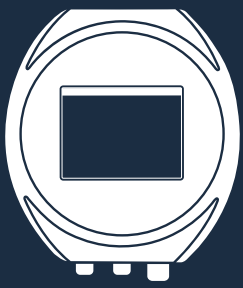
TriOS
Optical Sensors



TriBox mini

OPERATING INSTRUCTIONS

Table of Contents

1 General Information

1.1 Introduction

Welcome to TriOS.

We are glad that you have chosen to purchase our TriBox mini controller. This manual is valid for both TriBox mini and TriBox mini NET.

The TriBox mini is a 2-channel digital controller with two digital sensor inputs and two 4...20 mA outputs. The controller is compatible with all TriOS sensors. All of the measured values and diagnostics data that are saved can be selected using an integrated web browser. Features such as low power consumption, a robust aluminium housing and a range of interfaces make the TriBox mini suitable for all applications associated with environmental and drinking water monitoring, as well as wastewater treatment plants and many other areas.

In this manual, you will find all the information you need to commission and use the TriBox mini. The technical specifications and the dimensions can be found in Chapter 7.

Please note that the user is responsible for complying with local and national regulations on the installation of electronic devices. Any damage caused by incorrect use or unprofessional installation will not be covered by the warranty. All sensors and accessories supplied by TriOS Mess- und Datentechnik GmbH must be installed and operated in accordance with the specifications provided by TriOS Mess- und Datentechnik GmbH. All parts were designed and tested in accordance with international standards on electronic instruments. The device meets the requirements of the international standards on electromagnetic compatibility. Please use only original TriOS accessories and cables to ensure reliable and correct operation of the devices.

Before using the device, read the manual carefully, and keep this manual on hand for future reference. Before commissioning the controller, please make sure that you have read and understood the following safety precautions. Always make sure the controller is operated correctly. The safety precautions described on the following pages should ensure the reliable and correct operation of this device and any additional associated devices and should prevent injuries to yourself or other persons and damage to other equipment.

NOTICE	**If the translation is at all different from the original German text, the German version is binding.**

Software updates

TriOS Mess- und Datentechnik GmbH releases software updates for the TriBox mini from time to time. These updates include bug fixes, new features and options. This manual refers to software version 1.2.7. Devices with older versions of the software may not have all of the functions described here.

Copyright Notice

1.2 Health and Safety Information

This manual contains important information about health and safety rules. This information is labelled according to the international specifications of ANSI Z535.6 (“Product safety information in product manuals, instructions and other collateral materials”) and must be strictly followed. The following are distinct categories:

⚠ **DANGER**	**Danger warning / will lead to serious injury or death**
⚠ **WARNING**	**Warning / may lead to serious injury or death**
⚠ **CAUTION**	**Caution / may cause moderate injury**
NOTICE	**Can result in damage to property**

Tip / Useful Information

Electromagnetic waves

Devices that radiate strong electromagnetic waves can influence the measurement data or result in a malfunction of the connected sensor. Avoid using the following devices in the same room as the TriOS sensors: mobile phones, cordless phones, transmitters/ receivers and other electrical devices that produce electromagnetic waves.

1.3 Warnings

- Never use damaged products. After receiving the package, examine the device for any damage due to transport.
- Read the operating instructions carefully before beginning any installation or service.
- Make sure that the power cable is not damaged. Make sure there are no heavy objects on the cable and that the cable is not folded. Make sure that the cable is not anywhere near hot surfaces.
- If the cable is damaged, it must be replaced with an original cable by the customer service of TriOS Mess- und Datentechnik GmbH.
- Stop operation if excessive heat develops (i.e. if it is hot to the touch). Switch off the controller immediately and unplug the power cable from the power supply. Please contact your dealer or TriOS customer service.
- Never try to disassemble or modify a part of the controller if such a procedure is not explicitly described in this manual. Inspections, modifications and repairs may only be carried out by the dealer or by qualified experts authorized by TriOS.
- Devices from TriOS Mess- und Datentechnik GmbH meet the highest safety standards. Repairs to the device must be carried out by TriOS Mess- und Datentechnik GmbH or by a workshop authorized by TriOS. Faulty, improper repairs can result in accidents and injuries.

⚠ DANGER **TriOS does not guarantee the plausibility of the measured values. The user is always responsible for the monitoring and interpretation of the measured values.**

1.4 User and Operating Requirements

The TriBox mini was developed for use in industry and science. The target group for the operation of the controller is technically skilled staff in plants, sewage treatment plants, water plants and institutes. We assume that the personnel are sufficiently qualified to operate and install the device based on their professional training and experience. The personnel must be able to correctly understand and implement the safety labels and information on the packaging and in the package inserts.

1.5 Intended Use

The TriBox mini is intended to control the supported sensors and collect, process and store measurement data. Its use is described in this manual. Please note the technical data of the controller. Other uses do not comply with the intended use.

According to current scientific knowledge, the device is safe to use when it is handled according to the instructions in this user manual.

1.6 Disposal Information

At the end of the device's life or use, the device and its accessories can be returned to the manufacturer for environmentally friendly disposal (see address below). Please contact us for more details before you send the device back.

Address of manufacturer:

TriOS Mess- und Datentechnik GmbH
Bürgermeister-Brötje-Str. 25
26180 Rastede
Germany
Telephone: +49 (0) 4402 69670 - 0
Fax: +49 (0) 4402 69670 – 20

1.7 Certificates and Approvals

This product meets all of the requirements of the harmonised European standards. It therefore meets the legal requirements of the EU guidelines. TriOS Mess- und Datentechnik GmbH confirms the successful testing of the product by affixing the CE marking. (See Annex.)

2 Introduction

The TriBox mini is a stationary measurement and control unit for all sensors made by TriOS Mess- und Datentechnik GmbH and for select sensors made by other manufacturers.

The system assumes the power supply of the sensors and stores all measured values. The TriBox mini also assumes control of the entire measurement process and monitors the measurement values.

A potential-free relay output (changeover contact) can be used for external control tasks. The relay switches when a freely definable limit of a measurement parameter is exceeded or falls short, triggering an alarm or controlling external devices, such as pumps.

To clean the optical sensor, an external valve box can be connected that can switch on and off in adjustable intervals, triggering compressed air cleaning when combined with a compressed air source. Used in combination with the nano-coated glass panes in most optical sensors made by TriOS Mess- und Datentechnik GmbH, this makes for a very effective antifouling strategy.

Protection against water jets (IP65) allows operation in moist environments and extends the area of use when properly installed.

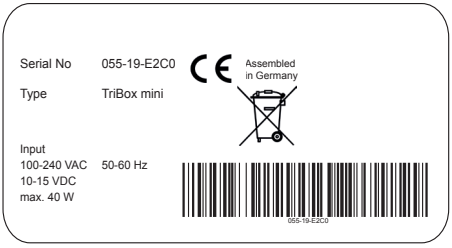
The measurement values are shown on a TFT color display (resolution of 320 X 240 pixels) and saved internally on an SD card. Depending on the device type, the saved measurement values can be exported via WiFi or network cable to then be processed further in a spreadsheet. The device is operated via a capacitive touch screen that lets the user navigate the menu structure. The user can adjust all of the settings on the device.

Two integrated analog outputs (4...20mA) allow the TriBox mini to be integrated into a PLC or other control system.

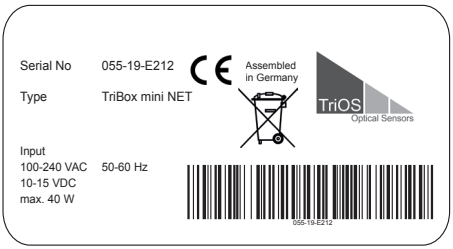
2.1 Product Identification

There is a rating plate on the product with the following information that you can use to uniquely identify the product:

Serial number
Product type
Power supply



Serial number
Product type
Power supply



In addition to the product bar code, the rating plate includes the TriOS Mess- und Datentechnik GmbH logo and the CE quality label.

Please note that the specifications given here are for illustration purposes only and may be different depending on the version of the product.

2.2 Scope of Delivery

The shipment contains the following components:

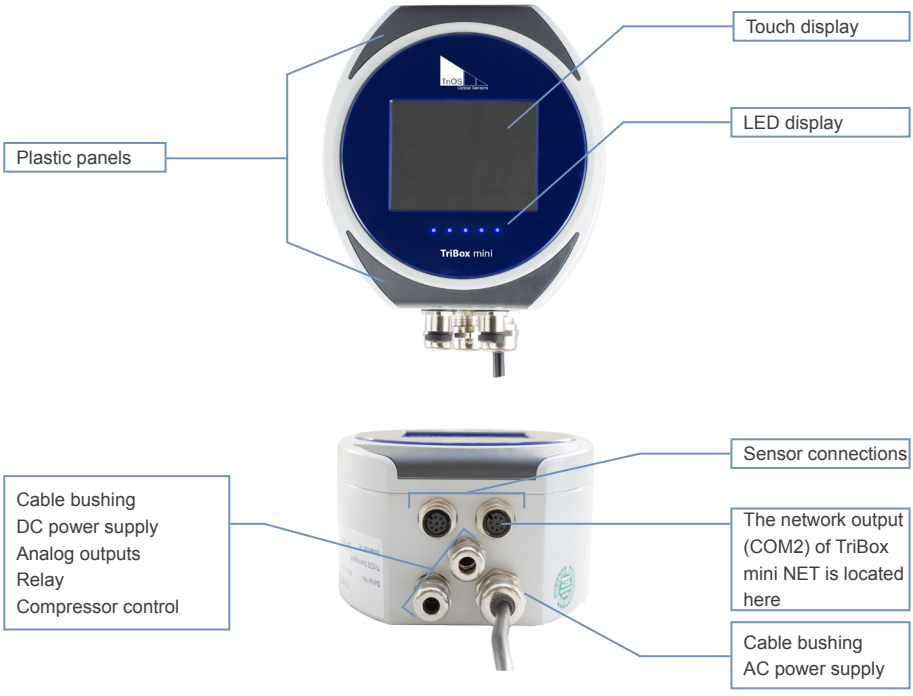
- TriBox mini with an installed power connector cable and shockproof plug for use in dry rooms.
- Operating Instructions
- Accessories (if applicable)

Keep the original packaging in case the device needs to be returned for service or repairs.

It is recommended to order a suitable network cable (M12 → RJ45) for TriBox mini NET from TriOS Mess- und Datentechnik GmbH.

2.3 Product Structure

The illustration below shows the structure of the TriBox mini.



2.4 Control Elements

The device is operated using either the touch display or the web-interface. This way the user can change settings with a smartphone or a laptop (wirelessly or using a network cable) or directly on TriBox mini devices.

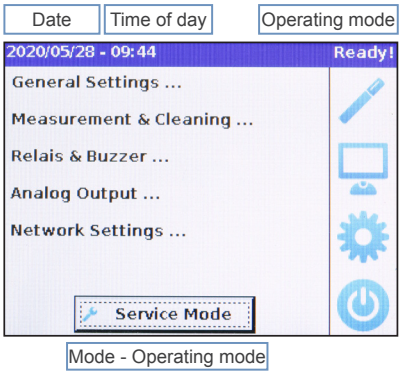
2.4.1 Display

Ongoing measurements are displayed on the 3.5 "TFT colour display (resolution 320 x 240 pixels) and backed up in the built-in memory (2 GB). The TriBox mini features a Wi-Fi module for wireless data transmission (measurement data and service configuration). This does not apply to the TriBox mini NET. The display is controlled by touch or light tapping and does not react to pressure. It can be operated with bare fingers or with a special touch screen pen.

NOTICE **The use of sharp or pointed objects when operating the touch display can lead to damage to the display.**

The main screen always displays the date, time and mode at the top. Permanent control elements on the right lead through the various configuration possibilities of the TriBox mini. Use the touch display to navigate the different screens. Tap on the “Mode” button at the bottom to change the operating mode of the TriBox mini. Always change the configuration in “Service Mode”. The upper right corner of the display shows the current operating mode.

TriBox mini



Functions:

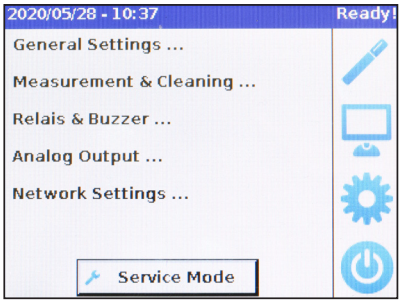
Sensors and COM ports

Screen and display

General and special settings

Turn off display

TriBox mini NET



Functions:

Sensors and COM ports

Screen and display

General and special settings

Turn off display

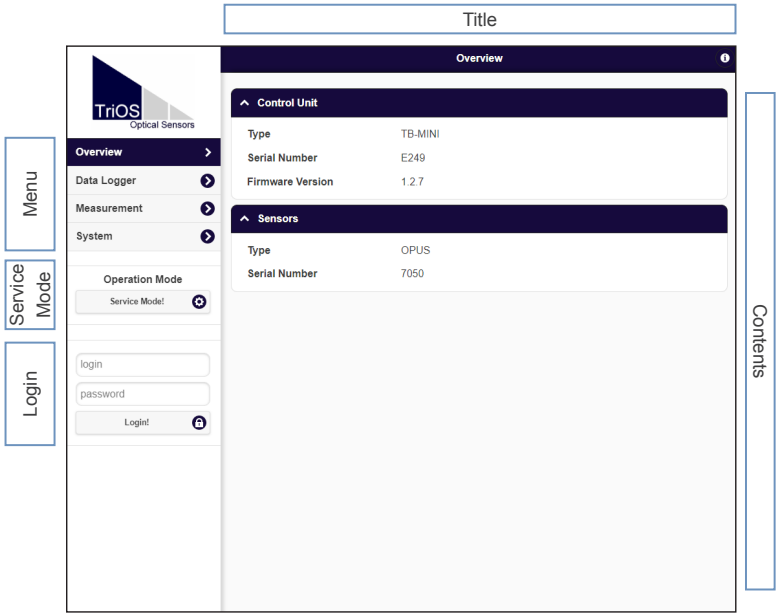
2.4.2 Status LED

- ● ● ● ● ● flashing in service mode
- ● ● ● ○ ○ measurement active, switch on sensor, start measurement
- ● ● ○ ○ ○ measurement active, waiting on result
- ● ○ ○ ○ ○ measurement active, processing results
- ○ ○ ○ ● ● cleaning active
- ○ ○ ○ ○ ● cleaning: pause before the measurement

2.4.3 Web Interface

The TriBox mini can be operated using the web interface in addition to the display. The process is platform-independent and operates on any PC or smartphone with a Wi-Fi connection and a browser.

Chapter 3.5 on the web interface describes the commissioning process in detail.



3 Commissioning

This chapter describes the commissioning of the controller up to the first function test. Please pay particular attention to this section and follow the safety precautions to protect the product from damage and yourself from injury.

Before the sensor is put into operation, please make sure that all connections are connected correctly.

3.1 Power Supply

The TriBox mini requires a secure power supply within the voltage range of 100 VAC to 240 VAC with a mains frequency of 50 Hz to 60 Hz. The power supply must be protected according to local safety standards.

⚠ DANGER **The device has a housing grounding (protective conductor), which must be connected to the ground potential when operating with 100 - 240 VAC. A protective conductor connection is recommended to provide functional grounding when operating with 10 - 15 V DC.**

Plug the supplied power cable into a professionally installed, shockproof socket. To protect against overloading, the device has internal glass tube fuses (see chapter 6.3.1).

The TriBox mini comes with a power cable that can be replaced by an alternative customer-specific cable if necessary (see chapter 4.2.1). The Tribox mini can also be powered by 10 - 15 V DC (see chapter 4.2.2).

The TriBox mini has connections for the relay, the DC power supply and other components. These can only be accessed by opening the device.

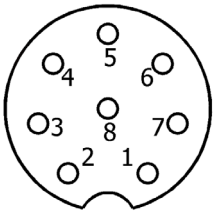
3.2 Sensor Interfaces

The TriBox mini has two M12 sensor interfaces (COM1 on the left and COM2 on the right). Only use original cables from TriOS Mess- und Datentechnik GmbH to connect the sensors.

TriBox mini NET has an additional network interface.

Both M12 sensor interfaces support RS232 and RS485 and can be configured for Modbus and other special protocols.

M-12 industrial plug



Face view (female)

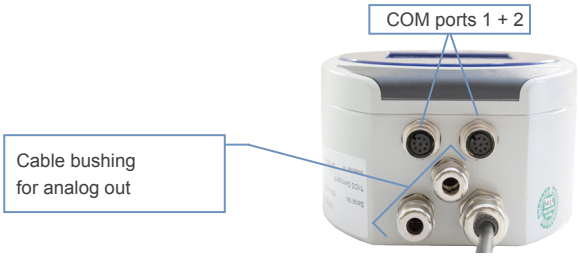
	TriBox mini	TriBox mini NET
	COM Port 1 & COM Port 2	COM Port 2
1.	RS232_TX / RS485_A	RS232_TX / RS485_A
2.	RS232_RX / RS485_B	RS232_RX / RS485_B
3.	not connected	Ethernet RX-
4.	not connected	Ethernet RX+
5.	not connected	Ethernet TX-
6.	+12 V DC	Ethernet TX+
7.	GROUND	GROUND
8.	+12 V DC	+12 V DC

The designations of the data lines can be seen on the TriBox mini device. For example, RS232_RX is the receiving line and RS232_TX is the transmission line of the TriBox mini.

The supply voltage on COM2 is exclusively on PIN 8 for TriBox mini NET. Therefore, only sensors that receive their power supply from this PIN can be connected to this COM port.

3.3 Outputs

The TriBox mini has two analog outputs. These are not assigned by default. In the standard setup, the power cable is already installed in the lower right cable bushing.

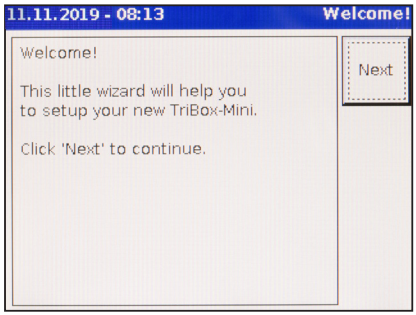


The sensor interfaces can also be configured as digital outputs, allowing measured values to the sent to a process control system, e. g. via Modbus. See also chapter 5.4.

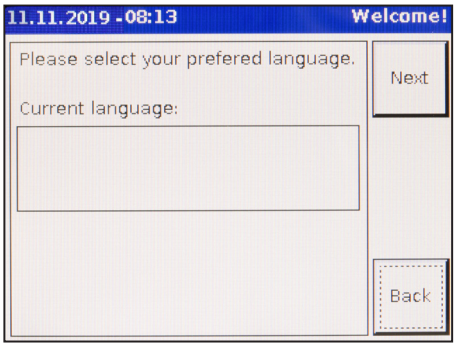
3.4 Menu

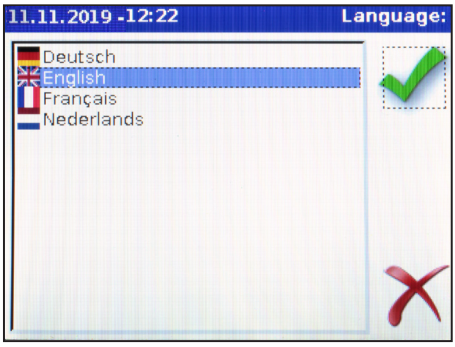
3.4.1 Presettings

The TriBox mini welcome screen appears during commissioning. This screen is always displayed in English.

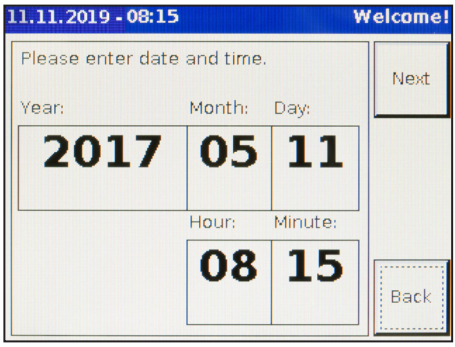


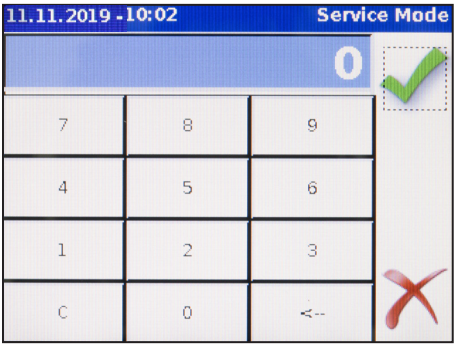
First, choose the language. Tapping on the large rectangle in the middle of the display will call up a submenu that lets you choose between English, German, French and Dutch. Your entry must always be confirmed with the green tick. Tap on the red cross to return to the last menu.





Next, set the system time. You can enter the time in the number field that appears when you tap on the button.

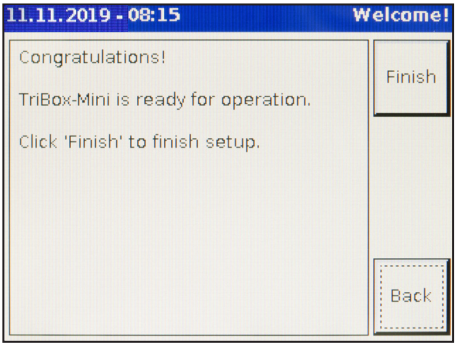




“C” key: back to 0

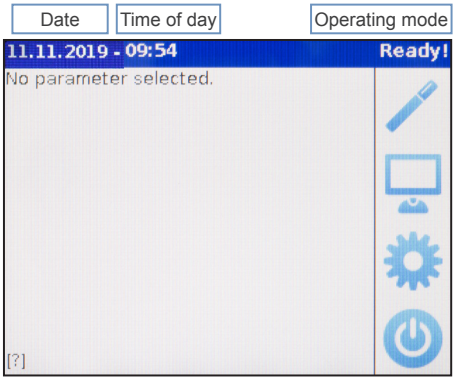
“<--” key: correct the last number entered

Once the language and time are set, the commissioning process is done and the welcome screen appears again.



3.4.2 Permanent display and control elements

The TriBox mini screen always displays the date, time and mode at the top. Permanent control elements on the right lead through the various configuration possibilities of the TriBox mini. Use the touch display to navigate the different screens.



Functions:

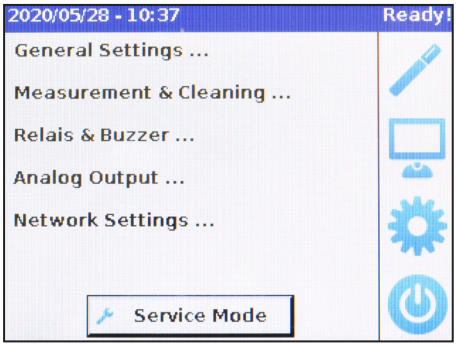
Sensors and COM ports

Screen and display

General and special settings

Turn off display

If you want to input setting on the TriBox mini itself, it first needs to the switched to “Service Mode”. This mode can be found in the “Options” submenu . Tap on the “Mode” button at the bottom to change the operating mode of the TriBox mini. The upper right corner of the display shows the current operating mode.

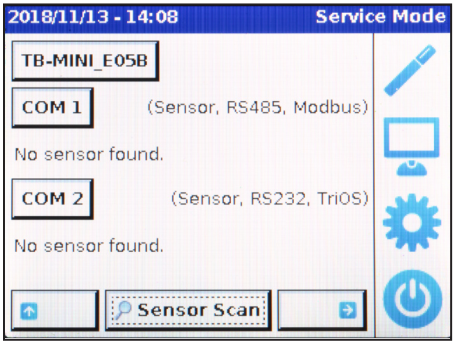


Mode - Operating mode

NOTICE **Always switch to “Service Mode” when making changes to the TriBox mini configurations.**

3.4.3 Sensor

The “Sensor” menu displays sensors connected to COM ports and allows configuration. Tap on the arrow keys on the screen to switch between “COM1” and “COM2”. The display shows the sensor name and measurable parameters. Other settings can also be viewed via this screen.

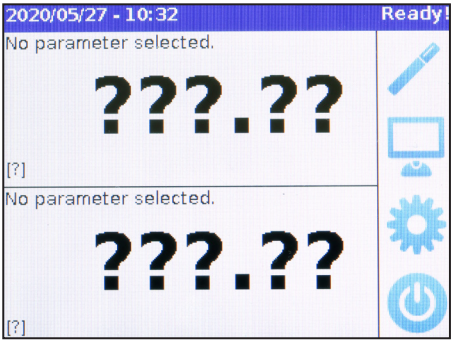


Setting for all TriOS sensors (except enviroFlu)

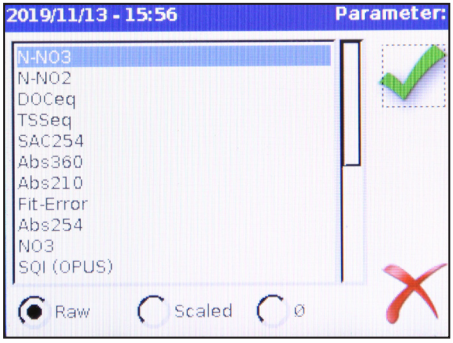
Setting for enviroFlu

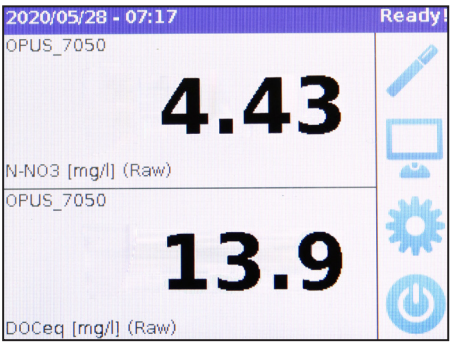
3.4.4 Display

The “Display” menu opens the main screen, which displays the measurement parameters of the sensors. Tap again on the “Display” menu icon to configure the display. A yellow frame will appear that you have to tap to keep your selection of measurement parameters.

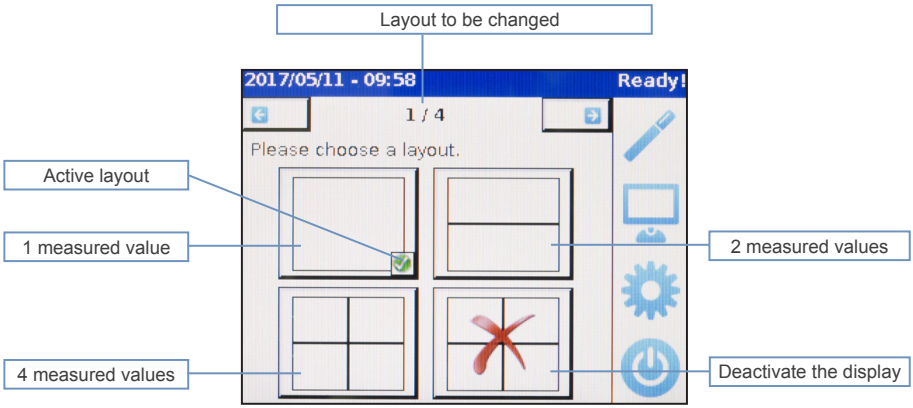


The measurement parameters that you can choose from depend on the sensor and are only available when the respective sensor is connected. Choose the parameter and representation (original raw data, scaled value or moving average). An error message will indicate if a sensor is connected that has the same parameter.





By holding the “Display” icon for at least 2 seconds, you can choose how many measured values are shown at the same time. You may set up up to four displays with different layouts. Several views can be configured that can be cycled through by “swiping” like on a smartphone.

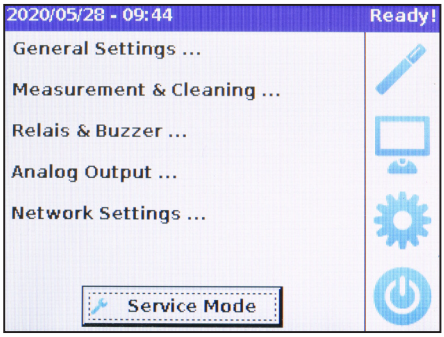


Simultaneous measurement of the same parameters is not provided for.

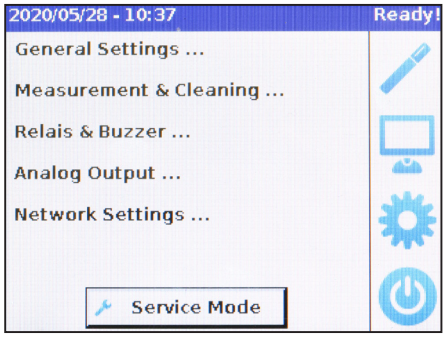
3.4.5 Options

In the “Options” menu, you can change local settings and additional functions of TriBox mini.

TriBox mini

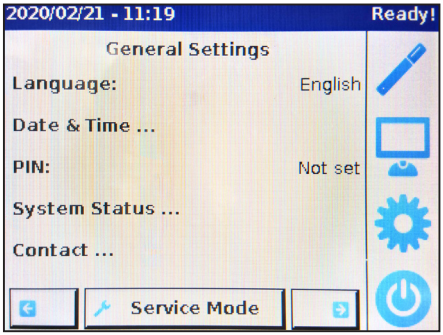


TriBox mini NET

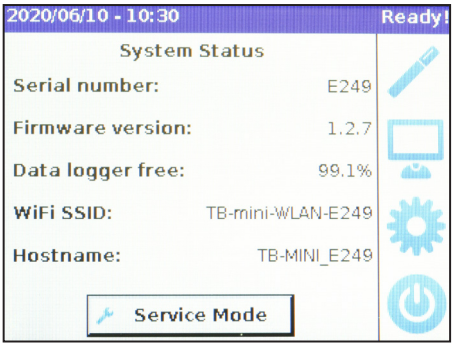


Press “Service Mode” to interrupt current measurements and change settings. The measurement interruption avoids fault alarms during cleaning of similar operations. Sensors can also be replaced in service mode.

In the sub-item “General Settings” subitem, the language (English, German, Dutch or French) can be set and the system time (menu navigation via numeric keypad) can be changed. The language is only changed when a new menu is called up (press the arrow key).



"System Status" provides information about the serial number (EXXX), firmware version, memory capacity [%] and network features, such as wireless SSID and hostname.



"Contact" has the contact information of the manufacturer.

3.4.6 Display Off

The "Off" icon deactivates the TriBox mini display, but the device remains switched on. Touching the screen again activates it.

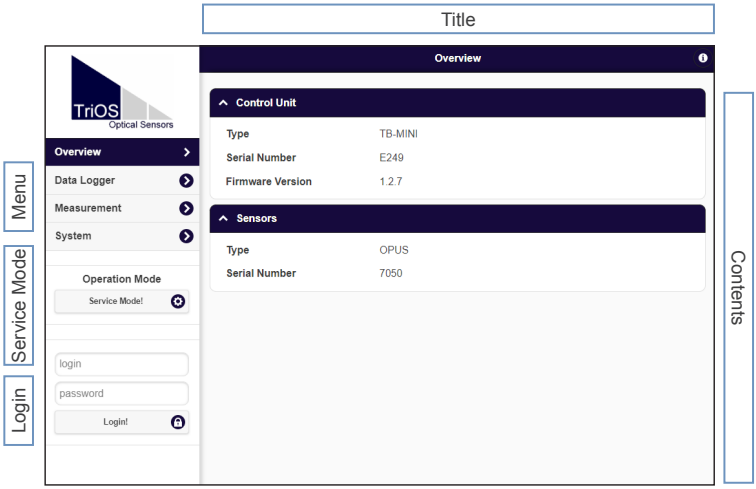
3.5 Web Interface

3.5.1 Access with TriBox mini (WiFi)

You can use a browser to access the TriBox mini (English) web interface (*http://tb-mini/*) via a wireless network connection (alternative address: *http://192.168.0.1/*). The process is platform-independent and works on any PC or smartphone with a Wi-Fi connection and a browser.

3.5.2 Access with TriBox mini NET

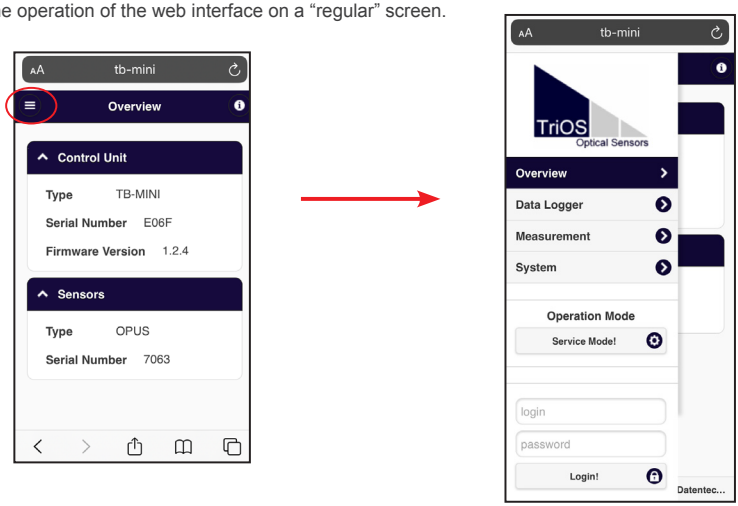
Connect a network cable to COM port 2 (M12 male / RJ45). In the network settings, you can check the connection properties such as IP address and subnet mask. Normally, entering the preset IP address in the address line of the browser is sufficient to gain access.



The web interface is identical for TriBox mini and TriBox mini NET. It is divided into three areas: title (top), menu (left under the TriOS logo) and content (right). Below the menu, there is a service mode and a login section; this area is only accessible to certified TriOS service technicians.

Smartphone

The layout is nearly identical on a smartphone. Here the menu and its subitems are displayed by tapping on the “Menu” button ≡ in the upper left corner. Because the differences are very small, in the following we will only describe the operation of the web interface on a “regular” screen.



The web interface displays the name of the current page highlighted in blue at the top of the screen. This clearly identifies which menu is open at all times.

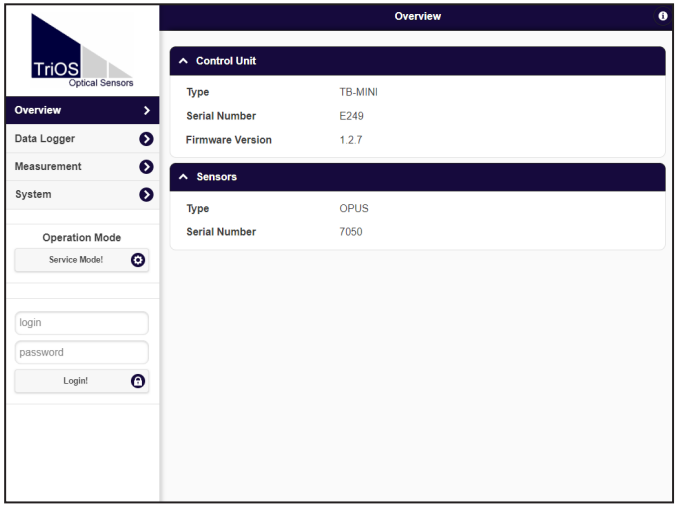
On the top right, there is a button that displays the contact details of the relevant TriOS dealer or TriOS Mess- und Datentechnik GmbH.

The menu is used to navigate the web interface. Each line is a link to another page with correspondingly different setting options. The link referring to the currently displayed page is always highlighted in the menu. Special, selected content and features are reserved to TriOS customer service staff.

The “Contents” area displays the relevant information and configuration options. Contents that require authentication are deactivated (“grayed out”).

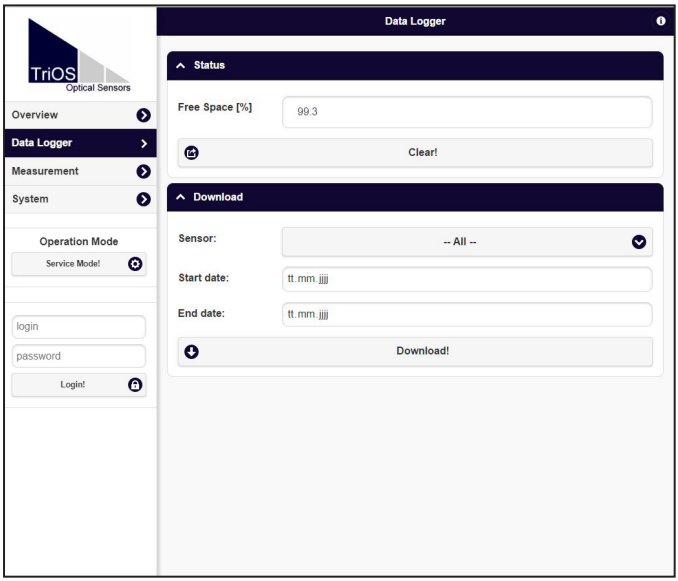
Using the web interface it is possible to switch between “Operation Mode” and “Service Mode”. The respective active mode is displayed in the top line.

3.5.3 Overview



The “Overview” page summarises the basic information on the TriBox mini and the connected sensors. At the top, you can find information on the TriBox mini, such as serial number and firmware, while the bottom shows the sensor type and sensor serial number (four digits).

3.5.4 Data Logger

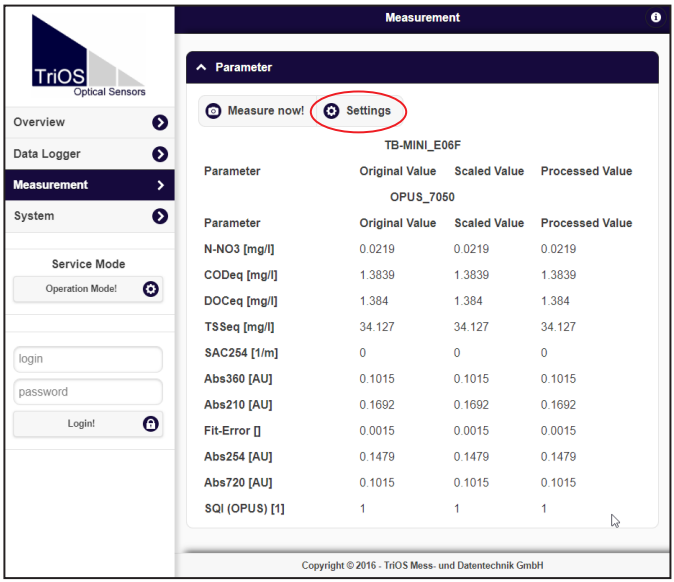


The TriBox mini has a 2GB internal memory. This enables the TriBox mini to operate almost completely self-sufficiently for a very long period of time (as long as there is a constant and sufficient power supply!) Each measurement is stored until the memory is full. The top line of the submenu shows what percentage of memory is available (Free Space [%]). Use the “Clear!” button to format the memory and delete all data. For security reasons, users will be prompted for confirmation before deletion.

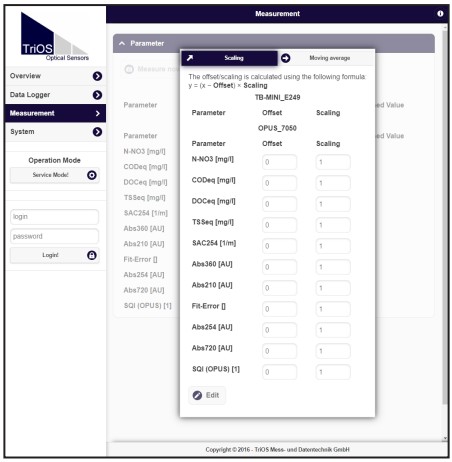
After confirming the security prompt, the memory and all data will be deleted.

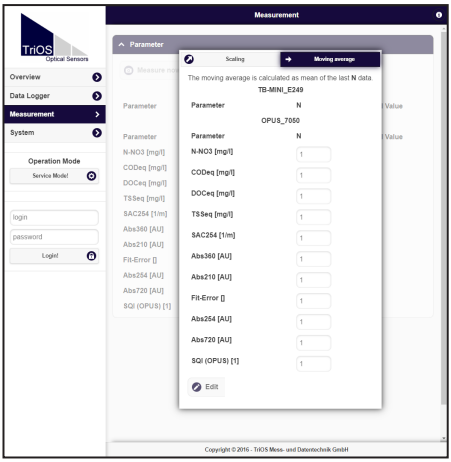
3.5.5 Measurement

The “Measurement” page shows the results of the last measurement along with the scaling formula (“Original Value” / “Scaled Value”). All parameters that the TriBox mini has measurements for are shown here.



The “Settings” button can be used to set Offset, Scaling and a Moving Average.





By pressing the “Edit” button, all available parameters can be scaled and provided with an offset (axis shift). The formula used to calculate the scaled measurement with the scaling factor and offset is displayed on the top line.

(Raw Value – Offset) x Scaling = Scaled Value

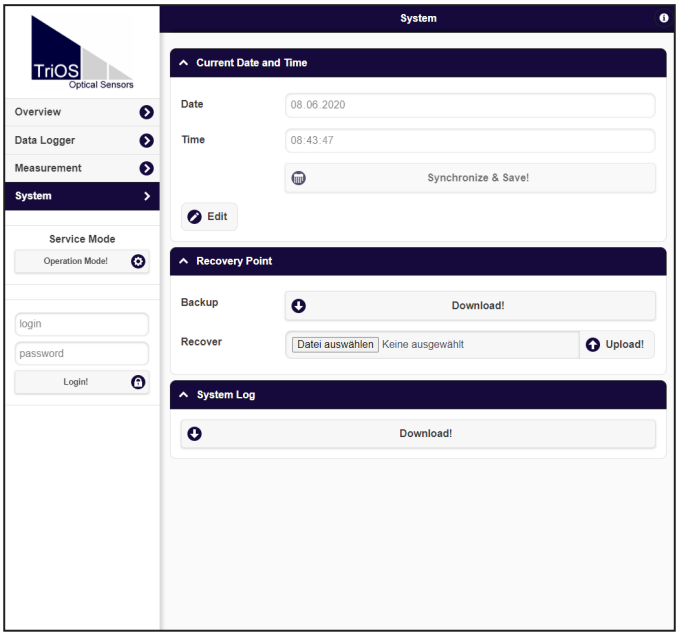
(Measured value - Axis Offset) x Scaling factor = Scaled measured value

3.5.6 System

The “System” page is used to manage the TriBox mini and to set the date and time. A recovery point can also be created, and the system log can be downloaded from this page.

Before fundamentally changing any of the settings, a recovery point should always be created.

You need the service password of TriOS Mess- und Datentechnik GmbH to re-upload recovery files to the TriBox mini!



NOTICE **If you have problems with your TriBox mini, it is recommended to send the recovery point and the system log with your support request.**

4 Use

The TriBox mini has a solid aluminium housing and is designed for outdoor use. The design of the TriBox mini meets the requirements of the IP65 protection class. This means that the internal components are protected against dust and water jets. For optimum operation, the device should be housed in a room or should be covered by a roof to protect against rain. The network cable for TriBox mini NET does not meet the requirements of the IP65 protection class (see chapter 8).

NOTICE	**Avoid direct sunlight and only operate the system within a temperature range of 0 °C and 40 °C.**

For service and inspection tasks, choose an easily accessible location.

⚠ CAUTION	**The TriBox mini comes with a power cable that is only intended for use in dry environments. For outdoor operation, this must be replaced by a suitable power cable.**

⚠ DANGER	**Risk of death due to electric shock. Due to the unrestricted voltage in the device, it may only be installed by trained electronics specialists who are authorised to do so based on their training. The relevant safety and VDE regulations must be observed. The device should only be opened when the power supply is disconnected.**

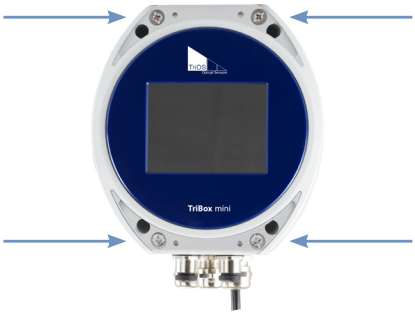
⚠ DANGER	**Risk of death due to electric shock. A fault-current circuit breaker with a maximum ignition current of 30 mA must be used. When installed outdoors, surge protection should be used.**

⚠ DANGER	**If the device is permanently connected, a power disconnection device must be integrated into the power line. This disconnection device must conform to the relevant standards and regulations. It must be installed near to the device where it can be reached by the user, and it must be labelled as a disconnection device for the controller. If a power cable permanently connected to the device is used, the plug of the power cable can serve as the local circuit breaker.**

4.1 Mounting

⚠ DANGER **Before making any changes to the power line or the plug, it is important to make sure that the power is disconnected and cannot be reconnected or switched on.**

1. Carefully remove the upper and lower plastic panels from the device.
2. Loosen the four screws around the edges of the TriBox mini.

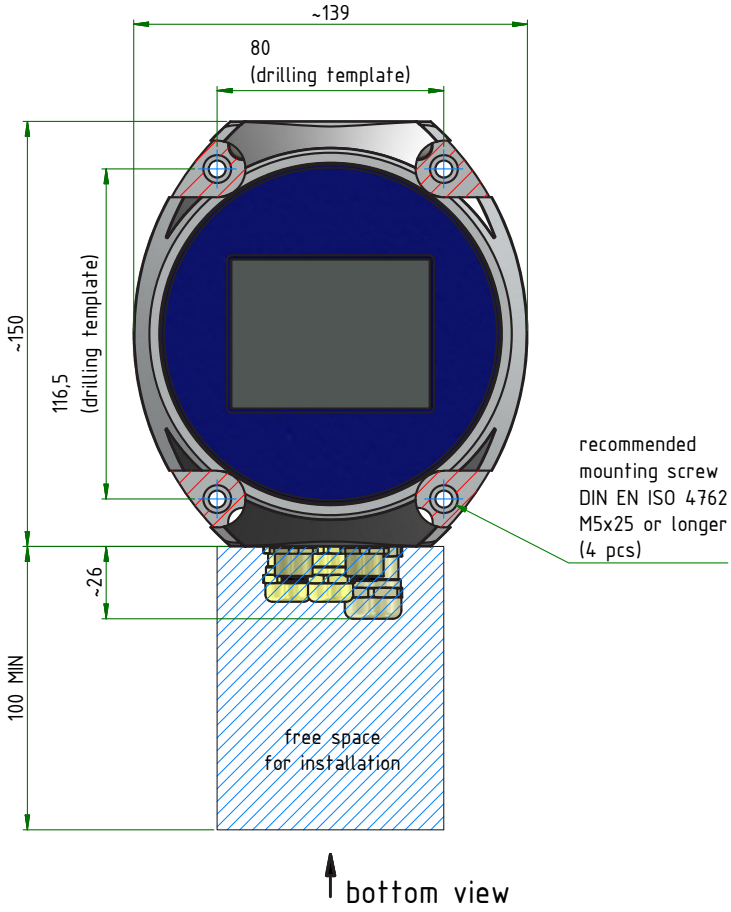


3. After removing the four screws, carefully lift open the cover of the housing. The housing cover should open without resistance and without application of force, as this would present the risk of damaging conductors in the device.

NOTICE **When opening and closing the housing cover, make sure the seal is positioned correctly and is not pinched.**

4. The device will be attached with the connection sockets facing down.
5. There are two 5.3 mm holes on each side of the TriBox mini for mounting. After installation, check the tightness of TriBox Mini.

For better orientation, the following figure illustrates the external dimensions and the dimensions of the mounting holes.



4.2 Electrical installation

The connections for the DC power supply can be found inside the TriBox mini and are only accessible when the unit is open. The following sections describe how to connect individual components.

4.2.1 Operation with AC Voltage

The TriBox mini can be operated with alternating voltage of 100-240 VAC, 50-60 Hz. Plug the supplied power cable into a professionally installed, shockproof socket. To prevent overloading, the device has internal glass tube fuses. See also chapter 6.3.1.

⚠ WARNING **If you need to replace a defective fuse, first unplug the power supply and use only fuses of the same type. Make sure you have completely eliminated the problem before putting the device back into operation.**

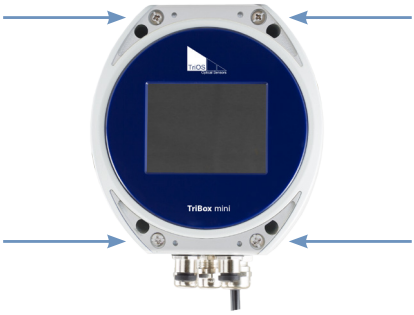
Alternatively, a permanent power supply can be installed. If so, remove the pre-installed power cable with the shockproof plug. To do this, please proceed as follows:

⚠ DANGER **Risk of death due to electric shock! Due to the unrestricted voltage in the device, it may only be installed by trained electronics specialists who are authorised to do so based on their training. The relevant safety and VDE regulations must be observed. The device should only be opened when the power supply is disconnected.**

⚠ DANGER **Before making any changes to the power line or the plug, it is important to make sure that the power is disconnected and cannot be reconnected or switched on.**

⚠ DANGER **The device has a housing grounding, which must be connected to the ground potential for operation.**

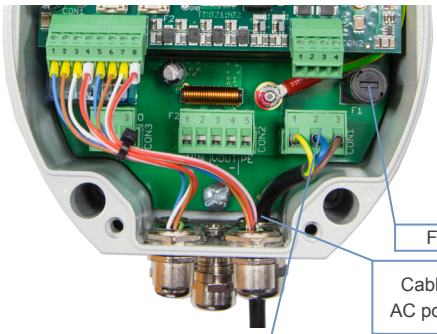
1. Carefully remove the upper and lower plastic panels from the device.
2. Loosen the four screws around the edges of the TriBox mini.



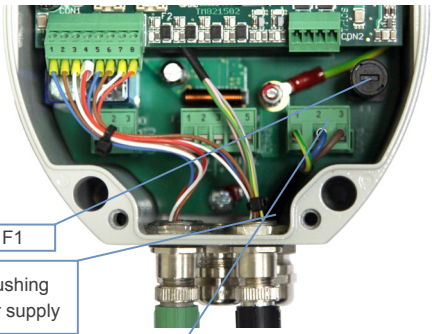
3. After removing the four screws, carefully lift open the cover of the housing. The housing cover should open without resistance and without application of force, as this would present the risk of damaging conductors in the device.

NOTICE **When opening and closing the housing cover, make sure the seal is positioned correctly and is not pinched.**

TriBox mini



TriBox mini NET



Fuse F1

Cable bushing
AC power supply

Remove the plug from the socket, take out the screws and disconnect the plug from the power supply line.

4. The figure shows the position of the 240 VAC connector plug on the circuit board. Pull out this 3-pin plug and disconnect it from the power supply.

NOTICE **Always use wire end ferrules for flexible lines. The large cable bushing in the lower right is designed for a sheath diameter of 5 mm to 10 mm.**

⚠ WARNING **Use only one power cable whose insulation is sufficient for the line voltage and which has a ground wire (PE). The cross section of the cable must be at least 0.75 mm².**

⚠ WARNING **Before the power line is inserted into the TriBox mini or touches it, it is important to make sure that the power to the TriBox mini is disconnected and cannot be reconnected or switched on.**

5. Insert the new power line through the cable bushing into the device. Connect the power cable to the plug labelled CON1 in the illustration. The following table describes the contact assignments.
6. Reconnect the plug to the circuit board and tighten the nut of the cable bushing.
7. Verify the grounding.
8. Close the housing of the TriBox mini and screw the cover back on. Attach the plastic panels. Put the device back into operation.

CON1 connector	
AC power supply	
Pin	**Assignment**
1	Protective conductor (PE)
2	Neutral conductor (N)
3	Phase (L)

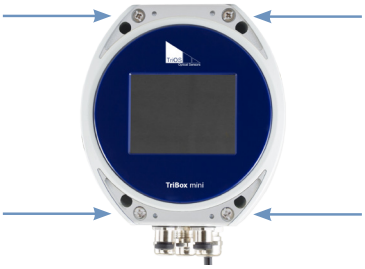
4.2.2 Operation with DC Voltage

The TriBox mini can be integrated into battery-powered stations, possibly in combination with solar or fuel cells. For such applications, the TriBox mini can be operated with 10 - 15 V DC voltage. In addition to the connection cable with its shockproof plug, the DC voltage must be connected directly to the TriBox mini. In direct voltage operation the shockproof plug can be removed, but this is not absolutely necessary. Make sure that the DC power source can provide the necessary maximum power and has an output with low impedance.

Follow these steps below to operate the TriBox mini with DC voltage:

⚠ DANGER **Before making any changes to the power line or the plug, it is important to make sure that the power is disconnected and cannot be reconnected or switched on.**

1. Carefully remove the upper and lower plastic panels from the device.
2. Loosen the four screws around the edges of the TriBox mini.

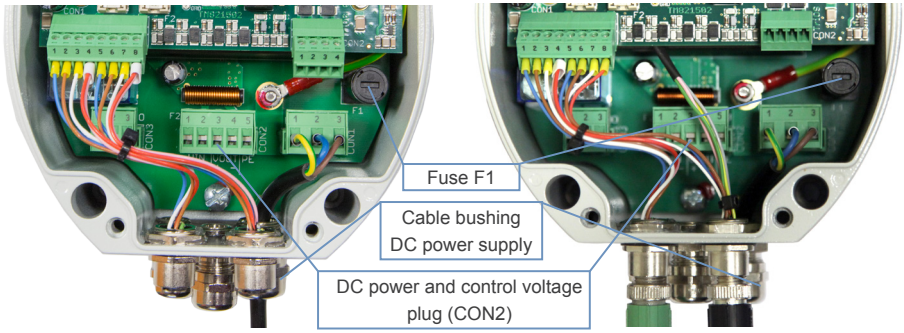


3. After removing the four screws, carefully lift open the cover of the housing. The housing lid should open without resistance and without application of force, as this would present the risk of damaging conductors in the device.
4. Connect the control cable to the 5-pin plug marked CON2 in the illustration. The table describes the contact assignments.

NOTICE **When opening and closing the housing cover, make sure the seal is positioned correctly and is not pinched.**

NOTICE **Always use wire end ferrules for flexible lines. The small cable bushings are designed for a sheath diameter of 3 mm to 7 mm.**

TriBox mini | TriBox mini NET



5. Insert the plug back into the socket and tighten the grommet to achieve a solid yet not excessively tight seat of the supply line in the grommet.

CON2 connector	
DC power supply	
Pin	**Assignment**
1	DC voltage 1, VIN1 (plus)
2	DC voltage 1, VIN1 (minus)
3	Control voltage 1, VOUT2 (plus)
4	Control voltage 2, VOUT2 (minus)
5	Protective conductor (PE)

6. Close the housing of the TriBox mini and screw the cover back on. After the plastic panels have been attached, the device can be put into operation.

4.2.3 Prioritized Supply Voltage

The TriBox mini can be operated with AC or DC voltage. The TriBox mini automatically uses the power supply with the highest priority from the available input voltages. Prioritisation is preset:

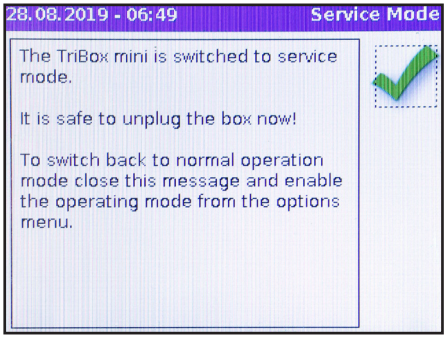
Priority	Assignment	Connector/pins
1	AC voltage	CON1, Pin 1-3
2	DC voltage VIN1	CON2, pin 1-2

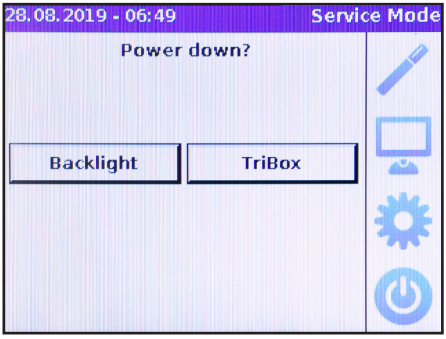
When more than one input voltage is supplied at the same time, the power supply can be switched or selected when the device is on, allowing operation without interruption.

4.2.4 Switching off the TriBox mini

To ensure that the SD card is not damaged, you should always put the TriBox mini into “Service Mode” or switch it off before disconnecting it from the voltage source.

NOTICE **To disconnect the TriBox mini from the power supply, the TriBox mini should always be set to “Service Mode” or switched off beforehand.**





4.3 Connection of the Sensors

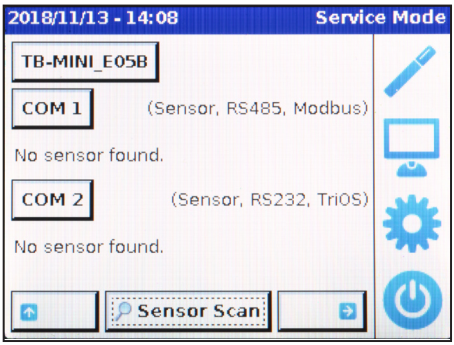
The TriBox mini has two serial sensor interfaces (COM1 on the left and COM2 on the right). The COM2 of TriBox mini NET offers a network connection. Pay attention here to possible applications. Only use original cables from TriOS Mess- und Datentechnik GmbH to connect the sensors.

First, connect the TriOS sensor cable with a COM port of the TriBox mini. To do that, insert the M12 plug into the desired COM port and secure the connection by tightening the screws.

It is also possible to connect several sensors to one COM port (see also Chapter 8.3 - Accessories). In that case, check the power consumption of the sensors and contact TriOS Support for recommendations if necessary.

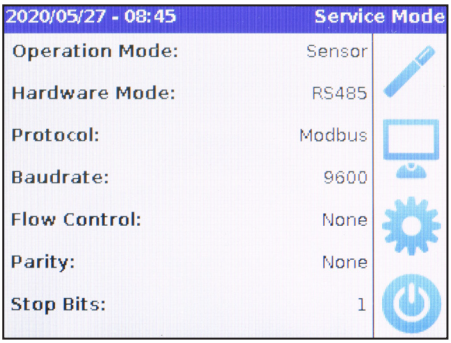
NOTICE **Always switch off the TriBox mini or switch to “Service Mode” to connect or disconnect sensors to or from the device.**

The “Sensor” menu displays sensors connected to COM ports. Tap on the arrow keys on the screen to switch between “COM1” and “COM2”. The display shows the sensor name and measurable parameters.



If several sensors are connected to one COM port, they will be listed here individually.

In service mode, tap on the “COM” button to change the sensor data transmission settings. The figure shows the default settings.



A sensor interface can be configured as an output in “Operation Mode”. See also chapter 5.4.

- Baud rate specifies the transmission speed.

If there are difficulties in communication, reduce the baud rate.

- Flow control activates the flow control at the software level (Xon/Xoff).

This is only supported by the TriOS data protocol and must be disabled when using Modbus RTU.

- Parity activates the parity check when transmitting data.

  Possible options are (default is “None”):

  - None (deactivated)
  - Even
  - Odd

- Stop bits specifies the number of stop bits.

When using various Modbus devices, it may be necessary to set this to “2” if no parity check is required

Modbus-capable TriOS devices must be configured while the TriBox mini is set to its default settings.

Default settings:

Hardware mode:	RS485
Protocol:	Modbus
Baud rate:	9600
Flow control:	None (setting locked when using Modbus protocol)
Parity:	None
Stop bits:	1

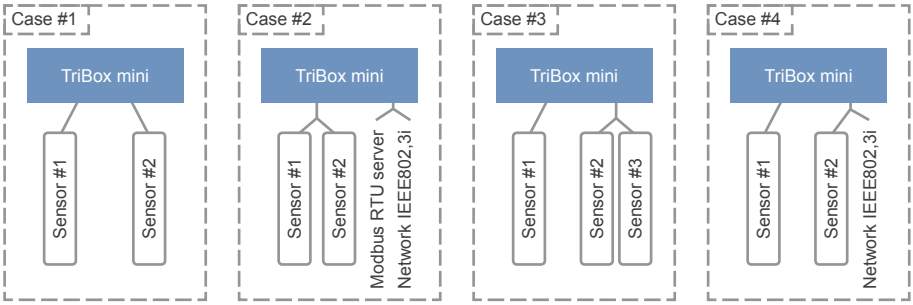
As soon as a sensor is connected to the TriBox mini, it is displayed below the corresponding COM port when the controller is switched on.

If a connected sensor is not shown on the COM port, press the “Sensor Scan” button in the “Sensors” submenu to scan all of the COM ports. The TriBox mini should be in “Service Mode” to search.

Possible applications with TriBox mini NET

Supported TriOS sensors:

- enviroFlu (sensor settings, when connecting for the first time you are asked to select the device type).
- LISA UV (v1.6.3 and v1.7.8)
- LISA color
- NICO
- OPUS
- VIPER
- matrixFlu VIS
- nanoFlu
- TTurb
- TpH
- TpH-D
- Conductivity
- Dissolved Oxygen
- Free Chlorine
- Chlorine dioxide



Case #1: Any two sensors

Case network off

Sensor #1 can be equipped as required.
Sensor #2 can be equipped as required, except:

- enviroFlu

Case network on

Sensor #1 can be equipped as required.
Sensor #2 can be equipped as required, except:

- enviroFlu
- LISA UV
- LISA color
- VIPER
- OPUS

Case #2: Network via COM2

Case network off

Sensor #1 and sensor #2 can be equipped as required.
COM2 provides Modbus RTU server.

Case network on

Sensor #1 and sensor #2 can be equipped as required.
COM2 provides Modbus RTU server and network access.

Case #3: Two sensors on COM2

Case network off

Sensor #1 can be equipped as required.
Sensor #2 and #3 can be equipped as required, except:

- enviroFlu

Case network on

Sensor #1 can be equipped as required.
Sensor #2 can be equipped as required, except:

- enviroFlu
- LISA UV
- LISA color
- VIPER
- OPUS

Case #4: Sensor and network on COM2

Case network off

Sensor #1 can be equipped as required.

Sensor #2 and #3 can be equipped as required, except:

- enviroFlu

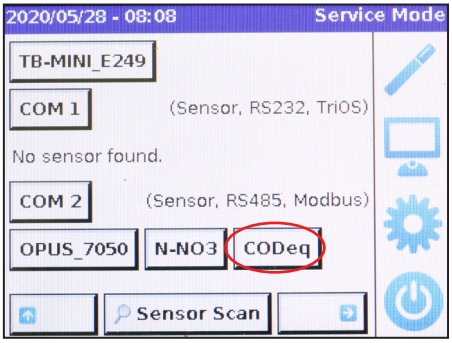
Case network on

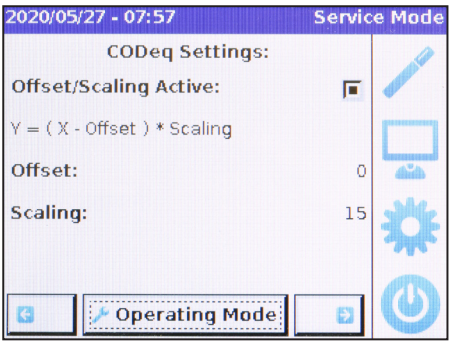
Sensor #1 can be equipped as required.

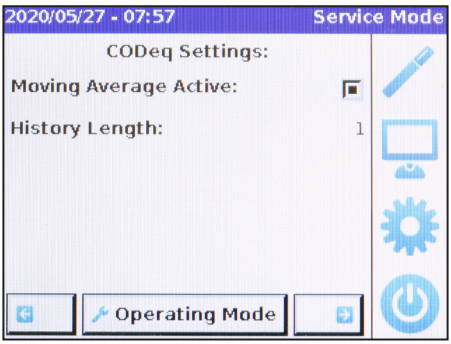
Sensor #2 must not be equipped

Setting the scaling factors

Tap on the parameters on the “Sensor” menu page to configure them individually using the offset and scaling and adapt them to the medium. Tap on the arrow key for the moving average settings. Here, you can define an average value from the number (“History Length”) of the last measurements, which is then shown on the display.







4.4 Installation of Compressed Air and Water Flushing

Sensors are often exposed to unclean environments. For this reason, they must be protected to prevent micro-organisms and other particles from adhering to the optical window when used for long periods of time. There are various methods to reduce exposure to contamination. TriOS combines two innovative methods. All optical windows in TriOS sensors receive a special nano-coating. This reduces deposits and simplifies cleaning by flushing or flow. All TriOS sensors are also available with components for compressed air cleaning. The sensors have a nozzle that directs the compressed air onto the glass plate to remove any biofilm or deposits.

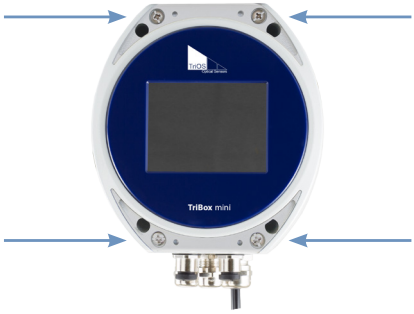
The TriBox mini supports the use of a controllable compressed air and water flush valve, which can be purchased as an optional accessory (chapter 8.4). The control unit stops measurements being taken during cleaning, which prevents erroneous results. TriOS sells hoses strictly for this purpose, i.e. compressed air cleaning of the sensors, because otherwise, there is no claim under warranty. The compressor needed for this function can be purchased from TriOS or supplied by the customer. The length of the compressed air hose from the sensor to TriBox mini should not exceed 10 m.

NOTICE **The nominal pressure for cleaning should be 4 to 6 bars to avoid damage to the valve.**

Proceed as follows to connect the optional valve box:

⚠ DANGER **Before making any changes to the power line or the plug, it is important to make sure that the power is disconnected and cannot be reconnected or switched on.**

1. Carefully remove the upper and lower plastic panels from the device.
2. Loosen the four screws around the edges of the TriBox mini.

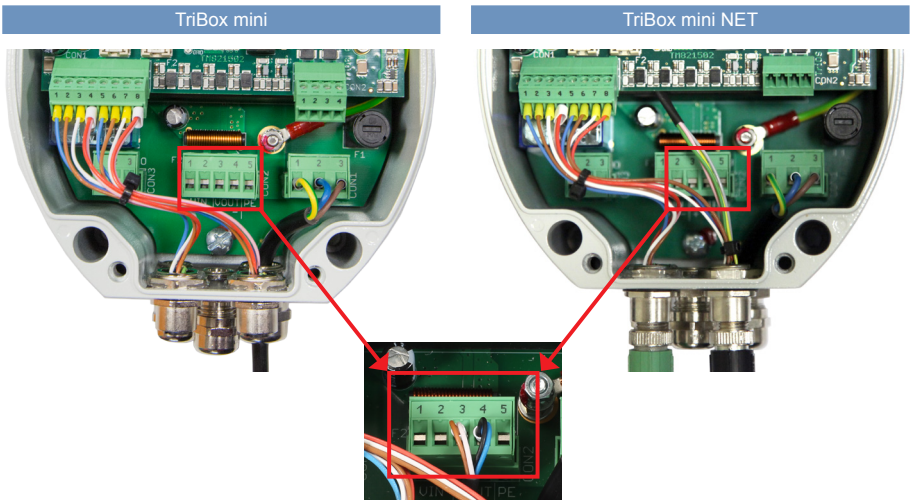


3. After removing the four screws, carefully lift open the cover of the housing. The housing cover should open without resistance and without application of force, as this would present the risk of damaging conductors in the device.

NOTICE **When opening and closing the housing cover, make sure the seal is positioned correctly and is not pinched.**

NOTICE **Always use wire end ferrules for flexible lines. The small cable bushings are designed for a sheath diameter of 3 mm to 7 mm.**

4. Insert the valve box wires through the cable bushing into the TriBox mini and then tighten the cable gland.

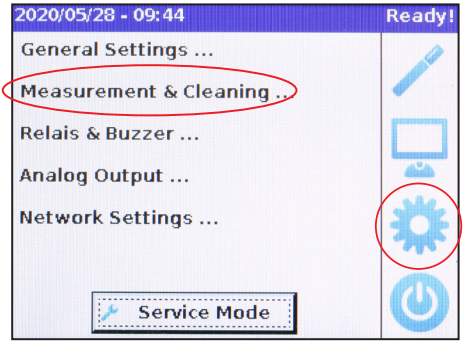


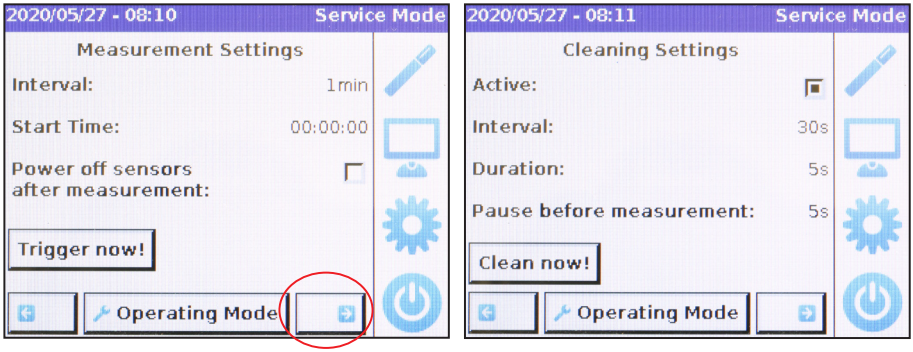
V2 Valve Box connection cable	TriBox Mini connector
brown and white wires	CON2, pin 3, VOUT+
blue and black wires	CON2, pin 4, VOUT-

5. Connect the brown and white wires of the connection cable to the CON2 connector, pin 3 (designated VOUT+) and the blue and black wires to the CON2 connector, pin 4 (designated VOUT-), as described in the table below. The wire pairs are already connected together in a ferrule. Tighten the screws.
6. Close the TriBox mini cover, tighten the four screws and place the grey caps on the TriBox mini.
7. Test the function by performing a cleaning cycle in the TriBox mini. The valve box must make an audible click.

Setting the measurement interval

In the “Measurement & Cleaning” (under “Options”), you can configure the automatic measurements (interval and start time). To do this, you must switch to the service mode.





You can also set the sensor to shut down after each measurement to save energy. The “Trigger now!” function is only active in service mode.

The “Cleaning Settings” menu can be found by clicking on the arrow key at the bottom right. When configuring the cleaning settings, the cleaning intervals must be adapted based on the calculation and measuring times of the sensor. Cleaning can only be done when the valve box is connected (see chapter 8 - Accessories).

Cleaning intervals under 30 seconds are not recommended. Intervals should be chosen to avoid overlapping with measuring times. Before a measurement, there should be a pause in cleaning of about 5 seconds. Cleaning time should be selected carefully to avoid abrasion damage to the windows.

Recommendations for measuring and cleaning intervals

When configuring the measurement intervals and the associated cleaning intervals, you must consider the different calculation times of TriOS sensors. This prevents measurements being interrupted.

Recommendations for timer and cleaning intervals*

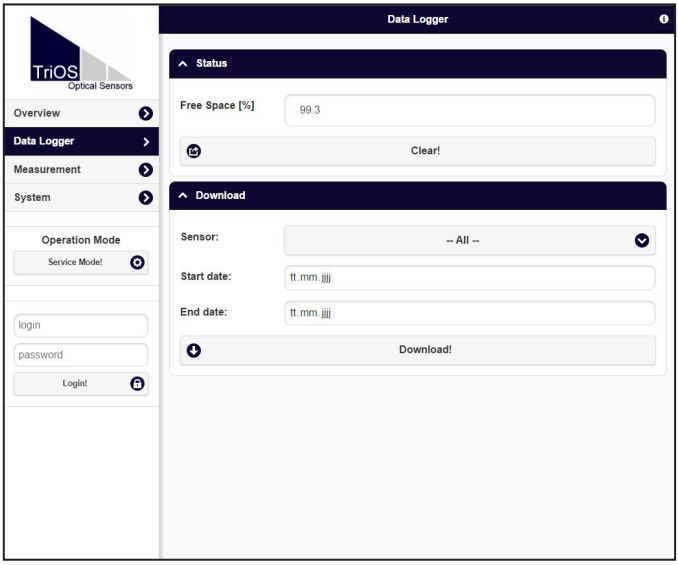
	Measurement interval	Cleaning interval	Cleaning time	Pause before measurement
minimum**	30 s	30 s	5 s	5 s
typical**	2 mins	15 min	10 s	5 s
maximum	1 day	6 hours	20 s	5 min

* with TriOS 10-meter 4/6 mm compressed air hose

** depending on the type of sensor

NOTICE **Some compressors are not designed for short compressed air intervals. Please always observe the relevant manufacturer's instructions.**

4.5 Data Storage



The TriBox mini has a 2GB internal memory. This enables the TriBox mini to operate almost completely self-sufficiently for a very long period of time (as long as there is a constant and sufficient power supply!) Each measurement is stored until the memory is full.

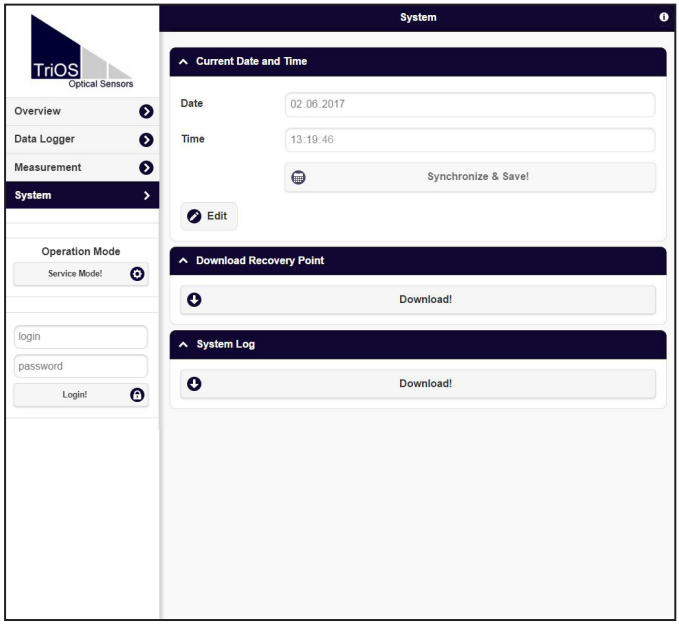
The percentage of free storage space (Free Space [%]) is displayed on the top line of the “Data Logger” submenu in the browser (via WiFi or via the network cable of the COM2 connection cable) or can be accessed directly in TriBox mini’s “System Status” submenu. Use the “Clear!” button to format the memory and delete all data. For security reasons, users will be prompted for confirmation before deletion.

After confirming the security prompt, the memory and all data will be deleted.

4.6 Creating a Recovery Point

The “System” page is used to manage the TriBox mini and to set the date and time. A recovery point can also be created, and the system log can be downloaded from this page.

Before fundamentally changing any of the settings, a recovery point should be created. If any problems come up, you should send the most recent recovery point to TriOS service. See also chapters 6.3.3 and 6.3.4.



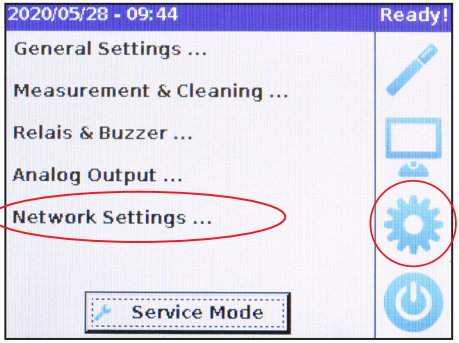
5 Advanced Use

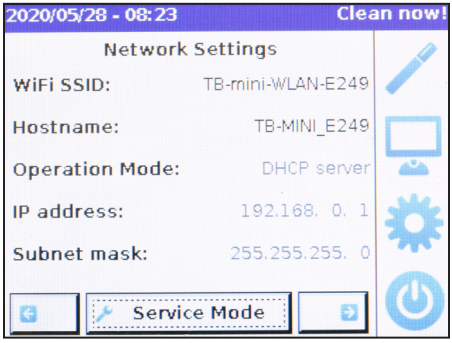
5.1 Data Export

5.1.1 Via WLAN

NOTICE **The service mode must first be activated for a data export.**

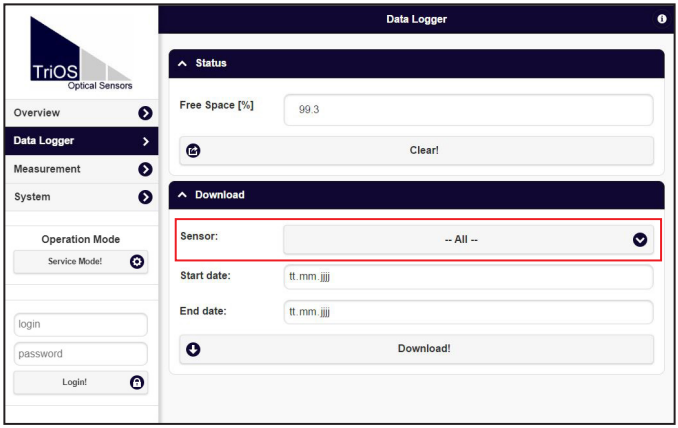
To export data, first activate the Wi-Fi in the TriBox mini menu. You can do this in the “Options” menu item in “Network settings”. The display also contains the wireless SSID (TB-mini-WLAN-EXXX, where EXXX is the four-digit serial number) and the host name (TB-MINI). Since the range of the wireless signal is limited, there is no encryption.





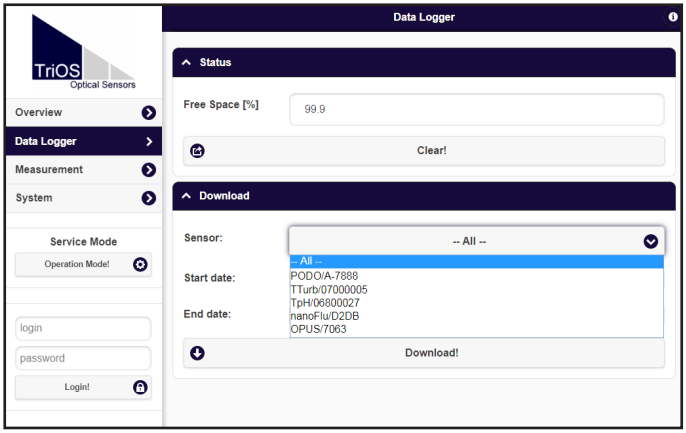
You can use a browser to access the TriBox mini (English) web interface (*http://tb-mini/*) via a wireless network connection (alternative address: *http://192.168.0.1/*). The process is platform-independent and operates on any PC or smartphone with a Wi-Fi connection and a browser.

In the web interface, use the “Download” button to copy stored data. The TriBox mini saves and presents stored data as a CSV file (comma separated values). CSV files can be read by common spreadsheet programs.



In the “Download” area, you can download data of individual sensors or the complete data set (“-- All --”). The data can be filtered according to time criteria. The TriBox mini stores the data from all of the sensors that have ever been connected to it. They are put in a separate folder every day.

NOTICE **When the memory is full, the oldest data is overwritten.**

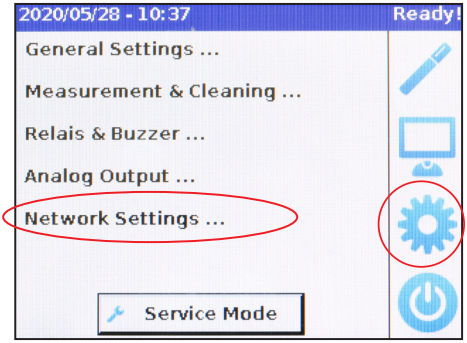


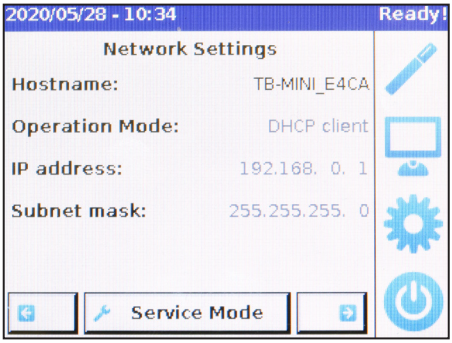
The measured values that are transmitted must first be decompressed (.tar format). After that, they can be processed in a spreadsheet programme or by other programmes designed for that kind of data.

5.1.2 Via Network Cable

The TriBox mini NET does not have a wireless network connection and must therefore be connected via Ethernet cable (COM2 with special M12-RJ45 cable).

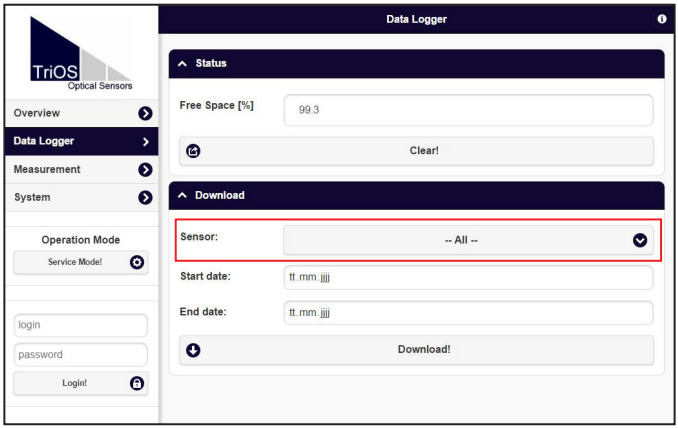
In the “Options” menu item under “Network Settings”, you can view the settings for host name, mode, IP address and subnet mask.





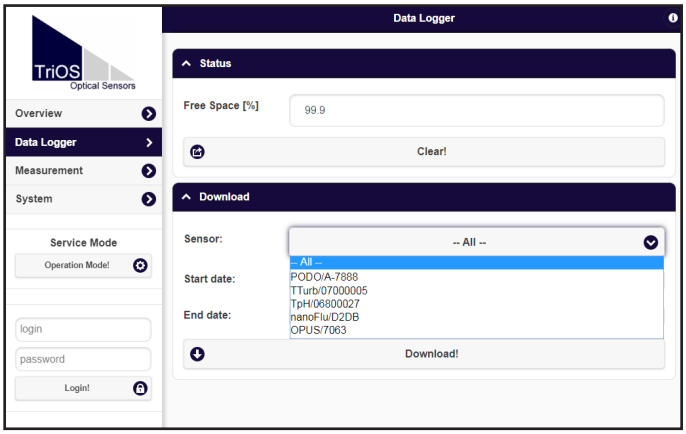
You can use a browser to access the TriBox mini (English) web interface (*http://tb-mini/*) via a network connection (alternative address: *http://192.168.0.1/*).

In the web interface, use the “Download” button to copy stored data. The TriBox mini saves and presents stored data as a CSV file (comma separated values). CSV files can be read by common spreadsheet programs.



In the “Download” area, you can download data of individual sensors or the complete data set (“-- All --”). The data can be filtered according to time criteria. The TriBox mini stores the data from all of the sensors that have ever been connected to it. They are put in a separate folder every day.

NOTICE **When the memory is full, the oldest data is overwritten.**



The measured values that are transmitted must first be decompressed (.tar format). After that, they can be processed in a spreadsheet programme or by other programmes designed for that kind of data.

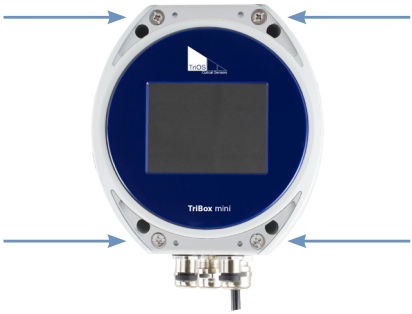
5.2 Analog output

The TriBox mini has two analog outputs. The measured values can be transferred to other systems (e.g. PLC systems) via the analog interface with a scaling of your choosing.

⚠ CAUTION **Please note that only passive components should be connected to the analog outputs so that no external voltage can enter and damage the TriBox mini.**

⚠ DANGER **Before making any changes to the power line or the plug, it is important to make sure that the power is disconnected and cannot be reconnected or switched on.**

1. Carefully remove the upper and lower plastic panels from the device.
2. Loosen the four screws around the edges of the TriBox mini.

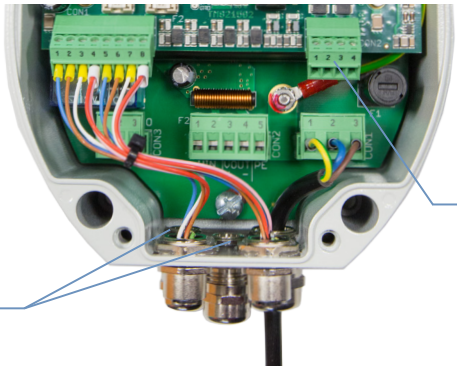


3. After removing the four screws, carefully lift open the cover of the housing. The housing cover should open without resistance and without application of force, as this would present the risk of damaging conductors in the device.

NOTICE **When opening and closing the housing cover, make sure the seal is positioned correctly and is not pinched.**

NOTICE **Always use wire end ferrules for flexible lines. The small cable bushings are designed for a sheath diameter of 3 mm to 7 mm.**

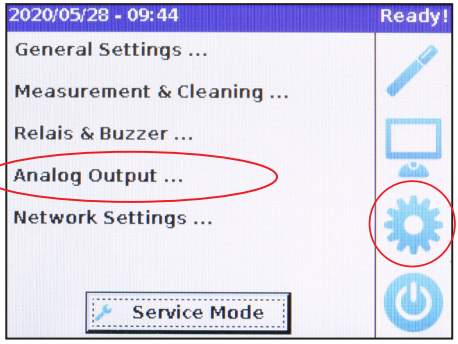
4. Connect the control cable to the marked 4-pin plug. The table describes the contact assignments.



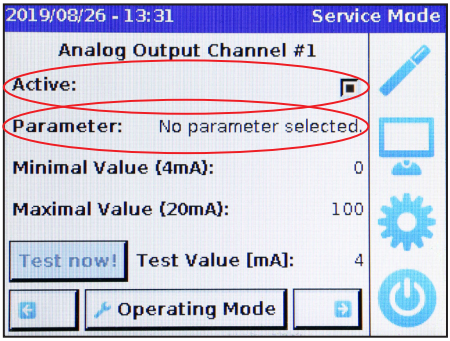
CON2 connector (upper board)	
Pin	**Assignment**
1	Analog output 1 (plus)
2	Analog output 1 (minus, GND)
3	Analog output 2 (plus)
4	Analog output 2 (minus, GND)

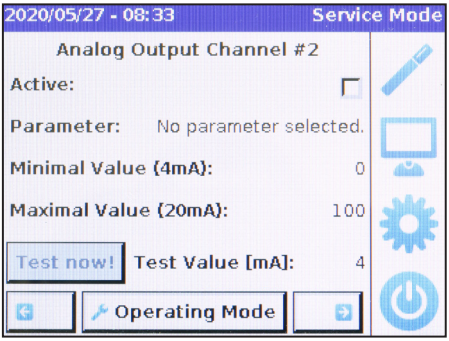
5. Insert the plugs into the socket and tighten the cable bushing snugly but not too tightly.
6. Close the housing of the TriBox mini and screw the cover back on. After the plastic panels have been attached, the device can be put into operation.

Two separate analog outputs can be configured in the subitem “Analog Output” (menu item “Options”) in the TriBox mini menu.



The parameters and resolution can be customised and configured. The analog signal can be fed to external systems, such as PLCs and SCADA, to be transformed into measurement signals. The minimum is 4 mA; the maximum is 20 mA.





To configure an analog output, it must first be activated (“Active” check mark). Next, a parameter must be selected. To do this, tap the “Parameter” field on the display. In the last step, the values are defined to connect the configuration of the analog output.

5.3 Relay and Buzzer

The TriBox mini includes a potential-free relay changeover contact. While the relay can switch small loads, it should only be used as a signal generator for power relays/contactors. The relay can be used to create a programmable alarm output. For example, the relay switches if concentration exceeds or falls below pre-programmed values. The relay requires one of the two cable bushings.

⚠ DANGER **Risk of death due to electric shock! Due to the unrestricted voltage in the device, it may only be installed by specialists who are authorised to do so based on their training. The relevant safety and VDE regulations must be observed. Before opening the device, please make sure that the power is disconnected and cannot be reconnected or switched on.**

1. Carefully remove the upper and lower plastic panels from the device.
2. Loosen the four screws around the edges of the TriBox mini.

3. After removing the four screws, carefully lift open the cover of the housing. The housing cover should open without resistance and without application of force, as this would present the risk of damaging conductors in the device.

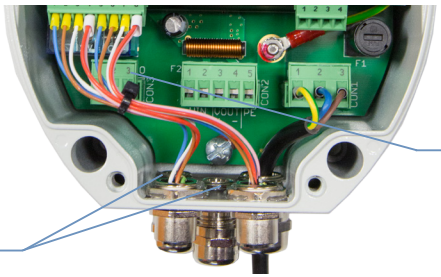
NOTICE **When opening and closing the housing cover, make sure the seal is positioned correctly and is not pinched.**

NOTICE **Always use wire end ferrules for flexible lines. The small cable bushings are designed for a sheath diameter of 3 mm to 7 mm.**

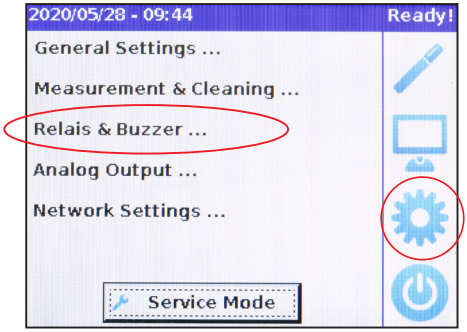
4. Remove the plug marked CON3 in the following illustration and connect it to the control cable. The pin assignment is described in the following table.

CON3 connector	
Relay changeover contact	
Pin	**Assignment**
1	Normally closed (NC) contact
2	Changeover (CO) contact
3	Normally open (NO) contact

5. Insert the plug into the socket and tighten the cable bushing snugly but not too tightly.
6. Close the housing of the TriBox mini and screw the cover back on. After the plastic panels have been attached, the device can be put into operation.

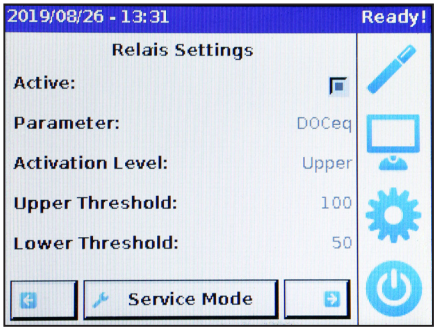


In subitem “Relay & Buzzer” (menu item “Options”), you can activate a routine by configuring certain properties. To avoid false alarms due to outliers, you can configure a moving average for the parameters (see chapter 4.3).



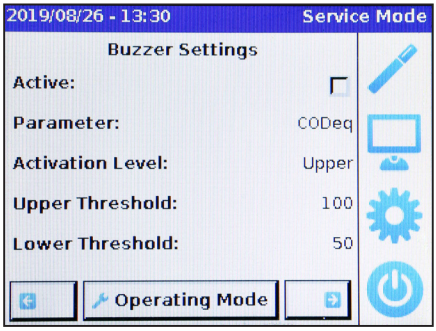
Relay

First, set the relay trigger parameter and then define its activation and deactivation limit. The main task is to monitor the corresponding input parameters and trigger the relay if the specified limits are reached.



Buzzer

In this subitem, mark the checkbox if you wish to activate the alarm. In the menu, define the desired parameter threshold (activation and deactivation limit).



Exceeded: activation when the value exceeds the upper threshold and deactivation when the value falls below the lower threshold.
Underrun: activation when the value falls below the lower threshold and deactivation when the value exceeds the upper threshold.

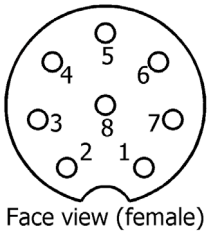
Make sure that the check mark for “Active” is set and a parameter has been defined (see 5.2).

5.4 Modbus Server (Digital Output)

The TriBox mini has two M12 sensor interfaces, which can also be used as digital outputs. The sensor interfaces support RS232 and RS485 and can be configured for Modbus.

The COM2 of TriBox mini NET supports RS232 sensors!

M-12 industrial plug

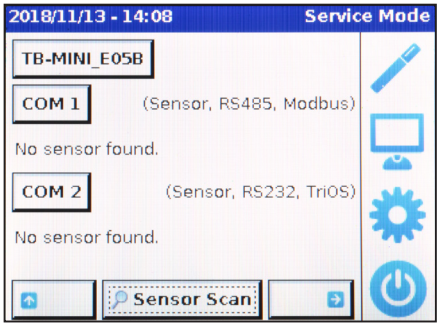


Face view (female)

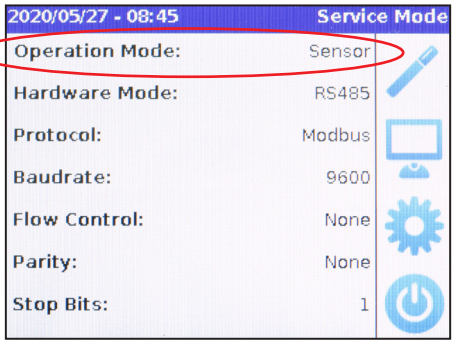
	TriBox mini	TriBox mini NET
	COM Port 1 & COM Port 2	COM Port 2
1.	RS232_TX / RS485_A	RS232_TX / RS485_A
2.	RS232_RX / RS485_B	RS232_RX / RS485_B
3.	not connected	Ethernet RX-
4.	not connected	Ethernet RX+
5.	not connected	Ethernet TX-
6.	+12 V DC	Ethernet TX+
7.	GROUND	GROUND
8.	+12 V DC	+12 V DC

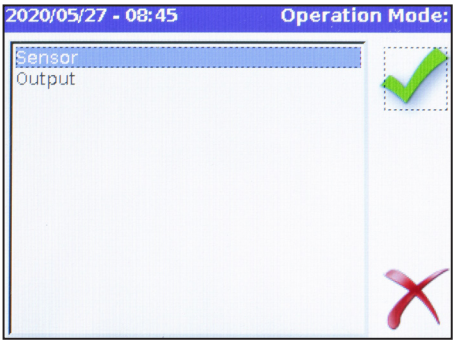
The designations of the data lines can be seen on the TriBox mini device. For example, RS232_RX is the receiving line and RS232_TX is the transmission line of the TriBox mini.

In the TriBox mini menu (menu item “Sensor”), you can configure the interfaces by tapping on “COM1” or “COM2” button, respectively.



A sensor interface can be configured as an output in subitem “Operation Mode”.





It is also possible to operate each sensor connection of the Tribox mini so that they are used as Modbus server outputs. In this way, Modbus RTU requests can be sent to the Tribox mini, e.g. to read out current measured values. To activate the output, select the “Output” setting in the port setting. In contrast to a simple Modbus device, the Tribox mini answers at several slave addresses, because the connected sensors are distributed over different addresses. The addresses of the connected sensors are used. This ensures the behaviour of the TriBox mini is transparent, meaning that there is hardly any noticeable difference to indicate whether you are communicating with the TriBox mini or with the sensor directly.

- **Baud rate** specifies the transmission speed.

If there are difficulties in communication, reduce the baud rate.

- **Flow control** activates the flow control at the software level (Xon/Xoff).

This is only supported by the TriOS data protocol and must be disabled when using Modbus RTU.

- **Parity** activates the parity check when transmitting data.
  Possible options are (default is “None”):
  - None (deactivated)
  - Even
  - Odd

- **Stop bits** specifies the number of stop bits.

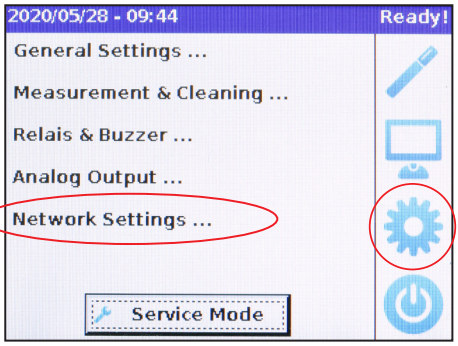
When using various Modbus devices, it may be necessary to set this to “2” if no parity check is required.

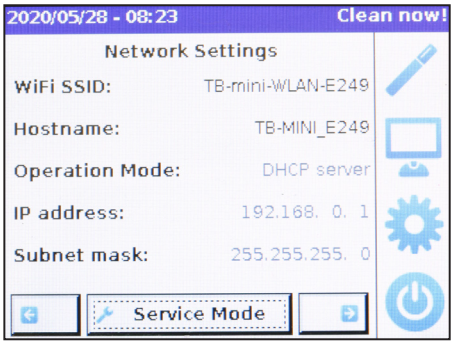
5.5 WLAN

Using the internal Wi-Fi module, you can connect the TriBox mini directly to a PC or a network.

Wi-Fi settings

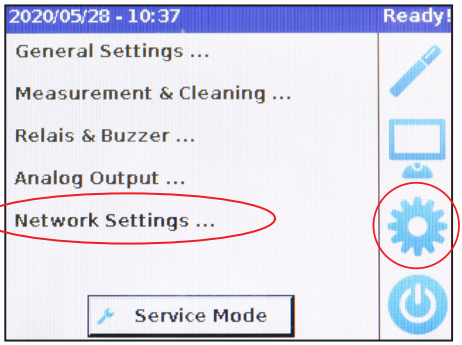
The Wi-Fi can be activated and deactivated in “Network Settings” (menu item “Options”).

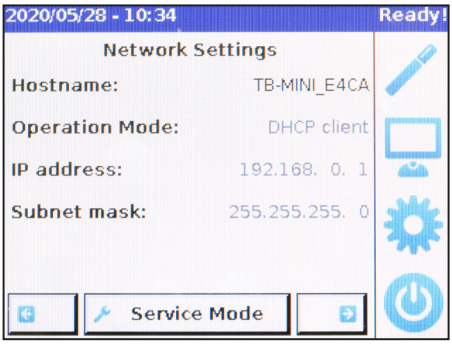




The display also contains the wireless SSID (TB-Mini-WLAN-EXXX, where EXXX is the four-digit serial number) and the host name (TB-MINI). Since the range of the wireless signal is limited, there is no encryption.

5.6 Network





The network of TriBox mini NET can be deactivated or activated under “Network settings” (Operation Mode → Disabled). This screen also shows the IP address, subnet mask and hostname of TriBox mini NET.

6 Malfunction and Maintenance

6.1 Cleaning and Upkeep

Contamination on the device can be removed with a damp cloth. Avoid aggressive substances for cleaning purposes.

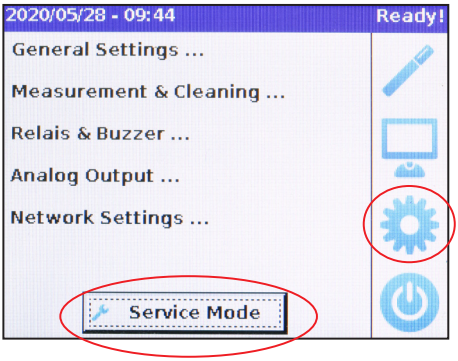
NOTICE	Damage caused by improper cleaning is not covered by the warranty!

6.1.1 Cleaning the Enclosure

- Regularly check the Tribox mini for mechanical damage.
- Regularly check all of the connections for leaks and corrosion.
- Regularly check all of the cables for mechanical damage.
- Clean the TriBox mini with a soft damp cloth as necessary. Use a mild cleaning solution if necessary.

6.1.2 Manual Sensor Cleaning

To prevent measurements from being taken when the sensors are manually cleaned and possibly generating false alarms, the TriBox mini should be set to service mode. See also chapter 6.2.1.



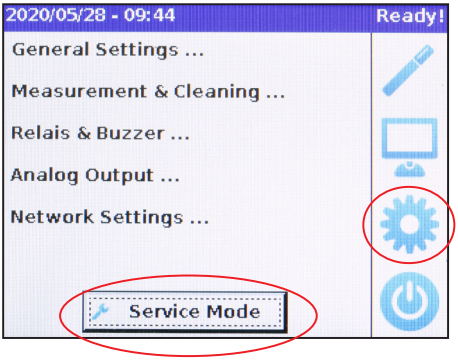
6.2 Maintenance and Inspection

6.2.1 Service Mode

When service mode is activated, the relay, valve and buzzer are deactivated.

Service mode also deactivates cleaning and prevents measurement commands from being sent to the sensor. The power voltages of the sensors are no longer changed by the global trigger, and measurement values, which are output by the analog outputs and are requested via the Modbus, are sent as the most recent measured value.

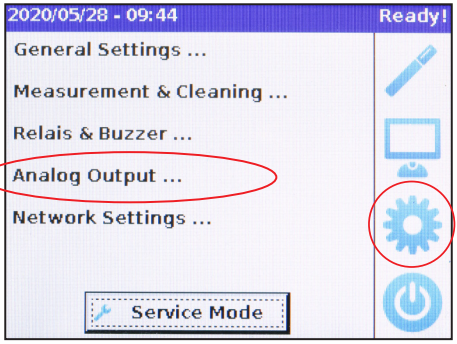
To prevent measurements when manually cleaning the sensors and potentially generating false alarms, the TriBox mini should be set to service mode.

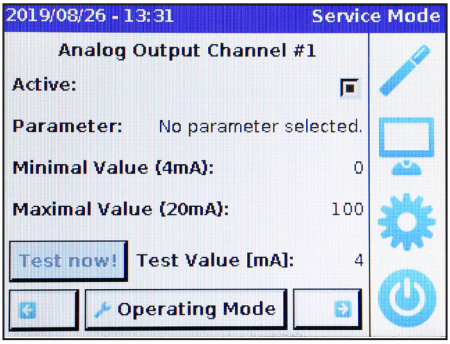


6.2.2 Checking the Analog Outputs

⚠ DANGER **Danger of electric shock and fire. Only qualified personnel should carry out the inspection check described in this chapter of the operating instructions.**

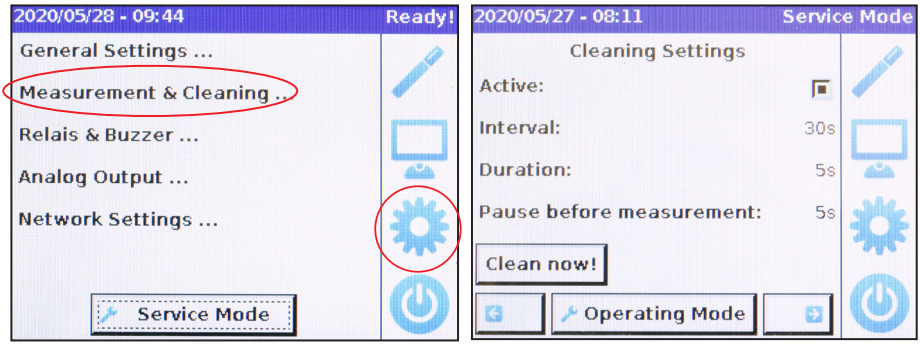
To check the functioning of the analog outputs, a constant, fixed output current can be set in the menu. This value can be measured directly at the corresponding analog output by activating service mode and clicking the “Test now!” button (see chapter 5.2). The hold on the analog values is automatically deactivated when the user returns to the main view.





6.2.3 Checking the Valve

To check the functioning of the external valve box, the valve can be directly controlled via the menu by activating service mode and clicking the “Clean now!” button. The compressed air from the input is then available at the output (below or closer to the wall). A clicking sound from the valve is heard every time it switches (see chapter 4.4).



6.2.4 Checking the Relay

⚠ DANGER **Danger of electric shock and fire. Only qualified personnel should carry out the inspection check described in this chapter of the operating instructions.**

A clicking sound from the relay is heard every time it switches. The transit can be measured at the corresponding inputs and outputs (see chapter 5.3).

6.3 Troubleshooting

If the Tribox mini cannot be operated as described in the manual or if it displays other abnormalities, please first make sure that it is not damaged.

If damage can be ruled out, the operating system may not be working properly. In this case, reboot the system. This applies in particular if a new sensor is not immediately detected.

6.3.1 Changing the Fuse

⚠ WARNING **If you need to replace a defective fuse, first unplug the power supply and use only fuses of the same type. Make sure you have completely eliminated the problem before putting the device back into operation.**

The Tribox mini uses the following fuses:

Interface board (upper board):

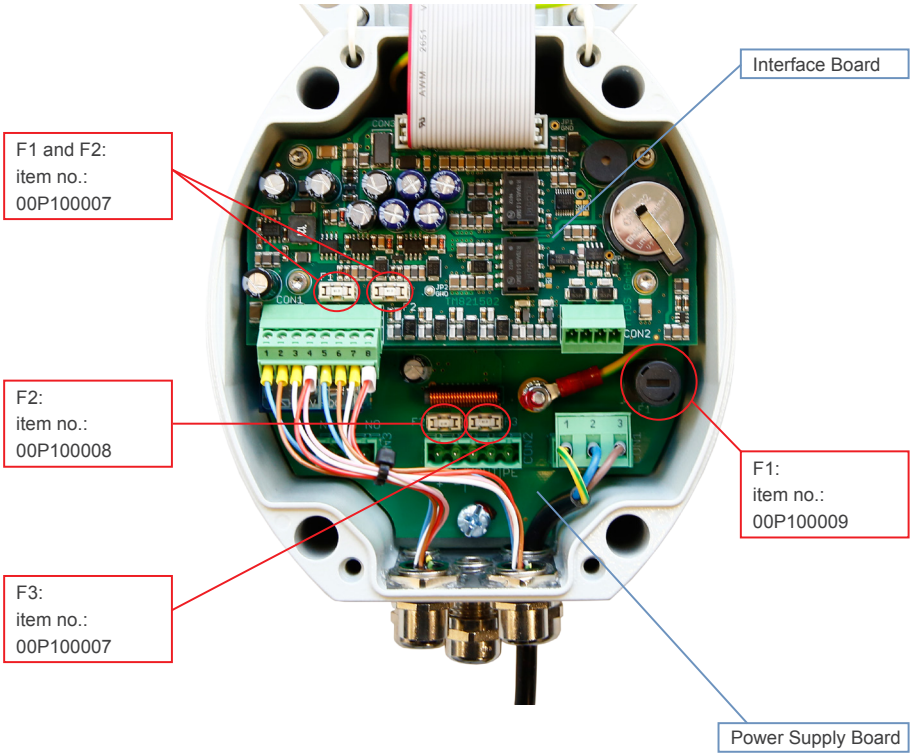
Fuse F1 and F2: 1A, 125V, fast-blow, SMD without holder; item no.: 00P100007

Power supply board (lower board):

Fuse F1: 1A, 250V, time-lag, 5x20mm; item no.: 00P100009

Fuse F2: 4A, 125V, fast-blow, SMD without holder; item no.: 00P100008

Fuse F3: 1A, 125V, fast-blow, SMD without holder; item no.: 00P100007



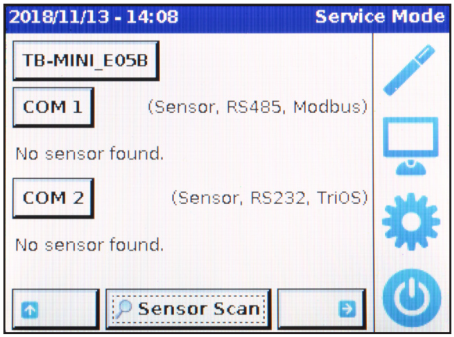
6.3.2 Sensor is Not Displayed

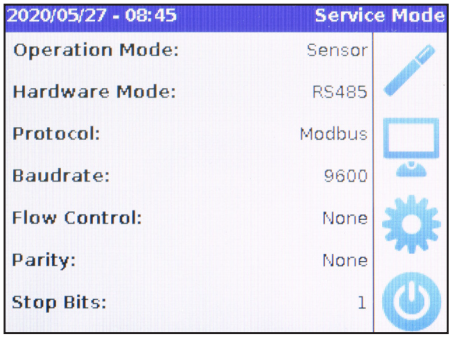
As soon as a sensor is connected to the TriBox mini, it is displayed below the corresponding COM port when the controller is switched on.

Modbus-capable TriOS devices must be configured while the TriBox mini is set to its default settings.

Default settings:

Hardware mode:	RS485
Protocol:	Modbus
Baud rate:	9600
Flow control:	None (setting locked when using Modbus protocol)
Parity:	None
Stop bits:	1





If a connected sensor is not shown on the COM port, press the “Sensor Scan” button in the “Sensors” submenu to scan all of the COM ports. The TriBox mini should be in “Service Mode” to search.

If the device is not displayed after configuring the COM port as above, you will have to check the current sensor settings via the G2 InterfaceBox and change them if necessary (see chapter 3.5 Web Interface).

Then reconnect the sensor to the TriBox mini and run the “Sensor Scan” function again.

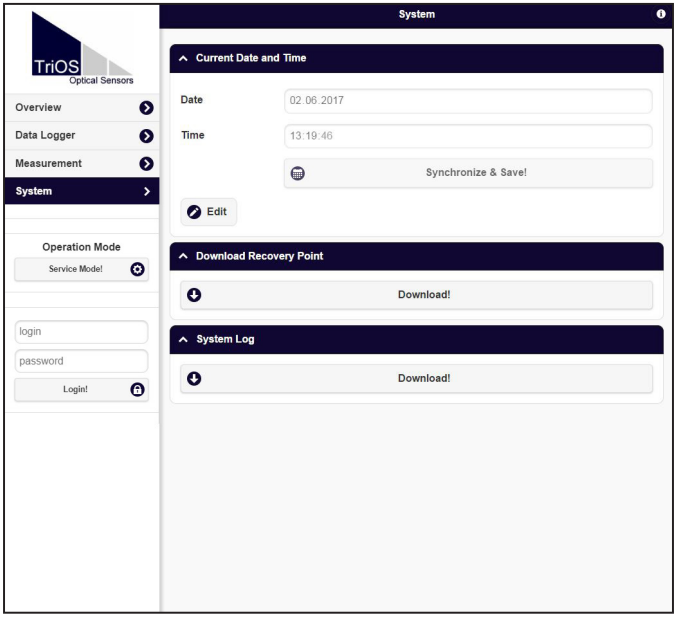
If the device still does not appear despite being configured to the default settings, there is a serious problem. In this case, please contact TriOS customer support.

6.3.3 Calling up the Recovery Point

Re-uploading recovery files to the TriBox mini is only necessary for service purposes. This can only be done if you have the service password that you received from TriOS Mess- und Datentechnik GmbH during a service training course. Contact TriOS support for help in this case.

6.3.4 Support Info

To ensure error-free and reliable measurements, the device should be checked and maintained periodically.



For many malfunctions that require customer service, it is helpful to document the status of the TriBox mini immediately after the occurrence of the possible malfunction.

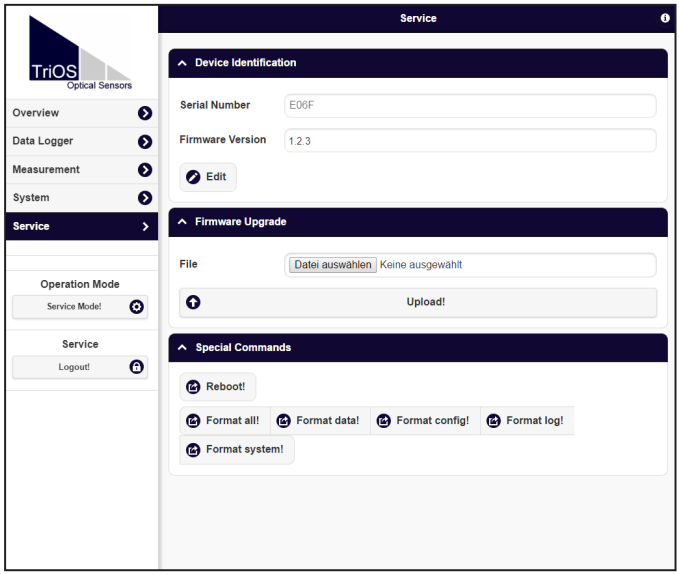
If the following sections do not help to correct the malfunction, please contact TriOS customer support at the following email address: **support@trios.de**. Please send the exported system log and the most recent recovery point to TriOS service to ensure that your problem is solved quickly.

6.3.5 Firmware Upgrade

Beginning with version 1.1.16, the firmware can also be upgraded via the web interface. You will need the service login that you received while participating in TriOS product training.

See the FAQ for firmware upgrades of older versions of the device.

After you have successfully logged in, go to the “Service” page in the “Firmware Upgrade” area of the web interface to upload an update.



6.4 Returns

Please observe the following instructions when returning items.

If a device needs to be returned, please contact customer service. To ensure hassle-free returns and avoid incorrect deliveries, each return package must first be reported to the customer service. You will receive an RMA form with a number, which you need to fill out completely and send back to us. Please write the number prominently on the package so that your return package can be correctly allocated and accepted.

A cleaning fee will be charged for very dirty devices.

Caution! Return shipments without an RMA number cannot be accepted and processed!

In order to prevent damage to the goods during shipping, use the original packaging. If this is not available, make sure that safe transport is guaranteed and that the sensor is safely packed with enough packing material.

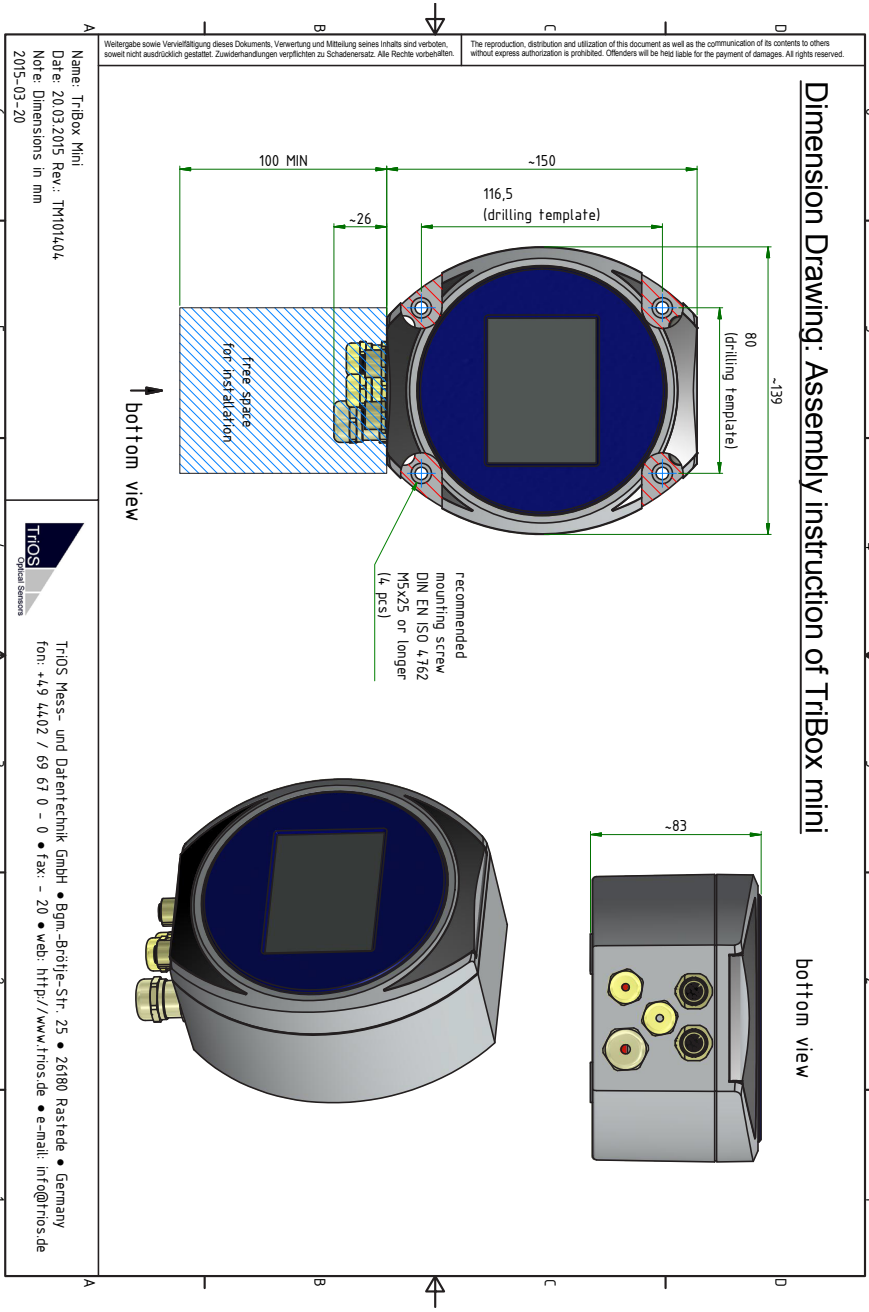
7 Technical Data

7.1 Technical Specifications

Voltage supply		100...240 VAC, 50...60 Hz, 10...15 VDC
Power consumption		Typ: 2 W, max.: 40 W
Connection		2 M12 industrial connectors for TriOS sensors
Standard		RS232, RS485
Protocol		Modbus RTU, TriOS
Server RTU		no
Client RTU		yes (on each sensor connector)
Parameters		Adjustable (default: 9600-8-N-1)
Standard	**TB mini**	WiFi IEEE 802.11b/g/n
	TB mini NET	Ethernet based on IEEE 802.3i
Connection	**TB mini**	Built-in WiFi antenna
	TB mini NET	COM2 sensor interface (right) with M12→RJ45 cable
Protocol		TCP/IP
Web Interface		yes
USB		no
Analog output		2 x analog outputs, configurable 4...20 mA
Load		max. 500 Ω
Connection terminals		1.5 mm² (AWG 16)
Error indicator		no
Measurement trigger		no
Control voltage		12 VDC (only for TriOS accessories), terminal: max. 2.5 mm² (AWG14)
Electrical specification		1 relay changeover contact (SPDT) / 250 VAC, 2 A / 30 VDC, 2 A
Connection terminals		max. 2.5 mm² (AWG14)
Valve		Optional: external connection possible
Display		3.5 inch capacitive touch display (320x240 pixels)
LED		5 status LEDs

Storage medium		Internal 2 GB microSD card
Data Export	**TB mini**	Via WiFi (compressed tar file)
	TB mini NET	via Ethernet (compressed tar file)
Operating temperature		0...+40 °C
Storage temperature		-20...+70 °C
Relative air humidity		0...95 % (non-condensing)
Protection type		IP65 (the network cable has a lower protection class)
Dimensions (width x height x depth)		150 x 139 x 80 mm
Weight		1.6 kg
Materials		Housing: Aluminium die-cast alloy Front panel: acrylic glass (PMMA)

7.2 External Dimensions



8 Accessories

8.1 Valve Box

The TriBox mini supports the operation of an externally controlled pneumatic valve for the purpose of compressed air cleaning and water flushing. All of the settings for the valve box can be configured in the TriBox mini menu (“Measurement and Cleaning” subitem “Cleaning”).

The valve box can be installed very easily. It has four 5.3 mm holes for installation.

8.2 AirShot

The convenient AirShot compressed air cleaning system uses pulses of compressed air rather than a continuous airflow. This significantly reduces the volume of air needed and allows the system to be very compact.

Moreover, compressed air pulses clean more effectively than a continuous stream of air, which makes the AirShot a valuable addition.

The AirShot can be used instead of a conventional compressor and can be controlled via the TriBox directly.

8.3 Modbus Distributor with 5 x M12

This distributor box allows a controller input to be expanded to allow five inputs, allowing significantly more sensors to be controlled via one controller than before.

8.4 Network Cable

The M12-RJ45 network cable can be used to connect TriBox mini NET to an existing network and thus control it via the web interface.

9 Warranty

The TriOS device warranty within the EU is valid for 2 years from the date of the invoice. Outside of the EU, the warranty is valid for one year. Normal consumables are not included in the warranty.

The warranty is subject to the following conditions:

- The device and all accessories must be installed as described in the corresponding manual and must be operated according to the specifications.
- Damage due to contact with corrosive and damaging substances, liquids or gases and damage during transport are not covered by the warranty.
- Damage due to improper handling and use of the device is not covered by the warranty.
- Damage resulting from modification or unprofessional attachment of accessories by the customer is not covered by the warranty

10 Customer Service

If you are having a problem with the sensor, please contact TriOS customer service.

Technical support contact:

E-mail: support@trios.de

Telephone: +49 (0) 4402 69670 - 0

Fax: +49 (0) 4402 69670 – 20

To help us provide you faster service, please send us the device ID number by email (the last four digits of the serial number consisting of letters and numbers, e.g. E249).

11 Contact

We are constantly working to improve our devices. Visit our website for news and information.
If you have found an error or bug in one of the devices or programs, please let us know:

Customer service:	support@trios.de
General questions / sales:	sales@trios.de
Website:	www.trios.de

TriOS Mess- und Datentechnik GmbH
Bürgermeister-Brötje-Str. 25
26180 Rastede
Germany
Telephone **+49 (0) 4402 69670 - 0**
Fax **+49 (0) 4402 69670 - 20**

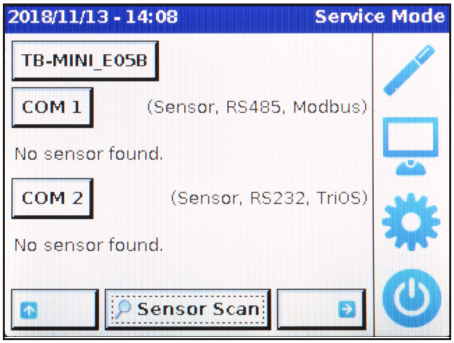
12 Keyword Index

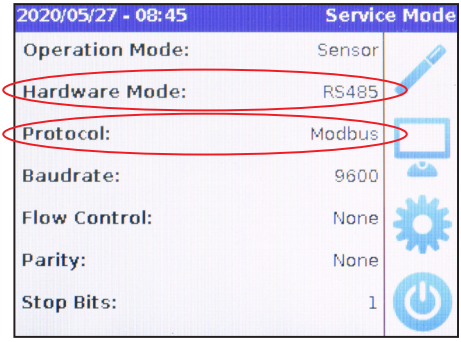
13 FAQ - Frequently Asked Questions

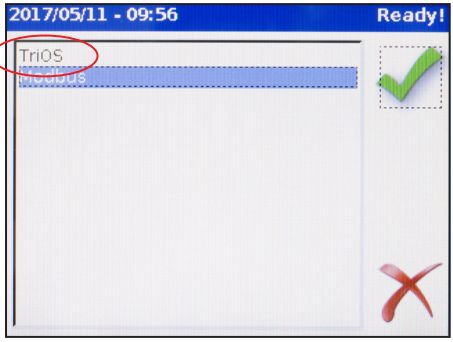
You can find more FAQs on our website: **www.trios.de**.

1. What should I consider when I want to connect an enviroFlu sensor to the TriBox mini?

   For TriOS enviroFlu (fluorometers) to be recognised by the controller, hardware mode must be switched to RS232 protocol must be switched to “TriOS”. Select the COM port that a device is to be connected to in the “Sensor” menu and change protocol settings and hardware mode.







For all enviroFlu sensors, the device type (500 or 5000) must be defined. After it is recognised, press the “enviroFlu” button in the “Sensor” menu.

2. My firmware version is older than 1.1.7. How can I update my software?

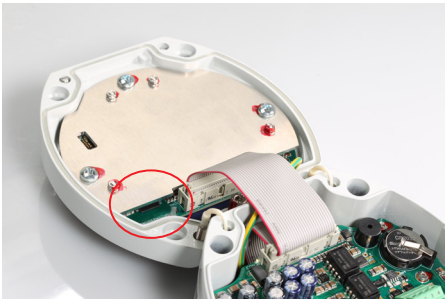
   Upon request, we will send you a software update stored on a micro SD card, which can then replace the one inserted in the TriBox mini. This service will be charged a fee.

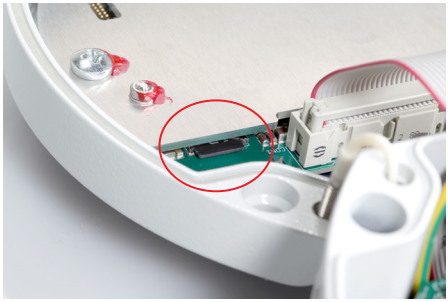
The micro SD card is located underneath the metal cladding in the cover. When a software update is available, TriOS GmbH will send a Micro SD card upon request, which must be manually exchanged by the customer (only when Tribox Mini is switched off!).

Before updating your software, please create a recovery point and send it to the TriOS Support (support@trios.de). You can then be sure that your settings are retained even if after updating your software.

To read measurement files faster, the micro SD card can be used on the computer with an SD adapter (not included).

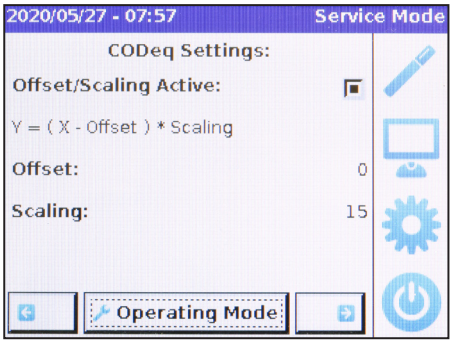
The micro SD card is partitioned, so your computer will only show the partition containing your measurements.





3. Why are values output under “Raw Value” in the web interface but only “N/A” appears under scaled value?

In this case, the scaling function for the values is deactivated. To make sure the values are also represented under Raw Value, you must check the box for “Offset/scaling Active” in the parameter settings (Click on a button for the parameter).



4. Is it possible to simultaneously display pH-values of two TpH-D, two TpH or one TpH-D and one TpH sensors respectively?

It is not possible to display the same parameters of identical sensors.

Annex

CE Declaration of Conformity

Hersteller/Manufacturer/Fabricant:	TriOS Mess- und Datentechnik GmbH Bürgermeister-Brötje-Str. 25 D- 26180 Rastede

Konformitätserklärung
Declaration of Conformity
Déclaration de Conformité

Die TriOS GmbH bescheinigt die Konformität für das Produkt
The TriOS GmbH herewith declares conformity of the product
TriOS GmbH déclare la conformité du produit

Bezeichnung Product name Designation	***TriBox mini** **TriBox mini NET**
Typ / Type / Type:	*Art.Nr.20C000000 mit WiFi Art.Nr.20C100000 ohne WiFi
Mit den folgenden Bestimmungen With applicable regulations Avec les directives suivantes	2014/30/EU EMV-Richtlinie 2014/35/EU Niederspannungsrichtlinie 2011/65/EU RoHS-Richtlinie *2014/53/EU RED-Richtlinie
Angewendete harmonisierte Normen Harmonized standards applied Normes harmonisées utilisées	EN 61326-1:2013 *EN 300 328 V2.1.1 *EN 301 489-1 V2.1.1 *EN 301 489-17 V3.1.1 EN 61010-1:2010 EN 50581: 2012
Datum / Date / Date 09.03.2018	Unterschrift / Signature / Signatur R. Heuermann

D05-055yy201803

Modbus Server RTU

Serial Interface

Upon delivery, the serial interface RS485 is configured with the following settings (9600, 8N1):

- Baud rate: 9600
- Data bits: 8
- Stop bits: 1
- Parity: none

Data types

Name	Register	Format
Uint16	1	Unsigned 16 Bit integer. Value range: 0x0000 - 0xFFFF
Uint32	2	Unsigned 32 bit integer. Value range: 0x00000000 - 0xFFFFFFFF
Float	2	IEEE 754 32 bit floating-point value
Char[n]	$[\frac{n}{2}]$	ASCII character string with n characters

All multi-register data types are saved in Big Endian format.

Functions

Name	Code	Description / Use
Read multiple registers	0x03	Reads register values, such as the serial number, firmware version and of course the measured values.

Read multiple registers (0x03)

The measured values can be found from register 1000 and are listed in the order that is shown on the "sensor"-menu screen.

Name	R/W	Register	Data type	Description
Serial number	R	10	Char[20]	Serial number of the sensor
Measured value #1	R	1000	Float	Main measured value of the sensor
Measured value #2	R	1002	Float	Second measured value of the sensor, if available
Measured value #3	R	1004	Float	Third measured value of the sensor, if available
etc.	R	etc.	Float	etc.

To read the measured values via Modbus, the according COM port must be configured („Sensor“ → COM port → „Operation Mode“ → „Output“).

Standard Modbus slave address

The TriBox mini Modbus server behaves as a virtual Modbus gateway to the connected sensors. The TriBox mini Modbus server generates a virtual register table for each sensor that is connected.

Sensor type	Slave address
NICO, OPUS, VIPER	1 (0x01)
LISA UV, LISA color	2 (0x02)
nanoFlu	3 (0x03)
Dissolved Oxygen [DO]	10 (0x0A)
TpH	20 (0x14)
TpH-D	21 (0x15)
Conductivity [COND]	30 (0x1E)
TTurb	40 (0x28)
Free Chlorine [Cl]	60 (0x3C)
Chlorine dioxide [ClO2]	70 (0x46)