Operating instructions
Eddy Current Signal Converter

Model: MNHµCON

Table of contents

1 General

Read carefully before use!

Please read and observe these operating instructions.

Keep for future reference!

Please keep these operating instructions in a safe place for future reference.

Handle the nameplate on the device with care!

The specification of the model type and the fabrication number is required for a repair and for the procurement of follow-up deliveries and spare parts. Both pieces of information are indicated on the type plate.

Warning and safety instructions

It is essential to observe the warnings and safety instructions given in these instructions to avoid personal injury and damage to property.

1.1 Warranty and liability

Any warranty and liability claims against MESSOTRON are lost if

- damage occurs which is due to non-observance of the operating instructions
- modifications have been made that are not documented in these operating instructions.

1.2 Technical support and contact details

We will be happy to answer any questions you may have. You can reach us at the following contact address:

MESSOTRON GmbH & Co KG
Friedrich-Ebert-Str. 37
64342 Seeheim-Jugenheim

Phone06257 999 730
Fax 06257 999 7309
Email: info@messotron.de

Further information can also be found on the website www.messotron.de/service.

2 Safety instructions

2.1 Intended use

Use the MNHµCON exclusively for operating eddy current sensors. Any use beyond this is considered improper.

Observe the legal and safety regulations required for the respective application. This also applies analogously to the use of accessories.

To ensure proper and safe operation, the device may only be operated in accordance with the information in these instructions.

2.2 Conditions at the installation site

Please inform yourself about the required conditions at the installation site e.g., temperature and other environmental conditions. These are described in chapter 11 Technical data.

If foreign bodies or liquids get inside the device, have the device checked by MESSOTRON before using it again.

Do not use the device in the vicinity of devices, machines and equipment that generate strong electric or magnetic fields.

2.3 General hazards due to non-observance of the safety instructions

The device corresponds to the state of the art and is safe to operate when used as intended. However, residual dangers may emanate from the device if it is used and operated improperly (e.g. by insufficiently qualified personnel).

2.4 Qualified personnel

Both the commissioning and the operation of the device may only be carried out by trained specialists who are aware of the present dangers. The specialists must be familiar with the national health and safety regulations, accident prevention regulations, guidelines and recognized rules of technology.

2.5 Check for transport damage

Before unpacking, check the packaging of the device to ensure that it is intact. If the packaging has been damaged during transport and if this gives rise to any suspicion that the device has been damaged, it must not be put into operation. Have the device checked by MESSOTRON before using it.

3 Warnings and labels

3.1 Use of warnings

The following hazard classes according to ANSI are used for warnings:

Warning sign, signal word	Meaning
DANGER	Indicates a hazardous situation in which death or serious bodily injury will occur if not avoided.
WARNING	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a hazardous situation in which minor to moderate bodily injury may occur if not avoided.
NOTE	Indicates possible damage to property: The product or the environment may be damaged.

Warnings for your safety are marked in a particularly conspicuous manner. It is essential that you observe them to avoid personal injury and damage to property.

A warning notice (valid for Danger, Warning and Caution) is structured as follows:

WARNING
Cause and possible consequences
• Note on avoidance

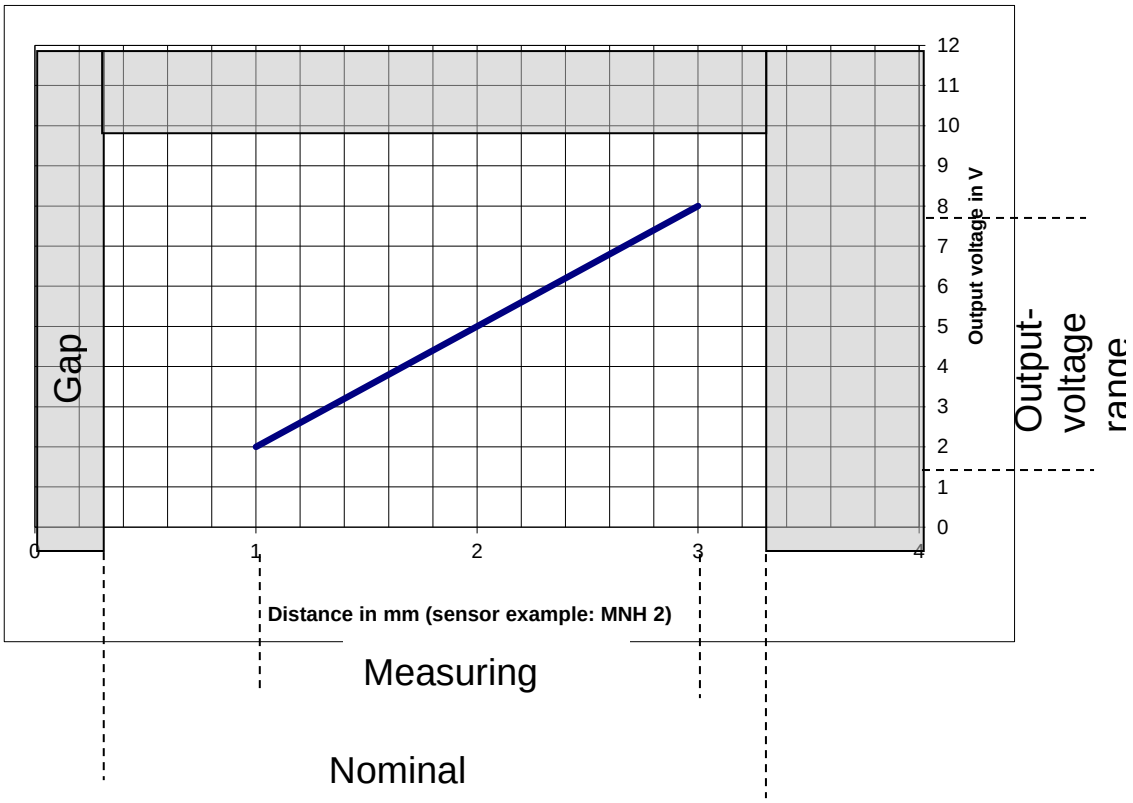
3.2 Other markings

TIP	Tips contain important information on how to use the device optimally. Disregarding a tip may result in incorrect measurement results, but will not normally damage the instrument.

4 Product description

4.1 Terms and definitions

Eddy current measuring chain	The eddy current measurement chain forms a coordinated sensor unit consisting of proximity sensor, converter and connecting cable.
Target	The target is the object whose distance to the proximity sensor is to be measured.
Gap	The gap specifies the minimum distance between target and proximity sensor, which should not be fallen short of for protection reasons (e.g. 0.3 mm).
Nominal measuring range	The nominal measuring range is the maximum distance range that can be detected with the MNHµCON. This can be found in the data sheet of the respective sensor (e.g. 0.3...3.3 mm).
Measuring range	The measuring range is a freely selectable (partial) range within the nominal measuring range which is to be used for the distance measurements (e.g. 1...3 mm).
Output voltage range	Range of the output signal assigned to the measuring range, (e.g. 2...8 V). The output signal increases with increasing distance and can be freely scaled in the defined measuring range.
Thresholds	Configurable (error) threshold values in the nominal measuring range. When these values are exceeded or undershot, the respective threshold value display (red LED inside the housing) lights up.
U_{osc}	Amplitude with which the oscillator circuit of the sensor unit oscillates.
I_{osc}	The oscillator current determines the energy supplied to the oscillator.



4.2 Important parameters when using eddy current sensors

The accuracy of eddy current-based distance measurements is particularly influenced by the following factors:

Material properties and size of the measured object

The characteristics of the MESSOTRON eddy current sensors generally apply to the following reference material:

- 42CrMo4
- flat surface, at least 3 times the head diameter

Suitable configuration sets for the converter are provided for the reference material. Other requirements can be realized on request.

Linearity of the eddy current sensor used

Due to the principle, the damping by the measuring object is non-linear dependent on the distance to the sensor head. The linearization of the output signal supplied by the (passive) sensor takes place in the downstream electronics (converter).

Length and type of connection cable

The length of the connecting cable represents a important influence on the measurement result, since the cable resistance affects the total resistance.

Operating temperature of the individual components

In eddy current electrodes, the conductivity of the target, the ohmic resistance of the sensor coil and the cable resistance change with the operating temperature. The resulting measurement error can be reduced in the MNHµCON by suitable parameterization (see chapter 5.3.6 Configurator level).

Hardware tolerances in the converter (evaluation electronics)

MESSOTRON electronics undergo an individual adjustment (board adjustment) before delivery. This minimizes the influence of component tolerances.

TIP	The transducer cable should never be parallel to power or control lines. Electromagnetic fields from motors, transformers, converters and power controls should be avoided.

4.3 Functionality

The eddy current converter MNHµCON is preferably used in conjunction with the MESSOTRON high temperature proximity sensors MNH for non-contact distance measurement. Thanks to modern processor technology, it can be flexibly adapted to different sensor characteristics and target properties and thus also for operation with other eddy current sensors with the aid of the "MNHµCON Configurator" software. The software is optionally available as an accessory.

Together with the eddy current sensor, the eddy current converter forms an oscillator circuit whose oscillation amplitude is damped by the approach of an electrically conductive target to the sensor head. This distance-dependent, nonlinear damping is detected in the converter, furthermore processed, and converted into an output signal linear to the distance.

Figure *1* *View of connection terminals and displays*

The MNHµCON is supplied in a cast aluminum housing for screw mounting on the substrate.

The connection cable for the voltage supply and the output signal is led into the housing via a cable gland and connected there to a 5-pole terminal row.

The proximity sensor is connected via a coaxial connector.

The converter is configured using the multifunction pushbutton or with the aid of the "MNHµCON-Configurator" PC software (section 5.3).

4.4 Type overview

The eddy current converter supplied in the following variants:

- Standard version MNHµCON with encapsulated electronics
- Special versions for negative supply voltage MNHµCON-24Vx ("plug converter") and SENSKON-011 (see separate operating instructions)

4.5 Scope of delivery

The following items are included in the scope of delivery:

- Eddy current converter MNHµCON
- Operating instructions

4.6 Suitable sensors

All MESSOTRON high temperature eddy current sensors of the MNH series are designed for operation with the eddy current converter MNHµCON. In some cases, a suitable connection adapter must be used.

If you want to operate other eddy current sensors with the MNHµCON and have any questions, please contact us.

4.7 Accessories

Description	Name
PC software (WinXP or higher) for parameterization	MNHµCON Configurator
USB-to-serial adapter, converter-side 10-pin socket (Rx, Tx, GND)	MNH USB2RS232/3V3

5 Commissioning

NOTE
The converter may only be commissioned by qualified specialists.

No PC is required to commission a preconfigured eddy current converter.

The PC software "MNHµCON-Configurator" allows convenient setting of the output voltage range and threshold values. The software is available as an option on request.

To record your own sensor characteristic curve or to reduce the temperature drift, the PC software is mandatory.

The following table shows the different configuration options of the multifunction pushbutton and the "MNHµCON-Configurator" PC software.

Configuration options	Button	Software
Change / adjust sensor characteristic curve		X
Change threshold values	X	X
Change measuring range	X	X
Reduction of the temperature drift		X
Change complete configuration set		X
Save / load configuration set		X

5.1 Hardware

5.1.1 Signal outputs

NOTE
The signal outputs are galvanically decoupled from the supply voltage.

The MNHµCON provides the measurement signal in the form of a voltage output (0...10 V) and a current output (0(4)...20 mA). Both outputs can be used simultaneously.

5.1.2 Terminal assignment of the terminal strip

NOTE
To plug in and release the connecting wires, the orange-colored actuating elements must be pressed down slightly. The signal outputs are galvanically decoupled from the supply voltage; the reference potential is 0 V (terminal 1).

Clamp	Signal
1	24 V supply (high)
2	24 V supply (low) V
3	Output voltage 0...10 V
4	Current output 0(4)...20 mA
5	0 V

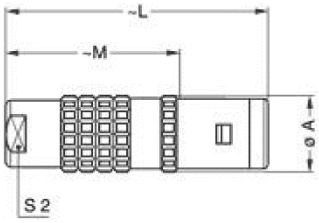
TIP	To connect the eddy current converter to the PC, you need a programming adapter (USB socket on the PC side, 10-pin socket

	connector on the converter side, see chapter 4.7. Accessories: MNH USB2RS232/3V3).

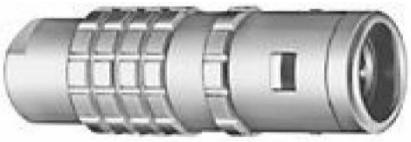
5.1.3 Sensor connection

The eddy current sensor is connected by means of Lemo connectors.

Lemo connector (sensor side): FFA.0E.650.CTAC30ZN



Dimensions



	A	L	M	S2
mm.	11	34	23	8
in.	0,43	1,34	0,91	0,31

5.2 Commissioning without PC

TIP	When commissioning without a PC, the MNHµCON Configurator software should not run in the background.

5.2.1 Status LEDs (normal operation)

Status	**L1 (red)** (lower limit)	**L2 (green)** (within the limits)	**L3 (red)** (upper limit)	
Normal operation				lower limit exceeded
				measured distance within the limits
				upper limit exceeded

In normal operation, one of the 3 LEDs lights up

5.2.2 Teach-in (option)

You can adjust the threshold values and the measuring range in the field without a PC using the multifunction button:

Setting the threshold values:

	Status	L1 (red) (lower limit)	L2 (green) (within the limits)	L3 (red) (upper limit)	Action
Programming cycle for the thresholds	**Normal operation**	**on or off**	**on or off**	**on or off**	1) Press the button for 1 second
	Setting the thresholds (L1+L2 / L2+L3 flash fast alternately)	**blinkt (3 Hz)**	**flashing (3 Hz)**	**off**	2.) Move the target to the "lower limit" and save the value by pressing the button
		off	**flashing (3 Hz)**	**flashing (3 Hz)**	3.) Move the target to the "upper limit" and save the value by pressing the button
	Normal operation	**on or off**	**on or off**	**on or off**	

Adjustment of the measuring range:

	Status	L1 (red) (lower limit)	L2 (green) (within the limits)	L3 (red) (upper limit)	Action
Programming cycle for the measuring range	**Normal operation**	**on or off**	**on or off**	**on or off**	1) Press the button for 3 seconds
	Setting the measuring range (L2 on, L1 + L3 flash slowly)	**flashing (1 Hz)**	**on**	**off**	2.) Move the target to the "minimum distance" and save the value by pressing the button
		off	**on**	**flashing (1 Hz)**	2.) Move the target to the "maximum distance" and save the value by pressing the button
	Normal operation	**on or off**	**on or off**	**on or off**	

Subsequently, the defined output voltage range is exactly adjusted to the approached measuring range.

5.2.3 Reset

By pressing the multifunction button for a longer time (>8 s), you restart the converter without interrupting the supply voltage. To do this, press the multifunction button until all 3 LEDs light up simultaneously.

Reset	**Normal operation**	**on or off**	**on or off**	**on or off**	1) Press the button for 8 seconds
	Perform a reset	**on or off**	**on or off**	**on or off**	2.) Release the button
	Normal operation	**on or off**	**on or off**	**on or off**	

5.3 Commissioning with PC and software "MNHµCON-Configurator " (optional)

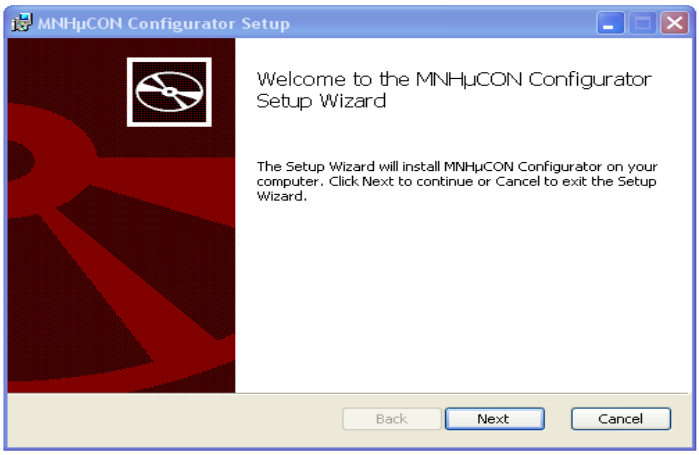
5.3.1 System requirements

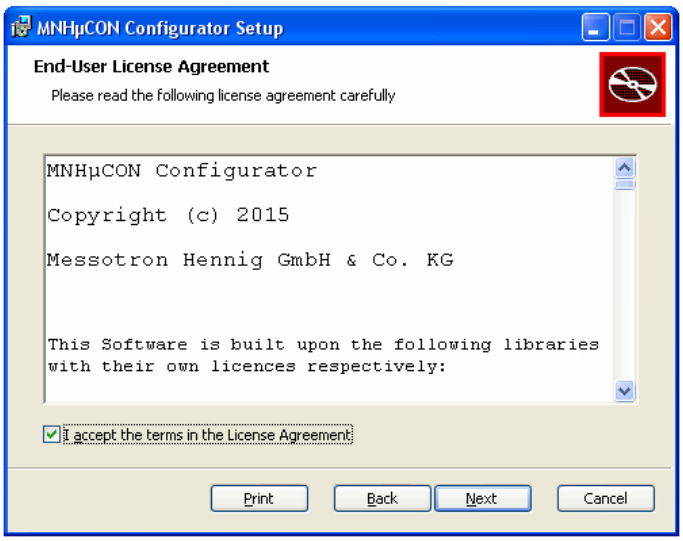
The following minimum requirements apply to the MNHµCON configurator software (you can obtain this optionally on request):

- PC with USB interface
- Windows XP or higher
- 1 GHz processor or higher
- min. 1 , GB RAM
- Drive with at least 25 MB free memory
- Programming adapter MNH USB2RS232/3V3, see 4.7 Accessories

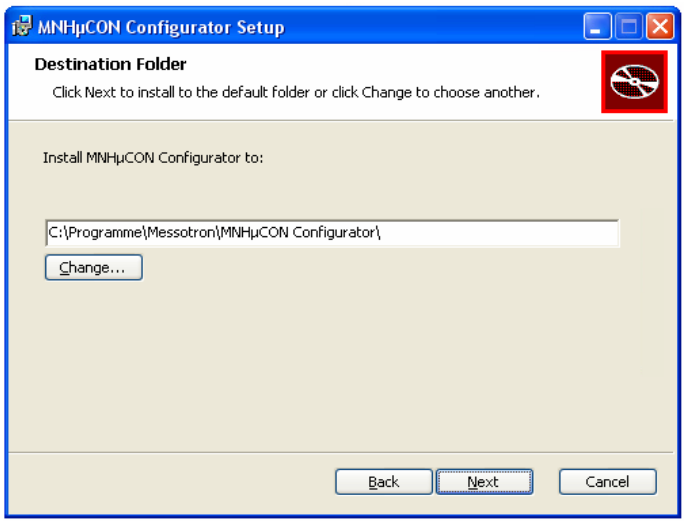
5.3.2 Software installation

Start the installation package MNHµCON-Configurator.msi.

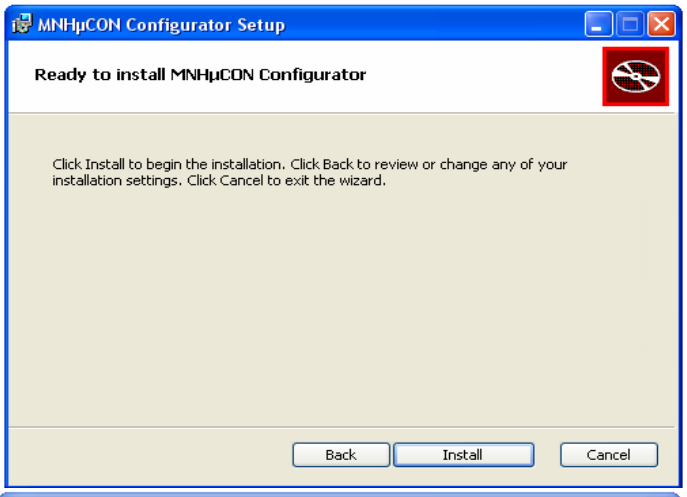




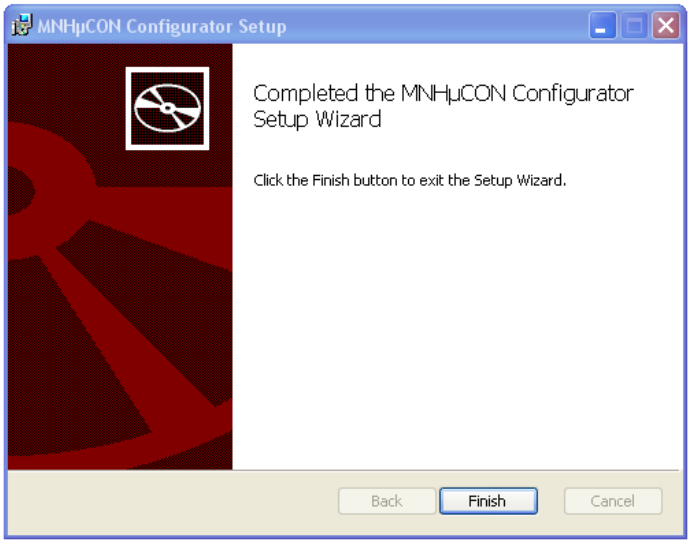
Confirm the license agreement.



Select the installation location.



Start the installation with "Install".

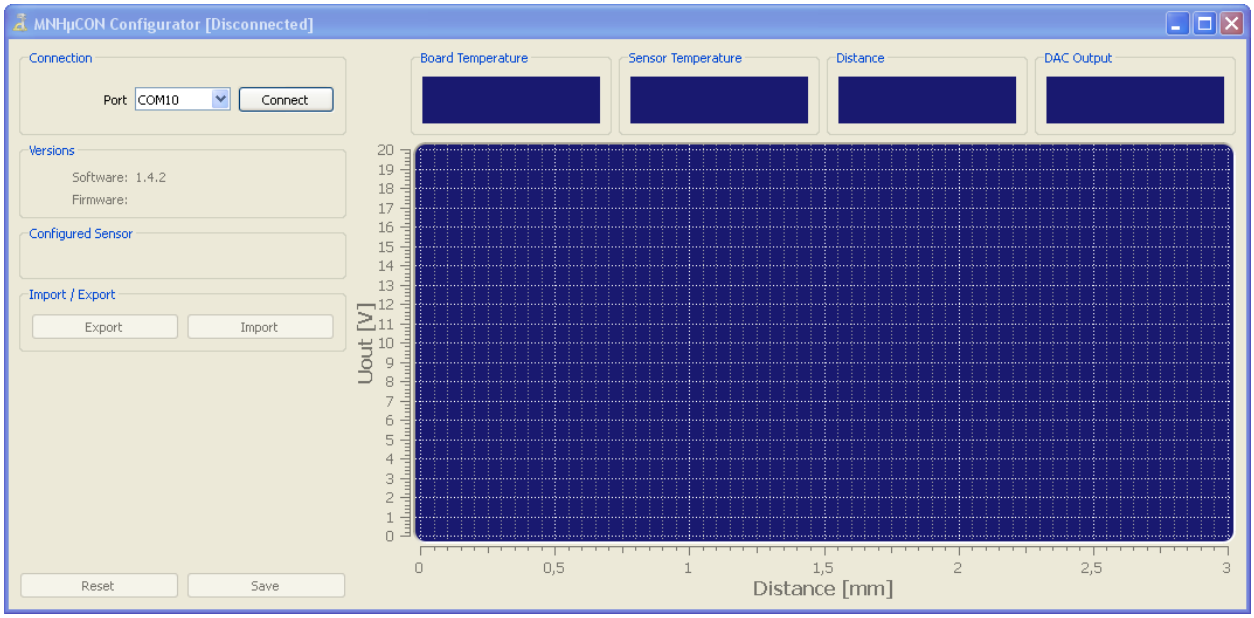


If this screen appears, then you have successfully completed the installation. You can now connect the eddy current converter to the PC (see 5.1.2 Terminal assignment of the terminal strip).

5.3.3 Starting the software

Click the newly created desktop icon to start the software.

After starting the program, first set the serial interface to which the converter is connected at "Port". Then click on "Connect".



As soon as the connection is established, all relevant sensor and measurement data are displayed. You are in the user level.

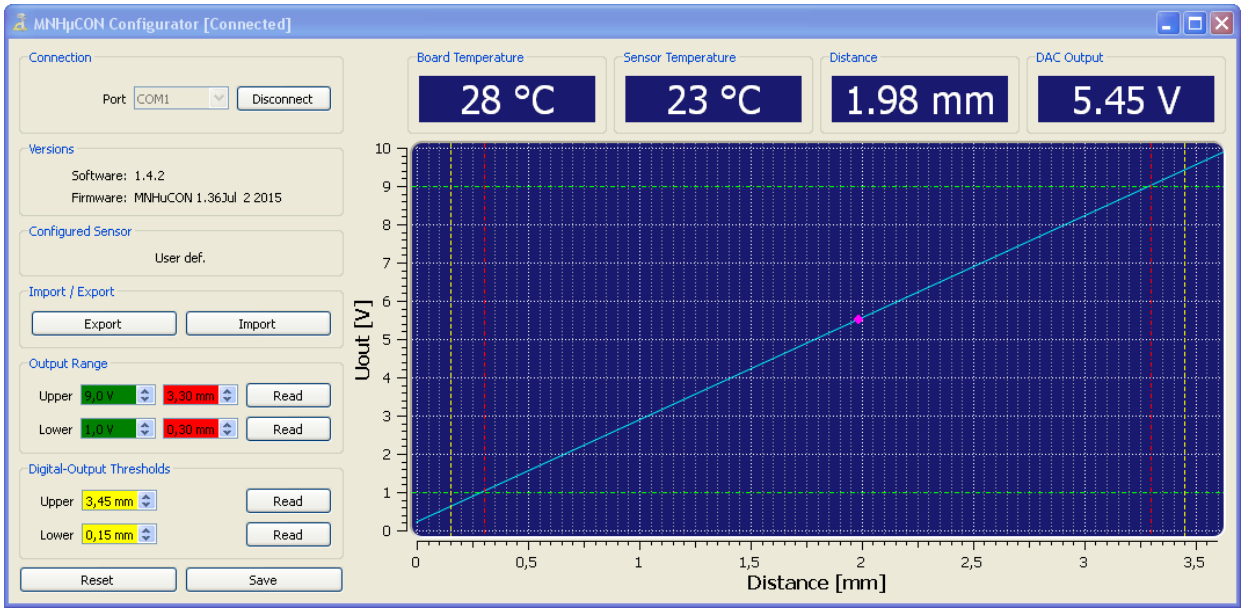
5.3.4 Reading in a standard configuration set (user level)

MESSOTRON offers ready-made configuration sets for many standard applications, with which all settings of the converter for operation can be made in one step.

To select a configuration set, click the "Import" button. Then save the new configuration permanently in the converter with "Save".

5.3.5 Create your own configuration set (user level)

In the user level, the measuring range, the assigned output voltage range and the threshold values can be checked and adjusted if necessary. It is also possible to load (import) or save (export) the complete configuration set.



In the setting fields with a red background, you define the measuring range within the nominal measuring range of the eddy current measuring chain.

You define the output voltage at the beginning or end of the configured measuring range with the setting fields highlighted in green.

The threshold values for alarm signaling (yellow fields) can be set to any values within the nominal measuring range.

As an alternative to entering the numbers, you can also set the corresponding position (distance of the sensor to the target) and read in the position value with "Read" (Teach-In).

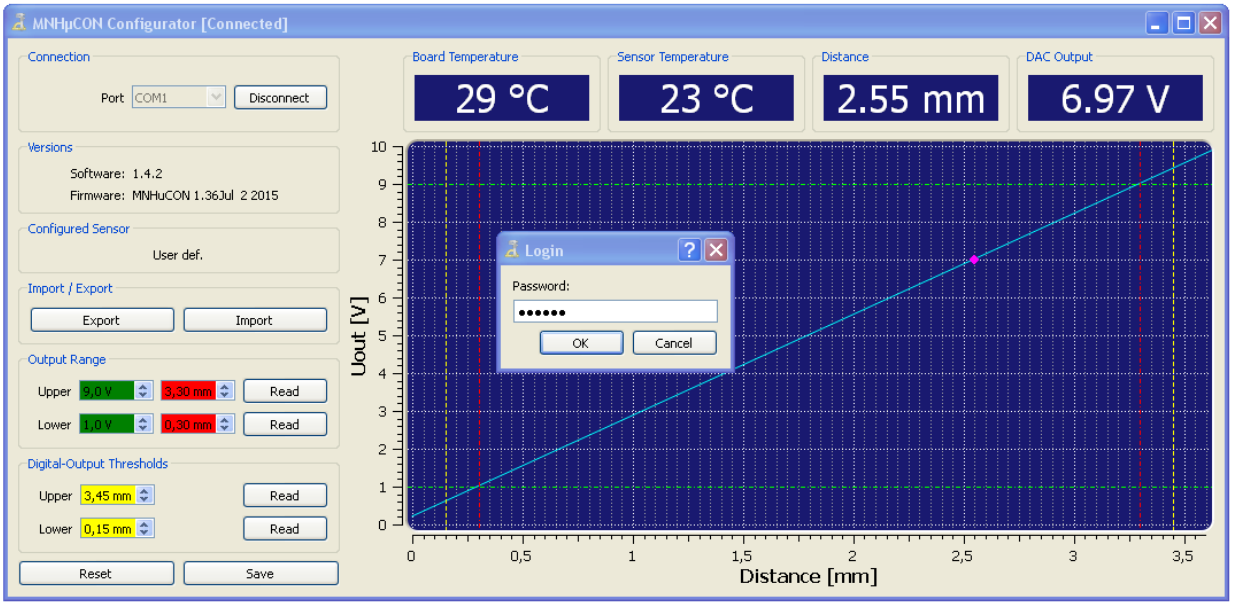
The set values are indicated in the diagram by colored, dashed lines.

With "Reset" all settings (incl. the sensor characteristic curve) are deleted. Before further measurements can be performed, the converter must be reconfigured - e.g. by reading in ("importing") a configuration set.

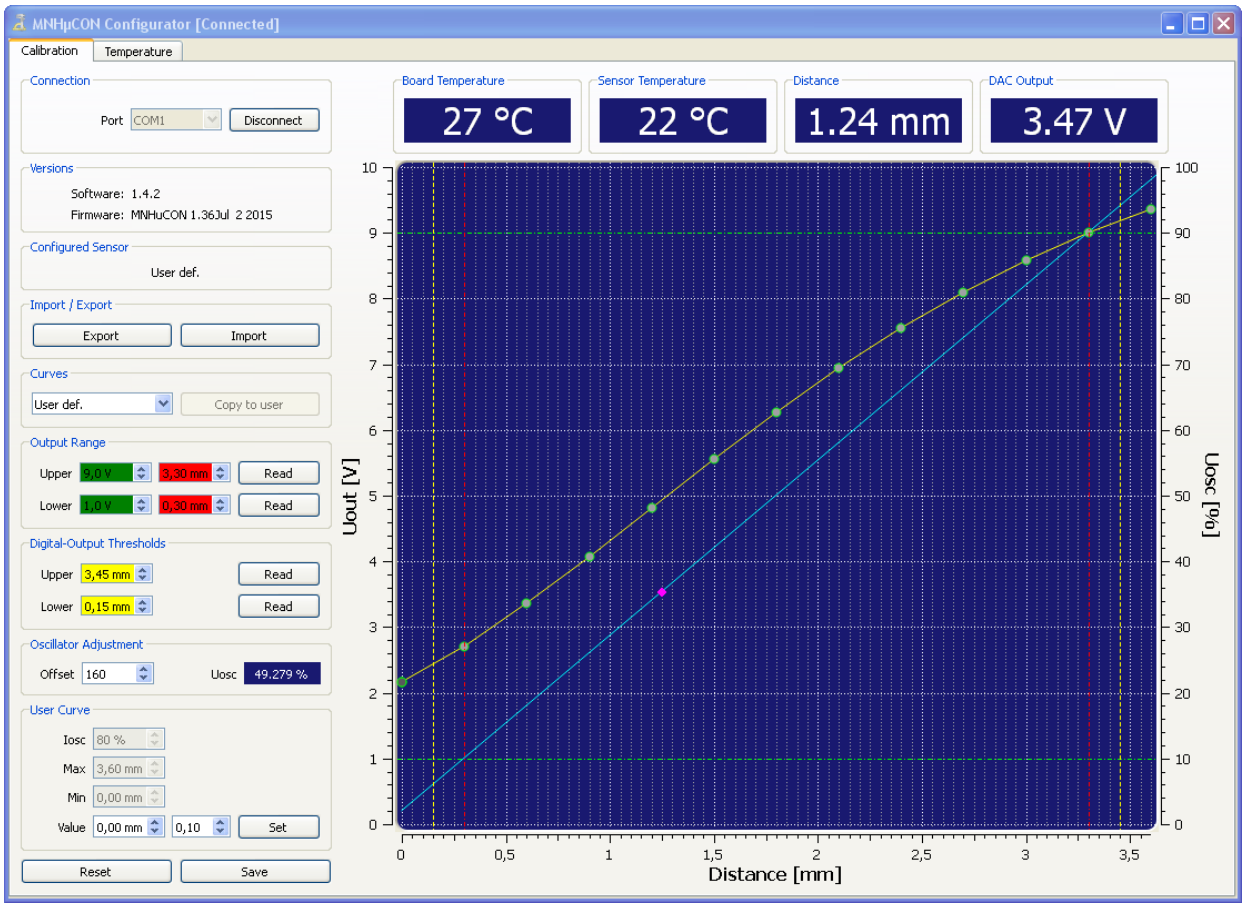
TIP	Changes made are permanently saved in the converter with "Save".

5.3.6 Individual adjustment (configurator level)

To use the extended setting options, e.g. recording your own sensor characteristic curve (individual adjustment), you must switch to the configurator level. This is done by pressing the F12 function key and entering the configurator password.



The password for the configurator level is: "secret".



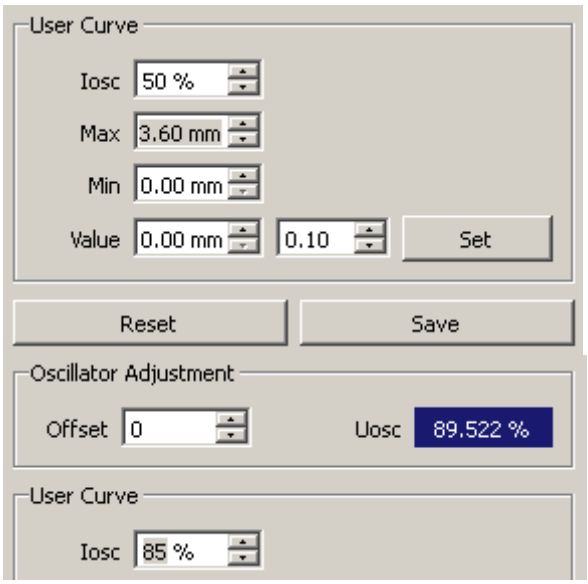
For most standard applications, it is sufficient to configure the converter with the configuration sets provided by MESSOTRON. Nevertheless, an individual adjustment may be necessary if

- a larger nominal measuring range is to be defined
- a different size and/or surface of the measuring object is present
- the measured object has other material properties
- the length of the connection cable is to be changed
- an existing eddy current sensor from another manufacturer is used
- a higher linearity is required (individual adjustment, i.e. use of a linearization curve optimized for the respective sensor).
- high requirements are placed on the temperature stability of the measured values

The individual steps that must be carried out for the individual adjustment in the configurator level are listed below. Example values are given in brackets in each case.

First, all settings are deleted with the "Reset" button.

Secondly determine in which distance range the electrode is to be used (e.g. 0.3...3.3 mm nominal measuring range). For good linearization even at the limits of the nominal measuring range, the linearization curve (user curve) should cover a somewhat larger range (e.g. 0...3.6 mm).

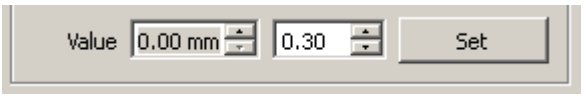


Position the target at the end of the nominal measuring range (distance 3.3 mm) and set the **oscillator current (**Iosc) so that an oscillator voltage (Uosc) of approx. 90 % results. This results in an optimum resolution without any limitation (non-linearity) occurring even when the nominal measuring range is slightly exceeded. The oscillator current to be set depends on the sensor type, maximum distance, target material and geometry.

First set the value for the fine adjustment (offset) to 0. The value is intended to be able to use the same parameterization for several similar measuring chains by means of board adjustment.

In the next step, record the new **linearization characteristic** and store it in MNHµCON. Ideally, you should use a measuring system for this, with which the

distance between the eddy current sensor and the measured object can be changed step by step.

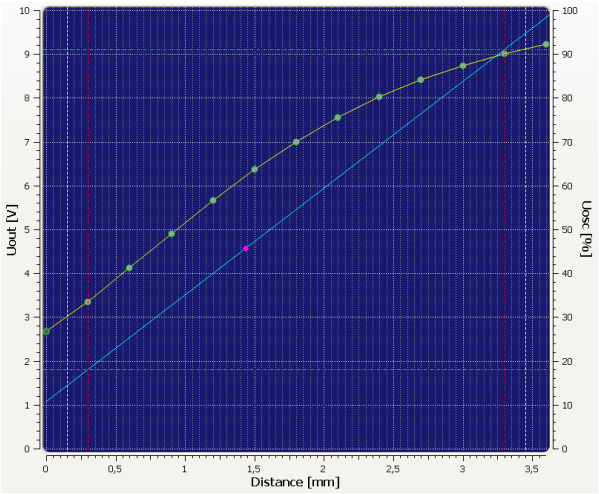


Move to the first measuring point on the measuring system. Enter the distance at "Value" and click "Set". This saves the value as the first base point of the sensor characteristic curve in the converter.

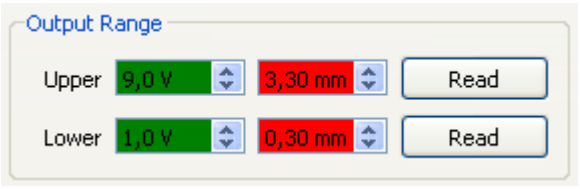
Set the next distance on the measuring system. The further distance values can be entered either numerically (input again via "Value") or stepwise via the arrow keys. The step width can be set in the middle input field (e.g. 0.30 mm). Click "Set" again to store the next interpolation point in the converter.

In this way, up to 16 interpolation points can be defined. Linearization values between 2 measuring points - are interpolated linearly.

The course of the linearization characteristic is displayed graphically.



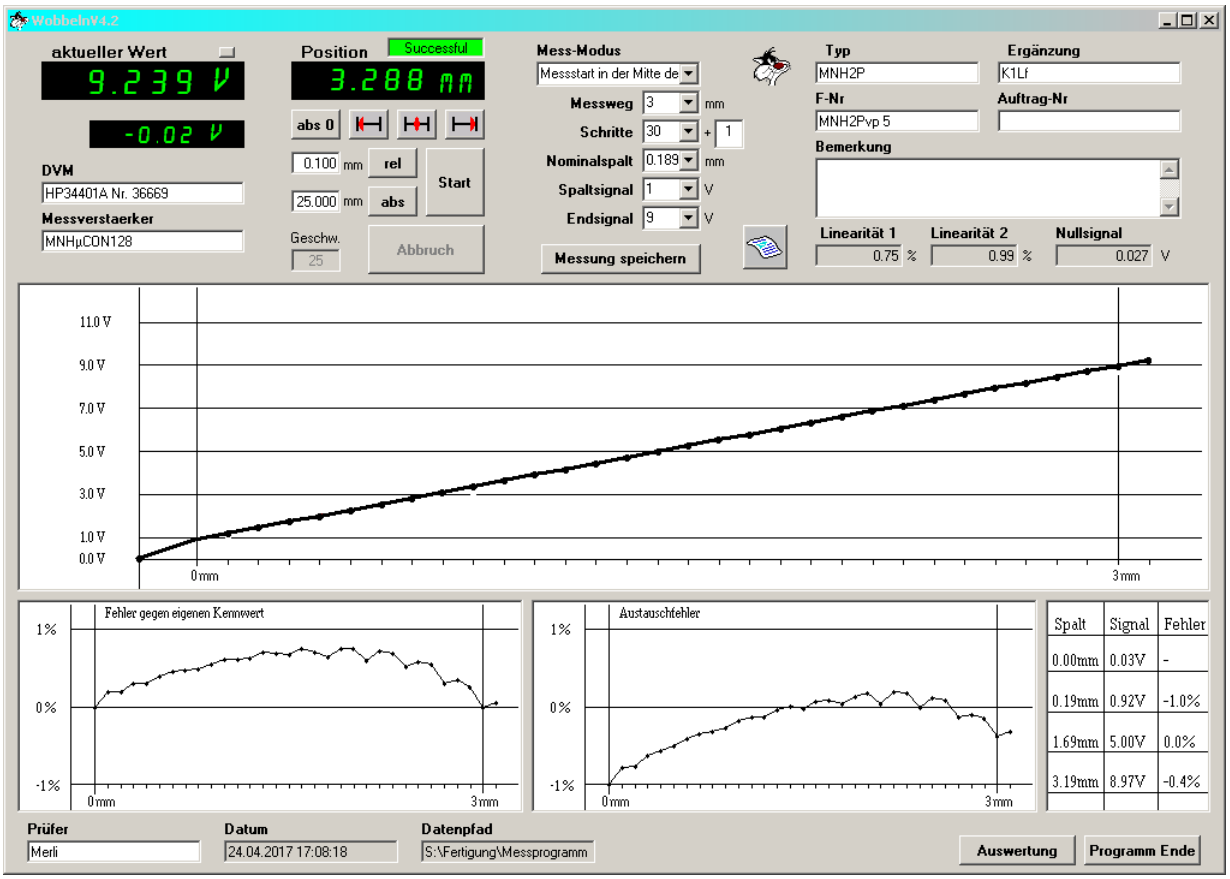
Check the entered linearization curve; you can delete individual interpolation points by clicking on them in the graphic display and move to them again for correction.



Scaling of the output signal: After recording the linearization characteristic, suitable output values - (current or voltage signals) must be assigned to the distance measurement values. This is done by entering 2 pairs of values. For this purpose, enter the desired output voltage, preferably at the beginning (Lower) and at the end (Upper) of the nominal measuring range (e.g. 1 V at 0.3 mm and 9 V at 3.3 mm).

In some applications, the passing or exceeding of certain thresholds is to be signaled separately. In the MNHµCON, you can define **threshold values for** this purpose. When these values are exceeded or not reached, the threshold value indicators (red LEDs inside the housing) light up.

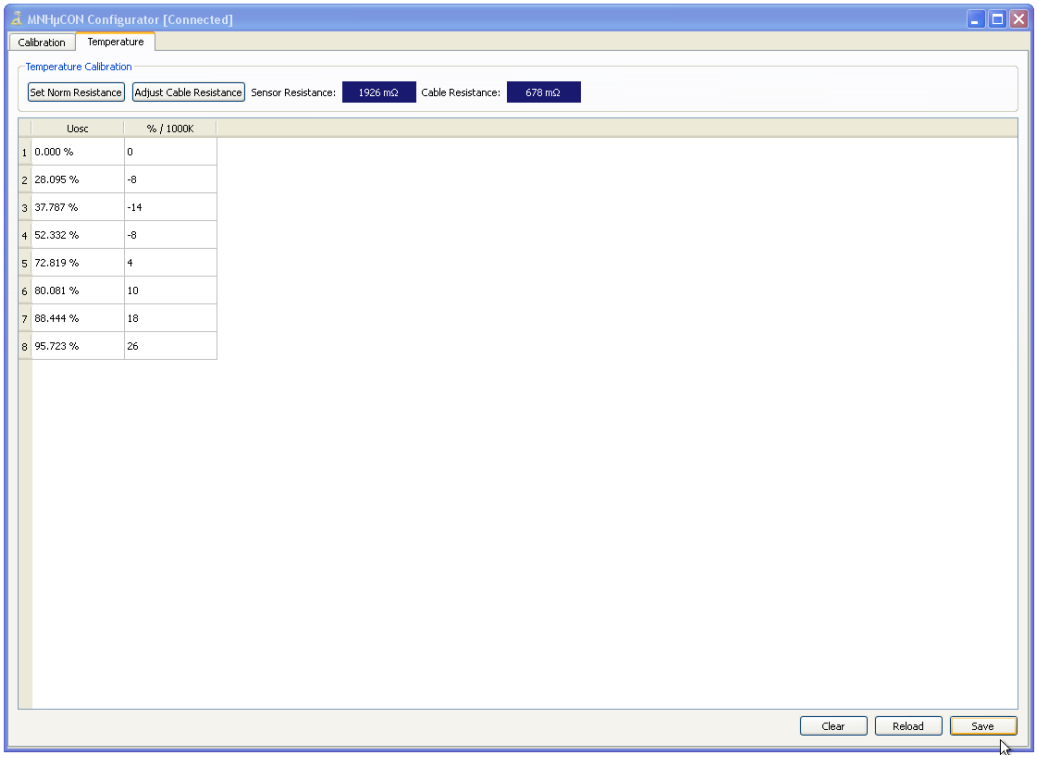
Example: Optional inspection with an automatic measuring system



TIP	After you have checked the linearization characteristic, press the "Save" button to save the settings.
TIP	Returning to the user level is possible only by restarting the program.

The converter is now optimally adapted to the eddy current sensor used and the measured object - but only at room temperature. Further adjustment steps are required to minimize the temperature influences on the measured value.

To reduce the **temperature drift,** switch from the "Calibration" tab to the "Temperature" tab.

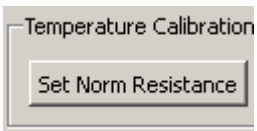


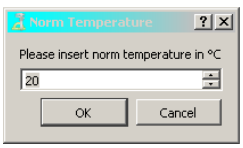
For the compensation of temperature influences during operation, a sufficiently accurate determination of the current sensor temperature is necessary. For this purpose, the sensor and converter must be adjusted to each other beforehand. Cable components that are subject to significant temperature fluctuations must also be taken into account.

With the aid of the PC software MNHµCON Configurator, this relatively complex adjustment can be reduced to a simple 2-point measurement (e.g. at room temperature and at operating temperature), ideally in the installed state.

The first adjustment is performed e.g. at room temperature, i.e. sensor, converter and cable are exposed to room temperature.

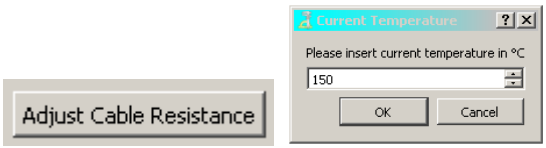
Temperature measuring point 1 (room temperature)





The second adjustment takes place, for example, at maximum operating temperature, i.e. the sensor and cable are exposed to the maximum operating temperature.

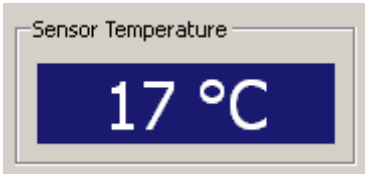
Temperature measuring point 2 (operating temperature)



The values required by the converter to determine the actual temperature are automatically calculated by the PC software and stored in the converter.

For control purposes, the determined values for the sensor resistance and the cable resistance are displayed.

After this calibration step, the MNHµCON can determine the sensor temperature. This can be checked in the MNHµCON Configurator in the "Calibration" tab.



In order to reduce the temperature drift of the measured values, corresponding correction values must be determined and stored in the converter. For standard configurations, MESSOTRON provides these values on request. However, you can also determine the values during an on-site calibration. Depending on the sensor type, a reduction of the temperature drift by a factor of 10 or more is thus possible.

	Uosc	% / 1000K
1	0.000 %	0
2	28.095 %	-8
3	37.787 %	-14
4	52.332 %	-8
5	72.819 %	4
6	80.081 %	10
7	88.444 %	18
8	95.723 %	26

Since the temperature drift usually changes with the distance to the measuring object, several correction values may have to be stored. The distance values correspond to the respective oscillator voltages (Uosc) to be entered. The corresponding correction values are entered in %/1000 K.

TIP	Returning to the user level is possible only by restarting the program.

5.3.7 Export and import configuration set

With the help of the "Export" button you can save the configuration set on your PC.

You can use the "Import" button to read a saved configuration set back into the converter.

6 Operation

The MNHµCON is intended for unattended continuous operation.

For decommissioning, it must be disconnected from the power supply.

No obvious status indicators are provided for operation. In normal operation, one of the 3 LEDs inside the housing lights up.

Status	L1 (rot) (untere Schwelle)	L2 (grün) (innerh. der Grenzen)	L3 (rot) (obere Schwelle)	
Normalbetrieb				unterer Schwellwert unterschritten
				Abstandswert liegt zw. unterer und oberer Schwelle
				oberer Schwellwert überschritten

7 Repair

NOTE

Do not attempt to repair a defective device on your own under any circumstances. Attempts at repair of any kind will result in the immediate loss of the warranty and liability claim.

MESSOTRON electronics are designed for use in a harsh industrial environment. They are designed for many years of trouble-free operation.

In case of any misbehavior or damage, please contact us by phone or email:

Tel: +49 (0) 6257 999 730
Email: info@messotron.de

If necessary, send the product (at your own expense) to:

MESSOTRON GmbH & Co KG
Friedrich-Ebert-Str. 37
64342 Seeheim-Jugenheim

Please include a delivery bill and a detailed description of the defect with all submissions.

8 Maintenance

8.1 Maintenance

The converter does not contain any parts to be maintained...

8.2 Cleaning

NOTE
Electrostatic discharges on electronic assemblies can lead to preliminary damage or direct failure of components. Therefore, take all necessary measures to avoid electrostatic charging (ESD protection measures).

Pay attention to the following points when cleaning:

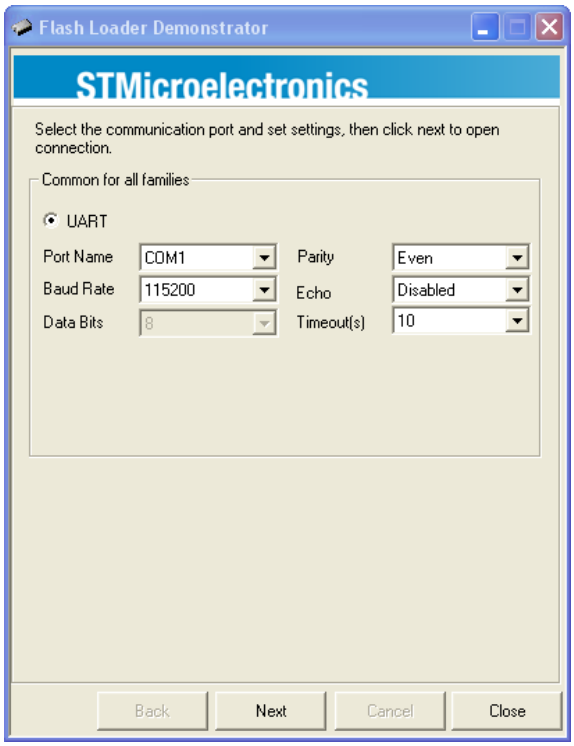
- Only clean the housing with a soft, slightly damp cloth.
- Carefully remove dry dirt on the boards with a vacuum cleaner or brush.
- If liquid gets into the device, have the device checked by MESSOTRON before using it again.

8.3 Firmware update

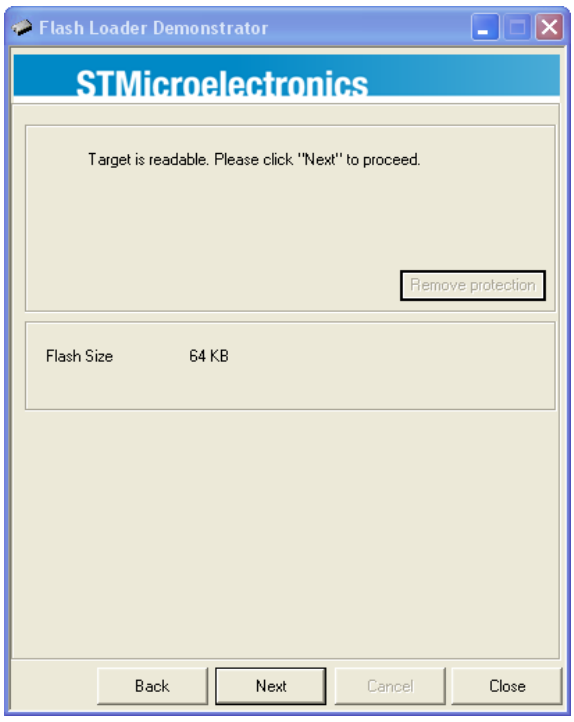
NOTE
The installation of new firmware may only be performed by qualified personnel.

Use the programming tool "Flash Loader Demonstrator" to perform a firmware update via the serial interface. The tool is available as a free download on the website of the processor manufacturer (STMicroelectronics).

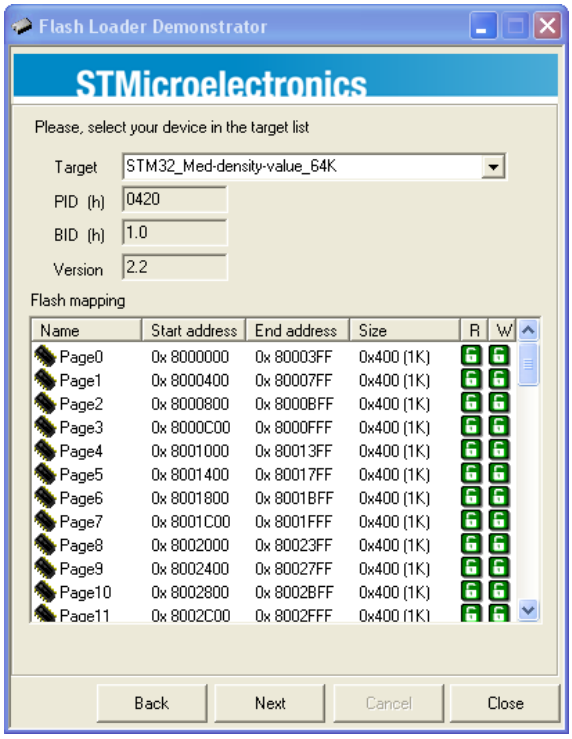
Start the STM programming tool "Flash Loader Demonstrator" (start screen).



To load the firmware, you must set the processor of the eddy current converter to programming mode. To do this, press the multifunction button under the dummy cover when switching on the supply voltage. It must not be released until the start screen of the programming tool is exited by clicking the "Next" button.

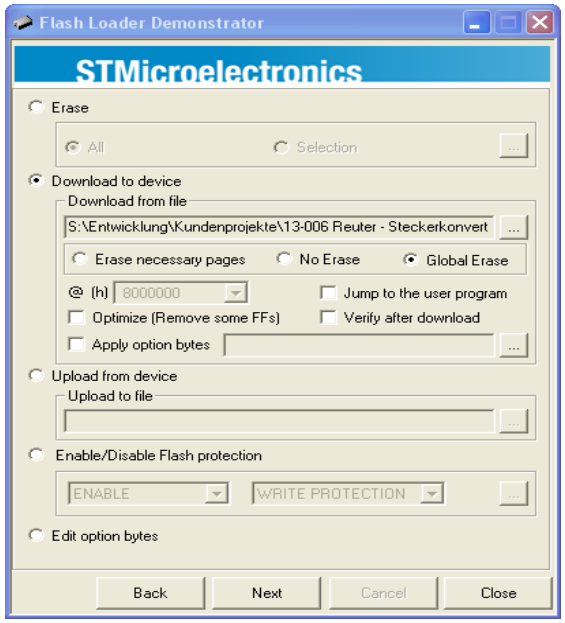


After that, select the target memory (flash memory of the processor)

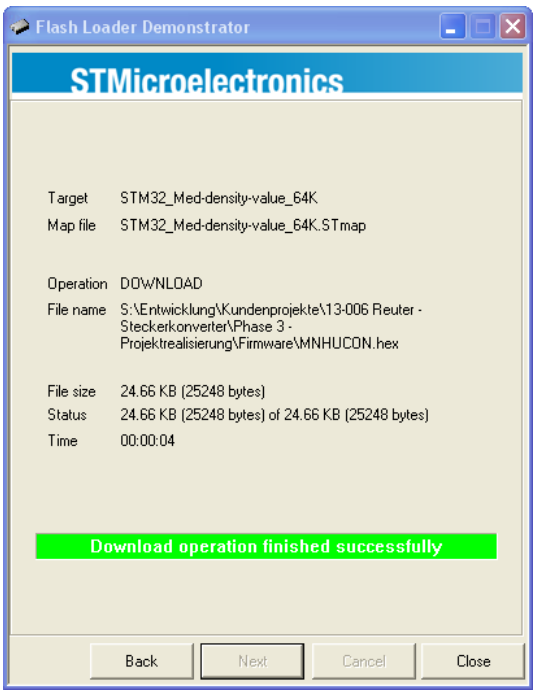


In the next step, select the file with the firmware. To ensure a defined behavior at the first start of the eddy current converter, you must reset the flash memory (also includes all setting parameters)➔ Set Global Erase

As soon as you have clicked the "Next" button the firmware is written into the flash memory of the processor.



Exit the programming tool after completing the programming with "Close".



TIP	To start the eddy current converter with the new firmware, you must briefly interrupt the power supply.

9 Disposal

The device, any accessories and packaging must be disposed of in accordance with the respective national guidelines. Please observe the national and local regulations for environmental protection and raw material recovery.

10 EU Declaration of Conformity / CE Marking

10.1 Electronics with a supply voltage < 50 V

EU – Konformitätserklärung

EU declaration of conformity / Déclaration UE de conformité

Hiermit erklären wir, dass die Produkte
Herewith we declare that the products / Nous déclarons que les produits

MBI 46.1x
MBI 46.31.1x, MBI 46.31.3x
MBI 46.32.1x, MBI 46.32.3x, MBI 46.32.4x
MBI 46.33.1x, MBI 46.33.3x
MBI 46.41.3x
MBI 46.51.39
MBI 50.25.x
MBI 50.33.x
MNHµCON, SENSKON-011

die grundlegenden Anforderungen folgender Europäischen Richtlinien erfüllt
is in conformity with the following European Directives / est conforme à la dispositions de la Directive

☒ **EMV-Richtlinie** — **2014/30/EU**
EMC Directive / Directive CEM

nachgewiesen durch die Einhaltung der aufgeführten harmonisierten Normen
verified by the compliance with the harmonised standards listed below /
et justifié par le respect des normes harmonisées mentionnées ci-dessous

EMV — **DIN EN 61326-1 (2013)**
EMC / CEM

☒ **RoHS -Richtlinie** — **2011/65/EU, 2015/863/EU**
RoHS Directive / Directive RoHS

Jahr der Anbringung der CE-Kennzeichnung — **2022**
year of declaration / année de déclaration du marquage

MESSOTRON
GmbH & Co KG

Seeheim-Jugenheim, den 16.05.2022

Stephan Hotz, Konformitätsbeauftragter

11 Technical data

General

Supply voltage	24 VDC (19.2...30 VDC)
Current consumption	< 200 mA (typical 50 mA at 24 VDC)
Nominal measuring range	up to 50 mm (depending on the sensor used)
Signal output	0...10 V or (0)4...20 mA
Load / load resistance	>10 kOhm / <500 Ohm
Sensor frequency	approx. 1 MHz (with MNH sensors)
Resolution	< 1 µm (depending on sensor /measuring range) MNH 2 approx. 0.1 µm; MNH 10 approx. 0.7 µm
Linearity	sensor-dependent, typ. << 1 % for MNHs
Dynamic range	0...10 kHz (3 dB)
Drift Supply spg.	<20 mV/V
Temperature error	sensor dependent, compensated typ. < 1 %/100 K for MNHs

Setting

via PC software	serial interface (RS232)

Mechanical

Housing	Cast aluminum housing
Dimensions	114 (140) mm x 64 mm x 30(45) mm
Weight	approx. 0.15 kg

Surroundings

Operating / storage temp.	-30...+70°C
Humidity	5...95 % (without condensation)
Protection class	IP40 (20)
EMC	EN 61326-1

Changes and errors excepted.

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