GO SYSTEMELEKTRONIK

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# Manual

# BlueBox R1 and Panel




BlueBox

**Version of this manual: 2.2 en**

www.go-sys.de

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**Manufacturer's declaration**

When installing the system, it is necessary to ensure correct electrical connection, protection against moisture and foreign bodies and excessive condensation, and system heating which can arise from both correct and incorrect use. It is the responsibility of the installer to ensure that the correct installation conditions are provided.

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## Table of Contents

*01 Meaning of the Safety Instructions* ..... 6
*02 Cleaning the Touchscreen* ..... 6
*03 Notes on the Commissioning Manuals* ..... 6
*04 Type Plates* ..... 6
*1 Introduction* ..... 7
*2 Overview* ..... 7
*3 Device Information* ..... 8
*3.1 Connectable Modules, Sensors and Repeater* ..... 8
*3.2 CAN Bus Termination of the BlueBox* ..... 8
*3.3 Note on the Operating System* ..... 9
*3.4 Notes on Storage Utilisation of the Data Memory* ..... 9
*3.5 Note on the Storage Behaviour* ..... 9
*3.6 BlueConnect Plus Board* ..... 10
*3.7 Active CAN Repeater* ..... 11
*4 Switching On the BlueBox* ..... 12
*5 Touch Screen Operation* ..... 12
*5.1 Main Menu Bar* ..... 12
*5.2 Standard Input Displays* ..... 13
*6 Sensor Display* ..... 14
*6.1 Views of the Sensor Display* ..... 15
*6.1.1 Sensor List View* ..... 15
*6.1.2 Sensor 1-way and 4-way (Sensor fields)* ..... 15
*6.1.3 Sensor Chart View* ..... 16
*6.1.4 User-Defined Error Messages* ..... 16
*6.2 Sensor Service Selection Display* ..... 17
*6.2.1 General Settings* ..... 18
*6.2.2 Data Processing* ..... 19
*6.2.2.1 Data Processing Output* ..... 19
*6.2.2.2 Data Processing Averaging* ..... 21
*6.2.2.3 Data Processing Smoothing* ..... 22
*7 System Display* ..... 23
*7.1 Language Selection* ..... 23
*7.2 Date und Time* ..... 24
*7.3 Network* ..... 25
*7.4 Settings Selection Display* ..... 27
*7.4.1 Setting Modem* ..... 27
*7.4.2 Settings Cloud* ..... 28
*7.4.3 Settings Connectivity* ..... 29
*7.4.4 Settings GPS S* ..... 29
*7.4.5 Settings CAN Bus* ..... 30
*7.5 Wi-Fi Setup* ..... 31
*7.6 Display Functions* ..... 32
*7.6.1 Display Colours and Power Saving* ..... 32
*7.6.2 Sensor Display Settings* ..... 32
*7.6.3 Dashboard Configuration* ..... 33
*7.6.4 Select Dashboard View Type* ..... 33

7.7 Back-Up/Reset ..... 34
7.8 Shutdown/Restart – Lock/Unlock ..... 35
8 Service Display ..... 36
9 User Variables Display ..... 37
9.1 Changing a User Variable Value ..... 37
10 Notifications ..... 38
11 Sensor Calibration ..... 39
11.1 Calibrating a pH Sensor ..... 39
11.1.1 Calibration pH Start Display ..... 40
11.1.2 Guided Two-Point Calibration pH ..... 41
11.2 Calibrating an ISE Sensor ..... 42
11.2.1 Calibration ISE Start Display ..... 42
11.2.2 Guided Calibration ISE ..... 43
11.3 Calibrating a Galvanic Oxygen Sensor ..... 44
11.3.1 Calibration O2 Start Display ..... 44
11.4 Reference Measurement ..... 45
11.4.1 Take Sample with Current Measurement Value ..... 46
11.4.2 Add Sample via Date and Time of the Measurement Recording ..... 46
11.4.3 Edit Sample ..... 47
11.4.4 Export Sample Table ..... 47
12 The BlueBox Web Interface ..... 48

Appendix A – The Configuration Data Sheet ..... 49
Appendix B – Status Messages ..... 51
Commissioning of the BlueBox R1 ..... 52
Commissioning of the BlueBox Panel ..... 63

## 01 Meaning of the Safety Instructions

| | |
|---|---|
| ⚠ | **Danger:** Used if non-observance threatens serious injury or death. |
| ⚠ | **Warning:** Used if non-observance threatens slight injuries or serious property damage. |
| ⚠ | **Caution:** Used if non-observance threatens minor property damage. |
| ⚠ | Symbol of safety instruction relating to the use of electricity. |

## 02 Cleaning the Touchscreen

Clean the touchscreen with a commercially available glass cleaner and a soft cloth.

## 03 Notes on the Commissioning Manuals

At the end of this manual, you will find the commissioning manuals.

- *Manual Commissioning of the BlueBox R1* see Page 52 to 62
- *Manual Commissioning of the BlueBox Panel* see Page 63 to 73

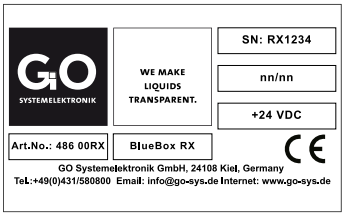
These manuals are each a standalone part of the Manual BlueBox R1 and Panel and describe the commissioning of the BlueBox R1 and the BlueBox Panel from GO Systemelektronik.

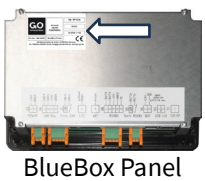
## 04 Type Plates




BlueBox R1

he BlueBox R1 type label is located at the bottom right-hand side.



BlueBox Panel

The BlueBox Panel type label is located at the back at the top left.

# 1 Introduction



BlueBox R1

This manual describes the **BlueBox R1** (Article number 486 00R1-X) and the **BlueBox Panel** (Article number 486 00RP-X) of GO Systemelektronik. .

**Described Firmware Version: 5.01.57**

The operation is carried out via the BlueBox touch screen and the BlueBox PC Software. The BlueBox PC Software is described in the enclosed *Manual BlueBox PC Software*.



BlueBox Panel

The specific operation of the **BlueBox RS** (a BlueBox R1 with integrated spectrometer) is described in the *Manual ISA Spectrometer*.

A comprehensive documentation of the BlueBox system can be found on www.go-sys.de/downloads.

The symbol ℹ indicates useful additional information.

The symbol ❗ indicates an important note for operation.

The symbol ❗ indicates an instruction, the non-fulfilment of which may affect the measuring operation.

The symbol ⚠ indicates a note to avoid an operating error.

**Note on Text References**

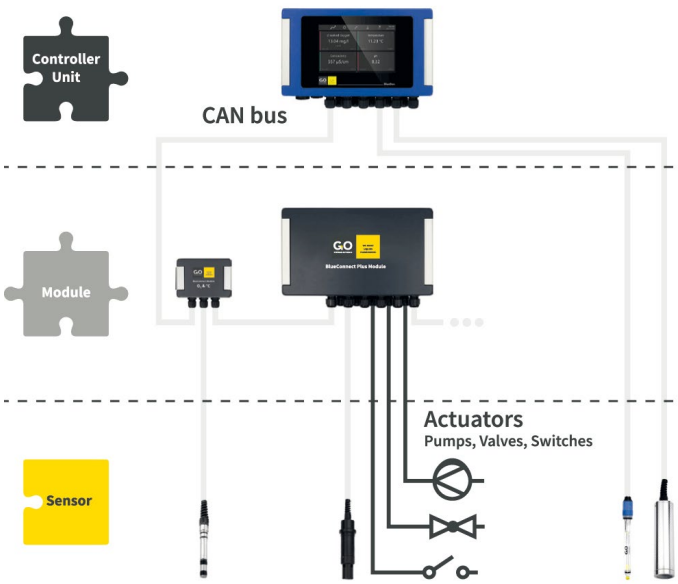
References to passages in this document or to passages in other documents are marked in italics.

- *5.2 Standard Input Displays* e.g. refers to the section 5.2 in this document. The short form is *5.2*.
- *Manual BlueBox PC Software* there *5 AMS – Advanced Managing Software* e.g. refers to the chapter 5 in the Manual BlueBox PC Software.

The products of GO Systemelektronik are constantly being developed, therefore deviations between this manual and the delivered product can result. Please understand that no legal claims can be derived from the contents of this manual.

# 2 Overview

The BlueBox is a modular and expandable basis for a variety of monitoring and control tasks.
It enables the management of extensive sensor and actuator networks.
With the help of the BlueBox as a central interface, the integration and connection of further systems can be realised.
A connection via internet or mobile phone networks expands the possibilities of transmitting measurement data and results and enables remote access and control of the system.



# 3 Device Information

## 3.1 Connectable Modules, Sensors and Repeater

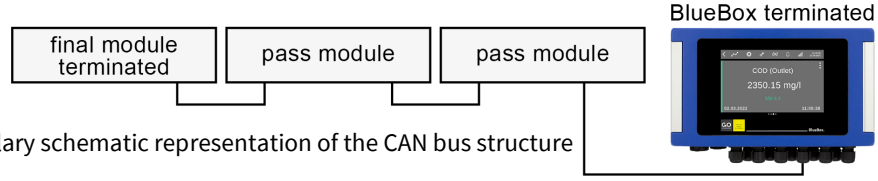
The following modules and sensors can be connected to the BlueBox:

- **External CAN bus modules**
  CAN bus modules of GO Systemelektronik are available in various forms as sensor modules and as actuator modules. The connection is made via the CAN bus clamp sockets on the BlueBox mainboard.
- **Internal CAN bus boards – BlueBox R1 only**
  At the completion of this manual, the following types of design were available:
  BlueConnect Plus board – can be fitted with up to four sensor and input/output boards
  Spectrometer board – ISA spectrometer sensor unit
  The connection is made via the CAN bus clamp sockets on the BlueBox mainboard.
- **BlueConnect Modules**
  The BlueConnect Modules of GO Systemelektronik are also CAN bus modules. So, they can be connected via the CAN bus clamp sockets on the BlueBox mainboard.
- **Modbus sensors**
  Modbus sensors can be connected directly via the RS485 clamp sockets on the BlueBox mainboard. For Modbus sensors virtual sensors must be set up.
  Modbus sensors of GO Systemelektronik are recognised automatically in most cases, the BlueBox then requests the necessary settings and sets up the Modbus sensor automatically.
- **RS485 devices***
  The connection is made via the RS485 clamp sockets on the BlueBox mainboard. You can connect up to 10 Modbus sensors from GO Systemelektronik directly here. With other RS485 devices, only one device can be connected at a time.
- **RS232 devices* – BlueBox R1 only**
  The connection is made via the CAN bus clamp sockets on the BlueBox R1 mainboard.
- **Active CAN Repeater** see *3.7 Active CAN Repeater*
  The connection is made via the CAN bus clamp sockets on the BlueBox R1 mainboard.

> There are many instructions on how to connect the BlueBox to various devices. For further information, please contact GO Systemelektronik.

## 3.2 CAN Bus Termination of the BlueBox

For a CAN-bus, it is important that the single elements of the CAN bus chain are correctly terminated. Physically, this means that the two elements at the end of the CAN-bus chain (final elements) must have a terminating resistor of 120 Ω each. This prevents signal reflections and interference.
Elements within a CAN bus line (pass elements) must therefore not have a terminating resistor.




Exemplary schematic representation of the CAN bus structure

The terminating resistor is switched on and off with a slide switch on the mainboard.
Termination BlueBox see *R1Com 5.2.3 Mainboard PIN Assignment and Termination* and *PCom 5.3 Connections and Termination BlueBox Panel*

* Only either the RS485 connection or the RS232 connection can be active; switching is carried out with the AMS program. see *Manual BlueBox PC Software* there *5.3.3.2 Custom Protocol Setup*

## 3.3 Note on the Operating System

The **BlueBox operating system** (called **firmware**) consists of Linux® and BlueBox specific components, the current version at the creation date of this manual is 5.01.57.

The firmware version is shown on the Backup/Reset display. see *7.7 Back-Up/Reset* there tapp on 
see also *7.8 Shutdown/Restart – Lock/Unlock*

## 3.4 Notes on Storage Utilisation of the Data Memory

**The following data is saved in the data memory:**

- Configuration of the virtual sensors, i.e. name, unit, interval etc. as well as all AMS formulae
- Sensor values/actuator values, i.e. sensor measurement values/actuator status values, spectra, calibration protocols etc.
- The settings of external protocols, e.g. the Modbus mapping table

A measurement value requires 8 - 12 bytes (16 - 20 bytes with GPS data). A spectrometer absorbance spectrum requires 1605 bytes. With expectable configurations, the data memory is only fully allocated after years.
However, it is recommended that the measurement intervals are as long as possible.

If the data storage is full, sensor data is deleted by the day to make space for new sensor data. Sensor data consists of the measurement values[1] and the log files of the sensors (sensor log, calibration log and system log). The oldest data will be deleted first.

## 3.5 Note on the Storage Behaviour

Captured measurement values, settings made via the display and the BlueBox PC Software etc. are first saved in the main memory.

**The transmission to the data memory takes place:**

- **If you shut down the BlueBox via the display.**
  see *7.8 Shutdown/Restart – Lock/Unlock*

  or
- **automatically every 10 minutes** [2]

Therefore, if you interrupt the power supply (i.e. simulate a power failure), previously recorded measurement values and changed settings may be lost.

[1] and possibly GPS data contained therein

[2] Depending on the system load, the interval may vary slightly.

## 3.6 BlueConnect Plus Board

**Artikel No. 410 CP00**

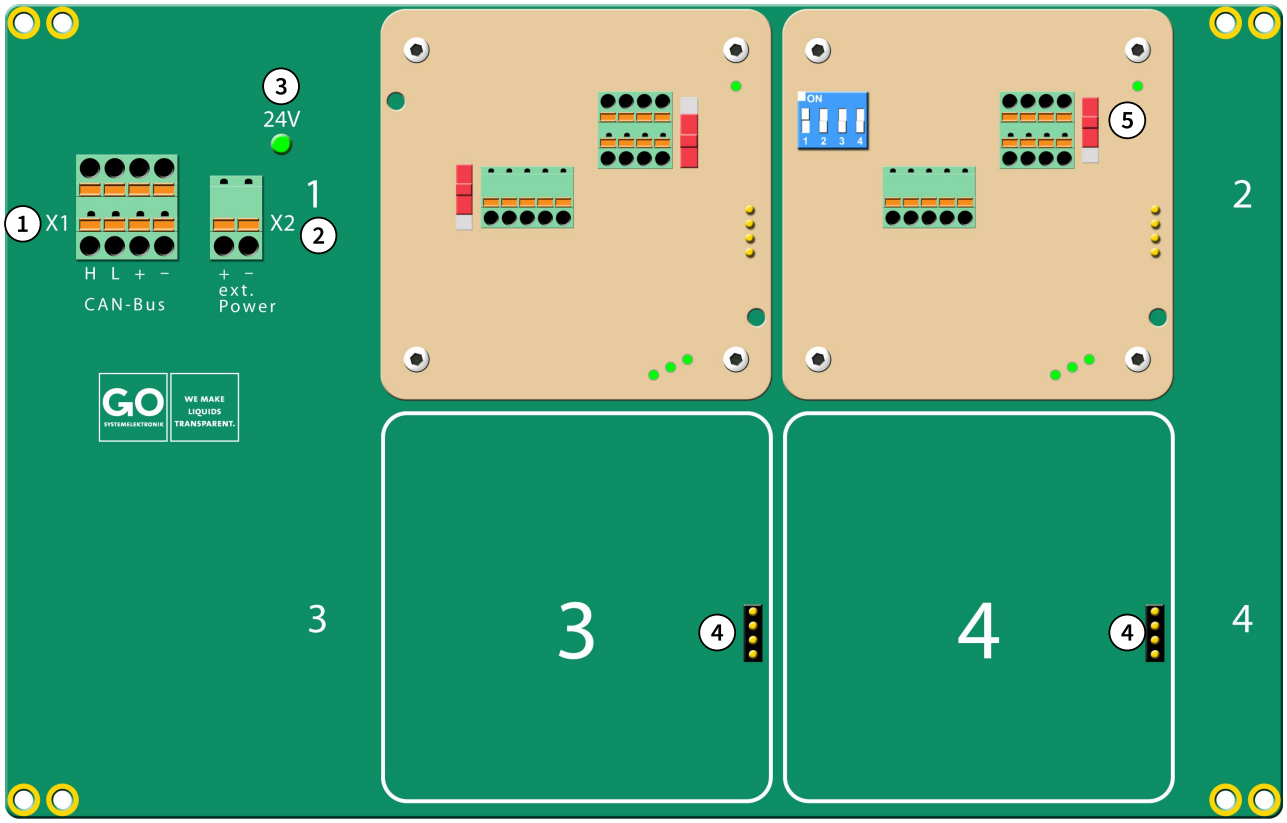
The BlueConnect Plus board can be equipped with up to four BlueConnect boards. The BlueConnect Plus board can be installed internally in a BlueBox R1 as well as in a sensor module.

The connection of an internal BlueConnect Plus Board is made via the internal DAM connection at slot X20 on the BlueBox mainboard. The individual BlueConnect boards appear as DAM (Data Acquisition Module) in the BlueBox System.

The necessary settings of BlueConnect boards **without Modbus connection** are not made with the BlueConnect configuration program, but with the AMS program as part of the BlueBox PC Software (and partly also via the display control on the BlueBox).

A BlueConnect board is mounted with 4 hex socket screws (⬡ 3 mm) each.

The board slots 1 to 4 can be equipped with BlueConnect boards as desired. In this example, slot 1 is equipped with a bus board and slot 2 with an RS232 board.




(1) The connection to the BlueBox System is made via the CAN bus connection X1.

(2) An additional voltage supply can be connected via connection X2.

(3) The LED lights up when the BlueConnect Plus board is supplied with voltage.

(4) The CAN bus connection of the BlueConnect boards is made via the pin headers at slots 1 to 4.



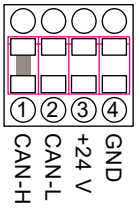
(5) The CAN bus termination of the BlueConnect Plus board is done with the slide switch to the right of the CAN bus connection of the last BlueConnect board in the sequence (here on slot 2).

Slide switch S2 – Termination CAN bus

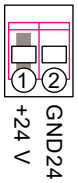



**Terminal assignment:**

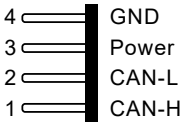
Clamp socket X1
CAN bus




Clamp socket X2
Voltage supply




Pin header



## 3.7 Active CAN Repeater

**Article No. 486 R000**

The active CAN repeater from GO Systemelektronik is a module for expanding the CAN bus structure.

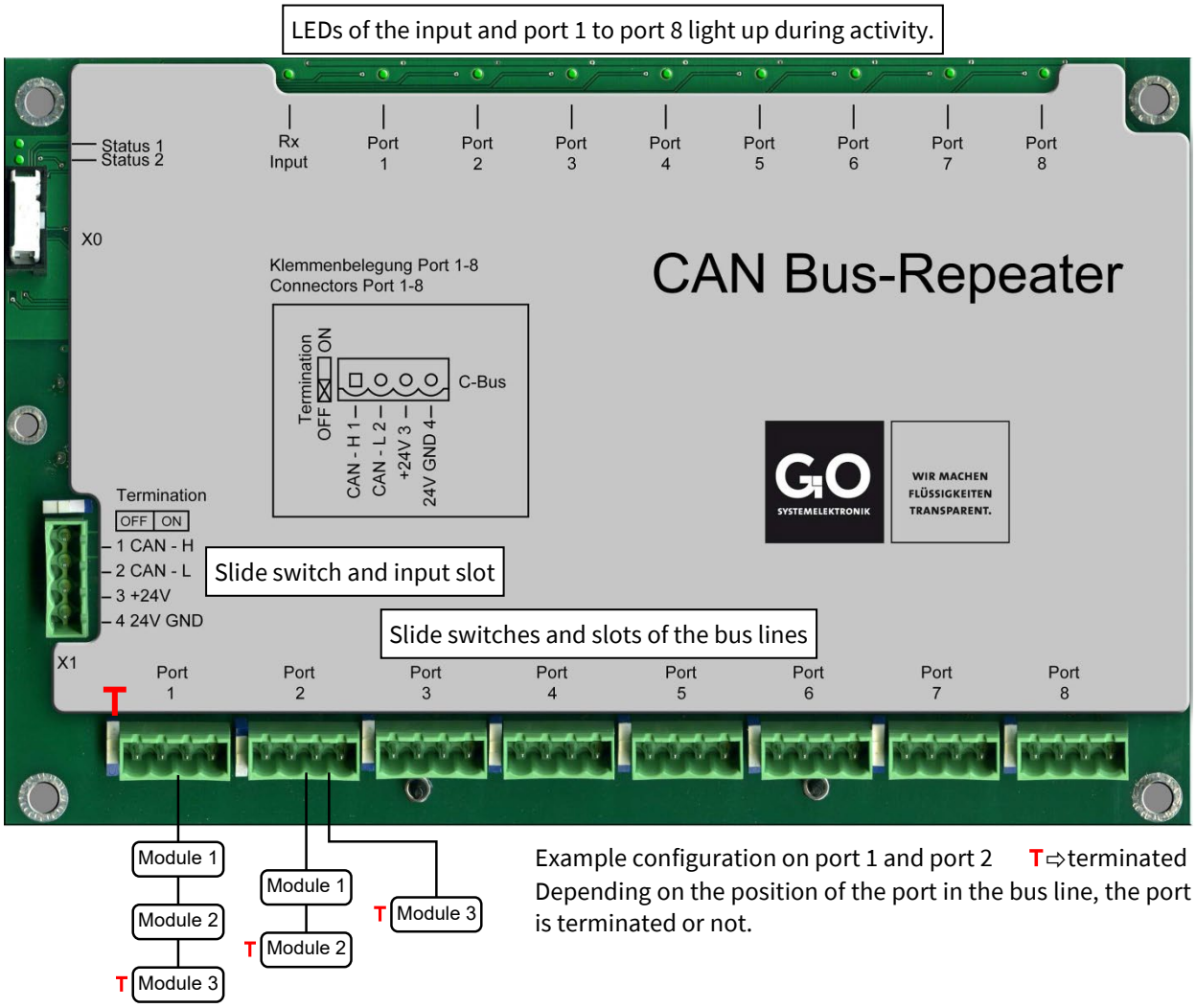
The active CAN repeater has eight galvanically isolated bus lines. Each of these bus lines can connect up to **five elements** on a length of up to 1000 m. The connections of the 8 bus lines are called port 1 to port; the transmission rate of each bus line is 50 kbit/s. If required, the individual bus elements can be provided with an independent power supply.

**Long cable lengths are not recommended for safety-relevant applications.**

The connection is made via clamp sockets on the board slots. The termination of the single bus lines is carried out with slide switches on the left side of the slots. The repeater itself is terminated or not, depending on its position in the CAN-bus.

It is recommended to terminate unused ports.

**Illustration of the repeater board with the board cover:**




Example configuration on port 1 and port 2 T⇨terminated
Depending on the position of the port in the bus line, the port is terminated or not.

## 4 Switching On the BlueBox




1. Switch on the power supply.
2. The BlueBox checks the database and initiates the system.
3. Then the BlueBox initiates the connected sensors and actuators.
4. The Parameter Display in list view in alphabetical order is the factory default start display. see *6 Parameter Display*

**Password entry:** To perform certain settings, a password consisting of 5 digits must be entered..see *Appendix A – The Configuration Data Sheet* there *1. BlueBox R1* there *BlueBox Password (PIN)*

## 5 Touch Screen Operation

The touch screen is divided in two sections, the **Main Menu Bar** and the **Function Display**.

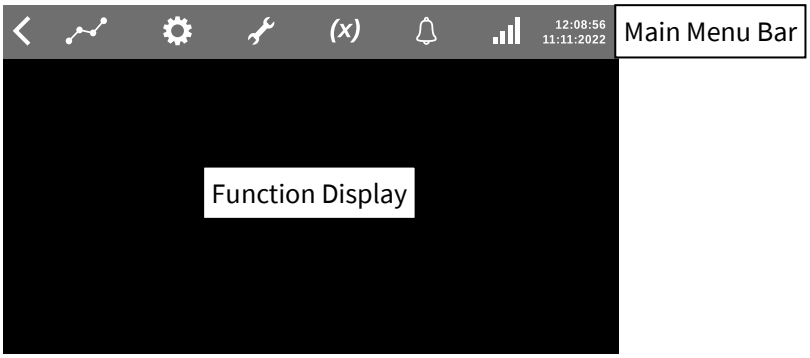
**Touch control**

tapping

horizontal swiping

vertical swiping

spreading and pinching




### 5.1 Main Menu Bar



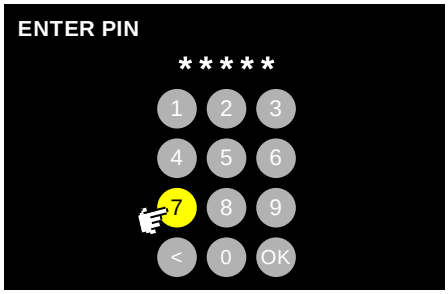

| | | |
|---|---|---|
| | Switches back to the previous display. | |
| | Switches to the Parameter Display. | see *6 Parameter Display* |
| | Switches to the System Display. | see *7 The System Display* |
| | Switches to the Service Display. | see *8 Service Display* |
| (x) | Switches to the User Variables Display. | see *9 User Variables Display.* |
| | Switches to the Notifications Display. Displays the number of current notifications in a red circle. | see *10 Notifications* |
| | Bar chart for the intensity of an optional LTE and GPS connection – Example 4G: At LTE and GPS: Chart LTE ↻ GPS cycling all 10 seconds | 4G |
| 12:08:56 11:11:2022 | Time and date display | |

## 5.2 Standard Input Displays

### Standard display input PIN

- Tap in the PIN.
- Tap (<) to delete the last entered digit.
- After entering the PIN, tap (OK).

You will find the PIN in the enclosed Configuration Data Sheet. see also *7.8*

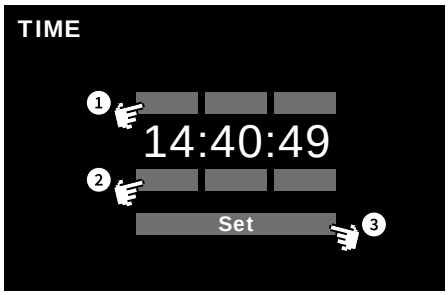



### Standard display input date and time

① One up

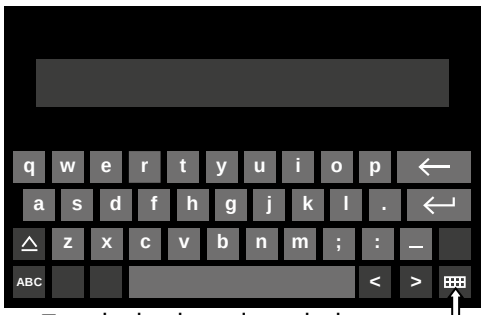
② One down

③ Saves entry




### Standard alphanumeric input display*

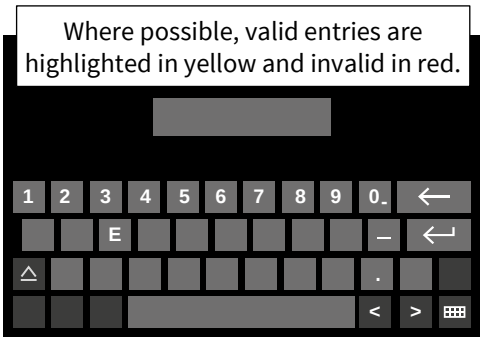
- Tap **ABC** to open the digit view.
  Tap **&123** to open the letter view.
- △ is off △ yellow dot is on
  Letter view - Tap △ to switch between small and capital letters as well as **;:-** and **,_**
- Digit view – Tap △ to change the special character assignment
- Deletes the character left of the cursor. ←
- Saves the entry. ↵
- Cursor one character back/forward. **< >**




- Tap the keyboard-symbol to return to the previous display without saving an entry.

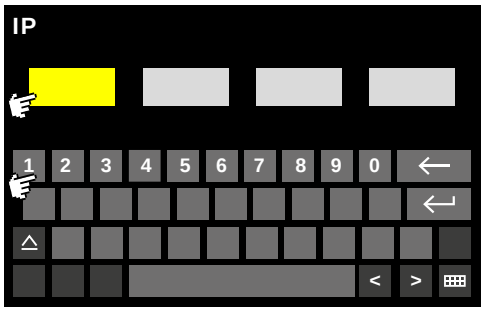
### Standard numeric input display *

- △ No function here.
- Deletes the character left of the cursor. ←
- Saves the entry. ↵
- Cursor one character back/forward. **< >**
- Tap the keyboard-symbol ⌨ to return to the previous display without saving an entry n.




### Standard IP input display

- △ No function here.
- Deletes the character left of the cursor. ←
- Saves the entry. ↵
- Cursor one character back/forward. **< >**
- Tap the keyboard-symbol ⌨ to return to the previous display without saving an entry.




* Decimal separator is the dot.

## 6 Sensor Display

**The Sensor Display shows the following:**

- the connected external sensors/actuators
- the connected internal CAN bus sensors
- the virtual (calculated) sensors
- the internal sensors (temperature and air pressure)[1]

**Only active sensors are displayed. see below**

**Of which:**

- the sensor name, the last recorded measurement value with unit and the date and time of the measurement recording
- Chart view with measurement values curve over time
- Sensor status messages
  see *Appendix B - Status Messages*
- Sample button and SQI value, if applicable

**There are five view types of the Sensor Display:**

- Sensor list view (max. 9 entries per list)
- Sensor view 1-way (view of one sensor)
- Sensor view 4-way (4 sensor fields)
- Sensor view 6-way (6 sensor fields)
- Single sensor chart view of one sensor (max. 30 per BlueBox)

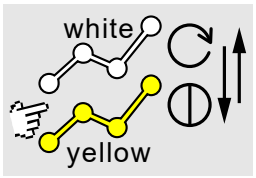
The sensors and actuators displayed, as well as the view type and sequence of the sensor views, are determined by the display functions.
see *7.6 Display Functions*

The Sensor Display in the sensor list view in alphabetical[2] order of sensor names is the factory default start display.

You can change the current view by swiping the display horizontal.

Example sequence: List 4 Sensors 6 Sensors Chart

Tap on to switch the cycling of the Sensor views on and off.




The Sensor Display symbol is also a status indicator.
Cycling ON: white[3] | Cycling OFF: yellow
Cycling ON means: A sensor view is displayed for 5 s; thereafter the display switches in a cycling way to the next sensor view.

Horizontal swiping at the display while cycling ON switches the cycling OFF.

**Connecting new sensors:**
If new sensors are connected to the BlueBox, the BlueBox creates a new sensor list view with only the newly recognised sensors, with more than 9 new sensors another sensor list view and so on.

If the BlueBox CAN bus connection is interrupted[4] during operation, this message appears on the Sensor Display:

**CAN-BUS-ERROR**
**INFO: IF NO CAN-BUS SENSOR CONNECTED, DISABLE THE CAN-BUS**

In this case, check the CAN bus connection. see also *7.4.5 Settings CAN Bus*
Operation of the BlueBox is still possible, but not at the Sensor Display.

**Deactivate/activate sensor*:** If you set a sensor name to **n/c** (not connected)**, the sensor is not active. This means that the sensor measurement value is neither recorded nor saved. In the sensor display inactive sensors are hidden. Certain sensors are not active ex factory. You can set a non-active sensor to active by changing the sensor name**

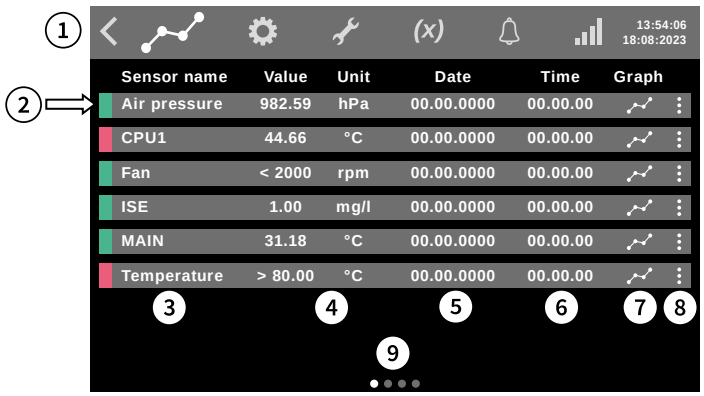
* also applies for actuators ** see *6.2.1 General Settings* there *Name*

You will get a list of the inactive sensors in the Service Display. see.*8 Service Display*
there: **SHOW ALL SENSORS** OFF ON Hides and shows non-active sensors.

[1] Depending on the version, there is also a humidity sensor.
[2] The sequence is that of the ASCII numeric value, i. e.: Special characters ⇨ numbers ⇨ capital letters ⇨ lower case letters
[3] or light grey
[4] and the CAN bus setting is set to **enabled** ☑ (factory setting) or **search** ☑
see *7.4.5 Settings CAN Bus*

## 6.1 Views of the Sensor Display

### 6.1.1 Sensor List View




(1) Main Menu Bar, see *5.1 Main Menu Bar*

(2) Status messages are not displayed, but are marked in colour here. see *Appendix B – Status Messages*
| green ⇨ Status no. 0 | orange ⇨ Status no. 4, 50, 51 | yellow ⇨ Status no. 57 |
| blue ⇨ Status no. 60 | red ⇨ Status no. 1, 2, 3 / 30, 31, 33 / 52, 53, 54, 55 |

(3) Sensor name

(4) Measurement value and unit

(5) Date of the last measurement

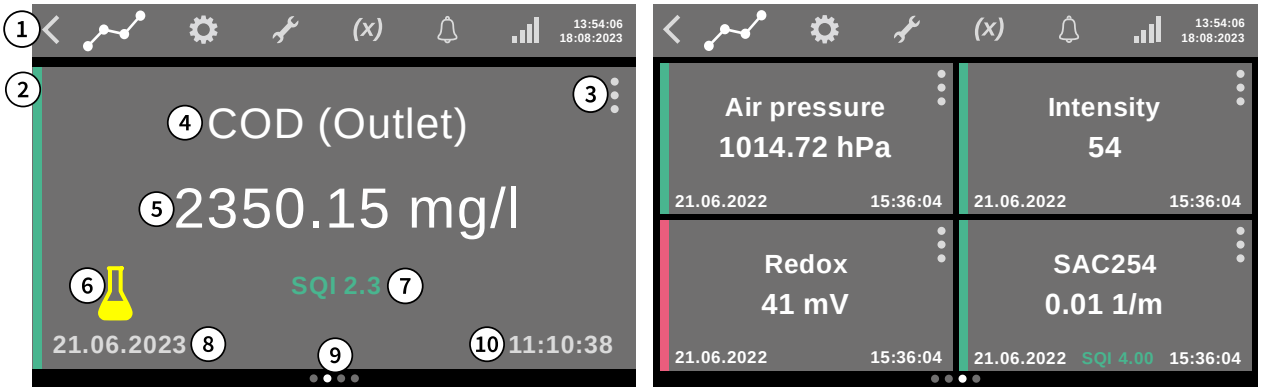
(6) Time of the last measurement

(7) Opens the measurement value chart* with the measurement values over the last 24 hours, scaled to min/max of all measurement values. Swiping horizontally shifts the x-axis. Spreading and pinching zooms the chart in and out. Tapping the display switches back to the Sensor Display.

(8) Switches to the Sensor Service Selection Display. see *6.2 Sensor Service Selection Display*

(9) ○●●● Position of the current Sensor view in the view sequence.

### 6.1.2 Sensor 1-way and 4-way (Sensor fields)




(1) Main Menu Bar, see *5.1 Main Menu Bar*

(2) Status messages are not displayed, but are marked in colour here. see *Appendix B – Status Messages*
| green ⇨ Status no. 0 | orange ⇨ Status no. 4, 50, 51 | yellow ⇨ Status no. 57 |
| blue ⇨ Status no. 60 | red ⇨ Status no. 1, 2, 3 / 30, 31, 33 / 52, 53, 54, 55 |

(3) Switches to the Sensor/Actuator Service Selection Display. see *6.2 Sensor Service Selection Display*

(4) Sensor name

* Not to be confused with the sensor chart view, see *6.1.3 Sensor Chart View*

(5) Measurement value and unit – Tapping ☞ opens the measurement value chart[1] with the measurement values over the last 24 hours, scaled to min/max of all measurement values. Swiping horizontally shifts the x-axis. Spreading and pinching zooms the chart in and out. Tapping the display switches back to the Sensor Display.

(6) Sample button, opens an assigned sample list.
see *7.6.4 Select Dashboard View Typen* and *11.4 Reference Measurement*

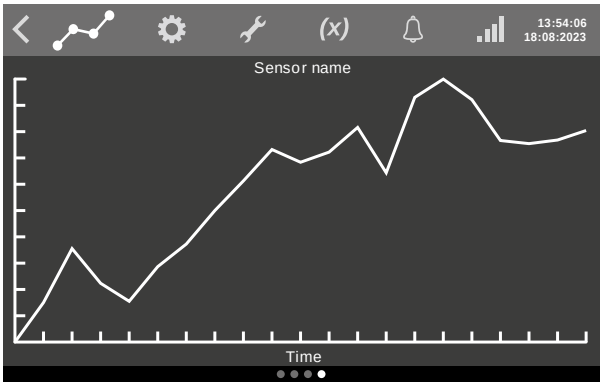
(7) SQI (Sensor-Quality-Index) for an application-specific parameter

(8) Date of the last measurement

(9) ●●○● Position of the current Sensor view in the view sequence

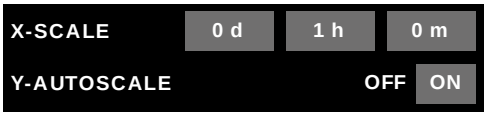
(10) Time of the last measurement

### 6.1.3 Sensor Chart View [2]




max. 30 sensor chart views at one BlueBox

X-Scale and Y-Scale as defined in *7.6.3 Dashboard Configuration Display* there CONFIG




**X-SCALE**: Scale of the elapsed time as set

**Y-AUTOSCALE:.**

**OFF** ⇨ Y-scaling: as set in *6.2.1 General Settings* there *Min Value/Max Value*

**ON** ⇨ Y-scaling: lowest/highest measurement value of the elapsed time as set under X-scaling

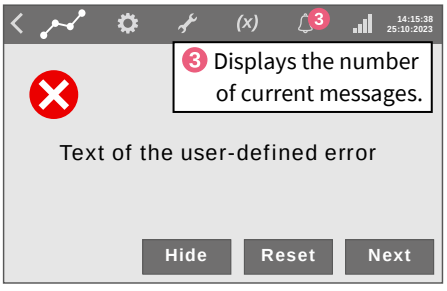
### 6.1.4 User-Defined Error Messages

User-defined errors are defined with the AMS[3] program. For current user-defined error messages, the current error message appears in the sensor display. Operation of the BlueBox is still possible, but not at the Sensor Display.

Hide Suppresses the displayed error message until the trigger is gone once and then back again, or until a restart. Then switches to the next error message, if present, and to the Sensor Display after the last error message.

Reset Resets the displayed error message. Then switches to the next error message, if present, and to the sensor display after the last error message.

Next Switches to the next error in a cycling way.




see also *10 Notifications*

[1] Not to be confused with the sensor chart view, see *6.1.3 Sensor Chart View*

[2] Not to be confused with the measurement value chart, see *6.1.1 Sensor List View there* (7).

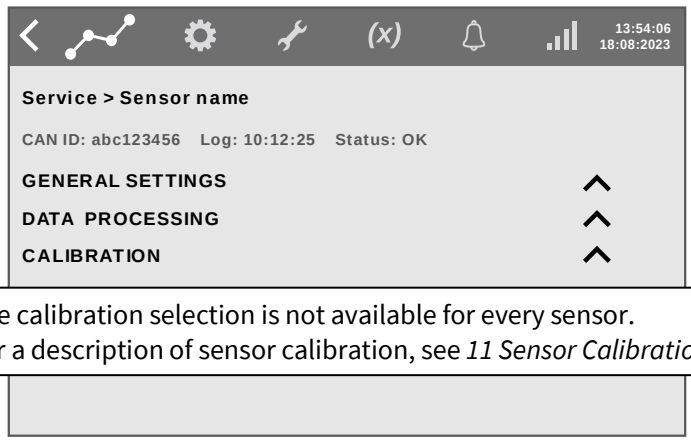
[3] The AMS program is part of the BlueBox PC Software.

## 6.2 Sensor Service Selection Display

You can use this display to determine the settings of a connected sensor, calibrate it if necessary and view the current settings of the sensor. The specific settings can be found in the sensor documentation. Sensor and actuator settings are held similarly.

It is recommended to make major changes via the Service Display, see *8 Service Display*, in the service mode. The service mode suppresses the recording of measurement-irrelevant maintenance data.

**Call up with** ☞ **in the Sensor Display**[1]




☜ Switches back to the previous Display.

☞ Switches to the corresponding Display.

The calibration selection is not available for every sensor.
For a description of sensor calibration, see *11 Sensor Calibration*.

| **Sensor name:** As entered in the "Name" field under General settings. see next page |

| **CAN ID:** see below | **Log:** Time of the last measurement at display call-up | **Status:** Sensor status[2] |

For optical sensors, there may also be the "Advanced Setup" option.

The terminology of the BlueBox system does not always differentiate between sensors and actuators. The states of an actuator can be interpreted as measured values and are also recorded as such. Accordingly, actuators have a sensor number.

### Identification numbers

- **DAM ID** (Module ID)
  - Identification number of a Data Acquisition Module
  - Identification number of an actuator module

    The DAM ID consists of 3 letters + 5 digits and is factory set.
- **Sensor number**: The sensor number (consecutive number 1 to 16) of a real sensor is factory set via the respective sensor input on the Data Acquisition Module.
- **CAN ID**[3] (Sensor ID) **of a real sensor** = DAM ID + sensor number
- **CAN ID**[4] (Sensor ID) **of a virtual sensor**: = 00[5] + **BlueBox serial number**[6] + sensor number
  The serial number of the BlueBox is factory set. The sensor number of a virtual sensor is factory set. **Modbus sensors** connected to the internal RS485 interface of the BlueBox and **the internal sensors** (temperature sensor and air pressure sensor)[7] have the ID of a virtual sensor.

[1] and with Configuration in the Service Display, see *8 Service Display*

[2] see *Appendix B – Status Messages*

[3] The CAN ID is strictly speaking the ID of the sensor input on the DAM.

[4] Strictly speaking, the ID of a virtual sensor is not a CAN ID.

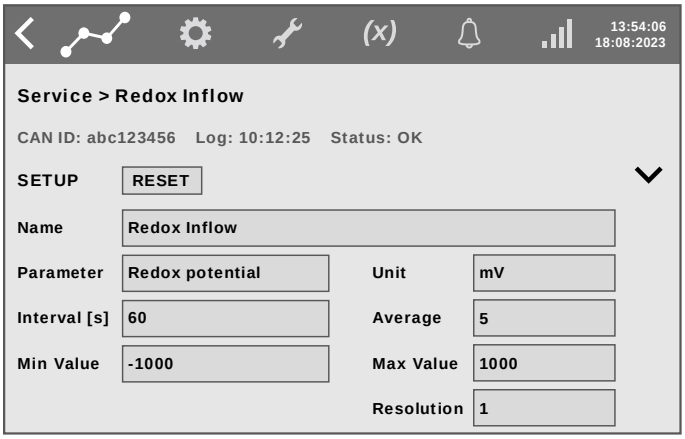
[5] 00 means zerozero

[6] The serial number (SN) of the BlueBox is on the type plate. see *04 Type Plates*
see also *Appendix A – The Configuration Data Sheet* there *1. BlueBox there Serial Number* and *7.8 Shutdown/Restart – Lock/Unlock*

[7] Depending on the version, there is additional a humidity sensor.

## 6.2.1 General Settings

**Sensor Service > General Settings**




Switches back to the previous display.

Switches back to the selection display.

Tap on a grey rectangle.

Example Redox electrode

RESET — without function here

**Name** — Switches to the input of a sensor name. max. 20 characters
Is shortened to 15 characters in the Sensor List view of the Sensor Display.

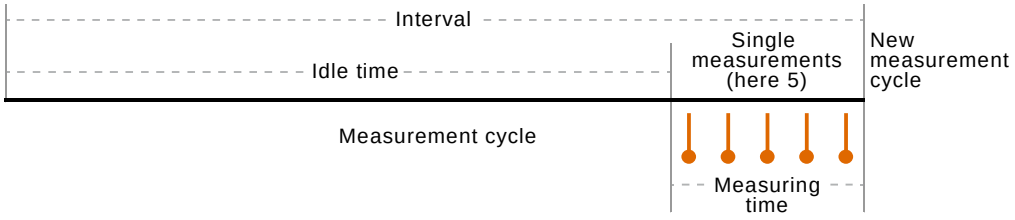
**Parameter** — Switches to the input of the name of the measured parameter. max. 20 characters

**Unit** — Switches to the input of the unit of the measurement value. max. 20 characters
Is shortened to 7 characters in the Sensor List view of the Sensor Display.

**Note on the interval (Measurement interval)**: Time in seconds between the end of a measurement and the end of the next measurement.[1] Choose the interval according to the characteristics of the sensor. Each sensor requires a certain minimum period for measuring a value. Please note the data sheet of the sensor.

**Interval [s]** — Switches to the input of the measurement interval.

**Average** — Switches to the entry of the number of single measurements from which the arithmetic mean value is calculated.




Here the arithmetic mean of 5 single measurements is calculated.

**Min. Value**
**Max. Value** — Switches to the entry of the lower range limit / upper range limit.[2]
At underrun and overrun the Sensor Status is set to 50 or 51.
The sensor is marked in orange. see *Appendix B – Status Messages*

**Resolution** — S witches to the input of the number of decimal places of the displayed measurement value. Entry 1 displays no decimal places, 0.1 one, 0.01 two, etc.
The values here differ from those in the AMS[3] sensor setup.

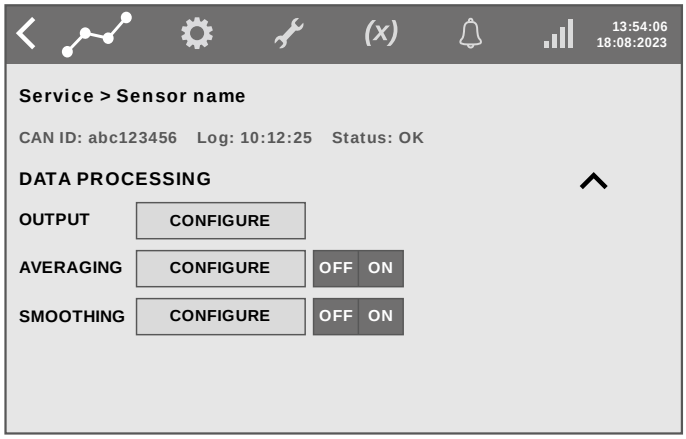
[1] The measurement interval is calculated in advance from the set interval time, the number of individual measurements and the properties of the sensor. This results in a low time drift of the recording times of the measurement values.

[2] The entry is limited by the number of digits that can be displayed. Exponential notation is recommended for larger numerical values. Invalid entries are highlighted in red at the input.

[3] The program AMS is part of the BlueBox PC Software.

## 6.2.2 Data Processing

**Sensor Service > Data Processing**




Switches back to the previous Display.

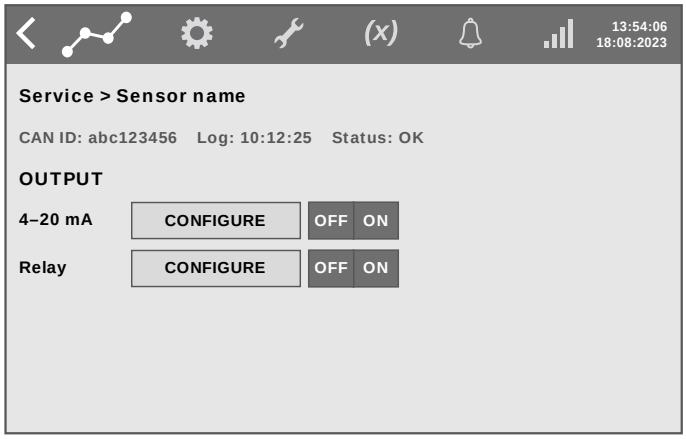
Switches back to the Selection Display

Tap on CONFIGURE opens the corresponding display.

Tap on OFF ON disables and enables the corresponding function. see next pages

## 6.2.2.1 Data Processing Output

**Sensor Service > Data Processing > Output**

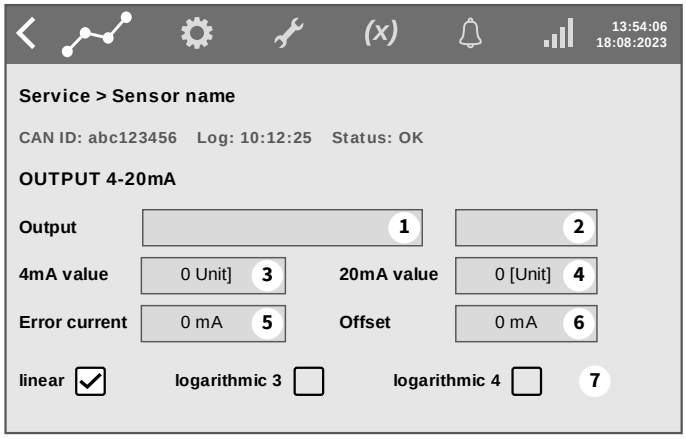



Switches back to the previous Display.

Tap on CONFIGURE opens the corresponding display.

Tap on OFF ON disables and enables the corresponding function. see next pages

**Sensor Service >**
**Data Processing >**
**Output >**
**4 – 20 mA**




Switches back to the previous Display.

(1) (2) Opens in each case the same list display for selecting a current output whose current values are controlled by the sensor values.
The name of the current output is entered in (1), the Sensor ID[1] in (2).

(3) Sets a sensor measurement value that corresponds to the 4 mA current value.

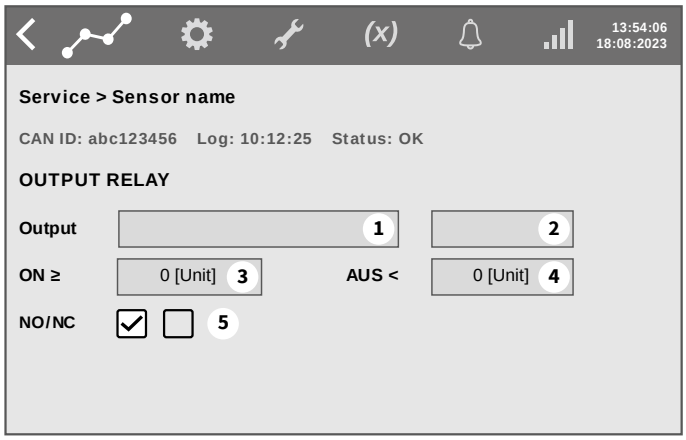
(4) Sets a sensor measurement value that corresponds to the 20 mA current value.

(5) Sets a error current value in mA. In the event of a device error[2] this current value is output.

(6) Sets an offset value in mA (e.g. for adaptation to a control center).

(7) Determines the output scale.
Linear ⇨ linear
logarithm 3 ⇨ logarithmically over 3 decades
logarithm 4 ⇨ logarithmically over 4 decades

**Sensor Service >**
**Data Processing >**
**Output >**
**Relay**




Switches back to the previous Display.

(1) (2) Opens in each case the same list display for selecting a relay whose switching status are controlled by the sensor values.
The name of the relay is entered in (1), the Sensor ID[1] in (2).

(3) The relay switches at a sensor measurement value ≥ to the value set here.

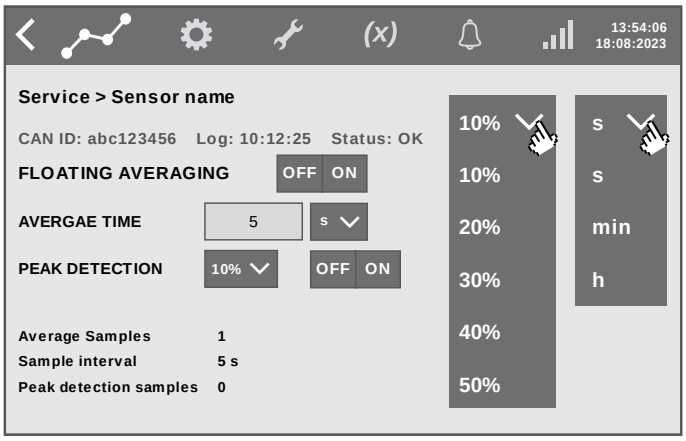
(4) The relay switches at a sensor measurement value <to the value set here.

(5) Sets the relay contact type to normally open (NO) or normally closed (NC).

[1] Strictly speaking Actuator ID, see also 6.2 Sensor Service Selection Display there Identification numbers
[2] see *Appendix B – Status Messsages* there status number 1, 2, 3 / 30, 31, 33 / 52, 53, 54, 55

## 6.2.2.2 Data Processing Averaging (Averaging and Outlier Suppression)

**Sensor Service > Data Processing > Averaging**




Switches back to the previous Display.

Here you can determine how a moving average is generated from measurement values and how outliers are suppressed.

If the moving average is enabled, the output sensor measurement value is calculated as a moving average of measured values recorded in the Average Time.

**FLOATING AVERAGE** Tap on OFF ON disables and enables the averaging.

**AVERAGE TIME** The time unit [s, min, h] is determined by selection in the drop-down list.
The moving average is calculated from the measured values recorded in the Average Time. The number of measured values at a given Average Time depends on the measurement interval (see *6.2.1*). With a double measurement interval (Average Time = 2x measurement interval) two measured values are taken into account, with a triple measurement interval three and so on.
This means, that only an integer multiple of the measurement interval is effective. Other values are taken as the next largest integer multiple of the measurement interval (see 6.2.1). An Average Time of 1xmeasurement interval is ineffective.

**PEAK DETECTION** Input of the **type of outlier/peak detection**, the unit is determined by selection in the drop-down list.

**Type of peak detection**

Tap on OFF ON disables and enables the peak detection.

The measurement values are sorted by size.

**10%** The lower and upper 10 percent by number are removed and the arithmetic mean is calculated.

**20%** The lower and upper 20 percent by number are removed and the arithmetic mean is calculated.

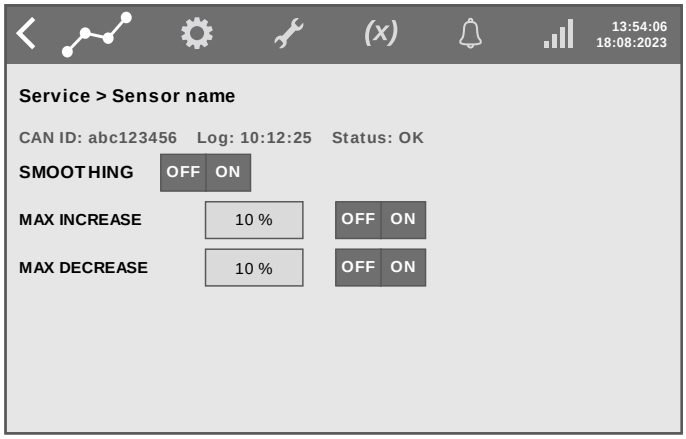
**30%** The lower and upper 30 percent by number are removed and the arithmetic mean is calculated

**40%** The lower and upper 40 percent by number are removed and the arithmetic mean is calculated

**50%** The calculated mean is the median of all n values.

### 6.2.2.3 Data Processing Smoothing

**Sensor Service > Data Processing > Smoothing**




Switches back to the previous Display.

Here you can define how the curve of the sensor measurement values is smoothed by a digital filter*.
Smoothing is performed separately for increasing and decreasing measured values.
The smoothed measured values are saved.

**SMOOTHING** Tap on OFF ON disables and enables all smoothing.

**MAX INCREASE** Opens the standard numeric input display for the input of a percentage value for increasing measured values.

Tap on OFF ON disables and enables the increase smoothing.

**MAX DECREASE** Opens the standard numeric input display for the input of a percentage value for decreasing measured values.

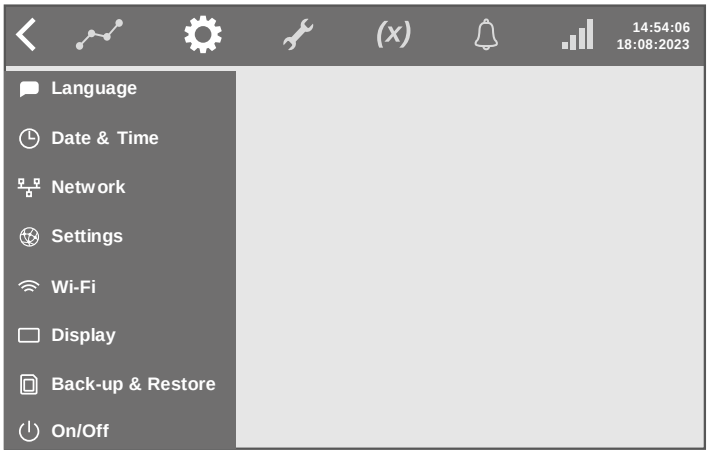
Tap on OFF ON disables and enables the decrease smoothing.

* **Calculation:** $Measvalue_{calc} = Measvalue_{old} \times (1 - maxvalue/100) + (Measvalue_{new} \times maxvalue/100)$
maxvalue is the value entered under <**MAX INCREASE**> for **increasing measured values**.
maxvalue is the value entered under <**MAX DECREASE**> for **decreasing measured values**.

## 7 System Display

Call-up with ⚙ in the Main Menu Bar. The System Display with its vertical System Menu appears.

Switches back to the previous Display.

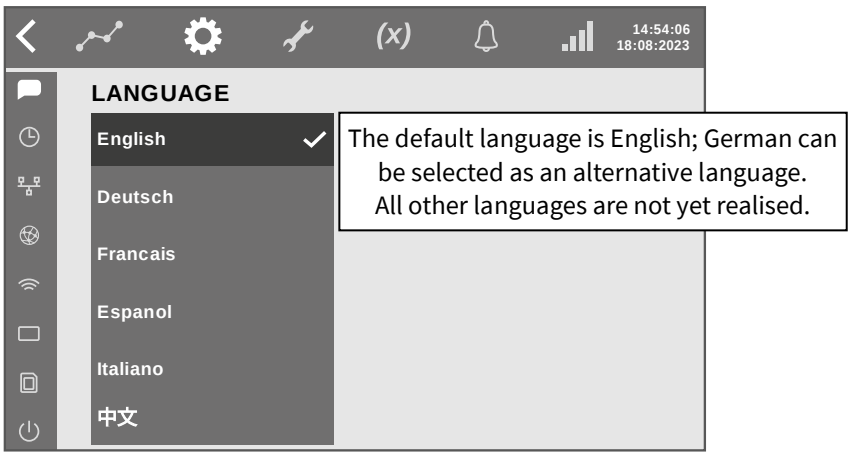



**System Menu**

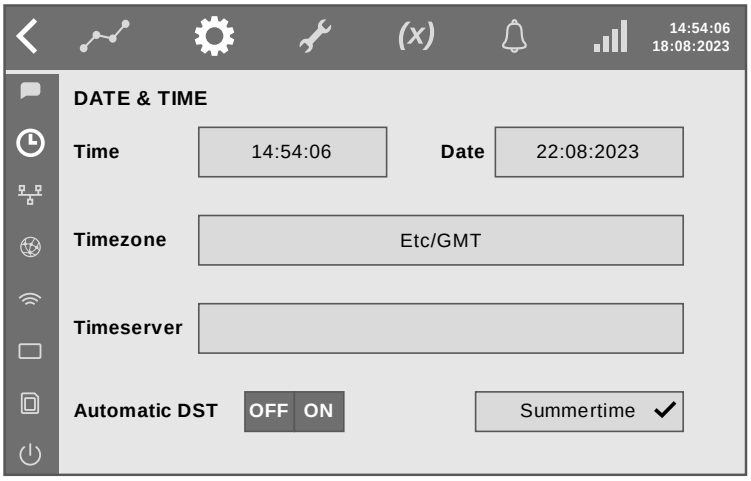
| | |
|---|---|
| **Language** | Switches to the language setting menu, see *7.1 Language Selection*. |
| **Date & Time** | Switches to the Date & Time menu, see *7.2 Date and Time*. |
| **Network** | Switches to the Network menu, see *7.3 Network*. |
| **Settings** | \| Modem Setup \| Cloud Setup \| Connectivity Setup \| GPS Setup \| CAN bus setup \| see *7.4 Settings Selection Display* |
| **Wi-Fi** | Switches to the Wi-Fi Setup Menu, see *7.5 Wi-Fi Setup* |
| **Display** | Switches to the Display Functions, see *7.6 Display Functions*. |
| **Back-up & Reset** | \| Configuration Back-up Import/Export \| Reset to Factory Settings \| \| Firmware and License Update \| Database Export/Reset see *7.7 Back-Up / Reset* |
| **On/Off** | \| BlueBox shut down and restart \| \| lock BlueBox, unlock permanently, lock for 15 and 30 minutes \| see *7.8 Shutdown/Restart – Lock/Unlock* |

## 7.1 Language Selection

Here you can select the display language.



## 7.2 Date und Time




**Time** Opens the standard display input date and time, see *5.2*.

**Date** Opens the standard display input date and time, see *5.2*.

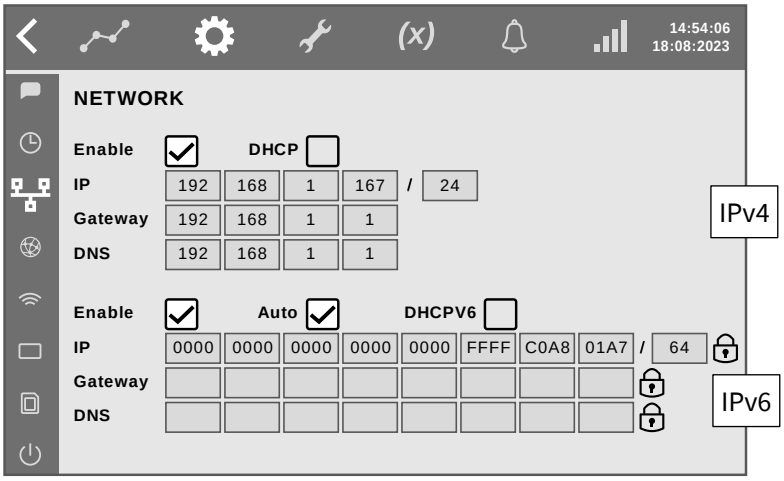
**Timezone** Opens a time zone input scroll display.
Scroll by swiping, and then select the appropriate time zone by tapping:
The time zone is now set.

**Timeserver** Opens the standard alphanumeric input display, see *5.2*. After setting a URL (web address) or an IP address of a time server, the BlueBox automatically synchronizes its system time with the time server.
GO Systemelektronik provides a time server under the URL "ntp.go-sys.de" (IP address 212.51.30.18) – the only requirement here is that the BlueBox has Internet access.
Synchronization is performed using the NTP protocol.

**Automatic DST** Daylight Saving Time
Automatic time changeover winter time ⇔ summer time OFF ON

**Summertime/Wintertime** Button for manual time changeover winter time ⇔ summer time
The button is also a status display.
(in case of automatic time changeover only a status display)

## 7.3 Network



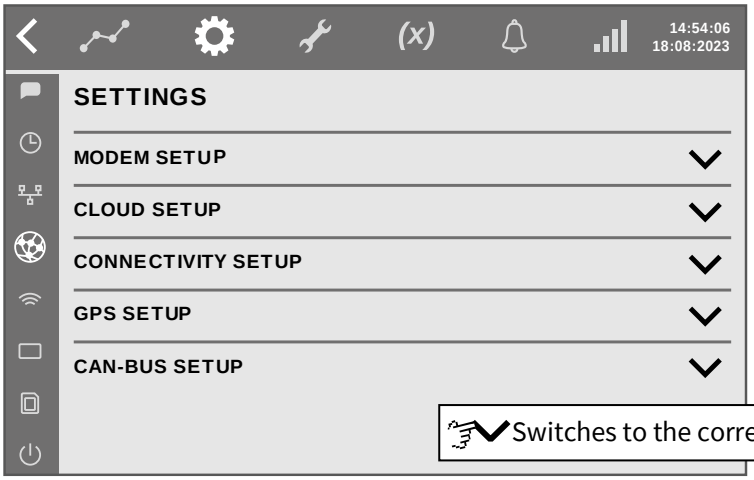

| | |
|---|---|
| **IPv4** | **Input of IP addresses see *5.2 Standard Input Displays*** |
| **Enable** | Enables and disables the IPv4 connection.<br>You can use the IPv4 connection with or without the IPv6 connection. |
| **DHCP** | Activates and deactivates the automatic assignment of an IPv4 address.<br>The IP address is set via the DHCP protocol when the BlueBox starts.<br>Right of the IP/Gateway/DNS input fields lock symbols appear, with means that no entries are possible. |
| **IP and Netmask**<br>in IPv4 [CDIR*] | Switches to the input of the local IPv4 address and netmask which identifies the BlueBox on your local network. Here you can enter the IPv4 address in the first four input fields and the netmask in the last input field.<br>The IP address and the netmask are configured at the factory.<br>see *Appendix A – The Configuration Data Sheet*<br>The current setting is displayed. |
| **Gateway** | Switches to the input of the IPv4 address of the device, which executes the connection to other networks.<br>If the BlueBox shall communicate via the LAN connection with other networks, enter the IP address of the device that executes the connection (another BlueBox, routers, servers etc.).<br>The current setting is displayed. |
| **DNS** | Switches to the input of a DNS server.<br>If the BlueBox is connected to the Internet via a router or similar and not via an internal modem and if you use names and not IP addresses for Internet addresses, then a DNS server must be entered here in the BlueBox.<br>The current setting is displayed. |

* Classless Inter-Domain Routing 24 ≙ 255.255.255.0

| | |
|---|---|
| **IPv6** | **Input of IP addresses see *5.2 Standard Input Displays*** |
| **Enable** | Enables and disables the IPv6 connection.<br>You can use the IPv6 connection with or without the IPv6 connection. |
| **Auto** | Automatic determination of a unique IPv6 address |
| **DHCPv6** | Activates and deactivates the automatic assignment of an IPv6 address.<br>The IP address is set via the DHCP protocol when the BlueBox starts.<br>Right of the IP/Gateway/DNS input fields lock symbols appear, with means that no entries are possible. |
| **IP and Netmask** in IP6 [CDIR*] | Switches to the input of the local IPv6 address and netmask which identifies the BlueBox on your local network. Here you can enter the IP6 address in the first eight input fields and the netmask in the last input field.<br>The IP address and the netmask are configured at the factory.<br>see *Appendix A – The Configuration Data Sheet*<br>The current setting is displayed. |
| **Gateway** | Switches to the input of the IPv4 address of the device, which executes the connection to other networks.<br>If the BlueBox shall communicate via the LAN connection with other networks, enter the IP address of the device that executes the connection (another BlueBox, routers, servers etc.).<br>The current setting is displayed. |
| **DNS** | Switches to the input of a DNS server.<br>If the BlueBox is connected to the Internet via a router or similar and not via an internal modem and if you use names and not IP addresses for Internet addresses, then a DNS server must be entered here in the BlueBox.<br>The current setting is displayed. |

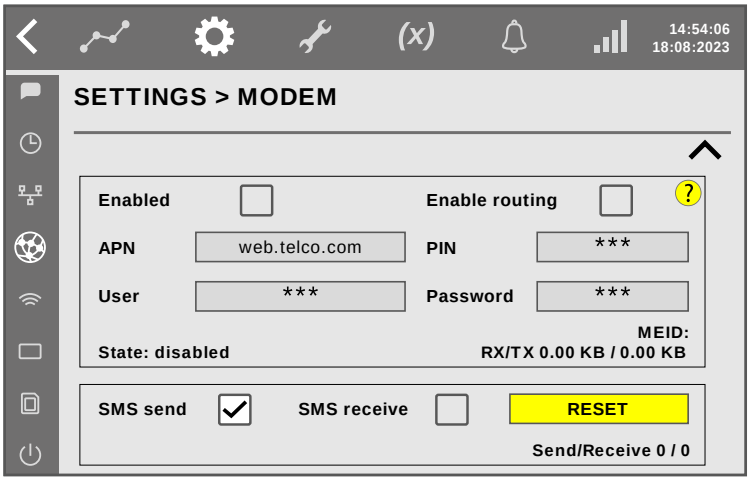
* Classless Inter-Domain Routing 64 ≙ 255.255.255.0

## 7.4 Settings Selection Display




The following menus are used for various settings. Prerequisite is an Internet connection via the network cable on the BlueBox or an Internet connection via an internal or external LTE modem (see *7.4.1 Settings Modem*).

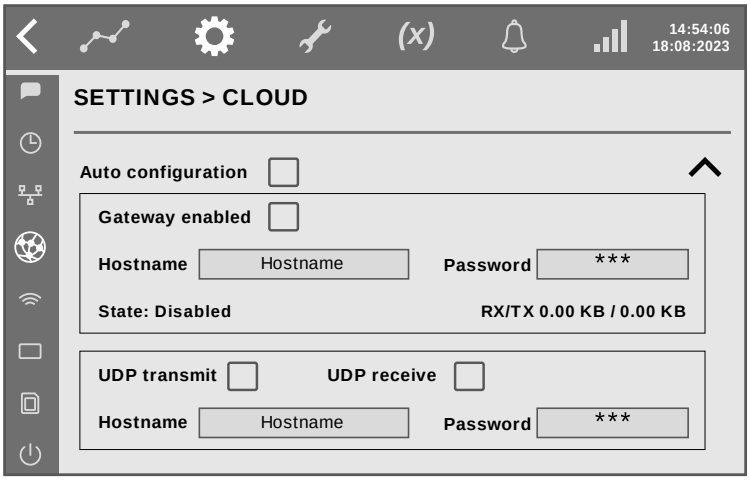
### 7.4.1 Setting Modem




| | |
|---|---|
| **Enabled**<br>**Enable routing** | Enables and disables the modem connection with or without routing. |
| ? | Opens an info display with the technical data of the modem. |
| **APN** | Switches to the input of the Access Point Name (APN). The current setting is displayed.<br>You can get the APN from your mobile phone provider or from the Internet |
| **PIN** | Switches to the input of the PIN number of a modem.<br>**Note on a possible operation error:** When starting a BlueBox for the first time, the SIM card must be deactivated to avoid a PIN error. |
| **User** | Switches to the input of the Username (Login name). |
| **Password** | Switches to the input of the Password (Login password). |
| **MEID** | Mobile Equipment Identifier – Identification number of the modem |
| **State** | Disabled or enabled |
| **RX KB**<br>**TX KB** | Data volume received since connection start<br>Data volume sent since connection start |

| | |
|---|---|
| **SMS send/receive** | Enables and disables the SMS sending and receiving. |
| RESET | Performs a modem reset. |
| **Send/ Receive** | Number of SMS sent / number of SMS received |

### 7.4.2 Settings Cloud




Switches back to the Selection Display.

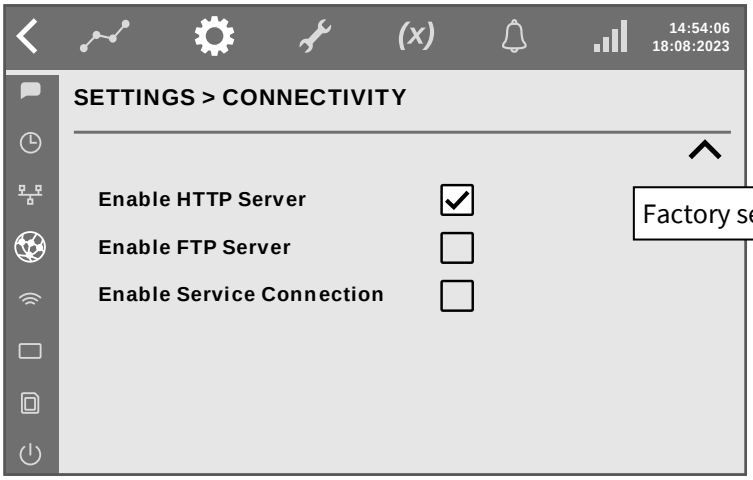
**Auto configuration** Enables and disables automatic configuration. If automatic configuration is enabled, the settings are queried from the Internet.

| | |
|---|---|
| **Gateway enabled** | Enables and disables the Gateway. |
| **Hostname** | Switches to the entry of the gateway host name.<br>The current setting is displayed. |
| **Password** | Switches to the entry of the gateway password. |
| **State** | Disabled or connected |
| **RX KB**<br>**TX KB** | Data volume received since connection start<br>Data volume sent since connection start |

| | |
|---|---|
| **UDP transmit**<br>**UDP receive** | Enables and disables UDP transmitting and receiving.<br>The UDP settings are necessary for the transmission of measurement data from and to a PC (e.g. for the online data service BlueGate). |
| **Hostname** | Here you can enter the IP address of the destination computer in the Internet, to which the measuring data is transmitted. The UDP protocol via port 14112 is used for the transmission. The current IP address is displayed.<br>If an access to the BlueGate server has been ordered from GO Systemelektronik, the IP address is set to the standard address 212.51.30.18 on delivery of the BlueBox. |
| **Password** | Switches to the input of the encryption password. |

Only enter the encryption password if GO Systemelektronik requires you to do so.

### 7.4.3 Settings Connectivity




Switches back to the Selection Display.

**Enable HTTP Server** ☑ Enables and disables the BlueBox web server and thus access to the BlueBox web interface, see *12 The BlueBox Web Interface*.

**Enable FTP Server** ☑ Enables and disables the FTP-Server.

**Enable Service connection** ☑ Enables and disables the extended debug functionality.
Default setting: Disabled

For service tasks, GO Systemelektronik can access the BlueBox from outside.

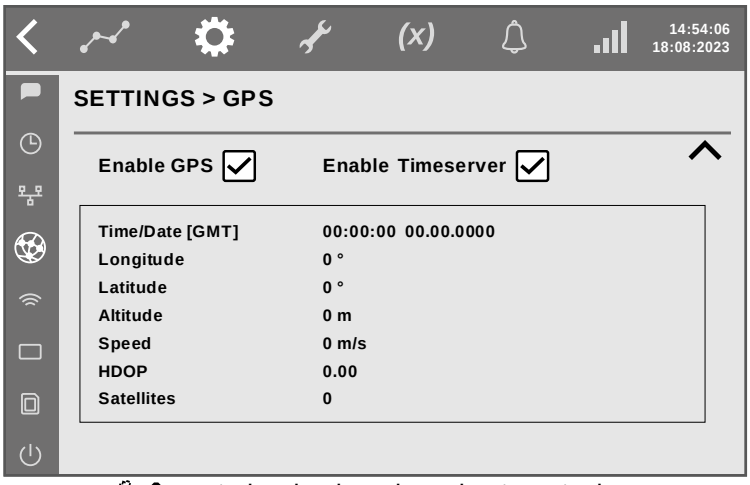
☑ **Enable Service Connection** ⇨ extended debug functionality enabled
- Also access to the operating system functions of the BlueBox

☐ **Service connection is not enabled**
- No access to the operating system functions of the BlueBox

Only enable the extended debug functionality if GO Systemelektronik requires you to do so.

**Do not forget to deactivate the extended debug functionality again.**

### 7.4.4 Settings GPS S

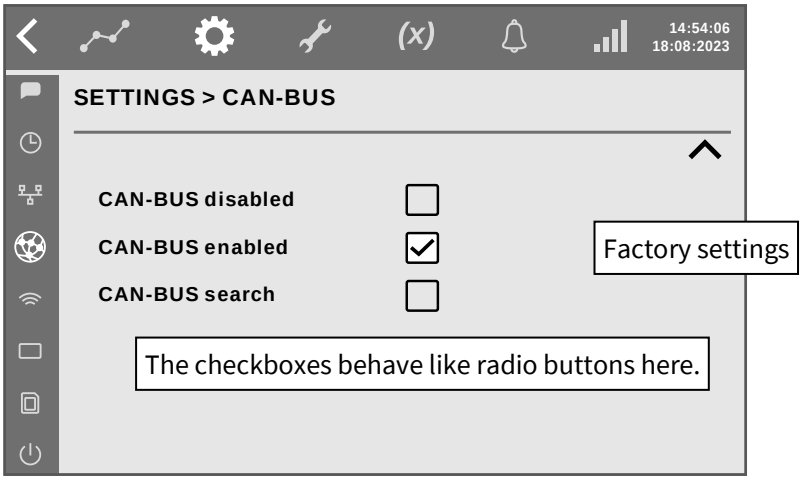



Switches back to the Selection Display.

**Enable GPS** ☑ If enabled, the GPS data is displayed below.

**Enable Timeserver** ☑ The GPS time is used as time signal.

### 7.4.5 Settings CAN Bus




Switches back to the Selection Display.

**CAN-BUS disabled** ☑
Deactivates the CAN bus, other sensors (internal sensors and Modbus sensors and RS232/485 devices) are recognised.

**CAN-BUS enabled** ☑
The BlueBox only boots successfully if at least one CAN bus module (external or internal) is connected to the BlueBox, regardless of whether other sensors (internal sensors and Modbus sensors and RS232/485 devices) are connected.
If no CAN bus module is recognised, the BlueBox starts up with an error message in the sensor display.*

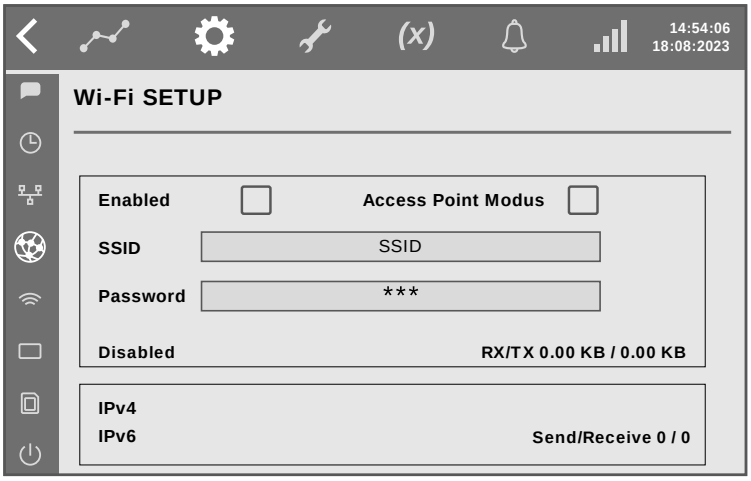
**CAN-BUS search** ☑
Does not require at least one CAN bus module to be connected. If no CAN bus module is recognised, the search continues and other sensors are recognised.

When there are no CAN bus modules at the BlueBox, there are two suitable settings here:
- CAN-BUS disabled – has the advantage that the BlueBox starts approx. 10 seconds faster.
- CAN-BUS search – has the advantage that CAN bus sensors connected later are recognised immediately.

In case of doubt, choose CAN-BUS search.

* Error messages in the Sensor Display:
**NO SENSOR FOUND**
After approx. 15 seconds another error message appears:
**CAN-BUS ERROR**
**INFO: IF NO CAN-BUS SENSOR CONNECTED, DISABLE THE CAN-BUS**

## 7.5 Wi-Fi Setup

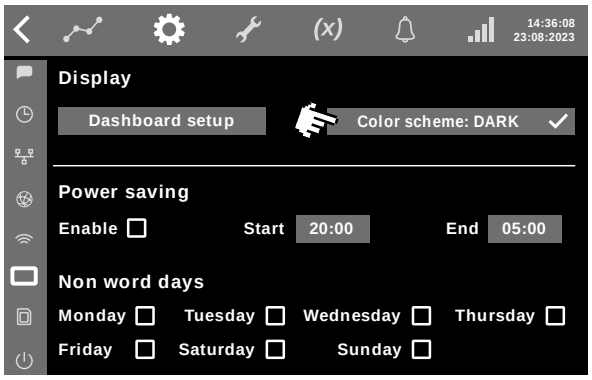



| | |
|---|---|
| **Enabled** | Enables and disables the Wi-Fi connection. |
| **Access Point Mode** | Enables and disables the Access Point Mode.<br>In access point mode, the BlueBox is a gateway for other devices. |
| **SSID** | Switches to the entry of the name of the WLAN connection. |
| **Password** | Switches to the entry of the wireless network password.<br>**The password must have at least 8 characters. If not, an error message occurs.** |
| **Disabled**<br>**Enabled** | Connection state |
| **RX KB**<br>**TX KB** | Data volume received since connection start<br>Data volume sent since connection start |

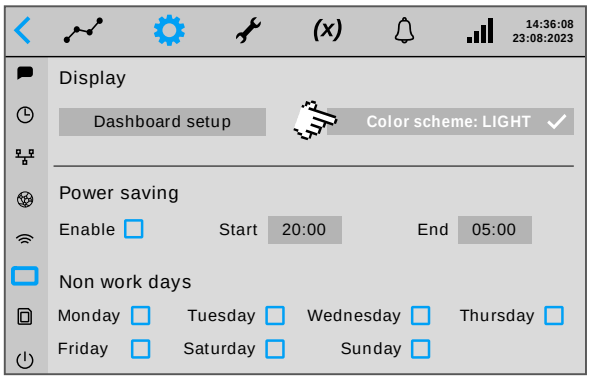
| | |
|---|---|
| **IPv4**<br>**IPv6** | Connection status information |

## 7.6 Display Functions

### 7.6.1 Display Colours and Power Saving




Display colour scheme Dark




Display colour scheme Light

Tapping the Button <Dashboard setup> opens the Display of the sensor display settings. see *7.6.2* below

Here you can change the display colours with the DARK⇔LIGHT Button, the Button is also a status indicator.

The power-saving function darkens the display on selected days and times of day. On non-working days, the display is darkened for the whole day, otherwise only as entered under Start/End.

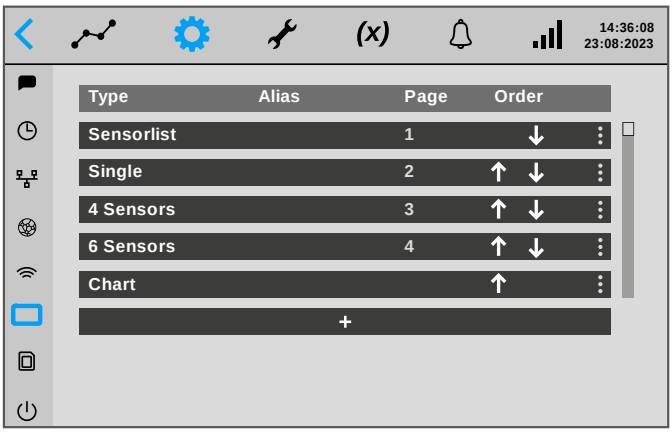
Tapping on the darkened display brightens it after three seconds for 150 seconds; each further user action resets the 150 seconds.

### 7.6.2 Sensor Display Settings

**There are five view types of a Sensor Display:**

- Sensor list* — Sensor list view (max. 9 entries per list)
- Single — Sensor view 1-way (view of one sensor)
- 4 Sensors — Sensor view 4-way (4 sensor fields)
- 6 Sensors — Sensor view 6-way (6 sensor fields)
- Chart — Single sensor chart view of a one sensor (max. 30 per BlueBox)

The displayed sensors and actuators as well as the particular view type are defined via the Dashboard Configuration Display. see below




ℹ You can reset the Sensor Display to the factory setting. see *7.7 Back-Up/Reset*

ℹ You can export the current setting as part of the configuration back-up and then import it again. see *7.7 Back-Up/Reset*

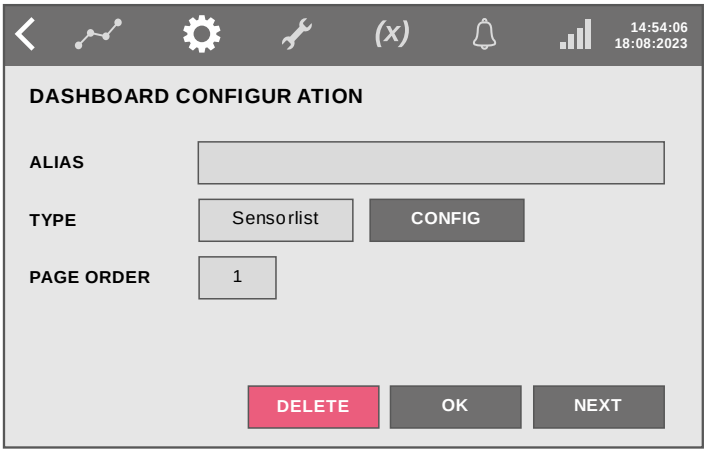
| | |
|---|---|
| **Type** | Current view types |
| **Alias** | Alias name of a view type |
| **Page** | Position in the appearance order at the display |
| **Order** | ↑↓ Moves the corresponding view type up or down one column. |
| ⋮ | Opens the Dashboard Configuration Display. see *7.6.3* |
| + | Opens the Select Dashboard Type Display. see *7.6.4* |

* The Sensor Display in list view in alphabetical order is the factory default start display.
The sequence is that of the ASCII numeric value, i. e.: Special characters ⇨ numbers ⇨ capital letters ⇨ lower case letters

### 7.6.3 Dashboard Configuration

This display allows you to assign a name to a Sensor Display, to define the view type, the displayed sensors and the display sequence, as well as to delete the parameter display.

Call up with ☞⋮ in the settings for the Sensor Display, see *7.6.2*




☞ Tap on a rectangle.

**ALIAS** Switches to the input of a name for the sensor view.

**TYPE** Shows the view type, see *7.6.4*

CONFIG Switches to the settings of the view type.

**PAGE ORDER** Switches to the input of the Position in the appearance order. The button is also a status indicator

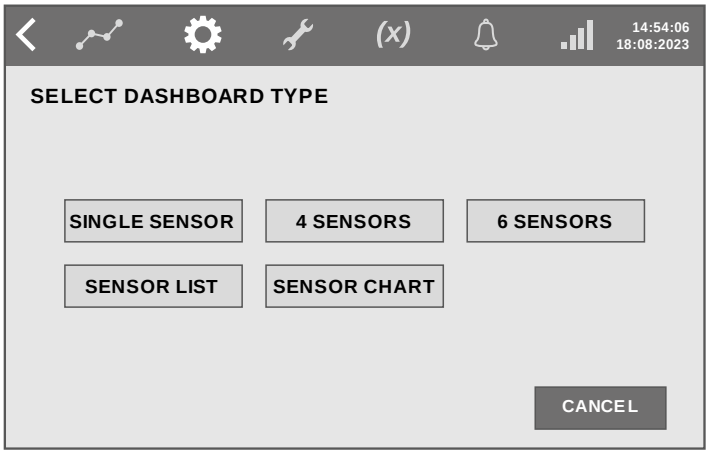
DELETE Deletes the Sensor view after a prompt.

OK Saves the settings.

NEXT Switches to the configuration display of the next sensor, if existing.

### 7.6.4 Select Dashboard View Type

Call up with ☞+ in the settings for the Sensor Display, see *7.6.2*

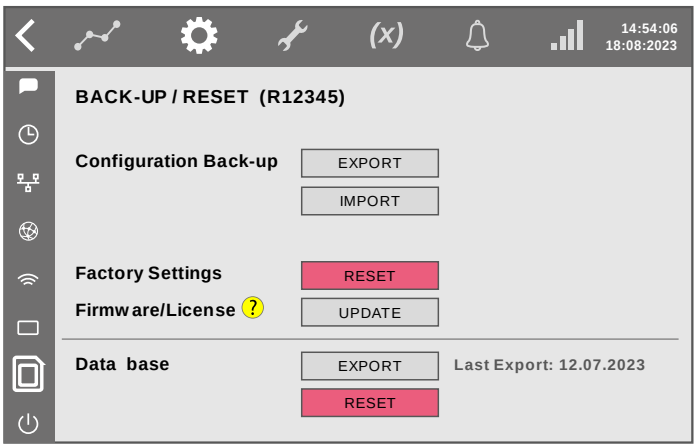



☞ Tap on a rectangle.

Here you have 5 buttons for the 5 view types of the Sensor Display. Tapping on one of these buttons will define the view type of the new sensor view and opens the Sensor Allocation Table for the new sensor view. Tapping on the button <CANCEL> switches back to the display of the sensor display settings.

For the first 3 view types <Show sample button ☑> can be selected for suitable sensors. When selected, the button symbol appears at the bottom left of the sensor field. Tapping on the symbol opens the corresponding Reference Value List, see *11.4 Reference Measurement*.

## 7.7 Back-Up/Reset



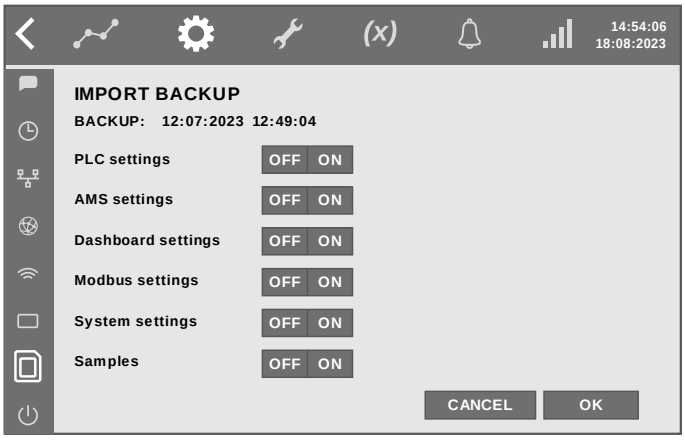

Tap on a rectangle.

**Configuration Back-up**

EXPORT The export function stores all configuration settings (all but measurement data and spectra) into a bsb[1]-file on the first level of a connected USB stick[2].

IMPORT The import function loads the Configuration Back-up from a bsb[1]-file on the first level of a connected USB stick[2].

A selection list with date and time of the bsb-files on the USB stick appears, select a bsb-file. A selection display appears.




Here you can select the types of configuration data to be imported.

**Samples** mean the reference measurements of a spectrometer.

**Factory Settings**

RESET Resets, after a confirmation, the BlueBox to the factory settings.

**Firmware/ License**

Tap on ? opens the Firmware Info Display.
Here you get the current firmware version and License notes
You close the licence notes by tapping the licence notes eight times.

UPDATE opens a function display with buttons:

Check for new Firmware The BlueBox searches in the Internet for a new firmware version.

Check for new Licence The BlueBox searches in the Internet for a new license.

Precondition is an active Internet connection.

Update from USB flash drive The BlueBox searches on a connected USB stick[2].

For more information contact GO Systemelektronik.

Never interrupt the power supply during the update process.

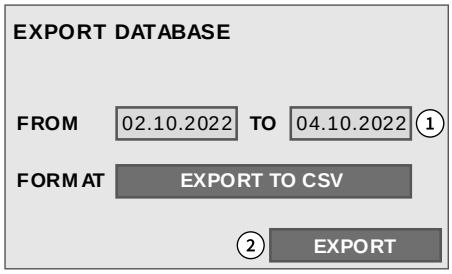
[1] **B**lueBox **S**ystem **B**ackup
[2] strictly speaking: USB storage device

**Database**

EXPORT

Opens a function display. The function transfers measurement data and the system log as csv-files to a connected USB stick.

The USB stick must be formatted in FAT/FAT32.



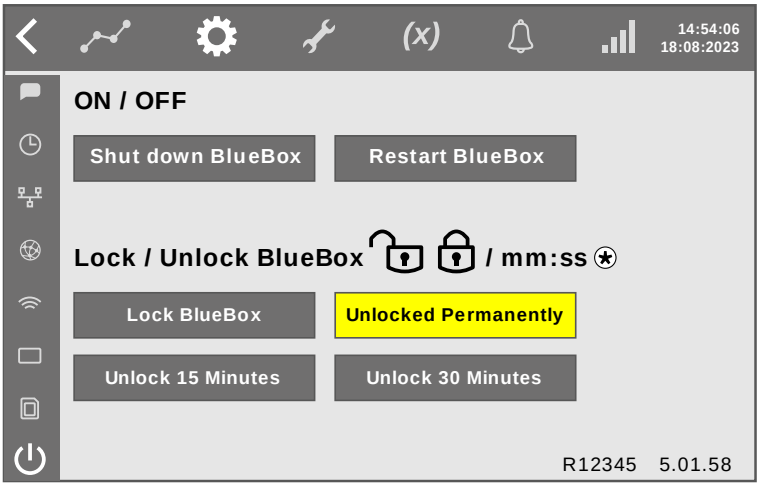

① Select a time range. Data that had been recorded during this period will be exported.

② The function creates a folder with the name "database" on* the first level and a data folder with the name of the BlueBox CAN-ID in this folder. The Ready button then appears, tapping it switches back to the previous display.

RESET

Deletes - after a confirmation - all measurement data on the BlueBox.

## 7.8 Shutdown/Restart – Lock/Unlock




black
temporary unlocked

red
permanently unlocked

black
locked

Serial number of the BlueBox ⇧ ⇧ Firmware version

**Shut down BlueBox** Switch off BlueBox

**Restart BlueBox** Restart BlueBox

In the default setting, the BlueBox is locked, i.e. you have to enter the PIN code of the BlueBox to make certain settings. If you have entered the PIN-Code, the BlueBox is unlocked for 15 Seconds.

**Lock BlueBox** PIN-Code needed (default setting after BlueBox start)

**Unlock Permanently** PIN-Code not needed The Button is also a status indicator – "Unlocked Permanently" is marked yellow.

**The BlueBox remains unlocked beyond a restart.**

**Unlock 15 Minutes** PIN-Code not needed for 15 minutes ⇨ countdown

**Unlock 30 Minutes** PIN-Code not needed for 30 minutes ⇨ countdown

* if not already existing

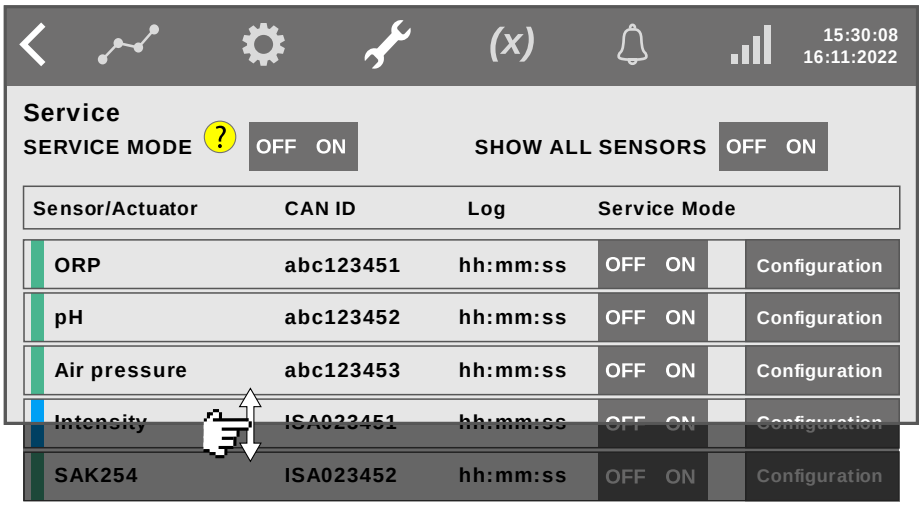
## 8 Service Display

In the Service Display you can operate the service mode. The service mode deactivates automatic cleaning and data recording and suppresses certain messages.

The service mode is useful for system maintenance, it suppresses the recording of measurement-irrelevant maintenance data.

Status messages are not displayed directly, but are marked in colour here. see *Appendix B*
| green ⇨ Status no. 0 | orange ⇨ Status no. 4, 50, 51 | yellow ⇨ Status no. 57 |
| blue ⇨ Status no. 60 | red ⇨ Status no. 1, 2, 3 / 30, 31, 33 / 52, 53, 54, 55 |

The Service Display lists the connected sensors in the order of their CAN ID. The CAN ID is unique for each sensor/actuator and is set at the factory.[1]




? Opens an info field at the upper right side of the Function Display.

Info field X **X** closes the Info field.

**SERVICE MODE** OFF ON Deactivates/activates the service mode for all sensors.
Sensors in service mode are marked in blue.

**SHOW ALL SENSORS** OFF ON Hides and shows sensors that are not active.

You deactivate a sensor[2] by setting the sensor name[3] to **n/c** (not connected).
The sensor measurement value is then neither recorded nor saved

**Sensor/Actuator** Name of connected sensor/actuator

**CAN ID** CAN ID[1] (identification number) of a sensor/actuator

**Log** Time of the last measurement

**Service Mode** OFF ON Activates/Deactivates the service mode for single sensors.
Sensors in service mode are marked in blue.
This button does not appear for virtual sensors. When using values from real sensors in the calculation of virtual sensors, the service mode of the real sensors used is transferred to the virtual sensor.

Configuration Opens a selection display for general settings, data processing and, if applicable, calibration.
see *6.2 Sensor Service Selection Display*

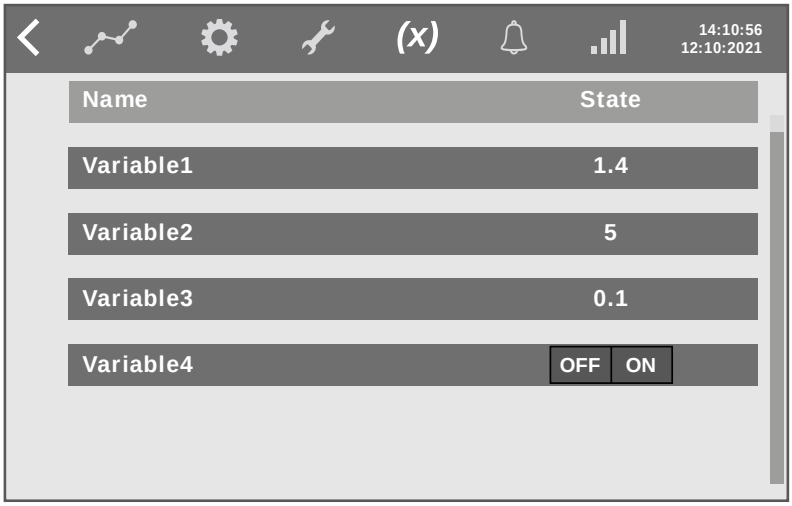
[1] see *6.2 Sensor Service Selection Display* there *Identification numbers*
[2] also applies to actuators [3] see *6.2.1 General Settings* there *Name*

## 9 User Variables Display

**On the BlueBox changeable permanent memory variables (user variables)** are defined in AMS Formula and can be changed on the BlueBox display.

see *Manual BlueBox PC Software* there *5.5.2 Variables*

Tap on the ***(x)*** symbol in the Main Menu Bar. The user variable list appears.




On the BlueBox changeable permanent memory variables (user variables) are marked in the AMS program with a preceding dollar sign (example: $Name). The dollar sign does not appear on the BlueBox display.

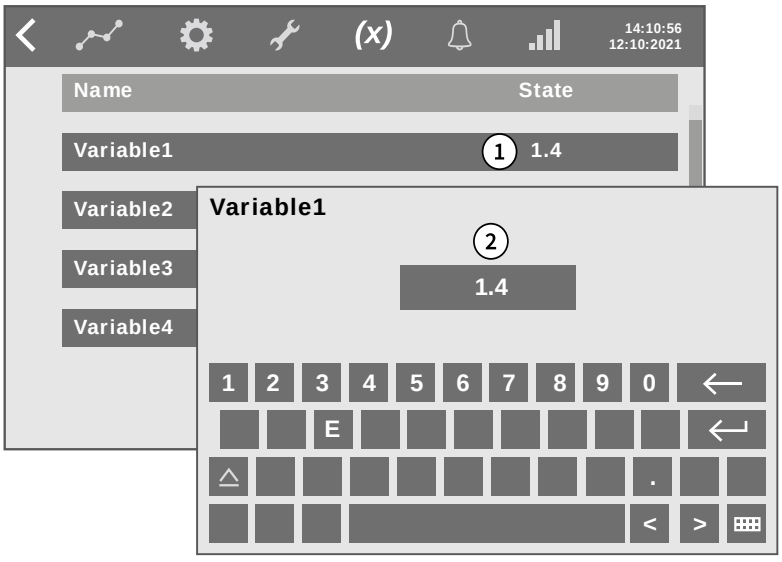
A suffixed ".MIN", ".MAX" or ".RESOLUTION" limits the adjustable value and defines the change increment.
Example: $Name.MIN = -5; $Name.MAX = 10; $Name.RESOLUTION = 0.01;

To control simple actuators (on/off), it is advisable not to define MIN, MAX and RESOLUTION. In this case, the variable value does not appear in the user variable list, but the button OFF ON **

* The AMS program is part of the BlueBox PC Software. ** OFF sets the variable value to 0 – ON sets the variable value to 1

### 9.1 Changing a User Variable Value

(1) Tap on the variable value. (2) The input display of the user variable appears.

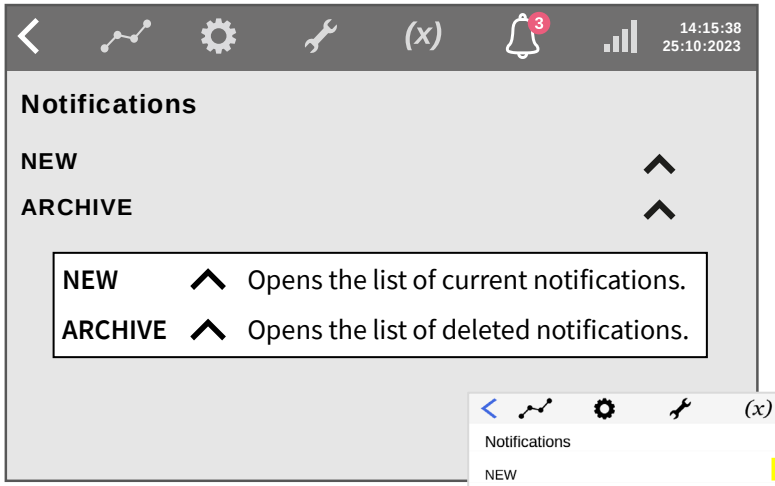


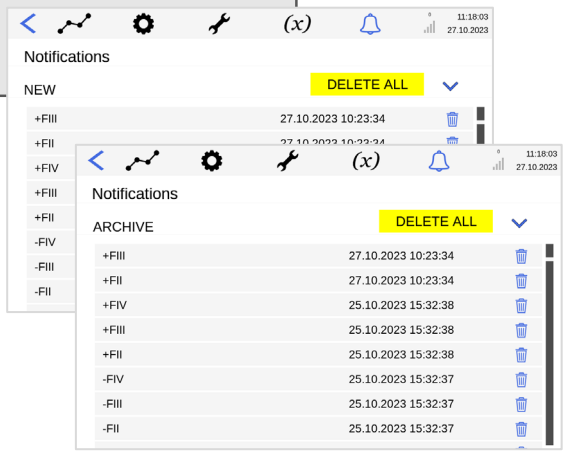

- △ No function here.
- Deletes the character left of the cursor. ←
- Saves the entry. ↵
- Cursor one character back/forward. < >
- Tap the keyboard-symbol ⌨ to return to the previous display without saving an entry.

Or tap on button OFF ON. OFF stands for the value 0 and ON for the value 1.

## 10 Notifications

3 Number of current notifications




DELETE ALL Deletes all entries.

Switches back to the Notification Display.

Deletes the entry.

Type of notifications:

- System notifications
  - Status notifications
  - Error notifications
- User-Defined Error Messages*

see also *6.1.4 User-Defined Error Messages*

The button appears for some messages. Tapping on the symbol opens a description of the message and, if applicable, options for handling.

* User-defined errors are defined with the AMS program. AMS is part of the BlueBox PC Software.

# 11 Sensor Calibration

**General information on sensor calibration:** How a sensor is calibrated depends, of course, on the properties of the respective sensor. Calibrating* is carried out for sensors on the CAN bus via the display operation on the BlueBox or with the AMS** program as part of the BlueBox PC Software. The result is a calibration polynomial of nth degree. The calibration polynomial can also be entered or changed directly with AMS, but usually the calibration polynomial is automatically generated after comparison with calibration measurements at certain measuring points. A calibration measurement value is the moving average of the measurement value from the last 15 seconds***. The calibration is stored in the respective sensor module.

* Strictly speaking, the sensor is already pre-calibrated at the sensor module.

** For Modbus sensors from GO Systemelektronik connected directly to the BlueBox and Modbus sensors on BlueConnect Modules, calibration is carried out using the Modbus Tool.exe program.

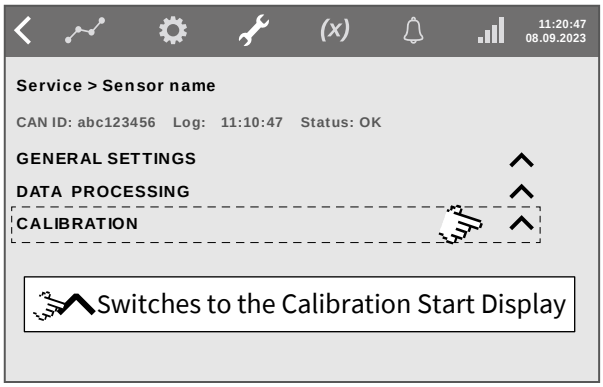
*** Strictly speaking, these are the last 15 measurement values, but since all connected sensors (strictly speaking all but the ISA spectrometer) are automatically set to a measurement interval of one second during calibration, it's the moving average of the last 15 seconds.

A supplement to the sensor calibration is the creation of a table with measurement values and reference values. see *11.4 Reference Measurement*

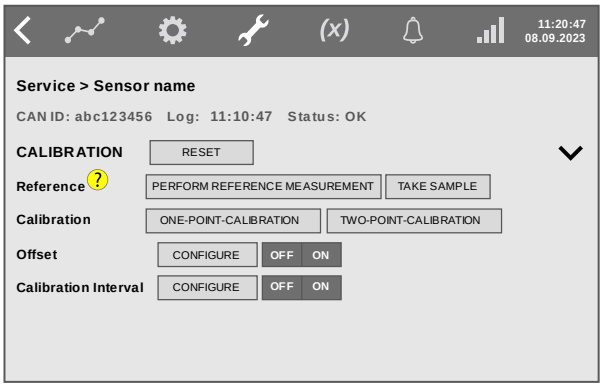
There are four kinds of guided calibrations: the **Standard One-Point/Two-Point-Calibration**, the **pH Calibration**, the **Oxygen Calibration**, the **ISE Calibration** and the **Spectrometer Calibration***. Depending on the type of sensor, one or more of these calibrations are offered.
During a guided calibration, the measurement data is only taken for calibration purposes and is not saved.

## Call-up Standard One-Point/Two-Point Calibration

Configuration Row of the sensor in *8 Service Display*




Sensor Service Selection Display




Calibration Start Display

It is also possible to call-up the calibration displays via the Sensor Display. see *6 Sensor Display*
The calibration procedure is described in the following sections.

## 11.1 Calibrating a pH Sensor

**pH sensors on BlueConnect Modules and other external CAN bus modules:** In order for the appropriate calibration sequences for a pH sensor to be called up, the pH sensor must be recognised by the BlueBox.
In the case of BlueConnect Modules, recognition is automatic via the BlueConnect Module. For all other CAN bus modules, the calibration sequences described here can only be called up if the entry in the parameter input field in the General Settings Display (see *6.2.1 General Settings*) begins with "**pHGlas**"* (case-sensitive).

* Strictly speaking, it is sufficient if the entry in the parameter field contains "pHGlas". For better recognisability, "**pHGlas**" should be at the beginning.

* The Spectrometer Calibration is described in the *Manual ISA and Process Spectrometer Commissioning – Maintenance –Service*.

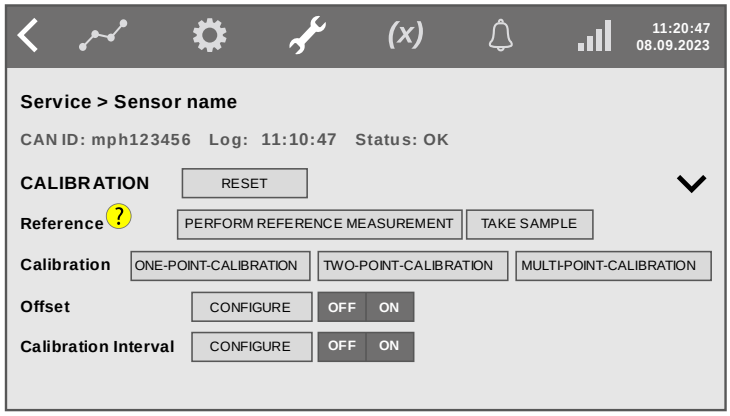
The pH sensors described here are electrochemical sensors. In order to function properly, electrochemical sensors must be recalibrated at regular intervals. This should ideally be done weekly, but at least monthly.
You need buffer solutions (calibration liquids) with different pH values as a reference, e.g. pH 4 and pH 7 for a two-point calibration. The BlueBox calculates the calibration curve from these reference measurements.
The buffer solutions (calibration liquids) are available as accessories under the article number 418 400X from GO Systemelektronik. You will also need clean tap water to rinse the electrodes between the calibration steps.

**Note on temperature compensation:** Temperature compensation is performed automatically if it is activated[1] and if a temperature sensor is connected. A temperature sensor is recognised either by its CAN ID or by the fact that the unit of the measured value is C° and the sensor name begins with "temperature" (case insensitive).[2]

### 11.1.1 Calibration pH Start Display

**Service Display**

Configuration




? no function here

Switches back to the Service Display.

Switches back to the Selection Display.

Tap on a grey rectangle.

**CAN ID:** Sensor ID | **Log:** Time of the last measurement at display call-up | **Status:** Sensor status[3]

RESET — Switches to the selection between two standard calibrations.

**Calibration mV** mV
Calibration measurement value in mV
Offset = 0 | Slope = 1
Switches back to the Calib. Start Display.

**Calibration Standard pH** Standard pH
Calibration measurement value in pH
7 pH ≙ 0 mV | Slope = 59.2 mV/pH at 25 °C
Switches back to the Calib. Start Display.

Setting **mV** or **Standard pH** witch YES Cancelled with NO

**Reference** PERFORM REFERENCE MEASUREMENT — Leads to the Sample List.
see *11.4 Reference Measurement*

TAKE SAMPLE — Leads to the sample taking with the current measurement value.
see *11.4.1 Taking a sample with the current measurement value*

**Calibration** Leads to a guided calibration sequence with one, two or three calibration points.
The 2-point calibration is described in the example on the next page.

**Offset** CONFIGURE — Switches to the entry of an Offset value.
The entered value is added to the measurement value.

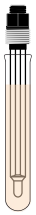
**Calibration interval** CONFIGURE — Switches to the Input of a calibration interval in days. When this interval is exceeded, the Sensor Status is set to 57[3] and an entry is set in the List of new Notifications[4].

Disables and enables offset and calibration interval. OFF ON
The button is also a status indicator.

[1] see *11.1.2 Guided Two-Point Calibration pH* there *Step 1 Checklist*
[2] Search sequence by Sensor ID, first before then after the Sensor ID of the pH sensor.
[3] see *Appendix B – Status Messages*
[4] *see 10 Notifications*

## 11.1.2 Guided Two-Point Calibration pH

Here, as an example, is the guided Two-Point calibration of a pH sensor.
Before immersing the sensor in a buffer solution, rinse the sensor glass shaft in clean tap water.



During the measurements, almost the entire sensor glass shaft must be in the buffer solution.

Tap on TWO-POINT-CALIBRATION

**Step 1 Checklist** Here you have three options for calibration.

**AUTOMATIC BUFFER DETECTION** GO Systemelektronik OFF ON NIST / DIN OFF ON

Here you activate the automatic detection of buffer solutions when using buffer solutions either from GO Systemelektronik or from laboratory buffer solutions according to NIST/DIN.

**PH TEMPERATURE COMPENSATION** OFF ON Here you activate the automatic temperature compensation.
see *Note on temperature compensation* on the previous page

NEXT

**Step 2 Notes on Service Mode and Activating Service Mode** NEXT

Rinse the sensor glass shaft in clean tap water.

**Step 3 Reference Value 1 – Measurement in Buffer Solution 1**
The current raw value and the temperature of the buffer solution 1 are displayed.
Wait until the measurement value is stable.
NEXT

**Step 4 Input Reference Value Buffer Solution 1** Enter the pH value of buffer 1 as the first reference value.
If automatic detection of the buffer solutions was activated in step 1, this step is carried out automatically.
NEXT

Rinse the sensor glass shaft in clean tap water.

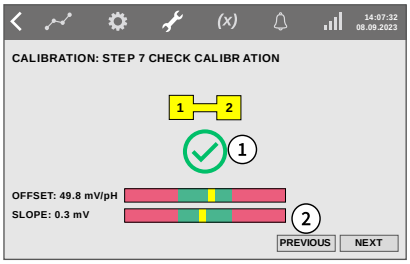
**Step 5 Reference Value 2 – Measurement in Buffer Solution 2**
The current raw value and the temperature of the buffer solution 2 are displayed.
Wait until the measurement value is stable.
NEXT

**Step 6 Input Reference Value Buffer Solution 2** Enter the pH value of buffer 2 as the first reference value.
If automatic detection of the buffer solutions was activated in step 1, this step is carried out automatically.
NEXT

**Step 7 Check Calibration**

① If there is a ⊗, the calibration is not successful.
If there is a ✓, the calibration is successful.

② The result of the calibration is displayed in values and graphically.
The yellow pointers must be in the green area.




NEXT

**Step 8 Check Calibration** The current measurement value is displayed

**The calibration is completed.**

**End Service Mode?** NO YES

## 11.2 Calibrating an ISE Sensor

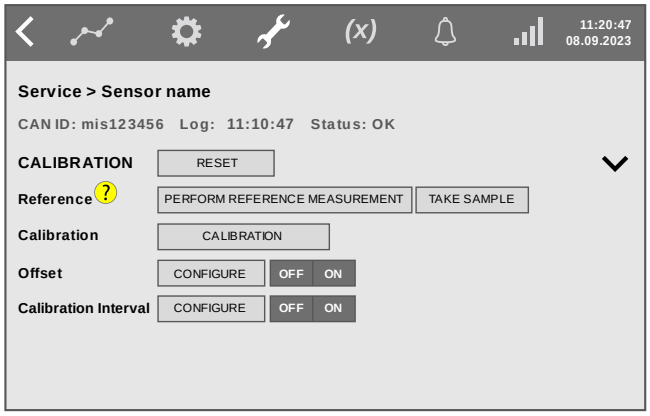
Ion-selective sensors are electrochemical sensors. In order to function properly, electrochemical sensors must be recalibrated at regular intervals. This should ideally be done weekly, but at least monthly.
A calibration generates **pairs of values** from **raw sensor values**[1] and **reference values** of calibration liquids by means of reference measurements in calibration media. The BlueBox calculates the calibration curve from these pairs of values. With ISE sensors, up to 6 reference measurements are possible on the BlueBox.

### 11.2.1 Calibration ISE Start Display

**Service Display**

Configuration

? no function here




Switches back to the Service Display.

Switches back to the Selection Display.

Tap on a grey rectangle.

**CAN ID:** Sensor ID | **Log:** Time of the last measurement at display call-up | **Status:** Sensor status[2]

RESET no function here

**Reference** PERFORM REFERENCE MEASUREMENT Leads to the Sample List.
see *11.4 Reference Measurement*

TAKE SAMPLE Leads to the sample taking with the current measurement value.
see *11.4.1 Taking a sample with the current measurement value*

**Calibration** CALIBRATION Leads to a guided calibration sequence with 3 to 7 calibration points.

**Offset** CONFIGURE Switches to the entry of an Offset value.
The entered value is added to the measurement value.

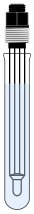
**Calibration interval** CONFIGURE Switches to the Input of a calibration interval in days. When this interval is exceeded, the Sensor Status is set to 57[2] and an entry is set in the List of new Notifications[3].

Disables and enables offset and calibration interval. The button is also a status indicator. OFF ON

[1] A raw sensor value is the uncalibrated sensor measurement value.
[2] see *Appendix B – Status Messages*
[3] *see 10 Notifications*

### 11.2.2 Guided Calibration ISE

Before immersing the sensor in a calibration solution, rinse the sensor glass shaft in clean tap water.



During the measurements, almost the entire sensor glass shaft must be in the buffer solution.

Tap on CALIBRATION

**Step 1 Checklist** NEXT

**Step 2 Notes on Service Mode and Activating Service Mode** NEXT

Rinse the sensor glass shaft in clean tap water.

**Step 3 Reference Value 1 – Measurement in calibration solution 1**
The current raw value is displayed.
Wait until the measurement value is stable. NEXT

**Step 4 Input Reference Value calibration solution 1**
Enter value of calibration solution 1 as the first reference value. NEXT
NEXT

Rinse the sensor glass shaft in clean tap water.

**Step 5 Reference Value 2 – Measurement in calibration solution 2**
The current raw value is displayed.
Wait until the measurement value is stable. NEXT

**Step 6 Input Reference Value calibration solution 2**
Enter value of calibration solution 2 as the second reference value.
From here, the calibration can be completed by tapping <CALCULATE> CALCULATE
Tap <CONTINUE> to continue the calibration sequence. NEXT

Rinse the sensor glass shaft in clean tap water.

**Step 7 to 14** From here you can perform 4 further measurements.

**Step 15 Check Calibration**
Check the calibration using comparative measurements in the calibration solutions. NEXT

**The calibration is completed.**

**End Service Mode?** NO YES

## 11.3 Calibrating a Galvanic Oxygen Sensor

The galvanic oxygen sensor is an electrochemical sensor. To function properly, electrochemical sensors have to be recalibrated at regular intervals. This is best done weekly, but at least monthly.

There are three ways of calibrating a galvanic oxygen sensor.

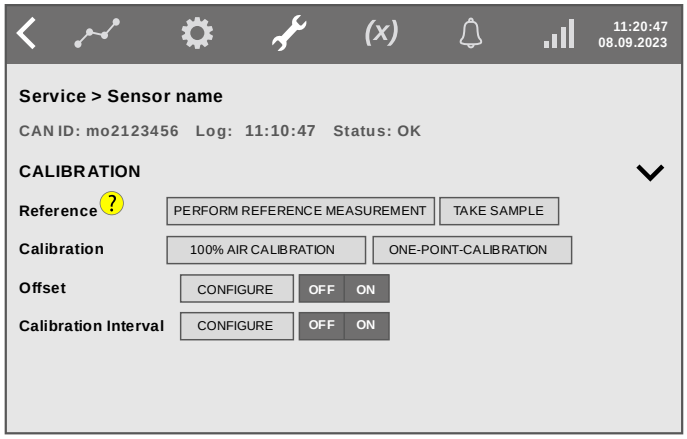
1. **Saturation calibration – Calibration in air**
2. **Reference calibration – Calibration with a reference measuring instrument**

### 11.3.1 Calibration O2 Start Display

**Service Display**

Configuration

? no function here




Switches back to the Service Display.

Switches back to the Selection Display.

Tap on a grey rectangle.

**CAN ID:** Sensor-ID | **Log:** Time of the last measurement at display call-up | **Status:** Sensor status[1]

**Reference** PERFORM REFERENCE MEASUREMENT Leads to the Sample List.
see *11.4 Reference Measurement*

TAKE SAMPLE Leads to the sample taking with the current measurement value.
see *11.4.1 Taking a sample with the current measurement value*

**Calibration** 100% AIR CALIBRATION Leads to a guided 100 % Saturation Calibration in Air[2].

ONE-POINT-CALIBRATION Leads to a guided One-Point Calibration with a reference measuring instrument.

**Offset** CONFIGURE Switches to the entry of an Offset value.
The entered value is added to the measurement value.

**Calibration interval** CONFIGURE Switches to the Input of a calibration interval in days. When this interval is exceeded, the Sensor Status is set to 57[1] and an entry is set in the List of new Notifications[3].

Disables and enables offset and calibration interval. The button is also a status indicator. OFF ON

[1] see *Appendix B – Status Messages*

[2] The galvanic cell for oxygen measurement is located at the bottom of the sensor body, the temperature sensor is near the center. Therefore, a saturation calibration in the air can only be carried out when the entire sensor body has reached the temperature of the ambient air. The larger the difference in temperature between the measuring medium and the ambient air, the greater the time required for a temperature adjustment (30 minutes or more, if applicable). The temperature adjustment can be accelerated by immersing the sensor in water, which has approximately the temperature of the ambient air, before per forming the saturation calibration.
Moreover, abrupt temperature changes (e.g., by direct exposure to the sun) must be avoided.

[3] *see 10 Notifications*

## 11.4 Reference Measurement

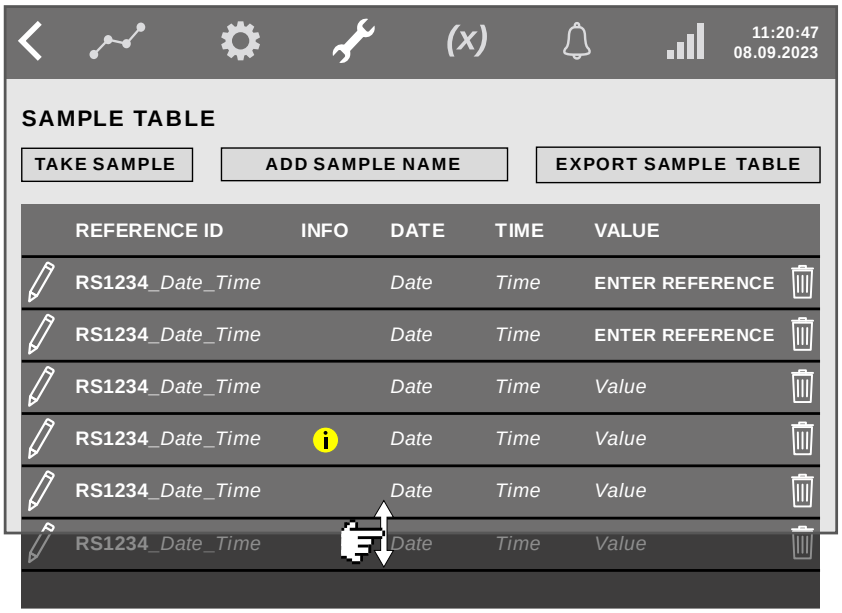
For an application-specific parameter calibration, it may be necessary to take reference values from chemical laboratory analyses and the respective associated measurement values for the parameter to be measured. A measurement value plus the corresponding reference value[1] is called sample. A unique sample name[2] is assigned to the sample. The samples and their sample names are displayed in the sample list. The sample list is saved in the respective sensor module or Modbus sensor.

For application-specific information, please contact GO Systemelektronik.

PERFORM REFERENCE MEASUREMENT — Start display of the respective sensor calibration

Switches back to the start display of the respective sensor calibration.

**Sample List**




TAKE SAMPLE — Opens the sample recording display with the last recorded measurement value.
see *11.4.1 Take Sample with Current Measurement Value*

ADD SAMPLE NAME — Add sample via date and time of the measurement recording.
see *11.4.2 Add Sample via Date and Time of the Measurement Recording*

EXPORT SAMPLE TABLE — Exports the sample list as a csv file and as a json[3] file to a connected USB stick.

Switches to the sample editing display. see *11.4.3 Edit Sample*.

Opens an info field with the content of the "Information" input field.
see *11.4.1 Take Sample with Current Measurement Value* or *11.4.3 Edit Sample*

ENTER REFERENCE — Switches to the input of the reference value of the sample.

*VALUE* — After an entry, the entered value appears here.

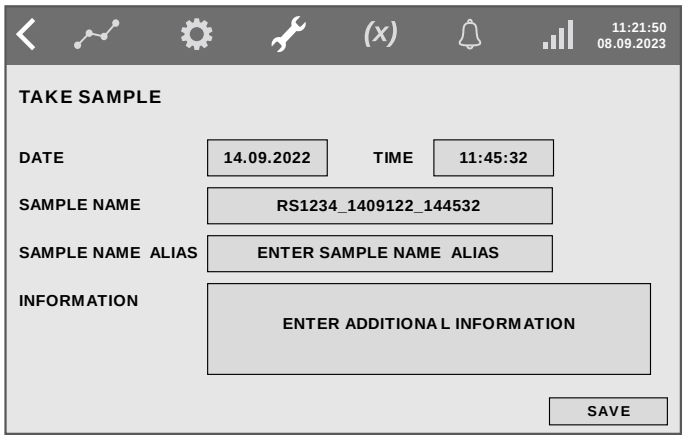
Deletes the sample.

[1] Bei Spektrometern können es mehrere Referenzwerte pro Spektralmessung sein.
[2] auch Referenz-ID genannt
[3] json ist ein unabhängiges Format für den Austausch von Textdaten.

## 11.4.1 Take Sample with Current Measurement Value

TAKE SAMPLE *11.4 Reference Measurement*

Switches back to the Sample Lis.




Take sample with the last recorded measurement value at display call-up

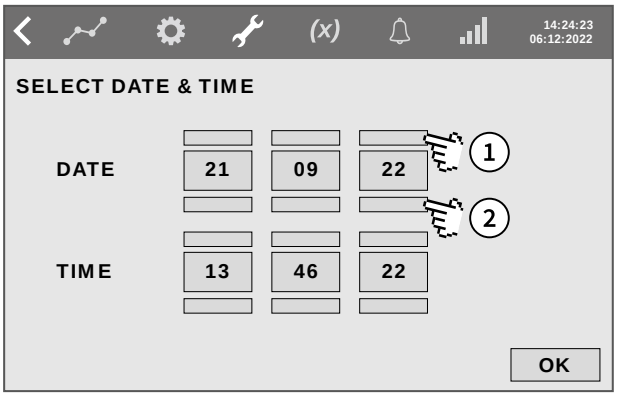
| | |
|---|---|
| **DATE TIME** | Date and time of the last measurement at display call-up |
| **SAMPLE NAME** | Automatically generated sample name |
| **SAMPLE NAME ALIAS** | Leads to the entry of an alias name for the sample name. |
| **INFORMATION** | Leads to the entry for the ⓘ info field in the sample list. |
| SAVE | Saves the sample and switches back to the sample list. |

Enter the corresponding reference value in the sample list via **ENTER REFERENCE**

## 11.4.2 Add Sample via Date and Time of the Measurement Recording

ADD SAMPLE NAME *11.4 Reference Measurement*

Switches back to the Sample List.




① One up

② One down

Add sample via date and time of the measurement recording

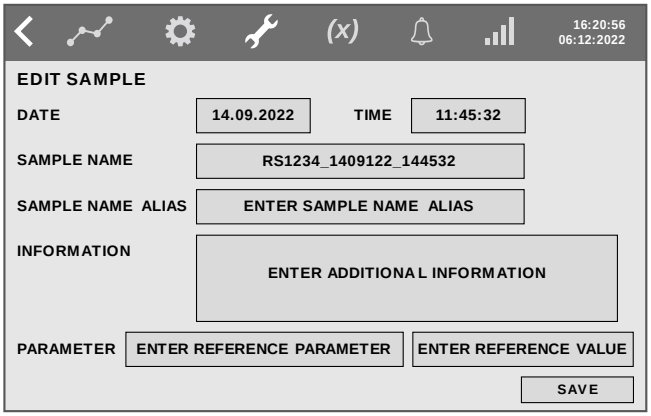
OK Saves the sample and switches back to the sample list.

Enter the corresponding reference value in the sample list via **ENTER REFERENCE**

## 11.4.3 Edit Sample

*11.4 Reference Measurement*

Switches back to the Sample List.




**DATE TIME** Date and time of the measurement

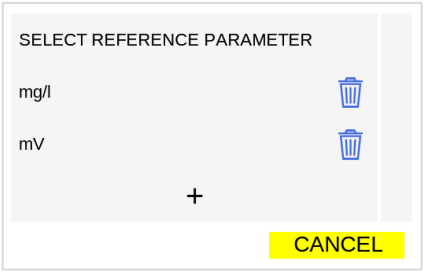
**SAMPLE NAME** Automatically generated sample name

**SAMPLE NAME ALIAS** Leads to the entry of an alias name for the sample name.

**INFORMATION** Leads to the entry for the ⓘ info field in the sample list.

ENTER REFERENCE PARAMETER

If reference values have other units of measurement than the sensor measured value, these other units can be specified here.
These other units of measurement are called "REFERENCE PARAMETER" here.
A Use case for spectral measurements and ISE measurements, amongst others




\+ Opens the standard alphanumeric input display.

CANCEL Closes the display.

Deletes the entry.

For more information, please contact GO Systemelektronik.

ENTER REFERENCE VALUE Leads to the input of the reference value.

SAVE Saves the sample and switches back to the sample list.

## 11.4.4 Export Sample Table

EXPORT SAMPLE TABLE *11.4 Reference Measurement*

Exports the reference list as a csv file and as a json* file to a connected USB stick.
For spectrometer data, a jdx file is also generated.

* json is an independent format for the exchange of text data.

## 12 The BlueBox Web Interface

**Precondition:** The BlueBox Webserver is enabled (factory setting).
see *7.4.3 Settings Connectivity* dort *Enable HTTP Server* ☑

Enter the IP address [1] of the BlueBox into the URL address bar of your browser.

Example[2]: http://192.168.1.167 or https://192.168.1.167

The https address is preferable, as here the password is transmitted in encrypted form; however, your browser will prompt you to release the access.
The login field of the BlueBox Web Interface opens. The standard username is ***bluebox***. Your password is the network password of the BlueBox, see *Appendix A – The Configuration Data Sheet* there *2. Network* there *Password*. After the login the sensor table appears:

**BlueBox live data**

Live Screen

| Sensor | Date / Time | Value | |
|---|---|---|---|
| Air Pressure | 9.5.2023 16:13:32 | 1011.46 hPa | |
| Redox | 9.5.2023 16:12:40 | 93 mV | |
| Temperature | 9.5.2023 16:12:14 | 18.7 °C | |

If there is a GPS function, Latitude and Longitude are displayed in the fourth and fifth column.

The Sensor table is in alphabetical[3] order of the sensor names. The sensor table shows the connected sensors, the time of the last recording of a measurement value and the measurement value.

The BlueBox transmits the time as Coordinated Universal Time (UTC). Your browser converts UTC to the browser's time zone.

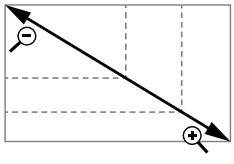
| | | | |
|---|---|---|---|
| Intensity | ..... | 0 | |

Connected sensors that have not yet recorded a measurement value are marked in red.

Click on opens the diagram display of the measurement values. Here you can select the sensor and the time range of the display.




The Cursor on a measurement point opens an info tag.



You can zoom the view in and out by drawing a rectangle to the right or to the left with the mouse while pushing the left mouse button.




Diagram display

### Live Screen

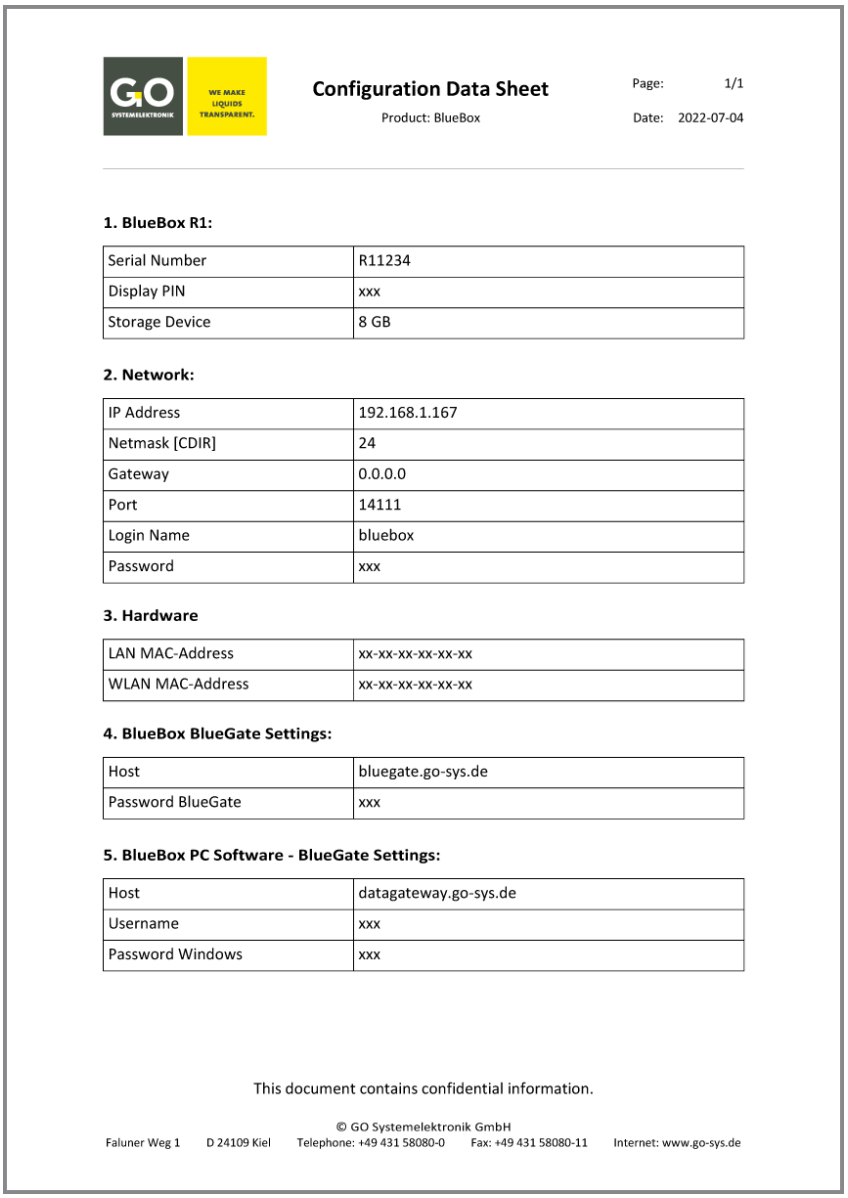
Click on **<Live Screen>** to open the live browser view. Here you can operate the BlueBox touch display in the browser window with the cursor. What does not work: spreading and pinching.
Copy the graphic of the touch display by clicking the right mouse button on an area that is not sensitive to tapping and then selecting <Save graphic as...>. The graphic format is PNG (8 bit RGB).

[1] You will find the IP address of your BlueBox in the Network Display. see *7.3 Network*
[2] 192.168.1.167 is the default IP address at delivery
[3] The sequence is that of the ASCII numeric value, i. e. special characters ⇨ numbers ⇨ capital letters ⇨ lower case letters

## Appendix A – The Configuration Data Sheet

The configuration data sheet contains the necessary settings to run the BlueBox.

**Example BlueBox R1:**



**Configuration Data Sheet**

Product: BlueBox

Page: 1/1

Date: 2022-07-04

**1. BlueBox R1:**

| | |
|---|---|
| Serial Number | R11234 |
| Display PIN | xxx |
| Storage Device | 8 GB |

**2. Network:**

| | |
|---|---|
| IP Address | 192.168.1.167 |
| Netmask [CDIR] | 24 |
| Gateway | 0.0.0.0 |
| Port | 14111 |
| Login Name | bluebox |
| Password | xxx |

**3. Hardware**

| | |
|---|---|
| LAN MAC-Address | xx-xx-xx-xx-xx-xx |
| WLAN MAC-Address | xx-xx-xx-xx-xx-xx |

**4. BlueBox BlueGate Settings:**

| | |
|---|---|
| Host | bluegate.go-sys.de |
| Password BlueGate | xxx |

**5. BlueBox PC Software - BlueGate Settings:**

| | |
|---|---|
| Host | datagateway.go-sys.de |
| Username | xxx |
| Password Windows | xxx |

This document contains confidential information.

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**1. BlueBox R1:**

| | |
|---|---|
| Serial Number | R11234 |
| BlueBox Password (PIN) | xxx |
| Storage Device | 8 GB |

**Serial Number**
Serial number of the BlueBox
With this serial number the BlueBox is identified by the BlueBox PC Software.
⇨ set at the factory, not changeable

**BlueBox Password (PIN)**
Password of the BlueBox
Is required to change the BlueBox system settings.
⇨ set at the factory, not changeable

**Storage Device**
Size of the internal BlueBox memory, here 8 GB
⇨ set at the factory, changeable by replacing

**2. Network:**

| | |
|---|---|
| IP Address | 192.168.1.167 |
| Netmask [CDIR] | 24 |
| Gateway | 0.0.0.0 |
| Port | 14111 |
| Login Name | bluebox |
| Password | xxxxx |

**IP Address** IP address of the BlueBox
At this address, the BlueBox is addressed on the network.
⇨ set at the factory, changeable

**Netmask [CDIR]** Netmask of the BlueBox
⇨ set at the factory, changeable

**Gateway** Standard gateway of the BlueBox
⇨ set at the factory, changeable

**Port** Default gateway of the Blue Box
⇨ set at the factory, not changeable

**Login Name** User name for a modem connection
⇨ set at the factory, not changeable

**Password** Network password of the BlueBox
Is required to access the BlueBox with the BlueBox PC Software.
⇨ set at the factory, not changeable

**3. Hardware:**

| | |
|---|---|
| LAN MAC-Address | xx-xx-xx-xx-xx-xx |
| WLAN MAC-Address | xx-xx-xx-xx-xx-xx |

**LAN MAC-Address** ⇨ set at the factory, not changeable

**WLAN MAC-Address** ⇨ set at the factory, not changeable

**4. BlueBox BlueGate Settings:**

| | |
|---|---|
| IP Address | bluegate.go-sys.de[1] |
| Password BlueGate | xxxxx |

**IP Address** IP address of an Internet Gateway
⇨ can be configured at the factory, changeable [2]

**Password BlueGate** Password of an Internet Gateway
⇨ can be configured at the factory, changeable

**5. BlueBox PC Software – BlueGate Settings:**

| | |
|---|---|
| Host | datagateway.go-sys.de[1] |
| Username | xxxxx |
| Password Windows | xxxxx |

If the BlueBox is accessed via a gateway (e.g. with an LTE connection), you have to enter these access data in the BlueBox SQL Software.

[1] default address of GO Systemelektronik
[2] changeable only at the default address

## Appendix B – Status Messages

Some status messages are not displayed in the Sensor Display, they are only highlighted in colour. The status messages are shown in full in the Sensor Service Displays of the sensors/actuators (*6.2 Sensor Service Selection Display* and following). Deviating messages in the Service Displays are labelled with ∗ in the table below.
The status messages are not displayed in the Service Display (see *8 Service Display*), they are only highlighted in colour.

| Status no. | Description | Display | Colour |
|---|---|---|---|
| 0 | Sensor sends data. | *Measurement value*<br>∗OK | green |
| 1 | Sensor sends no data. | No Data | red |
| 2 | A new sensor is recognized. (temporary at sensor initialization) | Wait… | red |
| 3 | Sensor-ID assigning. (temporary at sensor initialization) | Wait… | red |
| 4 | Measurement value is unreliable.<br>(currently only for spectrometers) | [*Measurement value*] | orange |
| 30 | Formula error | Formula error! | red |
| 31 | Unknown sensor is used in the formula. | ? Sensor | red |
| 33 | Default calculation time in for and while loops is exceeded. | Calc Timeout | red |
| 50 | Minimal measurement value underrun | < *min. Measurement value*<br>∗ Sensor error Lower limit | orange |
| 51 | Maximal measurement value overrun | > *max. Measurement value*<br>∗ Sensor error Upper limit | orange |
| 52 | Internal communication error | COM | red |
| 53 | Underrun of the lower limit of the AD converter | ADC min. | red |
| 54 | Overrun of the upper limit of the AD converter | ADC max. | red |
| 55 | General device error | Dev. Error | red |
| 57 | Calibration interval has been exceeded. | *no display*<br>∗ Calibration interval expired | yellow |
| 60 | Sensor Service Mode (only for real sensors)<br>(is overwritten by other status messages) | *no display*<br>∗Service | blue |

The entries in this column can be queried using AMS Formula.

| green ⇨ Status no. 0 | orange ⇨ Status no. 4, 50, 51 | yellow ⇨ Status no. 57 |
| blue ⇨ Status no. 60 | red ⇨ Status no. 1, 2, 3 / 30, 31, 33 / 52, 53, 54, 55 |

# Manual
# Commissioning of the BlueBox R1

Creation date: 19.11.2024 Version: 1.7 en

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This manual is a standalone part of the *Manual BlueBox R1 and Panel* and describes the commissioning of the **BlueBox R1** (Article number 486 00R1) of GO Systemelektronik.

A comprehensive documentation of the BlueBox system can be found on www.go-sys.de/downloads.

The products of GO Systemelektronik are constantly being developed, therefore deviations between this manual and the delivered product can result. Please understand that no legal claims can be derived from the contents of this manual.

### Notes on Text References

References to passages in this document or to passages in other documents are marked in italics.

- *7.1 Language Selection* e.g. refers to the section 7.1 in this document. The short form is *7.1*.
- *Manual BlueBox PC Software* there *5 AMS – Advanced Managing Software* e.g. refers to the chapter 5 in the Manual BlueBox PC Software.

### Table of Contents

*R1Com 1 Meaning of the Safety Instructions* ..... 53
*R1Com 2 Connecting the Power Supply* ..... 53
*R1Com 3 Notes on Operation* ..... 54
*R1Com 4 LAN Connection* ..... 54
*R1Com 5 Device Description* ..... 55
*R1Com 5.1 Technical Data BlueBox R1* ..... 55
*R1Com 5.2 Connections BlueBox R1* ..... 56
*R1Com 5.2.1 Housing Connections* ..... 56
*R1Com 5.2.2 Opening the Housing* ..... 56
*R1Com 5.2.3 Mainboard PIN Assignment and Termination BlueBox R1* ..... 57
*R1Com 5.3 Connectable Modules and Sensors* ..... 58
*R1Com 6 Commissioning Procedure* ..... 59
*R1Com 6.1 Housing Mounting* ..... 59
*R1Com 6.2 Set Up Operational Readiness* ..... 60
*R1Com 6.3 Switching On the BlueBox and Initial Operation* ..... 61
*R1Com 7 Housing Mounting Holes* ..... 62

## R1Com 1 Meaning of the Safety Instructions

| | |
|---|---|
|  | **Danger:** Used if non-observance threatens serious injury or death. |
|  | **Warning:** Used if non-observance threatens slight injuries or serious property damage. |
|  | **Caution:** Used if non-observance threatens minor property damage. |
|  | Used for general safety instructions. |
|  | Symbol of safety instruction relating to the use of electricity. |

## R1Com 2 Connecting the Power Supply

For connecting the power to the BlueBox R1 you need an external 24 VDC power supply.
see *R1Com 5.1 Technical Data BlueBox R1* there *Voltage supply* and *Power consumption BlueBox R1*

Connect the power supply to slot X06 at the BlueBox R1 mainboard.
see *R1Com 5.2.3 Mainboard PIN Assignment and Termination*

| | |
|---|---|
|  | The BlueBox should only be installed by a qualified person using suitable tools. Incorrect installation can result in serious malfunction and could damage the instrument. |

Please note that the power supply unit is placed close to the BlueBox because the voltage is declining with the length of the connecting cable.

| | |
|---|---|
|  | Please ensure that, depending on the installation location, an appropriate power cable is used. In outdoor areas, a suitable cable must be kept that is approved for the place of use. |

## R1Com 3 Notes on Operation



Improper handling of electrical devices endangers man and property. Commissioning of the BlueBox should only performed by skilful, trained personnel using appropriate tools. Incorrect installation could cause serious faults and errors that may damage the device.



Keep this manual handy for future reference. Never deliver the BlueBox to other persons without this manual. The manufacturer is not liable for improper or unintended usage.

This device is designed in accordance with the Low Voltage Directive and the safety regulations for electronic measurement devices.

The trouble-free operation and reliability can only be assured if you pay attention to the generally applicable safety measures and special safety instructions in this manual.

- Before the connection of the Blue Box to the power supply make sure that the labelled BlueBox operating voltage matches the supply voltage.
- The correct functioning and operational safety of the device can only be ensured, if the ambient conditions that are specified in section *R1Com 5.1 Technical Data BlueBox R1* are complianced.
- If the device is transported from a cold to a warm environment condensation may result in a failure of the function. In this case, wait until the device temperature is at the level of the ambient temperature before a new start-up.
- Maintenance and repair work may only be performed by a specialist who is authorized by GO Systemelektronik.

If it is to be assumed that the device can no longer be operated safely, it must be put out of operation and secured with identification markings against further commissioning.

The safety may be compromised by the device if, for example, the device:

- has visible damages,
- no longer works as required,
- has been stored in improper conditions for a longer time,
- was exposed to improper transport conditions.

In cases of doubt give notice to GO Systemelektronik GmbH. If necessary, send the device to GO Systemelektronik for reparation respectively maintenance.



Earth the BlueBox. This is the only way to ensure trouble-free measurement operation.

## R1Com 4 LAN Connection

To retrieve the data and communicate directly with the BlueBox, the BlueBox PC Software must be installed on your local computer (see *Manual BlueBox PC Software*).

The MDI crossover supported connection to a network is made by a RJ-45-connector at the bottom of the BlueBox (see also *R1Com 5.2.1 Housing Connections*).

Please ensure that the RJ-45-plug snaps into the socket with a click.

## R1Com 5 Device Description

## R1Com 5.1 Technical Data BlueBox R1



Article No. 486 00R1

| | | | |
|---|---|---|---|
| **Computer:** | ARM Cortex-A53; 4x 1200 MHz | | |
| | Operation system: Embedded Linux® | | |
| | Main memory 1 GB minimum | | |
| **Storage media:** | 8 GB Flash minimum | | |
| **Display:** | Touch screen 7″; 1280 x 800 Pixel; colour 24 bit | | |
| | Viewing angle horizontal/vertical 85° | | |
| **Mechanical data:** | Housing dimensions: | 303 mm x 200[1] mm x 93 mm (L x W x H) | |
| | Weight: | approx. 3.3 kg | |
| | IP class (housing): | IP65 | |
| | Material: | Die-cast aluminium housing, powder coated | |
| | Colour: | RAL 5010 | |
| **Voltage supply:** | Nominal voltage: 24 VDC (18 V – 28 V) [2] | Fuse protection 1.1 A Polyswitch (The CAN bus has its own fuse protection.) | |
| **Power consumption BlueBox R1:** | typical 7 W | | |
| **Power supply for modules via BlueBox R1 CAN bus interface:** | The power supply of the BlueBox R1 CAN bus interface can be loaded with a maximum of 45 W (24 VDC; Polyswitch fuse). [3] | | |
| **Interfaces:** | Housing: | 1x USB | |
| | | 1x Ethernet 10 Mbit/s \| 100 Mbit/s (MDI crossover) | |
| | Mainboard: | 1x CAN (+24 V) – Fuse protection output current 1.85 A Polyswitch, recovers automatically | |
| | | 1x CAN (internal DAM) | |
| | | 1x RS232 | |
| | | 1x RS485 (half-duplex) – with 12 VDC 6 W sensor power supply | |

**Modem and Wi-Fi optional**

| | | | |
|---|---|---|---|
| **Ambient conditions:** | Ambient temperature: | Storage: | -10 °C to +50 °C |
| | | Operation: | -20 °C to +45 °C |
| | | avoid direct sunlight | |
| | Relative humidity: | ≤ 90 % (annual average) | |

To protect the device and to ensure the proper functioning of the device, the specified ambient conditions must be strictly adhered to!

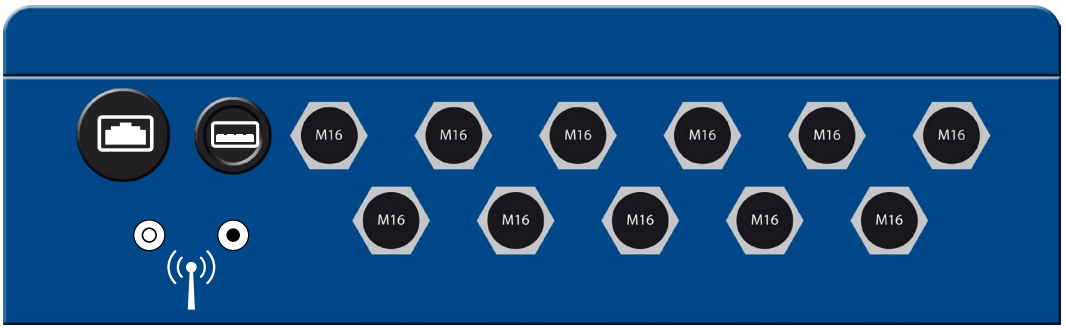
[1] with PG glands

[2] The connected CAN-bus modules receive their power from the BlueBox. Some modules have a constricted input range, so there is an input voltage tolerance of ± 10 %.

[3] CAN bus modules can also be supplied directly via a power supply unit.

## R1Com 5.2 Connections BlueBox R1

### R1Com 5.2.1 Housing Connections




Earth the BlueBox. This is the only way to ensure trouble-free measuring operation.
The earth connection is located on the left side of the housing.

**LAN connection**, see *R1Com 4 LAN Connection*

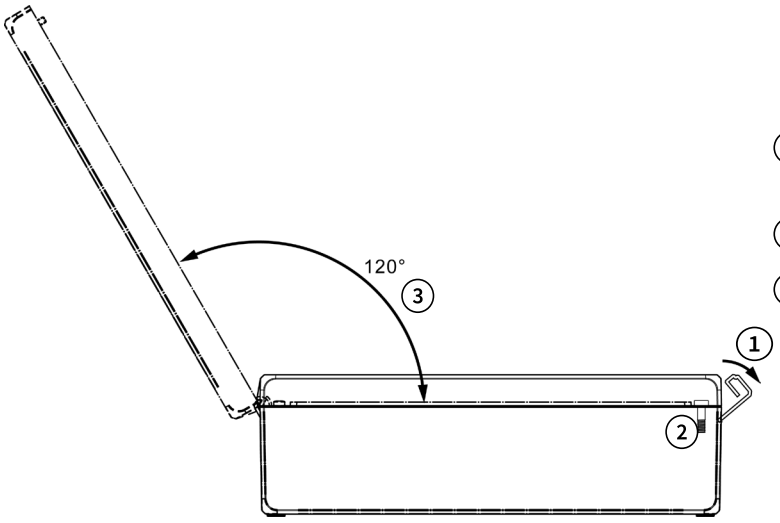
**USB Connection**
The USB port at the BlueBox is designed for data export and for firmware and license update.

**Antenna connections**
◎ LTE Panel socket (female)
◉ WiFi Panel plug (male)

In case of doubt, differentiate the antenna connectors as follows:
Panel socket = LTE (female) Panel plug = WiFi (male)

**PG glands M16**
Via these glands the cables are laid to the connections on the mainboard.
Ensure proper fitting.

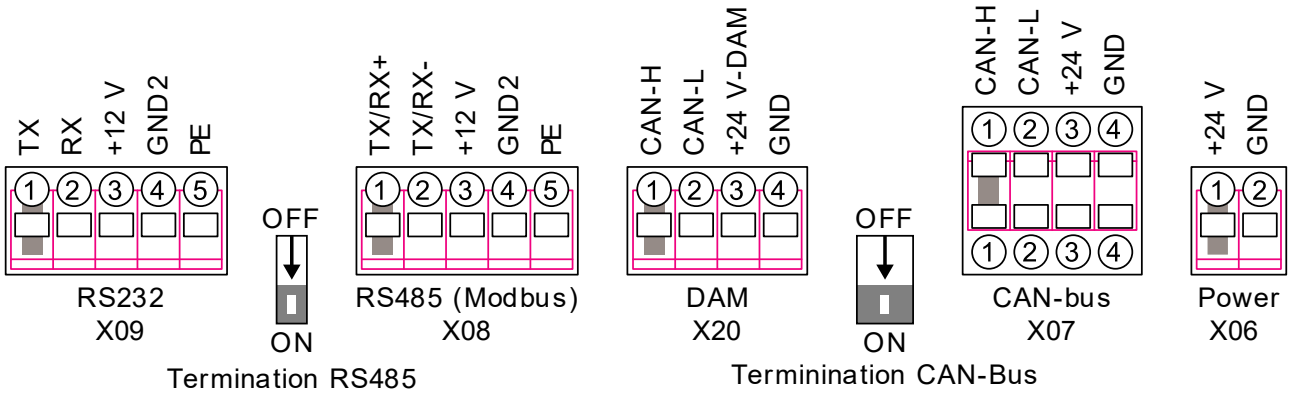
### R1Com 5.2.2 Opening the Housing




1. Turn the housing bracket to the right.
   If necessary, use a suitable tool.
2. Loosen the two cover screws (Torx T20).
3. Open the housing cover to the left.

## R1Com 5.2.3 Mainboard PIN Assignment and Termination BlueBox R1

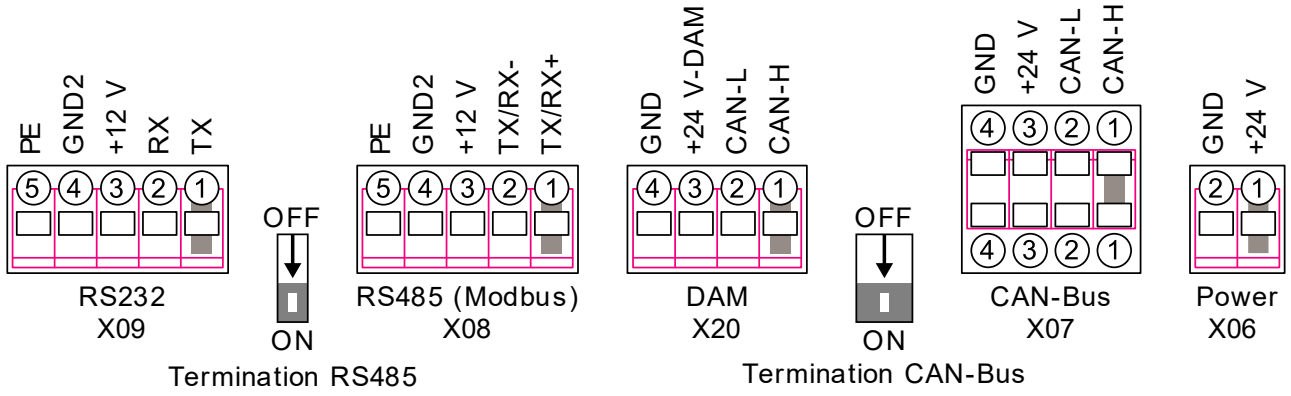
### First generation mainboard




The difference between the first- and second-generation mainboards is that the assignment of all slots has been "rotated".
**You can see the difference in the assignment by looking at the mainboard labelling.**

**Caution:** Reverse polarity can destroy the device.

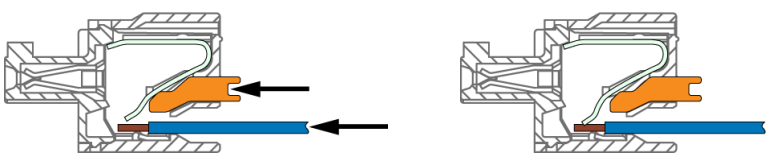
### Second generation mainboard




**Note on RS232 X09 and RS485 X08:**
Only one of the two connections can be active, toggling is done via the AMS program.
see *Manual BlueBox PC Software* there *5.3.3.2 Custom Protocol Setup*

**Note DAM X20:**
Internal DAM connection to an internal BlueConnect Plus board or an internal spectrometer.

### Functionality of the cable clamp



## R1Com 5.3 Connectable Modules and Sensors

The following modules and sensors can be connected to the BlueBox:

- **External CAN bus modules**
  CAN bus modules of GO Systemelektronik are available in various forms as sensor modules and as actuator modules. The connection to the BlueBox is made via the CAN bus clamp sockets at slot X07 on the BlueBox mainboard.
- **Internal CAN bus boards**
  At the completion of this manual, the following types of design were available:
  BlueConnect Plus board – equippable with up to four BlueConnect sensor and input/output boards
  Spectrometer board – ISA spectrometer sensor unit
  The connection to the BlueBox is made via the DAM clamp sockets at slot X20 on the BlueBox mainboard.
- **BlueConnect Modules**
  The BlueConnect Modules of GO Systemelektronik are also CAN bus modules. They can therefore be connected via the CAN bus clamp sockets at slot X07 on the BlueBox mainboard.
- **Modbus sensors**
  Modbus sensors are connected directly via the RS485 clamp sockets at slot X08 on the BlueBox mainboard. For Modbus sensors, virtual sensors must be set up.
  Modbus sensors of GO Systemelektronik are recognised automatically in most cases, the BlueBox then requests the necessary settings and sets up the Modbus sensor automatically.
- **RS485 devices**
  The connection to the BlueBox is made via the RS485 clamp sockets at slot X08 on the BlueBox mainboard. You can connect up to 10 Modbus sensors of GO Systemelektronik directly here. With other RS485 devices, only one device can be connected at a time.
- **RS232 devices**
  The connection to the BlueBox is made via the RS232 clamp sockets at slot X09 on the BlueBox mainboard.
- **Active CAN Repeater** see *3.7 Active CAN Repeater*
  The connection to the BlueBox is made via the CAN bus clamp sockets at slot X07 on the BlueBox mainboard.

> There are many separate instructions on how to connect the BlueBox with several devices. For more information, please contact GO Systemelektronik.

## R1Com 6 Commissioning Procedure



Earth the BlueBox. This is the only way to ensure trouble-free measurement operation.



**Caution:** The BlueBox must be installed in such a way that they are not exposed to direct sunlight, rain or snow. Direct sunlight can lead to extreme temperatures, which significantly reduces the service life of electronic components. The manufacturer is not liable for improper or non-application use.



**Caution:** Handle the touch display with care. Do not remove the protective foil from the touch display until all work has been completed.



**Warning:** Before the connection of the Blue Box to the power supply make sure that the labelled BlueBox operating voltage matches the supply voltage.



Manuals, data sheets etc. of the BlueBox System can be found on:
www.go-sys.de/downloads/

A great advantage of the BlueBox is their design flexibility. Therefore construction of installation will vary by application. A description of the structure and assembly of the BlueBox can only serve as an example.

**Precondition:**

- Carefully unpack the BlueBox.
- Familiarise yourself with the structure of the BlueBox, see in particular:
  - *R1Com 5.1 Technical Data BlueBox R1*
  - *R1Com 5.2 Connections BlueBox R1*

## R1Com 6.1 Housing Mounting

Despite the construction of the BlueBox in IP class IP65 you have to install the device in a rain- and sun-protected site.

If this is not possible, the BlueBox must be mounted in an additional housing.

Be careful when choosing the location of the BlueBox, the location has to achieve the following properties:

- rain-and sun-protected location
- convenient location for a mobile network coverage,
  if the Blue Box is used with an LTE modem
- a vertical mounting surface (if possible)

1. Open the housing.
   see *R1Com 5.2.2 Opening the Housing*
2. At each corner of the housing, you see the holes for the mounting screws.
   see *R1Com 7 Housing Mounting Holes*
3. Choose suitable mounting screws and dowels, which are suitable for the material of the mounting surface and fix the housing.

## R1Com 6.2 Set Up Operational Readiness

1. Open the housing. see *R1Com 5.2.2 Opening the Housing*

2. **Optional –** Insert your SIM card into the SIM card slot.
   ❗ Ensure that the SIM card is not activated.

3. Terminate CAN bus and RS485 (Modbus) according to your requirements.

4. Pass the cables of the units to be connected through the PG cable glands to the respective cable clamps.

5. Assign the cable clamps according to your requirements and plug the cable clamps back into the corresponding slots.

6. Assign the antenna connections according to your requirements.

7. Tighten the PG cable glands.

8. Earth the BlueBox.

9. Remove the protective foil from the touch display.

10. Switch on the power supply of the BlueBox, the BlueBox will start up.
    see *R1Com 6.3 Switching On the BlueBox and Initial Operation*

## R1Com 6.3 Switching On the BlueBox and Initial Operation




1. Switch on the power supply.
2. The BlueBox checks the database and initiates the system.
3. Then the BlueBox initiates the connected sensors and actuators.
4. The Sensor Display in list view in alphabetical order is the factory default start display. see *6 Sensor Display*

**Password entry:** To perform certain settings, a password consisting of 5 digits must be entered. see *Appendix A – The Configuration Data Sheet* there *1. BlueBox RP* there *BlueBox Password (PIN)*

In the default setting, the BlueBox is locked, i.e. you have to enter the PIN code of the BlueBox to perform certain settings. When setting up the BlueBox, it might be more convenient if the BlueBox is temporarily unlocked, see *7.8 Shutdown - Restart - Lock - Unlock*. **Do not forget to switch it back.**

If no CAN bus module is connected, the BlueBox starts up with an error message on the Sensor Display:

**NO SENSOR FOUND**

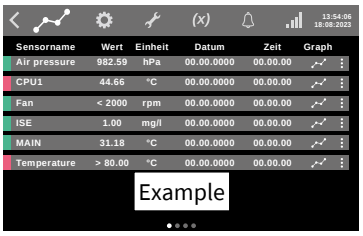
After approx. 15 seconds another error message appears:

**CAN-BUS ERROR**

**INFO: IF NO CAN-BUS SENSOR CONNECTED, DISABLE THE CAN-BUS**

In this case you have to disable the CAN bus:
SYSTEM > SETTINGS > CAN-BUS SETUP
see also *7.4.5 Settings CAN bus*
Operation of the BlueBox is still possible, but not at the Sensor Display.

**Precondition:** The BlueBox has booted up without an error message and the Sensor Display in list view is shown.



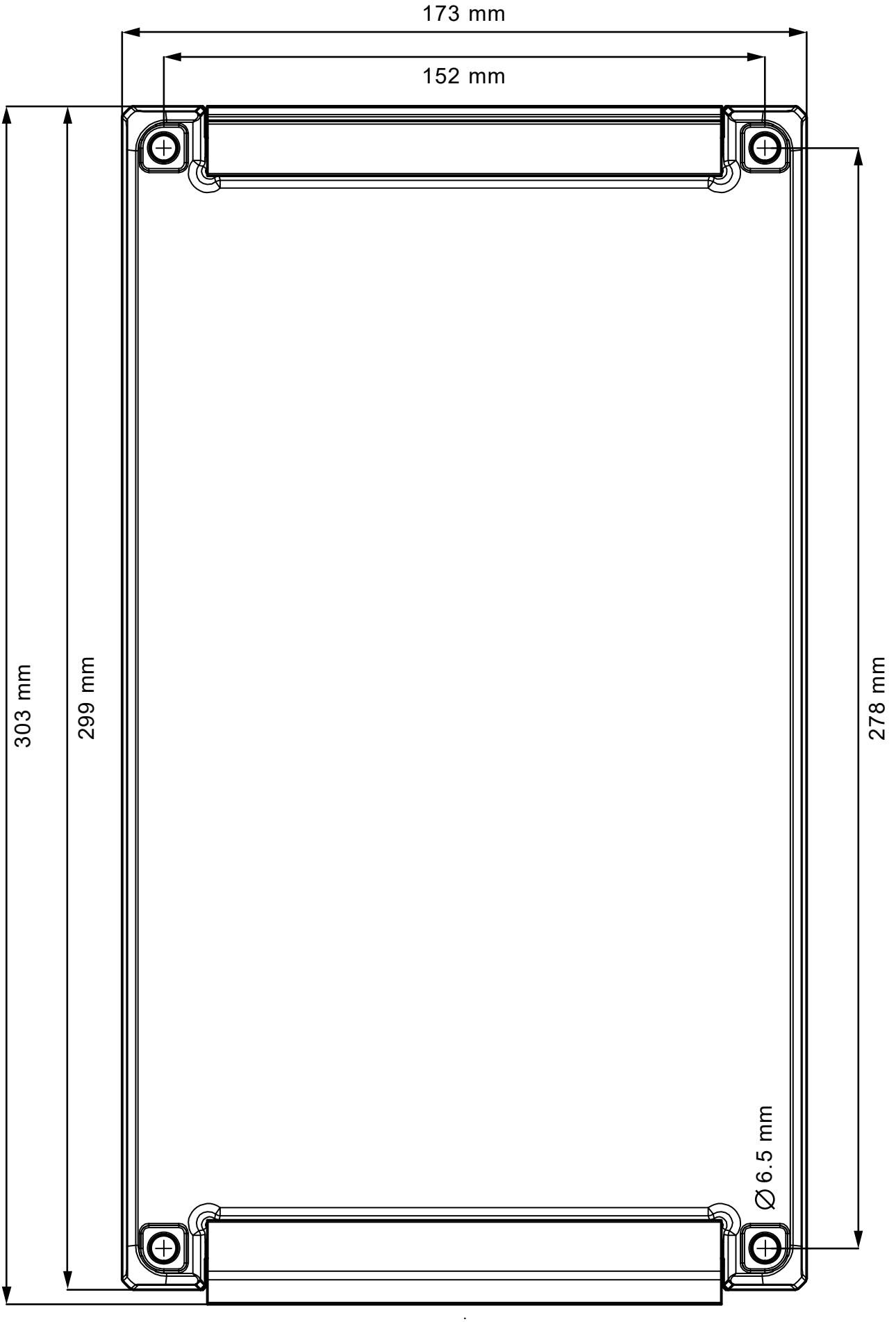
Example

**Precondition:** The optional SIM card is not activated.

**Procedure**

1. Language setting — see *7.1 Language*
   The default language is English; German can be selected as an alternative language.
2. Date and Time setting — see *7.2 Date & Time*
3. Network settings — see *7.3 Network*
4. Modem settings (optional) — see *7.4.1 Settings Modem*

## R1Com 7 Housing Mounting Holes



# Manual
# Commissioning of the BlueBox Panel

Creation date: 19.11.2024 Version: 1.7 en

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This manual is a standalone part of the *Manual BlueBox R1 and Panel* and describes the commissioning of the **BlueBox Panel** (Article number 486 00RP) of GO Systemelektronik.

A comprehensive documentation of the BlueBox system can be found on www.go-sys.de/downloads.

The products of GO Systemelektronik are constantly being developed, therefore deviations between this manual and the delivered product can result. Please understand that no legal claims can be derived from the contents of this manual.

### Notes on Text References

References to passages in this document or to passages in other documents are marked in italics.

- *7.1 Language Selection* e.g. refers to the section 7.1 in this document. The short form is *7.1*.
- *Manual BlueBox PC Software* there *5 AMS – Advanced Managing Software* e.g. refers to the chapter 5 in the Manual BlueBox PC Software.

### Table of Contents

*RPCom 1 Meaning of the Safety Instructions* ..... 64
*RPCom 2 Connecting the Power Supply* ..... 64
*RPCom 3 Notes on Operation* ..... 65
*RPCom 4 LAN Connection* ..... 65
*RPCom 5 Device Description* ..... 66
*RPCom 5.1 Technical Data BlueBox Panel* ..... 66
*RPCom 5.2 Overview Mainboard* ..... 67
*RPCom 5.3 Connections and Termination BlueBox Panel* ..... 68
*RPCom 5.4 Connectable Modules and Sensors* ..... 69
*RPCom 6 Commissioning Procedure* ..... 70
*RPCom 6.1 Hardware* ..... 70
*RPCom 6.2 Switching On the BlueBox and Initial Operation* ..... 71
*RPCom 7 Dimensions* ..... 72
*RPCom 8 Setup and Mounting* ..... 73

## RPCom 1 Meaning of the Safety Instructions

| | |
|---|---|
|  | **Danger:** Used if non-observance threatens serious injury or death. |
|  | **Warning:** Used if non-observance threatens slight injuries or serious property damage. |
|  | **Caution:** Used if non-observance threatens minor property damage. |
|  | Used for general safety instructions. |
|  | Symbol of safety instruction relating to the use of electricity. |

## RPCom 2 Connecting the Power Supply

For connecting the power to the BlueBox Panel you need an external 24 VDC power supply.
see *RPCom 5.1 Technical Data BlueBox Panel* there *Voltage supply* and *Power consumption BlueBox Panel*

Connect the power supply to slot X3 at the BlueBox Panel mainboard.
see *RPCom 5.3 Connections and Termination BlueBox Panel*

| | |
|---|---|
|  | The BlueBox should only be installed by a qualified person using suitable tools. Incorrect installation can result in serious malfunction and could damage the instrument. |

Please note that the power supply unit is placed close to the BlueBox because the voltage is declining with the length of the connecting cable.

| | |
|---|---|
|  | Please ensure that, depending on the installation location, an appropriate power cable is used. In outdoor areas, a suitable cable must be kept that is approved for the place of use. |

## RPCom 3 Notes on Operation



Improper handling of electrical devices endangers man and property. Commissioning of the BlueBox should only performed by skilful, trained personnel using appropriate tools. Incorrect installation could cause serious faults and errors that may damage the device.



Keep this manual handy for future reference. Never deliver the BlueBox to other persons without this manual. The manufacturer is not liable for improper or unintended usage.

This device is designed in accordance with the Low Voltage Directive and the safety regulations for electronic measurement devices.

The trouble-free operation and reliability can only be assured if you pay attention to the generally applicable safety measures and special safety instructions in this manual.

- Before the connection of the Blue Box to the power supply make sure that the labelled BlueBox operating voltage matches the supply voltage.
- The correct functioning and operational safety of the device can only be ensured, if the ambient conditions that are specified in section *RPCom 5.1 Technical Data BlueBox Panel* are complianced.
- If the device is transported from a cold to a warm environment condensation may result in a failure of the function. In this case, wait until the device temperature is at the level of the ambient temperature before a new start-up.
- Maintenance and repair work may only be performed by a specialist who is authorized by GO Systemelektronik.

If it is to be assumed that the device can no longer be operated safely, it must be put out of operation and secured with identification markings against further commissioning.

The safety may be compromised by the device if, for example, the device:

- has visible damages,
- no longer works as required,
- has been stored in improper conditions for a longer time,
- was exposed to improper transport conditions.

In cases of doubt give notice to GO Systemelektronik GmbH. If necessary, send the device to GO Systemelektronik for reparation respectively maintenance.



Earth the BlueBox. This is the only way to ensure trouble-free measurement operation.

## RPCom 4 LAN Connection

To retrieve the data and communicate directly with the BlueBox, the BlueBox PC Software must be installed on your local computer (see *Manual BlueBox PC Software*).

The MDI crossover supported connection to a network is made by a RJ-45-connector at the bottom of the BlueBox (see also *RPCom 5.3 Connections and Termination BlueBox Panel*).

Please ensure that the RJ-45-plug snaps into the socket with a click.

# RPCom 5 Device Description

## RPCom 5.1 Technical Data BlueBox Panel




Article No. 486 00RP

**Computer:**
ARM Cortex-A72; 4x 1500 MHz
Operation system: Embedded Linux®
Main memory 1 GB minimum

**Storage media:**
8 GB Flash minimum

**Display:**
Touch screen 7″; 1280 x 800 Pixel; colour 24 bit
Viewing angle horizontal/vertical 85°

**Mechanical data:**

| | |
|---|---|
| Dimensions: | 226 mm x 146 mm x 52,5 mm (L x W x H) |
| Weight: | approx. 1 kg |
| IP class (installed): | IP65 |
| Material: | PVC and galvanised sheet steel |
| Colour: | black |

**Voltage supply:**
Nominal voltage: 24 VDC (18 V – 28 V) [1]
Fuse protection 1.1 A Polyswitch
(The CAN bus has its own fuse protection.)

**Power consumption BlueBox Panel:**
typical 7 W

**Power supply for modules via BlueBox Panel CAN bus interface:**
The power supply of the BlueBox Panel CAN bus interface can be loaded with a maximum of 45 W (24 VDC; Polyswitch fuse).[2]

**Interfaces:**
2x USB
1x Ethernet 10 Mbit/s | 100 Mbit/s | 1000 Mbit/s (MDI crossover)
1x CAN (+24 V) – Fuse protection output current 1.85 A Polyswitch, recovers automatically
1x RS485 (half-duplex) – with 12 VDC 6 W sensor power supply
1x 24 V switch output
The switch output X6 is only defined after the operating system has been started.

**Modem and WiFi optional**

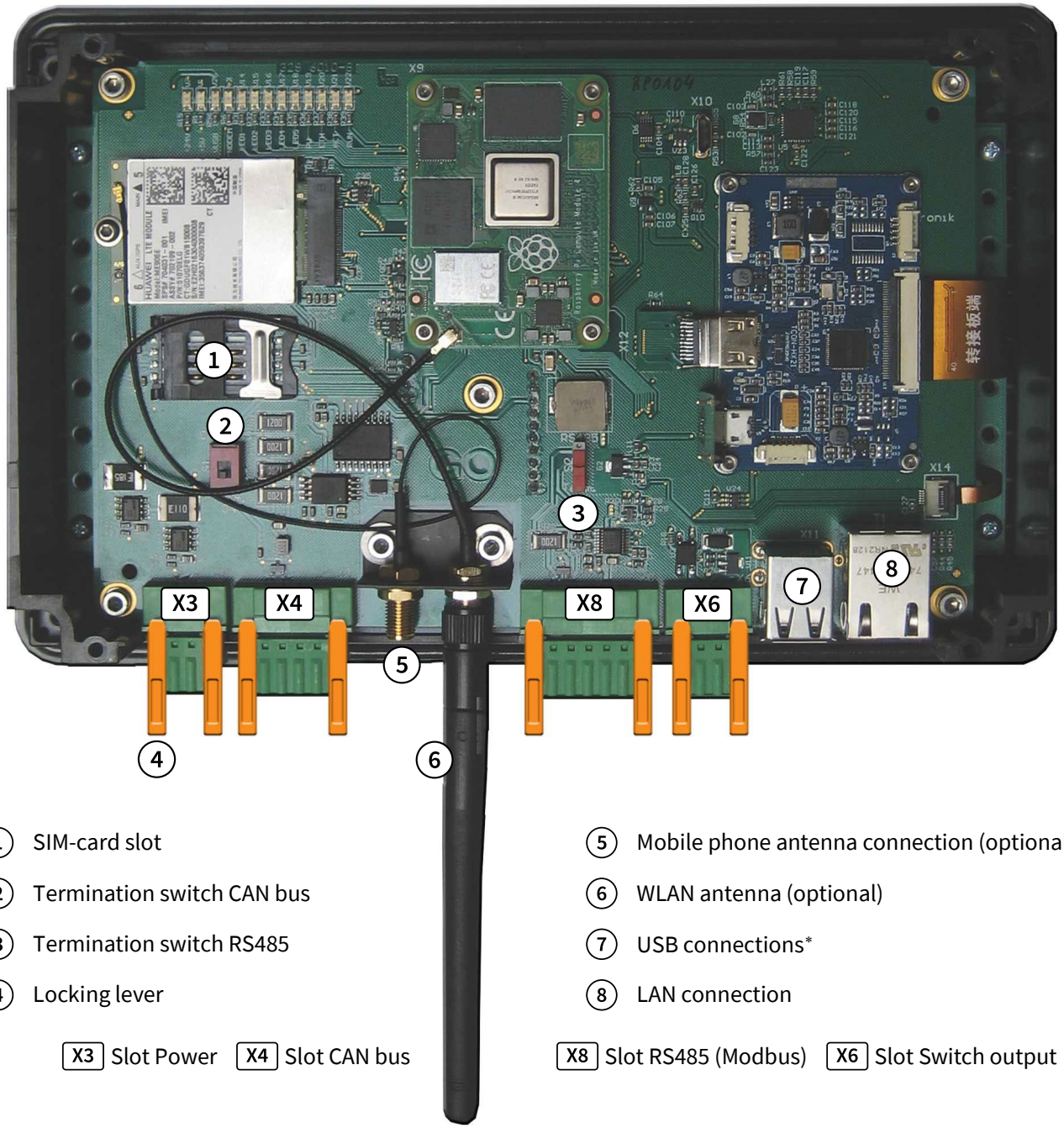
**Ambient conditions:**

| | | |
|---|---|---|
| Ambient temperature: | Storage: | -10 °C to +50 °C |
| | Operation: | -20 °C to +45 °C |
| | avoid direct sunlight | |
| Relative humidity: | ≤ 90 % (annual average) | |

To protect the device and to ensure the proper functioning of the device, the specified ambient conditions must be strictly adhered to!

[1] The connected CAN-bus modules receive their power from the BlueBox. Some modules have a constricted input range, so there is an input voltage tolerance of ± 10 %.
[2] CAN bus modules can also be supplied directly via a power supply unit.

## RPCom 5.2 Overview Mainboard



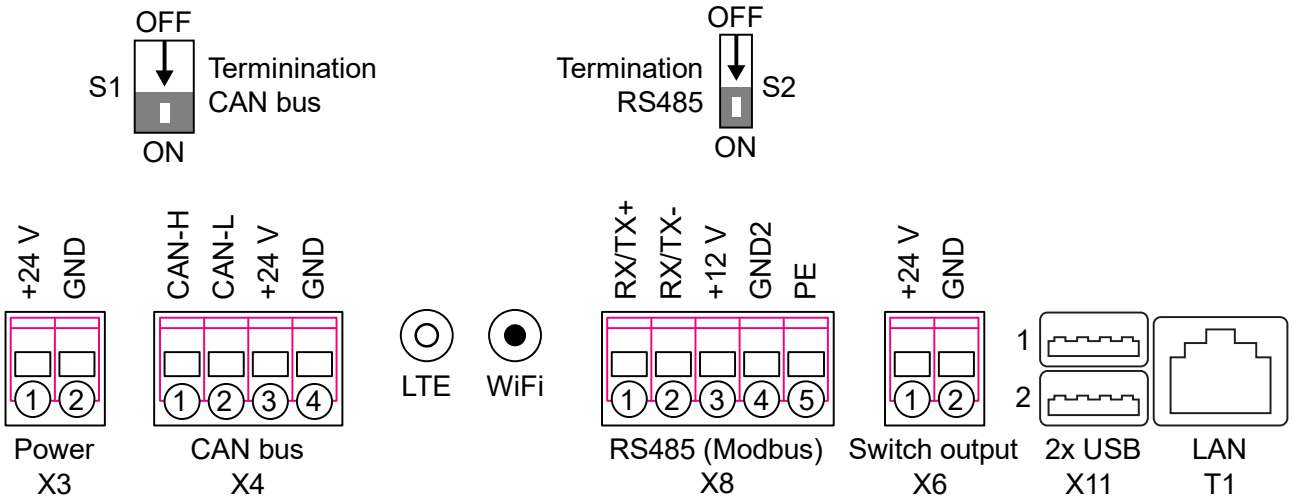

1. SIM-card slot
2. Termination switch CAN bus
3. Termination switch RS485
4. Locking lever
5. Mobile phone antenna connection (optional)
6. WLAN antenna (optional)
7. USB connections*
8. LAN connection

X3 Slot Power X4 Slot CAN bus X8 Slot RS485 (Modbus) X6 Slot Switch output

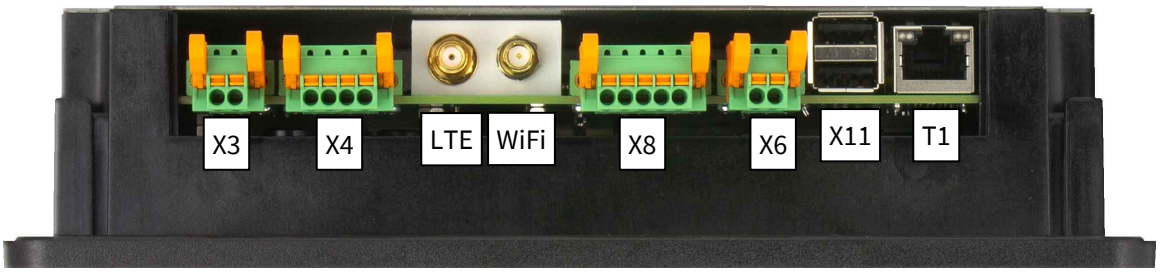
The switch output X6 is only defined after the operating system has been started.

* The USB ports at the BlueBox are designed for data export and for firmware and license update.

## RPCom 5.3 Connections and Termination BlueBox Panel




The switch output X6 is only defined after the operating system has been started.




At the slots X3, X4, X8 and X6 are cable clamps with locking lever.

- The cable clamps are removed by pushing the locking lever carefully downwards and then pulling the cable clamps out.
- Reinsertion is done in reverse order.

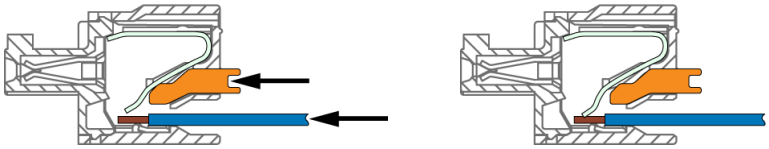
① Type plate

② Earthing connection

③ Sticker with assignment




### Functionality of the cable clamps



## RPCom 5.4 Connectable Modules and Sensors

The following modules and sensors can be connected to the BlueBox:

- **CAN bus modules**
  CAN bus modules of GO Systemelektronik are available in various forms as sensor modules and as actuator modules. The connection to the BlueBox is made via the CAN bus clamp sockets at slot X4.
- **BlueConnect Modules**
  The BlueConnect Modules of GO Systemelektronik are also CAN bus modules. They can therefore be connected via the CAN bus clamp sockets at slot X4.
- **Modbus sensors**
  Modbus sensors are connected direct via the RS485 clamp sockets at slot X8. For Modbus sensors, virtual sensors must be set up.
  Modbus sensors of GO Systemelektronik are recognised automatically in most cases, the BlueBox then requests the necessary settings and sets up the Modbus sensor automatically.
- **RS485 devices**
  The connection to the BlueBox is made via the RS485 clamp sockets at slot X8.
  You can connect up to 10 Modbus sensors of GO Systemelektronik directly here. With other RS485 devices, only one device can be connected at a time
- **Active CAN Repeater** see *3.7 Active CAN Repeater*
  The connection to the BlueBox is made via the CAN bus clamp sockets at slot X04 on the BlueBox mainboard.

There are many separate instructions on how to connect the BlueBox with several devices. For more information, please contact GO Systemelektronik.

The switch output (Switch output X6) is only defined after the operating system has been started.

## RPCom 6 Commissioning Procedure



Earth the BlueBox. This is the only way to ensure trouble-free measurement operation.



**Caution:** Handle the touch display with care. Do not remove the protective foil from the touch display until all work has been completed.



**Warning:** Before the connection of the Blue Box to the power supply make sure that the labelled BlueBox operating voltage matches the supply voltage.

## RPCom 6.1 Hardware

1. Carefully unpack the BlueBox.
2. Familiarise yourself with the structure of the BlueBox, see in particular:
    - *RPCom 5.1 Technical Data BlueBox Panel*
    - *RPCom 5.2 Overview Mainboard*
    - *RPCom 5.3 Connections and Termination BlueBox Panel*
    - *RPCom 8 Setup and Mounting*
3. Place the BlueBox with the display side on a suitable soft surface.
4. Remove the four screws holding the back cover and remove the back cover.
5. Terminate CAN bus and RS485 (Modbus) according to your requirements.
6. **Optional** – Insert your SIM card into the SIM card slot.
   Ensure that the SIM card is not activated.
7. Release the cable clamps by carefully pushing down the locking lever and pull out the cable clamps.
8. Insert the BlueBox into the fitting opening and place the four corner clamps on the guides and fix the corner clamps with the corner clamp fixing screws.
9. Assign the LTE, WiFi, USB and LAN connections according to your requirements.
10. Assign the cable clamps according to your requirements and plug the cable clamps back into the corresponding slots. Fix the cable clamps by carefully pushing the locking lever upwards.
11. Earth the BlueBox.
12. Switch on the power supply of the BlueBox, the BlueBox will start up.
    see *RPCom 6.2 Switching On the BlueBox*
13. Remove the protective foil from the touch display.

## RPCom 6.2 Switching On the BlueBox and Initial Operation




1. Switch on the power supply.
2. The BlueBox checks the database and initiates the system.
3. Then the BlueBox initiates the connected sensors and actuators.
4. The Sensor Display in list view in alphabetical order is the factory default start display. see *6 Sensor Display*

**Password entry:** To perform certain settings, a password consisting of 5 digits must be entered. see *Appendix A – The Configuration Data Sheet* there *1. BlueBox RP* there *BlueBox Password (PIN)*

In the default setting, the BlueBox is locked, i.e. you have to enter the PIN code of the BlueBox to perform certain settings. When setting up the BlueBox, it might be more convenient if the BlueBox is temporarily unlocked, see *7.8 Shutdown - Restart - Lock - Unlock*. **Do not forget to switch it back.**

If no CAN bus module is connected, the BlueBox starts up with an error message on the Sensor Display:

**NO SENSOR FOUND**

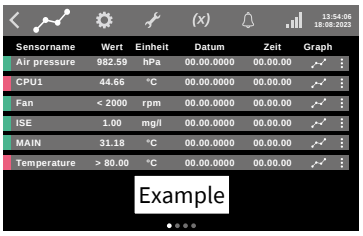
After approx. 15 seconds another error message appears:

**CAN-BUS ERROR**

**INFO: IF NO CAN-BUS SENSOR CONNECTED, DISABLE THE CAN-BUS**

In this case you have to disable the CAN bus:
SYSTEM > SETTINGS > CAN-BUS SETUP
see also *7.4.5 Settings CAN bus*
Operation of the BlueBox is still possible, but not at the Sensor Display.

**Precondition:** The BlueBox has booted up without an error message and the Sensor Display in list view is shown.



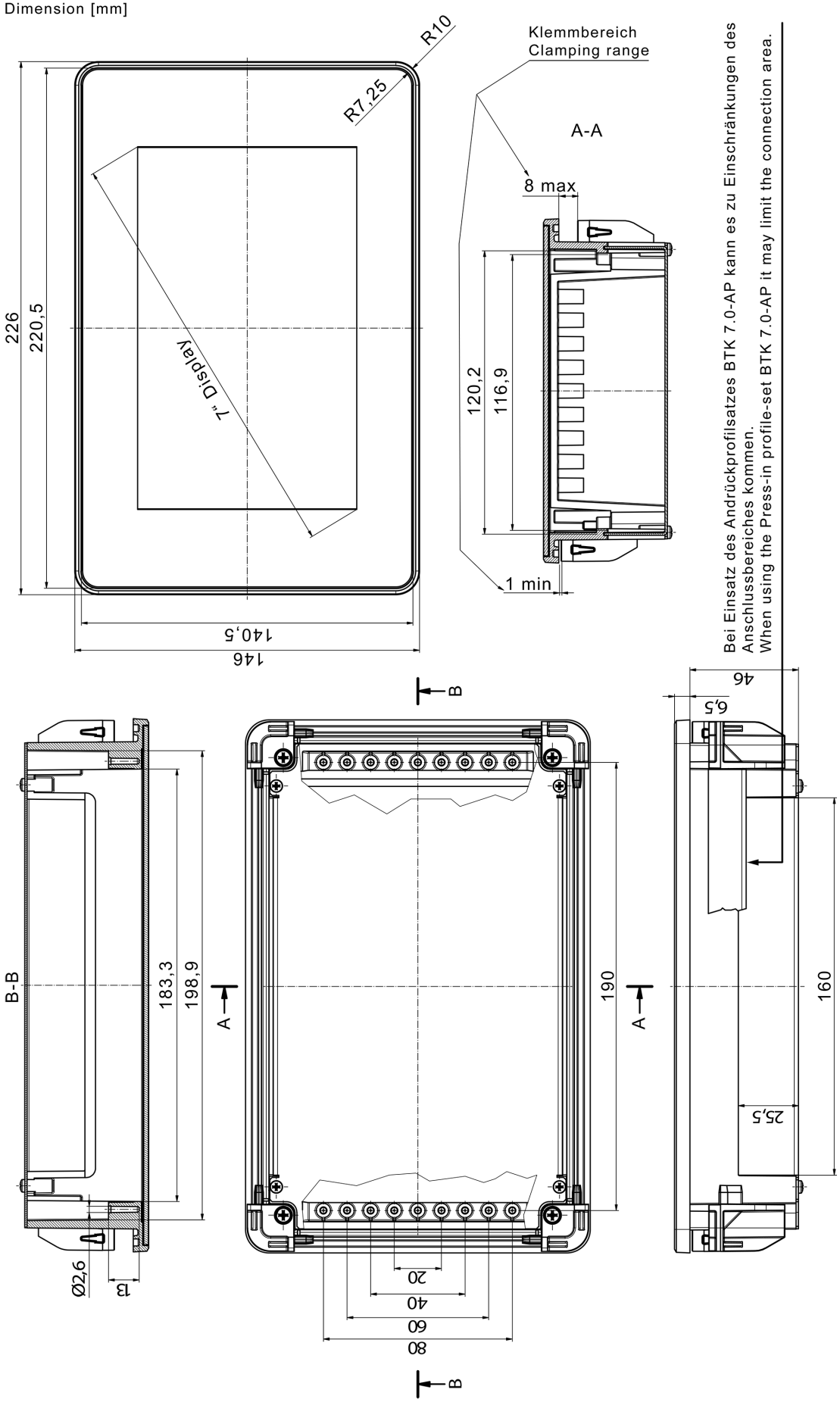

**Precondition:** The optional SIM card is not activated.

**Procedure**

5. Language setting — see *7.1 Language*
   The default language is English; German can be selected as an alternative language.
6. Date and Time setting — see *7.2 Date & Time*
7. Network settings — see *7.3 Network*
8. Modem settings (optional) — see *7.4.1 Settings Modem*

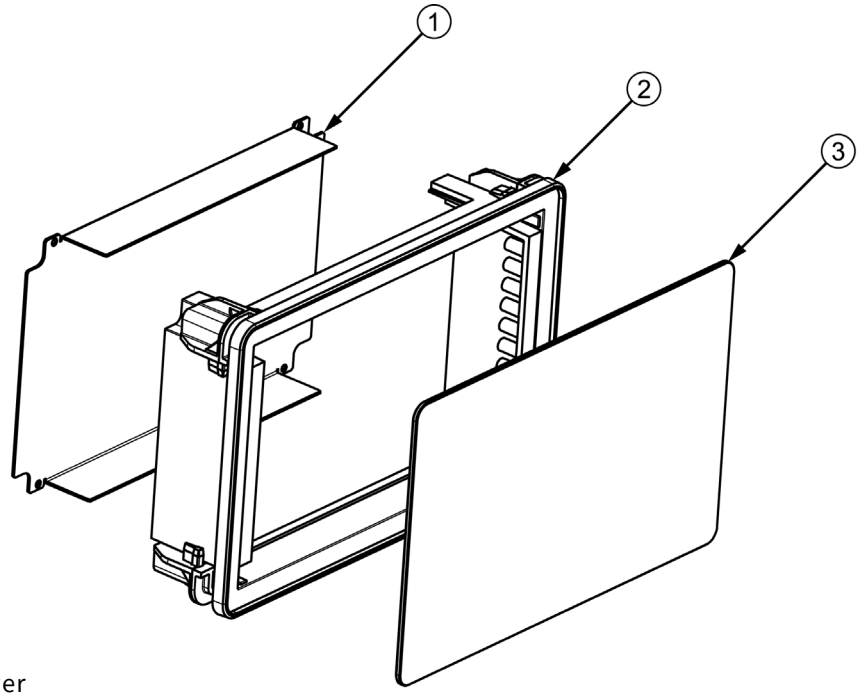
## RPCom 7 Dimensions

Dimension [mm]

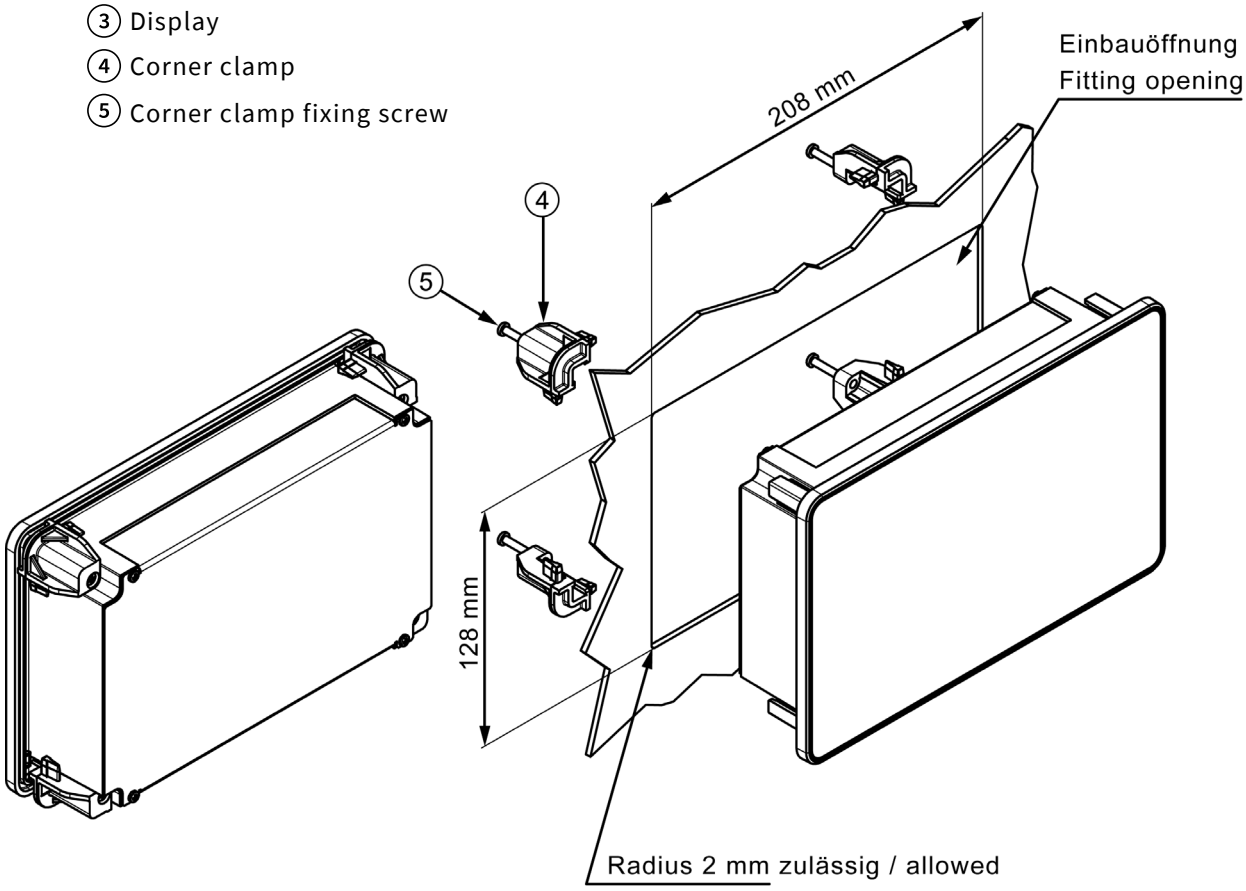



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## RPCom 8 Setup and Mounting




1. Back cover
2. Housing frame
3. Display
4. Corner clamp
5. Corner clamp fixing screw




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