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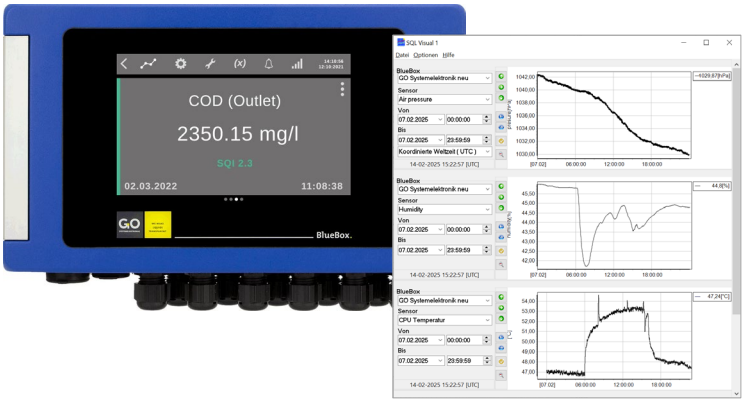
Manual

BlueBox PC Software



BlueBox Soft

Version of this manual: 5.0 en

www.go-sys.de

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Changes

GO Systemelektronik GmbH retains the right to modify the contents of the manual without prior notice.

Liability exclusion

GO Systemelektronik GmbH takes no responsibility for correct system operation under all possible operating conditions. It is not possible to guarantee that the software will function completely without error under all possible circumstances. GO Systemelektronik GmbH therefore disclaims all liability for any direct or indirect damage resulting from system operation or the contents of this manual.

Product observance

Within the scope of our obligation for product observance GO Systemelektronik GmbH will endeavour to warn third parties about all identified dangers which could arise from the interaction between hardware and software and from the use of other components. Effective product observance is only possible with adequate information from the end user about the planned field of application and the hardware and software used. If the conditions of use change or if the hardware or software is changed, due to the complex relationships between hardware and software, it is no longer possible to describe all possible dangers and their effects on the total system, in particular on our system. This manual does not describe every possible property and combination of the system. For further information, please contact GO Systemelektronik GmbH.

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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Creation date: 3.6.2026
Version of this manual: 5.0 en
File name: 420 6213-BDA BlueBox PC Software 5p0 en.pdf

0 Installation Notes

You have received a USB stick containing all the software and a USB dongle for licensing the BlueBox PC Software. This USB dongle protects the BlueBox PC Software against unauthorised use.
Alternatively, a “software dongle” is also available as a software licence linked to the PC's hardware/software. Details are available on request from GO Systemelektronik.

The BlueBox PC Software cannot be used effectively without a licence.

The BlueBox PC software runs on Windows systems from Windows 7 onwards.

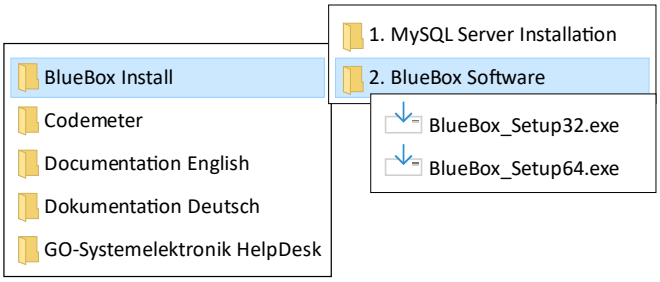
For installation, see *Appendix B – Installing of the BlueBox PC Software.*

Compatibility with BlueBox T4/TS*: To use the full range of functions offered by the BlueBox PC Software, you need BlueBox firmware version 4.05.30 or higher and BlueBox storage firmware version 3.26 or higher. For BlueBox firmware versions, see *5.4 The AMS Start Window* and *5.3.4 Help* there *BlueBox Info*.
* BlueBox T4 and BlueBox TS are the predecessors of the current R series.

MariaDB® Server und MySQL™ Server: From mid-2024 onwards, the MySQL™ database server in the BlueBox PC Software was replaced by the MariaDB® database server. There is no difference between the two in terms of operation, only the installation differs slightly.

Without a MariaDB® server or a MySQL™ server and a database managed by it, the BlueBox PC software cannot be used effectively.

0.1 Contents of the USB Stick



- **1. MySQL Server Installation** contains the files for installing the SQL Server
  see *Appendix A – Installation MariaDB® Server*
- **BlueBox Software** contains the installation programs for 32-bit and 64-bit systems. see *Appendix B – Installation of the BlueBox PC Software*
- **CodeMeter** contains the CodeMeter Software required for the USB dongle to function; this is installed automatically when the BlueBox PC Software is installed.
- **Documentation/Dokumentation** contains the manuals in English and German.
  You can find continuously updated documentation at www.go-sys.de/downloads.
- **GO-Systemelektronik HelpDesk** contains the file *TeamViewerQS.exe*, Double-click thereon starts the GO HelpDesk. see *0.5 GO HelpDesk*

0.2 The MariaDB® Software

MariaDB® is a relational database management system used to set up a database.
The BlueBox PC Software stores the measurement data requested by a BlueBox in this database.
Installation see *Appendix A – Installation MariaDB® Server*

0.3 The BlueBox Programs

Double-click on "BlueBox_Setup32.exe" for 32-bit programs or "BlueBox_Setup64.exe" for 64-bit programs in the "2. BlueBox Software" folder to start the installation program.
The installation of the BlueBox PC Software is described in *Appendix B – Installation of the BlueBox PC Software*.
Unless you select a different folder, the installation will create the folder "C:\Program Files (x86)\BlueBox" for 32-bit programs and the folder "C:\Program Files\BlueBox" for 64-bit programs with all the necessary files.

0.4 The CodeMeter Software

When using the CodeMeter Software from Wibu-Systems with the corresponding USB dongle[1], the BlueBox PC Software is protected against unauthorised access[2] and, if not already present, is automatically installed when the BlueBox PC Software is installed. You can install the BlueBox PC Software on as many computers as you like and use it with the USB dongle.
The CMDongle contains the so-called CMContainer with the licenses.

CMDongle
(USB dongle)

The CodeMeter runtime server is installed as a service by default and is therefore automatically started each time the system is booted.

I If the CodeMeter runtime server is not active, it can be easily started via the CodeMeter control centre. The CodeMeter runtime server can only be started once on each computer!

In the info area of the Windows taskbar, different colours of the CodeMeter symbol represent the status of the connected USB dongles.

	grey	No CMDongle is connected.
	green	A CMDongle is connected.

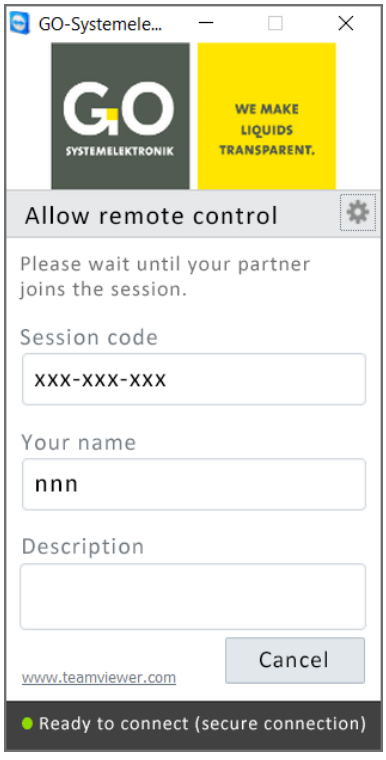
Double-clicking with the left mouse button or clicking with the right mouse button will take you to the CodeMeter control centre and CodeMeter webadmin (opens in your default browser).
Here you can change settings, view licence information, and access online help

0.5 GO HelpDesk

Remote access to your computer by GO Systemelektronik

Only upon request by GO Systemelektronik: Double-click on the file "TeamViewerQS-idcrv7udfu.exe" in the folder "GO-Systemelektronik HelpDesk" to start the GO Helpdesk.

The sequence of numbers in the “Session code” is generated automatically each time the program is started. Your Windows user name appears under “Your name”.
If you want remote access to your computer, give GO Systemelektronik the session code. This allows a one-time connection to GO Systemelektronik to be established.
The connection ends when the program is closed.



[1] Called CMDongle in the CodeMeter Software.

[2] The Visual1 and VisualN programs can access existing data without a dongle. (including the deletion of measurement points).

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Table of Contents

1 Introduction

The BlueBox PC Software is the Windows PC software for a BlueBox system. A Documentation of the BlueBox system can be found on the enclosed USB stick and at www.go-sys.de/downloads.

This manual describes the BlueBox PC Software from GO Systemelektronik with the **article number 420 6213**.

This manual describes the BlueBox PC Software with a BlueBox from the current R series (BlueBox R1, RS and RP). Significant differences from the T series (BlueBox T4 and TS) are mentioned.

The BlueBox PC Software is also called BlueBox SQL PC Software. This is to emphasise the importance of the database connection via an SQL server.

The symbol ❗ indicates an important note for operation.

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

Note on Text References

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

- *5.4 The AMS Start Window* e.g. refers to the section 5.4 in this document.
  The short form is *5.4*.
- *Manual BlueBox R1 and Panel* there *8 Service Display* e.g. refers to the chapter 8 in the *Manual BlueBox R1 and Panel*.

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.

1.1 Software Versions of the BlueBox PC Software

There is the software version of an individual program and there is the software version of the installation file BlueBox-Setup32.exe or BlueBox-Setup64.exe (see *0.1 Contents of the USB Stick*).

- You can find the software version of an individual BlueBox PC Software program in the help drop-down menu of the program window (see, for example, *3.8 Help*), and in Windows File Explorer via the rollover information or the context menu (Properties>Details) of the program file.
- You can find the version of the installation software (see *0.1 Contents of the USB Stick*) in Windows File Explorer via the rollover information or the context menu (Properties>Details) of the installation file. In addition, the version of the AMS software (see *5.3.4 Help*) corresponds to the version of the installation software.

2 Overview

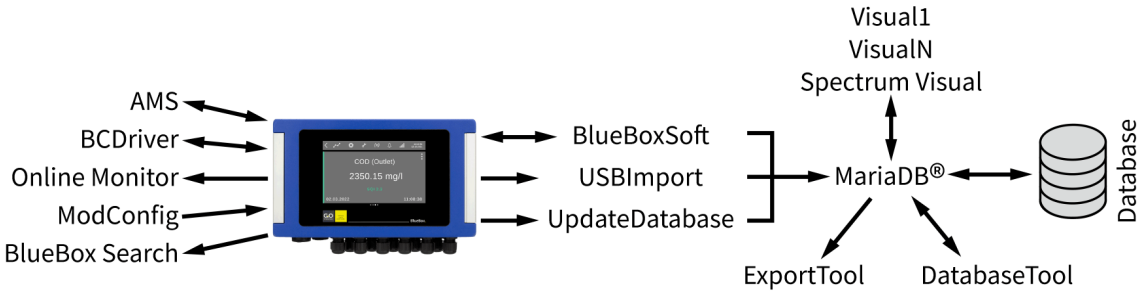
BlueBox T4/TS*: To use the almost full range of functions of the BlueBox PC Software, you need BlueBox firmware version 4.05.30 or higher and BlueBox storage firmware version 3.26 or higher.
For BlueBox firmware versions, see *5.4 The AMS Start Window* and *5.3.4 Help* there *BlueBox Info*
* BlueBox T4 and BlueBox TS are the predecessors of the current R series.

Compatibility: Newer versions of BlueBox PC Software are backward compatible with older versions.*
This means you can install the new version without any problems. However, newer versions include new functions and updates to the database structure, so you should stop using the older version of BlueBox PC Software once the newer version has been installed.
* Exceptions: SCADA, BCD driver and importing previously exported databases

The BlueBox PC Software runs on Windows systems from Windows 7 onwards.
A 32-bit version and a 64-bit version are available.

A MariaDB® Server is essential for operating the BlueBox PC Software.
see *Appendix A – Installation MariaDB® Server*

If you did not select a different folder during installation, the 32-bit programs are located in the folder "C:\Program Files (x86)\BlueBox" will be created for the 32-bit programs and the folder "C:\Program Files\BlueBox" for the 64-bit programs.



Main programs

- **BlueBoxSoft** see *3 BlueBoxSoft*
  BlueBoxSoft is management software for BlueBox systems. The program is used to set up databases, transfer data stored in a BlueBox to a database, and set up and manage BlueBox systems.

- **AMS – Advanced Managing Software** see *5 AMS – Advanced Managing Software*
  The AMS Software enables a direct access to a BlueBox and their working parameters. An effective instrument is the integrated formula language.

Programs for data display and visualisation

1. **Online Monitor** see *4.1 Online Monitor*
   Online display of the current measuring data of a BlueBox direct from a BlueBox

2. **Visual1** see *4.2 Visual1*
   Displays the measurement values of four sensors from databases in each one diagram, the sensors can also be connected to different BlueBox systems.

3. **VisualN** see *4.3 VisualN*
   Displays the measurement values of multiple sensors from a database in one diagram.

Programs for data transfer and configuration

1. **ExportTool** see *6.1 ExportTool*
   Export of measurement values/GPS data from the database into txt, csv and gpx format
2. **ModConfig** see *6.2 ModConfig (Modbus Client Configuration)*
   Configuring the Modbus interface of a BlueBox
3. **DatabaseTool** see *6.3 DatabaseTool*
   Database tool
4. **BlueBox Search** see *6.4 BlueBox Search*
   List view of all BlueBox/BlueMon devices accessible on the PC's network
5. **USBImport** useful only with BlueBox T3/T4, see *6.5 USB Import*
   Transferring measurement data from a BlueBox to a database and into the csv-format using a USB storage device
6. **BCDriver** see *6.6 BCDriver*
   BlueBox Communication Driver with integrated gateway
7. **UpdateDatabase** see *Appendix E – UpdateDatabase: Periodic Database Update*
   Periodic Update of the database

Other programs (not described in this manual)

1. **ISA Spectrometer Software** only for the ISA Spectrometer, see *Manual ISA Spectrometer*
2. **Spectrum Visual** only for the ISA Spectrometer, see *Manual ISA Spectrometer*
   Enables, among others, the display of database spectra as graphs. Here you can analyse the spectra and save them in a common graphics format.
3. **Translation program**
   Language localisation of BlueBox PC Software by the user
4. **SQLCheck**
   Database check for current format, usually called up automatically
5. **SoftwareLicense**
   Required if you want a software licence connected to the PC's hardware/software instead of a USB licence dongle, Details available on request from GO Systemelektronik.
6. **unins000.exe**
   Is automatically called up when uninstalling the BlueBox PC Software.
7. **ModbusMaster** Optional addition to the BlueBox PC Software with a single licence
   Integration of external Modbus devices into the BlueBox system via Modbus RTU (RS485/RS232)
   Further details available on request from GO Systemelektronik

Note: The programs **BBBackup.exe** and **BBRestore.exe** are no longer part of the BlueBox PC Software; their functions are now performed via the BlueBox display.

Note for BlueBox T2 and older: If no CAN-bus module is connected, the BlueBox will not be recognised by the BlueBox PC Software.

3 BlueBoxSoft

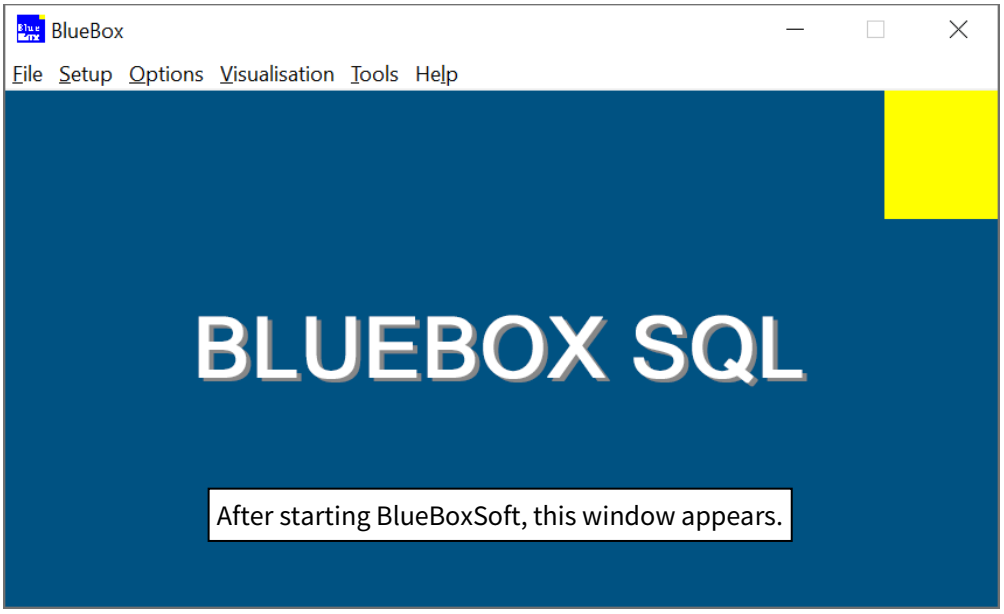
described program version: from 5.1

BlueBoxSoft is a management software for BlueBox systems. The program is used to set up databases, transfer data stored in a BlueBox to a database, and set up and manage BlueBox systems. All relevant data is stored and managed in a database using an SQL server.

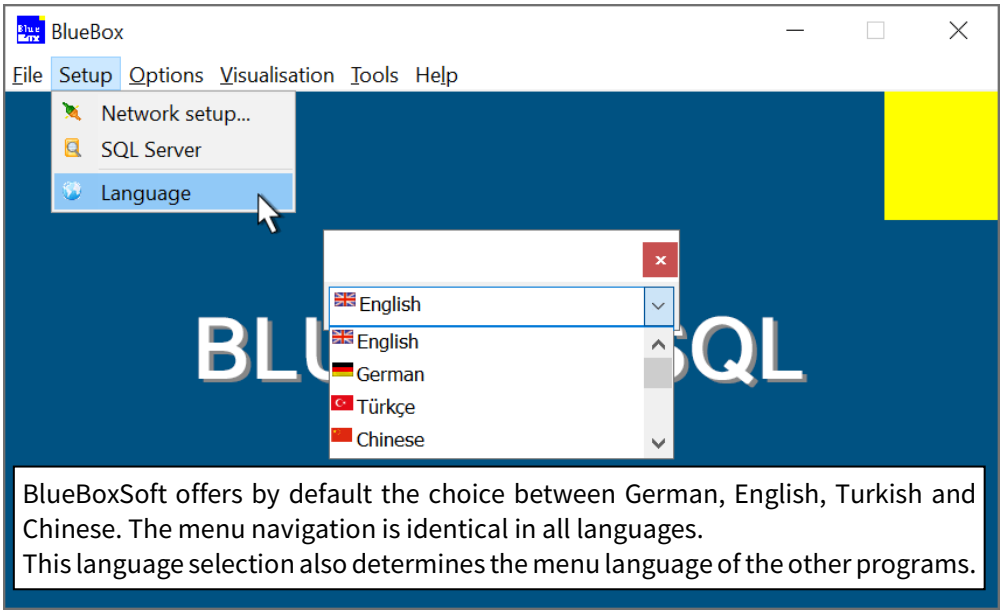
Storage of measurement data in the BlueBox system
The measurement data is first stored* in the main memory of the BlueBox. It is transferred to the data storage of the BlueBox when you shut down the BlueBox via the display, or automatically every 10 minutes**, and can then be transferred to a database either manually (see *3.4 Data Transfer to a Database)* or automatically (see *Appendix E – UpdateDatabase: Periodic Database Update*).

* see *Manual BlueBox R1 and Panel*
there *3.4 Notes on Storage Utilisation of the Data Memory/3.5 Note on the Storage Behaviour*

** Depending on system load, the interval may vary slightly.



3.1 Language Selection



3.2 Network Setup

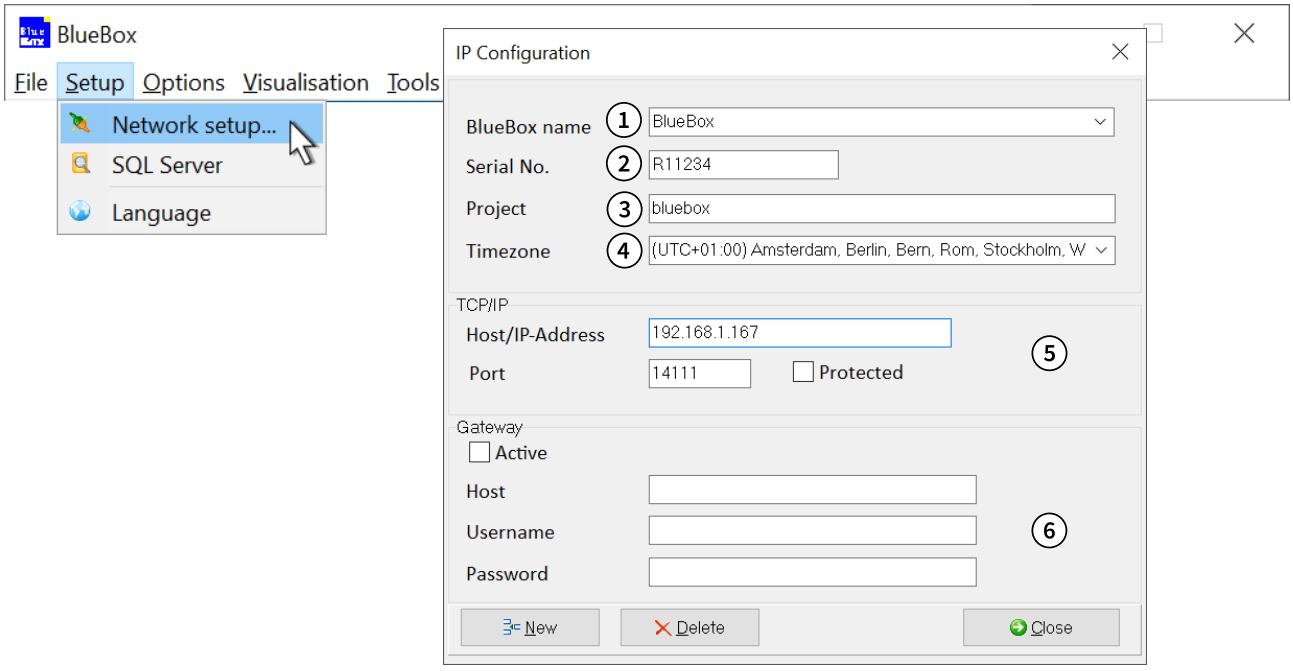
In the network settings, you can

- set up new BlueBox systems with the assigned databases,
- delete BlueBox systems and assigned databases
- and set up the network connection.

Notes on timestamps: The recording times of the measurement values and associated information (e.g. GPS data) are stored in the database in Coordinated Universal Time (UTC). Changing the time zone in the Network Setup may only alter the display time in the Visual1 and VisualN programs, and not the timestamp in the database.
The timestamps of the measurement data records in the database are converted to UTC in accordance with the time setting on the BlueBox display.

3.2.1 Network Settings at a BlueBox

Open the network setup window.



① Drop-down menu for selecting and renaming a BlueBox
see *3.2.2 Setting Up a BlueBox* there ①
Note: If this entry is changed using the keyboard, it can be confirmed by pressing the Enter key. The name of the BlueBox is then changed and this change **cannot be undone** with the Esc key

② Serial number of the selected BlueBox

③ Name of the associated project, **cannot be changed later**, is assigned when setting up a new BlueBox, see *3.2.2 Setting Up a BlueBox* there ②.

④ Drop-down menu for selecting a time zone see above *Notes on timestamps*

⑤ Network identification of the selected BlueBox
The IP address is usually detected automatically. If the IP address cannot be detected automatically, the IP address entered here will be used.

⑥ If the BlueBox is to be accessed via a gateway (e.g. for an LTE connection), the access data must be entered here (see *3.2.2 Setting Up a BlueBox*). This is necessary because the BlueBox is usually located behind the provider's firewall and therefore cannot accept requests directly.

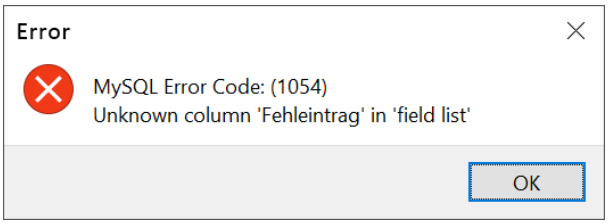
☑ **Protected** If this checkbox is activated, data transmission will be encrypted with AES and the port will be set to 14110.

Encryption is mandatory if the BlueBox has a public IP address!

Public IP addresses are IP addresses outside the range of private IP addresses.

Private IP address range:	10.0.0.0	to	10.255.255.255
	172.16.0.0	to	172.31.255.255
	192.168.0.0	to	192.168.255.255

Entries that have not yet been saved can be cancelled by pressing the Esc key.
For exceptions, see point (1) on the previous page.



Invalid entries will not be accepted.

Buttons

New — Leads to the setup of a new BlueBox, see next page.

Delete — Deletes the list entry and the assigned database of the selected BlueBox.

Close — Closes the window.

If you make changes to the settings (2) to (6), the buttons will change.

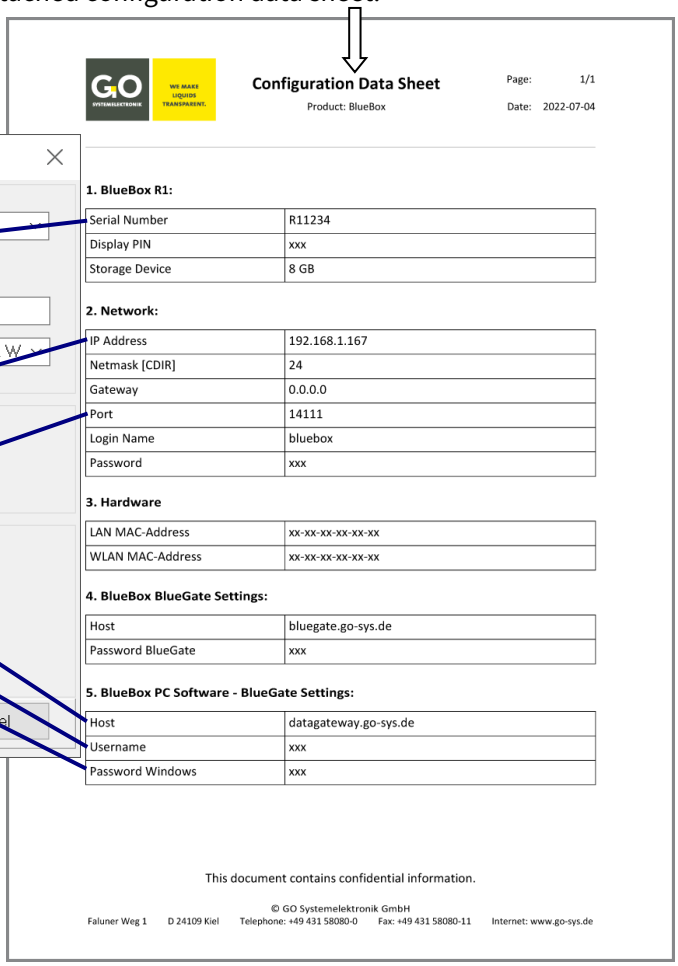
Save — Saves the changes.

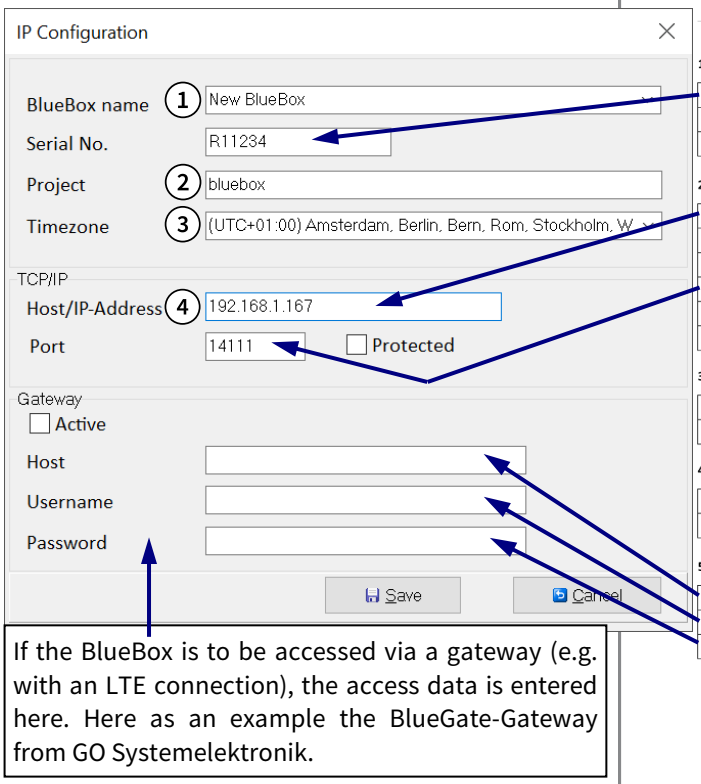
Cancel — Cancels the operation; changes are not saved.

3.2.2 Setting Up a BlueBox

New *3.2.1 Network Settings at a BlueBox*

The settings of a new BlueBox can be found in the attached configuration data sheet.
see: *Appendix G – The Configuration Data Sheet*





If the BlueBox is to be accessed via a gateway (e.g. with an LTE connection), the access data is entered here. Here as an example the BlueGate-Gateway from GO Systemelektronik.

Enter the data of the new BlueBox in the input fields.

① Drop-down menu for assigning a BlueBox name
In addition to the BlueBox serial number, this name can be used to access the BlueBox with the BlueBox PC Software. max. 30 characters

② Project name of the selected BlueBox
No spaces, no special characters, no capital letters[1] – default name is “bluebox”
By assigning project names, the data of a BlueBox can be stored in different databases of an SQL server. A database is created under the project name. The project name is only displayed in the BlueBox PC Software here in the network settings and in the system information window (see *3.6*). When assigning a project name, it is recommended that you also assign a uniquely assigned BlueBox name, otherwise the BlueBox name will be listed multiple times.

③ The default setting is the time zone of the computer on which the BlueBox SQL Software is installed.

④ If the network identification is done automatically[2], no IP address is entered here.
The assignment is then done via the serial number of the BlueBox.

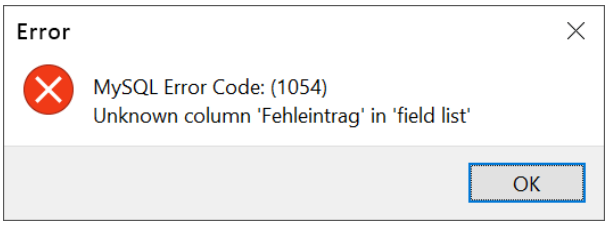
Save Sets up the new BlueBox.

Cancel Cancels the process; the new BlueBox will not be set up.

Entries that have not yet been saved can be undone by pressing the Esc key.

[1] Capital letters entered are converted to lowercase letters when saved.

[2] see *Manual BlueBox R1* and *Panel* there *7.3 Network* there *DHCP*



Invalid entries will not be accepted.

☑ **Protected** If this checkbox is activated, data transmission will be encrypted with AES and the port will be set to 14110.

Encryption is mandatory if the BlueBox has a public IP address!

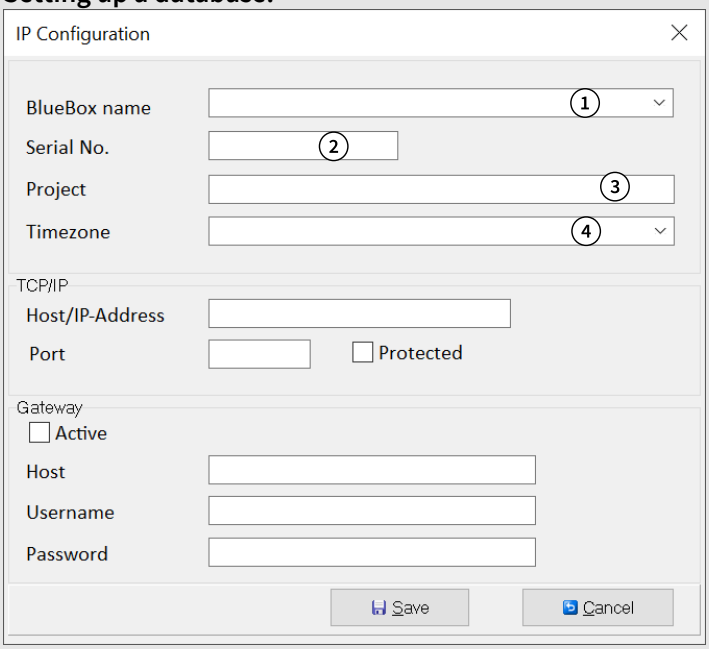
Public IP addresses are IP addresses outside the range of private IP addresses.

Private IP address range:	10.0.0.0	to	10.255.255.255
	172.16.0.0	to	172.31.255.255
	192.168.0.0	to	192.168.255.255

Note on a particular feature of Spectrum Visual*

The program Spectrum Visual is part of the BlueBox PC Software and displays, among other things, the spectra of GO Spectrometers from a database as graphs. With Spectrum Visual it is possible to export spectra from a database (source database) to a database of the same name (target database) on another computer (target computer). If this database of the same name does not exist on the target computer, it must be set up.

Setting up a database:



① Freely selectable name, does not have to match the BlueBox name on the source computer

② Serial number of the BlueBox of the source database

③ Name of the source database

④ Time zone of the target computer (preset)

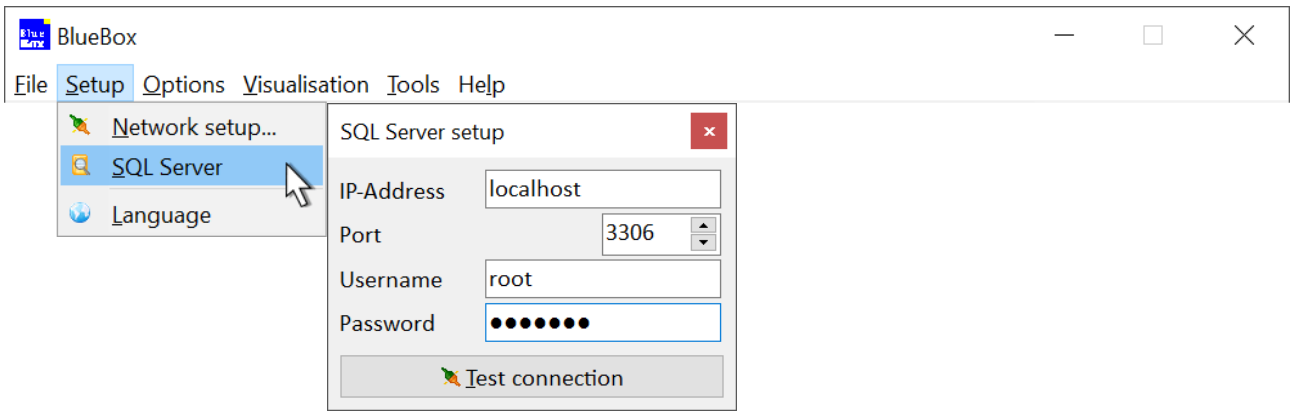
Click on Save creates the database on your computer.

Note: The generated database appears in the BlueBox PC Software as an actually existing BlueBox, to which direct access (e.g. retrieving data from the BlueBox or changing settings) is not possible.

Note on the time stamp: The record times of the spectra are stored in the database in Coordinated Universal Time (UTC), just like all other acquisition times. Changing the time zone may only affect the time displayed, not the timestamps in the database.

* The program Spectrum Visual is described in the *Manual ISA Spectrometer* there *11 Spectrum Visual.*

3.3 SQL Server Settings



Here you determine the SQL server that writes the BlueBox data to a database.

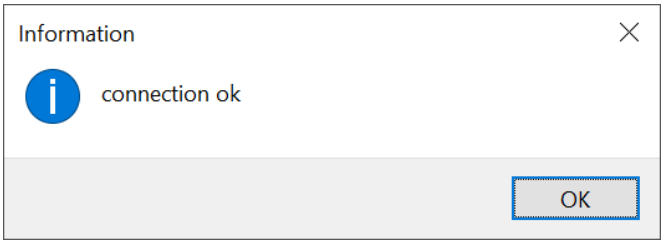
IP-Address IP address of your SQL server. If the server is running on the same PC on which the BlueBox PC software is installed, enter "localhost' here.

Port Standard port address 3306 of the SQL server

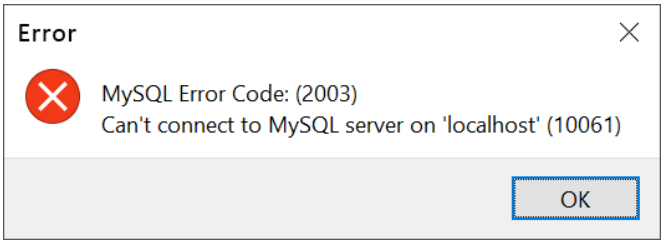
Username Username of the SQL server, default name is “root” (default root).

Password Password of your SQL server, assigned during installation of the SQL server.

Tests the connection to the SQL server.

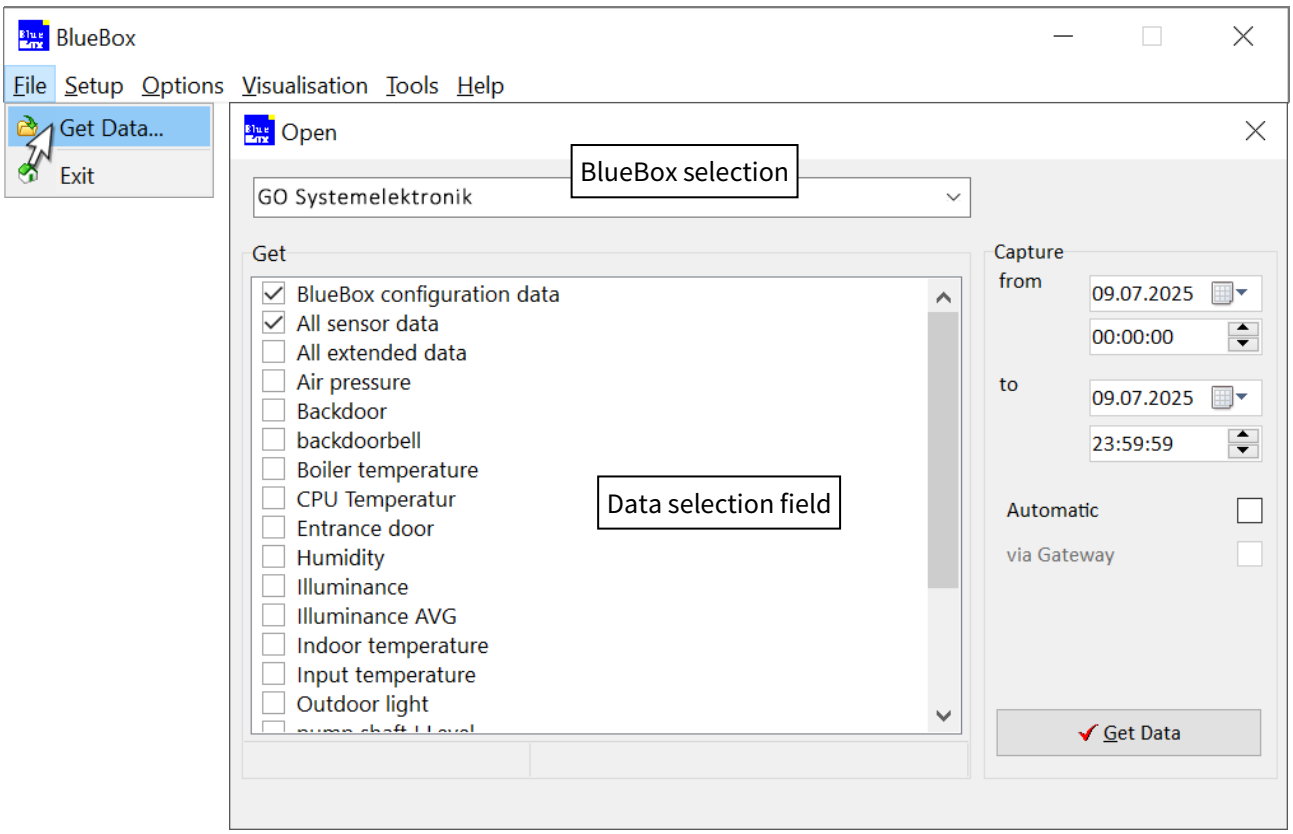


The connection is established. You can use the SQL server.



The connection is not established. Check the settings.

3.4 Data Transfer to a Database



This window is used to transfer configuration data and measurement data from the BlueBox data memory to a database. The transfer can also be carried out automatically; see Appendix E – UpdateDatabase: Periodic Database Update.

Note on storing measurement data on the BlueBox
Recorded measurement data is first stored in the BlueBox main memory. This data is then transferred to the BlueBox data storage either when you shut down the BlueBox via the display or automatically every 10 minutes.

☑ **BlueBox configuration data** Transfers configuration data

- Sensor names and all Sensor settings
- the Calibration protocol (Calibration log)
  see *3.5 Sensor Information and Deletion of Sensors*
- the System protocol (Changelog) see *3.6 System Information*
- AMS formulas

☑ **All sensor data** Transfers all **measurement data** except spectral data.

Measurement data are:

- Time of data recording in UTC (timestamp)
  The timestamps of the measurement records in the database are converted to UTC in accordance with the time setting on the BlueBox display.
- Measurement value (sensor measurement value or actuator status value*)
- where applicable: Sensor status 4, 50 and 51
  see 5.4.1.1 Sensor Status Messages in the Sensor Setup Window
- where applicable: GPS position (longitude and latitude)
- where applicable: SQI (only for application-specific parameters generated from spectral data)

☑ **All extended data** Transfers all spectra data. see *Manual ISA Spectrometer*

* The states of an actuator can be interpreted as measured values and are also recorded as such.

from – to Transfers all measurement data[1] from the selected sensors from the period specified here. Time specifications according to the PC on which the BlueBox PC Software is installed.[2]

Automatic ☑ If this checkbox is selected, the program tracks when[3] the last data record from a sensor was saved to the database. Only the data records for that sensor recorded in the BlueBox since then will then be transferred to the database.

via Gateway ☑ The connection is established via a gateway.

Get Data Transfers the data. The progress of the transfer is displayed.

[1] and spectral data, if selected with ☑ All extended data

[2] If you then retrieve data using the “Automatic” option, time gaps may appear in the measurement records in the database. To avoid these time gaps, disable the automatic option once and select a suitable “from – to” time period under “Capture”.

[3] If the time is set incorrectly, this point in time may lie in the future, which can also result in database time gaps.

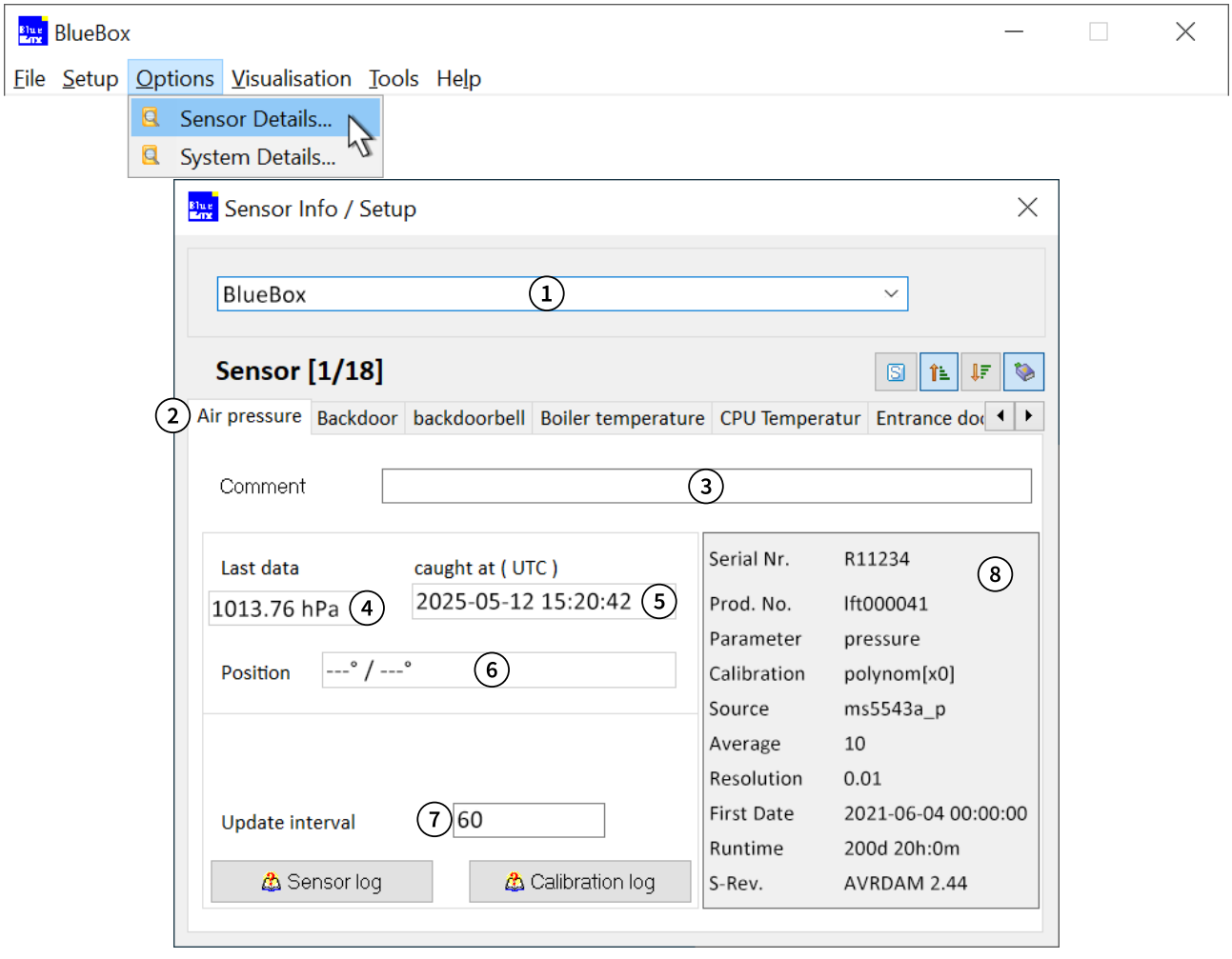
3.5 Sensor Information and Deletion of Sensors

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*** (Sensor ID) **of a real sensor** = DAM ID + sensor number
- **CAN ID**** (Sensor ID) **of a virtual sensor** = 00*** + **serial number of the BlueBox** + 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/RS232 interface of the BlueBox and the **internal sensors** (temperature sensor and air pressure sensor)**** have the ID of a virtual sensor.

* The CAN ID is strictly speaking the ID of the sensor input on the DAM.
** Strictly speaking, the ID of a virtual sensor is not a CAN ID.
*** 00 means zerozero
**** Depending on the model, there is also a humidity sensor.



Sorts the sensor tabs by serial number.

Sorts the sensor tabs in ascending alphanumeric order.

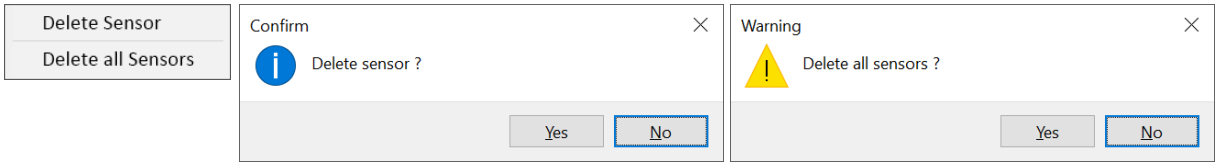
Sorts the sensor tabs in descending alphanumeric order.

Shows or hides inactive sensors.
Sensors are inactive if the sensor name in the Sensor Setup window is set to n/c (not connected). see *5.4.1 The Sensor Setup Window*

? Sensor log	Opens a window displaying general information about the sensor/actuator.
? Calibration log	Calibration log – Opens a window displaying a log of all calibrations performed for this sensor via the BlueBox display interface or using the AMS software. The log lists each date and the coefficients of the corresponding calibration polynomial.

① In this drop-down menu the BlueBox is selected.

② Bar of the tabs for the sensors and actuators The descriptions here also apply to actuators.
Here you can delete sensors from the configuration data in the database, for example if individual sensors have been physically removed. The sensors will then no longer be listed in the BlueBox PC Software programs. Left-clicking on one of the tabs selects the sensor. Right-clicking on a tab opens the delete menu for the respective sensor. Clicking on “Delete sensor” or “Delete all sensors?” with the left mouse button opens the following window:



Clicking <Yes> will delete the sensors from the database configuration data. The measurement data will remain in the database. You can access* this data via the corresponding sensor name if required. It is therefore advisable to make notes of the names of the removed sensors and not to reassign them.
Note: If you accidentally delete a connected sensor, the sensor name will remain in the BlueBox configuration. By transferring this configuration to the database, you can restore the previous state.
Transferring the configuration data to a database:
see *3.4 Data Transfer to a Database* there ☑ *BlueBox configuration data*

③ as entered in the sensor setup
Display of the last measured value of this sensor in the database

④ Display of the last measurement value of this sensor in the database

⑤ Display of the timestamp of the last measurement value of this sensor in the database
in Coordinated Universal Time (UTC)

⑥ If a GPS system is integrated, the exact position of the last measurement is displayed here.
As entered under Interval in the sensor setup10:36 AM

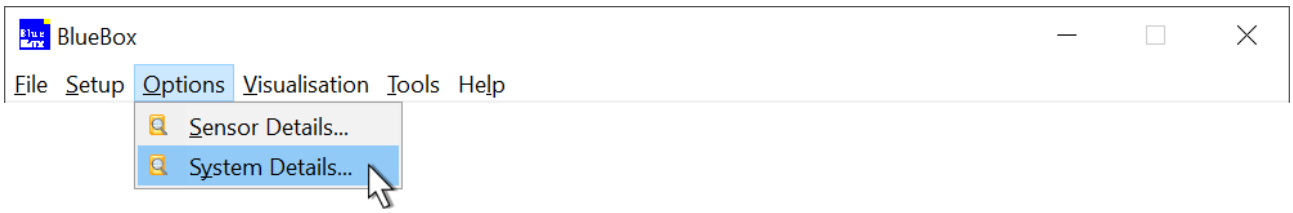
⑦ As entered under Interval in the sensor setup

⑧ Sensor field with the serial number of the BlueBox and information about the sensor/actuator update, see *3.4 Data Transfer to a Database*

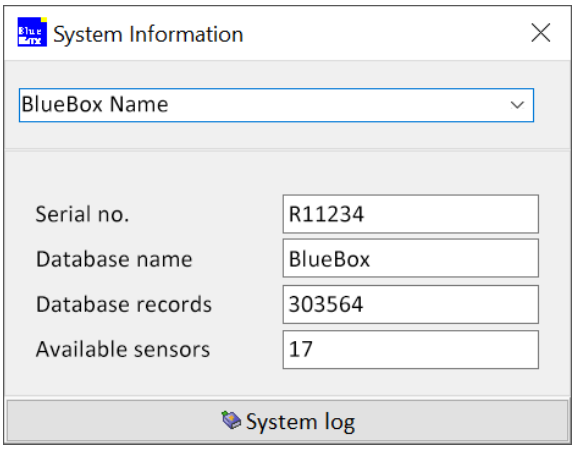
Serial Nr.	Serial number of the BlueBox
Prod. No.	CAN ID (Sensor ID) of the sensor/actuator
Parameter	as entered under Parameters in the sensor setup
Calibration	Type of calibration
Source	Type of connection
Average	as entered under Average in the sensor setup
Resolution	as entered under Digits after in the sensor setup
First Date	Date and time of the first measured value of the sensor in the database
Runtime	Absolute runtime of the sensor (not for all sensors)
S-Rev.	Real sensors: DAM ID of the module | Virtual sensors: Firmware version of the BlueBox

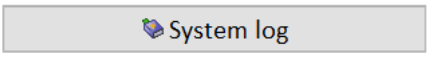
* Further information from GO Systemelektronik

3.6 System Information



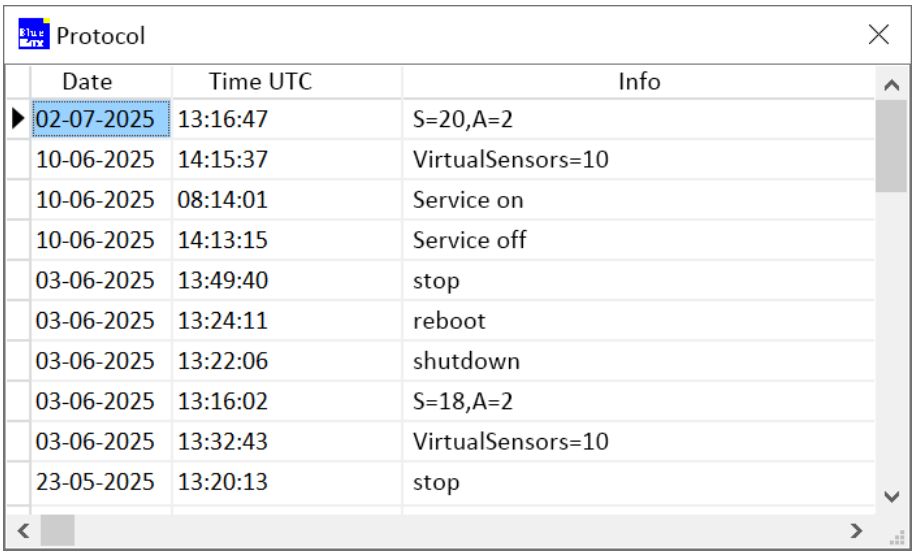
This window displays the basic data of the selected BlueBox.





Opens the system protocol window of the BlueBox.

System protocol window of the BlueBox



Date	Time UTC	Info
02-07-2025	13:16:47	S=20,A=2
10-06-2025	14:15:37	VirtualSensors=10
10-06-2025	08:14:01	Service on
10-06-2025	14:13:15	Service off
03-06-2025	13:49:40	stop
03-06-2025	13:24:11	reboot
03-06-2025	13:22:06	shutdown
03-06-2025	13:16:02	S=18,A=2
03-06-2025	13:32:43	VirtualSensors=10
23-05-2025	13:20:13	stop

This continuously recorded log file lists the various system messages (see next page) from the BlueBox since it was first put into operation.
Example: In the above illustration, this means that on 02.07.2025 at 13:16:47 UTC 20 sensors and 2 actuators were connected to the selected BlueBox.

List of the system messages see next page.

3.6.1 System Messages

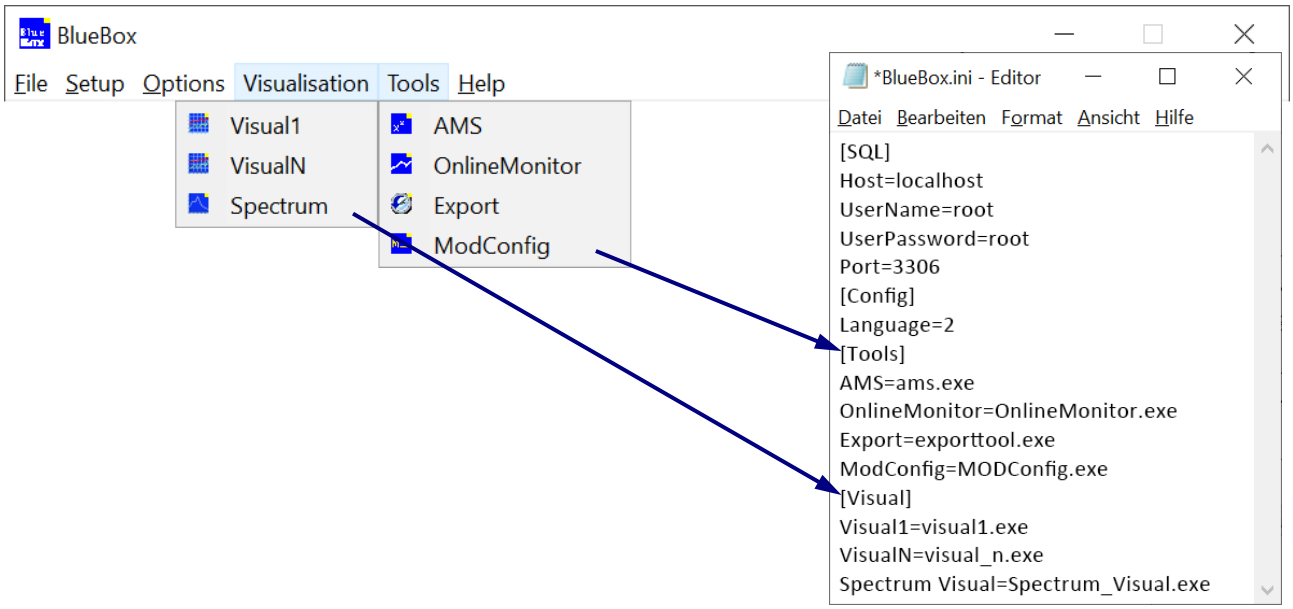
Message (Info)	Description	Log no.[1]
Date(*01***/***07***/***13 16***:***41***:***34***)**	Date and time set	0
S=*17***, A=***2*	17 sensors and 2 actuators detected at BlueBox start	1
shutdown **stop** **reboot**	BlueBox status: Shutdown, Stop, Reboot	2
GPS timeout	GPS module not sending data	3
Service on **Service off**	Service mode is switched on/off see *Manual BlueBox R1 und Panel* there *8 Service Display*	4
UPS Ok **UPS On Line** **UPS Communication Error** **UPS Battery Ok** **UPS On Battery** **UPS Battery charging** **UPS Battery error**	Status of a UPS (Uninterruptible Power Supply)	10
C *nn***°C M** *nn***°C**	Overtemperature warning[2] when Temperature C > 80°C M.> 69°C C=CPU M=Mainboard (Air temperature inside housing)	11
SMS receipt from *49431580800* **SET variable=***Variable* **from** *49431580800* **Unknown variable from** *49431580800* **SMS error from** *49431580800* **SMS from unknown**	– Message transmission via SMS from telephone number 49431580800 interrupted – Variable changed via SMS – Variable of SMS does not exist – SMS syntactically incorrect – Phone number of the SMS not in the phone number list	50
Virtual Sensors = *10*	Number of virtual sensors is set to 10	60

In addition, there is the service message **stopped** (which has no meaning for the user).

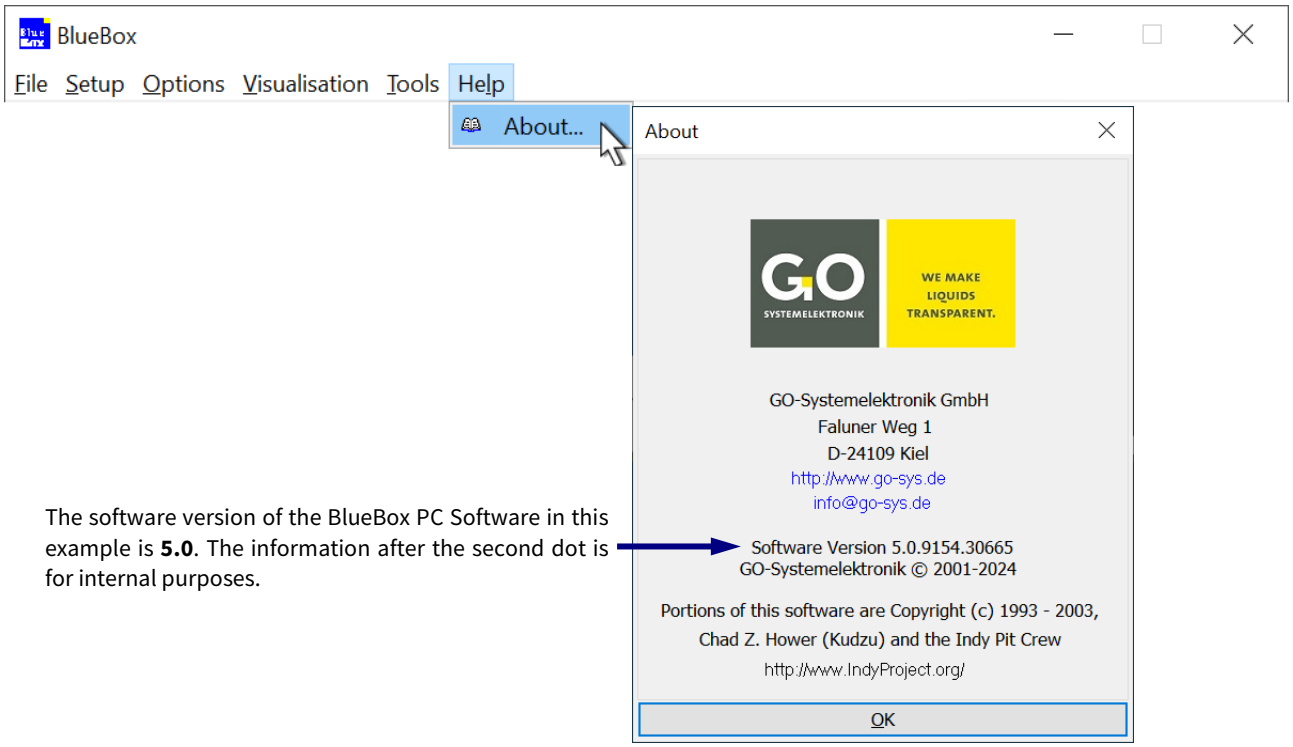
[1] The Log no. is not listed in the system log window, it is useful for a database query.
[2] When triggered, the BlueBox switches to the energy-saving mode.

3.7 Drop-down Menus Visualisation and Tools

In "Visualization" and "Tools" only the programs appear, that are listed as exe files in the BlueBox.ini file. The BlueBox.ini file is located in the folder where the BlueBox PC Software was installed. If you did not select a different folder during installation, the 32-bit programs are located in the folder "C:\Program Files (x86)\BlueBox" and the 64-bit programs are located in the folder "C:\Program Files\BlueBox".



3.8 Help



The software version of the BlueBox PC Software in this example is **5.0**. The information after the second dot is for internal purposes.

If you have any, questions for GO Systemelektronik, please always quote this software version number.
see also *1.1 Software Versions of the BlueBox PC Software*

4 Programs for Data Display and Visualisation

The BlueBox software offers users various options for displaying measurement data. The different programs and their features are described below.

Note on timestamps: The recording times of the measurement values and associated information (e.g. GPS data) are stored in the database in **Coordinated Universal Time (UTC)**, converted from the local time setting on the BlueBox Display. Changing the time zone on the BlueBox Display and in the BlueBox PC Software only changes the time displayed and not the timestamps in the database.

Note: It is recommended that you synchronize the time settings of the BlueBox and BlueBox PC software via a time server. see *Manual BlueBox R1 and Panel* there *7.2 Date and Time*.

Note: The Spectrum Visual program is described in the *Manual ISA Spectrometer*.

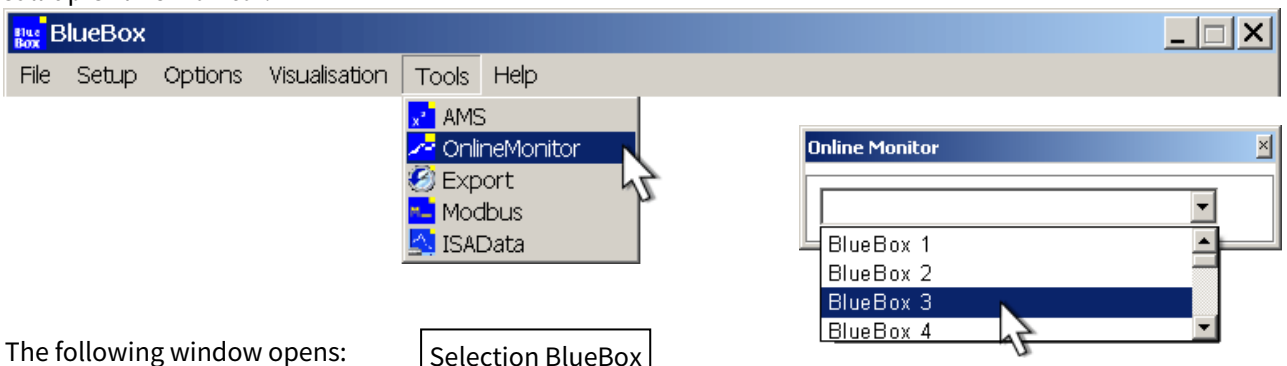
Note: The Visual1 and VisualN programs can access existing data without a dongle, including the deletion of measuring points in the database.

4.1 Online Monitor

described program version: from 4.2

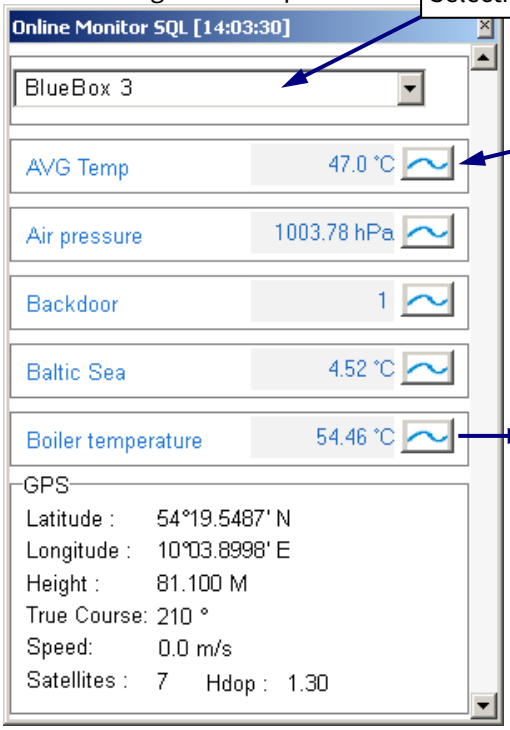
Online display of current measurement values and, if available, GPS data
The current measurement values do not have to be identical to the values stored in the BlueBox (and thus later in the database). see *5.4.1.2 Display and Storage Mode*

Call-up Online Monitor:



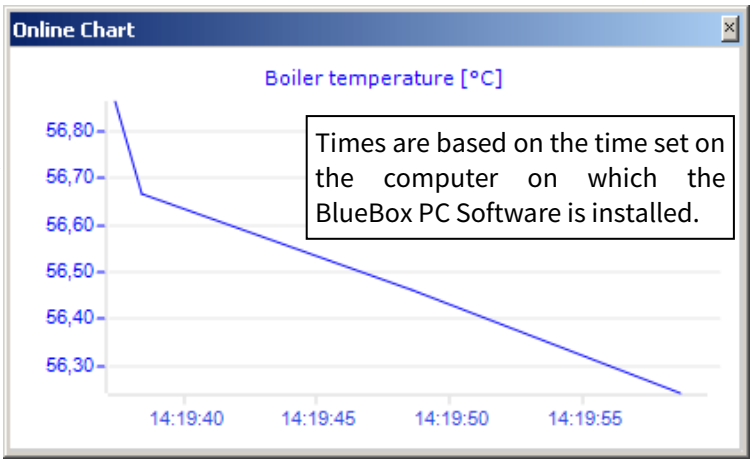
The following window opens:

Selection BlueBox



Click on one of these buttons opens the current graphical representation of the measurement values of the corresponding sensor.
Multiple selection is possible.

Example:



Times are based on the time set on the computer on which the BlueBox PC Software is installed.

If available, displays the SQI (Spectral Quality Index) on the right-hand edge of the line graph for application-specific parameters derived from spectral data.
In all other cases, the SQI value is meaningless here.

4.2 Visual1

described program version: 5.0

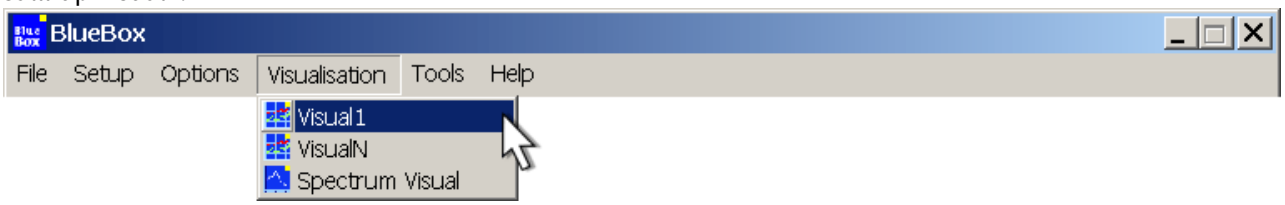
Visual1 displays the measurement values from four sensors from databases in a single diagram; the sensors can also be connected to different BlueBox systems.

If the databases being queried are updated while the program is running, the display will also be updated.

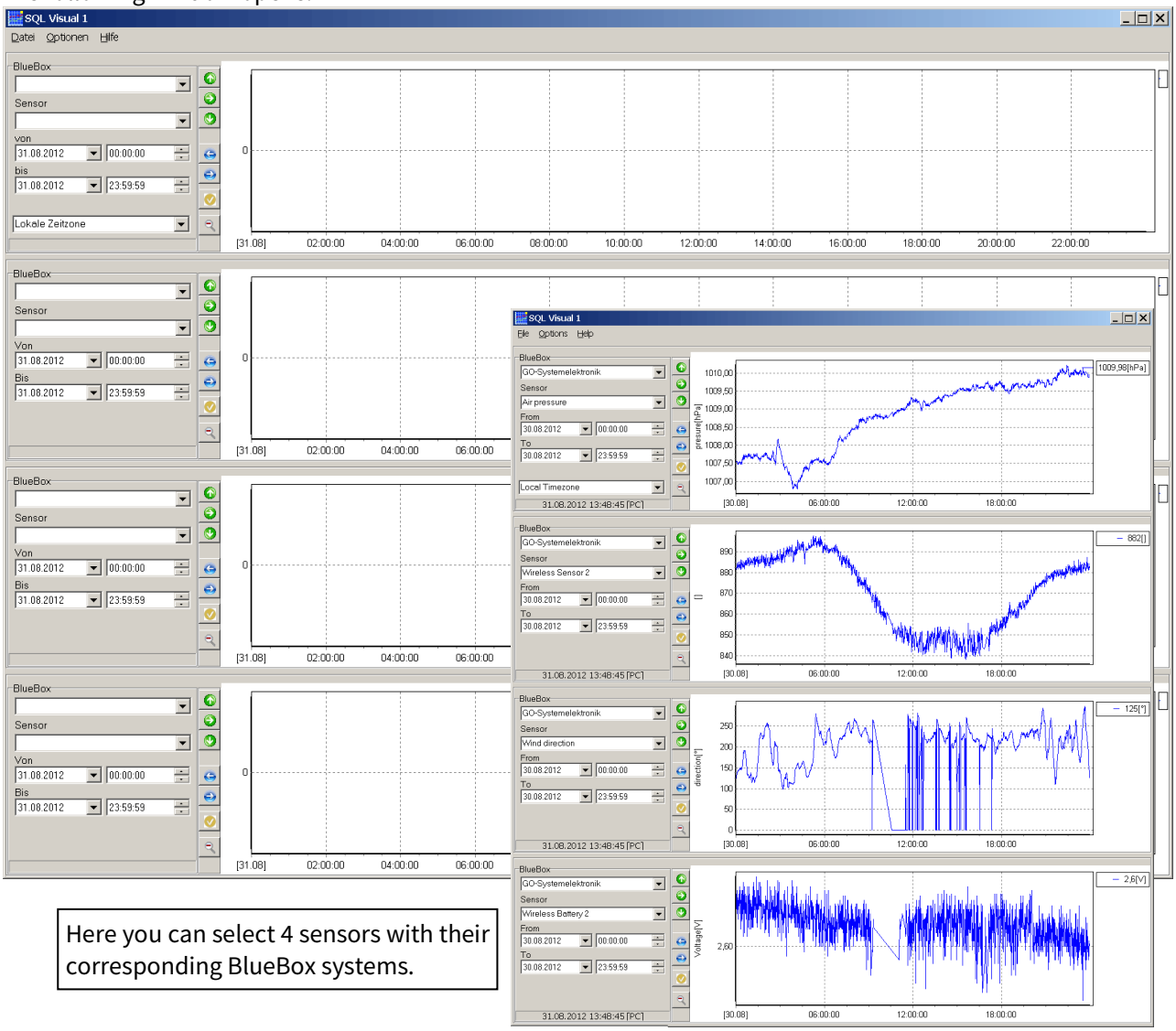
Note on the colour coding of the graph

If the sensor had sensor status 4, 50 or 51 whilst recording the measurement values, the graph of these measurement values will be marked in orange. for sensor status see *5.4.1.1 Sensor Status Messages in the Sensor Setup Window*

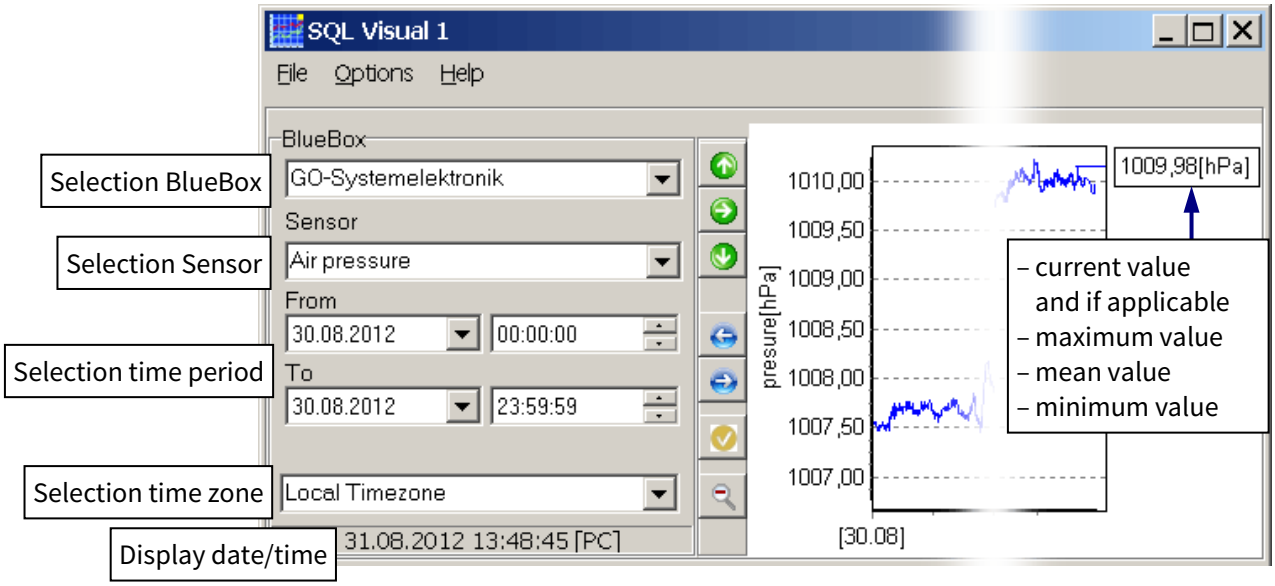
Calll-up Visual1:



The following window opens:



Here you can select 4 sensors with their corresponding BlueBox systems.



Selecting a time zone The displayed time zone can be changed as follows.

- **Coordinated Universal Time [UTC]** Display date/time in UTC according to the timestamp in the database
- **Local Timezone [PC]** Display date/time according to calculation from Coordinated Universal Time [UTC] to the time zone of the PC on which the BlueBox PC Software is installed.
- **BlueBox Timezone [BB]** Display date/time according to calculation from Coordinated Universal Time [UTC] to the selected time zone in the BlueBoxSoft network settings, see *3.2 Network Setup.*

 The maximum value measured in the selected time period will be shown as red curve.

 The average value measured in the selected time period will be shown as blue curve.

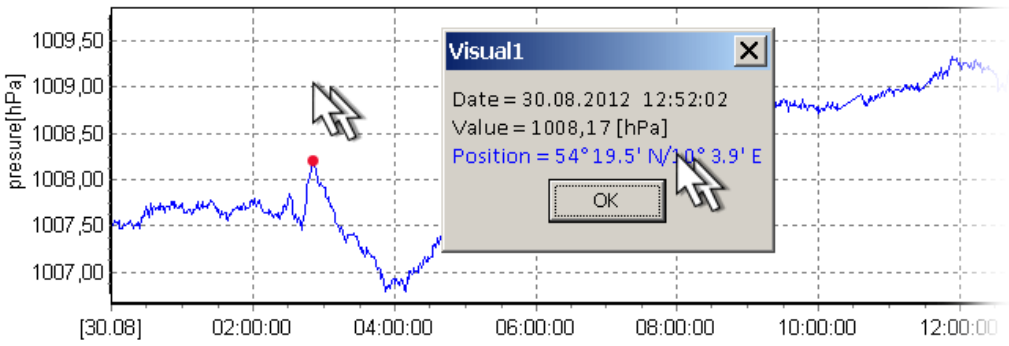
 The minimum value measured in the selected time period will be shown as yellow curve.

 Sets the display period back by one day.

 Sets the display period forward by one day.

 If available, additionally displays the SQI (Spectral Quality Index) for application-specific parameters derived from spectral data. In all other cases, the SQI value is meaningless here.

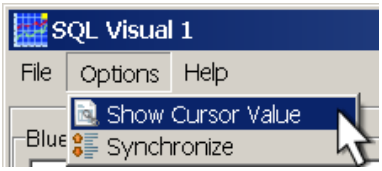
 Resets the zoom factor back to 1.



A red dot appears at the position on the graph closest to the mouse cursor.

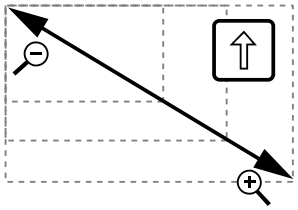
The key combination Ctrl+Delete deletes the measuring point from the display and the database.* Double-click opens a window with the measurement value, date, and time (and GPS data, if applicable) for the measurement point located under the red dot. Double-click on the position entry opens Google Maps at this position in your default browser.

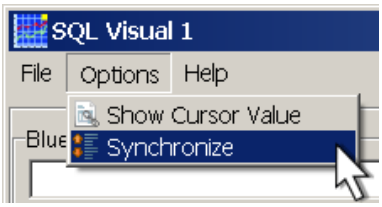
* Deletion cannot be undone in Visual1; however, the deleted data point remains in the BlueBox data memory and can be restored using the BlueBoxSoft program; see *3.4 Data Transfer to a Database* there *from – to*.



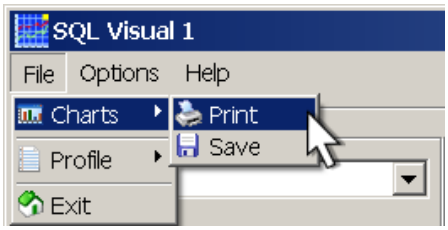
If [Show Cursor Value] is activated, the measurement value, date, and time are permanently displayed to the right of the graph.

You can zoom in or out by holding down the Shift key and the left mouse button and dragging a rectangle to the right or left.
Hold down the right mouse button in the diagram or use the mouse scroll wheel to move the diagram's time axis.

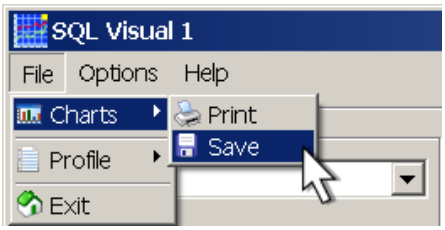




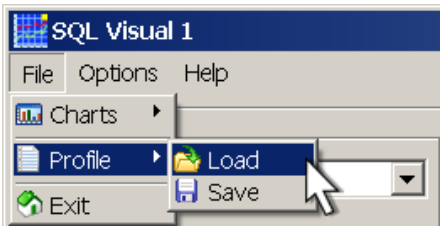
To better compare the four graphs, it is advisable to synchronise them in terms of time. The time settings within the first graph are decisive for this.
The four graphs are synchronised in terms of time by selecting [Synchronise] under [Options].
The graphs below are then adjusted to the time range of the first graph.



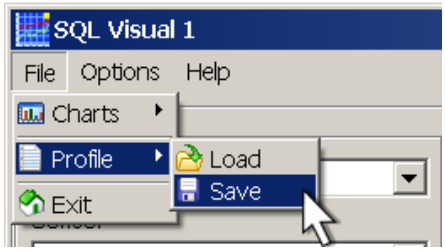
Opens the standard-printer-menu and prints all diagrams.



Saves every diagram separately in common graphic formats.

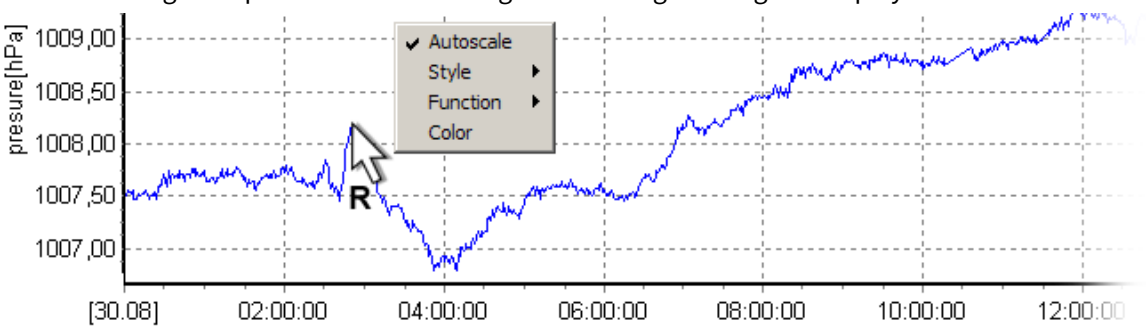


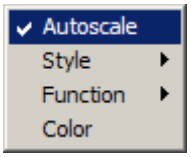
Loads a previously saved setting-profile of a vp1-file.



Saves a previously saved setting-profile (=current state of the Visual1 window) as vp1-file.

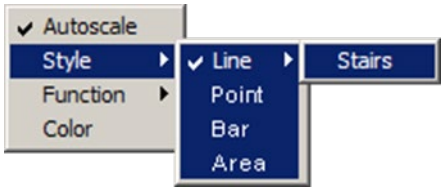
Right- click in the diagram opens a selection dialogue for setting the diagram display.





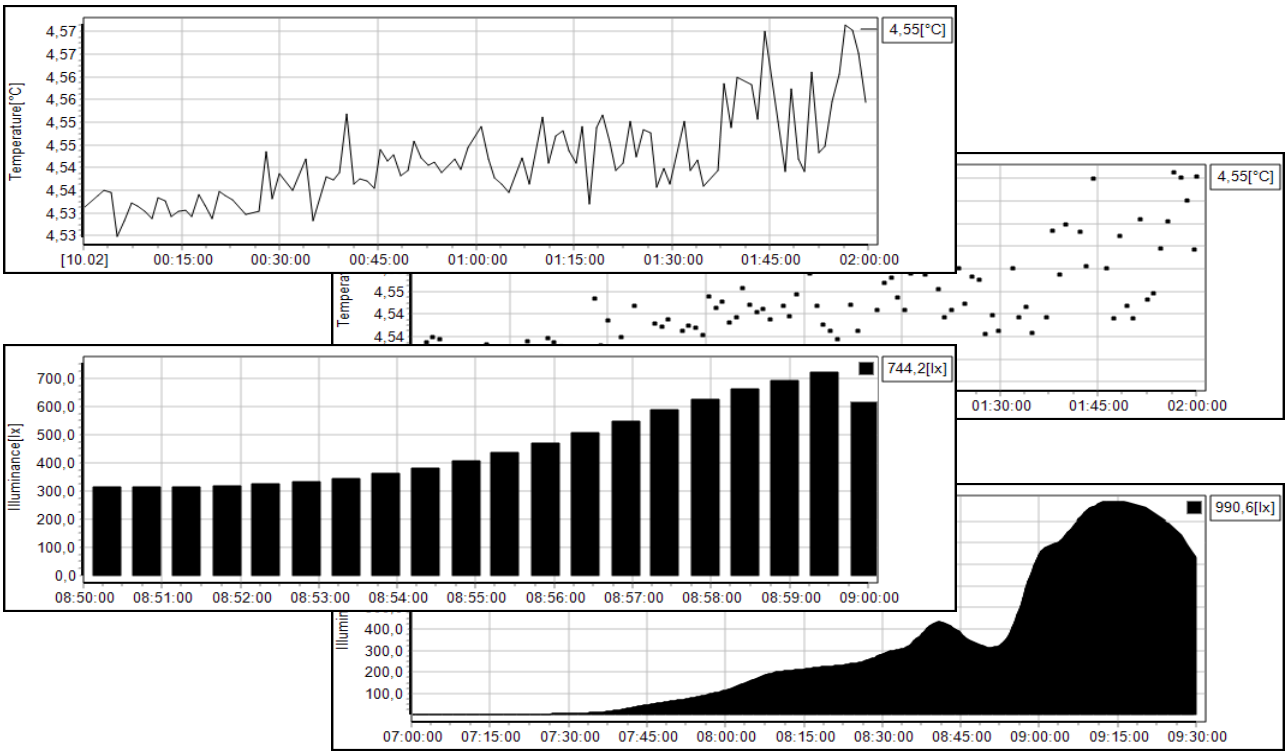
If [Autoscale] is enabled (default), the y-axis will be scaled in reference to the displayed measurement values, otherwise the y-axis will be scaled in reference to the measuring range of the sensor (see *5.4.1*).

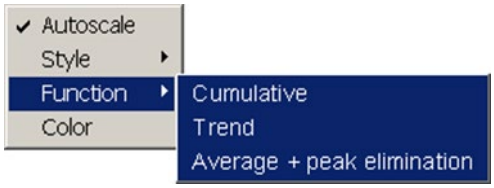
Note: Time periods without stored measurement values are easier to identify in the point or bar display.



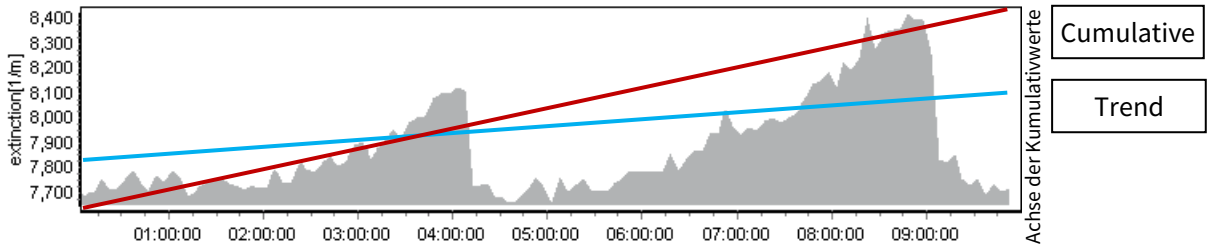
Switches the graph display back and forth between slanted (Peak) and straight (Stair) lines.
The stair diagram presents the switching points better.

Peak   Stair

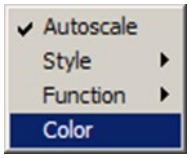




Setting for assigning functions to graphs. You can choose between displaying the cumulative value (“Cumulative”) and the trend value (“Trend”). Graphs are displayed in the diagram for both functions.

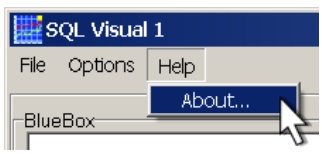


Average + peak elimination see *4.3.1 Averaging and Outlier Suppression*



Selecting a graph colour: The graph will be displayed in the selected colour.
The colour change will only take effect once the graph has been drawn or redrawn.

Note: If the sensor had sensor status 4, 50 or 51 whilst recording the measurement values, the graph of these measurement values will be marked in orange. It is therefore recommended not to use orange here.



Opens a window displaying the software version number. For any questions to GO Systemelektronik, please always quote this software version number.

4.3 VisualN

described program version: 4.5

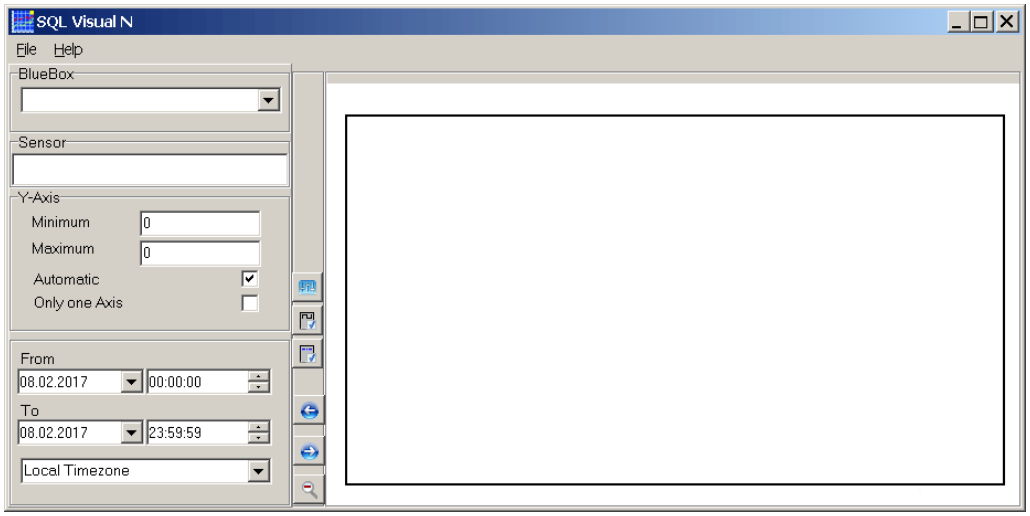
VisualN displays the measurement values from multiple sensors from a database in a diagram. Each sensor is represented by a coloured graph. The graph, scale and legend are all the same colour.

If the queried databases are updated during program runtime, the display is also updated.

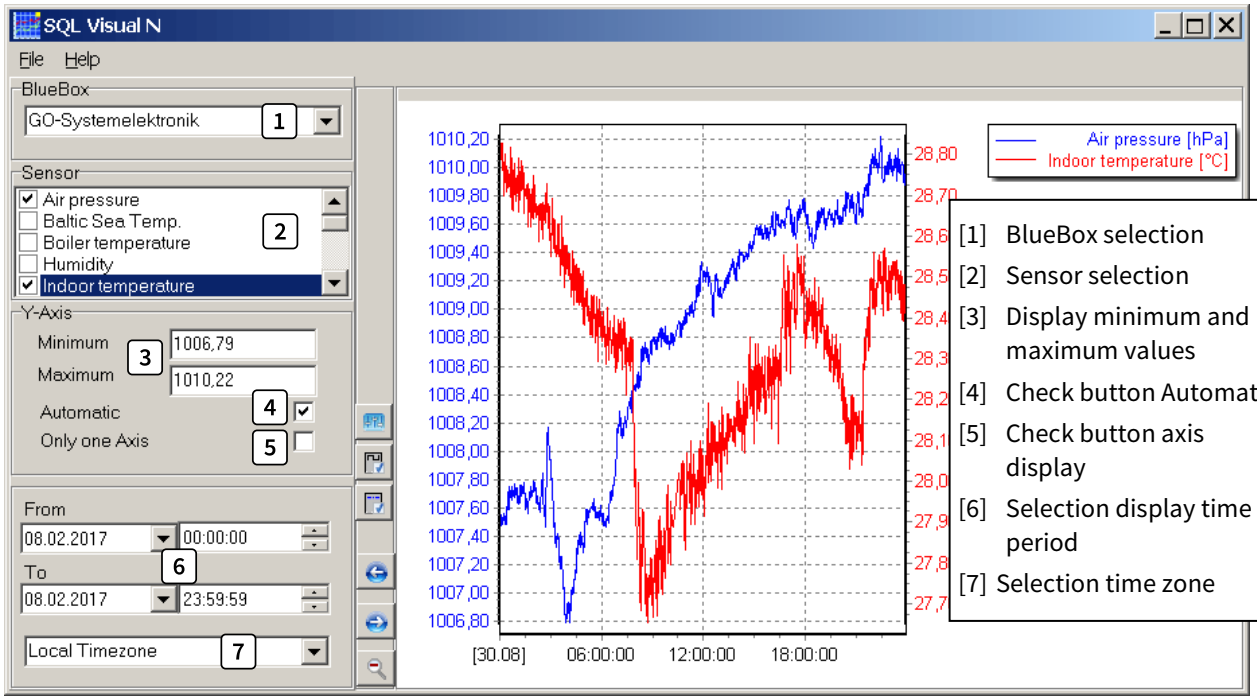
Note: Time periods without stored measurement values are easier to identify in the point or bar display in the Visual1 programme (see previous page).

Call-up VisualN:

The following window open:



Here you can select a BlueBox and the sensors connected to it.



Opens the window of the Button of the mean value settings.
see *4.3.1 Averaging and Outlier Suppression*

Switches the graph display back and forth between slanted (Peak) and straight (Stair) lines.

Peak   Stair

The stair diagram presents the switching points better.

Switches the graph display back and forth between continuous and dashed lines.

Sets the display period back by one day.

Sets the display period forward by one day.

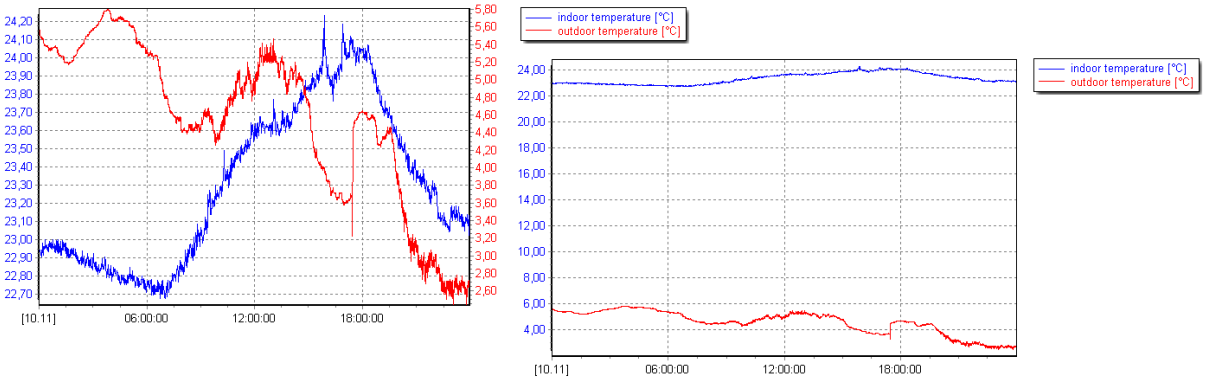
Resets the zoom factor to 1.

Automatic	☐	Automatic scaling of the vertical axis: Off
Automatic	☑	Automatic scaling of the vertical axis: On
Only one Axis	☐	Each sensor graph has its own y-axis.
Only one Axis	☑	The measurement values are scaled to one y-axis.

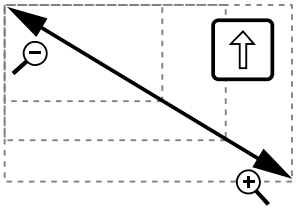
Selecting a time zone The displayed time zone can be changed as follows.

- **Coordinated Universal Time [UTC]** Display date/time in UTC according to the timestamp in the database
- **Local Timezone [PC]** Display date/time according to calculation from Coordinated Universal Time [UTC] to the time zone of the PC on which the BlueBox PC Software is installed.
- **BlueBox Timezone [BB]** Display date/time according to calculation from Coordinated Universal Time [UTC] to the selected time zone in the BlueBox-Soft network settings, see *3.2 Network Setup*

For better comparability of the graphs, it is recommended to select "Only one axis" if several sensors of the same parameter are to be displayed in the diagram. The display will then only have a y-axis.



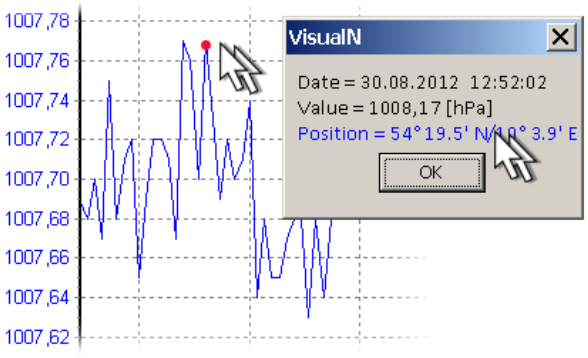
You can zoom in or out by holding down the Shift key and the left mouse button and dragging a rectangle to the right or left.
Hold down the right mouse button in the diagram to move the time axis of the diagram, and use the scroll wheel of the mouse to move the y-axis.

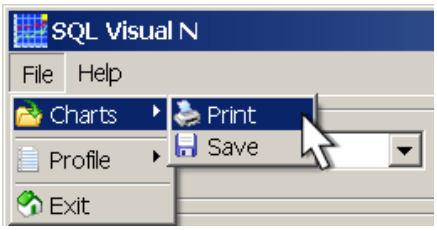


A red dot appears at the point on a selected graph that is closest to the mouse cursor.

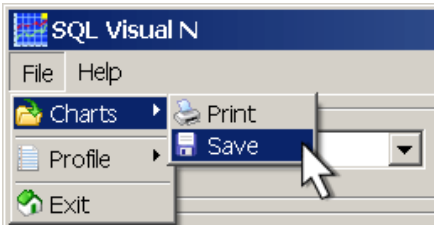
The key combination Ctrl+Delete deletes the measuring point from the display and the database.*

Double-click opens a window with the measurement value, date, and time (and GPS data, if applicable) for the measurement point located under the red dot.
Double-click on the position entry opens Google Maps at this position in your default browser.

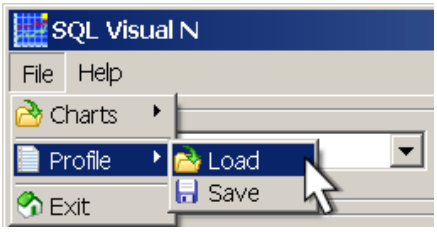




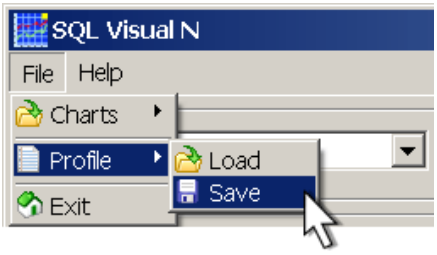
Opens the standard-printer-menu and prints the diagram.



Saves the diagram in common graphic formats.



Loads a setting-profile of a vpn-file.



Saves a setting-profile (=current state of the VisualN window) as vpn-file.

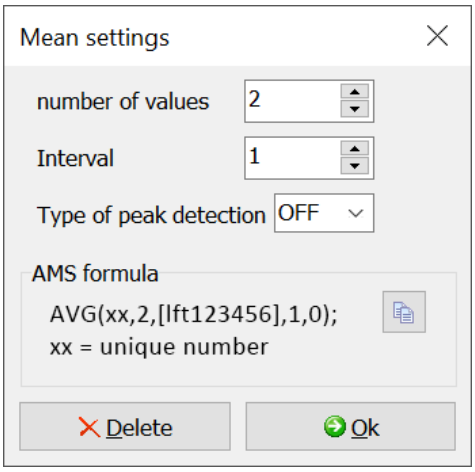
Opens a window displaying the software version number. If you have any questions to GO Systemelektronik, please always quote this software version number.

* Deletion cannot be undone in VisualN; however, the deleted data point remains in the BlueBox data memory and can be restored using the BlueBoxSoft program; see *3.4 Data Transfer to a Database* there *from – to*.

4.3.1 Averaging and Outlier Suppression

Visual1 Right-click in the diagram view > Functions > Averaging and peak elimination

VisualN Button of the mean value settings



Here you can specify how the AMS formula element **AVG**[1] is used to calculate a moving average and how outliers are detected and suppressed.

The settings **only change the display of the measurement values** in Visual1 and VisualN and **have no effect on the measurement values in the database**. Here, the effect of the formula element AVG[1] can be tested on existing measurement values

If necessary, the corresponding AMS formula can be copied into the formula input field of a sensor.

Delete — Disables the entries for the diagram view and closes the window. Similarly, click on ✕.

Ok — Enables the entries for the diagram view and closes the window.

Number of values Number of measurement values from which the moving average is calculated; the minimum is 2.

Interval[2] **Time distance in seconds**
This determines the time distance at which measurement values are added to the moving average. For example, if the entry is 60, a measured value is only added to the average every 60 seconds.

Type of outlier/peak detection: Type selection for outlier detection in the drop-down list

0 (OFF)	No outlier suppression

The n measurement values determined by the number of values (see above) are sorted by size.

1	The lower and upper 10 percent by number are removed and the arithmetic mean is calculated.
2	The lower and upper 20 percent by number are removed and the arithmetic mean is calculated.
3	The lower and upper 30 percent by number are removed and the arithmetic mean is calculated.
4	The lower and upper 40 percent by number are removed and the arithmetic mean is calculated
5	The calculated mean is the median of all n values.

AMS formula This field displays the corresponding AMS formula entry.

AVG(*xx,b,[Sensor-ID],d,e*);

xx = Identification number of the moving average calculation (0 to 9999) Each identification number may only be assigned once within a BlueBox.

b = Number of measurement values to be averaged.

[Sensor-ID] = measurement value of the sensor

d = Interval (Time distance in seconds)

e = Type of outlier detection

Click on copies den formula entry into the clipboard.

[1] see *5.5.3.1 Elements of the Formula Input Assistance* there *Moving Averaging and Outlier Suppression*

[2] Not to be confused with the measurement interval.

5 AMS – Advanced Managing Software

described program version: 5.1

5.1 Introduction AMS

Advanced Managing Software gives you direct access to a BlueBox and its operating parameters. An essential tool of AMS is the integrated formula language AMS Formula (see *5.5 AMS Formula*).
With AMS, you can only access BlueBox systems that have been set up with the assigned database via the BlueBoxSoft program.

Features of AMS (excerpt):

- Setting system and communication functions
- System monitoring
- Sensor setting including sensor calibration
- Mathematical functions for calculating measurement values
- Logical links between sensors and actuators
- Setup of virtual (calculated) sensors
- Notification by e-mail and SMS for freely definable events
- Change of variables by SMS

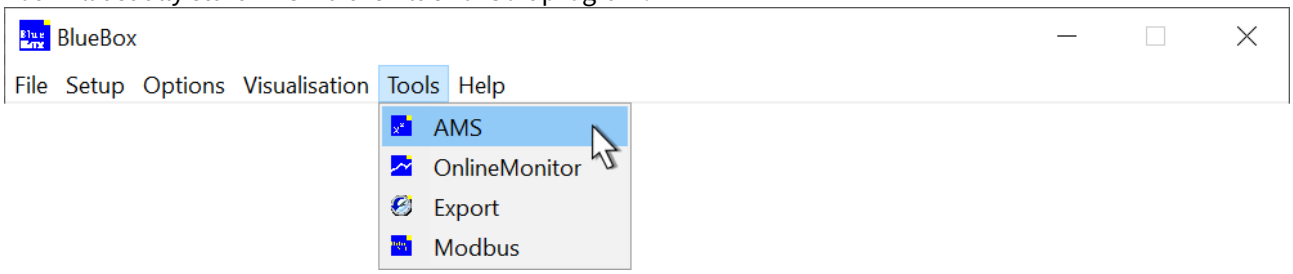
Note: There is a PLC[1] function extension in AMS. This extension is not described in this manual. For more information, please contact GO Systemelektronik.

5.1.1 Note on Storage Behaviour

Settings made using AMS are transferred immediately to the data storage memory of the BlueBox and to the sensor modules/sensor electronics. Exceptions to this are AMS formula entries: The content of an AMS formula field is only permanently stored in the data storage memory of the BlueBox 30 seconds after being transferred to the BlueBox.[2] This means that, following a crash caused by a formula, the BlueBox can be safely restarted.

5.2 Call-Up AMS

You will usually start AMS via the BlueBoxSoft program.



You can also start AMS via the Windows Explorer. Unless otherwise specified during installation, AMS.exe is located in the folder "C:\Program Files\BlueBox" or "C:\Program Files (x86)\BlueBox".

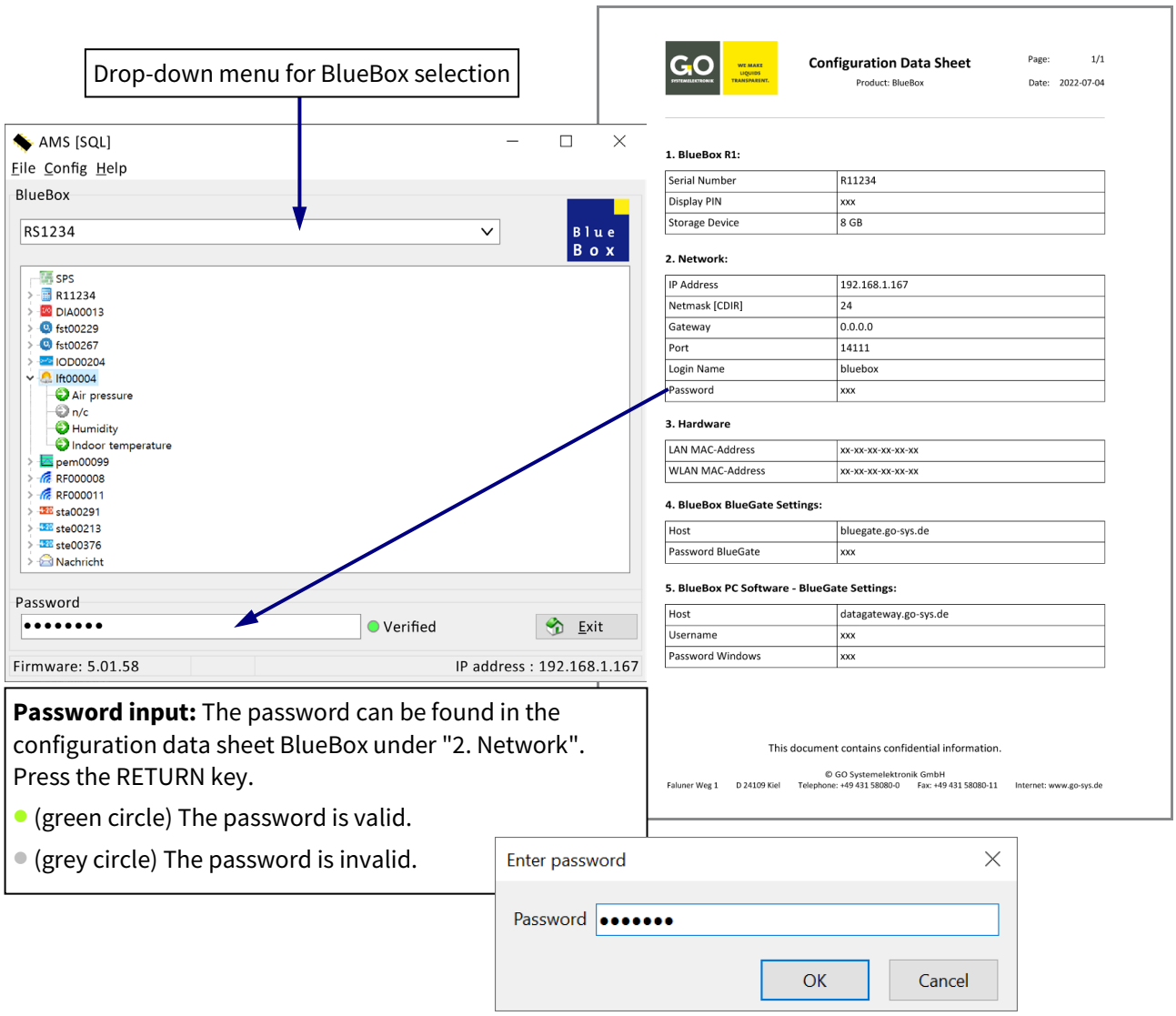
[1] PLC – Programmable Logic Controller

[2] Therefore, any changes you make to the formula will be lost if you shut down the BlueBox within those 30 seconds.

5.3 System Functions and Communication Settings

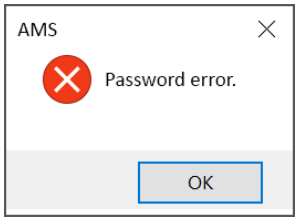
5.3.1 Password Input

After starting AMS and the selection of a BlueBox you will see the following window.
To gain full access to BlueBox, the corresponding network password must be entered. The network password can be found on the configuration data sheet that comes with every BlueBox.



Password input: The password can be found in the configuration data sheet BlueBox under "2. Network". Press the RETURN key.

- (green circle) The password is valid.
- (grey circle) The password is invalid.



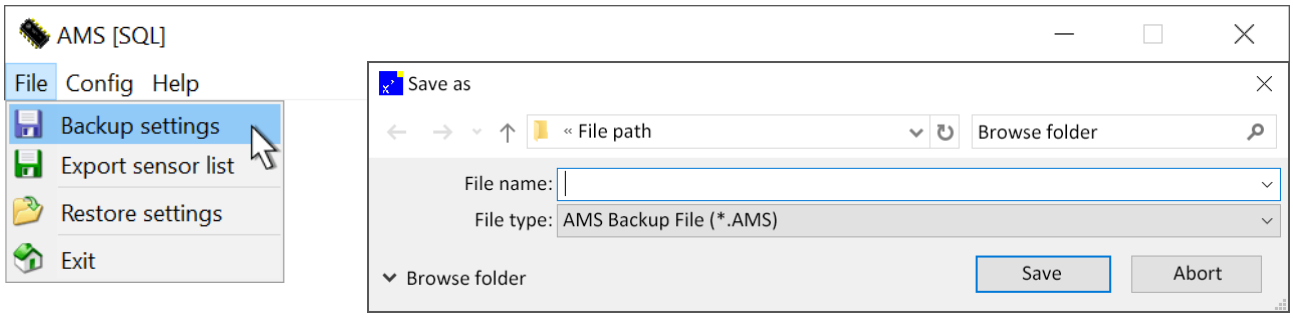
If the password you have entered is incorrect, an error message will appear. If you have not entered the correct password, you will still be able to start the program, but you will not be able to change any settings or view calibration values and raw data.
The “Enter password” prompt only appears if ⚙ > 🌐 > **CONNECTIVITY SETUP >** ☑ **Block anonymous connections** is enabled on the BlueBox display.
If ☑ **Block unprotected connections** is enabled there, ☑ **Protected** must be enabled in the BlueBoxSoft program, see *3.2 Network Setup*.

If ⚙ > 🖧 > **NETWORK ADDRESSES >** ☑ **Block IP after authentication error** is enabled on the BlueBox display, the connection is subject to a timeout as a safety measure.
If you enter the wrong password several times, the BlueBox will block the connection. It takes a few seconds for the blocked IP address to appear at the bottom left of the display.

5.3.2 File

5.3.2.1 Save Settings for Virtual Sensors and Messages

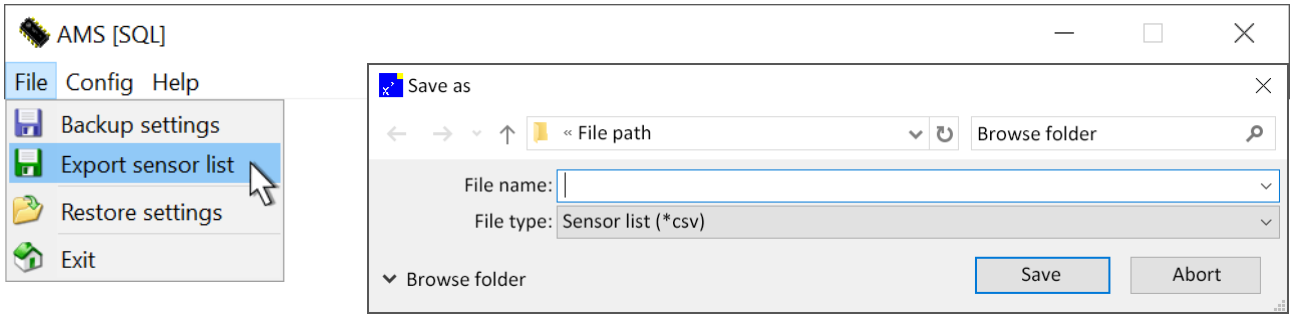
Here you can save the settings and AMS formulas for all virtual sensors and all messages as an AMS backup file. A window opens in which you can select the storage path.



To restore settings, see below *5.3.2.3 Restore Virtual Sensor and Message Settings*

5.3.2.2 Export Sensor List

Here you can save the sensor list as a csv file. The sensor list contains all sensors (real and virtual) with their sensor IDs, settings and storage modes.
A window opens in which you can select the storage path.



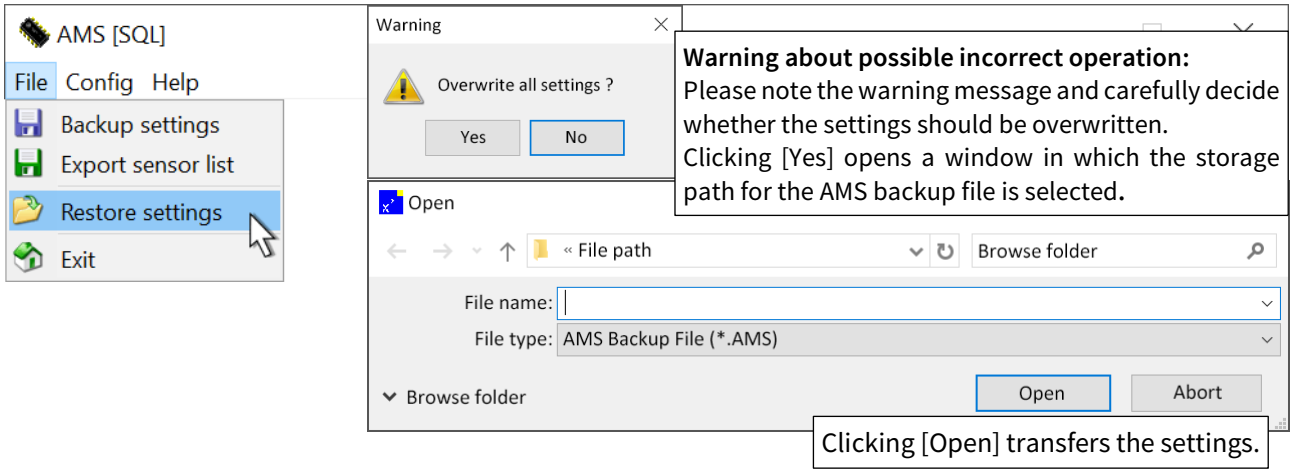
The data in this csv file is separated by semicolons.

Structure: Modul;Sensor;Name;Comment;Parameter;Source;Value;Unit;Min;Max;Decs;Interval;Average;Store mode
| Module-ID | Sensor number | Sensor name | Comment | Parameter | Connection type | Last measurement value | Meas. unit | | Min. measurement value | Max. measurement value | Decimal places | Measurement interval | Averages | Storage mode (internal value) |

The data in a csv-file is separated by semicolons. It is recommended to open these files with a program that displays the data in a clearly arranged way. see *Appendix F – Opening of a csv-File*

5.3.2.3 Restore Virtual Sensor and Message Settings

Here, AMS backup files (see *5.3.2.1 Save Settings for Virtual Sensors and Messages* above) can be restored, i.e. the settings are transferred back to the BlueBox, overwriting the current BlueBox settings. After selecting "Restore settings", a warning window appears asking whether the settings should be overwritten.



Warning about possible incorrect operation:
Please note the warning message and carefully decide whether the settings should be overwritten.
Clicking [Yes] opens a window in which the storage path for the AMS backup file is selected.

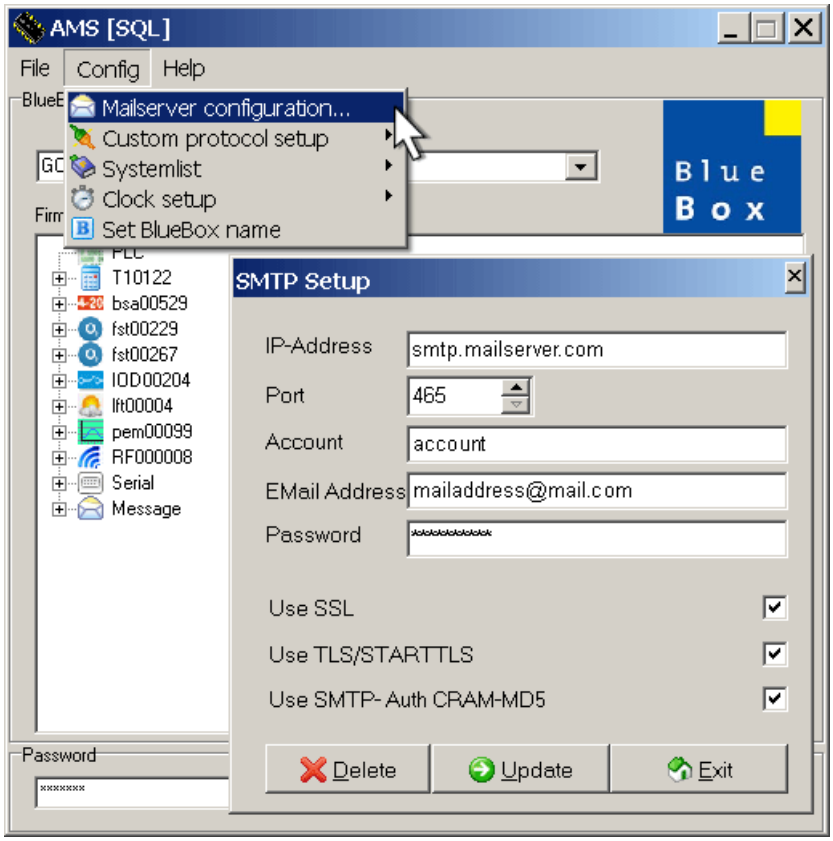
Clicking [Open] transfers the settings.

5.3.3 Configuration

5.3.3.1 Mailserver Setup

Here you can configure the mail server settings.

Emails will be sent from BlueBox using the email address entered here.



IP-Address IP address of your e-mail server or the name of your e-mail server
Is the name of your mail server written here and is the BlueBox connected to the internet via a router or similar and not via an internal modem, then a DNS server must be entered in the BlueBox.

Menu operation: System ⇨ Network ⇨ DNS-Server ⇨ DNS-Server 1

Port Here as an example port 465 (default port for a SMTP connection).

Account Account name of the e-mail account

E-Mail Address E-Mail address of the e-mail account

Password E-mail password

Use SSL ☑ E-mails are encrypted with SSL.

Use TLS/STARTTLS ☑ E-mails are encrypted with TLS/STARTTLS.

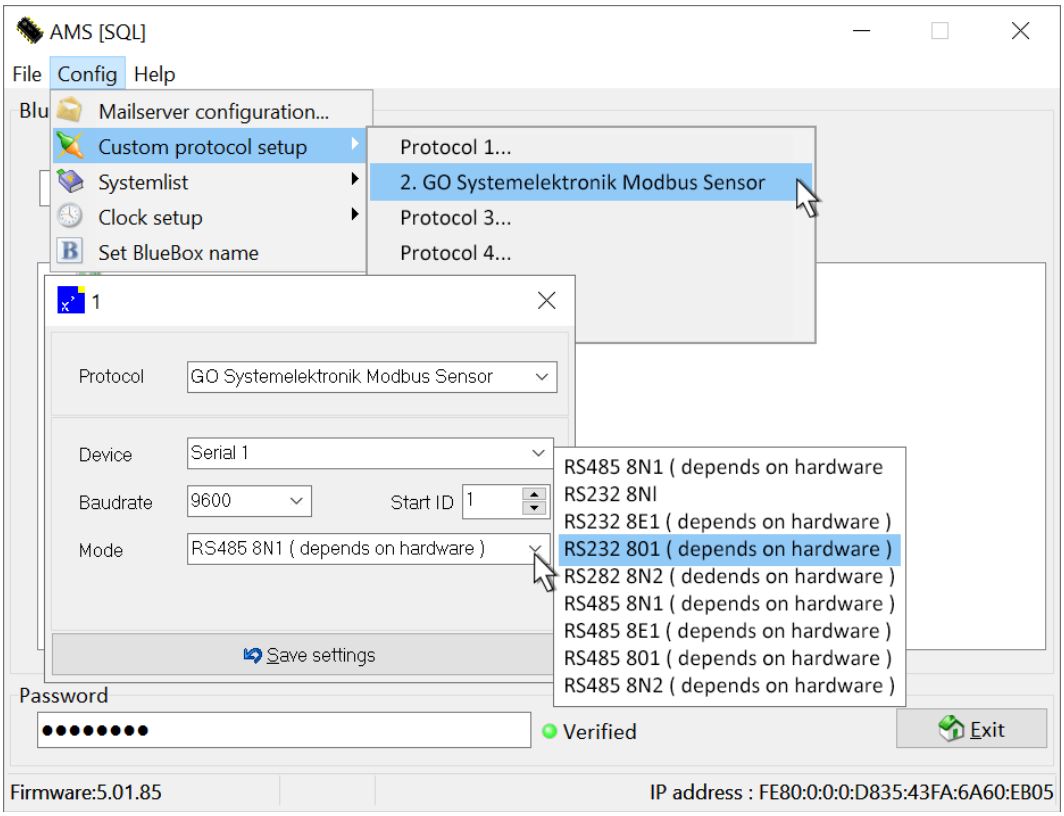
Use SMTP-Auth CRAM-MD5 ☑ SMTP authentication accordingly CRAM-MD5

Delete — Deletes all entries except the port entry.

Update — Transfers the settings to the BlueBox.

5.3.3.2 Custom Protocol Setup

These settings allow external devices to be connected.
Example: GO Modbus sensor on the internal serial interface of the BlueBox.



Note: When connecting a GO Modbus sensor (BlueTrace, BlueEC) **to the internal RS485 serial interface** of the BlueBox R series, the sensor is automatically detected and entered with the appropriate protocol settings.
Prerequisites: The internal RS485 interface of the BlueBox must be active and no user protocol must have been entered yet.

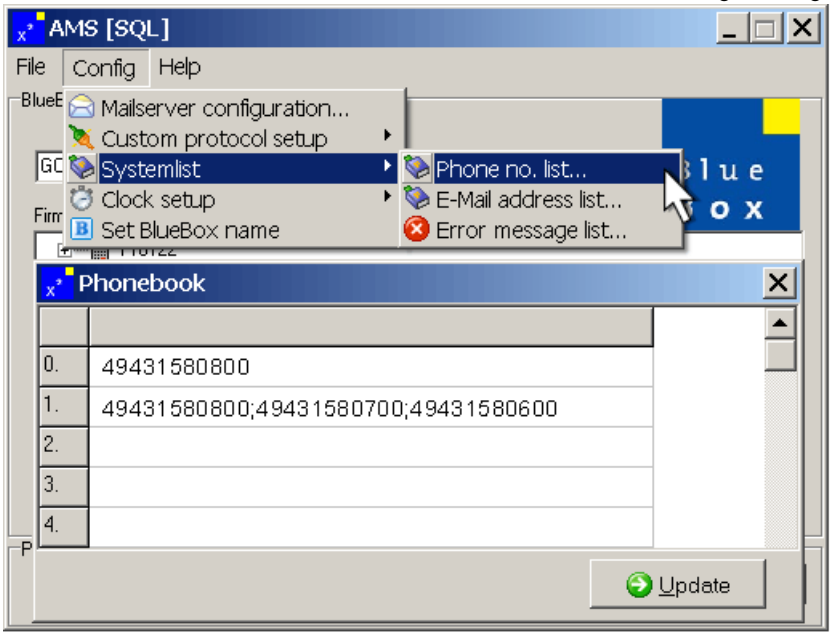
The connection of Modbus devices is described in *6.2 ModConfig (Modbus Client Configuration)*.

The settings for other devices are determined by the respective configuration and are hardware-dependent.
For further information on setting up other devices, please contact GO Systemelektronik.

5.3.3.3 System Lists

5.3.3.3.1 Phone Number List

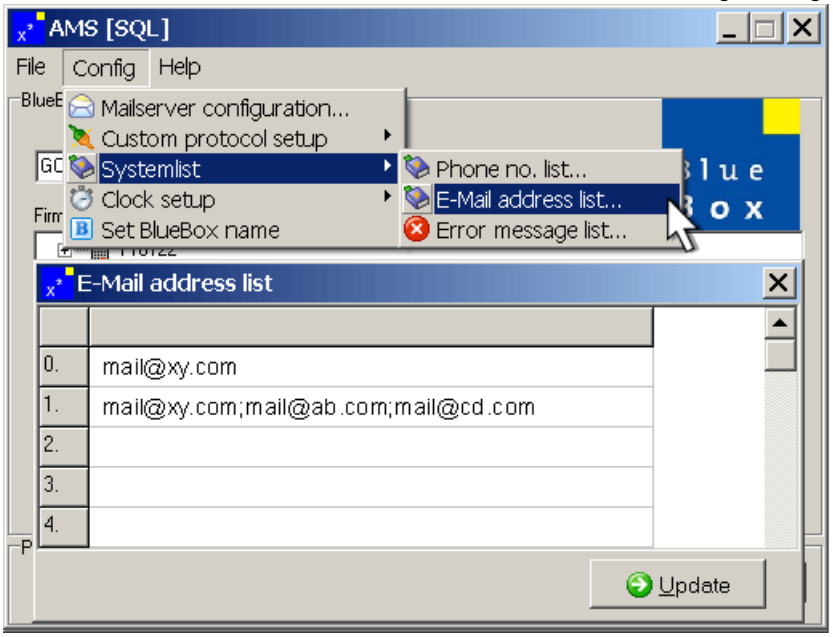
When sending SMS messages with AMS, you can refer to the corresponding telephone numbers via the row number. see *5.4.2 Sending Messages by E-Mail and SMS*



Here you can enter and delete phone numbers in the international format without the plus sign (+). The phone number from GO Systemelektronik in the footer of this page has to be entered as 49431580800. You can also enter multiple telephone numbers in one line, separated with a semicolon or a space*. Click on <Update> to transfer the telephone number list to the BlueBox. An entry is deleted by deleting the entry in the line and then clicking on <Update>.

5.3.3.3.2 E-Mail Address List

When sending e-mails with AMS, you can refer to the corresponding e-mail addresses via the row number. see *5.4.2 Sending Messages by E-Mail and SMS*

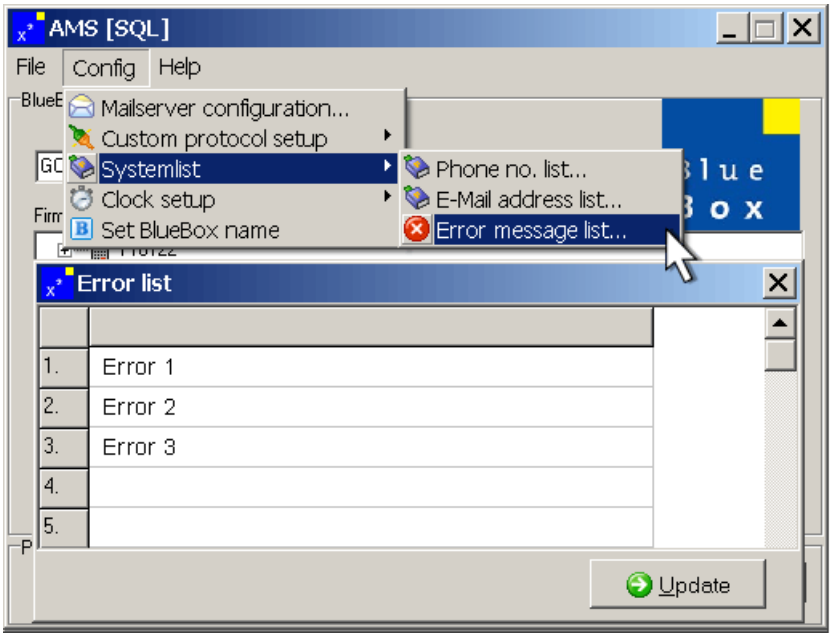


Here you can enter and delete e-mail addresses. You can also enter multiple e-mail addresses in one line, separated with a semicolon or a space*. Click on <Update> to transfer the e-mail address list to the BlueBox. An entry is deleted by deleting the entry in a row and then clicking on <Update>.

* max. 120 characters – Row 1. in these examples has 35 characters

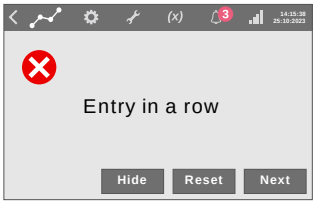
5.3.3.3.3 Error Message List (user-defined)

Using AMS formulas, user-defined error messages can be displayed on the BlueBox display.



In this window you can define error messages.
An error is set, reset and queried using the appropriate AMS formula entries.
see *Appendix H – List of the AMS Formula Elements* there *18. Errors (user-defined)*

The entry in a row appears in an error message on the BlueBox display.
see *Manual BlueBox R1 and Panel* there *6.1.4 User-Defined Error Messages*



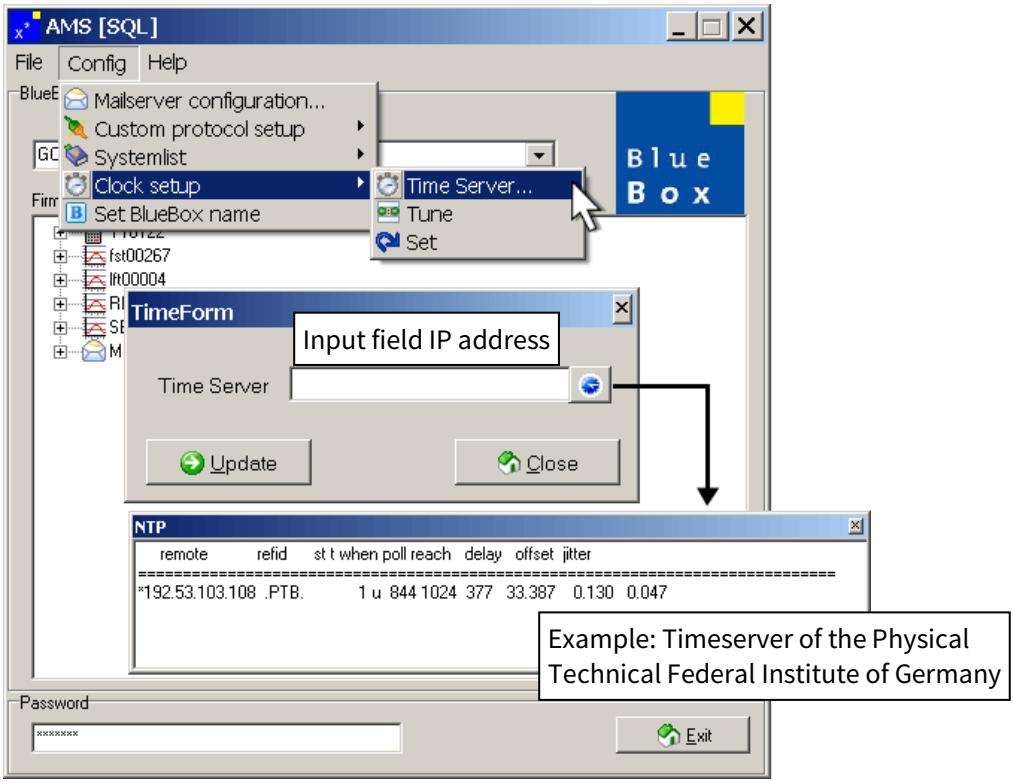
User-defined error message on the BlueBox display

Clicking  transfers the list of error messages to the BlueBox.

An error message is deleted by deleting the entry in the row
and then clicking <Update>.

5.3.3.4 Clock Setup

5.3.3.4.1 Time Server

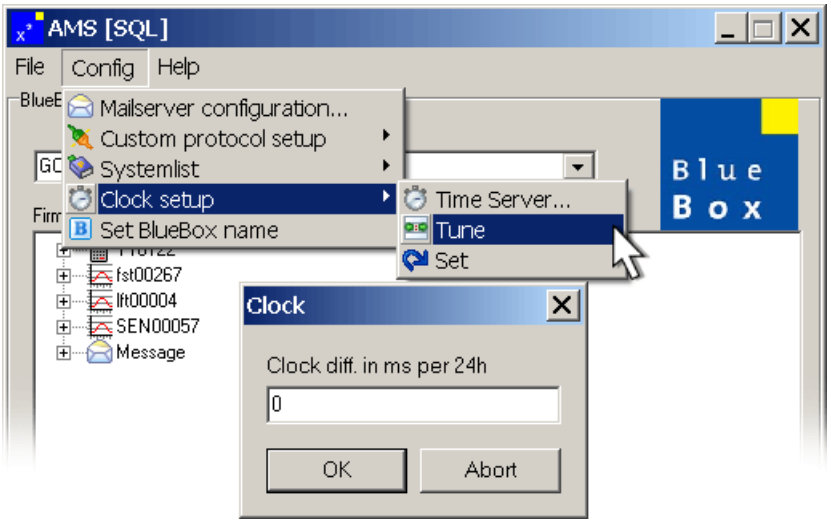


To have the exact time at the BlueBox, there is the possibility to synchronize the BlueBox with an exact time server. You enter the IP address of the time server in the input field.

Clicking this button transfers the entered IP address to the BlueBox.

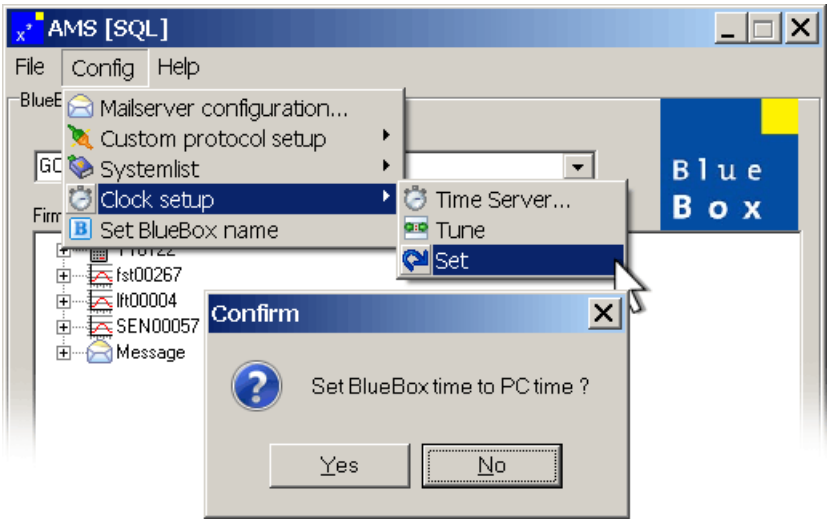
Clicking this button displays the current setting and status of the time server.

5.3.3.4.2 Clock Tuning



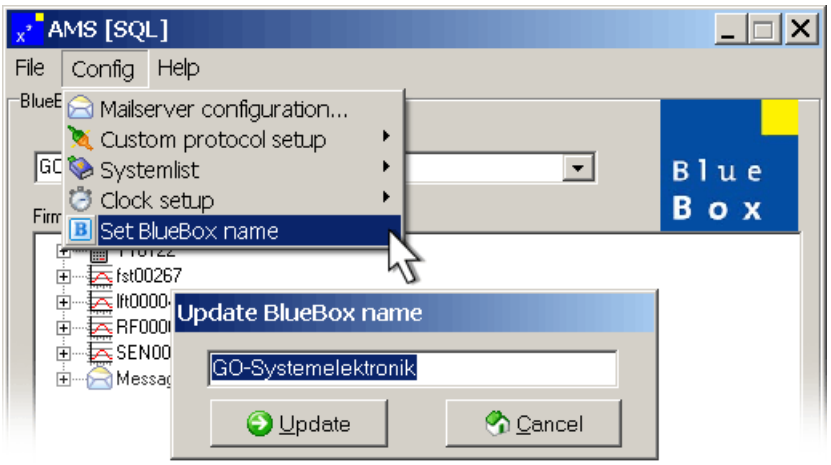
In order to calibrate the internal clock of the BlueBox, the time variation within 24 hours of the internal clock has to be entered here. The internal clock is then faster (positive value) or slower (negative value). The value has the unit milliseconds [ms]. Only useful if no time server is specified!

5.3.3.4.3 Set Date and Time



Sets the UTC time of the BlueBox[1] to the UTC time of the Windows computer[2].
The actual time shown on the display of the BlueBox is dependent on the time zone, set on the BlueBox.
Only useful if no time server is specified!

5.3.3.5 Change BlueBox Name

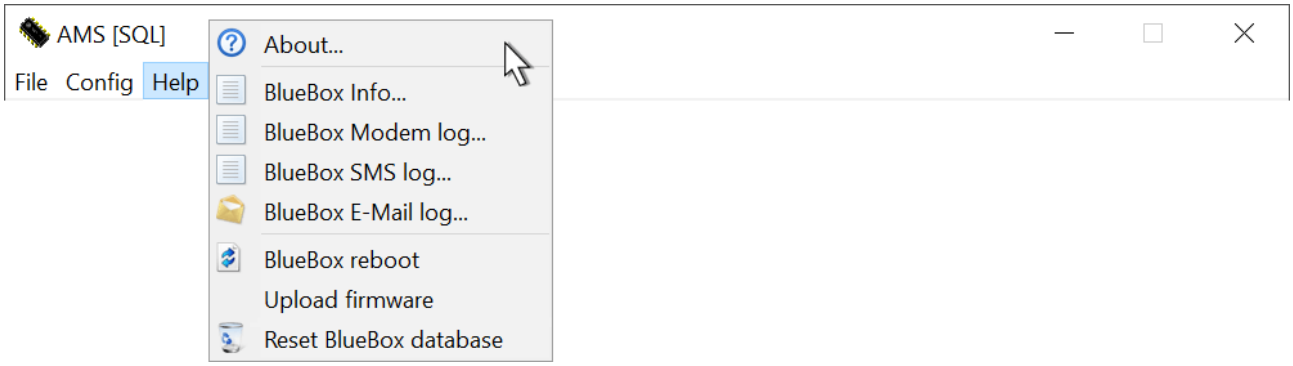


Here you can change the name of a BlueBox. see also *3.2.1* and *3.2.2*

Saves the name change and closes the window.

[1] displayed clock time of the BlueBox +/- time zone
[2] displayed clock time of the computer +/- time zone

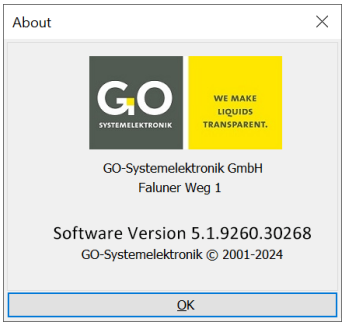
5.3.4 Help



Info Opens a window containing the version number of the AMS software. The software version in this example is **5.1**.
The information after the second dot is for internal purposes.

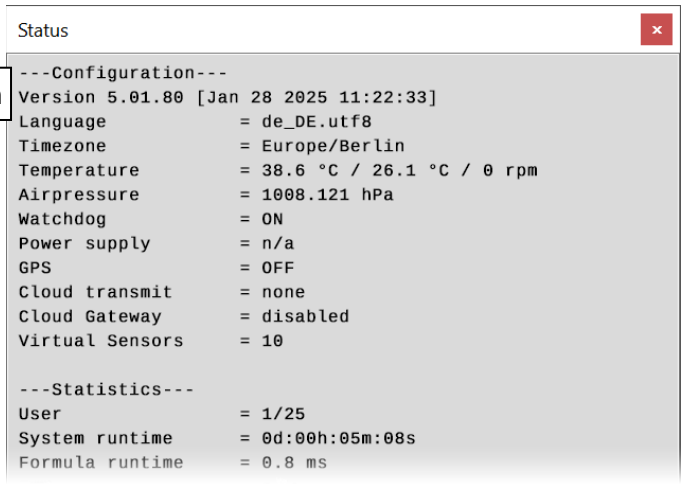
The version of the AMS software corresponds to the version of the installation software.

see also *1.1 Software Versions of the BlueBox PC Software*



BlueBox Info… Opens a window with advanced system information.

BlueBox firmware version



BlueBox Modem log… Opens a window with the connection log of a modem.

BlueBox SMS log… Opens a log of SMS messages sent and received using the messaging function.

see *5.4.2 Sending Messages by E-Mail and SMS*

BlueBox E-Mail log… Opens a log of e-mails sent using the messaging function.

see *5.4.2 Sending Messages by E-Mail and SMS*

BlueBox reboot Restarts the current BlueBox. Confirmation needed

Upload firmware Enables a BlueBox firmware update via AMS[1]
Further details available from GO Systemelektronik if required

Reset BlueBox database[2] Deletes all measurement data on the BlueBox. Confirmation needed

⚠ **Warning: This deletion is irreversible!**

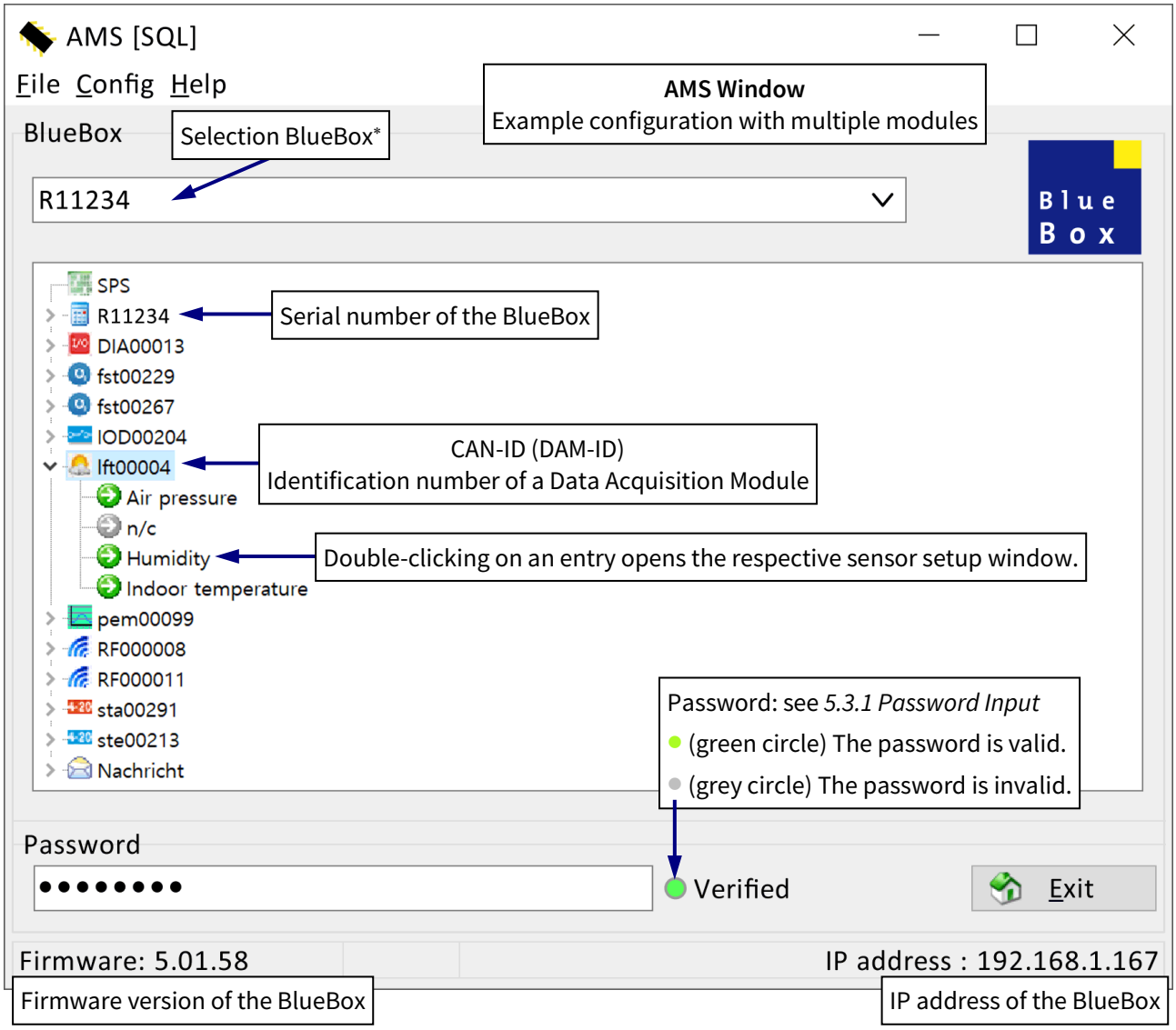
[1] This is only required if the BlueBox has no internet connection and an update cannot be performed via the USB port on the BlueBox.

[2] Measurement data consists of a timestamp, the measurement value, possibly the sensor status at the time of measurement, possibly GPS data, and possibly the SQI (only for spectral data).
Deleting this data is really only advisable when a BlueBox is being passed on to another party.

5.4 The AMS Start Window

If settings are changed on the BlueBox display, the changes are only transferred to AMS when a connection is established after a program start or using the reconnect function (keyboard key F1 on the computer when the AMS Start Window is active).

Start the AMS program, e.g. via the BlueBoxSoft program. The AMS Start Window opens.



Symbols of the AMS Start Window

Symbol of the virtual sensors

... Specific symbols of external modules

... Sensor status symbols, see next page

Message symbols, see next page

Symbol for the PLC function extension in AMS. This extension is not described in this manual. For more information, please contact GO Systemelektronik.

Note on actuators: There are analog actuators (e.g. a current output) and digital actuators (state 0 or 1). For digital actuators, the term relay is used here as a synonym.

* Strictly speaking, no BlueBox is selected, but a name assigned to the BlueBox (see *3.2.1 Network Settings on a BlueBox* there ① *BlueBox Name*) and therewith a BlueBox. The input is auto completive.
You can also enter the BlueBox's serial number and IP address.

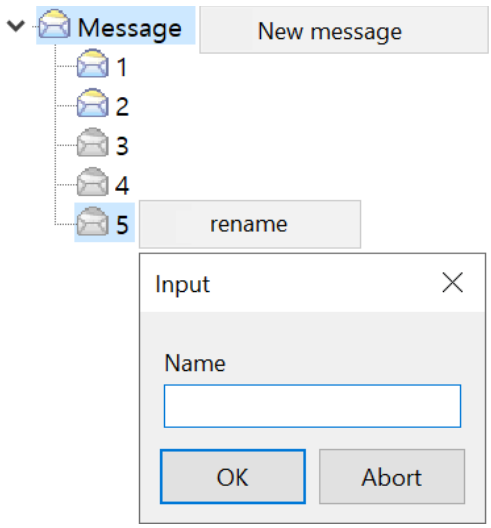
There are 6 different sensor status symbols with the following meanings.

	green	The sensor works.
	grey	The sensor is not active. Sensors are not active if in the sensor setup window, the sensor name is set to **n/c** (not connected). see *5.4.1*
	red	Sensor error
	blue with magnifying glass	Waiting for the first measurement value
	rotating arrows	The service mode[1] is switched on.
	Warning sign	The value of a virtual sensor is outside the measurement range limits [2] or the limit value of the SQI value of an application-specific parameter from spectra data is exceeded.
	Scale	The maximum calibration interval of a sensor is exceeded, currently only realized in the clear water calibration of a spectrometer.

Notes on actuators: 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 status.

Messages  Message symbol (SMS and E-Mail)
Double-clicking on a message symbol opens the message setup window.[3]
 As long as a message condition[3] is fulfilled, the message symbol is a warning sign.

Message list



Five messages are entered in the message list by default. Right-click and click on <New message> to create a new message.

New messages start with message number 6. New messages without a formula entry are deleted when a connection is established (program start/reconnect [F1]).

 Messages without an entry are displayed in grey.

The name of the message (here **5**) is highlighted in blue:
Right-clicking and selecting <rename> opens an input window for assigning a message name.

The names are only stored locally on the PC. If the names of the messages are accessed from other PCs, the name changes made here will be ignored.

[1] Service mode suppresses the recording of maintenance data that is irrelevant to measurements.
see *Manual BlueBox R1 und Panel* there *8 Service Display*

[2] see *5.4.1 The Sensor Setup Window* there *Min. Value* and *Max. Value*

[3] see *5.4.2* Sending Messages by E-Mail and SMS

Identification numbers

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

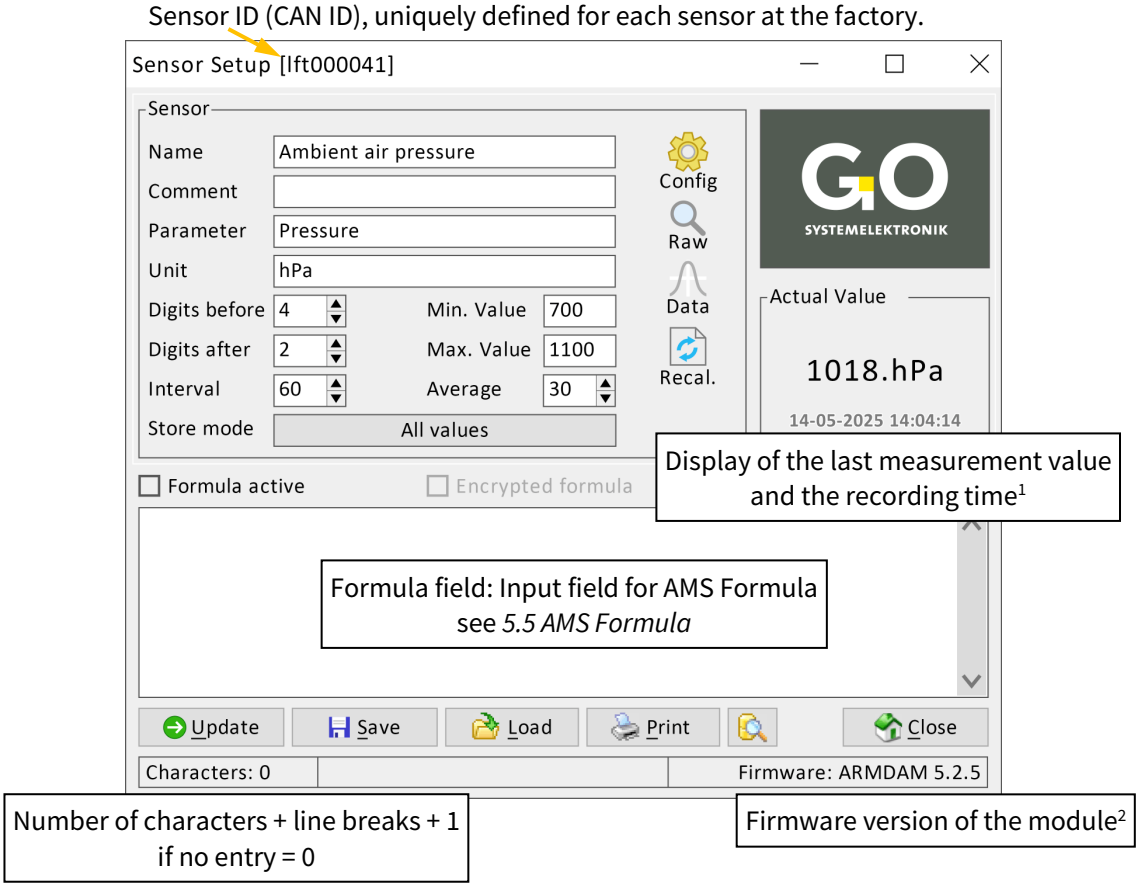
  The DAM ID consists of 3 letters + 5 digits and is factory set.
- **Sensor number:** The sensor number (consecutive number 1 to 16) of a real sensor is factory set via the respective sensor input on the Data Acquisition Module.
- **CAN ID*** (Sensor ID) **of a real sensor** = DAM ID + sensor number
- **CAN ID**** (Sensor ID) **of a virtual sensor** = 00*** + **serial number of the BlueBox** + 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/RS232 interface of the BlueBox and the **internal sensors** (temperature sensor and air pressure sensor)**** have the ID of a virtual sensor.

* The CAN ID is strictly speaking the ID of the sensor input on the DAM.
** Strictly speaking, the ID of a virtual sensor is not a CAN ID.
*** 00 means zerozero
**** Depending on the model, there is also a humidity sensor.

5.4.1 The Sensor Setup Window

on the example of a real sensor

Double-click on the name of a sensor in the AMS Start Window (see *5.4*). The Sensor Setup Window opens.



Opens the calibration window of the sensor (see *5.4.1.2 Sensor Calibration*)

Displays the uncalibrated[3] value (raw value) of the Sensors, as received by the sensor module.

Opens the data processing window (smoothing, moving average calculation and peak detection). see *5.4.1.3*

For some sensors (e.g. oxygen, pH, Redox) and for analog actuators (e.g. current outputs) the recalibration button is visible. Clicking this button opens the input window for reference values for quick recalibration of the sensor/actuator, see *5.4.1.4.2* and *5.4.1.4.4*.

Designations

Entries become effective after pressing the Enter key on the PC keyboard or clicking on an active window element (not —□×).

Name	Name des Sensors, is queried by other BlueBox programs. At effective entry **n/c** the sensor is not active, i.e. the sensor measurement value is neither recorded nor saved.	max. 20 characters
Comment	Any comment text[4]	max. 20 characters
Parameter	Designation of the measured parameter characters	max. 20 characters
Unit	Unit of the measurement value	More than 5 characters can't be displayed at the BlueBox display.

[1] Time information according to BlueBox time

[2] For virtual sensors, the firmware version of the BlueBox is displayed here.

[3] Strictly speaking, the sensor value is already precalibrated at the sensor module.

[4] In older software versions, it was also possible to specify how a measured value is stored in the database. Now, the setting is made using the button <All values>.

Settings of the measurement recording

Entries become effective after pressing the Enter key on the PC keyboard or clicking on an active window element (not −□×).

Digits before Number of integer places of the displayed value

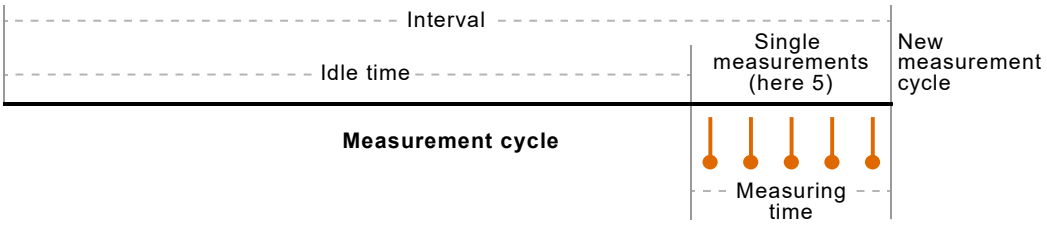
Digits after Number of decimal places of the displayed value

Interval Measurement interval: Time in seconds between the end of a measurement and the end of the next measurement [1]

Min. Value
Max. Value Lower measurement range limit / Upper measurement range limit
If the measurement undershoots or overshoots the range, this is indicated by a **<** or **>** symbol and the minimum or maximum measurement value entered here is displayed and saved; in the AMS start window, the sensor symbol appears as a warning sign ⚠.[2]

Average Number of single measurements from which the arithmetic mean is derived.
This arithmetic mean is the recorded measurement value.
For actuators, this should always be set to 1.

All values Leads to a menu where you can specify how the measurement values are stored in the database. see 5.4.1.2 Display and Storage Mode



Formula settings

Formula settings and formula changes take effect when you click on Update.

☑ **Formel active/inactive** Switches a formula entry active/inactive.

☑ **Formula encrypted/unencrypted** A separate licence is required.
Here you can assign a password to the formula in the formula input field and encrypt it.
Encrypted formulas can only be viewed and changed after entering the password.

Button bar

Update Transfers formula settings and formulas to the BlueBox.

Save Opens a window to save the formula entry on the PC.

Load Opens a window to load a saved formula entry from the PC.

Print Opens a window to print these sensor-settings.

Opens a list of the current variables with their current values.

Close Closes the sensor setup window.

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

[2] Under- and overshooting also affects the colour marking of a sensor on the BlueBox display.
see *Manual BlueBox R1 und Panel* there *Appendix B – Sensor Status Messages*

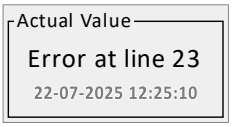
5.4.1.1 Sensor Status Messages in the Sensor Setup Window

Sensor status messages are displayed in the sensor setup window in the display of the last measurement value.
Exceptions: Status 5, 6, and 32

Status	Description	Display
0	Sensor sending data.	*Measurement value*
1	Sensor not sending data.	**No Data**
2	New sensor detected. (briefly during sensor initialisation)	**Wait**
3	Sensor ID being assigned. (briefly during sensor initialisation)	**Wait**
4	The validity limit of the SQI value of an application-specific parameter from spectral data has been exceeded.	SQI-display orange **SQI *n.nn*** *Measurement value*
5	Measurement value is below the detection limit. (BlueMon[1] only)	no Display *Measurement value*
6	Sensor calibration error (BlueMon[1] only)	no Display *Measurement value*
30	Formula error	**Error at line** *n*
31	Unknown sensor in the formula	**? Sensor**
32	Measurement data is not being saved.[2]	no Display *Measurement value*
33	Default calculation time in for and while loops is exceeded.	**Runtime!**
50	Minimum measurement value has been undershot.	**<** *min. Meas. value*
51	Maximum measurement value has been overshot.	**>** *max. Meas. value*
52	Internal communication error.	**COM**
53	Lower limit of the AD converter has been undershot.	**ADC min.**
54	Upper limit of the AD converter has been overshot.	**ADC max.**
55	General device error.	**Dev. Error**
57	Calibration interval has been exceeded.	*Meas. value*
60	The sensor is in service mode. (only for real sensors)	*Meas. value*
nan	undefined numeric value	**Inf. Value**

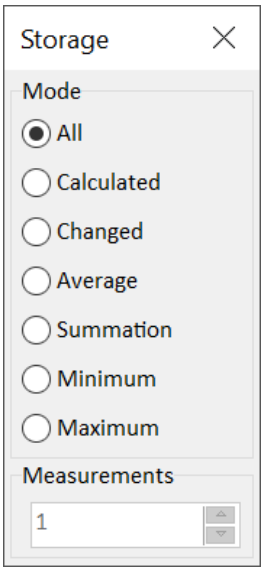
The entries in the status column can be queried with AMS formula.
see *Appendix H – List of the AMS Formula Elements* there *2. Sensors*

Example of a formula error message
Incorrect formula lines are displayed when they are executed.[3]



[1] The BlueMon wet-chemical analyser is a separate device.
[2] see *Appendix H – List of the AMS Formula Elements* there *20. System*
[3] Before software version 3.6.3 and BlueBox firmware version 2.77, only Calc Error is displayed.

5.4.1.2 Display and Storage Mode



The button [All values] in the sensor setup window opens a window where you can specify how measurement values[1] are displayed in AMS and Online Monitor and saved in the BlueBox, and thus later in the database.
The button also a status indicator.
Entries become effective when the window is closed (click on ✕).

CAN bus sensors

- ◉ **All** (Default setting) – The result of the formula entry is added to the measured value as an offset value and is displayed and stored as such.
  If the measurement value of a sensor is used in the formula of the sensor itself, only the offset-free[2] value should be used, i.e. the addition of the subsequent measurement values is prevented.
- ◉ **Calculated** – The result of the formula entry is not used as an offset value; the calculated value is displayed and saved.
- ◉ **Changed** – The **offset-affected** measurement value is only saved when the value changes, but at least one value per hour is saved (minimum data set). Displayed is the offset-affected measurement value.
- ◉ **Average** – The **offset-affected** measured value is calculated as the average of n measurement values (n = entry in the Measurements input field). The offset-affected measurement value is displayed.
- ◉ **Summation** – The **offset-affected** measurement value is stored as the sum of n measurement values (n = entry in the Measurements input field). Can be used, e.g. to calculate flow rates. The offset-affected measurement value is displayed.
- ◉ **Minimum** – The **offset-affected** measurement value is stored as the smallest measurement value from n measurements (n = entry in the Measurements input field).
  Displayed is the offset-affected measurement value.
- ◉ **Maximum** – The **offset-affected** measurement value is stored as the largest measurement value from n measurements (n = entry in the Measurements input field).
  Displayed is the offset-affected measurement value.

Virtual sensors[3]

- ◉ **All** – The calculated value is displayed and saved.
- ◉ **Calculated** – Is replaced by ◉ **None**, the calculated value is displayed but not saved.

Specifics actuators (also applies to analog actuators, e.g. current outputs)

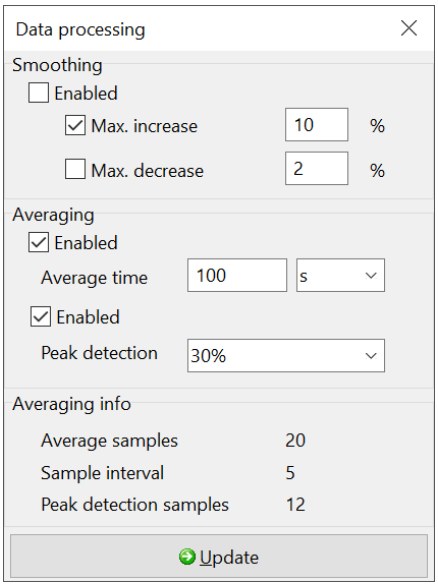
1. Mode ◉ **All**: A change in the actuator status (= actuator value) is always saved, regardless of the interval setting.
2. Mode ◉ **All**: If the actuator value changes during the interval, this actuator value is saved and the interval starts again.
3. Mode ◉ **Changed**: Although this mode saves memory space, it makes debugging module errors more difficult. Therefore, avoid this mode for alarm-relevant applications whose error states may be important for error analysis.
4. After restarting the BlueBox, an actuator without an active formula entry only delivers values after the interval has elapsed; with an active formula entry, the actuator values are delivered immediately

[1] This also applies to the status values of actuators.
[2] Formula element [!abc123456] The exclamation mark indicates the offset-free measurement value.
[3] **Note:** Modbus sensors on the RS485/RS232 interface of the BlueBox are handled as virtual sensors.

5.4.1.3 Data Processing (smoothing, moving average calculation and peak detection)

This button in the sensor setup window allows you to specify how the curve of the sensor measurement values is smoothed by a digital filter, how a moving average is calculated, and how peak detection and suppression is performed.

Note: These functions can also be performed using the BlueBox display controls.



Smoothing Enabled ☑ activates the smoothing.

Smoothing is performed separately for increasing and decreasing measurement values. The smoothed measurement values are stored.*

Max. increase ☑
activates smoothing for decreasing measurement values.

Max. decrease ☑
activates smoothing for increasing measurement values.

Averaging Enabled ☑ activates the moving average calculation.
The moving average is calculated from the measurement values recorded during the averaging time.

The number of measured values at a given average time depends on the measurement interval (see *5.4.1*). 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 *5.4.1*). An Average Time of 1xmeasurement interval is ineffective.

Peak detection Enabled ☑ activates the peak detection.

Selection of the type of outlier suppression from the drop-down list.

The measurement values determined over the averaging period 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.

Averaging info

- Average samples — Number of measurements in the average time
- Sample interval — Measurement interval of the sensor
- Peak detection samples — Number of removed measurement values
  At 50% (median), *Average Samples* minus 1 is displayed.

Update — Transfers the settings to the BlueBox.

* **Calculation:** current measurement value × (1 – maxvalue/100) + (new measurement value × maxvalue/100)
maxvalue is the percentage entered under <Max. increase> for rising measurement values.
maxvalue is the percentage entered under <Max. decrease> for falling measurement values.

5.4.1.4 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. A calibration measurement value is the moving average of the measurement value from the last 15 seconds**. The result is a calibration polynomial of the 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.
- Modbus sensors from GO Systemelektronik connected directly to the BlueBox and Modbus sensors on BlueConnect modules are calibrated using the Modbus Tool.exe program.

The calibration is stored in the respective sensor module/sensor electronics.

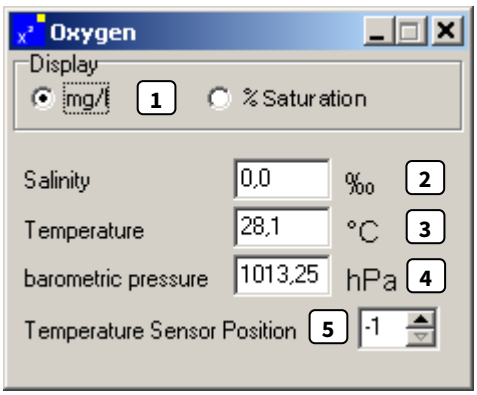
* Strictly speaking, the sensor is already pre-calibrated at the sensor module/sensor electronics.

** 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.

*** see *5.4.1.4.5 Direct Input of the Coefficients of the Calibration Polynomial*

5.4.1.4.1 Calibration Example Oxygen

Sensor Setup Window



[1] Selection whether the measuring value is displayed in mg/l or % saturation, if necessary, adjust unit in the sensor setup window, see *5.4.1 Sensor Setup*

[2] Salinity of the measuring fluid, entered by hand*, small deviations are tolerable.

[3] Temperature of the measuring fluid, entered by hand* if no temperature sensor is associated (in this case the value in [5] must be set to zero).

[4] Average air pressure at the measuring point, entered by hand* if no air pressure sensor is connected, small deviations are tolerable.

[5] Relative position of the temperature sensor in relation to the oxygen sensor in the sensor list. see *5.4 The AMS Start Window*.

5.4.1.4.2 Recalibration Example Oxygen (galvanic)

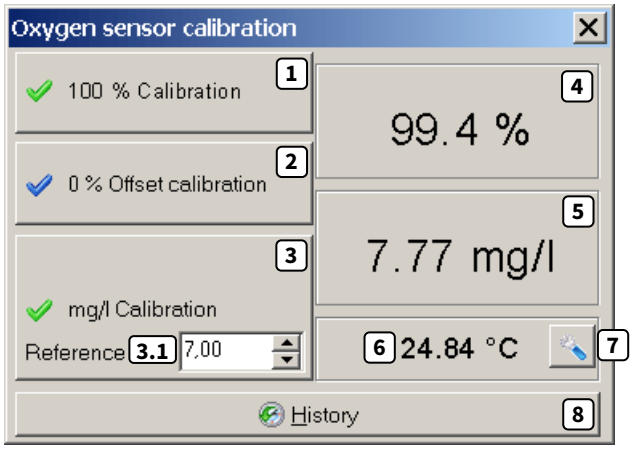
Article number 461 4000

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**
3. **Offset calibration – Zero calibration with a reference fluid**

Sensor Setup Window



* Confirmatin with the Enter key

[1] Button of the saturation calibration

[2] Button of the offset calibration

[3] Button for the reference calibration with input field for the reference value [3.1]

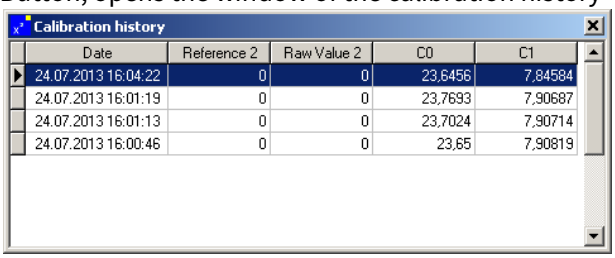
[4] Display of the current measurement value in % saturation

[5] Display of the current measurement value in mg/l

[6] Temperature display, if no temperature sensor is associated, the value is taken from [3] of the calibration window (see previous page).

[7] Button for manually entering the temperature

[8] Button, opens the window of the calibration history



Saturation calibration:

a. Keep the oxygen sensor in the air.

b. Wait until the displayed oxygen value and the displayed temperature value are stable (minimum 10 min).[1]

c. Click button [1]. ⇨ The saturation calibration is completed.

Reference calibration:

a. Enter the oxygen content of the reference measurement.

b. Immerse the oxygen sensor in your measuring medium.

c. Wait until the displayed oxygen value and the displayed temperature value are stable.

d. Click button [3]. ⇨ The reference calibration is completed.

Offset calibration:

After a long period of use, it may be necessary to ensure that the zero point is really zero.

a. Immerse the oxygen sensor in a 0 mg/l reference liquid and wait until the displayed values are stable.

b. After a few seconds, the offset calibration button [2] will appear – Precondition is that the sensor

c. generated voltage is less than 3 mV.[2]

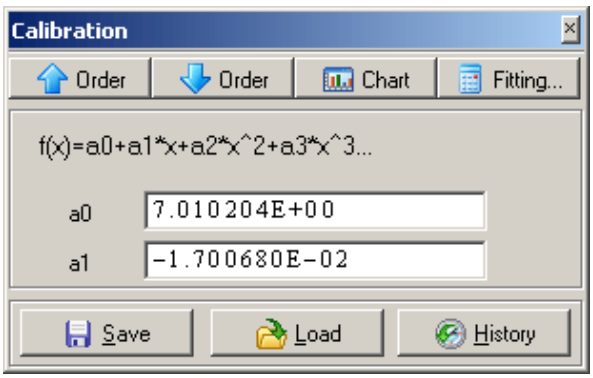
d. Click button [2]. ⇨ The offset calibration is completed.

[1] 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 performing the saturation calibration.
Moreover, abrupt temperature changes (e.g., by direct exposure to the sun) must be avoided.

[2] If the offset calibration button appears and the sensor should produce values > 3 mV, the sensor may be defective.

5.4.1.4.3 Calibration Example pH Value and ISE (Ion-Selective Electrode)

Sensor Setup Window



Description as *5.4.1.4.5 Direct Input of the Coefficients of the Calibration Polynomial*

Note: The calibration of electrochemical pH and ISE sensors is usually done with the convenient recalibration function (see below). In special cases, you can enter the calibration polynomial here directly or change the polynomial directly**.**

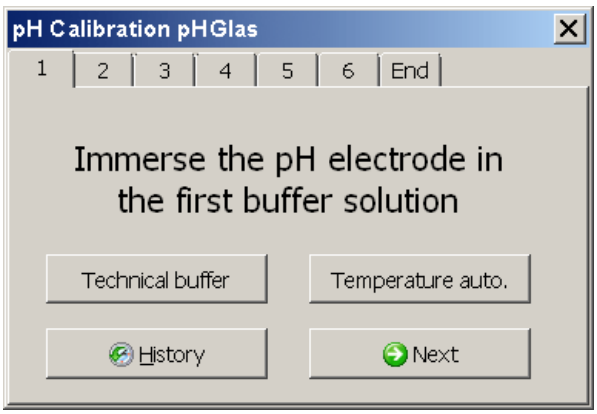
5.4.1.4.4 Recalibration Example pH

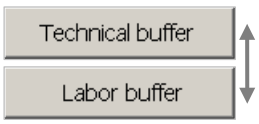
The pH sensor is an electrochemical sensor. To function properly, electrochemical sensors have to recalibrate in regular intervals. This is best done weekly, but at least a monthly.

You need two calibration fluids (buffer solutions) with different pH values, e.g. pH 4 and pH 7. In addition, you need clean tap water for rinsing of the electrodes between the calibration steps. In this two-point calibration it is always the lower value first and then the higher value is measured. The BlueBox calculates the calibration curve automatically.

Note: The calibration procedure described here is only operable, if in the associated sensor setup window of the AMS software the entry in the parameter field begins with "**pHGlas**"(case sensitive).*

Sensor Setup Window



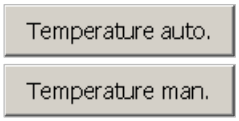


Input of the type of buffer solutions

Technical buffer ⇨ Buffer solution for calibration of pH sensors from GO Systemelektronik 418 400X

Labor buffer ⇨ Calibration according to NIST/DIN

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

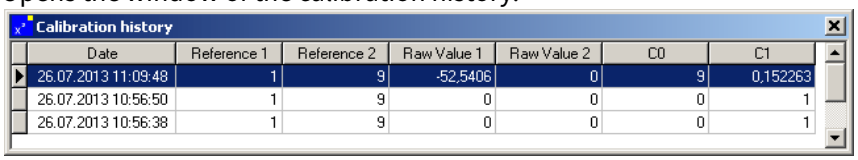


Determines the type of temperature compensation.

Temperature auto. ⇨ The temperature compensation is automatic, if a temperature sensor is connected.

Temperature man. ⇨ The temperature compensation is carried out manual, i.e. the temperature is entered from a menu.

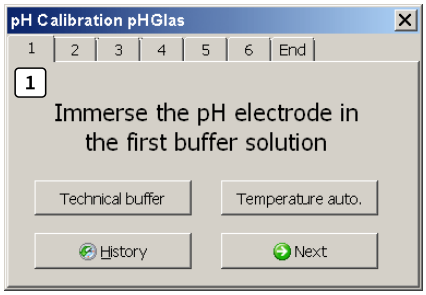
Opens the window of the calibration history.

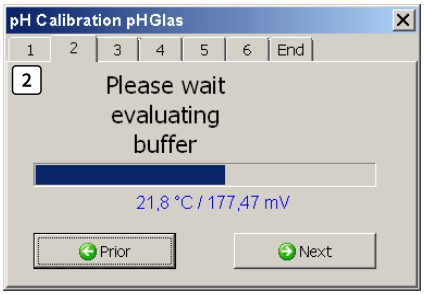


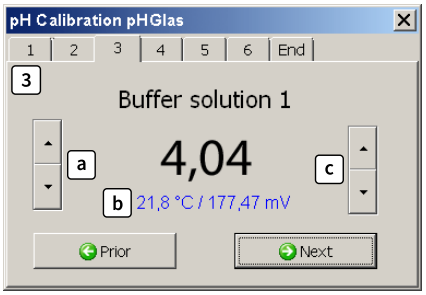
Date	Reference 1	Reference 2	Raw Value 1	Raw Value 2	C0	C1
26.07.2013 11:09:48	1	9	-52,5406	0	9	0,152263
26.07.2013 10:56:50	1	9	0	0	0	1
26.07.2013 10:56:38	1	9	0	0	0	1

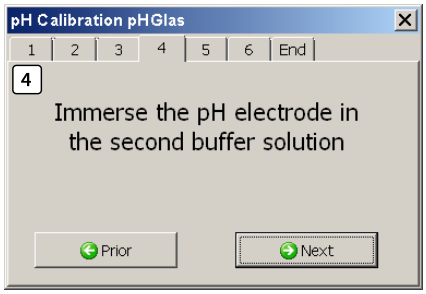
Open the next window and starts the calibration procedure.

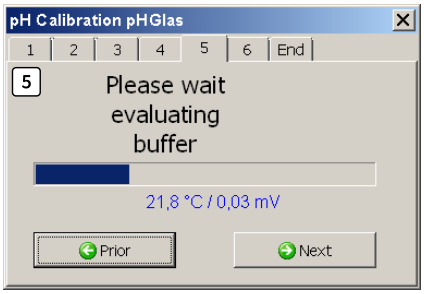
Procedure:

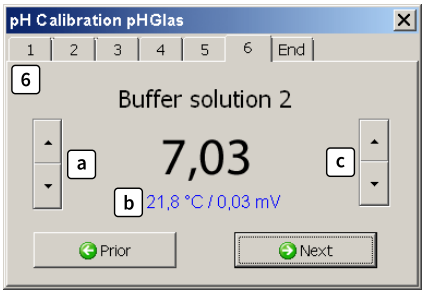


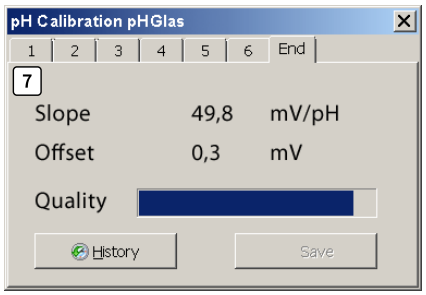












[1] Select the type of buffer solution and the type of temperature compensation, see previous page. Immerse the pH sensor in the first buffer solution and before immersing rinse the electrode in clean tap water. Click on <Next>.

[2] Wait until the detection of the first buffer solution is completed.

[3] If no temperature sensor is connected, use the arrow buttons [**a**] to enter the actual temperature of the buffer solution. The entered temperature is displayed [**b**].
Use the arrow buttons [c] to enter the pH value of the first buffer solution. Click on <Next>.

[4] Immerse the pH sensor in the second buffer solution and before immersing rinse the electrode in clean tap water. Click on <Next>.

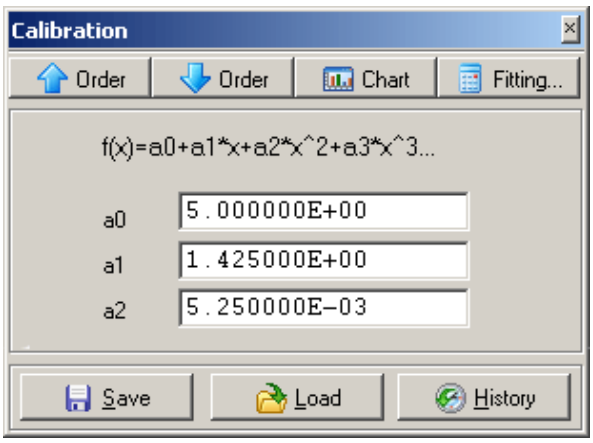
[5] Wait until the detection of the second buffer solution is completed.

[6] If no temperature sensor is connected, use the arrow buttons [**a**] to enter the actual temperature of the buffer solution. The entered temperature is displayed [**b**].
Use the arrow buttons [c] to enter the pH value of the first buffer solution. Click on <Next>.

[7] The result of the calibration is displayed. At Quality, a quality factor calculated from slope and offset is displayed graphically. Click on <History> to open the window of the calibration history. Clicking on <Save> saves and ends the calibration.

5.4.1.4.5 Direct Input of the Coefficients of the Calibration Polynomial

Sensor Setup Window



Direct coefficient setting for the calibration polynomial (see also the next page).
Already existing coefficients are displayed.
E+/E- like exponential notation e.g. yE+02 ≙ y × 100 e.g. yE-02 ≙ y × 0.01

Increases the number of calibration coefficients (max. 8).

Reduces the number of calibration coefficients.

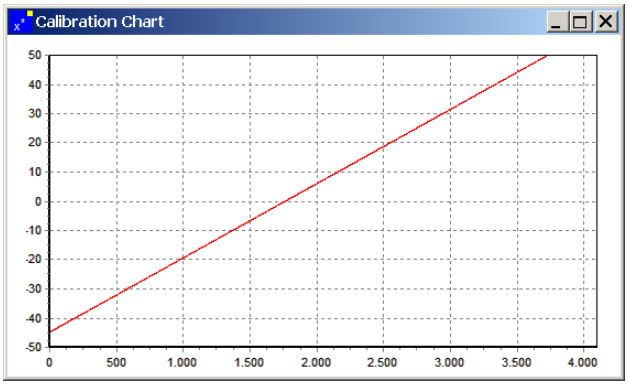
Opens a window that displays the assignment of the raw values to the measurement values graphically.

Opens the calibration fitting window (see next page).

Opens a window for choosing the file storage path.
Saves the calibration settings as cal-file on the PC.

Opens a window for choosing the file storage path.
Already stored calibration settings are loaded from the P.

Opens the calibration history.



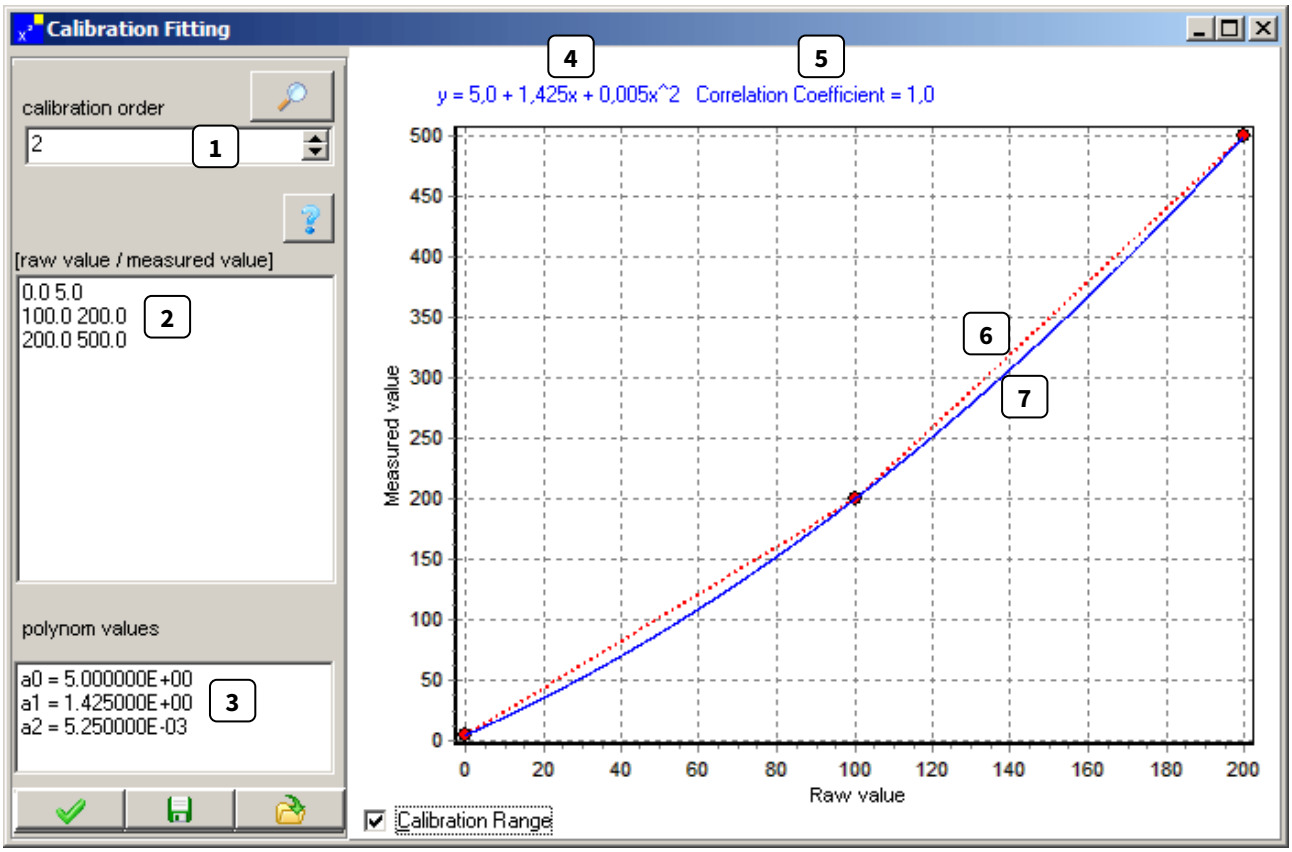
Assignment of the raw values (x-axis) to the measurement values (y-axis)
Example of a degree 1 polynomial

Calibration Fitting

Fitting... Start window of the calibration

A calibration generates, by a comparison with calibration mediums, value pairs out of sensor raw values and reference values. These value pairs will be considered as points in a coordinate system.
Through these points a curve will be placed preferably exactly of a **degree 1 up to a degree 8 polynomial**, this is the **calibration polynomial**.

Example manual 3-point-calibration:



[1] Input **2** ⇨ The curve of calibration will be calculated with a degree 2 polynomial.

[2] Input **0.0 5.0 | 100.0 200.0 | 200.0 500.0** ⇨ value pairs of raw value and reference value
To each raw value of the sensor the value of a calibration medium or a reference instrument is allocated, here as example 3 value pairs. By changing the input 1 you can change the degree of the calibration polynomial to put the curve of the polynomial as accurately as possible along the coordinate points of the value pairs. In each line, the entry has to be confirmed by pressing the Enter key.

[3] the coefficients of the computed calibration polynomial
E+/E- like exponential notation e.g. yE+02 ≙ y × 100 e.g. yE-02 ≙ y × 0.01

[4] the calibration polynomial

[5] Correlation Coefficient is the grade of approximation of the correction curve to the calibration value pairs, here as example 1, i.e. the curve of the calibration polynomial touches all coordinate points of the value pairs.*

[6] coordinate points of the value pairs (red) connected with straight lines (red)

[7] curve of calibration polynomial (blue)

* Describes the point correlation, not the curve in the region outside of the coordinate points of the value pairs.

Displays the actual raw value.

Opens a note window.
Use CTRL-R to insert the actual raw value.

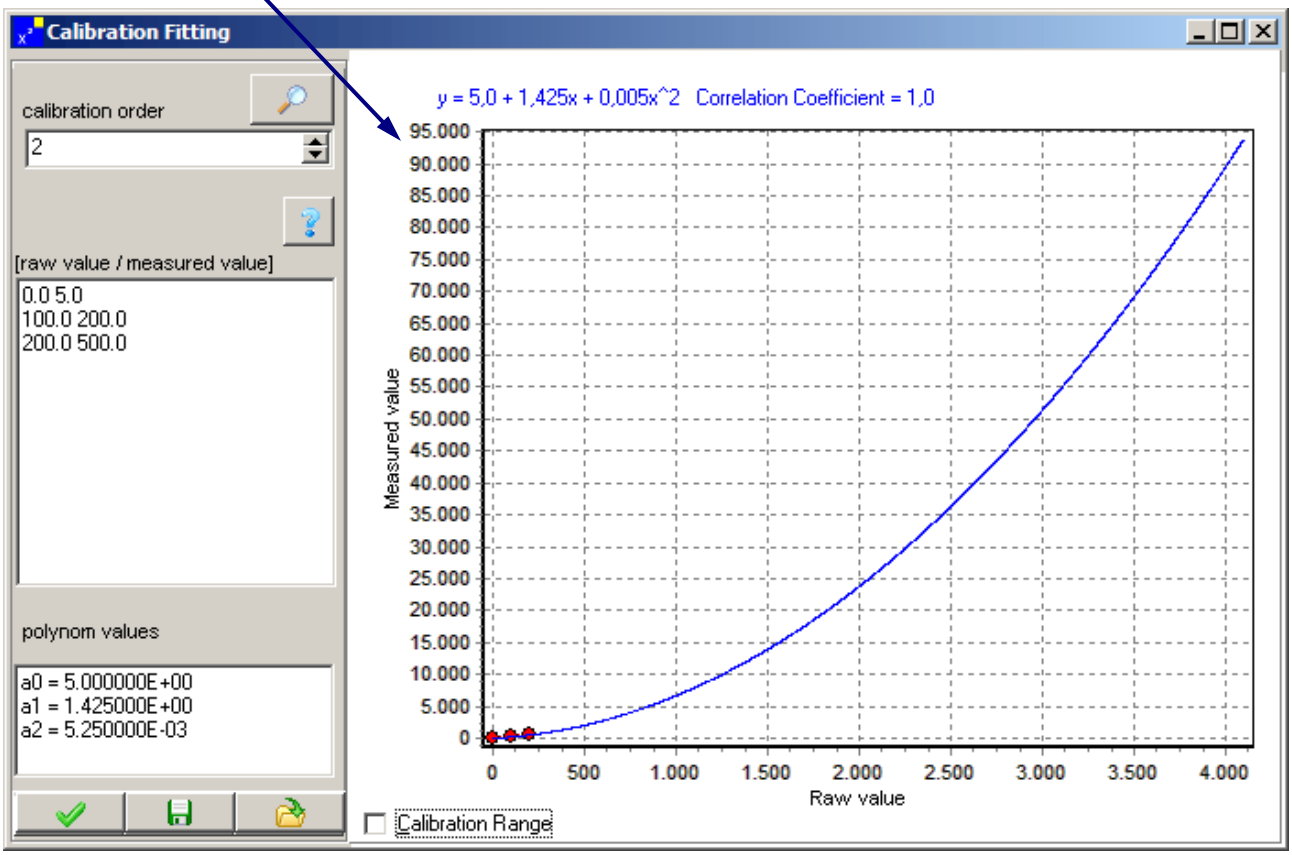
Transfers the calibration function to the sensor.

Saves the calibration values as .cal-file.

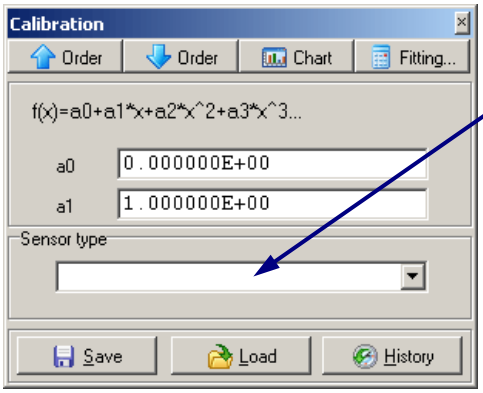
Loads an already existing .cal-file.

Calibration Range Displays only the range of coordinate points of the pairs of value.

Calibration Range Displays the whole range of measurement of the sensor.



5.4.1.4.5.1 Specifics Pulse Input BlueBox T4



The calibration window for the **two internal pulse inputs** on the BlueBox T4 has the additional selection menu "Sensor type".

Selection options:

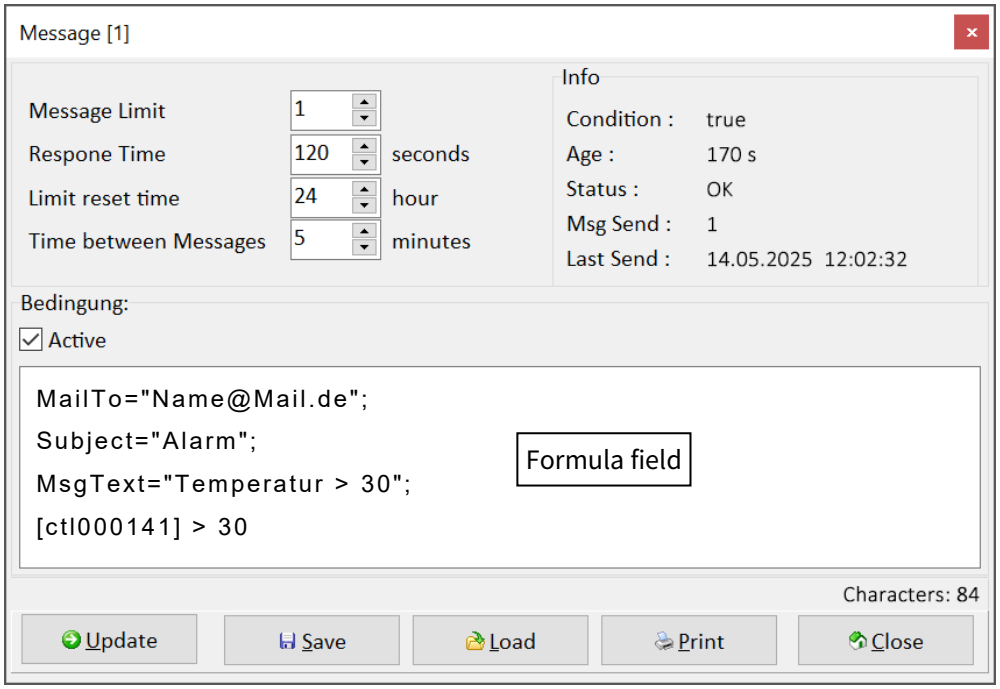
- Static input – Pulse input is static
- Frequency (Positive edge) – Frequency (rising edge)
- Frequency (Negative edge) – Frequency (falling edge)
- Frequency (debounced max. 20 Hz)

For **external pulse input modules** on the BlueBox T4, there may be fewer options available

5.4.2 Sending Messages by E-Mail and SMS

AMS enables messages to be sent via e-mail and SMS. Messages are sent after a set response time once an AMS-formula-defined message condition* is fulfilled.
The message condition can be the result of any formula entry.
The **setup window for a message** is opened by double-clicking on the message symbol in the AMS start window, see *5.4 The AMS Start Window* there *Messages*.

Example: Setup window of Message [1] – Sending an e-mail when a measurement value is exceeded



In this example, the message condition is that the measurement value of the sensor ct1000141 exceeds 30.

Message Limit Maximum number of messages which can be transmitted in the Limit reset Time.

Response Time Time period in seconds from the appearance of the message condition till the sending of the message. If the message condition changes in the response time, the process is cancelled and the message won't be transmitted.

Limit reset Time During this time in hours, no more messages can be sent, as it is defined above in Message Limit.

Time between Messages Minimum time in minutes until the next message is sent.

Condition:
true The message condition is fulfilled.
false The message condition is not fulfilled.

Age: Duration in seconds since the message condition has been fulfilled

Status:
After clicking Update
OK The formula is syntactically error-free.
Calc Error The formula has at least one syntax error.

* **If the message contains a sensor measurement value:**
- The message is sent if the sensor status is not equal to 0. Please take this into account when setting the message limit, see above.
- For some sensor status messages, the corresponding display in the sensor setup window is sent instead of the measurement value.

You can prevent both of these by making the appropriate entries in the formula field. see *5.4.1.1 Sensor Status Messages in the Sensor Setup Window* and *Appendix H – List of the AMS Formula Elements* there *2. Reference to sensor data*

Msg Send: Number of previously sent messages

Last Send: Date and time of the last message sent

☑ **Active** The formula is active and effective when you click on Update.

☐ **Active** The formula is inactive and effective when you click on Update.

Characters: 85 Number of characters + line breaks + 1 if no entry = 0

Example entry in the formula field: E-mails with multiple addresses are sent as CC.

Mailto="Name@Mail.de";…;… E-mail addresses, separation of individual e-mail addresses with semicolon or space, max. 120 characters

MailTo="n" Exactly one entry n from the e-mail address list
see *5.3.3.3.2 E-Mail Address List*

Subject"Alarm"; Subject[1] of the e-mail, max. 30 characters

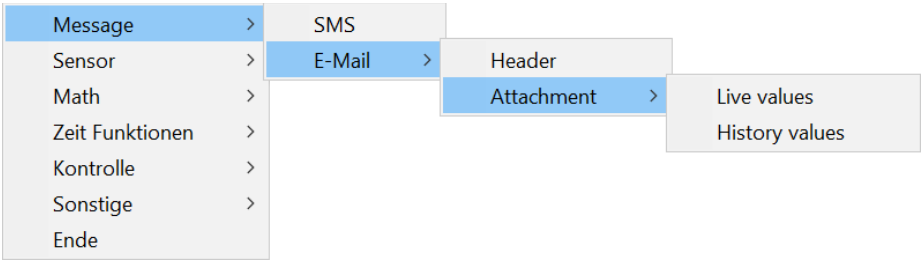
MsgText="Temperatur > 30"; Text[2] of the e-mail, HTML and ASCII, max. 160 characters

[ct1000141] > 30; Message condition for sending the e-mail:
The measurement value of sensor ct1000141 is greater than 30.

Update Transfers the entry in the formula field and the activation state (☑ Formula active ⇔ ☐ Formula inactive) to the BlueBox.

Message specific formula elements:

A click with the right mouse button in the formula field opens the input assistance. (see also *5.5.3*)



SMS Entry *MsgText=" ";*
PhoneNo=" ";

Header Entry *MailTo=" ";*
Subject=" ";
MsgText=" ";

Live values Entry *MailAttachment="[LIVE]";*

History values Opens a list of all sensors and actuators. Double-clicking on a list entry sets a formula entry
Example: *MailAttachment="[bsa005041,1d]";*

[1] The e-mail must contain a subject line.
[2] The e-mail/SMS must contain text.

Formula element	Description
MsgText=“*Text*“	Message text of the e-mail or the SMS, the e-mail/SMS must have a text (max. 160 characters).
PhoneNo=“*Telephone number*“	International telephone number without 0, the telephone number of GO Systemelektronik would then be 49431580800 Multiple telephone numbers are separated by a semicolon or a space (max. 120 characters).
PhoneNo=“*n*“	Entry in row n of the telephone number list see *5.3.3.3.1 Telephone Number List*
MailTo=“*Mail address*“	Mail address = Destination address Multiple e-mail addresses are separated by a semicolon or a space (max. 120 characters).
MailTo=“*n*“	Entry in row n of the e-mail address list see *5.3.3.3.2 E-Mail Address List*
Subject=“*Text*“	Subject of the e-mail, the e-mail must have a subject (max. 90 characters).
MailAttachment="[LIVE]"	HTML table in the text of the email and a zipped csv-file attached to the e-mail containing the current measurement values from all sensors and actuators shown on the BlueBox display. max. 20160 measurement values
MailAttachment="[*Sensor-ID***,*n***d** *or n***h]"**	HTML table in the text of the e-mail and a zipped csv-file attached to the e-mail containing the measurement values of the sensors identified by the sensor IDs from the past period specified by nd or nh. max. 20160 measurement values nd = n days (n = 1 to 30) or nh = n hours (n = 1 to 24) Multiple naming of sensors possible: “[ID1,nd] [ID2,nh] [ID3,nd]...”

Specifics e-mail:

- If an e-mail cannot be sent, another attempt to send it will be made after 3 minutes.
- If an e-mail cannot be sent within 12 hours, it will be deleted.
- A maximum of 100 e-mails are stored for sending.
  If more are added, the oldest e-mails will be deleted.

Specifics SMS:

- Sending an SMS is only possible if the BlueBox has an SMS-compatible modem and the SMS card is activated for SMS transmission.
- If the receiving phone of an SMS message sends back an SMS with the message text **SMS RECEIVED** in capital letters, the sending of further SMS messages is interrupted.
  Preconditions:
  1. The telephone number of the receiving telephone sending the reply is stored in the BlueBox telephone number list. see *5.3.3.3.1 Phone Number List*
  2. At least 30 seconds and no more than 30 minutes have elapsed since the last SMS message was sent from the BlueBox.

  As soon as the message condition is no longer fulfilled, this interruption is cancelled.
  The receipt of the return SMS is entered in the SMS log.
- You can change variable values on a BlueBox with an SMS. see *5.5.2 Variables*

5.5 AMS Formula

described program version: 5.1

The AMS formula enables, amongst others, the manipulation of sensor data and actuators, the setting up of virtual calculated sensors (in contrast to real sensors) and the sending of messages via e-mail and SMS. The formula code is written into the formula field of a sensor setup window or into the setup window of a message and transferred to the BlueBox.

If an offset[1] value has been entered in the formula field of a sensor and this offset is to be removed, it is important to ensure that the formula field is completely empty. Even spaces must be deleted.[2]

After transferring the contents of a formula field to the BlueBox, it is permanently stored in the BlueBox data memory only after 30 seconds. This means that the BlueBox can be restarted safely after a formula-induced crash. Therefore, any changes you make to the formula will be lost if you shut down the BlueBox within those 30 seconds.

5.5.1 Formula Structure

- The **formula syntax** is defined by lines.
  Skip functions do not exist; the formula is executed line by line sequentially.
  Maximum number of characters in a formula field: 4000[3]

- **Upper and lower case** letters are differentiated (**case sensitive**).

- **Decimal separator** is the **full stop**.

- **;** The semicolon marks the **end of a statement**.

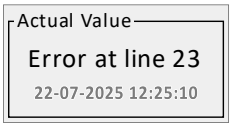
- **#** The number sign marks the following characters of the line as a **comment**.
  Comment text max. 30 characters per line [4]

- **()** The **argument of a function** is enclosed in **round brackets**. Empty round brackets denote a function with no parameters, example NOSAVE().
  In **calculation formulas**, round brackets express the **priority of one calculation operation** over others in the calculation sequence. Multiple nesting is permitted.

- **{}** A **block of statements** is started with an opening **curly bracket {**and ended with a closing curly bracket**}**.
  For conditional statements, you must define instruction blocks if more than one instruction is to be executed. Meaning: if (*condition*) {*statement1*;*statement2*;...;*statementN*;}

- **Spaces** Spaces outside formula elements may improve readability; apart from that, they are ignored and removed during syntax analysis.

- At **formula errors**, incorrect formula lines are displayed when executed.[5]



[1] see *5.4.1.2 Display and Storage Mode* there *CAN bus sensors* there ◉ *All*

[2] **For very old versions, the following applies:** If an offset value is entered in the formula field of a sensor, this offset value remains active even if the formula is deactivated. To deactivate the offset value, enter “0;“ instead of the offset value, otherwise the BlueBox must be restarted.

[3] Formulas in the PLC programming window (not described here) may be considerably longer.

[4] from software version 4.02 onwards

[5] Before software version 3.6.3 and BlueBox firmware version 2.77, only Calc Error is displayed.

5.5.2 Variables

Variables are created by entering a variable name in the formula field of a sensor or message and transferring the entry to the BlueBox. Maximum number of variables per BlueBox: 700[1]

Variables

- ⇨ Can only contain integers and floating-point numbers. All numbers are stored internally in double format. All calculations are performed in double format on the BlueBox.
- ⇨ The value is assigned using *variable name=value*; without value assignment, the value is 0.
- ⇨ Are global within a BlueBox.
- ⇨ Can be changed with an SMS message to the BlueBox.
  Prerequisite: The telephone number of the sending telephone is in the BlueBox telephone number list.
  see *5.3.3.3.1 Phone Number Lis*t
  Syntax: SET *variable name value*
- ⇨ Are deleted by first removing the variable name completely from the formula fields[2] of a BlueBox.
  The deletion then takes effect after restarting the BlueBox.

Variable names

- ⇨ Consist only of ASCII letters and ASCII digits.
- ⇨ The first character must be either a leading underscore (see below) or the dollar sign (see below) or a letter.
- ⇨ If the first character is an underscore or the dollar sign, the second character must be a letter.
- ⇨ Variable names are case sensitive.
- ⇨ The maximum length is 30 characters.
- ⇨ Cannot begin with the character strings of AMS formula elements.[3]
  ❗ If the first character is a leading underscore or dollar sign, it cannot be followed by character strings of AMS formula elements either.[4]

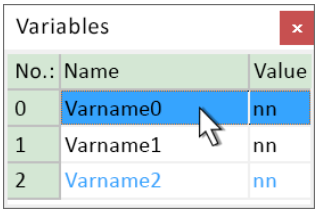
Variable types There are three types of variables:

- ⇨ **Standard variables**, the content is deleted when the BlueBox is shut down and set to 0 (zero) when restarted.
- ⇨ **Permanent stored variables** are stored permanently on the BlueBox; they are declared with a preceding underscore (example: _Name). The data is saved permanently when you shut down the BlueBox via the display, or automatically every 10 minutes. After restarting the BlueBox, the variable has the last saved value. see also *3 BlueBoxSoft* there gray box *Storage of measurement data in the BlueBox system*.
- ⇨ **User variables (at BlueBox adjustable permanently stored variables)** have the same storage behaviour as permanent stored variables. User variables can be changed on the BlueBox display; they are declared with a preceding dollar sign (example: $Name).
  A suffixed ".MIN", ".MAX" limits the value that can be set. A suffixed ".RESOLUTION" determines the number of decimal places. In the following example, the entry 0.01 determines two decimal places.
  Example: $Name.MIN = -5; $Name.MAX = 10; $Name.RESOLUTION = 0.01;
  If both MIN and MAX are set, only values within the specified range can be entered **on the BlueBox display**.
  The number of decimal places is determined by RESOLUTION. If MIN and MAX are not set, the variable is treated as an on/off digital switch **on the BlueBox display**.
  Note: The dollar sign does not appear on the BlueBox display.

Note: References in a formula to measurement values from internal BlueBox sensors and formula elements relating to the Power Management Module PMM also begin with $. see *Appendix H – List of the AMS Formula Elements* there *3. Measurement values of internal BlueBox sensors* and *16. Power Management Module PMM*

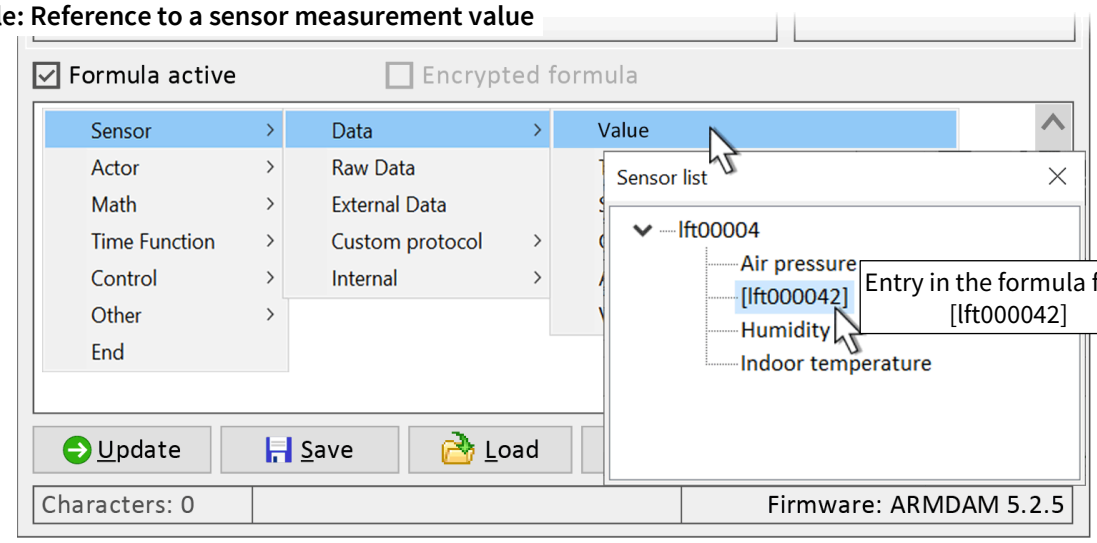
[1] from software version 4.01
[2] except for areas marked as comments, of course
[3] Here too, upper and lower case letters are differentiated.
[4] An underscore and a dollar sign must not follow either.

The current variables and their values can be viewed in the sensor setup window by clicking the variable list button  .
Double-clicking on a row in the list opens an input window for assigning a value. A list item is highlighted in blue when it has been clicked. A list entry is marked with blue text, if it is used in the formula field of the current sensor. [1]



5.5.3 The AMS Formula Input Assistance

Example: Reference to a sensor measurement value

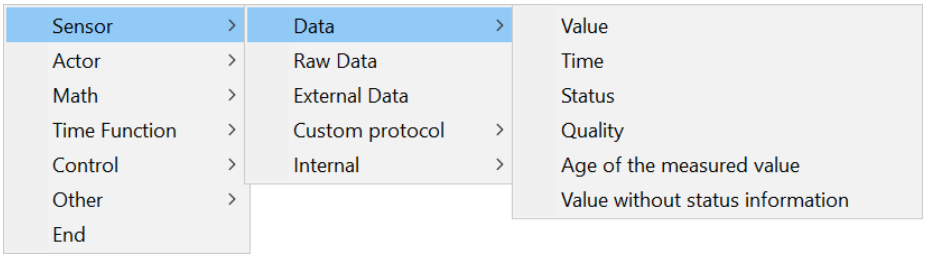


A click with the right mouse button in the formula field opens the input assistance.
Click on an entry in the selection list leads forward correspondingly.
Double-click on a sensor in the sensor list inserts the sensor identification[2] into the formula field.

A complete list of AMS formula elements can be found in: Appendix H – List of the AMS Formula Elements.

5.5.3.1 Elements of the Formula Input Assistance

Sensor data



Value Opens a selection list of all sensors of the current BlueBox, click on an entry sets a reference to the measurement value plus offset of the selected sensor. Example [lft000044]

Time Opens a selection list of all sensors of the current BlueBox, click on an entry sets a reference to the recording time of the last measurement value of the selected sensor (hhmmss), displayed time is the Coordinated Universal Time (UTC). Example [lft000044.TIME]

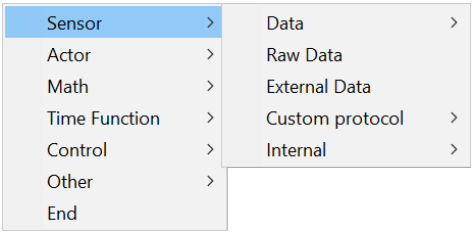
Status Opens a selection list of all sensors of the current BlueBox, click on an entry sets a reference to the status of the selected sensor (see *5.4.1.1 Sensor Status Messages in the Sensor Setup Window*). Example [lft000044.STATUS]

Quality Opens a selection list of all sensors in the current BlueBox. Clicking on an application-specific parameter entry from spectral data sets a reference to the SQI[3] (spectral quality index); in all other cases, the SQI value is meaningless. Example [lft000041.SQI]

[1] Exception: The variable was created in the formula field without being assigned a value.
[2] see *3.5 Sensor Information and Deletion of Sensors* there *Identification numbers*
[3] A licence may be required.

Age of the measured value Time elapsed in seconds since the last measured value was recorded.
Example [lft000041.SEC]

Value without status information Measured value of the sensor without transferring[1] the sensor status.
Example [lft000041.VAL]

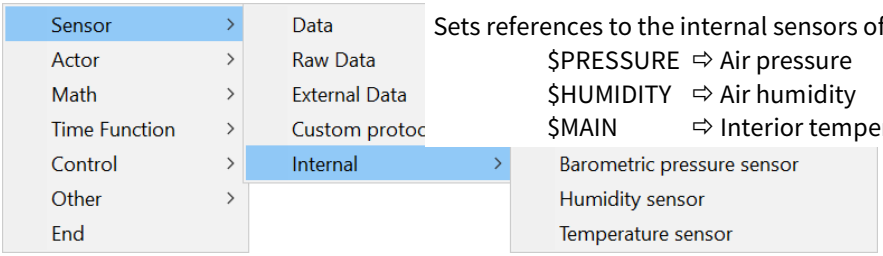


Raw Data Opens a selection list of all sensors of the current BlueBox, click on an entry sets a reference to the offset-free measurement value of the selected sensor.
Example [!lft000044] **Not to be confused with the raw value of the sensor.**

External Data Measurement value from another BlueBox
Reference to the measurement value of the sensor selected by the Sensor ID.
[*Sensor ID] Identifiable by the asterisk.

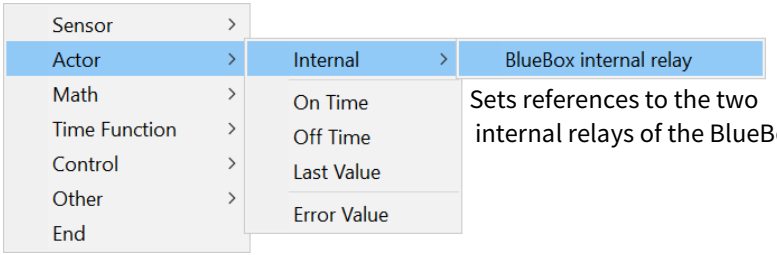
Custom protocol Entry **CUSTOMn[m]** – mth measurement value in the string received via custom protocol n.

Internal



Sets references to the internal sensors of the BlueBox.
$PRESSURE ⇨ Air pressure
$HUMIDITY ⇨ Air humidity
$MAIN ⇨ Interior temperature

Internal
only BlueBox T4



Sets references to the two internal relays of the BlueBox T4.

On Time Entry **ONTIME** – Time in seconds since the actuator was switched on.

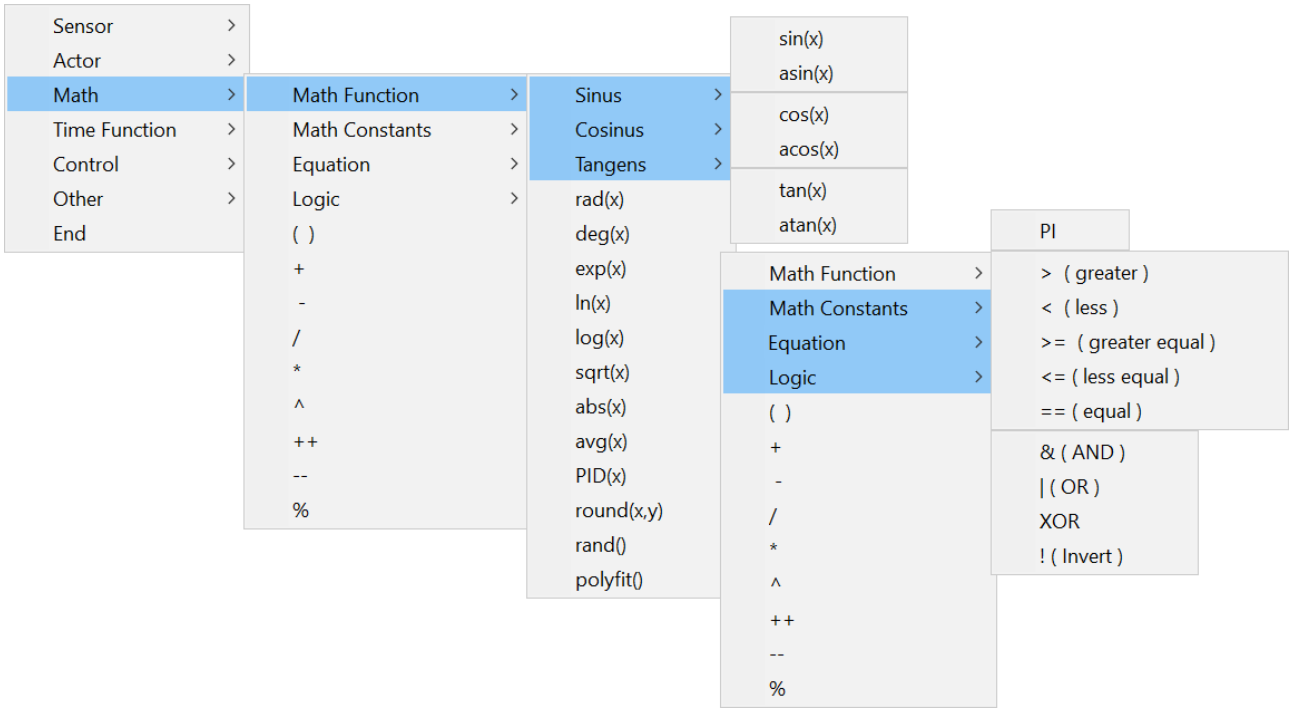
Off Time Entry **OFFTIME** – Time in seconds since the actuator was switched off.

Last Value Entry **LASTVALUE** – Status of the actuator at the last calculation
Status >0.5 actuator switched-on Status <0.5 actuator switched-off

[1] When referring to sensor measurement values from another sensor, the sensor status of that sensor is adopted. The entry .VAL suppresses this behaviour.

Error Value Entry ERRORVALUE= n – Determines whether an actuator is switched-on or off at an incorrect calculation (e.g. breakdown of a sensor).
ERRORVALUE=1 Actuator is switched-on. ERRORVALUE=0 Actuator is switched-off.
If this value is used, it should be entered in the first line of the formula field!

For calculations, various mathematical operators, functions, etc. are accessible.



Trigonometric functions

Sinus Sine function sin(x)
Cosinus Cosine function cos (x)
Tangens Tangent function tan(x)

Inverse trigonometric functions

asin(x) Arc sine
acos(x) Arc cosine
atan(x) Arc tangent

Angle dimensions

rad(x) Converts degree to radian (e.g.: 60° is π/3 rad, also circa 1.0472 rad)
deg(x) Converts radian to degree

Exponential function

exp(x) Exponential function whose base is Euler's number e: e^x

Logarithmic functions

Logarithms are the inverse functions of exponential functions
ln(x) Logarithmus naturalis, log (x)
log(x) log10 (x)

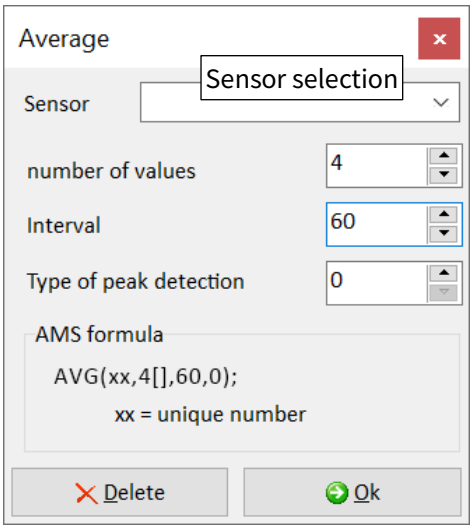
Root function

sqrt(x) **square** root of x

Absolute value

abs(x) Absolute value of x
When forming the value, positive real numbers and zero remain unchanged; for negative real numbers, the corresponding positive real numbers are output.

Averaging adjustments with outlier suppression
Here you can specify how the AMS formula element AVG is used to calculate a moving average and how outliers are detected and suppressed.
These functions can be tested on existing measurement values. see *4.3.1 Averaging and Outlier Suppression*



Delete — Closes the window without a formula entry. Similarly, clicking on ✕.

Ok — Closes the window with no formula entry.

Note: The functions described here can also be executed in the sensor setup window without entering a formula.
see *5.4.1.3 Data Processing*

number of values Number of measurement values from which the moving average is calculated; the minimum is 2.

Interval* **Time distance in seconds**
This determines the time interval at which measured values are added to the moving average.
For example, if the entry is 60, a measured value is only added to the average every 60 seconds.

Type of outlier/peak detection: Type selection for outlier detection in the drop-down list

0	No outlier suppression

The n measurement values determined by the number of values (see above) are sorted by size.

1	The lower and upper 10 percent by number are removed and the arithmetic mean is calculated.
2	The lower and upper 20 percent by number are removed and the arithmetic mean is calculated.
3	The lower and upper 30 percent by number are removed and the arithmetic mean is calculated.
4	The lower and upper 40 percent by number are removed and the arithmetic mean is calculated
5	The calculated mean is the median of all n values.

AMS formula This field displays the corresponding AMS formula entry.
AVG(*xx,b,[Sensor-ID],d,e*);
xx = Identification number of the moving average calculation (0 to 9999)
Each identification number may only be assigned once within a BlueBox.
b = Number of measurement values to be averaged.
[Sensor-ID] = measurement value of the sensor
d = Averaging interval in seconds
e = Type of outlier detection

* Not to be confused with the measurement interval.

PID controller

PID(String) Entry **PID(1, actual value,target value,P,I,D);**

The PID controller has a proportional, integral and differential component in the control effect. The respective strength of the component in the control effect is determined by the input values for **P**, **I** and **D**. see *Appendix H – List of the AMS Formula Elements* there *6. PID controller*

Rounding

round (x,y) Entry **round(Value,y)**

Rounds the value defined with Value to y decimal places.

Random numbers

rand() Entry **rand()**

Generates random numbers between 0 and 1.

Calculation of a polynomial from measurement values

polyfit The polyfit function calculates the coefficients of a polynomial by minimising the sum of the squares of the deviations from given measured values (least squares fitting).

Entry in the formula field:

```
A[0][0]=x0;
A[0][1]=x1;     defines the array of the x-values
A[0][2]=x2;

A[1][0]=y0;
A[1][1]=y1;     defines the array of the y-values
A[1][2]=y2;
corr = polyfit(number of values,order);
number of values = Number of measurement values / order = Degree of the polynomial
⇨ writes the correlation coefficient to the variable corr
⇨ writes the coefficients of the polynomial to the array [2]
#Result A[2][0] - A[2][order];
```

Constant

PI π=3,14159265

Equation (Relational operators)

Relational operators are particularly necessary for setting switching points.

> greater than

< less than

>= greater or equal

<= less or equal

== equal

Logical connectives

Logical connectives can also be used to set switching points (see above).

& and

| or

XOR exclusive or

! Bit inversion

OR

a	b	y
0	0	0
0	1	1
1	0	1
1	1	1

XOR

a	b	y
0	0	0
0	1	1
1	0	1
1	1	0

AND

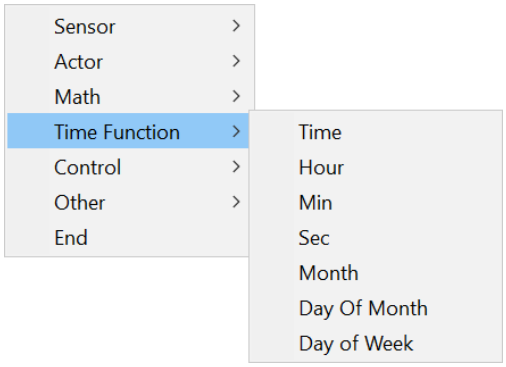
a	b	y
0	0	0
0	1	0
1	0	0
1	1	1

Truth table

Arithmetic operators

( )	Preferred execution of the basic arithmetic operation in brackets
+	Addition
-	Subtraction
/	Division
*	Multiplication
^	Exponentiation, a^n corresponds to a^n
++	Addition of 1 (+1)
--	Subtraction of 1 (-1)
%	Modulo operator, remainder of an integer division

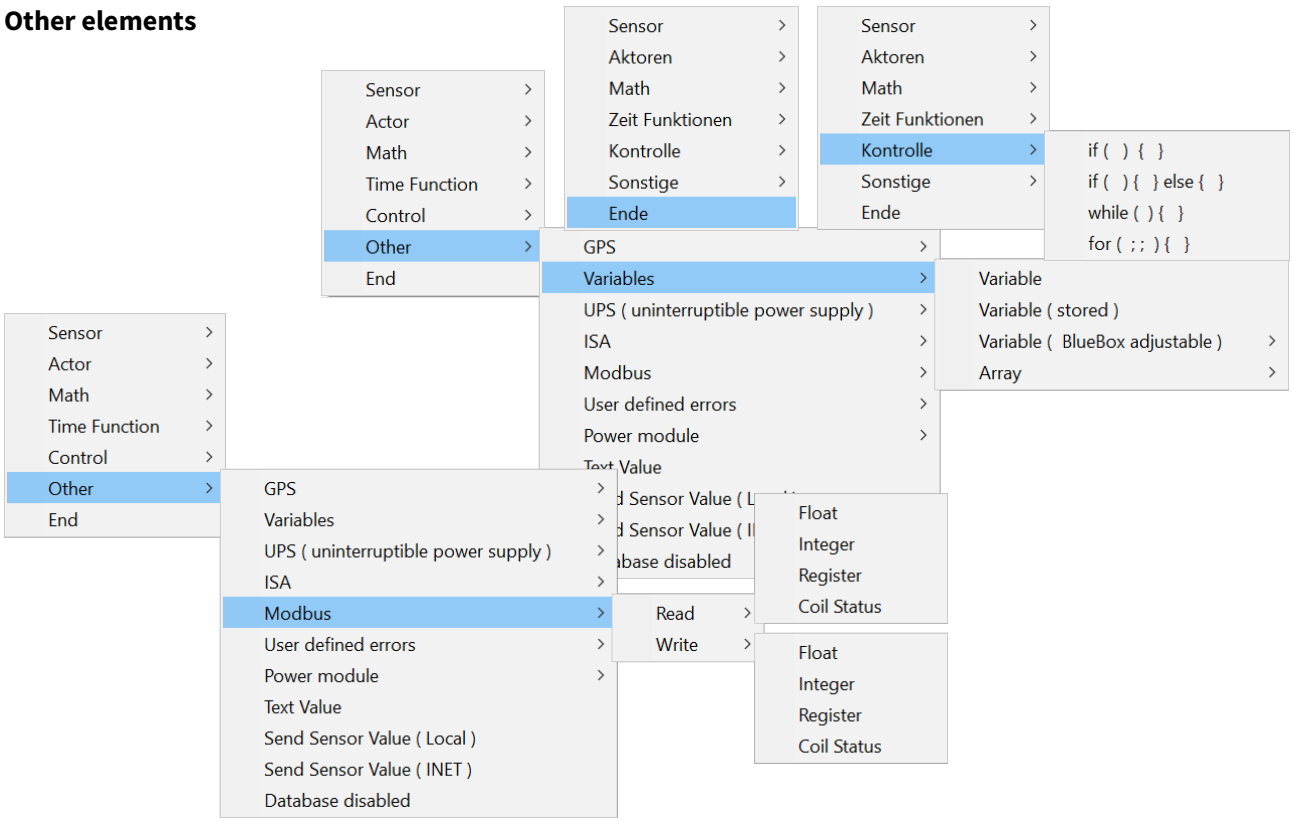
Time functions



The information refers to the local time of the BlueBox.

Time	TIME	current time
Hour	HOUR	current hour
Min	MIN	current minute
Sec	SEC	current second
Month	MONTH	current month (0 – 11)
Day of Month	DAYOFMONTH	current day of month
Day of Week	DAYOFWEEK	current day of week 0 corresponds Sunday 1 corresponds Monday, 2 Tuesday etc.

Other elements

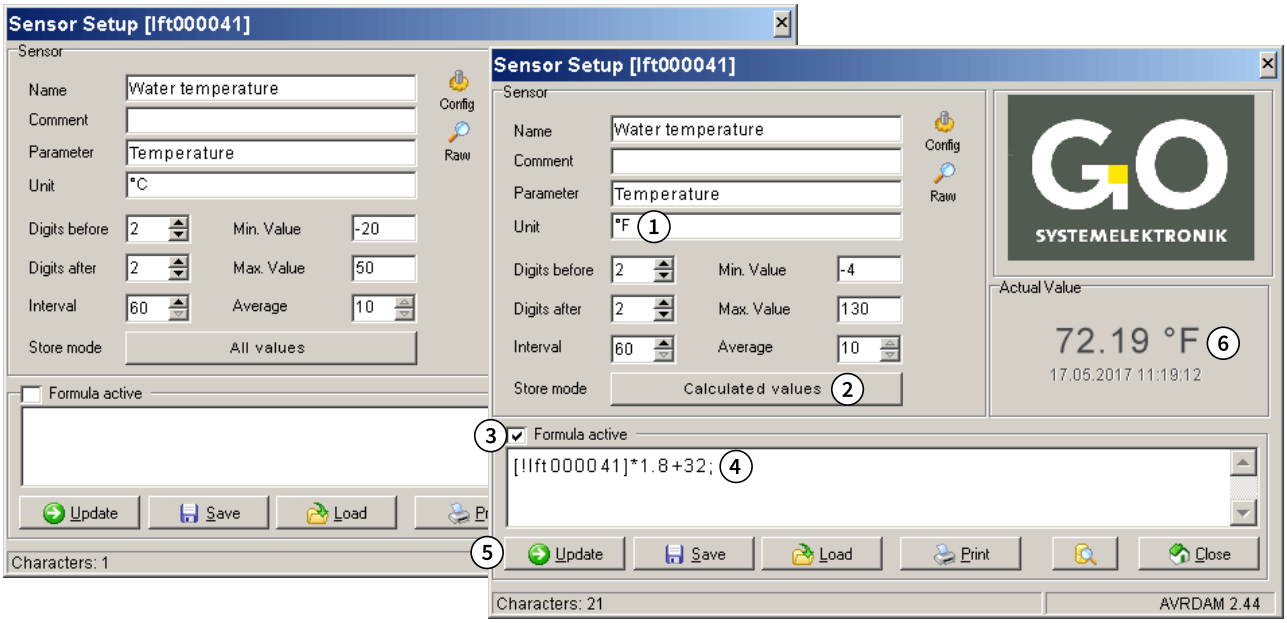


A complete list of the AMS Formula elements you see at: Appendix H – List of the AMS Formula Elements

5.6 AMS Examples

5.6.1 Changing Output Values of a Sensor

Example: The output value of a temperature sensor should be converted from °Celsius to °Fahrenheit.
TFahrenheit = TCelsius - 1.8 + 32



Procedure:

① Input **°F** ⇨ The unit of the value is °F.

② Selection **Calculated values** ⇨ Ensures that the formula entered in the formula field is not used as an offset value, so that the calculated value is displayed and saved.

③ ☑ Activating the formula

④ Input **[!lft000041]*1.8+32;**

[!lft000041]	⇨	Offset free value of the sensor itself. The exclamation mark says that the offset free value of the sensor is used here. Otherwise, the individual calculated values would add up to each other
*1.8	⇨	multiplies the raw value of the sensor with 1,8
+32	⇨	adds 32 to the result of previous multiplication
;	⇨	marks the end of the statement

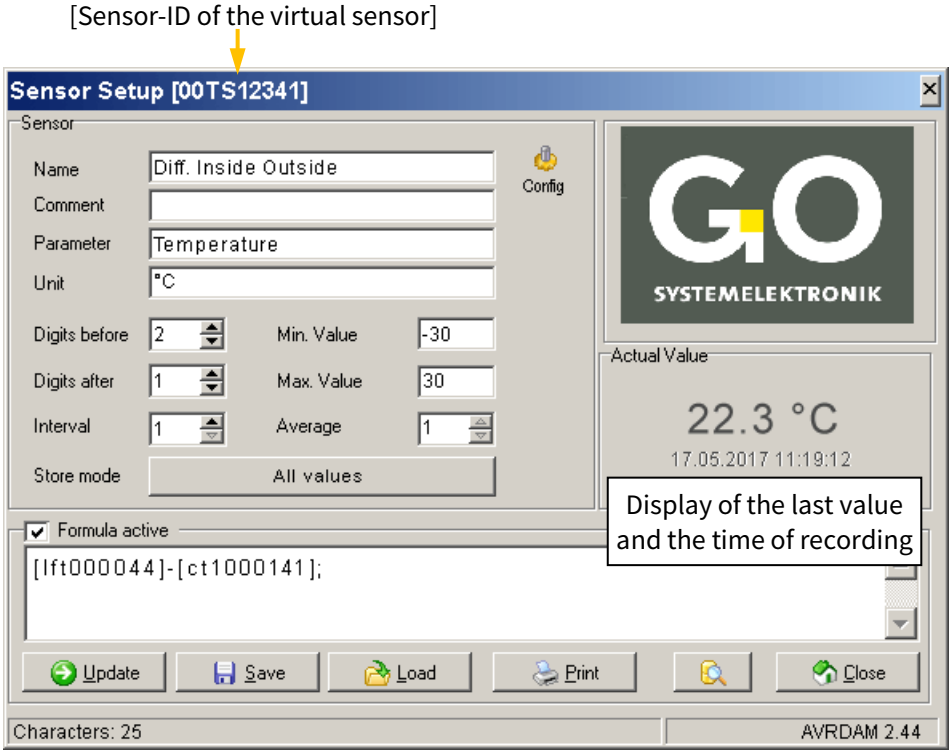
⑤ Click on Update transfers the formula in the formula field to the BlueBox.

⑥ The calculated value is displayed after the end of the current interval.

5.6.2 Settings of a Virtual Sensor

Example: Calculation of the difference value of two sensors

[Sensor-ID of the virtual sensor]



Opens the calibration window of the virtual sensor.
see *5.4.1.4.5 Direct Input of the Coefficients of the Calibration Polynomial* there *Calibration Fitting*

Name	*Diff. Inside Outside*	Sensor name, retrieved by the other BlueBox programs.
Comment		General comment
Parameter	*Temperature*	Name of the measured parameter
Unit	*°C*	Unit of the output value

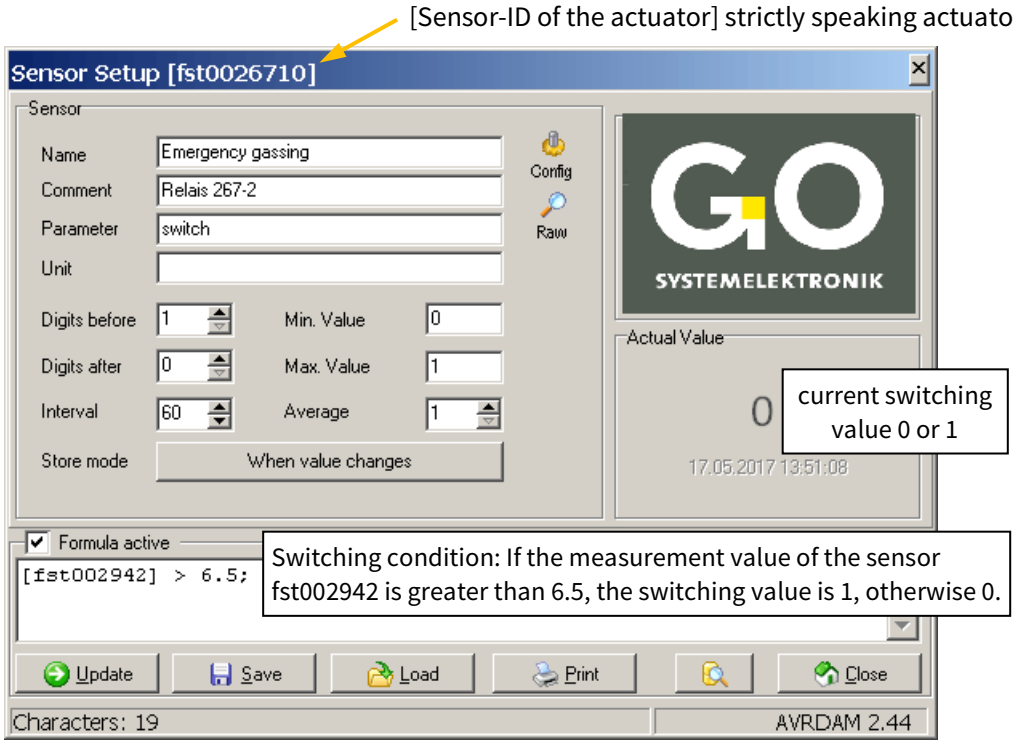
Min. Value	*-30*	lowest saved and displayed value
Max. Value	*30*	highest saved and displayed value

[lft000044]-[ct1000141];
Subtraction: measurement value of sensor lft000044 minus measurement value of sensor ct1000141
; (Semicolon) marks the end of the statement

Transfers the formula to the BlueBox.
The value is displayed and stored only when one of the two sensor values in this formula changes.

5.6.3 Settings of an Actuator

Example: Switching a relay when a value is exceeded



Config — Opens the actuator configuration window. Here you can choose between "Normally open" (status 0 = open) and "Normally closed" (status 0 = closed). *

Raw — Is not required with a relay, but not with calibratable actuators *.

Name	*Emergency gassing*	Actuator name, retrieved by the other BlueBox program.
Comment	*Relais 267-2*	General comment
Parameter	*switch*	Description of the switching parameter
Unit		Since this is a simple switch (status 0 or 1), the actuator parameter has no unit.
Digits before	*1*	Number of integer places
Digits after	*0*	Number of decimal places
Interval	*60*	Testing every 60 seconds if the actuator is still there, if not "No Data" appears under Actual Value.
Min. Value	*0*	Status 0
Max. Value	*1*	Status 1
Average	*1*	Has no function for actuators.

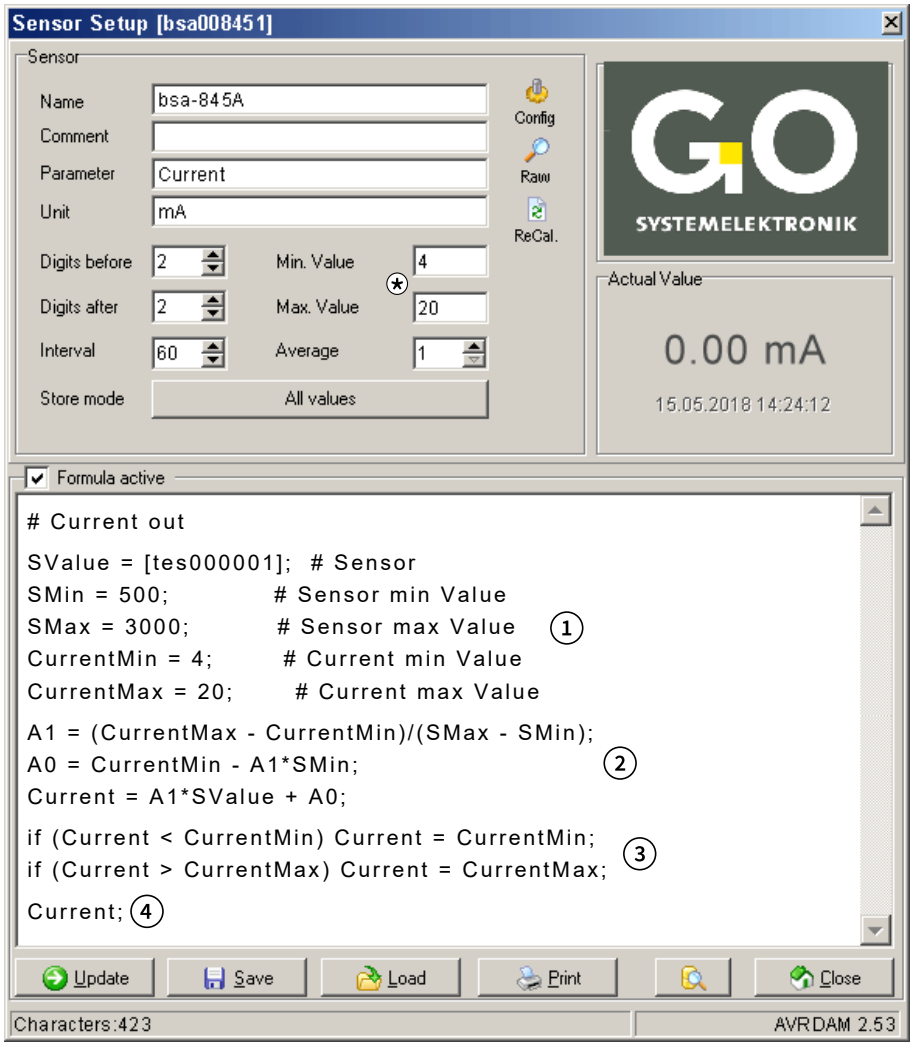
When value changes — The actuator value is only stored if the value is changed, but at least one value per hour is stored (minimal dataset).

Update — Transfers the formula to the BlueBox.

* Does not apply to the special case of calibratable actuators; for further details, please contact GO Systemelektronik.

5.6.4 Settings of a Current Output

A current output is an analog actuator and is parameterized similar to a sensor. The measurement values from an assigned sensor control a current output. In the example selected here, a current output (here *bsa008451*) has to convert the measurement values of a sensor (here *tes000001*) into current values of 4 mA to 20 mA.



⊛ The entries in [Min. Value] and [Max. Value] do not refer to the value range of the sensor measurement values or the value range of the current values.

The buttons have no function in this example.

Entry in the formula field:

① The **sensor measured value** of the sensor *tes000001* is written into the variable *SValue*. The following variables determine the **value range of the sensor measured values** (variables SMin and SMax) and the **value range of the current values** (variables CurrentMin and CurrentMax).

② Calculation of the conversion with a first-order polynomial with the slope A1 that intersects the y-axis at A0 (y = 0.0064x + 0.8).
The **current value** (Variable *Current*) is calculated from this (*A1* x *SValue* + *A0*).

③ If the measurement value of the sensor leaves its value range (SMin to SMax), the current value is limited to the value range of the current values (CurrentMin to CurrentMax).

④ The current value is generated and displayed.

6 Programs for Data Transfer and Configuration

Unless you selected a different folder during installation, the 32-bit programs are located in the "C:\Program Files (x86)\BlueBox" folder and the 64-bit programs in the "C:\Program Files\BlueBox" folder.

6.1 ExportTool

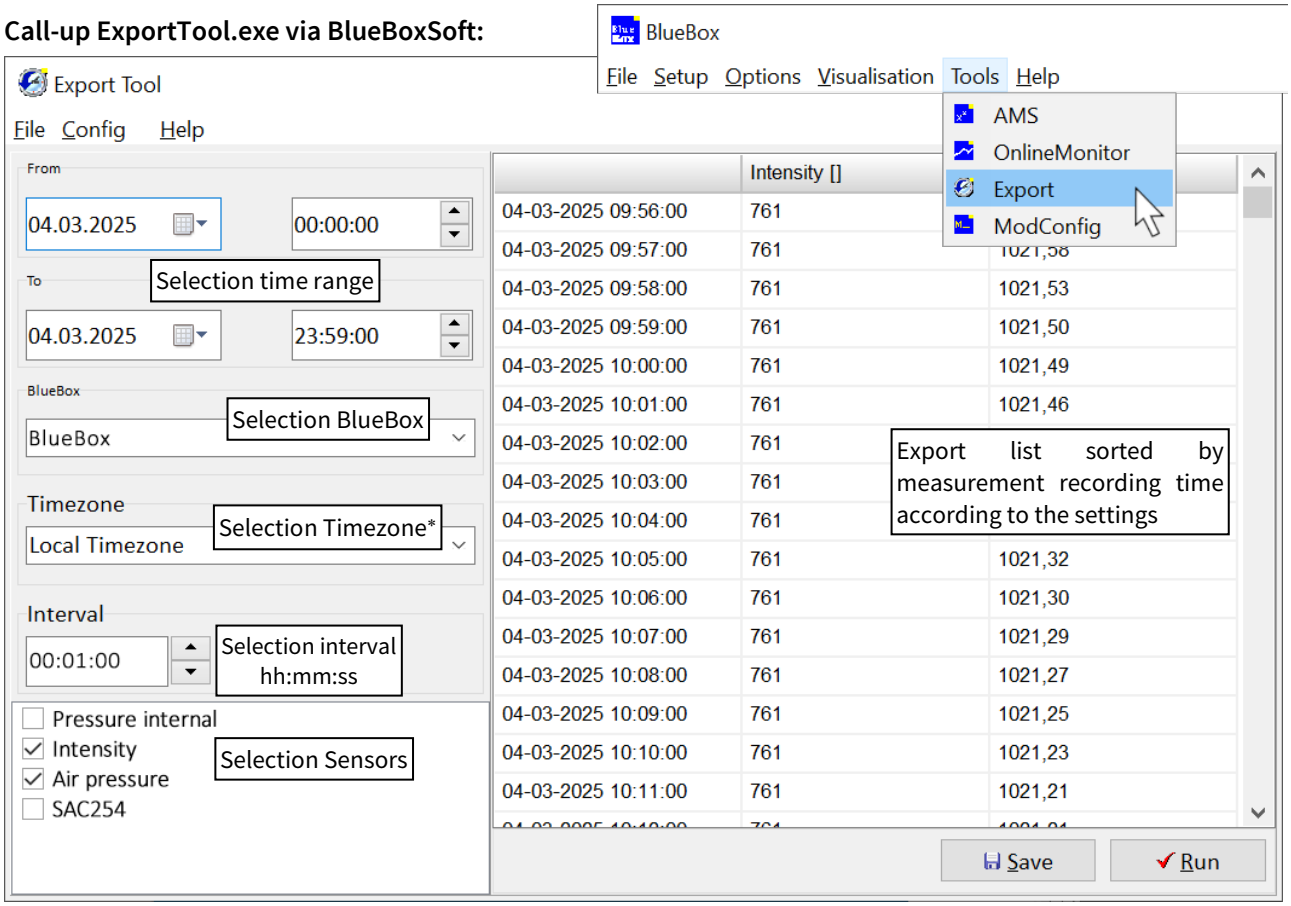
described program version: 5.1

The ExportTool.exe program reads measurement data and GPS data from a BlueBox Database.

Functions:

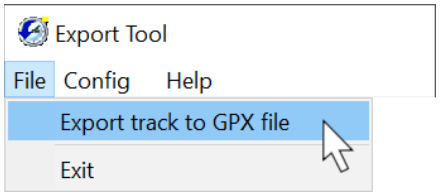
- Listing of measurement values and GPS data from a selected range
- Calculation and listing of min/max, average and summation values from a selected interval.
- Export of the list entries of the measurement values in txt- and csv-format
- Export of the list entries of the GPS data in gpx-format

Call-up ExportTool.exe via BlueBoxSoft:



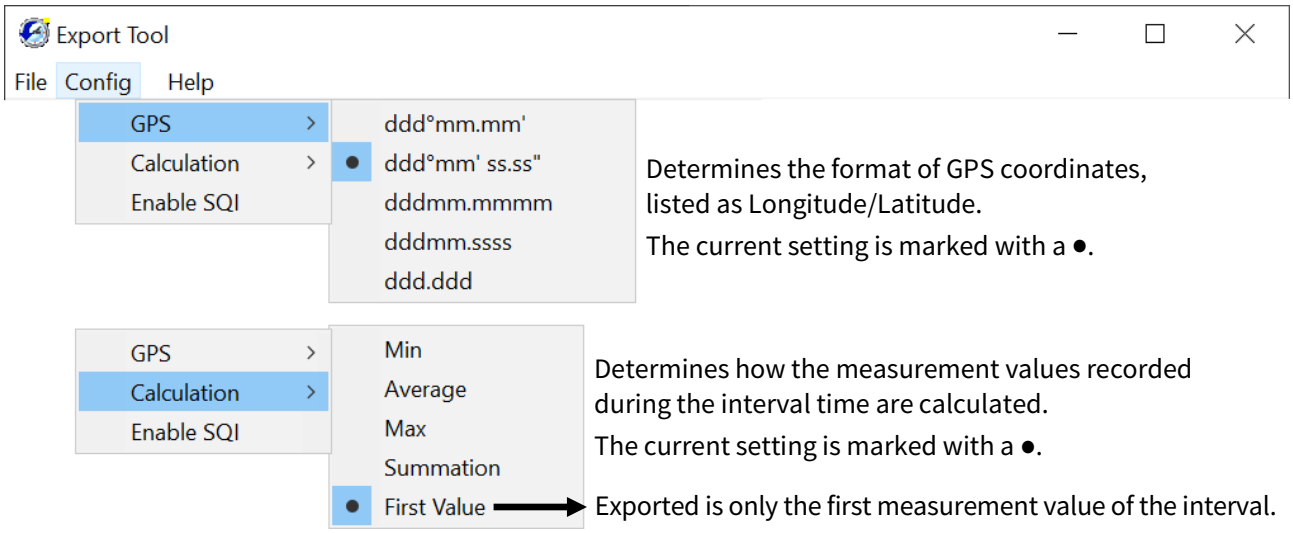
Run — Loads the selected data into the list.

Save — Exports the measurement data in txt- and csv-format. Opens a window in which the storage path and format can be selected. The data in the txt file is separated by tabs, and the csv file by semicolons. see *Appendix F – Opening a csv-File*



Exports GPS data to gpx-format. Opens a window in which the storage path can be selected.

* see next page there *Selection Timezone*



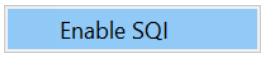
Determines the format of GPS coordinates, listed as Longitude/Latitude.

The current setting is marked with a ●.

Determines how the measurement values recorded during the interval time are calculated.

The current setting is marked with a ●.

Exported is only the first measurement value of the interval.



For application-specific parameters from spectral data, the SQI* values are listed. In all other cases, the SQI value is meaningless here.

Selecting a time zone

The displayed time zone can be changed as follows.

- **Coordinated Universal Time [UTC]**
  Display date/time in UTC according to the timestamp in the database
- **Local Timezone [PC]**
  Display date/time according to calculation from Coordinated Universal Time [UTC] to the time zone of the PC on which the BlueBox PC Software is installed.
- **BlueBox Timezone [BB]**
  Display date/time according to calculation from Coordinated Universal Time [UTC] to the selected time zone in the BlueBoxSoft network settings, see *3.2 Network Setup*

Note on time stamp: The recording times of the measurement values and associated information (e.g. GPS data) are stored in the database in Coordinated Universal Time (UTC). Changing the time zone on the BlueBox Display and in the BlueBox PC Software only changes the time displayed, not the time stamp in the database.

* SQI = Spectral Quality Index

6.2 ModConfig (Modbus Client Configuration)

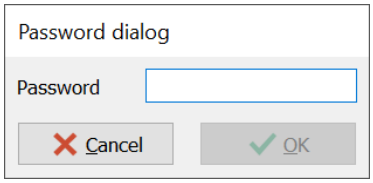
described program version: 4.5/5.1

Note: The complexity of setting up Modbus devices varies depending on the system configuration and hardware. Detailed descriptions are available as service documentation.
Contact GO Systemelektronik.

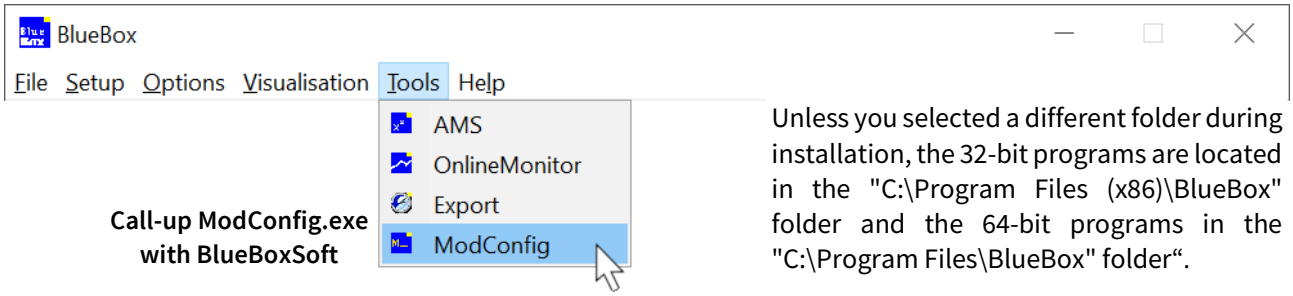
Available Modbus interfaces of the BlueBox:

- CAN-bus with External Serial Interface Module — see *6.2.2*
- Ethernet via TCP/IP — see *6.2.3*
- Internal Serial Interface — see *6.2.4*

For some settings, you will need the password for the respective BlueBox. see *Appendix G – The Configuration Data Sheet* there *Network* there *Password*



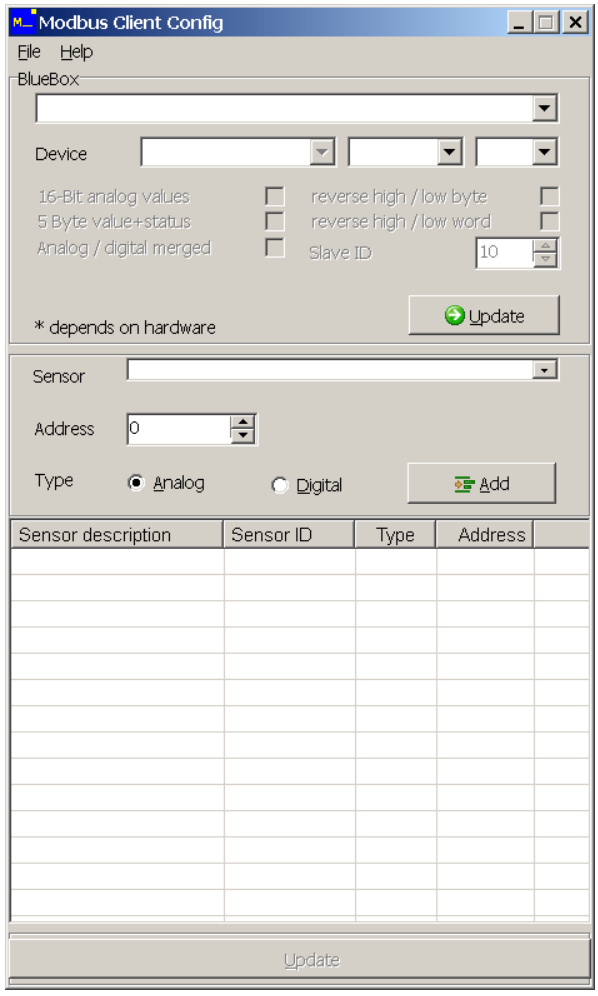
6.2.1 Starting ModConfig.exe



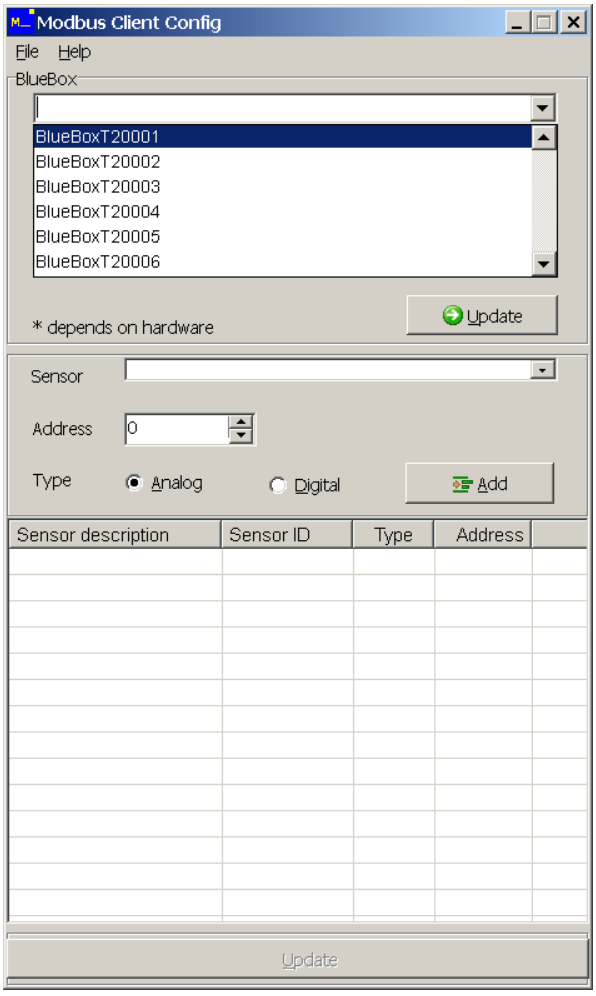
Call-up ModConfig.exe with BlueBoxSoft

Unless you selected a different folder during installation, the 32-bit programs are located in the "C:\Program Files (x86)\BlueBox" folder and the 64-bit programs in the "C:\Program Files\BlueBox" folder“.

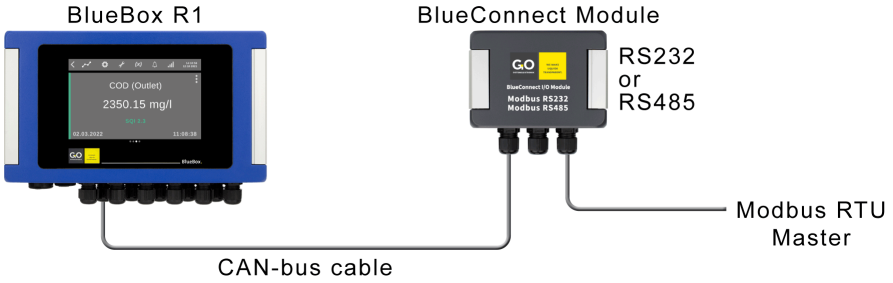
After starting, this window will open.



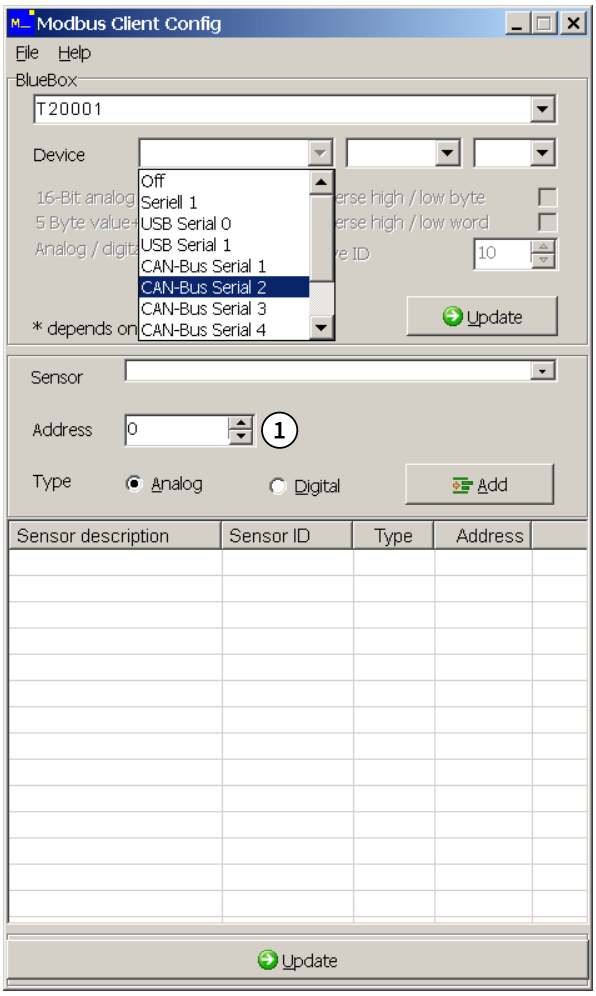
Select a BlueBox.



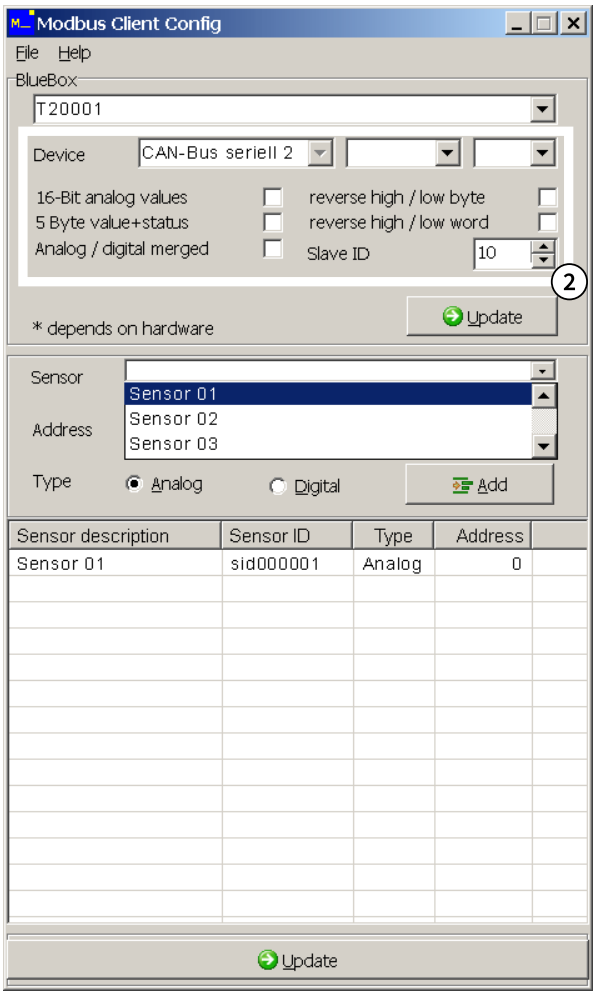
6.2.2 CAN-bus with External Serial Interface Module



Select CAN-Bus Serial 1 to 6.*



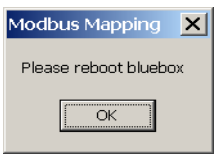
Select Sensor and click on Add



Click on <Update> transfers the settings to the BlueBox.

① 0 equates to register 30001 for analog sensors and register 10001 for digital sensors.

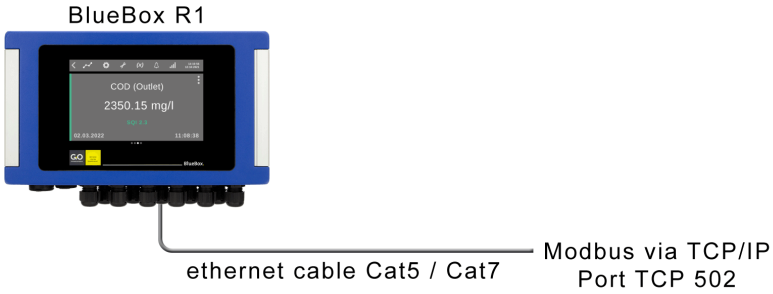
② Apply the change by clicking Update
For older configurations, you will be prompted to restart the BlueBox after changing these settings.



If you want to connect an additional module, select CAN-Bus Serial 3 accordingly.
CAN-Bus Serial 1 is reserved for the internal serial interface.
If you receive the error message "Unsupported firmware", the BlueBox firmware needs to be updated.
In this case, please contact GO Systemelektronik.

* ! At the BlueBox T4 and TS, select **CAN-Bus Serial 2 to 6** here.

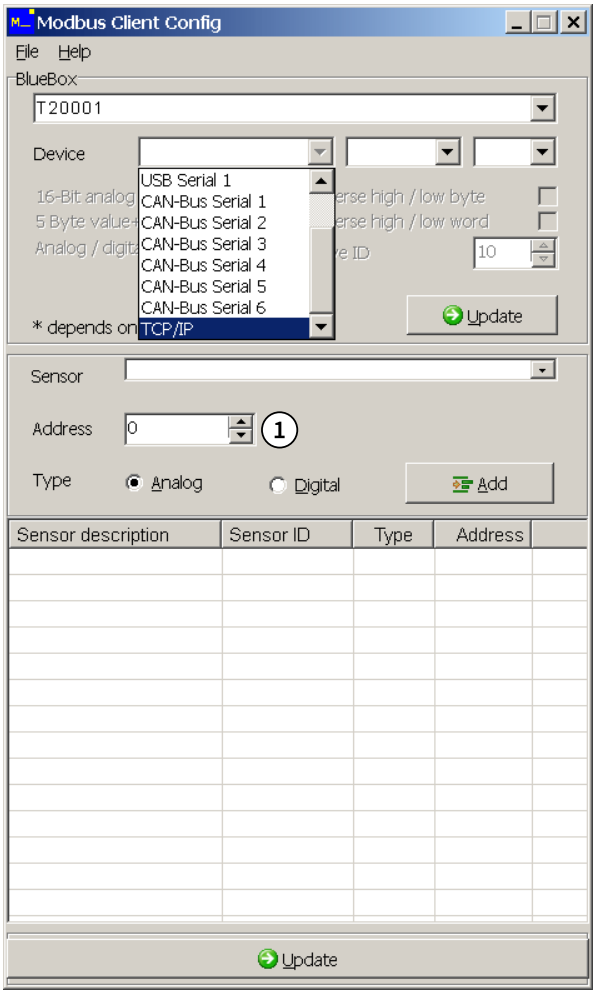
6.2.3 Ethernet via TCP/IP



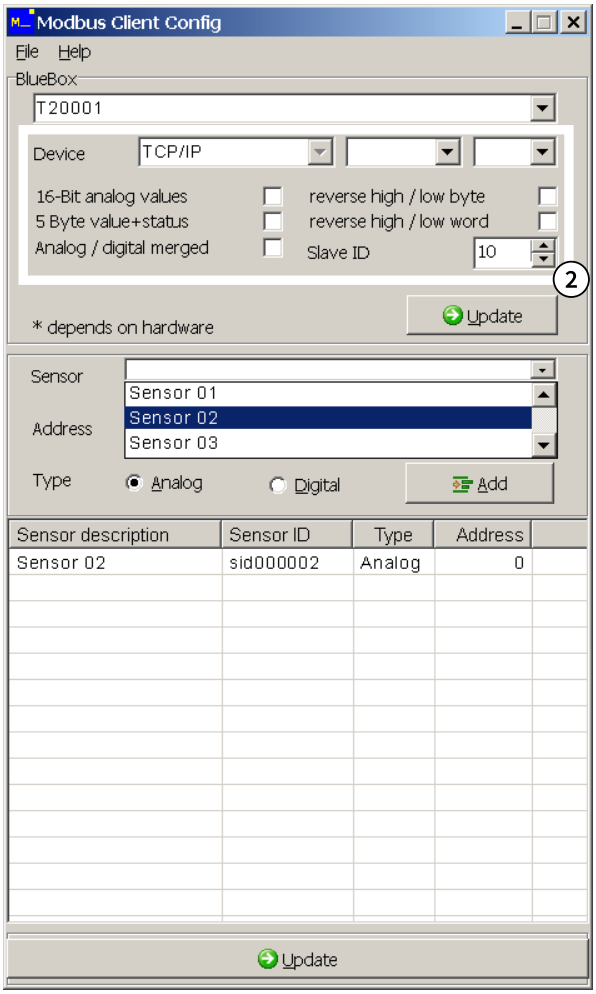
The Modbus TCP/IP interface can only be accessed from private network addresses:

10.0.0.0/8	(10.0.0.1 – 10.255.255.254)
172.16.0.0/12	(172.16.0.1 – 172.31.255.254)
192.168.0.0/16	(192.168.0.1 – 192.168.255.254)

Select TCP/IP.



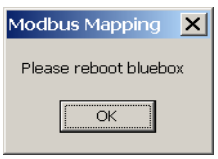
Select Sensor and click on Add



Click on <Update> transfers the settings to the BlueBox.

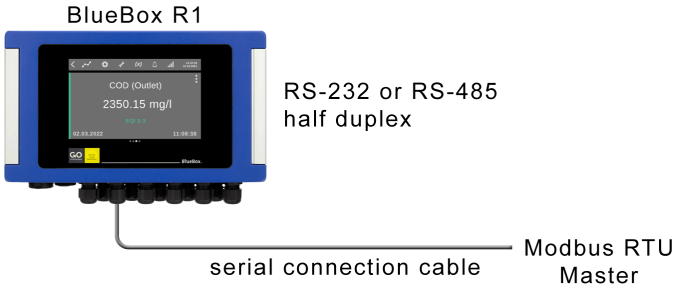
① 0 equates to register 30001 for analog sensors and register 10001 for digital sensors.

② Apply the change by clicking Update
For older configurations, you will be prompted to restart the BlueBox after changing these settings.

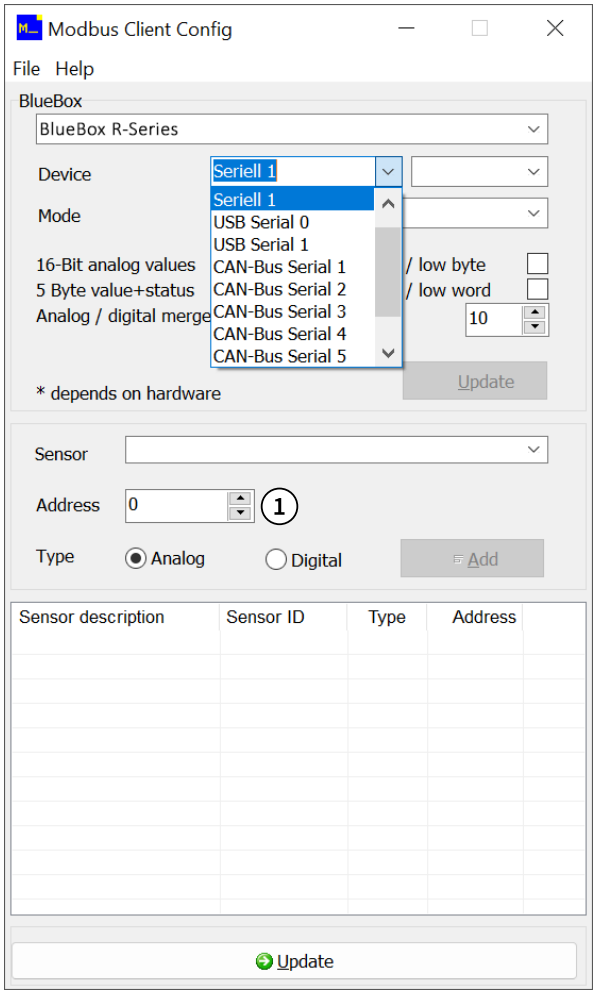


If you receive the error message "Unsupported firmware", the BlueBox firmware needs to be updated. In this case, please contact GO Systemelektronik.

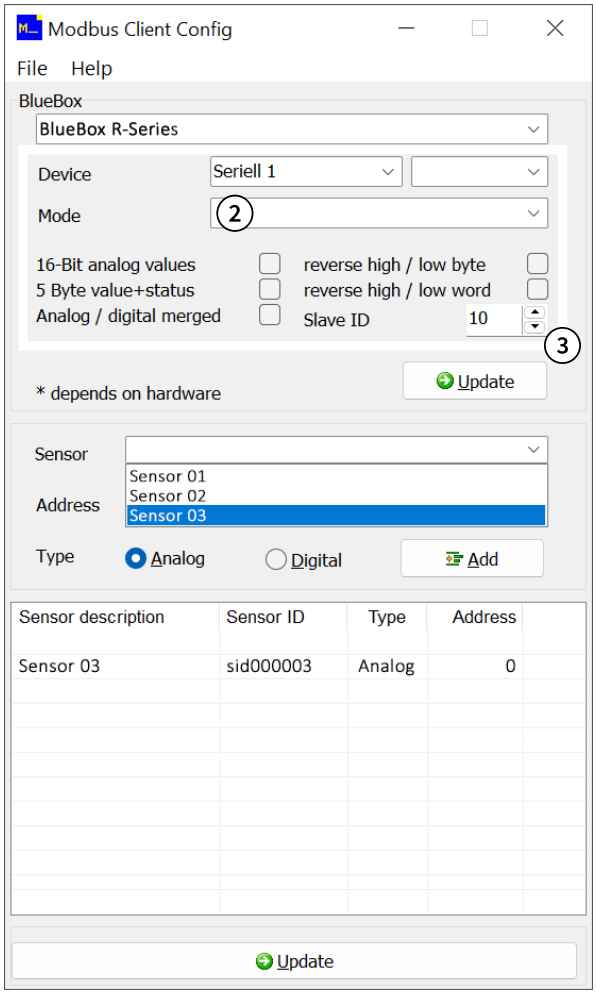
6.2.4 Internal Serial Interface



Select Seriell/Serial 1.*



Select Sensor and click Add

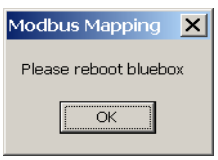


Click on <Update> transfers the settings to the BlueBox.

① 0 equates to register 30001 for analog sensors and register 10001 for digital sensors.

② Setting the operating mode according to the hardware

③ Apply the change by clicking Update
For older configurations, you will be prompted to restart the BlueBox after changing these settings.



If you receive the error message "Unsupported firmware", the BlueBox firmware needs to be updated. In this case, please contact GO Systemelektronik.

* At the BlueBox T4 and TS, select **CAN-Bus Serial 1** here.
see also *6.2.4.1 Internal Serial Interface at the BlueBox T4/TS*

6.2.4.1 Internal Serial Interface at the BlueBox T4/TS

BlueBox T4/TS*: To use the almost full range of functions of the BlueBox PC Software, you need BlueBox firmware version 4.05.30 or higher and BlueBox storage firmware version 3.26 or higher.
For BlueBox firmware versions, see *5.4 The AMS Start Window* and *5.3.4 Help* there *BlueBox Info*
* BlueBox T4 and BlueBox TS are the predecessors of the current R series.

Setting up Modbus devices on a T series BlueBox

Setting up Modbus devices with ModConfig.exe from software version 5.0 onwards on the serial interface of a T series BlueBox differs from that on an R series BlueBox.

Some operating modes cannot be used on a T series BlueBox.
Operating modes that cannot be used are shown in italics.

On a T series BlueBox, the internal serial interface setting is not "Serial 1" as on an R series BlueBox, but "CAN-Bus Serial 1". **However, with the remaining RS232 operating modes, it is possible to operate a serial interface set to RS485 by means of a jumper setting.**
For further information, please contact GO Systemelektronik.

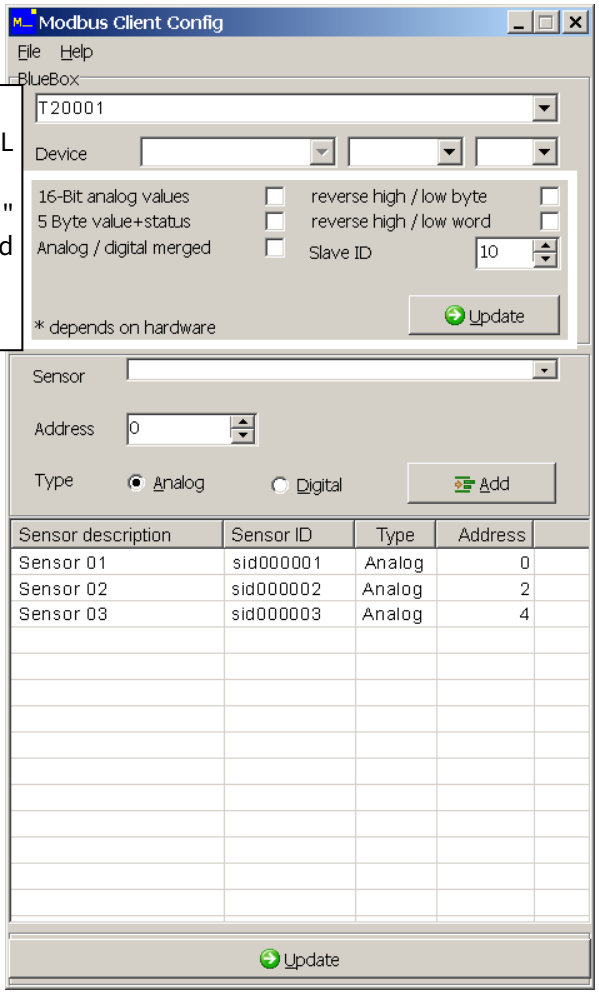
RS232 8E1 (depends on hardware)
RS232 801 (depends on hardware)
RS232 8N2 (depends on hardware)
RS485 8N1 (depends on hardware)
RS485 8El (depends on hardware)
RS485 801 (depends on hardware)
RS485 8N2 (depends on hardware)

6.2.5 Configuring the Sensors

Setting the data transmission format
If nothing is checked, the value is 4 Byte float in INTEL "Little-Endian" format (LSB first.

For the MODBUS/MOTOROLA format ("Big-Endian" format (MSB first)), mark **reverse high / low byte** und **reverse high / low word**.

Apply the change by clicking on Update



You can assign an ascending address to the selected sensor using the Address selection field. (For analog sensors, the addresses are increased by 2 and for digital sensors by 1, i.e. two 16-bit registers are always read out for an analog measurement.)

It is necessary to communicate the assigned addresses to the technicians of the remote device. It is recommended to create a shared table.

For each sensor, you must also select whether the sensor is analog (e.g. temperature) or digital (e.g. a float switch).
Type ◉ Analog ◉ Digital

The sensor drop-down menu lists the sensors that have already been selected, with analog sensors marked in blue and digital sensors marked in green.
You can change or expand the table at any time. However, you must always inform the technician of the remote device.

Clicking on <Update> transfers the settings to the BlueBox.

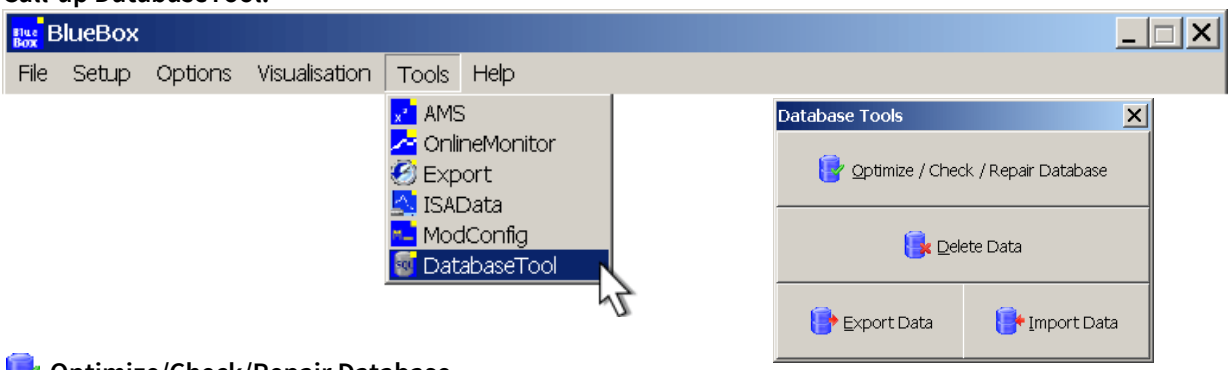
6.2.6 Configuration Settings Save and Load

Via the menu item File > Export you can save the current configuration as a map-file.
Via the menu item File > Import you can load a map-file and thereby a saved configuration.

6.3 DatabaseTool

described program version: 4.2

Call-up DatabaseTool:



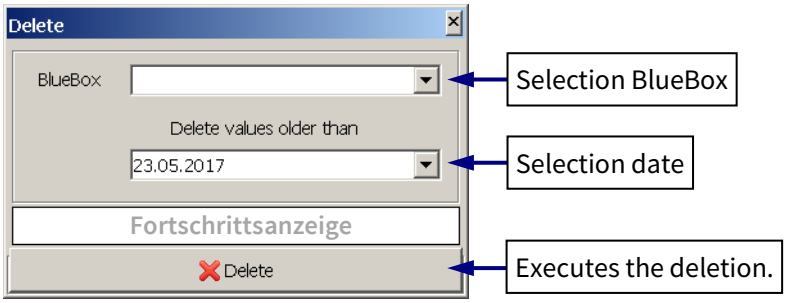
Optimize/Check/Repair Database
Opens a window in which a BlueBox and the associated database can be selected.

Optimise: Searches the database for deleted records and removes them.

Check: Checks the database for errors and outputs an error list.

Repair: Repairs and compresses (formats) the database.

Delete Data Deletes data older than a selected date from the database.

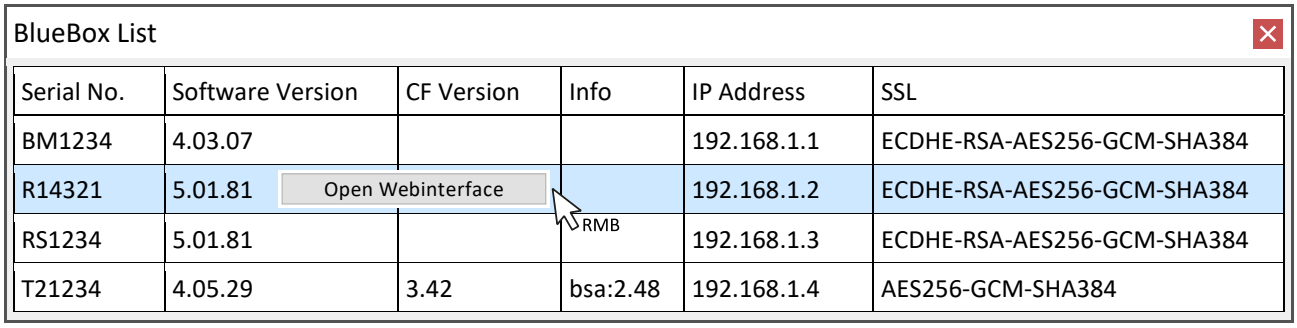


6.4 BlueBox Search

described program version: 5.0

The BlueBox_Search.exe program searches the PC's network for BlueBox/BlueMon devices.
Unless you selected a different folder during installation, the 32-bit programs are located in the "C:\Program Files (x86)\BlueBox" folder and the 64-bit programs in the "C:\Program Files\BlueBox" folder“.

After starting the program, the device list appears:



| **Serial No.:** Serial number of the device | **Software Version:** Firmware version of the device |
| **CF Version:** CompactFlash version of the device[1] | **Info:** Connection status, ISA spectrometer firmware version, internal current output firmware version (bsa)[1] | **IP Address:** IP address of the device | **SSL:** Type of encryption for the network connection |

Clicking with the right mouse button (RMB) in a line causes the button Open Webinterface to appear; clicking with the left mouse button on the button opens the BlueBox Web Interface[2] (see *Manual BlueBox R1 and Panel* there *12 The BlueBox Web Interface*).

[1] only at BlueBox T series
[2] only at BlueBox R series

6.5 USB Import useful only with BlueBox T3/T4 described program version: 4.5

Transferring measurement data from a BlueBox to your PC using a USB stick

If you did not select a different folder during installation, the 32-bit programs are located in the folder “C:\Program Files (x86)\BlueBox” and the 64-bit programs are located in the folder “C:\Program Files\BlueBox”.

Precondition: A USB stick[1] with a folder named “database”[2] at the top level. The measurement data was transferred to this folder via the display control of a BlueBox. see *Manual BlueBox R1 und Panel* there *7.7 Back-Up/Reset* there *Data base EXPORT*

Transferring measurement data from the USB stick to a database on your PC

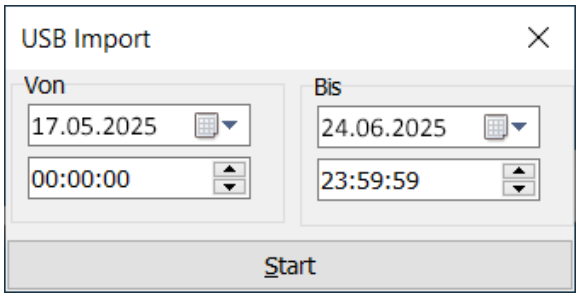
Precondition: The BlueBox is set up on the target computer with the BlueBoxSoft program (see *3.2.2 Setting Up a BlueBox*). Therewith an assigned database exists.

Insert the USB stick into a USB port on your computer. Start the USBImport.exe program.

Select a time period. The measurement data recorded during this period will be transferred to the correct database after clicking <Start>.

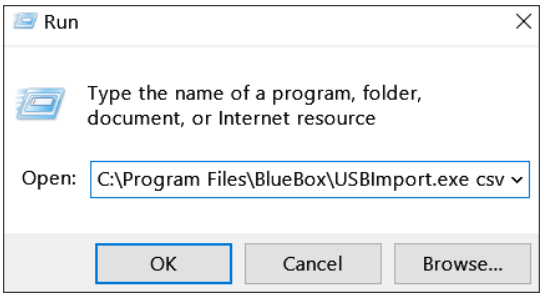
USBImport.exe program window:

The time is UTC.



Transfer of measurement data from the USB stick into csv-files on your PC

Plug the USB stick into a USB port of your computer. Open the Run window of your PC, e.g. in Windows 10 with the key combination Windows Key+R. Enter the storage path of USBImport.exe with the argument "csv".
Entry with default storage location, see the right graphic ⇨
Click on <OK>. The program creates a folder with the name "CSV" in the storage path of USBImport.exe and opens the program window (see above).
After clicking <Start>, the measurement data are stored in csv format in the "CSV" folder.



[1] strictly speaking: USB storage device

[2] note upper/lower case

6.6 BCDriver (BlueBox Communication Driver)

described program version: 4.5

The BCDriver program (BlueBox Communication Driver) is a program with integrated gateway for network communication with a BlueBox System (hereinafter also simply called BlueBox) via Intranet and Internet and for receiving measurement data.

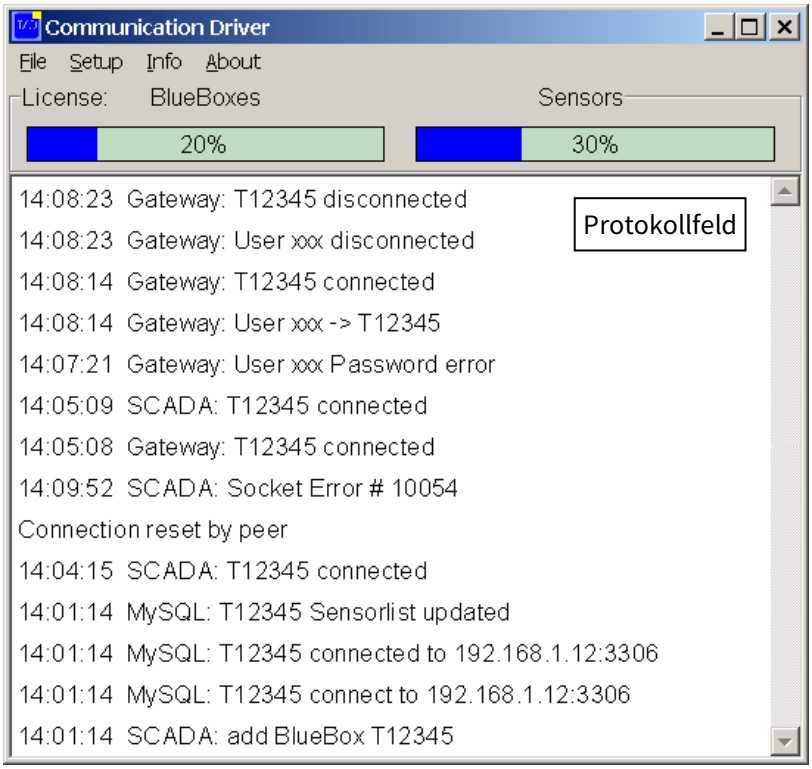
For a bidirectional connection to a BlueBox system behind a firewall, a gateway with a fixed IP address is required.

Without BCDriver the program SCADA-BlueBox Control Center is not useful to operate, therefore BCDriver is part of the SCADA scope of delivery. Special license conditions also apply.

BCDriver is license-dependent* executable, licensed is the number of connectable BlueBox systems, the number of connectable sensors/actuators and the number of possible gateway connections. You can find out the type of license via the menu item <About> in the menu bar of the BCDriver start window, see below.

If you did not select a different folder during installation, the 32-bit programs are located in the folder “C:\Program Files (x86)\BlueBox” and the 64-bit programs are located in the folder “C:\Program Files\BlueBox”.

Start the program BCDriver.exe, the start window opens:



The BCD start window displays the utilization of the number of license-dependent possible BlueBox Systems and sensors/actuators graphically and in percentage values.
The menu item <About> opens an information window with the software version and the number of licenses for BlueBox Systems (B), sensors (S) and gateway connections (G).

If there are connection problems with router connections, do the following:

Measurement data transmission with the UDP protocol
Enable the following port in the router of the BlueBox: • Port 14112 UDP – IP address

Bidirectional connection using the TCP protocol
Enable the following port in the router of the BlueBox: • Port 14003 TCP – IP address
Enable the following port in the router of the computer on which the requesting BlueBox PC Software is installed: • Port 14002 TCP – IP address of the BlueBox

If a time server is set at the BlueBox, Port 123 UDP (NTP protocol) ⇔ Timeserver IP is needed.

* In server operation (see *Appendix C – BlueBox PC Software in Server Operation*) licenses are first searched locally on the computer. If there is no license here, the server is searched.

Note: If the internal network is not a Class A, B or C network then communication with the BlueBox is only possible over:

- Port 14110/TCP (SSL encrypted)

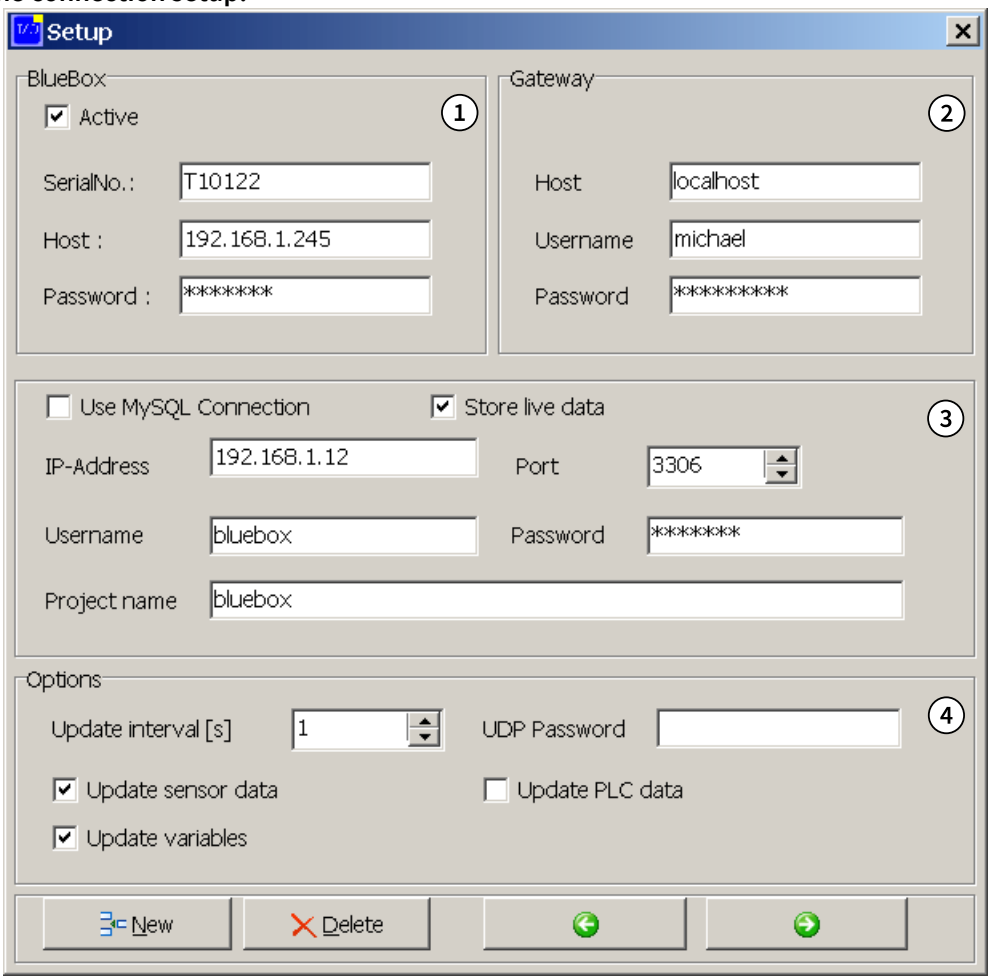
Unencrypted communication with the BlueBox is only possible from the following networks:

- 10.0.0.0/8 Class A network
- 172.16.0.0/12 Class B network
- 192.168.0.0/16 Class C network

6.6.1 Connection Setup

Call-up of the connection setup:

Window of the connection setup:



Use this window to specify,

- with which BlueBox systems a connection is established and, if necessary, whether this connection goes via an external or internal gateway,
- whether data is queried directly from a BlueBox System or from an assigned database (only useful for SCADA),
- whether queried measurement and configuration data are stored in a database and
- whether data is queried regularly.

① **BlueBox connection**

☑ **Active**	☑ Connection active ⇔ ☐ Connection inactive
SerialNo.:	Serial number of the BlueBox*
Host:	IP address of the BlueBox*
Password:	Network password of the BlueBox*

* see *Appendix G – The Configuration Data Sheet* there *2. Network*

② **Gateway access data**

Host	IP address of the gateway *localhost* for the integrated gateway
Username	Gateway username
Password	Gateway password

③ **Direct query, database query and Storage**

see *3.3 SQL Server Setup*
see also *Appendix A – Installation MariaDB® Server*

☑ **Use MySQL Connection**	SQL connection With the SQL connection, the measurement and configuration data are not queried directly from the BlueBox, but from a database.
☑ **Store live data**	Saving the queried measurement and configuration data. The queried measurement and configuration data are stored in the database specified with *Project name* (see below).
IP-Address	IP address of the SQL Server
Port	Port number of the SQL Server, default address 3306
Username	User name of the SQL Server, default name root
Password	Port number of the SQL Server
Project name	Project name = Name of the database see *3.2.2 Setting Up a BlueBox*

④ **Connection options**

Update interval	Update interval in seconds of an automatic data query
UDP Password	If the UDP data transmission of the requested BlueBox is encrypted, the password must be entered here. see *Manual BlueBox R1 and Panel* there *7.4.2 Settings Cloud*
☑ **Update sensor data**	Transfer sensor/actuator data
☑ **Update PLC data**	PLC data transfer – only for SCADA
☑ **Update variables**	Transfer variables – only for SCADA

Buttons

Opens the setting of a new connection, see next page.

Deletes the displayed connection.

Opens the setting of the previous connection (if existing).

Opens the setting of the following connection (if existing).

If you make changes to the settings, the buttons change.

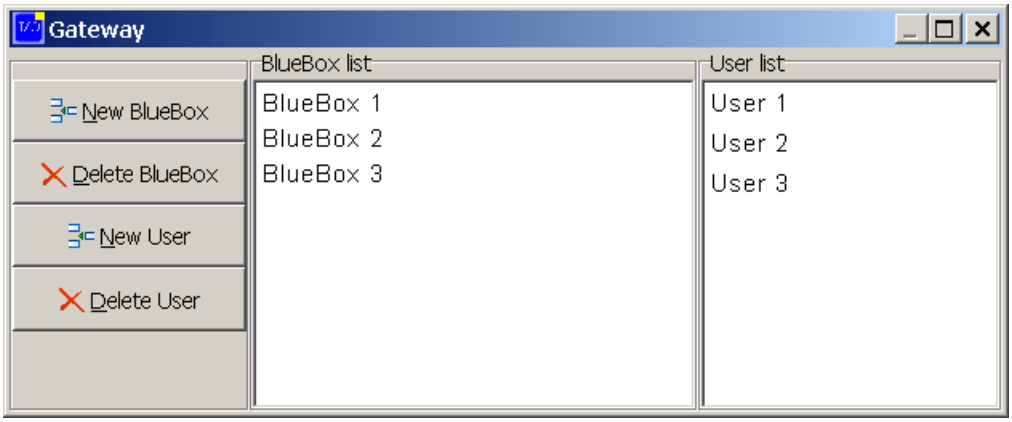
Saves the changes.

Cancels the process, the changes are not saved.

6.6.2 Integrated Gateway

Call-up gateway settings:

Window of the gateway settings:



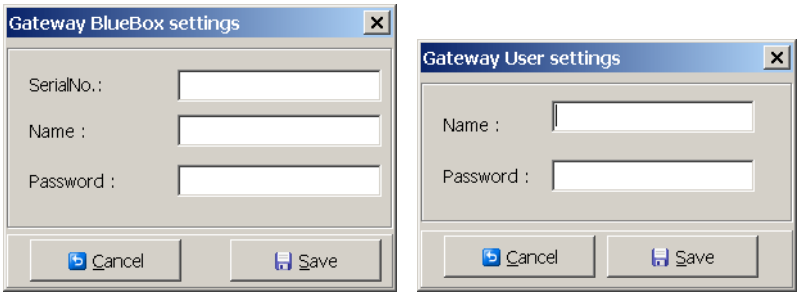
The BlueBox Systems that can be connected via the integrated gateway are listed here with their assigned user names.

Opens a window for entering a BlueBox serial number, a BlueBox name and a password. The password is then entered in the BlueBox to be queried, see *Manual BlueBox R1 and Panel* there *7.4.2 Settings Cloud*

Deletes the BlueBox system with its user names from the list.

Opens a window for entering a user name and password for the selected BlueBox list element. These are then entered in the BlueBox to be queried, see *3.2 Network Setup*. Multiple user names can be assigned to a BlueBox entry.

Deletes the user name from the list.

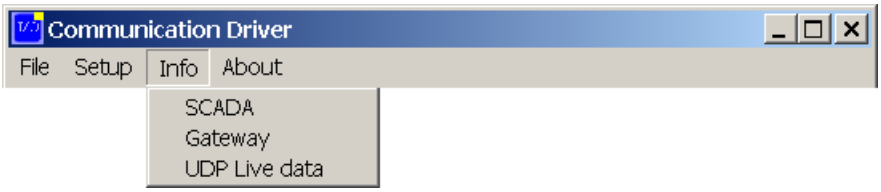


Cancels the process, the entries are not saved.

Saves the entries.

6.6.3 Info

Call-up protocol windows:



SCADA: This function currently applies only to the discontinued SCADA program “BlueBox Control Center” from GO Systemelektronik and cannot be executed without the program.
In the **SCADA protocol window**, the BlueBox Systems entered in the connection settings window are listed. Displayed is the connection status, the time of the last connection establishment, the number of connected sensors and the firmware version of the connected BlueBox.

Example:

BlueBox	Online	Last connected	Sensors	Firmware
T12345	yes	24.04.2018 10:34:14	75	4.02.10

In the **gateway protocol window** is listed, which BlueBox has logged on to the gateway, whether a user has established a connection via the gateway and the amount of data transferred.

Example:

BlueBox	Status	User	RX	TX
T12345	connected	name	5430 bytes	5430 bytes

In the **UDP live data protocol window** is listed, when which sensor/actuator ID has sent which value to which BlueBox System. Example: *10:56:04 UDP: fst00267 30.86 -> T12345*

Appendix A – Installation MariaDB® Server

MariaDB® is a free relational open source database management system. It originated from a fork (split) of MySQL™. In the BlueBox PC Software, MariaDB® replaced the previously used database management system MySQL™ in mid-2024.

You can continue to use MySQL™. If you want to switch from MySQL™ to MariaDB®,
see below *6 Switching from MySQL™ to MariaDB®*.

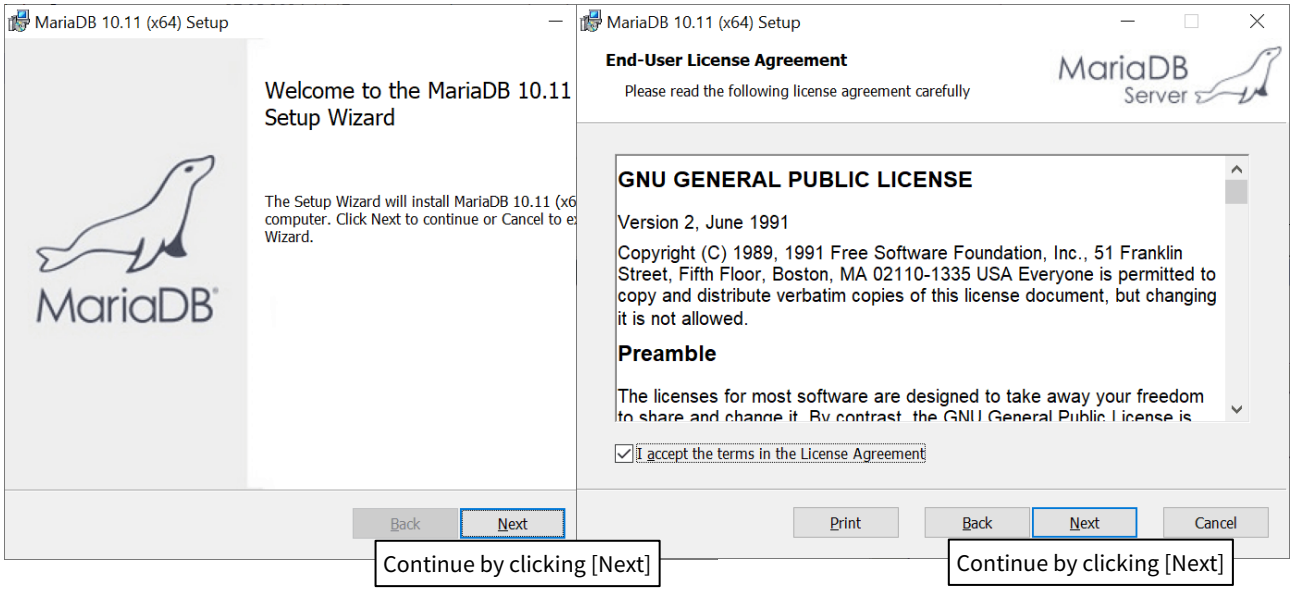
The MariaDB® installer installs an SQL server. A database is created using a project name in the BlueBoxSoft program, see *3.2.2 Setting up a new BlueBox*.

1 Preparation Installation MariaDB Server

The installation program for the SQL server can be found on the supplied USB stick under:

- **BlueBox Install\1. MySQL Server Installation\ mariadb-10.11.8-winx32.msi** (32-bit-version)
  or
- **BlueBox Install\1. MySQL Server Installation\ mariadb-10.11.8-winx64.msi** (64-bit-version)

Start the installation programme and follow the instructions during installation.

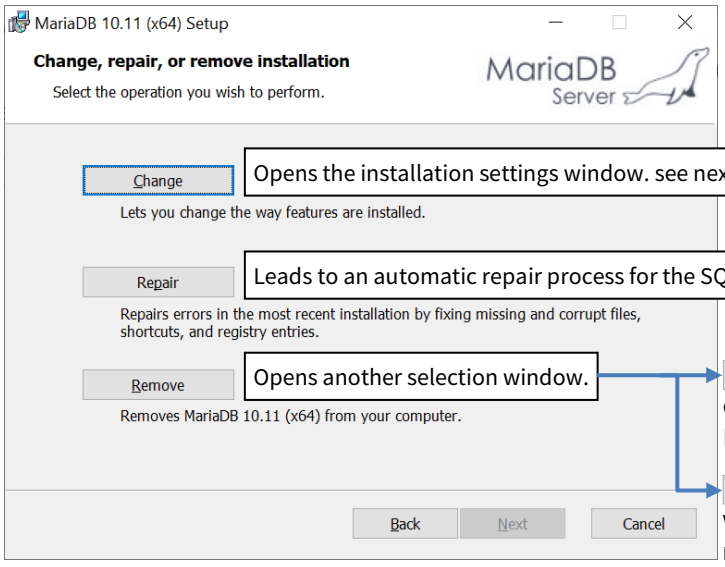


Continue by clicking [Next]

Continue by clicking [Next]

1.1 Change, Repair or Remove

If MariaDB® is already installed on the computer, this selection window will open.
If not, continue with the installation settings, see next page.



Opens the installation settings window. see next page

Leads to an automatic repair process for the SQL server.

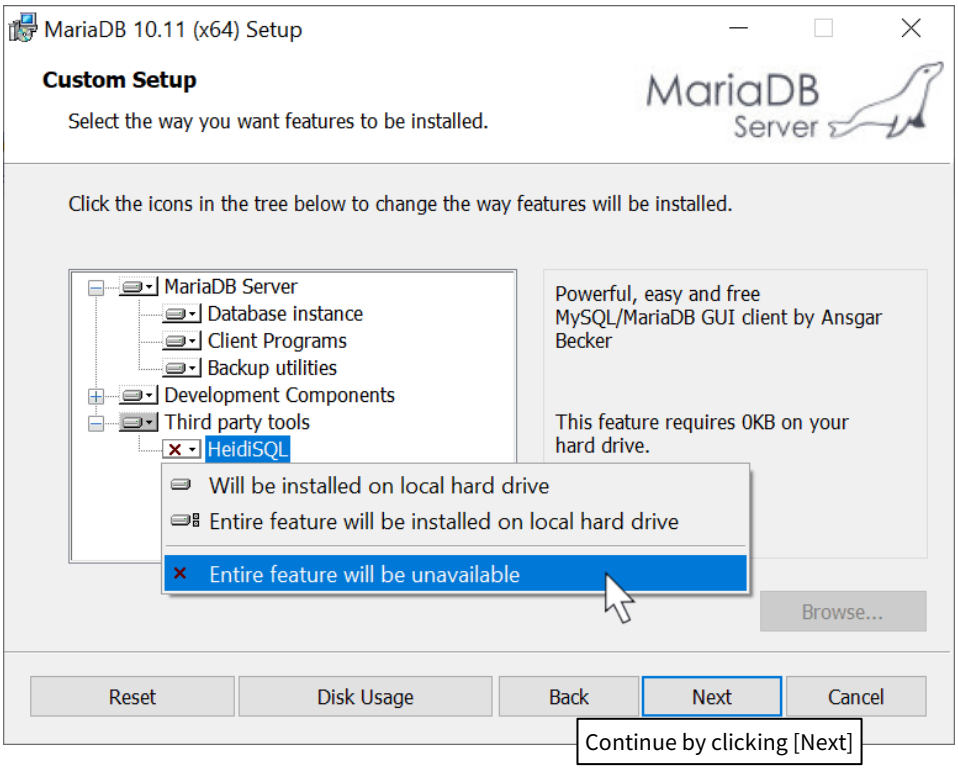
Opens another selection window.

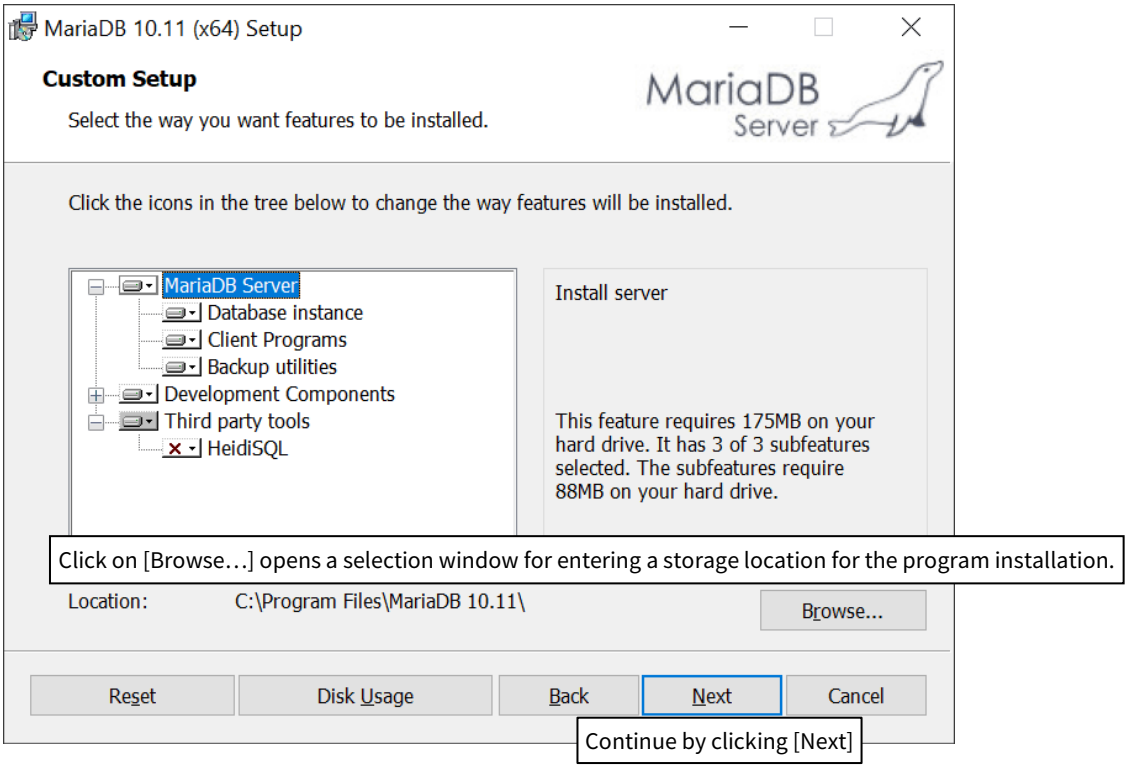
Remove data Selection of complete uninstallation of MariaDB® including the database with the BlueBox measurement data

Keep data Selection of uninstalling MariaDB® while keeping the database with the BlueBox measurement data

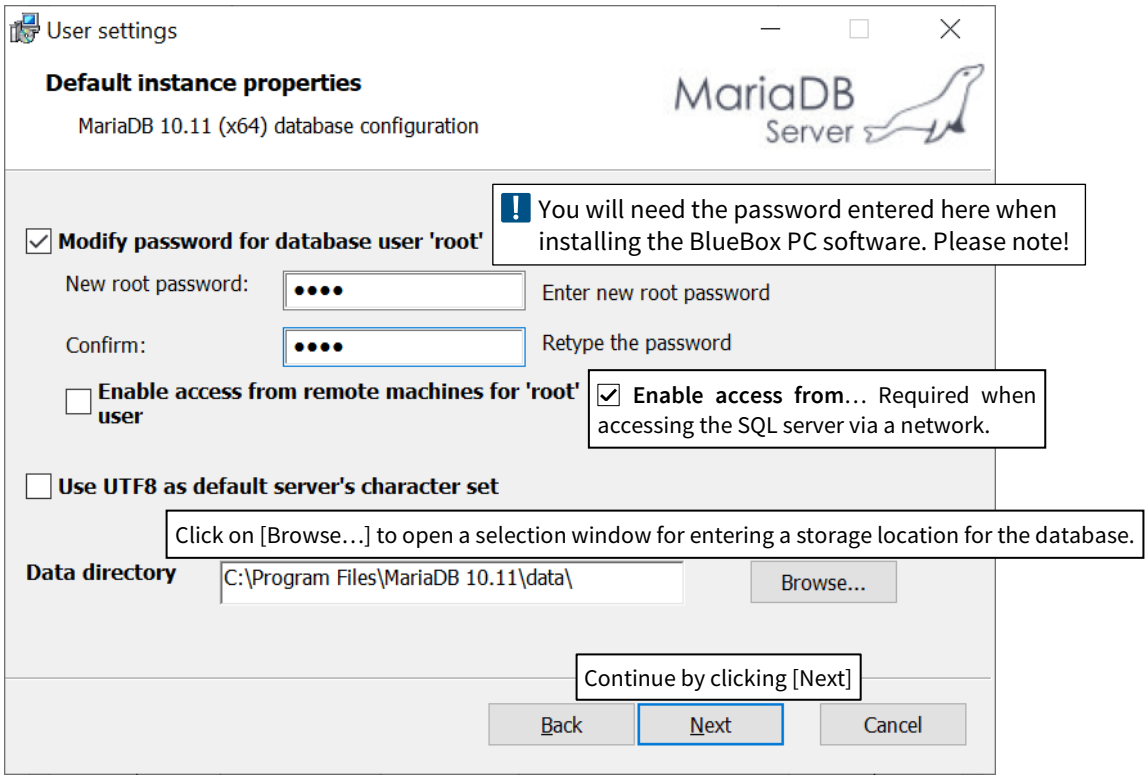
2 Installation Settings

Deselect the installation of the additional program HeidiSQL. The program is not required.



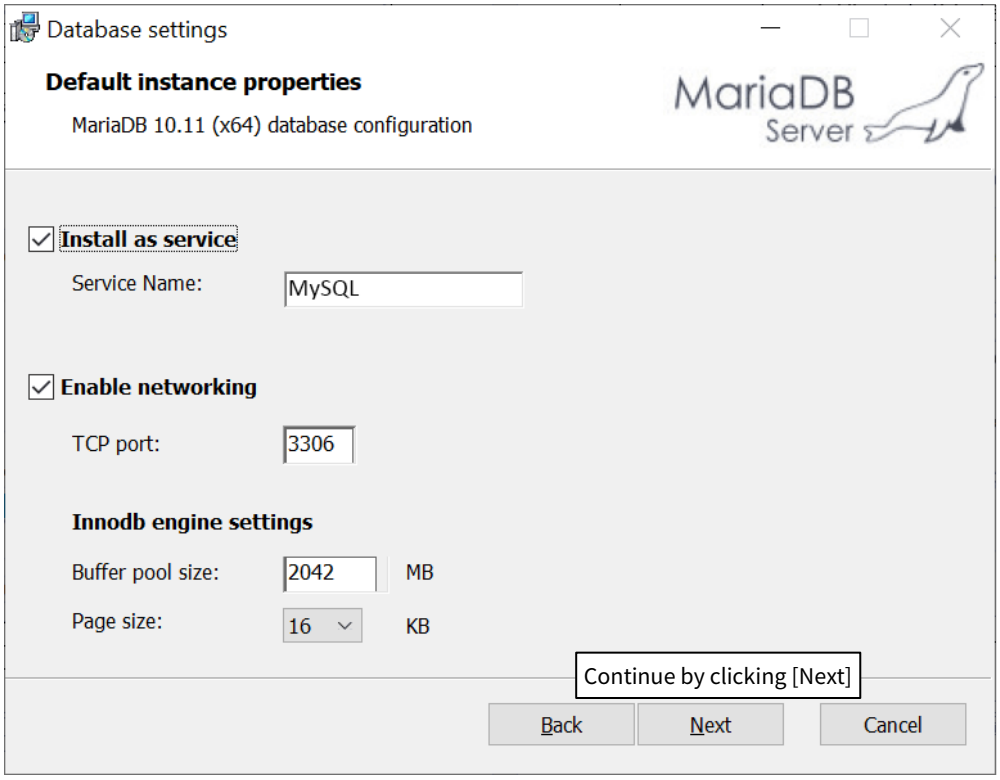


3 Program Settings I

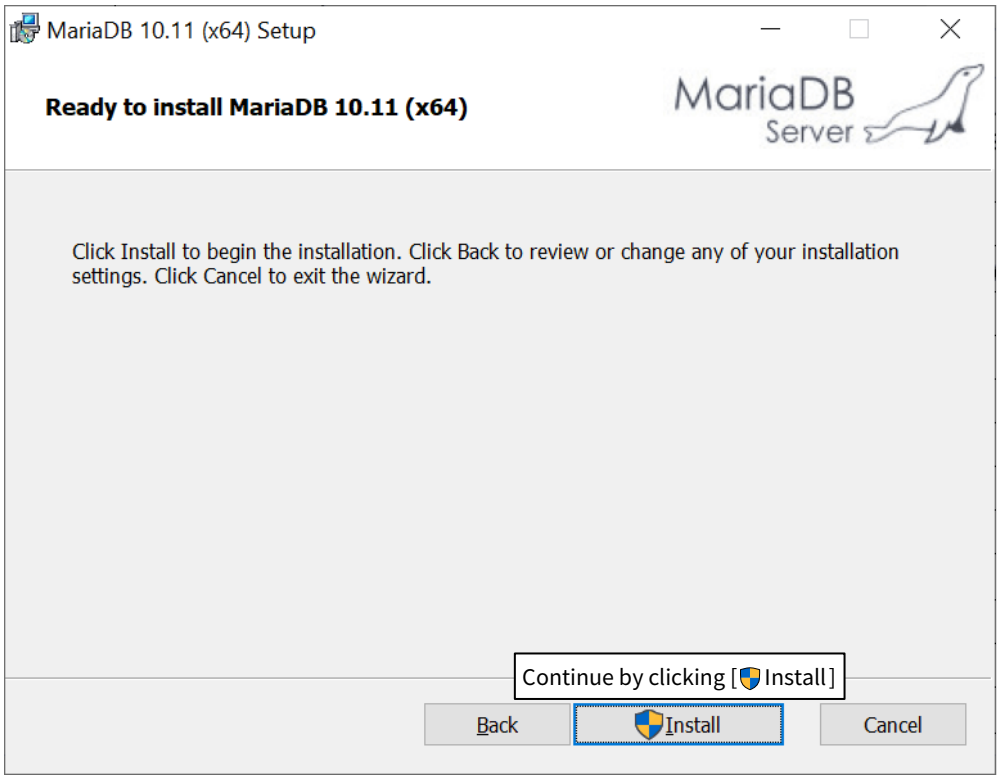


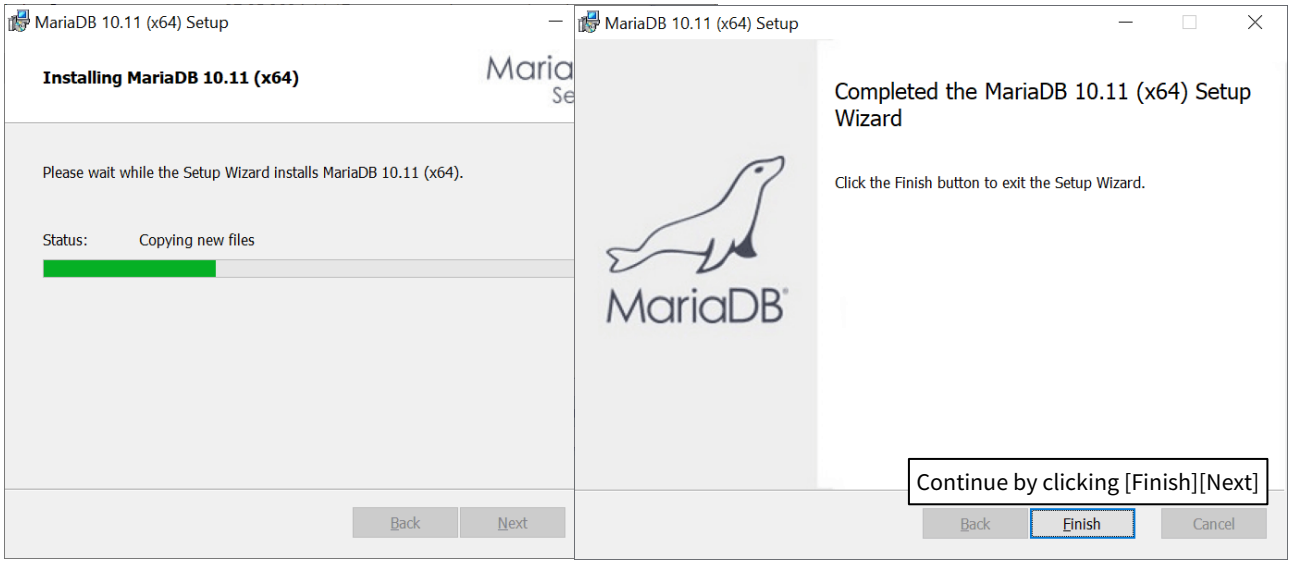
Note: By default, the database is created in the hidden directory *C:\ProgramData*. It is not possible to access the data there using Windows Explorer. It is therefore advisable to assign the database to a different, open directory. It may be helpful to note the storage location.

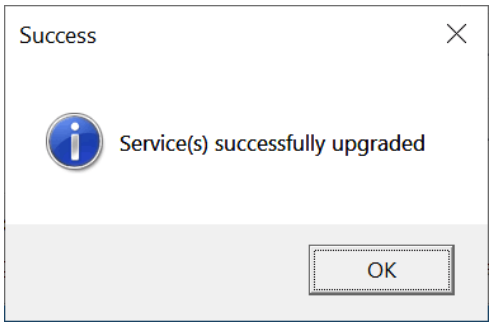
4 Program Settings II



5 Installing



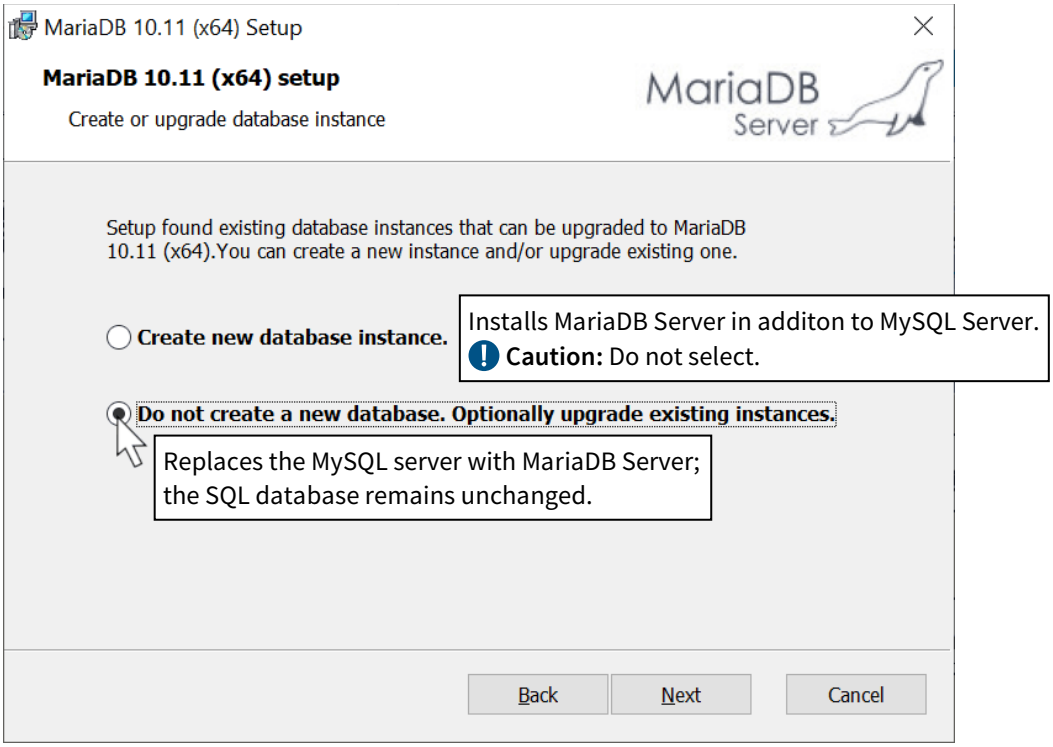




The installation is complete, click [OK].

6 Switching from MySQL™ to MariaDB®

If the MariaDB® installer detects an installed MySQL™ server, this window will open.



Clicking [Next] opens the installation settings window, see above *2 Installation Settings*.

Note: A reasonably up-to-date version of the BlueBox PC Software is required for the switch. Further details on request from GO Systemelektronik.

END

Appendix B – Installation of the BlueBox PC Software

The BlueBox PC Software can be installed on Windows systems from Windows 7 onwards.
Ein MariaDB® Server or a MySQL™ Server is essential for operating the BlueBox PC Software.
see *Appendix A* – Installation MariaDB® Server

Programs of the BlueBox PC Software

AMS.exe	Standard	OnlineMonitor.exe	Standard
BCDriver.exe	Standard	SoftwareLicense.exe	Standard
BlueBox_Search.exe	Standard	Spectrum_Visual.exe	optional
BlueBoxSoft.exe	Standard	SQLCheck.exe	Standard
Control.exe	optional	UpdateDatabase.exe	Standard
DB_Tool.exe	Standard	USBImport.exe	Standard
ExportTool.exe	Standard	visual_N.exe	Standard
ModbusMaster.exe	optional	visual1.exe	Standard
ModConfig.exe	Standard		

If the CodeMeter Software is not already installed on your computer, it can be installed when you install the BlueBox PC Software.

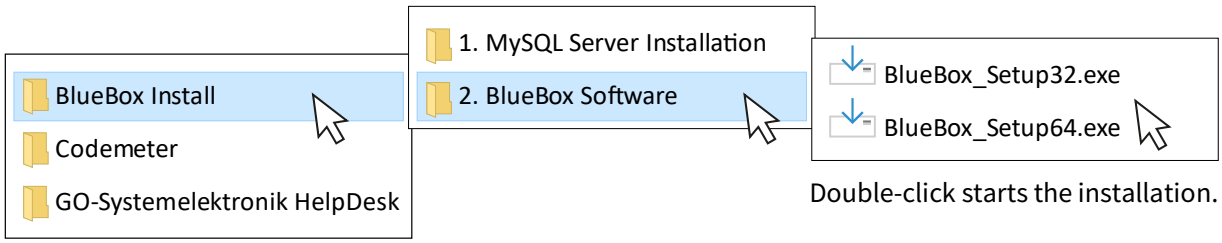
You will need the USB stick and USB dongle from GO Systemelektronik. The USB dongle and CodeMeter Software together protect the BlueBox PC software from unauthorised access.

USB stick

USB dongle

The USB stick contains the program data.

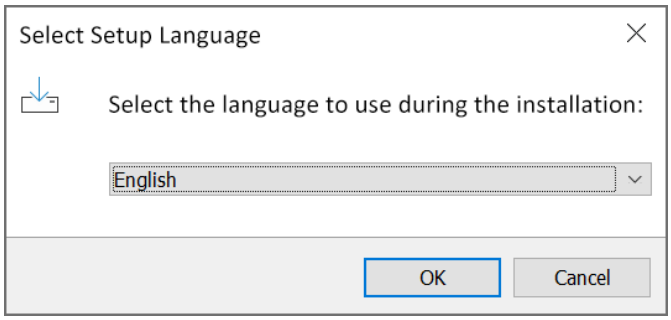
Insert the USB stick into a USB port on your PC.



Double-click starts the installation.

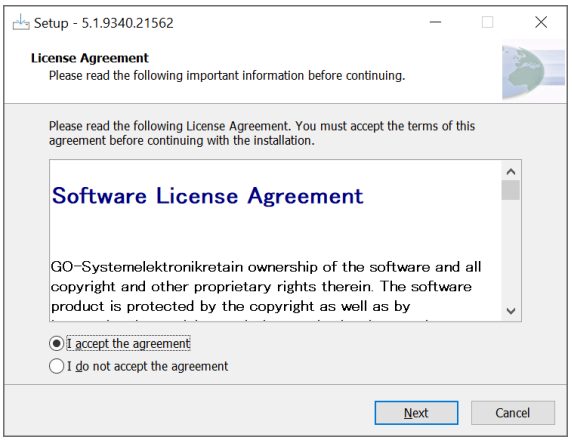
During installation, unless you select a different folder below, the folder "C:\Program Files (x86)\BlueBox" will be created for the 32-bit programmes and the folder "C:\Program Files\BlueBox" for the 64-bit programs, containing all the necessary files.

Select your language.

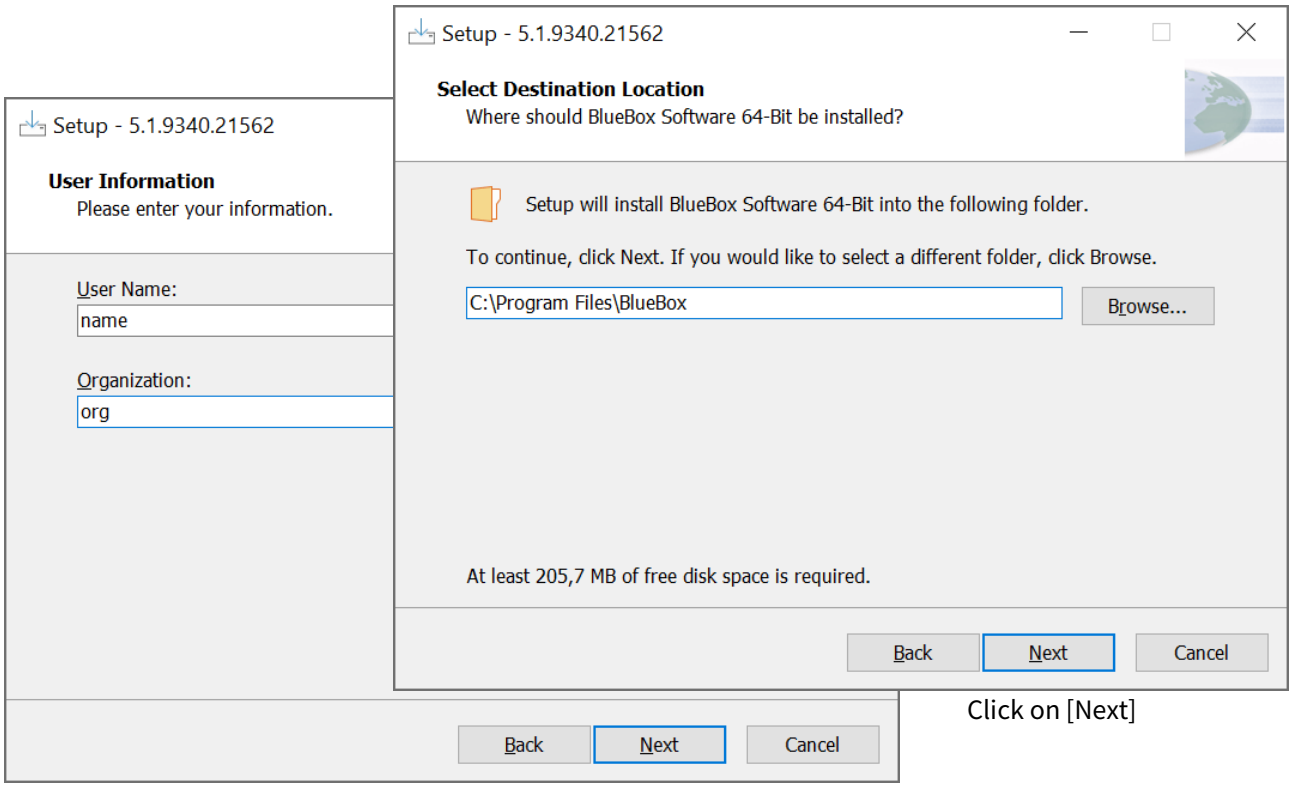


Click on [OK]

Confirm the licence agreement.

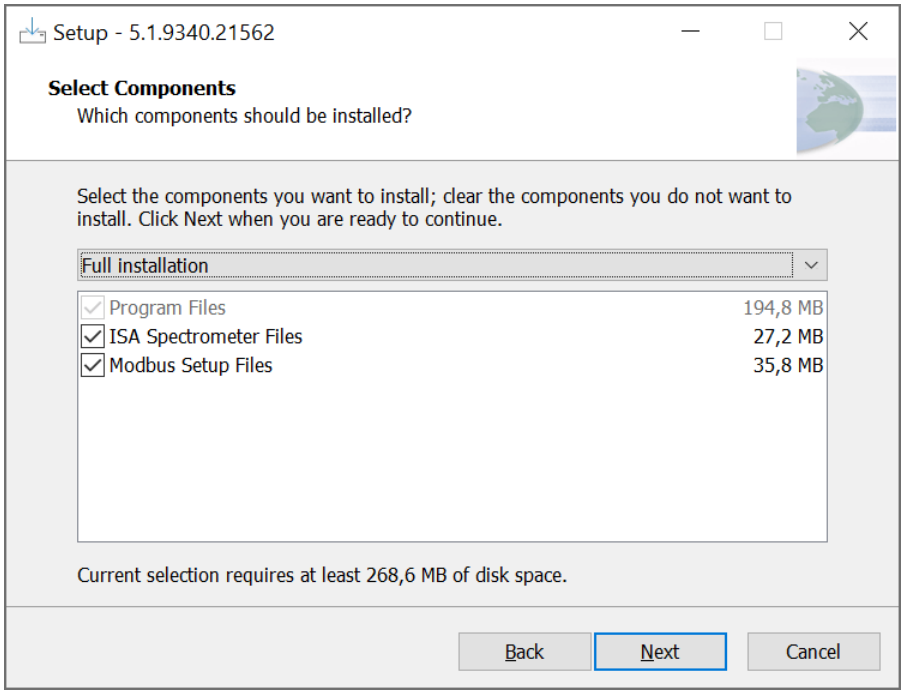


Click on [Next]



Click on [Next]

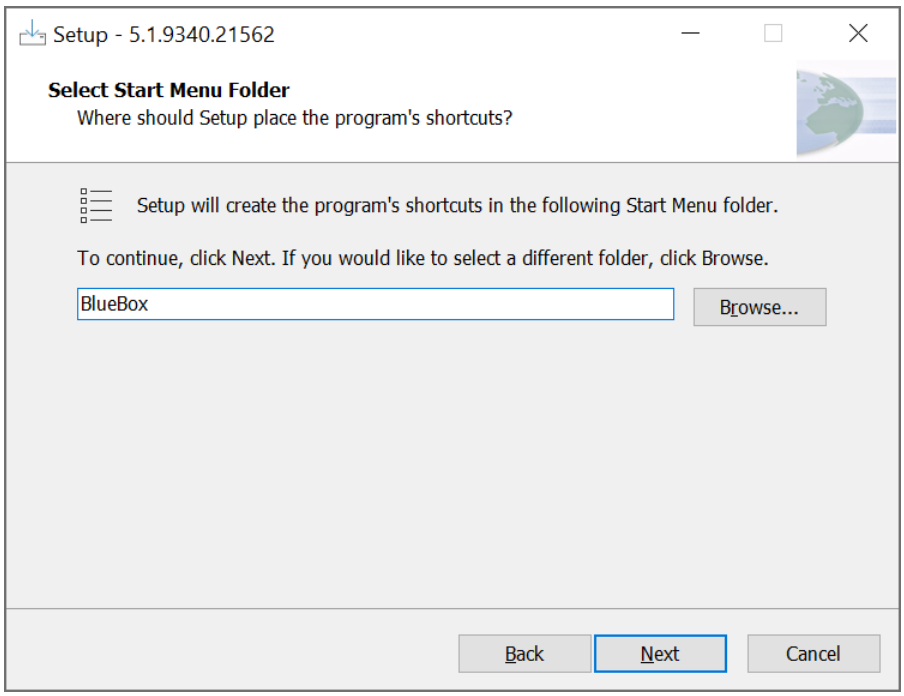
Click on [Next]



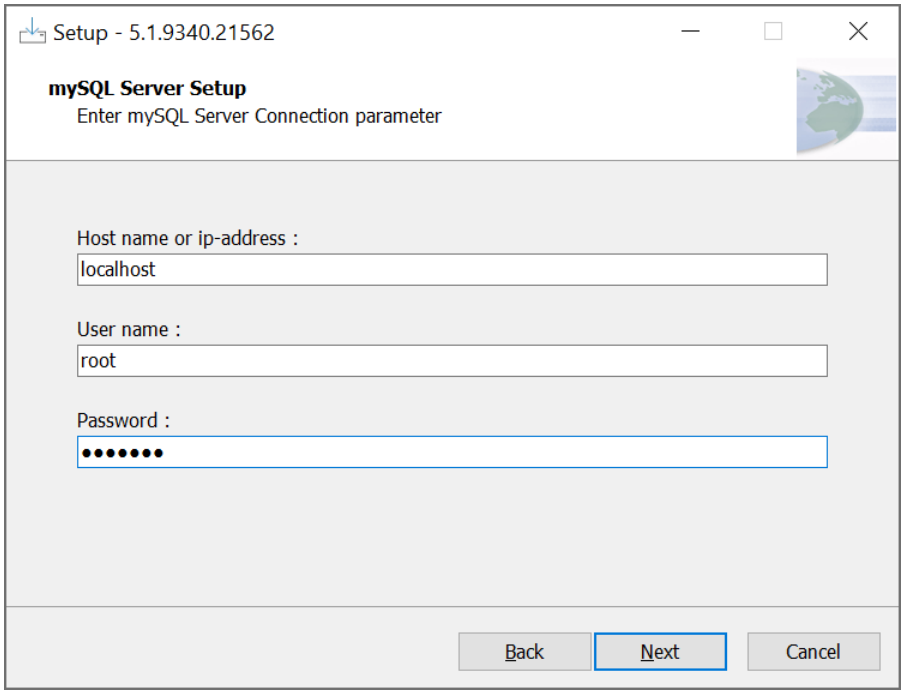
☑ Program files is always activated and causes the BlueBox PC Software to be installed. If the BlueBox PC Software is already installed, newer programme versions will be installed.

Deselect additional programmes if desired.

Click on [Next]



Click on [Next]



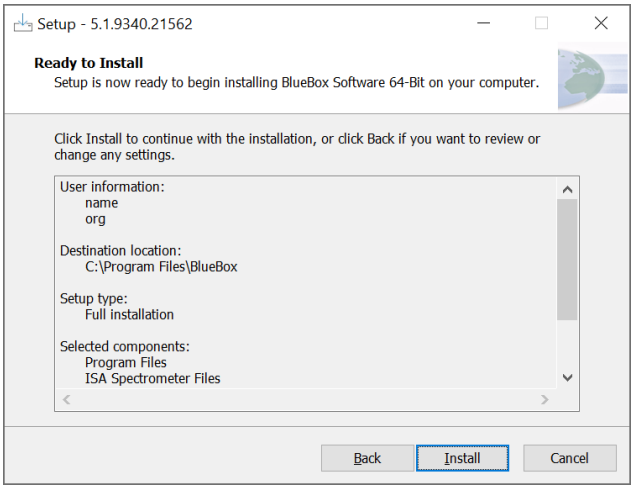
Host name or IP address: The IP address of your SQL server.
If the server is installed on the current computer, enter "localhost".

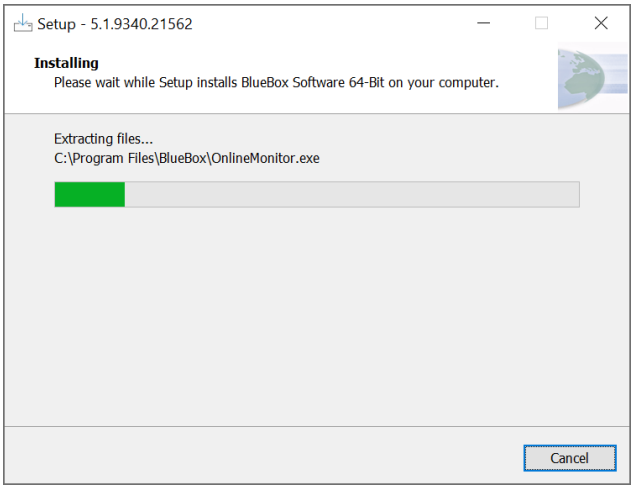
If the SQL server is not installed on the current PC but on a server in the network, ☑ **Enable access from remote machines for 'root' user** must be activated (see *Appendix A – Installation MariaDB® Server* there ② *Program Settings I*). **Note:** In most cases, it is advisable to create a separate database here (see *3.2.2 Setup of a New BlueBox* there Project name of the selected BlueBox)

User name: Root user name of the SQL server, here the default name "root".

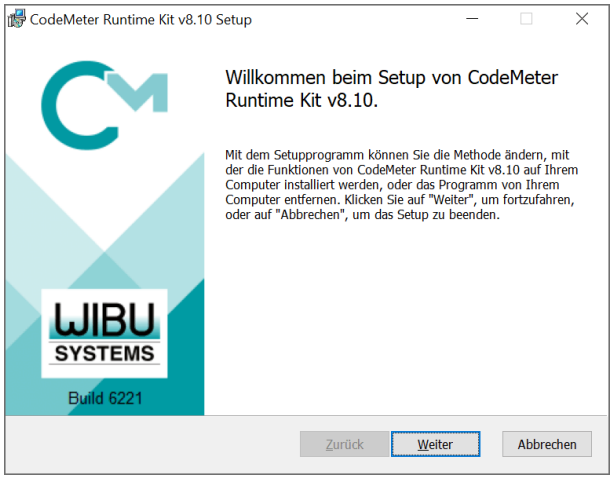
Password: Root password of the SQL server, entered during the installation of the server.
Assigning root password see *Appendix A – Installation MariaDB® Server* there *3 Program Settings I*

Click on [Next]

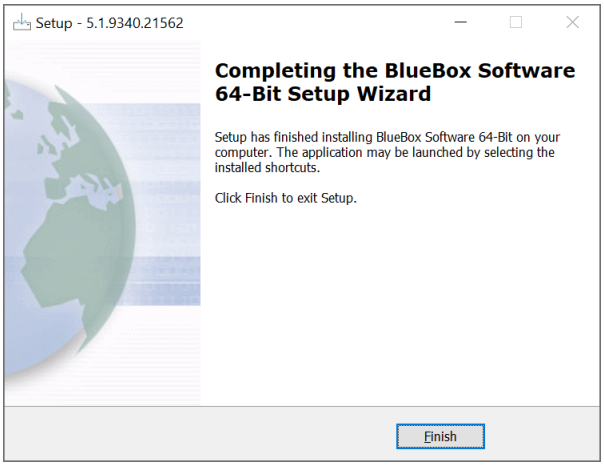




Click on [Install]



If the CodeMeter Software is not already installed on your computer, it can be installed now.
The CodeMeter Software, together with the supplied USB dongle, protects the BlueBox PC Software against unauthorised access.



Click on [Finish]

The installation is completed.

Before starting the software, insert the USB dongle into a USB port on your computer.
The USB dongle protects the BlueBox PC Software against unauthorised access.

Assignment of the programs in the programs folder to the entries in the Windows start menu:

Start menu Windows 10		Programs	
	BlueBox	„C:\Program Files (x86)\BlueBox“ 32-Bit version „C:\Program Files\BlueBox“ 64-Bit version	
1	Aktualisiere Datenbank Format		
2	AMS	2	AMS.exe
3	BCDriver	3	BCDriver.exe
4	BlueBox	5	BlueBox_Search.exe
5	BlueBox Suche	4	BlueBoxSoft.exe
6	Daten Export	13	Control.exe
7	Datenbank Tool	7	DB_Tool.exe
8	Lizenz Anfrage	6	ExportTool.exe
9	Messwerte abfragen	11	ModbusMaster.exe
10	Modbus Einstellungen	10	ModConfig.exe
11	Modbus Master Einstellungen	12	OnlineMonitor.exe
12	Online Monitor	8	SoftwareLicense.exe
13	SCADA	14	Spectrum_Visual.exe
14	Spectrum	1	SQLCheck.exe
15	USB Import	9	UpdateDatabase.exe
16	Visual1	15	USBImport.exe
17	VisualN	17	visual_N.exe
		16	visual1.exe

END

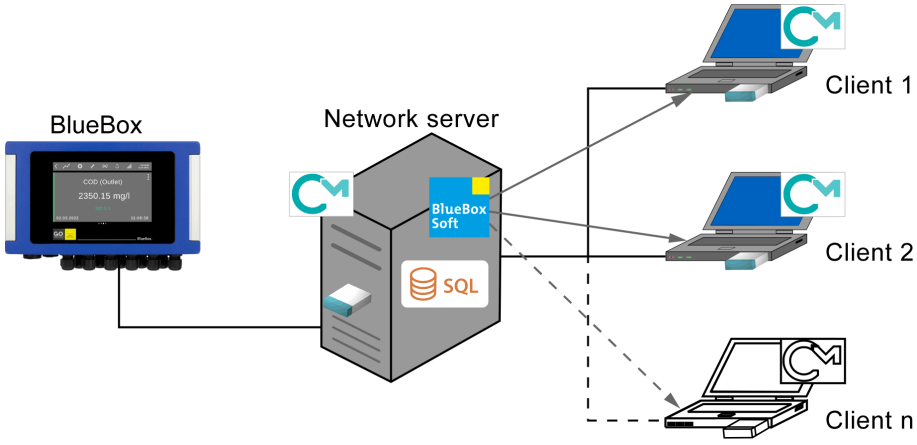
Appendix C – BlueBox PC Software in Server Operation

With the CodeMeter Software from Wibu-Systems and the accompanying USB dongle, the BlueBox PC Software is protected against unauthorised access and includes the CodeMeter Runtime-Server.
see *0.4 The CodeMeter Software*
A CodeMeter Runtime-Server does not have to be on the network server, but can just as easily be on the network client. The CodeMeter Runtime-Server on the network server is described here.

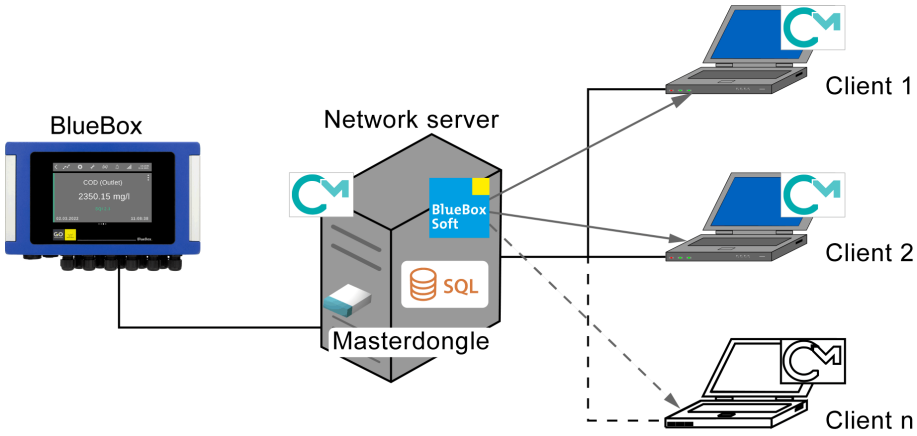
1 Overview

The BlueBox can be connected to clients via a network server in two ways.

1. The network server and each client have a dongle; any number of clients can be connected.



2. The server has a master dongle; the number of connected clients depends on the licence.



Master dongle on the network server or dongle on all computers
The dongle contains the so-called CMContainer with the licences.

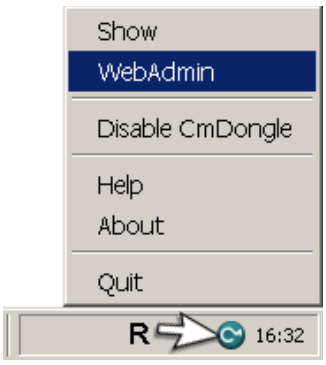
SQL A MariaDB® Server or a MySQL™ Server must be installed on the network server.

The CodeMeter Software must be installed on the network server and on each client.

The BlueBox PC Software must be installed on the network server. It can be installed on the clients, but usually a link to the BlueBox PC Software installed on the network server is created on the clients.

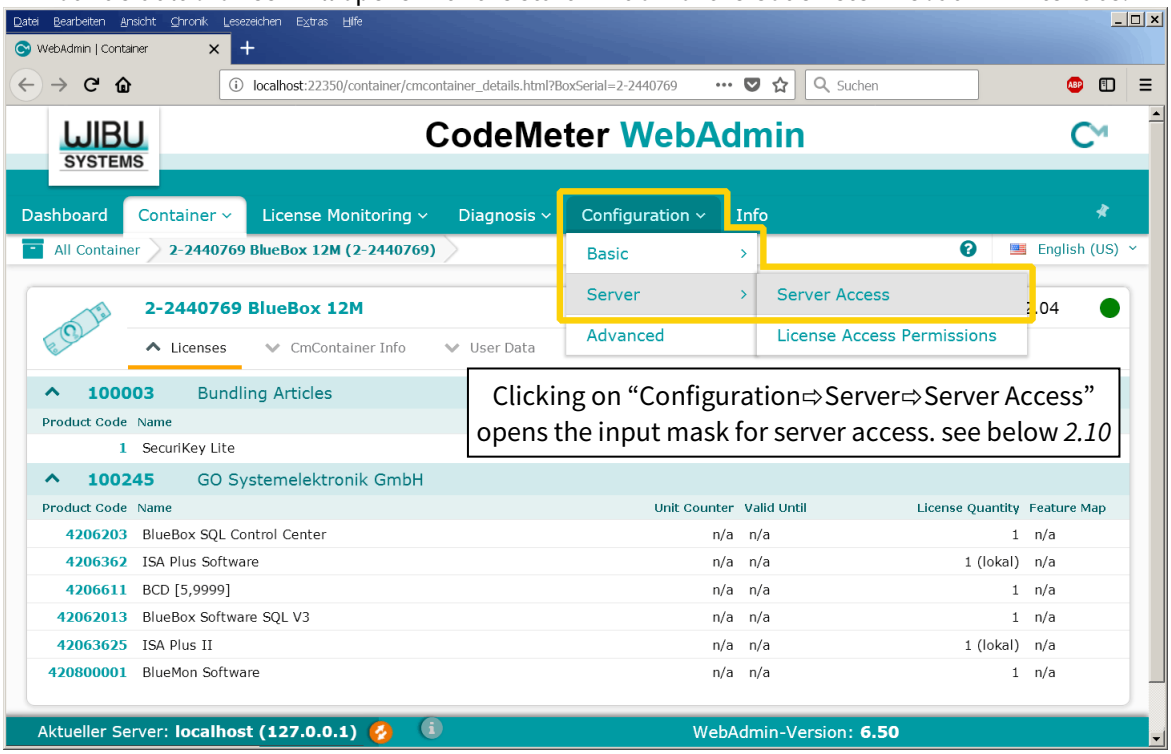
2 CodeMeter Software Settings for Operation with Masterdongle

In order for the clients to use the master dongle, you must make the following entries in the CodeMeter Software of the network server and the clients.



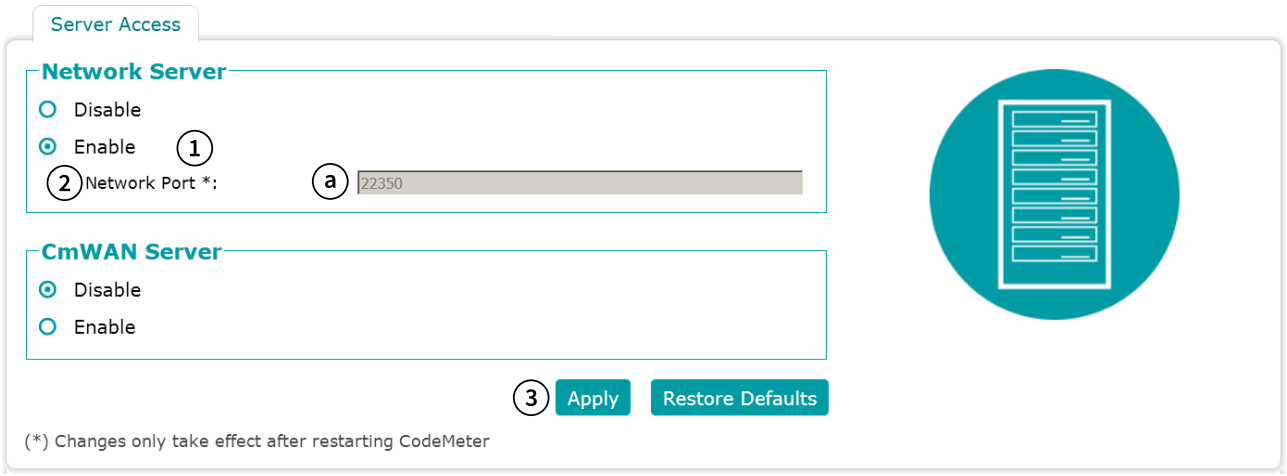
Right-click on the CodeMeter icon in the Windows taskbar.
Left-click on the “Webadmin” list entry.

Your default browser will opens with the start window of the CodeMeter Webadmin interface.



2.1 Settings of the CodeMeter Software at the Network Server

Input mask for Server Access:



To activate a CodeMeter Server, please proceed as follows:

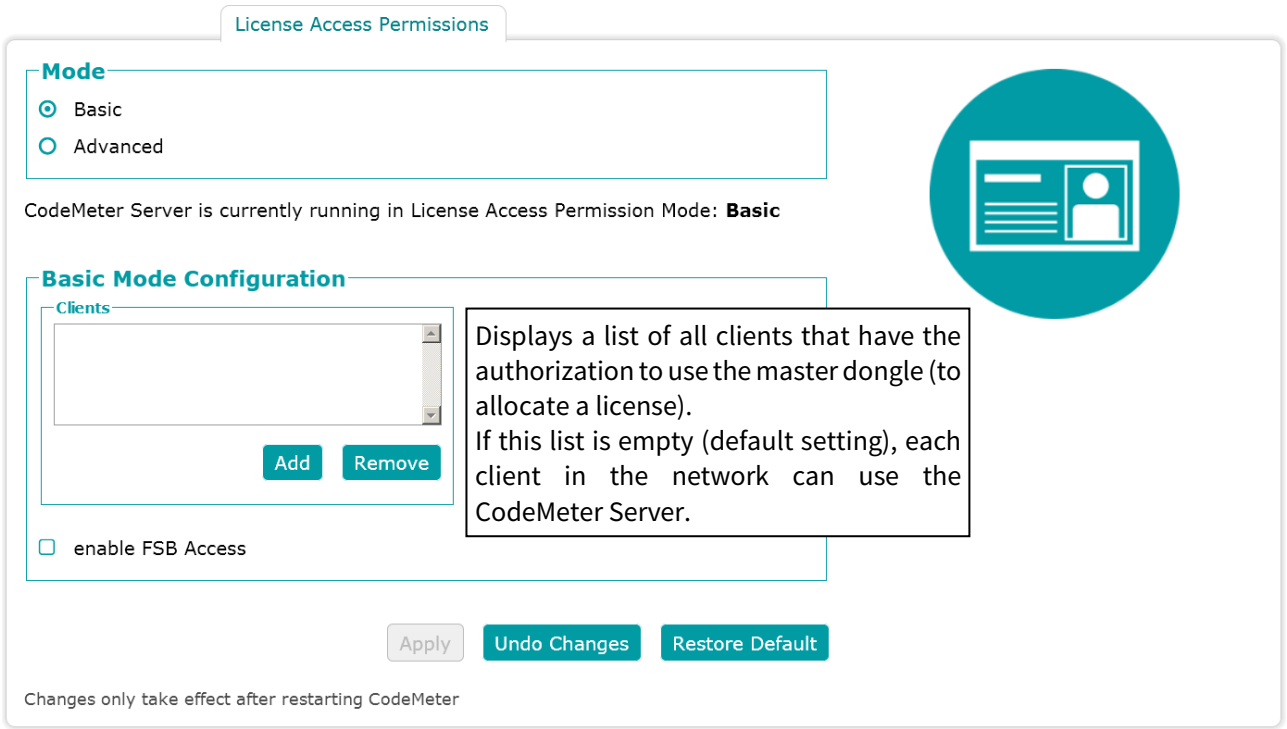
① Click the <**Enable**> radio button.
Therewith this computer makes its CodeMeter licences available on the network via the “CodeMeter Licence Server”.

② By default, the port with port number 22350 is used for the CodeMeter communication. This port is registered at IANA (Internet Assigned Numbers Authority) and uniquely assigned for the CodeMeter communication.

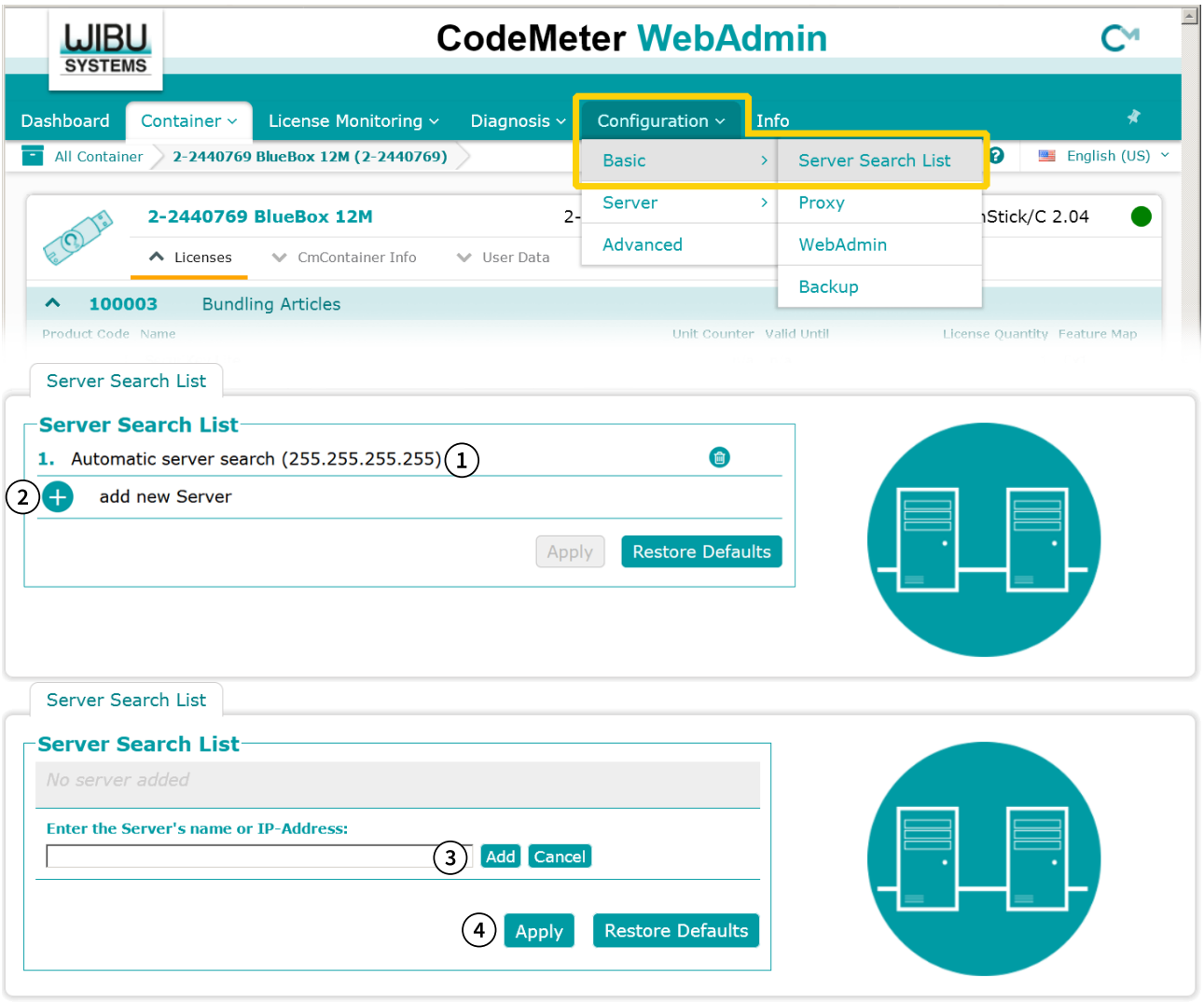
③ Click on <**Apply**> saves the changes.
(Click on <Restore Defaults> restores the default settings.)

2.1.1 Fixing Connection Problems

If connection problems occur, check the settings on the server in the entry mask <License Access Permissions>.



2.2 Settings of the CodeMeter Software at the Client



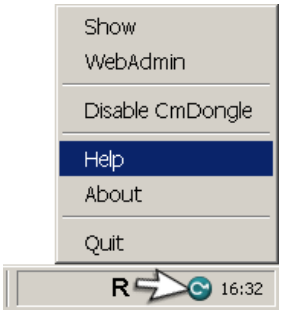
① Es wird automatisch im Netzwerk nach einem CodeMeter Runtime-Server gesucht. Falls keiner gefunden wird, siehe ②.

② Click on the **plus sign** to open an input field.

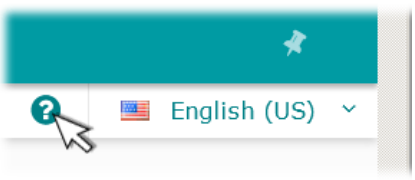
③ Enter the computer name or IP address of the computer with the CodeMeterRuntime server in this field. Click on <**Add**> to add the CodeMeterRuntime server to the Server Search List.

④ Click on <**Apply**> saves the changes.
(Click on <Restore Defaults> restores the default settings.)

A complete description of the WebAdmin interface can be found at:



Windows taskbar



WebAdmin interface

END

Appendix D – Requesting a Dongle Upgrade for a License Upgrade

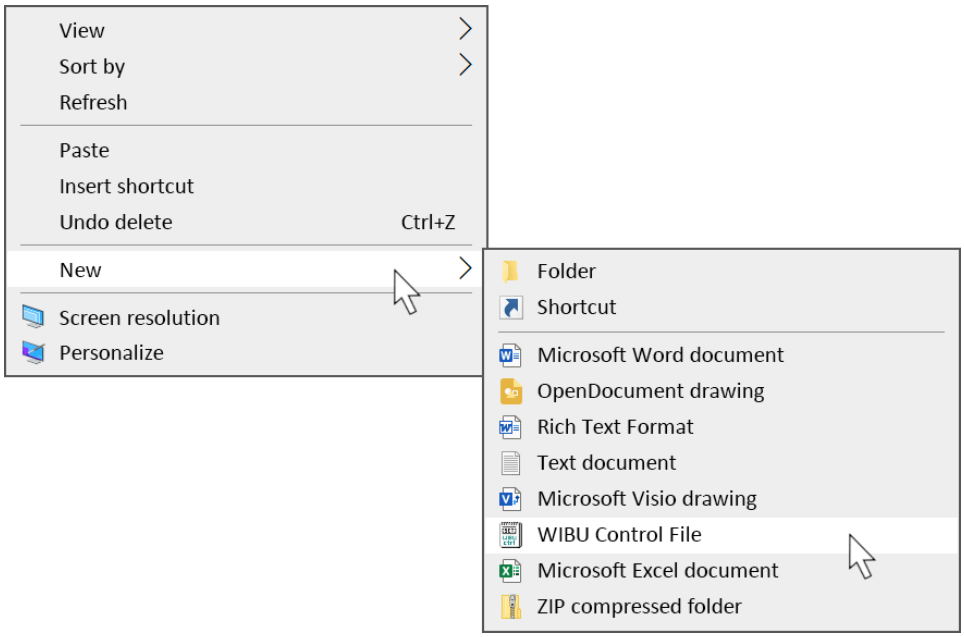
Precondition:

- inserted USD-Dongle from GO Systemelektronik
- installed CodeMeter Software

Both are included in scope of delivery of BlueBox PC Software.

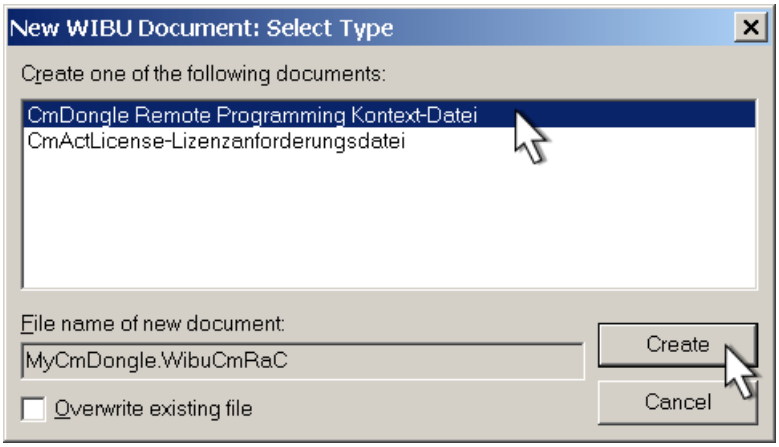
1. Call-up of "WIBU Control File"

Click with the right mouse button on the background of the Windows desktops. Select "New" and then "WIBU Control File".



2. Document Selection

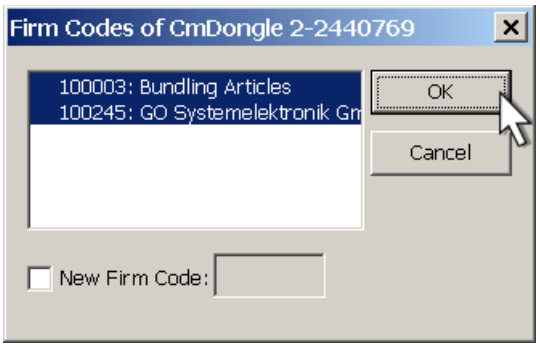
Select the entry "CM Stick Remote Programming Kontext-Datei". "CM Stick Remote Programming Kontext-Datei" denotes a license file. Click on [Create].



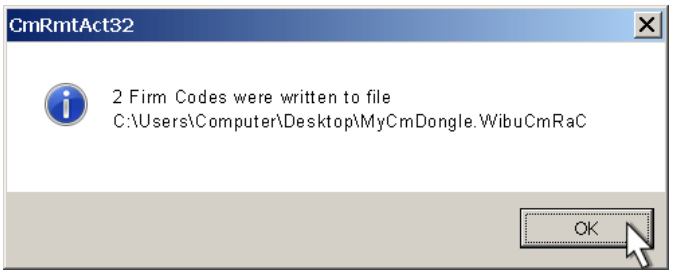
Select the entry "CmActLicense-Lizenzanforderungsdatei" if you want a PC-based software licence instead of a USB licence dongle. Further details on request from GO Systemelektronik.

3. Creating a Context File

Select both entries in the list field. Click on [OK].



Click on [OK]. The program creates the file “MyCmStick.WibuCmRaC” on the desktop.



4. File Sending

Send the license file “MyCmStick.WibuCmRaC” to GO Systemelektronik: info@go-sys.de

5. License Extension

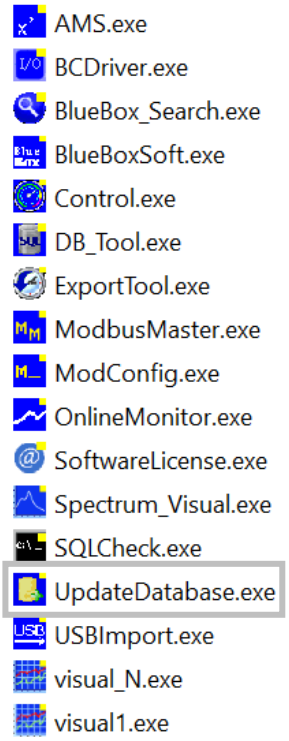
Within short time you will get a new license file back. Open this file with a double-click. The license will be extended automatically.

END

Appendix E – UpdateDatabase: Periodic Database Update

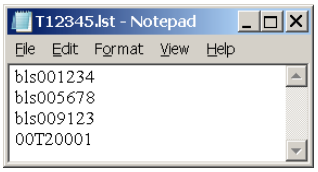
described program version: 4.5

You need the UpdateDatabase.exe program and the Windows System Program “Task Scheduler”. With the BlueBox software installation the folder "C:\Program Files\ BlueBox" or "C:\Program Files(x86)\BlueBox" with the adjacent content was created, if you had not selected another folder. Here you can find the program UpdateDatabase.exe.



The BCDriver program has a similar update function, see *6.6 BCDriver.*

Update restriction:
If you want to restrict the update to the values of certain sensors, create a simple text file[1] in the directory of "UpdateDatabase.exe" in the form "*serial number of a BlueBlueBox*.lst" (example: T12345.lst).

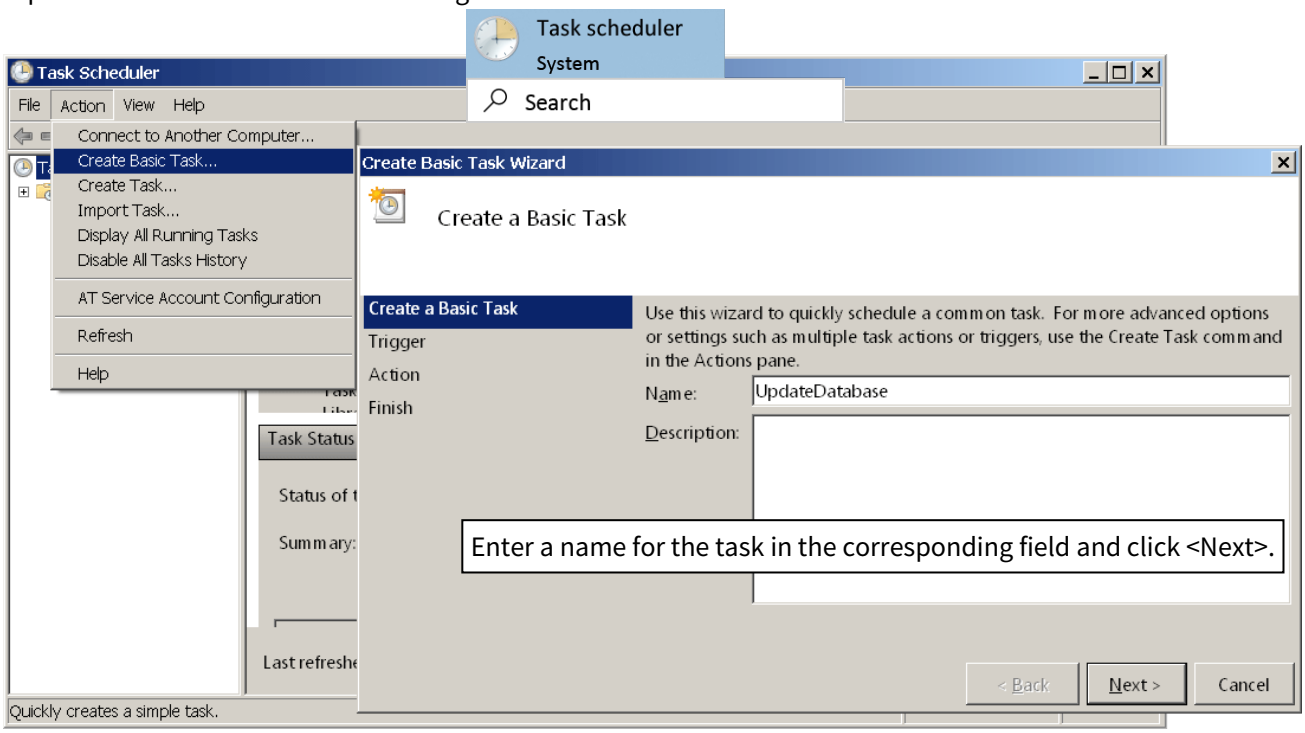


If Sensor-IDs are listed line-by-line in this file, the update for the related BlueBox is only carried out for the listed sensors.
If a "*" is written behind a spectrometer serial number, the spectra are also downloaded (example: ISA123456*).
With the line entry "UPDATE_CHANGELOG" the Changelog[2] of the BlueBox is also updated, with the line entry "UPDATE _CALIBRATIONLOG" the Calibrationlog[3] of the BlueBox is also updated.

If the file is empty, nothing is updated.

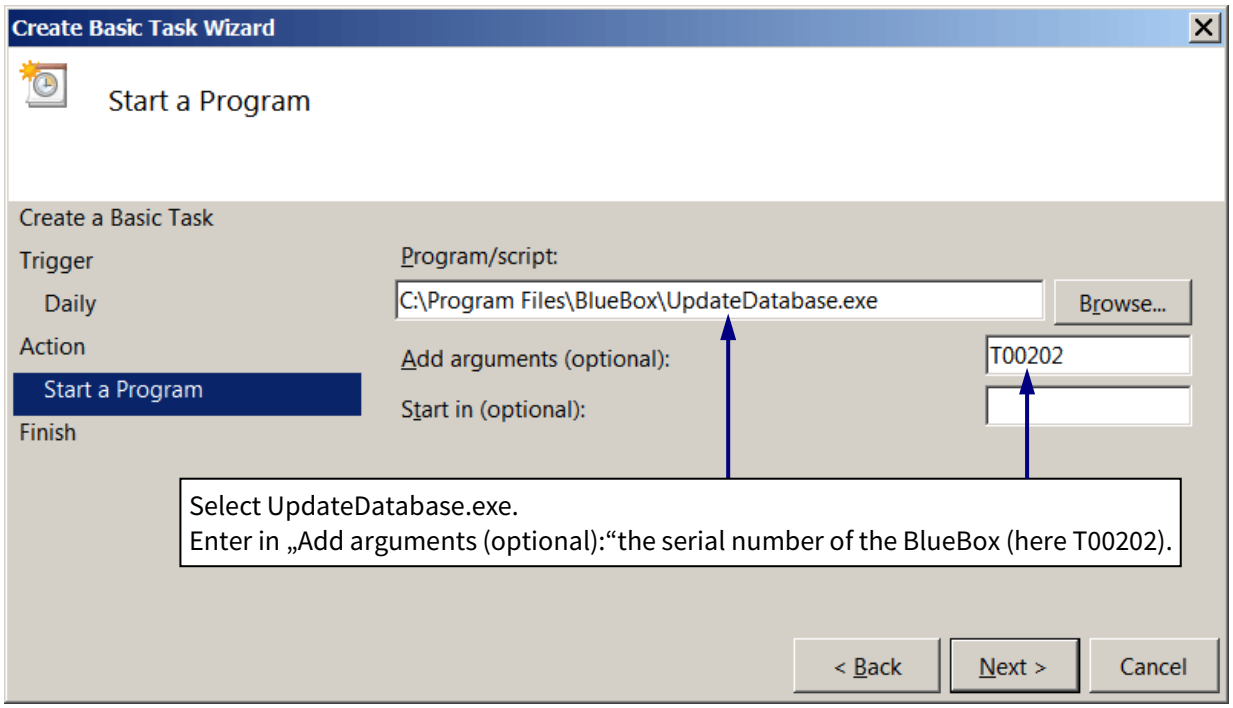
Setup Periodic Database Update

Open the Task Scheduler window using the search function at the bottom left of the Windows taskbar.

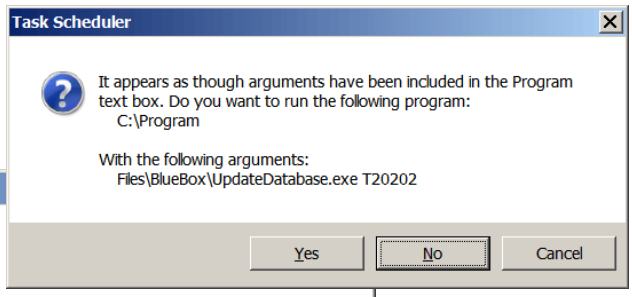


Select in the following two windows as a Trigger (triggering moment) "Daily" and as an action "Start this program".

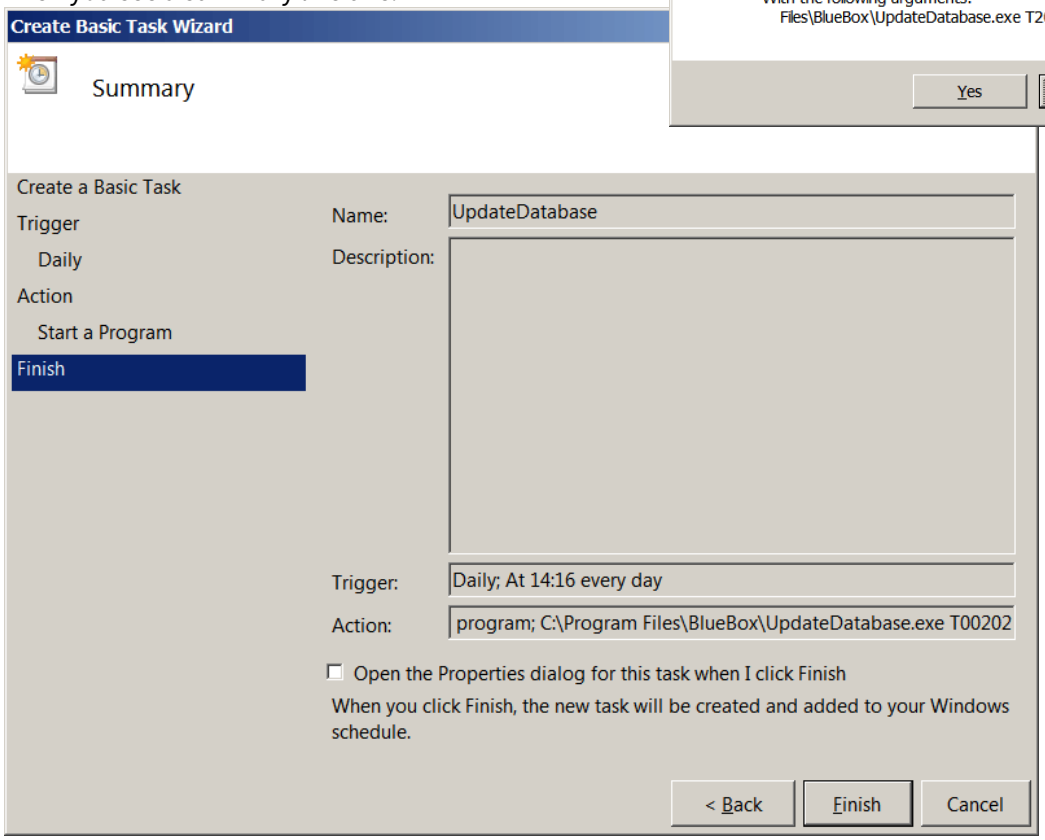
[1] e.g. made with the Windows Notepad text editor
[2] see 3.6 System Information
[3] see 3.5 Sensor Info



In some cases, a message appears.
Click on <Yes>.



Then you see a summary like this:



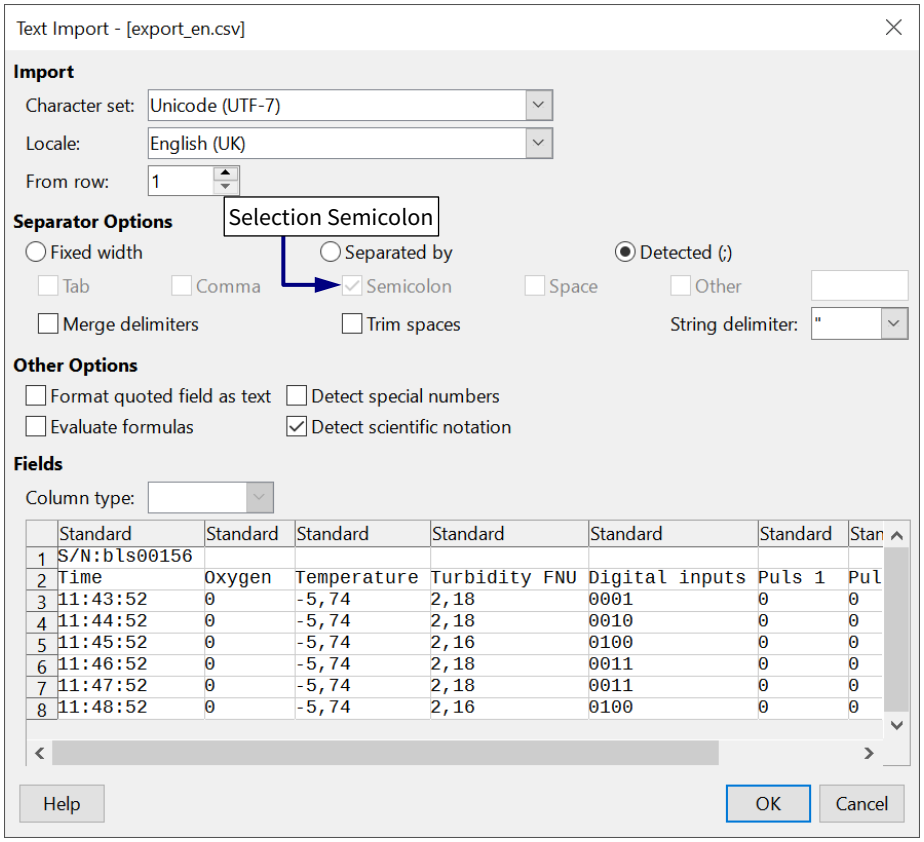
After clicking <Finish>, the periodic update is set up.
For further information, please refer to your Windows documentation.

END

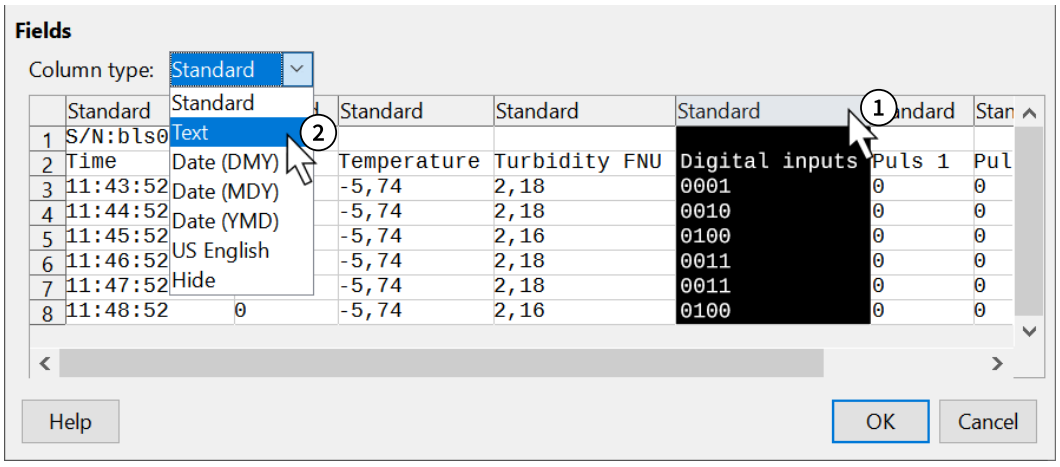
Appendix F – Opening a csv-File

The data in a csv-file generated with the BlueBox PC Software is separated by a semicolon. It is recommended to open these files with a program that displays the data in a clearly arranged way.

Example: opening a csv-file with the LibreOffice Calc spreadsheet program from the LibreOffice package



Columns with entries with leading zeros (for example on digital inputs) must be converted when opened in the text format. Otherwise, leading zeros are ignored.

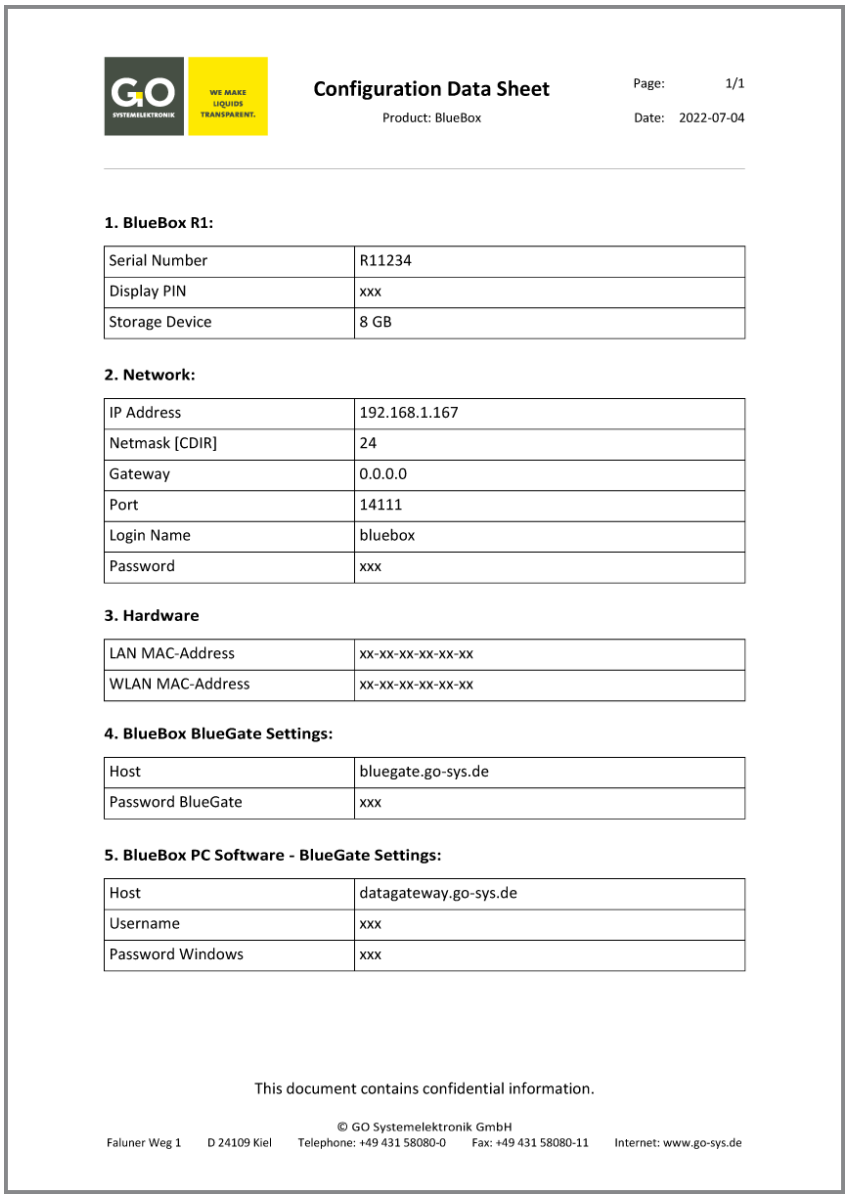


END

Appendix G – 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.

Faluner Weg 1 D 24109 Kiel Telephone: +49 431 58080-0 Fax: +49 431 58080-11 Internet: www.go-sys.de

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 preconfigured at the factory, changeable[2]

Password BlueGate Password of an Internet Gateway
⇨ can be preconfigured at the factory, changeable[2]

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), these access data are entered in the BlueBox PC Software or at the BlueBox display.

END

[1] default address of GO Systemelektronik
[2] not changeable at the default address

Appendix H – List of the AMS Formula Elements

described program version: 5.1

Table of Contents

1. Code marking	Description
;	Marks the end of a statement, e.g. Var = 1;
#	Marks the following characters of the line as a comment.

2. Reference to sensor data	Description
[*Sensor-ID*]	Measurement value of a sensor or status of an actuator with offset
[**!***Sensor-ID*]	Measurement value of a sensor without offset
[*****Sensor-ID*]	Measurement value of a sensor of another BlueBox (transmitted via UDPSEND)
%*n*	Can be used instead of the Sensor-ID and designates the nth sensor of the DAM to which the formula is assigned, [%1] stands for the first sensor etc.
[*Sensor-ID*.**STATUS**]	**Query AMS Status Message**

Status	Beschreibung
0	Sensor sends data
1	Sensor sends no data
2	New sensor is recognized (temporary at sensor initialization).
3	Sensor-ID assigning (temporary at sensor initialization)
4	Measurement value is unreliable. (SQI)
5	Measurement value is under the detection limit. (only BlueMon)
6	Sensor calibration failure (only BlueMon)
30	Formula error
31	Unknown sensor in the formula
32	Measurement value is not been saved.
33	Default calculation time for for and while loops is exceeded.
50	Minimal measurement value underrunned
51	Maximal measurement value overrunned
52	Internal communication error
53	Underrun of the lower limit of the AD converter
54	Overrun of the upper limit of the AD converter
55	General device error
57	Calibration interval exceeded
60	Sensor service mode (only for real sensors)
nan	Undefined numerical value

[*Sensor-ID*.**VAL**]	Measurement value of the sensor without considering the sensor status
[*Sensor-ID*.**TIME**]	UTC time of the day of the last measurement value of this sensor (format hhmmss)
[*Sensor-ID*.**SEC**]	Time elapsed since the last measurement was taken, in seconds
[*Sensor-ID*.**SQI**]	SQI (Spectral Quality Index) of an application-specific parameter out of spectral data
	Note: Combinations are possible, e.g. [!%1.VAL]

3. Measurement values of internal BlueBox sensors	Description
$HUMIDITY	Inside humidity (if available)
$CPU	CPU temperature
$MAIN	Inside temperature
$PRESSURE	Inside air pressure
$CPU	PC104 CPU temperature (BlueBox T4/TS)
$MAIN	PC104 inside temperature (BlueBox T4/TS)

4. Custom protocol	Description
CUSTOM*n*[*m*]	m-th measured value in the string received via user protocol n (n = 1 to 6). Example: Protocol "Space coded (Value Value Value...)" receives the string "14.4 17.5 19.33 20.1". The command CUSTOMn[2] returns the value 17.5.

5. Reserved words/characters	Description
pi	Number Pi; π
AND bzw. **&**	Logic operation AND
OR bzw. **|**	Logic operation OR
XOR	Logic operation exclusive OR
!	Inversion
==	Comparison: is equal
!=	Comparison: is not equal
<	Comparison: is less
<=	Comparison: less than or equal
>	Comparison: greater
>=	Comparison: greater than or equal
++	Variable plus 1
--	Variable minus 1
+=	Variable plus, test += 5; is the same as test = test + 5;
-=	Variable minus x, test -= 5; is the same as test = test - 5;
***=**	Variable multiplied with x, test *= 5; is the same as test = test * 5;
/=	Variable divided with x, test /= 5; is the same as test = test / 5;

6. Mathematical functions	Description
sin(*x*)	Sine x
asin(*x*)	Arcsine x
cos(*x*)	Cosine x
acos(*x*)	Arc cosine
tan(*x*)	Tangent
atan(*x*)	Arctangent
rad(*x*)	Converts degree to radian
deg(*x*)	Converts radian to degree
exp(*x*)	Exponential function to base e, exp(x)
ln(*x*)	Logarithmus naturalis, logarithm to base e, log (x)
log(*x*)	Logarithm to base 10, $\log_{10}$(x)
sqrt(*x*)	Square root of x
%	Modulo Operation (remainder of division)
abs(*x*)	Absolute value of x
round(*Wert*,*n*)	Rounds the value defined with value to n decimal places
rand()	Generates random numbers between 0 and 1. Number of decimal places as set in the sensor setup
^	Exponent , e.g. 10^3=1000
+	Addition
-	Subtraction
/	Division
*****	Multiplication
()	Preferred execution of the basic arithmetic operation in brackets

7. Averaging	Description
AVG(*N***)**	Current value of the averaging with the identification number N (0 bis 9999)
AVG(*N***,***b***,[***Sensor-ID***])**	Moving averaging; N = identification number; b = number of measurement values to be averaged
AVG(*N***,***b***,[***Sensor-ID***],***d***,***e***)**	Moving averaging with outlier suppression; N = identification number; b = number of measurement values to be averaged; d = time distance* in seconds (no entry d = 1); e = type of outlier suppression (no entry e = 0) * This setting determines the time distance at which measurement values are added to the moving averaging; for example, if the value is set to 60, a measurement value is added to the averaging only every 60 seconds.

see also *5.5.3.1 Elements of the Formula Input Assistance* there *Averaging adjustments with outlier suppression*

Each identification number N may only be assigned once within a BlueBox.

8. Polynomial formation	Description
A[0][0]=*x0***;** **A[0][1]=***x1***;** … **A[1][0]=***y0***;** **A[1][1]=***y1***;** … *corr***=polyfit(***n***,***0***);**	xn = x-values of the measurement values in array 0 yn = y-values of the measurement values in array 1 n = number of measurement values / 0 = degree of the polynomial Writes the correlation coefficient to the variable corr and the coefficients of the polynomial to array 2

9. Arrays	Description
ARRAY_SIZE(*n***)=***x*	Declaring an array Array n can take x values (n = 0 to 9) (x = 1 to 10000).
ARRAY_SIZE(*n***,***s***)=***x*	Declaring an array and its storage behaviour Array n (n = 0 to 9) can take x (x = 1 to 10000) values. If s = 1, the array is stored on the BlueBox beyond a restart. If s = 0, the array is initialised with 0 upon restart.
ARRAY(*n***,***p***)=***Value*	Storing value Value in array n (n = 0 to 9) at position p (x= 0 to 9999)
*Variable***=ARRAY(***n***,***p***)**	Writing values in array n (n = 0 to 9) at position p (p= 0 to 9999) to a variable
STAT_MEAN(*n***,***x***)**	Arithmetic mean of the first x (x = 1 to 10000) values of array n (n = 0 to 9)
STAT_VARIANCE(*n***,***x***)**	Variance of the first x (x = 1 to 10000) values of array n (n = 0 to 9)
STAT_SD(*n***,***x***)**	Standard deviation of the first x (x = 1 to 10000) values of array n (n = 0 to 9)
STAT_SORT(*n***)**	Sorting the array n (n = 0 to 9) by value size
	Note: A maximum of 10 arrays may be defined in a BlueBox. Each array may contain a maximum of 10000 values.

10. PID controller	Description
PID(*M***)**	Current value of the PID controller with the controller number M
PID(*M***,[***Sensor-ID***],***Targetvalue***,***P***,***I***,***D***)**	M = controller number; Sensor-ID = actual value; Targetvalue = target value; P,I,D = controller parameter
PID_RESET(*M***)**	Sets integral from PID controller M to 0 (zero)
PID_RESET(*M***,***x***)**	Sets integral from PID controller M to value x
	Note: Each controller number M may only be assigned once within a BlueBox. The data of the PID controllers are permanently stored on the BlueBox (storage interval 3 min). After a restart, the controller continues where it left off.

11. Conditional statements	Description
if (*Condition***) {***Statement1***;***Statement2***;...;***Statementn***;}**	if request
if ( ) { } else { }	if else request
while ( ) { }	while loop
for(i=*a***;i<***b***;i++) { }**	for loop, i++ → jump by 1, i+=x → jump by x, - is also possible

12. Time	Description
TIME	Current time of day as a value, 131014 for 13:10:14 (Local time of the BlueBox)
HOUR	Current hour, e.g. 13
MIN	Current minute, e.g. 10
SEC	Current second, e.g. 14
MONTH	Current month 0= January 1=February etc.
DAYOFMONTH	Current day of the month (1-31)
DAYOFWEEK	Current day of the week (days since Sunday) Sun= 0, Mon=1, Tue=2 etc.
‘*hh*:*mm*:*ss*‘	The time in the format hh: mm: ss in inverted commas is converted to hhmmss. Example 131014, if (TIME == ’13:10:14‘)

13. Modbus	Description
MODF(*x***)**	Modbus measurement value (float) read/write x = 0 bis 199
MODR(*x***)**	Modbus Register (2-Byte) read/write x = 0 bis 399
MODI(*x***)**	Modbus Integer (4-Byte) read/write x = 0 bis 199
	Note: Can be accessed via Modbus using the commands READ_HOLDING_REGISTER(3), WRITE_SINGLE_REGISTER(6) and WRITE_MULTIPLE_REGISTER

14. Actuator specific	Description
ERRORVALUE= 1 *or* **0**	Determines whether an actuator is switched on or off in the event of an incorrect calculation (e.g. due to failure of a sensor). ERRORVALUE=1⇨ Actuator is switched on. ERRORVALUE=0⇨Actuator is switched off. To be entered in the first line of the formula field!
ONTIME	Time in seconds since the relay is on
OFFTIME	Time in seconds since the relay is off
LASTVALUE	State of the relay at the last calculation
TEXT="*Text***"**	At the display of the BlueBox the measurement value is not shown, instead this text is shown, e.g. if (temp> 20) {TEXT = "WARM";}
NMEA("000000001")	At a RS-232 module (NMEA) a NMEA string with the format "$BBMVA,HHMMSS,YYMMDD,000000001,,,,,measurement value,status,*XX" is released.
FSEND("*a***,***b***,***c***,***d***")**	At a RS-232 module (NMEA) a string with the format „01,aa.aa,bb.bb,cc.cc,dd.dd,\r" is released.
FIX("000000001")	At a RS-232 module (NMEA) a string with the format "01 17.44 0 FF" is released. FF is a checksum.

15. Uninterruptible Power Supply (UPS) Article-No. 48 806 J00 00 A1	Description
UPS.STATUS	Status of a connected UPS; -2 ≙ UPS error; -1 ≙ UPS not detected; 0 ≙ UPS online; 1 ≙ UPS on Battery; 2 ≙ UPS search; 10 ≙ UPS change battery or error
UPS.VOLTAGE	Battery voltage of a connected UPS in Volt
UPS.CAPACITY	Residual capacity of a connected UPS in %
UPS.TIME	Remaining operation time of a connected UPS in seconds

16. Power Management Module PMM	Description
$CURRENT	Current consumption PMM
$VOLTAGE	Voltage PMM
$STATE	Switch status PMM
$SHUTDOWN("*nn***:***nn***")**	Shut down BlueBox with PMM and restart, e.g. at 10:30

17. GPS (NMEA 0183)	Description
LONGITUDE	Current GPS position longitude (GPS sensor needed with output $GPGGA)
LATITUDE	Current GPS position latitude (GPS sensor needed with output $GPGGA)
GROUNDSPEED	Current speed over ground in m/s (GPS sensor needed with output $GPVTG)
TRUECOURSE	Current course in ° (GPS sensor needed with output $GPVTG)
MAGCOURSE	Current magnetic course in ° (GPS sensor needed with output $GPVTG)

18. Errors (user-defined)	Description
SET_ERROR(*n***)**	Sets error n (n = 1 – 100) from the AMS error list*
CLEAR_ERROR(*n***)**	Resets error n (n = 1 – 100) from the AMS error list*
GET_ERROR(*n***)**	Control whether error is set, 0 = no, 1 = yes
ERROR_COUNT()	Number of errors that are set
ERROR_COUNT(*n***)**	Number of errors that are set whose error number is > = n

* see *5.3.3.3.3 Error Message List (user-defined)*

19. Network	Description
UDPSEND()	Sends a measurement value as a network broadcast
UDPSEND(“*a.b.c.d***“)**	Sends a measurement value to the IP address a.b.c.d
UDPSENDV(“*var***“)**	Sends the variable “var” as a network broadcast
UDPSENDV(“*var***“,“***a.b.c.d***“)**	Sends the variable “var” to the IP address a.b.c.d

20. System	Description
NOSAVE()	Suppresses the saving, sending and printing of measurement data.
IGNORE()	As NOSAVE(), but in addition, the display in the BlueBox PC Software and on the BlueBox display will not be actualised.
NOSTATUS()	Resets the error status of a formula. ❗ Caution: Error checking must then be programmed!

21. E-Mail/SMS	Description
MsgText="*Text***"**	Message text of the e-mail or the SMS, the e-mail/SMS must have a text (max. 160 characters).
PhoneNo="*Telephone number***"**	International telephone number without 0, the telephone number of GO Systemelektronik would then be 49431580800 Multiple telephone numbers are separated by a semicolon or a space (max. 120 characters).
PhoneNo="*n***"**	Entry in row n of the telephone number list see 5.3.3.3.1 Telephone Number List
MailTo="*Mail address***"**	Mail address = Destination address Multiple e-mail addresses are separated by a semicolon or a space (max. 120 characters).
MailTo="*n***"**	Entry in row n of the e-mail address list see *5.3.3.3.2 E-Mail Address List*
Subject="*Text***"**	Subject of the e-mail, the e-mail must have a subject (max. 90 characters).
MailAttachment="[LIVE]"	HTML table in the text of the email and a zipped csv-file attached to the e-mail containing the current measurement values from all sensors and actuators shown on the BlueBox display. max. 20160 measurement values
MailAttachment="[*Sensor-ID***,***n***d** *or n***h]"**	HTML table in the text of the e-mail and a zipped csv-file attached to the e-mail containing the measurement values of the sensors identified by the sensor IDs from the past period specified by nd or nh. max. 20160 measurement values nd = n days (n = 1 to 30) or nh = n hours (n = 1 to 24) Multiple naming of sensors possible: "[ID1,nd] [ID2,nh] [ID3,nd]..."

22. ISA	Description
ISA="*CAN-ID***"**	CAN-ID = CAN-ID of a spectrometer[1] If various spectrometers are connected to a BlueBox, this element defines a spectrometer to which the following ISA formula elements refer.
ISA(*l***)**	Absorbance at wavelength l (l = 200 to 708)
ISA'(*l***)**	First derivation of the absorbance at wavelength l (l = 200 to 708)
ISA0(*n***)**	Raw value of pixels n (n= 0 to 255) – see below *Notes on the compatibility of older Spectrometers*
ISA.REFERENCE	Value of the DualBeam photometer – see below *Notes on the compatibility of older Spectrometers*
ISAFP(*l***)**	Difference of the absorbance to the absorbance of the fingerprint spectrum at wave length l (l = 200 to 708) – valid until AMS software version 4.3.4.0 only
ISA.FP(*k***)**	Greatest deviation of the absorbance in percent from the fingerprint with the identification number k (k = 0 ; 1 ; 2 ; 3) – valid from AMS software version 4.3.4.0 included
ISA.FP(*k,l***)**	Deviation of the absorbance in percent from the fingerprint with the identification number k (k = 0 ; 1 ; 2 ; 3) at wavelength l (l = 200 to 708) – valid from AMS software version 4.3.4.0 included
ISA_CAL()	Performs a clear water calibration, e.g. if (TIME == 170000) {ISA_CAL();} performs a clear water calibration at 17:00 or at the first measurement after 17:00.
ISA.MEASURE()	Performs a spectral measurement, e.g. if (TIME == 170500) {ISA.MEASURE();} performs at 17:05 h a spectral measurement.
ISA.STATE	**Query spectrometer status** This query can be used to neutralise measurement errors occurring on other sensors during compressed air flushing/wiper cleaning.
ISA.PathLength	Query of the path length of a spectrometer as in the configuration window of the spectrometer. If no path length is entered there, a default value (10 mm) is set.

Status	Description
0	Inactivity
1	Compressed air cleaning is running
2	Measurement is running
3	Intensity calibration is running
4	Clearwater calibration is running
5	Transmission of spectra data to the BlueBox is running
6	Cleaning wiper is running
7	Wait time after Compressed air cleaning /Wiper cleaning

Specifics of the older, first-generation spectrometers[2]	
ISA0(1)	For first-generation spectrometers: value of the DualBeam photometer
ISA.REFERENCE	For first-generation spectrometers: invalid

END

[1] Strictly speaking, the CAN-ID (Sensor-ID) of the intensity parameter of a spectrometer

[2] see *Manual ISA Spectrometer* there *Notes on the Compatibility of Older and Newer Spectrometers* on Page 3