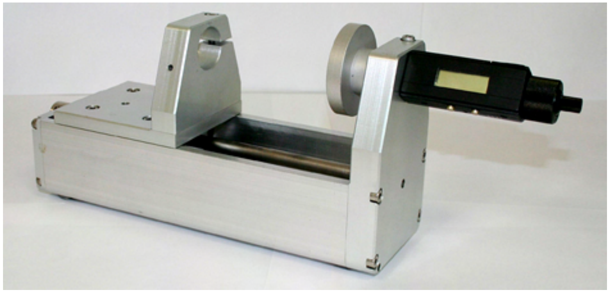
➡ Disconnect the sensor, supply and output cable on controller.

Incorrect disposal may cause harm to the environment.

➡ Dispose of the device, 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.

Appendix

A 1 Accessories

PS2020		Power supply unit (DIN-rail mounting), output 24 VDC/2.5 A, input 230 VAC
MC25D		Digital micrometer calibration device, setting range 0 - 25 mm, adjustable zero, for all sensors

A 2 Ethernet Interface

A 2.1 General

You can also read out the measuring values in digital form via the Ethernet interface. For this purpose use the integrated web interface or your own program.

Micro-Epsilon supports you with the driver MEDAQLib, that contains all commands for the eddyNCDT 3100. You will find further informations in the Internet at www.micro-epsilon.com/software “Standard applications > MEDAQlib“.

A 2.2 Hardware, Interface

To use the Ethernet interface, the eddyNCDT 3100 must be connected with a free Ethernet interface on the PC.

➡ Connect the eddyNCDT 3100 with a free Ethernet interface on PC. For this purpose use the network cable included in delivery.

You need a defined IP address of the network interface card in the PC for a connection with the eddyNCDT 3100. Change to the system control\network connections. If necessary, create a new LAN connection. For this purpose ask your network administrator.

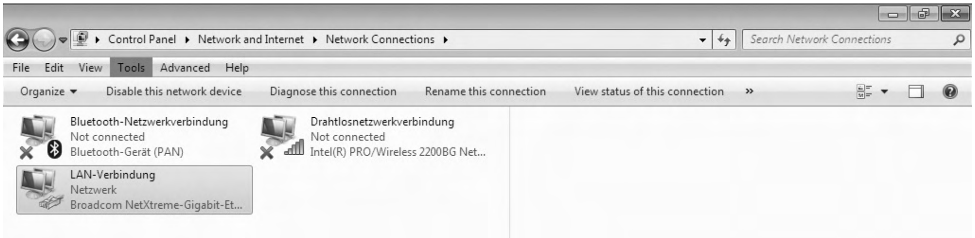
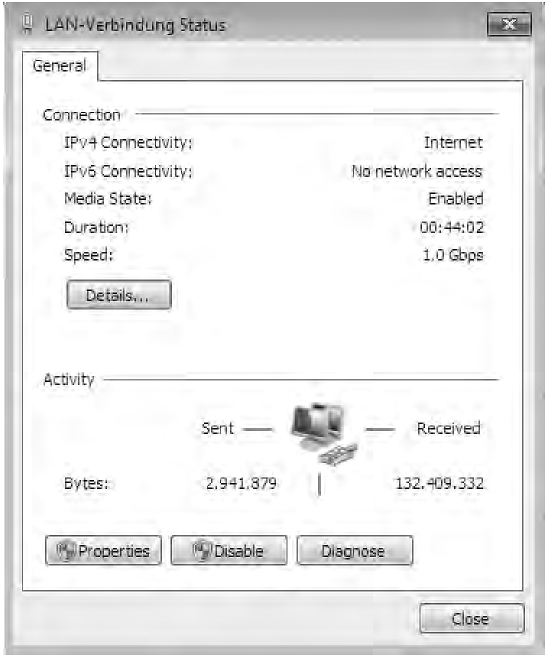


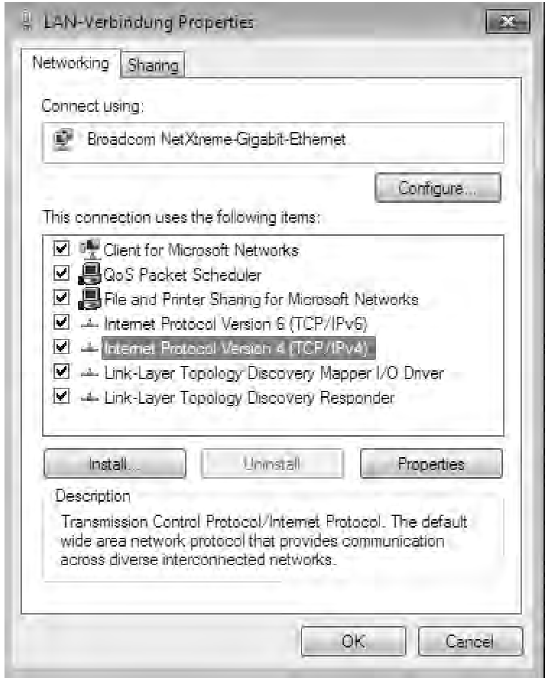
Fig. 37 LAN connection of a PC

➡ Define the following address in the properties of the LAN connection:

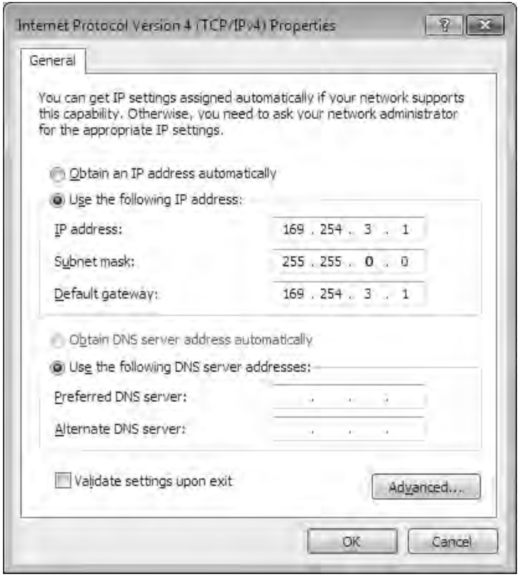
IP address: 169.254.3.1 / subnet mask: 255.255.0.0



Select “Properties“



Select „Internet Protocol (TCP/IP) > Properties“



The IP address of the controller is factory set to 169.254.3.100 and the port is set to 10001. This can be changed at any time:

- through web interface, see Chap. 5.3.2. Among other things here can also assigned a host name for the device and the DHCP service can be activated,
- with the software “Lantronix Device Installer“,
- by a firmware update, see Chap. 5.3.3.

A 2.3 Commands

A 2.3.1 General

As soon as a $ character is received, the controller sends no more measuring values.

After the reply has been sent, the controller starts again to send measuring values (applies for the measuring mode `Measuring on`).

The commands are transmitted in the ASCII format; measuring values are transmitted in binary code.

A timeout is reached about 2 s after the last character input.

Several successive various parameters, for example with command STS, are separated by semicolon

Commands must end with <CR> or <CRLF>.

When the system starts and in case of a change or disconnecting and re-connecting a sensor, $CST, $STS and $SET must be queried initially by the WIPort in this order for setting the right buttons or displays.

Should the controller be still in Calibration State ($CST) 1 after connecting the sensor, possible errors on EEPROM (for example wrong datas) or the measurement chain configuration can be displayed by an error query.

For the calibration ($SMR, $EMR, $MMR) applies:
- After each of the three commands $BSY must be queried first until the reply conforms 255. Therewith the calibration step is completed.
- Then the calibration state $CST and an error query should be performed with $ERR in order to activate the buttons for the calibration and to detect and display calibration errors.

A 2.3.2 Commands

ASCII command	ASCII reply DT3100	Description	
$SRA0<CR>	$SRA0OK<CR><LF>	Set Samplerate0	Data rate 3600 SPS
$SRA1<CR>	$SRA1OK<CR><LF>	Set Samplerate1	Data rate 7200 SPS
$SRA2<CR>	$SRA2OK<CR><LF>	Set Samplerate2	Data rate 14400 SPS
$SRA?<CR>	$SRA?2OK<CR><LF>	Samplerate?	Data rate request
$AVT0<CR>	$AVT0OK<CR><LF>	Averaging Type 0	Averaging from
$AVT1<CR>	$AVT1OK<CR><LF>	Averaging Type 1	Averaging type „moving average“
$AVT2<CR>	$AVT2OK<CR><LF>	Averaging Type 2	Averaging type „recursive average“
$AVT3<CR>	$AVT3OK<CR><LF>	Averaging Type 3	Averaging type „Median“; changes the data rate by a factor set, for example, at SRA=2, AVT=3 and AVN=5 results in a data rate of 2880 SPS
$AVT?<CR>	$AVT?nOK<CR><LF>	Averaging Type?	Averaging type request
$AVN0<CR>	$AVN1OK<CR><LF>	Averaging Number 0	Averaging number for moving and recursive average = 4; for Median = 3
$AVN1<CR>	$AVN2OK<CR><LF>	Averaging Number 1	Averaging number for moving and recursive average = 8; for Median = 5
$AVN2<CR>	$AVN3OK<CR><LF>	Averaging Number 2	Averaging number for moving and recursive average = 16; for Median = 7
$AVN3<CR>	$AVN4OK<CR><LF>	Averaging Number 3	Averaging number for moving and recursive average = 32; for Median = 9
$AVN?<CR>	$AVN?nOK<CR><LF>	Averaging Number?	Averaging number request

ASCII command	ASCII reply DT3100	Description	
$VTTn<CR>	$VTTnOK<CR><LF>	Values To Take	n=Number of measuring values as maximal 4-digit number (from 1 up to 9999), with or without leading zeros
$VTT?<CR>	$VTT?10OK<CR><LF>	Values To Take?	Number of measuring values request (values to take); here, for example, 10 values (without leading zeros)
$MMD0<CR>	$MMD0OK<CR><LF>	Measuring mode: no measuring	Receive no measuring values
$MMD1<CR>	$MMD1OK<CR><LF>	Measuring mode: continuous transmission	Receive continuous measuring values
$MMD2<CR>	$MMD2OK<CR><LF>	Trigger on rising edge	Admission of a number of measuring values set by $VTT at rising edge with set data rate
$MMD3<CR>	$MMD3OK<CR><LF>	Trigger on falling edge	Admission of a number of measuring values set by $VTT at falling edge with set data rate
$MMD4<CR>	$MMD4OK<CR><LF>	Gate function at high level	Admission of measuring values with the set data rate as long as a high level is on the trigger input
$MMD5<CR>	$MMD5OK<CR><LF>	Gate function at low level	Admission of measuring values with the set data rate as long as a low level is on the trigger input
$MMD?<CR>	$MMD?nOK<CR><LF>	Measuring mode?	Request measuring mode
$GMD<CR>	$GMDOK<CR><LF> Measuring values in binary form (see data format of measuring values)	Get Measured Data	Read out a single measuring value; distance in μm = measuring value / 65535 * (EMR in μm - SMR in μm)

ASCII command	ASCII reply DT3100	Description	
$CST<CR>	$CSTnOK<CR><LF>	Calibration State	Outputs the current status of the three-point calibration or the sensor detection, n = 0 up to 6.
$TARn<CR>	$TARnOK<CR><LF>	Target [1]	Selection of target material, no combinations possible (only single bits selectable) 1 = ferromagnetic (iron) 2 = not ferromagnetic (aluminum) 4 = customized 1 (iron 2) 8 = customized 2 (aluminum 2)
$TAR?<CR>	$TAR?4OK<CR><LF>	Target?	Request of a set target material (here bit 2 = customized 1)
$ETFm<CR>	$ETFmOK<CR><LF>	Edit Text Field [1]	Content of the text field; m = maximum 32 characters long
$ETF?<CR>	$ETF?mOK<CR><LF>	Edit Text Field?	Request of the editable text field
$SET<CR>	$SETMMDn;SRAn;AVTn;AVNn;VTTa;TARn;ETFmOK<CR><LF>	Setting	Outputs the current settings of measuring mode, data rate, Values To Take (without leading zeros), target selection and the content of the text field. a = 1 up to 9999; m = A until Z in capital letters; everything each separated by semicolon.
$SSE<CR>	$SSEOK<CR><LF>	Save Setting [1]	Save settings of trigger mode, data rate and Values To Take in the internal EEPROM.
$RSE<CR>	$RSEOK<CR><LF>	Read Setting	Read out the settings of trigger mode, data rate, Values To Take, target selection and content of text field from the internal EEPROM.

1) Number of cycles max. 1,000,000!

ASCII command	ASCII reply DT3100	Description	
$STS<CR>	$STSCBLn;ATRnOK <CR><LF>	Status	Status request: - Cable (Factory setting n = 0) - Available Targets (targets available for selection n: bit 0 (LSB) = ferromagnetic (iron), bit 1 = not ferromagnetic (aluminum), bit 2 = customized 1 (iron 2), bit 3 = customized 2 (aluminum 2); also following combinations possible: Iron/aluminum, iron/customized2, customized1/aluminum, customized1/customized2; bit 7 (MSB) = customized sensor with designation EPxx-LC“. Everything each separated by semicolon.
$BSY<CR>	$BSY..OK <CR><LF>	Busy	Value for progress bar during sensor calibration; ..= 0 (0 %) up to 255 (100 %)
$SMRm<CR>	$SMRmOK <CR><LF>	Start of Measuring Range	Sensor calibration: Calibrate start of measuring range; optional: m = Information of the position in µm from sensor front
$EMRm<CR>	$EMRmOK <CR><LF>	End of Measuring Range	Sensor calibration: Calibrate end of measuring range; optional: m = Information of position in µm from sensor front; If the values for SMR and EMR are set apart more than 100 %, the message “PARAMETER OUT OF RANGE<CR><LF>“ is output, and “$EMRm“ must be input with corrected parameter.

ASCII command	ASCII reply DT3100	Description	
$MMRm<CR>	$MMRmOK <CR><LF>	Mid of Measu- ring Range	Sensor calibration: Calibrate midrange; optional: m = Information of position in μm from sensor front. If m is not specified, according to 0 %, 50 % and 100 % are set as distance.
$ECA<CR>	$ECAOK<CR><LF>	Exit Calibration	Abort of sensor calibration; The last valid calibration is loaded, deletes calibration error (ERR32 and/or ERR64)
$FCA<CR>	$FCAOK<CR><LF>	Factory Calibration [1]	Load factory calibration of sensor (Reset sensor calibration)
$DSE<CR>	$DSEMMD0;SRA2;AVT0; AVN1;VTT1;TARn; ETFEDITOK<CR><LF>	Default Setting [1]	Default settings for measuring mode, data rate, Values To Take, n: depending on available target
$ERR<CR>	$ERR....OK<CR><LF>	Error	Error output: Number between 0 and 2^16-1 1 = Error sensor calibration: Poti at lower stop 2 = Error sensor calibration: Poti at upper stop 4 = Error sensor calibration: Other errors 8 = a wire line short-circuited 16 = no sensor-/cable-EEPROM or a wire line on +5 V 32 = Error when reading the sensor-/cable-EEPROM´s 64 = more than three sensor-/cable-EEPROM´s 128 = erroneous data on a sensor-/cable-EEPROM 256 = erroneous data on an internal EE-PROM Bit 9 up to 15 (MSB) = not used

1) Number of cycles max. 1.000.000!

ASCII command	ASCII reply DT3100	Description	
$IND<CR>	$INDSN……..;PC……..; RIX;SWuuw;Opn;NMmOK <CR><LF>	Index	Reading the index of controller: Serial number (number between 0 and 2^32-1 without leading zeros), product code (number between 0 and 2^32-1 without leading zeros), revision index, software version (format: u.uw), option, name (designation of the controller). u = 0 up to 9; w = a until z in lower case; n = 0 up to 99; X = A until Z in capitals; m = maximum 32 characters long; everything each separated by semicolon.
$SEN<CR>	$SENSN……..;PC…..; RIX;OPn;NMxyy;Lm; SMRm;MMRm; EMRmOK <CR><LF>	Sensor	Index of sensor: Serial number (number between 0 and 2^32-1 without leading zeros), product code (number between 0 and 2^32-1 without leading zeros), revision index, option, designation of sensor in 3 ASCII characters (x = „S“ or „U“, y = „0“ up to „9“ or spaces), length of integrated cable in 10 cm, start of measuring range (µm), midrange (µm), end of measuring range (µm).

ASCII command	ASCII reply DT3100	Description	
$GCT<CR>	$GCTmOK <CR><LF>	Get Controller Temperature	Readout of the controller temperature in 0.25 °C steps from -55 °C up to +125 °C (without leading zeros, decimal separator is „.“), for example m = 30.25
$GST<CR>	$GSTmOK <CR><LF>	Get Sensor Temperature	Readout of sensor temperature in 0.25 °C steps (without leading zeros, decimal separator is „.“), for example m = 30.25
$WPTm;m;m<CR>	$WPTm;m;mOK <CR><LF>	Write Potentiometer	Describe and set the potentiometer positions in the order: DA_Null, DA_Gain and DA_Lin (m = 1 up to 4095)
$RPT<CR>	$RPTm;m;mOK <CR><LF>	Read Potentiometer	Readout the potentiometer positions in the order: DA_Null, DA_Gain and DA_Lin (m = 1 up to 4095)
$DSC<CR>	$DSCmOK <CR><LF>	Detect Sensor Change	Restore a flag, that displays, if the sensor has been disconnected or changed; the flag remains set up to the query of flag with this command and will be deleted by the query. m=0: Sensor was not disconnected; m=1: Sensor was disconnected

A 2.3.3 Messages

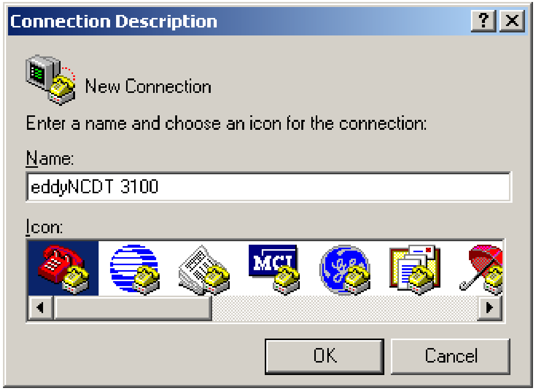
ASCII reply DT3100	Description
(ECHO)+$UNKNOWN COMMAND<CR><LF>	Unknown command
$WRONG TARGET<CR><LF>	Wrong target selected (target not available)
$PARAMETER OUT OF RANGE<CR><LF>	Parameter out of valid range
$WRONG PARAMETER<CR><LF>	Wrong parameter
$SETTING NOT AVALIABLE<CR><LF>	Setting not possible
$NO SENSOR<CR><LF>	No sensor connected
$WRONG STATE<CR><LF>	Wrong Calibration State
$TIMEOUT<CR><LF>	Timeout when input command

A 2.4 Data Format of Measuring Values

Output value 1/ 2:

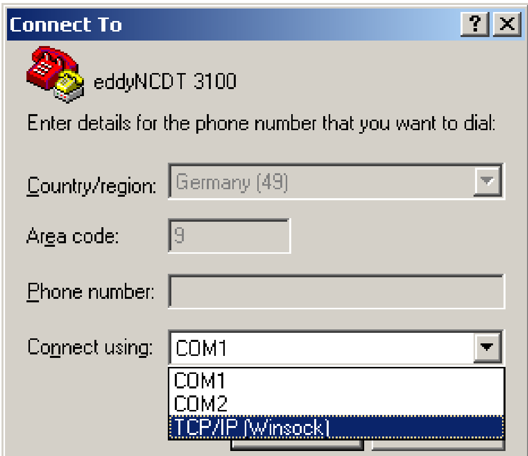
	MSB							LSB
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
L-Byte	0	0	D5	D4	D3	D2	D1	D0
M-Byte	0	1	D11	D10	D9	D8	D7	D6
H-Byte	1	0	X	0	D15	D14	D13	D12

A 3 HyperTerminal

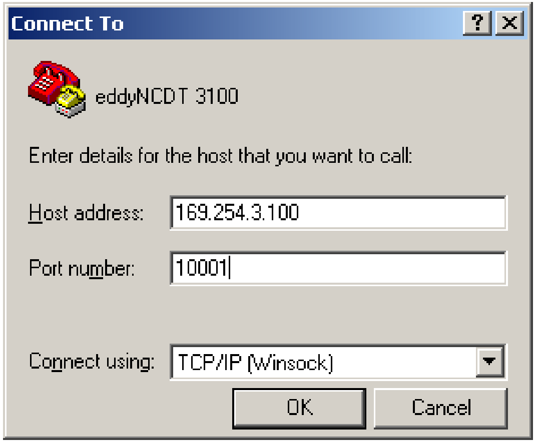


You can receive data via the Ethernet interface and configure the controller with the default program HyperTerminal®. All you need is a free Ethernet interface on your PC and the described commands, see Chap. A 2.

- Connect the controller with a free Ethernet interface on PC.
- Start the program HyperTerminal® (Menu `Start > Programs > Accessory > Communication > HyperTerminal`)
- Type in the name of the connection an click on the `OK` button.



- Select the interface `TCP/IP (Winsock)` and click on the `OK` button.



➡ Define the following interface parameters:

- Host address: 169.254.3.100
- Port number: 10001

➡ Finally click on the `OK` button.

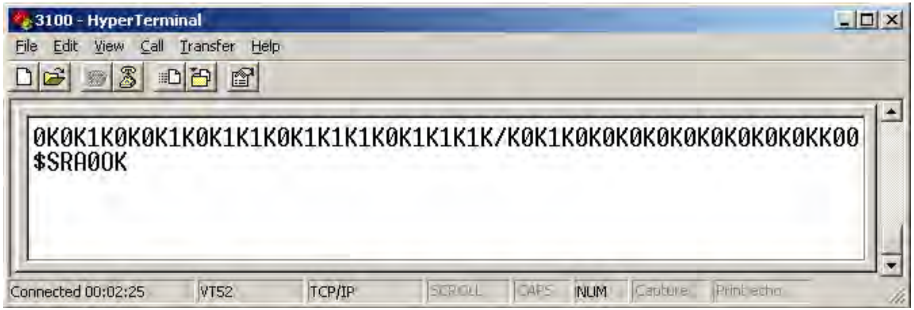


Fig. 38 User surface in terminal operation

i A currently entered command will only be displayed if “Local echo“ is enabled. This function can be accessed via file menu `File` > `Properties` > `Settings` > `ASCII Setup`.

➡ Save finally, unless performed earlier, the current hyperterminal configuration. For more convenience you don’t have to reconfigure the interface for each new hyperterminal session.

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