GO SYSTEMELEKTRONIK

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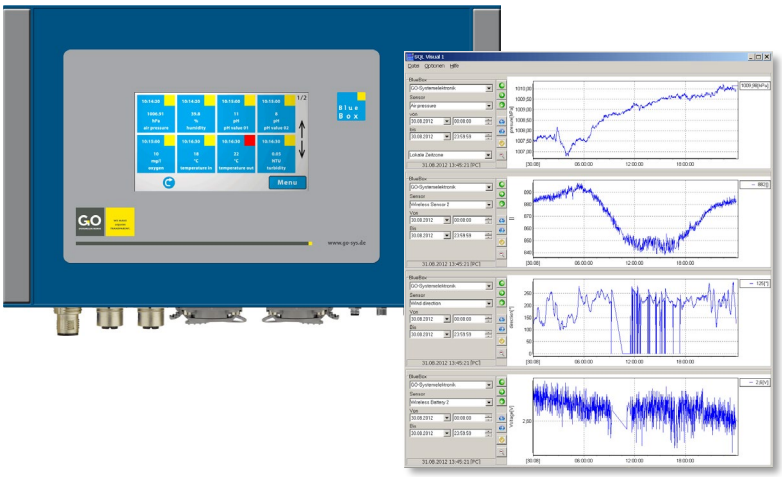
Manual

BlueBox PC Software



BlueBox Soft

Version of this manual: 4.32 en

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Changes

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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: 19.7.2023
Described software versions: BlueBox SQL: 4.1.4.0 AMS: 4.1.4.0
Version of this manual: 4.32 en
Article number of this manual: DOC 420 6213-E-4.32-BDA
File name: DOC 420 6213-E-4.32-BDA Manual BlueBox PC Software.pdf

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Table of Content

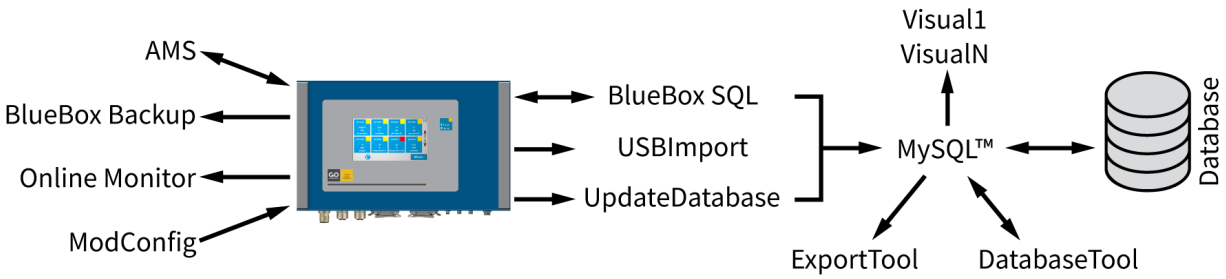
1 Overview

This manual describes the BlueBox PC Software, i.e. the Windows PC software for a BlueBox system.
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.

Precondition for the use of the full functional scope of the BlueBox PC Software is a firmware of the BlueBox from version 3.00.18 and a storage firmware of the BlueBox from version 3.26.
Firmware versions of a BlueBox see *5.4 The AMS Start Window* and *5.3.4 Help* there *BlueBox Info*

A MySQL™ Server is mandatory necessary for the running of the BlueBox PC Software.
see *Appendix A – Installation MySQL™ Server*

If you did not choose another folder during installation, the programs are stored in the folder „C:\Program files\BlueBox“.



Main components

- **BlueBox SQL Software** see *3 BlueBox SQL Software*
  The BlueBox SQL Software is the administration software for BlueBox systems. The program is used to set up databases, transfer the data stored in a BlueBox to a database, and set up and manage BlueBox systems.
- **AMS - Advanced Managing Software** see *2.4 The CodeMeter Software*
  The AMS Software enables a direct access to a BlueBox and their working parameters. An effective instrument is the integrated formula language.

CodeMeter Software
Protects your BlueBox Software against unauthorized access.

ISA Spectrometer Software only for the ISA Spectrometer, see *Manual ISA*

Programs for data display and visualisation

1. **Online Monitor** see *3 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 chart.
4. **Spectrum Visual** only for the ISA Spectrometer, see *Manual ISA*
   Enables among others the display of database spectra as graphs. Here you can analyze the spectra and save them in a common graphics format.

Programs for configuration and data transfer

1. **ExportTool** see *6.1 ExportTool*
   Exporting measurement values from a database into the txt- and csv-format
2. **ModConfig (Modbus Client Configuration)** see *6.2 ModConfig*
   Configuring the Modbus interface of a BlueBox
3. **DatabaseTool** see *6.3 DatabaseTool*
   Database tool
4. **BlueBox BackUp** see *6.4 BlueBox Backup*
   Backup of the BlueBox system data
5. **USBImport** see *6.5 USB Import*
   Transfers measurement data from a BlueBox into a database via a USB memory stick.
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
8. **ISAData** only for the ISA Spectrometer, see *Manual ISA*
   Transfers spectra data from a BlueBox to a database

Other programs (not described in this manual)

1. **Control Center Software** (license dependent executable)
   Design of graphical interfaces for displaying measurement data in real time
2. **Translation tool**
   Allows language localization of the BlueBox PC software by the user.
3. **SQLCheck**
   Database check on current format, is usually called up automatically

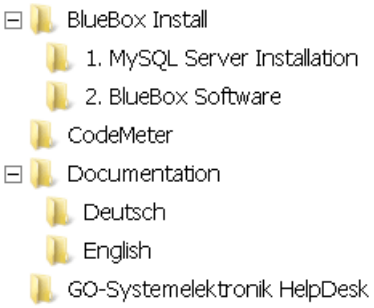
2 Installation Notes

You have got a USB-Dongle and a USB memory stick with the whole software.
This USB-Dongle protects your BlueBox Software against unauthorized access. That is means, that the software is not executable without this USB-Dongle.
Please understand this procedure, in case of loss of the USB-Dongle you will of course get replacement from GO Systemelektronik. The BlueBox PC software runs on Windows systems up from Windows 7.

Installation see *Appendix B – Installation of the BlueBox PC Software*

2.1 Content of the USB Stick

- **1. MySQL Server Installation** contains the files for the installation of the MySQL™ Server (see Appendix A - Installation MySQL™ Server).
- ***2. BlueBox Software*** contains the file „setup.exe“.
  Double click on “setup.exe” starts the installation program.
- ***CodeMeter*** contains the CodeMeter software required for the function of the USB-Dongle, this software will be installed at the installation of the BlueBox PC Software automatically.
- ***Documentation*** contains the english and german manuals.
- ***GO-Systemelektronik HelpDesk*** contains the file *TeamViewerQS.exe*, Double-click thereon starts the GO HelpDesk.



2.2 The MySQL™ Server Software

MySQL ™ Server is a so-called relational database management system, the installation will also set up a database. The retrieval of the BlueBox SQL software (see 3.4) saves the data in this database.
Installation see Appendix *A – Installation MySQL™ Server*

A MySQL™ Server is mandatory for the running of the BlueBox PC Software.

2.3 The BlueBox Programs

Double-click on “setup.exe” in the folder “2. BlueBox Software” starts the installation program. The installation of the BlueBox PC Software is described in *Appendix B – Installation of the BlueBox PC Software*.
If you did not choose another folder during installation, the programs are stored in “C:\Program files\BlueBox“ with all necessary files.

2.4 The CodeMeter Software

Using the CodeMeter software and the corresponding USB-Dongle[1] the BlueBox PC Software will be protected against an unauthorized access[2]. If not already there, this software will be installed at the installation of the BlueBox PC Software automatically. You can install the BlueBox PC Software on your computers and can 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 by default as a service and starts therefore automatically at every system start-up.

If the CodeMeter Runtime Server is not running, it can easily be started from the CodeMeter Control. The CodeMeter Runtime Server can be started only once on each computer!

In the info area of the Windows task menu different colours of CodeMeter symbols represent thereby the status of USB-Dongle.

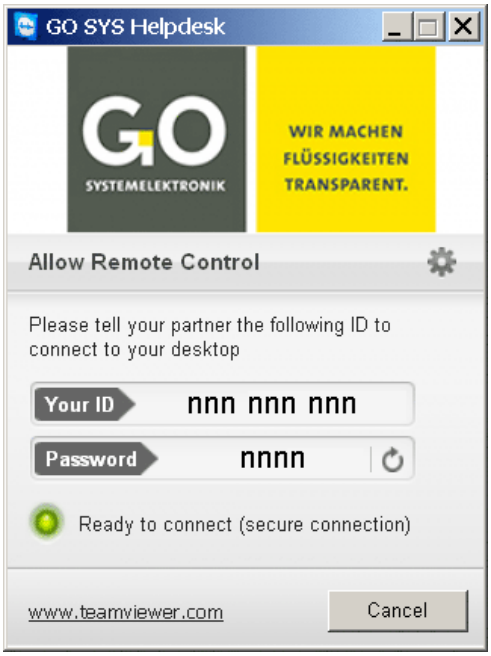
grey — No CmStick is connected or the CodeMeter Runtime Server is not started.

green — An activated CmStick is connected.

Double-click with the left mouse key or click with the right mouse key leads to the CodeMeter-Control centre and to the CodeMeter-Webadmin (will be opened within your standard browser).
Here you can change settings, modify licenses, see license information and call up an Online-help.

2.5 GO HelpDesk

Double-click on the file "TeamViewerQS.exe" in the folder "GO-Systemelektronik HelpDesk" starts the GO helpdesk.
The digit sequences of "Your ID" and "Password" are automatically recreated each time TeamViewerQS.exe is started.
If you want a remote access to your computer, GO Systemelektronik needs these digits. This allows establishing a one-time connection to GO-Systemelektronik.
The connection ends with the program.



[1] Is called CMDongle in the CodeMeter software.
[2] The programs Visual1 and VisualN also run without dongle.

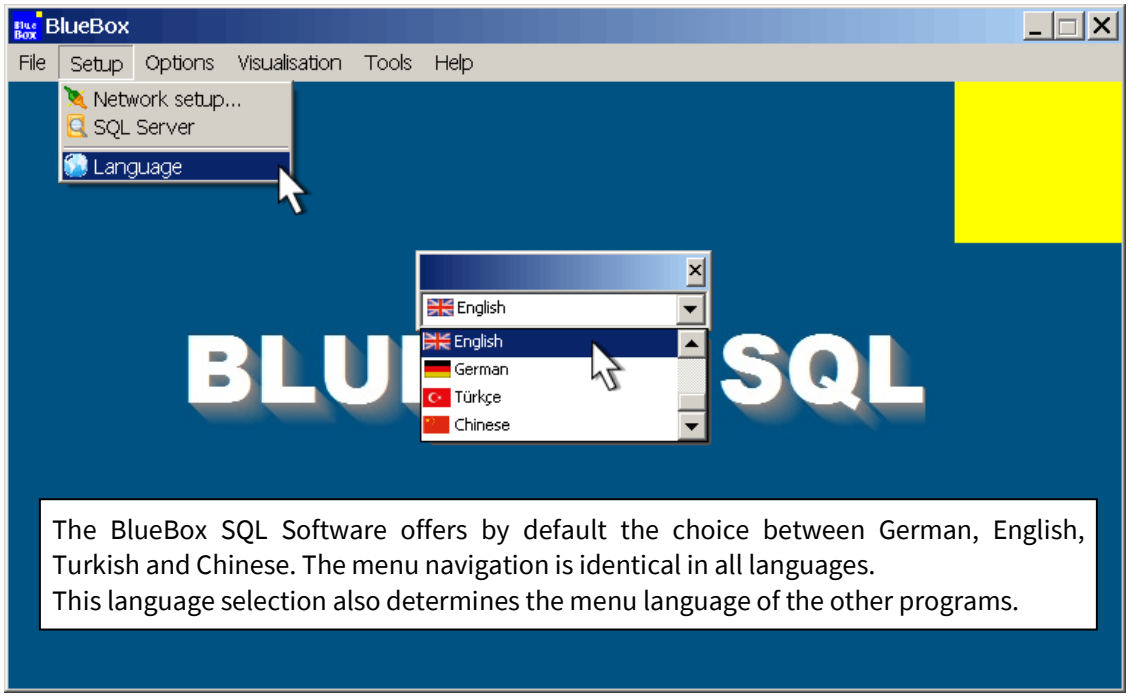
3 BlueBox SQL Software

Programmversion: 4.1.4.0

This software is, on the one hand, a database application for the processing and archiving of measurement values and on the other hand serves to set up and manage any number of BlueBox systems.
All relevant data is stored and managed in a database with a MySQL ™ server.

As long as the BlueBox is not yet fully booted, it is not recognized by the BlueBox PC software.
Error message: Socket error # 10061/Connection refused)
BlueBox T2 and older:
If no module is connected, the BlueBox is not detected from the BlueBox PC software.
Error message: Socket Error # 10061/Connection refused)

3.1 Language Selection



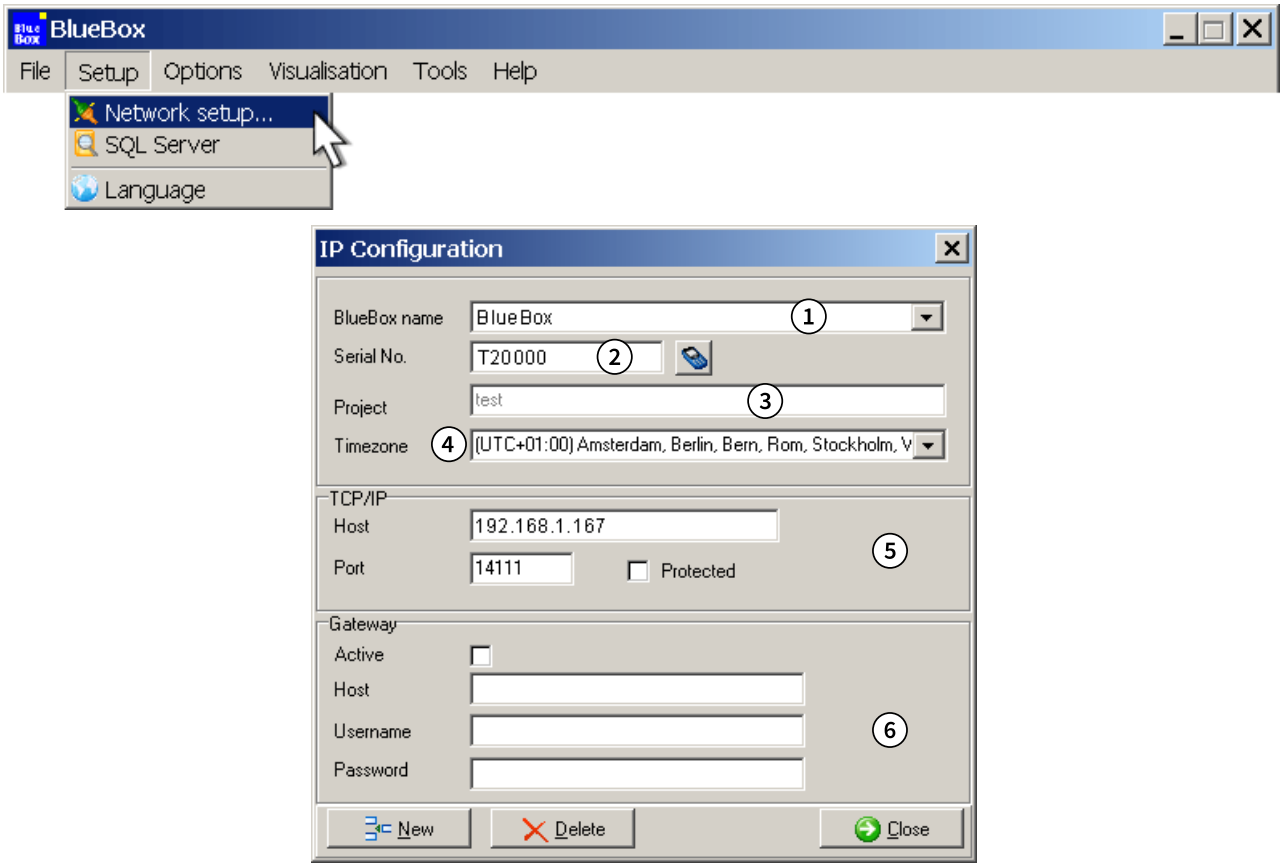
3.2 Network Setup

In the network setup you can

- setup new BlueBox systems with their allocated databases,
- delete BlueBox systems with their allocated databases
- and setup the network connection including a modem dialup connection (optional).

3.2.1 Settings of an Existing BlueBox

Open the network setup window.



① Drop-down menu for selecting a BlueBox and changing the name of a BlueBox

Note on a possible operation error: If this entry is changed via keyboard, it can be confirmed with the Enter key. After that the name of the BlueBox is changed, this change cannot be undone with the Esc key.

② Serial number of the selected BlueBox

③ Name of a related project, **not changeable later**, it is assigned at setup of a new BlueBox (see *3.2.2 Setup of a New BlueBox*).

④ Drop-down-menu for the selection of a time zone

⑤ Network-identification of the selected BlueBox

⑥ If the BlueBox will be accessed via gateway (e.g. with a UMTS connection), the access data will be entered here (see *3.2.2 Setup of a New BlueBox*.

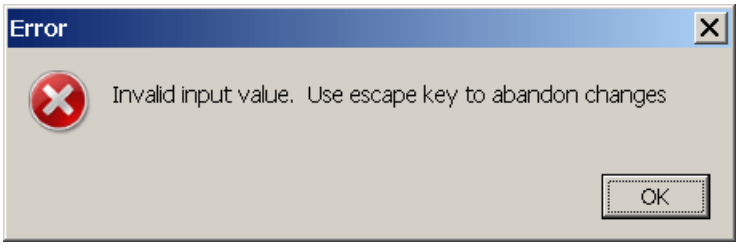
Opens the settings of a RAS Setup (see 3.3.3).

If these checkbox is activated, the data transfer will be encoded with AES and the port is set to 14110.
The encryption is necessary 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

You can undo any unsaved entries by pressing the Esc key.
Exception is [1]

Invalid entries will not be accepted.



Buttons

Leads to the setup of a new BlueBox, see the following page.

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

Closes the window.

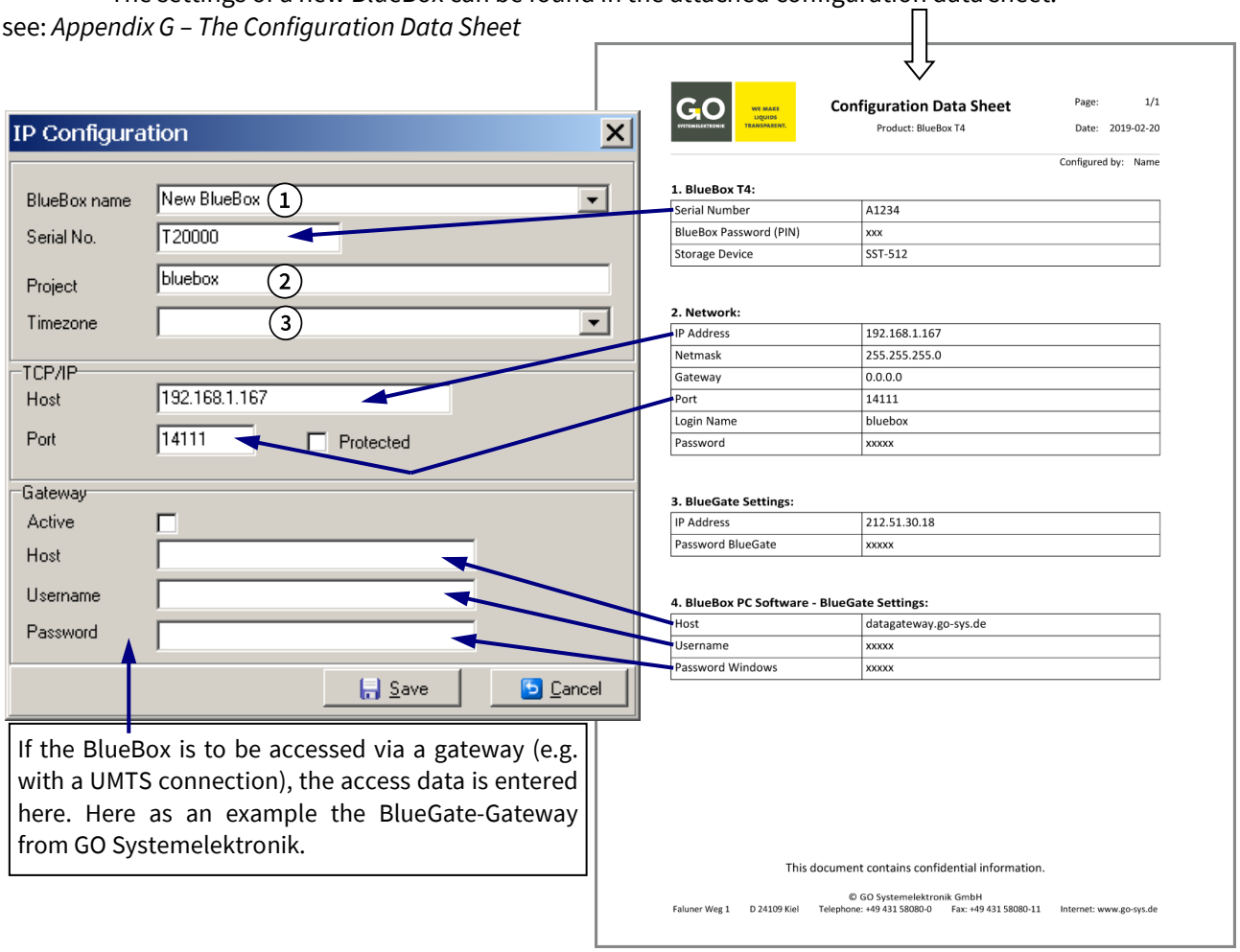
If you make changes in [2] to [6], the buttons change.

Saves the changes.

Cancels the operation, the changes are not saved.

3.2.2 Setup of a New BlueBox

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



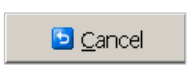
Enter the data of the new BlueBox in the input fields.

① Drop-down menu to select a blue box and assign a BlueBox name

② Project name of the selected BlueBox
no spaces, no special characters, no upper case letters* – default name is *bluebox*
By assigning project names, the data of a BlueBox can be stored in different databases of a SQL server .A database is created under the project name.
The project name is displayed in the BlueBox PC Software only here in the IP settings and in the system information window (see 3.6).
When you assign a project name, we recommend that you also assign a uniquely assigned BlueBox name, otherwise the BlueBox name will be listed more than once.

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

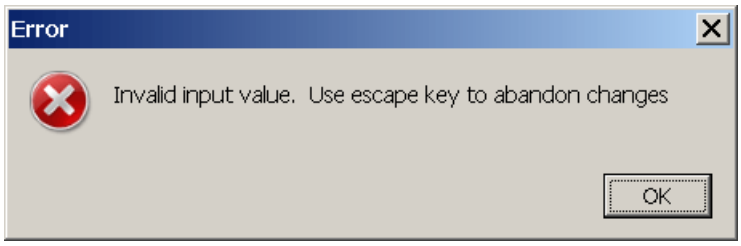
Setup of the new BlueBox



Cancels the operation, no Setup of the new BlueBox

Unsaved entries can be undone by pressing the Esc key.

* Entered upper case letters are converted into lower case letters at saving.



Invalid entries will not be accepted.

Protected

If these checkbox is activated, the data transfer will be encoded with AES and the port is set to 14110.

The encryption is necessary if the BlueBox has a public IP-address!

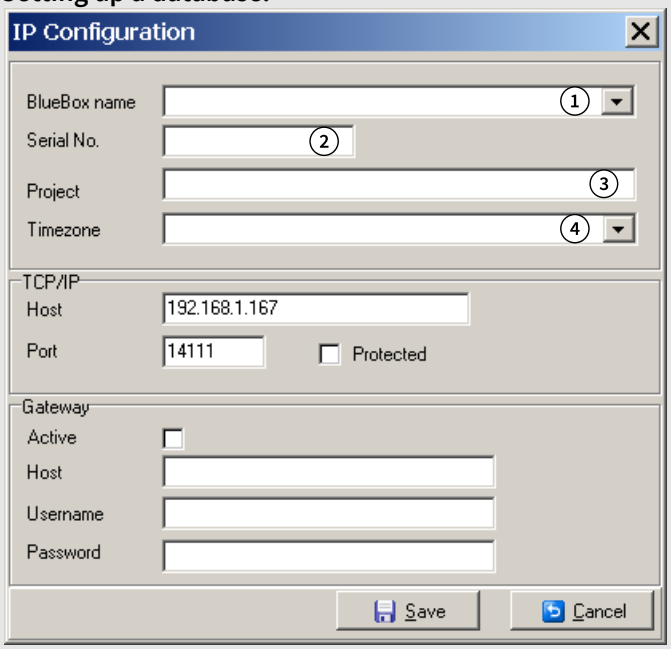
Public IP addresses are IP addresses outside the range of private IP addresses.

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

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.

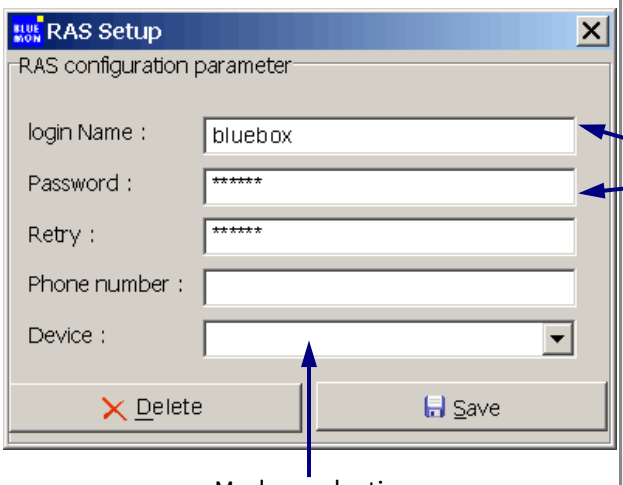
④ Time zone of the source database

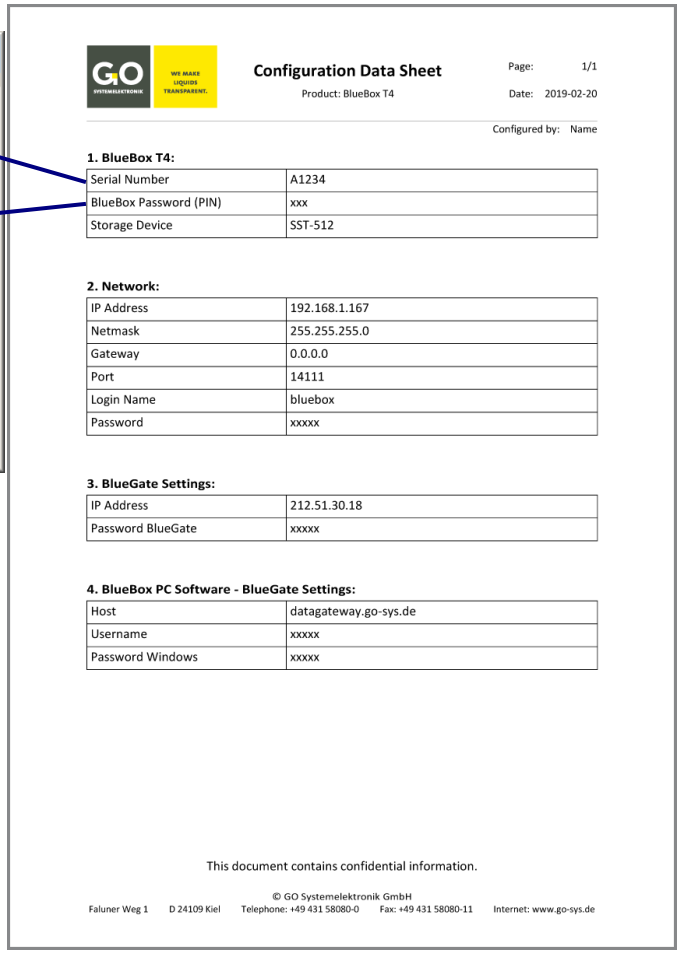
Note on the time stamp: The record times of the spectra are stored in the database in Coordinated Universal Time (UTC), just like all other acquisition times. Changing the time zone, e.g. in Spectrum Visual, only changes the time stamp of the display, and not the time stamp in the database.

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

3.2.3 RAS Setup (Modem Configuration)

Window IP Configuration, see 3.2.1





Configuration Data Sheet

Product: BlueBox T4

Page: 1/1

Date: 2019-02-20

Configured by: Name

1. BlueBox T4:

Serial Number	A1234
BlueBox Password (PIN)	xxx
Storage Device	SST-512

2. Network:

IP Address	192.168.1.167
Netmask	255.255.255.0
Gateway	0.0.0.0
Port	14111
Login Name	bluebox
Password	xxxxx

3. BlueGate Settings:

IP Address	212.51.30.18
Password BlueGate	xxxxx

4. BlueBox PC Software - BlueGate Settings:

Host	datagateway.go-sys.de
Username	xxxxx
Password Windows	xxxxx

This document contains confidential information.

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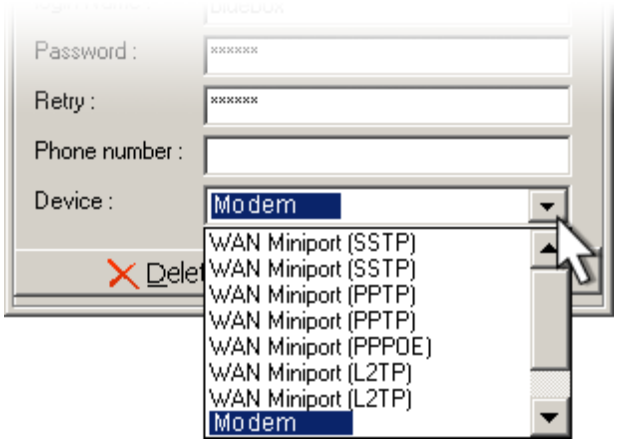
You obtain the password settings of the new Blue-Box from the attached configuration data sheet.
see *Appendix G – The Configuration Data Sheet*
After entering the login name, the password and after confirming it in the text field "Retry", enter in "Phone Number "the modem phone number.

Modems selection:



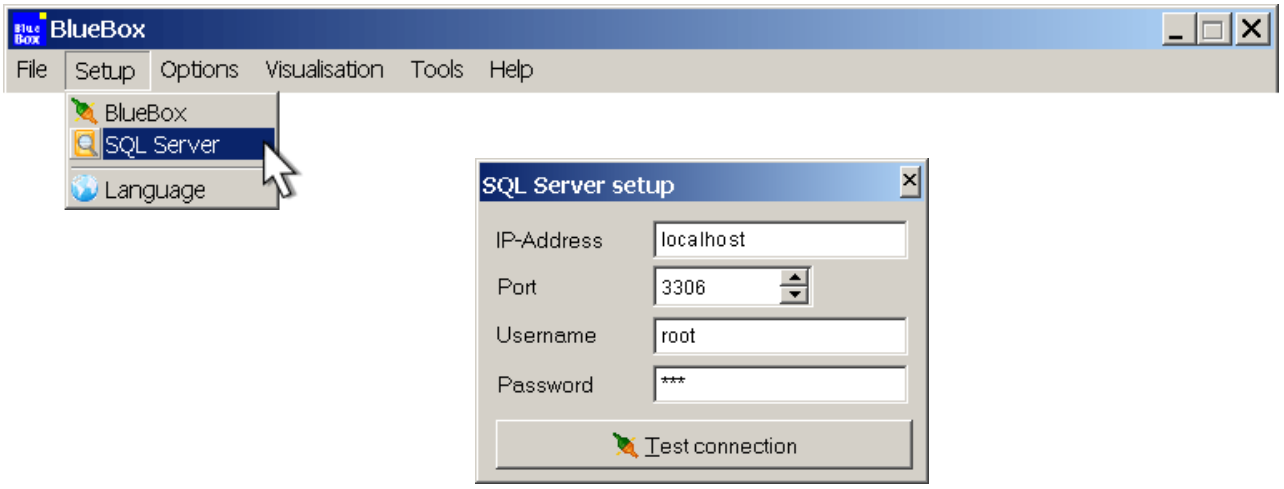
In the drop-down menu "Device" the modem is selected.

Deletes the settings.

Saves the settings.

Please confirm your entries by clicking on the <Save> button.
The setup is now completed, you can close the window.

3.3 SQL Server Setup



Here you determine in which MySQL™ Server the data of the BlueBox will be stored.

IP-Address The IP address of your MySQL™ Server. If the server runs on the same PC as the BlueBox SQL Software, you have to enter „localhost“.

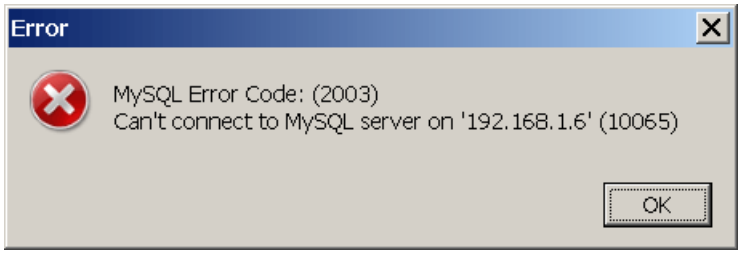
Port Default port address 3306 of the MySQL™ Server

Name Username of the MySQL™ Server, default name is „root“.

Password Password of the MySQL™ Server, set at the installation of the MySQL™ Server.

Testing of the connection to the MySQL™ Server

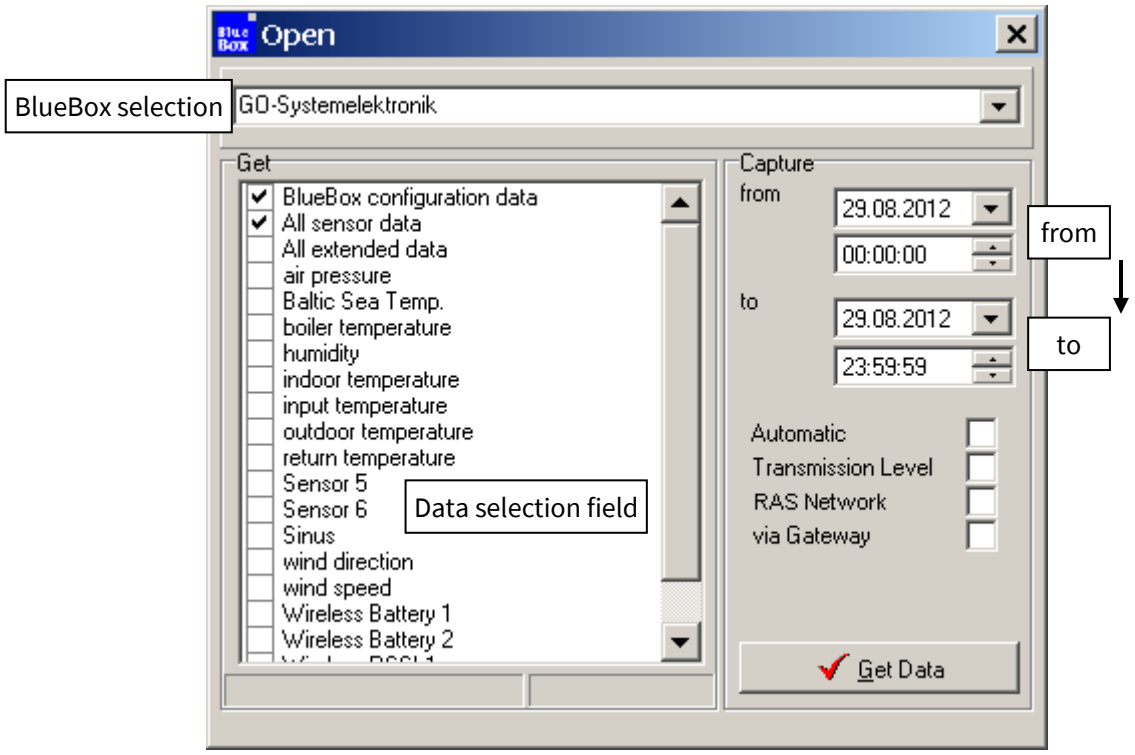
The connection exists. You can use the MySQL™-Server.



The connection does not exist. Check your settings.

3.4 Get Data

Use this window to transfer the BlueBox data into the database.



☑ **BlueBox configuration data** Transfers all sensor settings, the sensor protocol, the calibration protocol and the system protocol (Changelog) of the selected BlueBox.

☑ **All extended data** Transfers spectra, see *Manual ISA Spectral Analyser*

Automatic ☑ If this checkbox is activated, all new measurement values since the last data transfer of the selected sensor will be called up automatically. The transfer is based on the last record in the database that was retrieved for the BlueBox.
If this checkbox is deactivated, only the data within the delimited time period “from” “to” of the selected sensor will be called up.

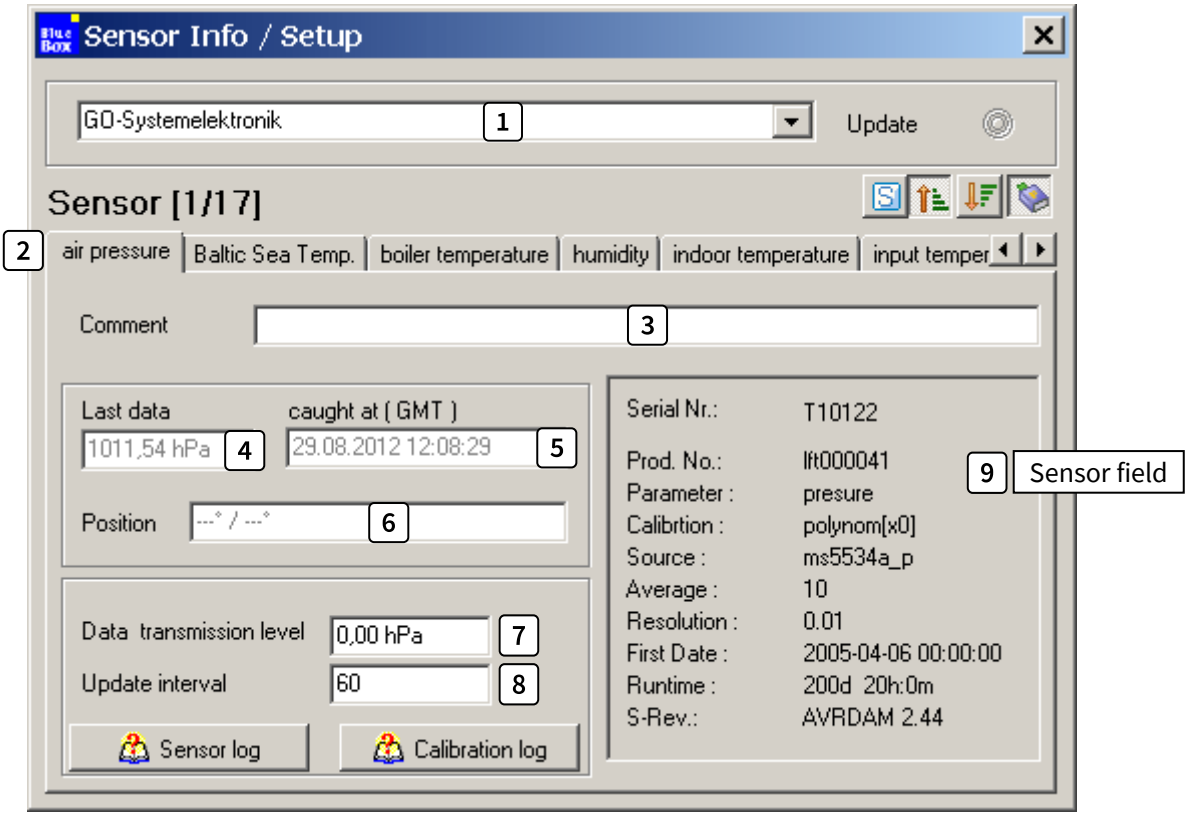
Transmission Level ☑ Transmits only the measurement values of the selected sensors that differ at least in minimum to the value of the "data transmission level" that is determined in the window of "3.5 Sensor Info".
This function spares memory capacity and allows a shorter data transmission time. However, at least 1 value per hour is transmitted.

RAS Network ☑ The connection is established via modem.

via Gateway ☑ The connection will be established via a gateway.

Get Data Transfers the data.

3.5 Sensor Info



Sorts the tab of the sensors by serial numbers

Sorts the tab of the sensors descending alphanumeric.

Sorts the tab of the sensors ascending alphanumeric.

Hides not active sensors or not.*

Opens the protocol window of the sensors.

Opens the protocol window of the calibrations.

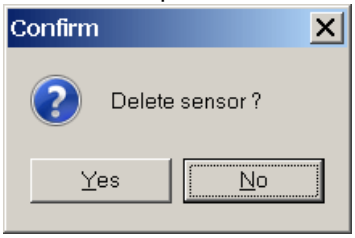
* Sensors are not active if the sensor name is set to n /c (not connected) in the window of the sensor settings.
see *5.4.1 Sensor Setup*

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

[2] Bar tab of sensors and actuators, on click on a tab the corresponding sensor/actuator will be selected.

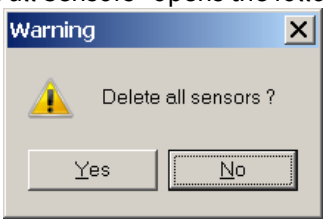
Right mouse click on the selected tab* opens a selection men

Click on „Delete Sensor“ opens the following window:



Here you can delete the selected sensor/actuator from the database,
e.g. if individual sensors/actuators have been physically removed.

Click on “Delete all Sensors” opens the following window:



Here you can delete all sensors/actuators from the database. After that the actual configuration of the Blue-Box has to be retrieved from BlueBox into the database (see 3.4 Retrieve Data).

[3] Any comment text

[4] Display of the last measurement value of this sensor in the SQL database

[5] Display of the time of the last measurement value of this sensor in the SQL database

[6] If a GPS system is integrated, the exactly position of the last measurement is shown here.

[7] In this field, the "Data transmission level" is displayed. This value indicates at what difference from the previous measurement value the actual measurement value will be saved in the database (precondition: compression enabled, see 3.4 Retrieve Data). This feature saves storage space and allows shorter transmission times (for example, 0.01 hPa, i.e. only if there is a difference of at least 0.01 hPa from the previously measurement value the data will be transferred into the data base).
At least 1 value per hour will be transferred.

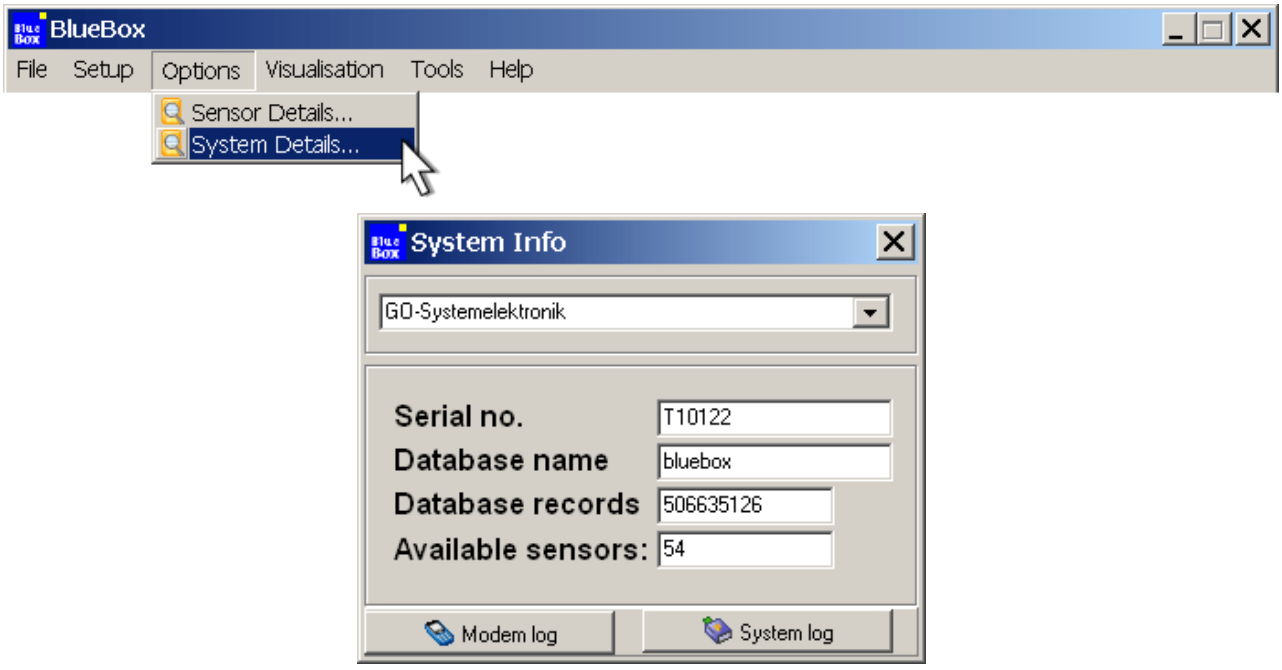
[8] Display of the interval of measurement in seconds. The interval determines how often measurements are executed (example: input 60, every 60 seconds/every minute a measurement value is recorded).

[9] Sensor field, general information about the sensor/actuator

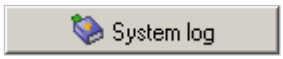
* an every other tab

3.6 System Information

This window displays the basic data of the selected BlueBox.

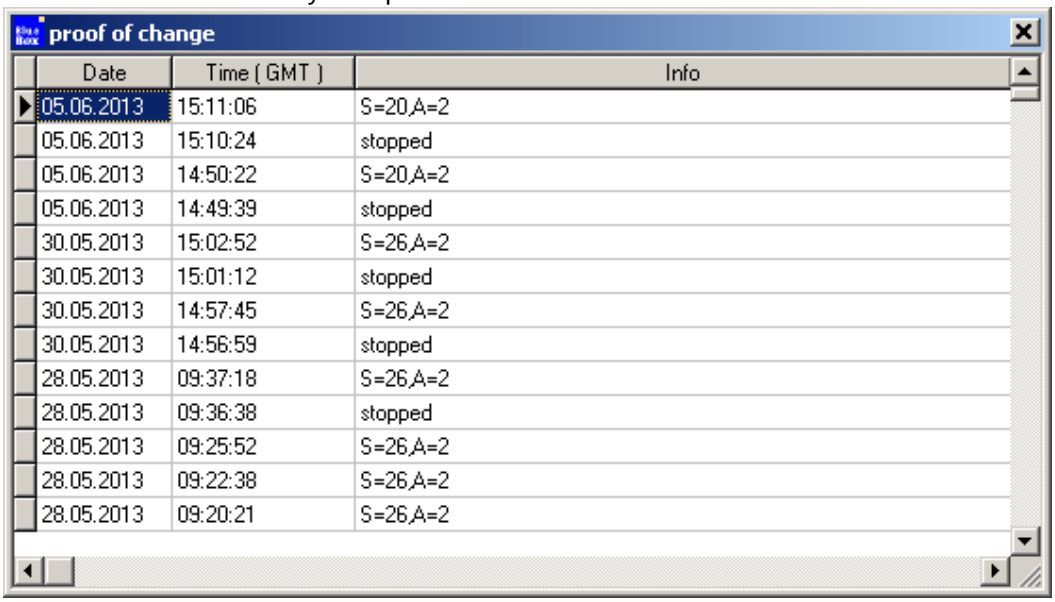


Opens the protocol window of a connected modem



Opens the window of the system protocol (changelog).

System protocol window of the BlueBox



In this continuously logging logfile, the various status messages of a BlueBox from the beginning of service are displayed.
In the figure above, this means that on 05/06/2013 at 15:11:06 (GMT) 20 sensors and 2 actuators were connected to the selected BlueBox.

3.6.1 Status Messages of the System Protocol Window

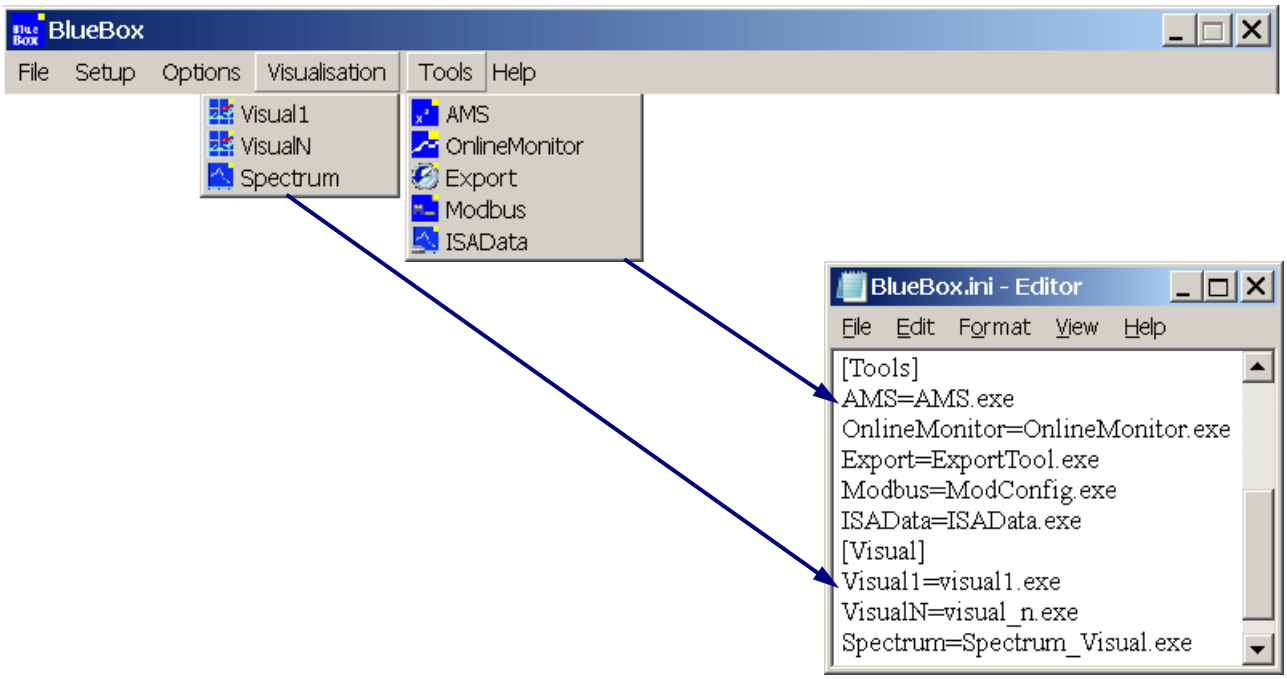
Message (Info)	Description	Log no.*
Date(*01***/***07***/***13 16***:***41***:***34***)**	Time has been set	0
S=*17***, A=***2*	17 sensors and 2 actuators detected at BlueBox start	1
Shutdown **Stop** **Reboot**	BlueBox status: Shutdown, Stop, Reboot	2
GPS timeout	GPS module is sending no data	3
Service on **Service off**	Service mode (see Manual *BlueBox T4* there *8.2.1.1.5 Internet Settings*) of the BlueBox switched on/off.	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 *80***°C M** *69***°C**	Temperature C 80°C M 69°C C=CPU M=Mainboard	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

Note: In addition, there is the service message **stopped**, it has no meaning for the user.

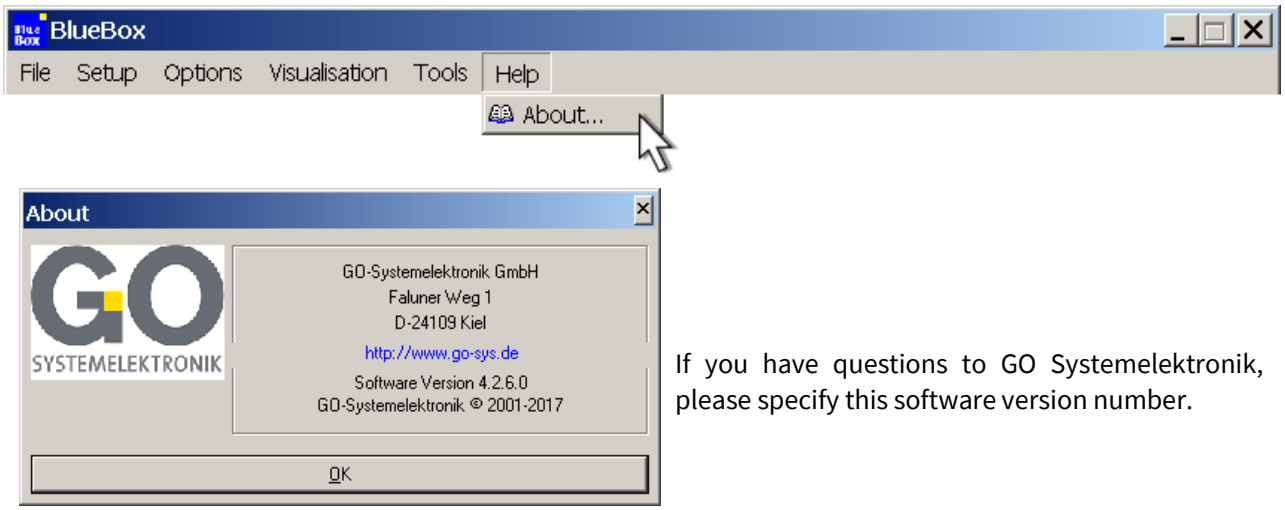
* The Log no. is not listed in the system log window, it is useful for a database query.

3.7 Drop-down Menus Visualisation and Auxiliary Programs

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 is stored.
In general, this can be found under the following path: C:\Program Files\BlueBox.



3.8 Help



If you have questions to GO Systemelektronik, please specify this software version number.

4 Programs for Data Display and Visualisation

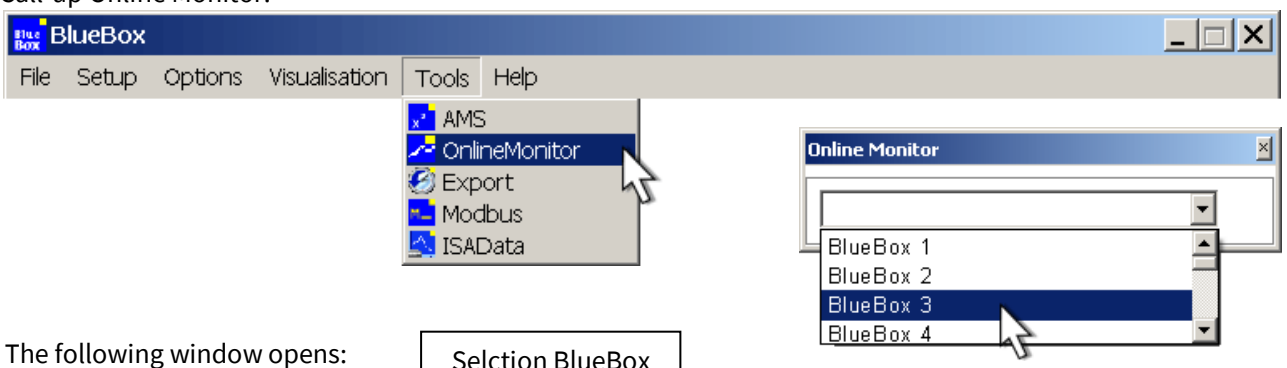
The BlueBox PC Software features various options for data presentation. Below the different programs and their properties are described.

4.1 Online Monitor

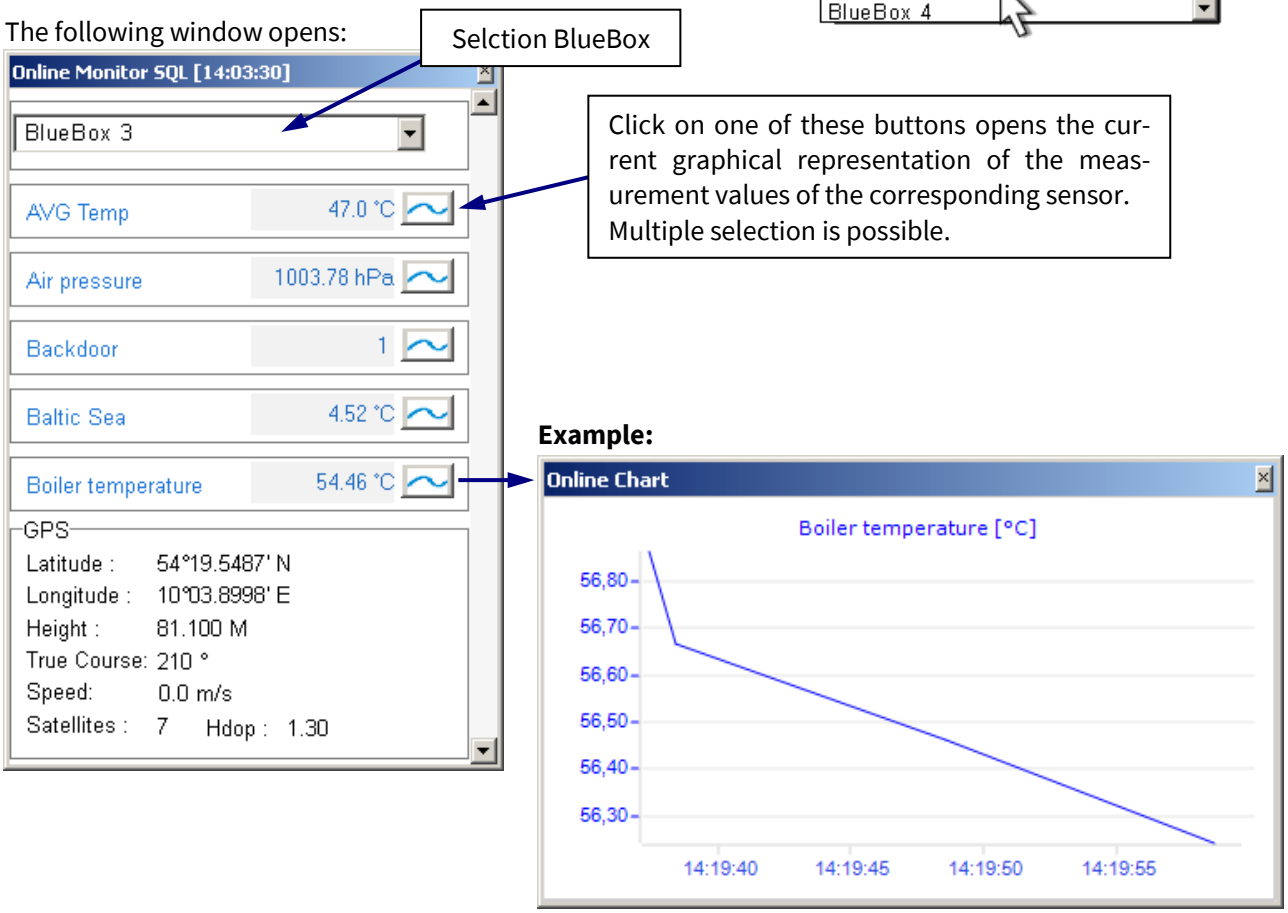
Program version: 4.2.3.0

Online display of actual measured data and, if available, the GPS data
The current measurement data do not have to be identical with the values stored in the BlueBox (and thus later in the database). see *5.4.1 Sensor Setup* there *Display and save mode.*

Call-up Online Monitor:



The following window opens:



Example:

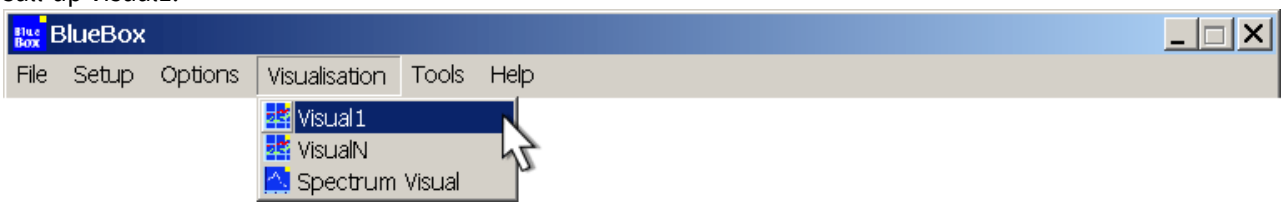
4.2 Visual1

Program version: 4.3.0.0

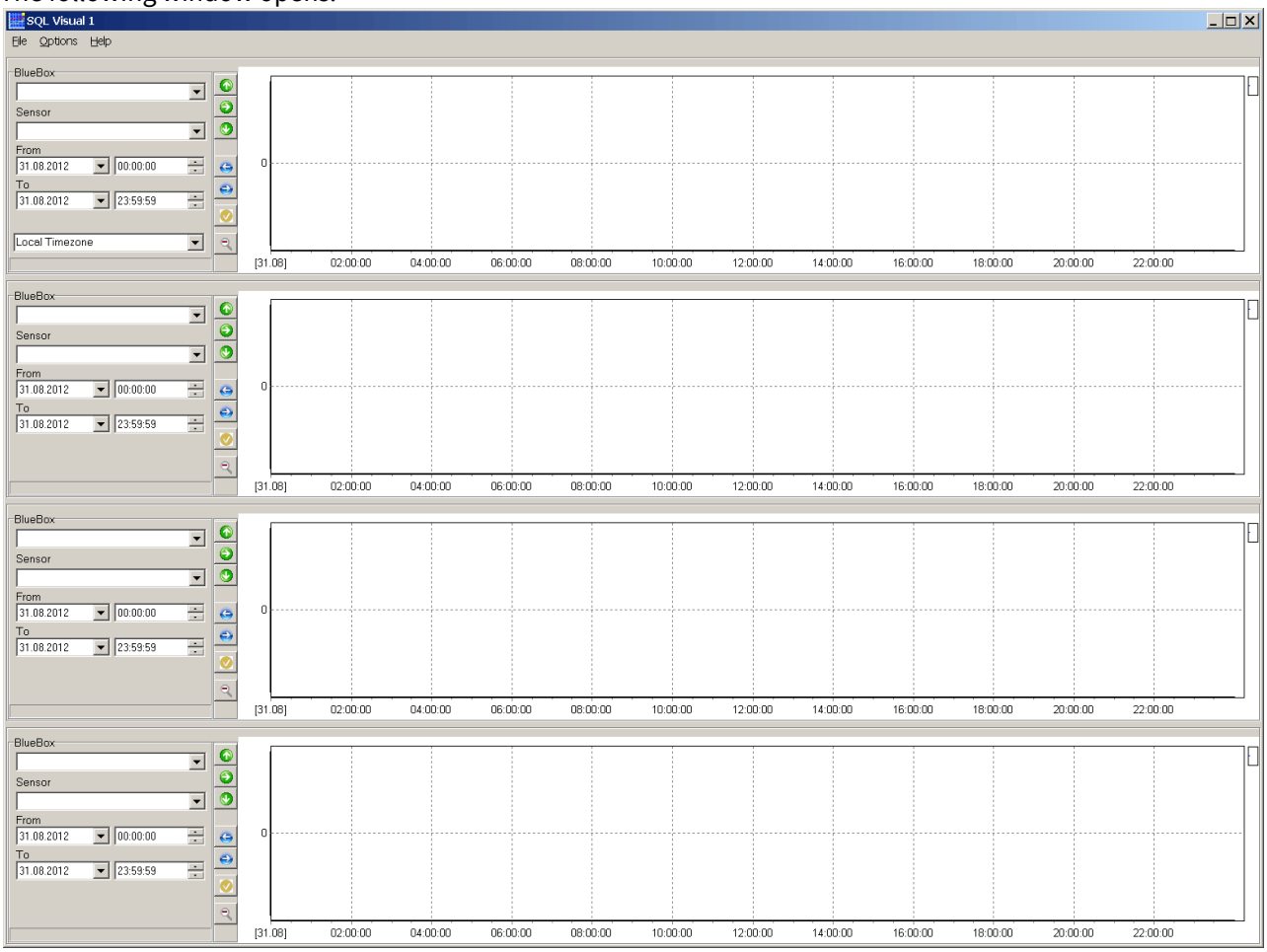
Visual1 displays the measurement values of four sensors from databases in each one diagram, the sensors can also be connected to different BlueBox systems

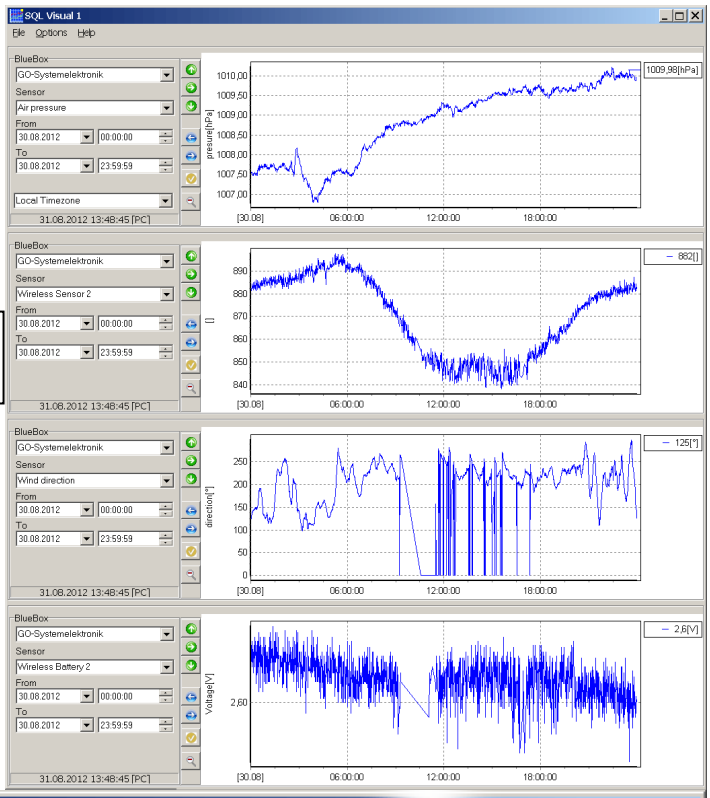
Note: If the queried databases are updated during the program runtime, the display is also updated.

Call-up Visual1:

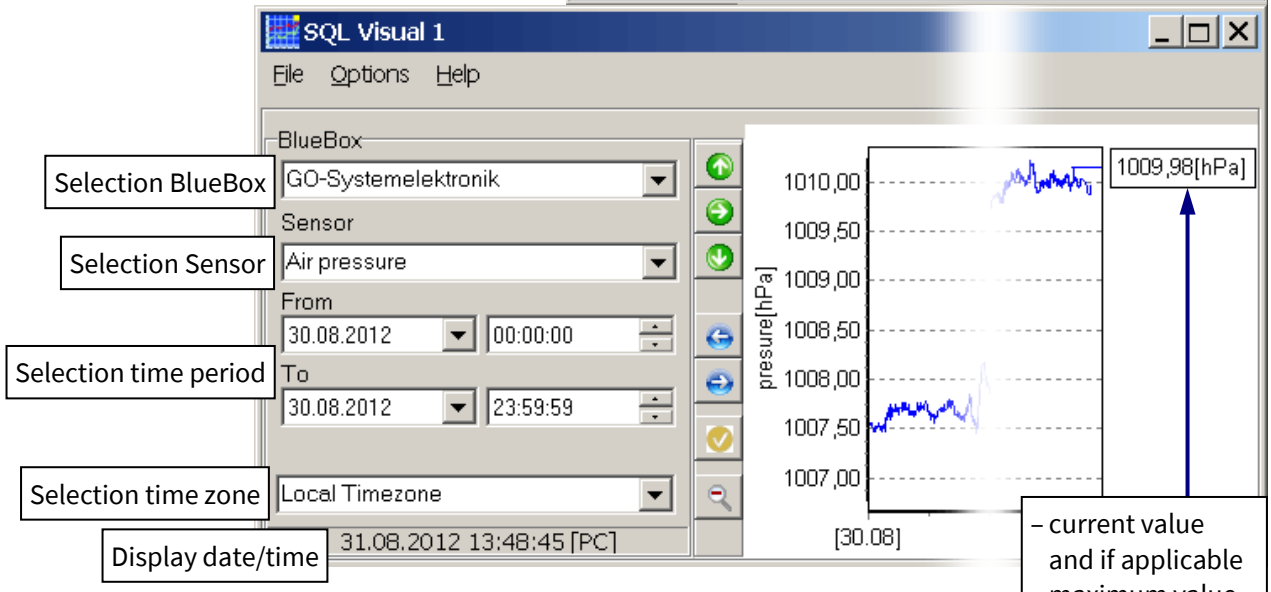


The following window opens:





Here you can select 4 sensors and the corresponding BlueBox systems.



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

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

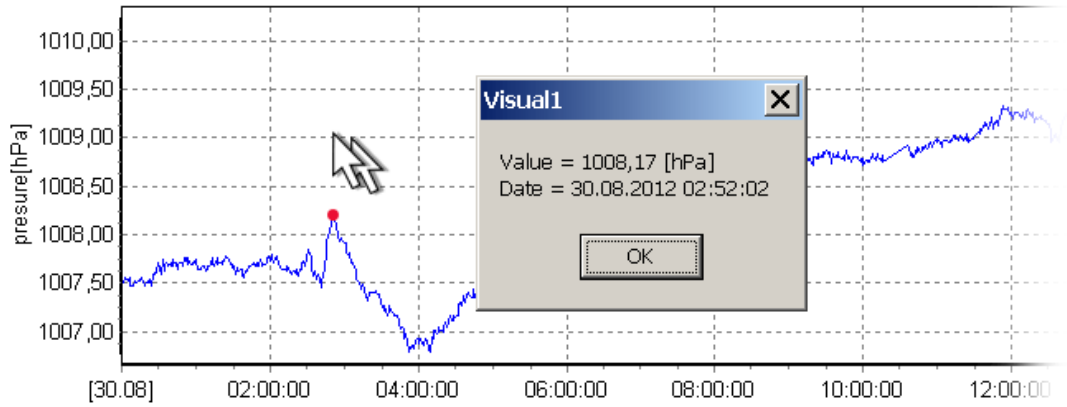
The minimum value measured in the selected time period will be shown as yellow curve.

Sets the display period back by one day.

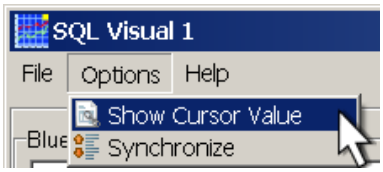
Sets the display period forward by one day.

Displays the SQI (Spectral Quality Index) in the case of application-specific parameters from spectral data.

Resets the zoom value to 1.

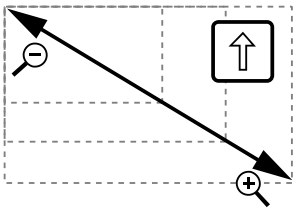


A red dot appears at the location of the graph closest to the mouse cursor. The key combination Ctrl+Del deletes the measurement point in the database and thus also in the display (!not to be undone).
Double-click opens a window with the value, the date and the time (at using GPS also the position data) of the measurement values underlying the red point.

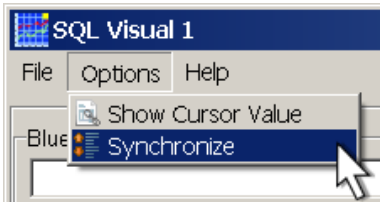


If “Show Cursor Value” is activated, value, date and time will be shown permanently beside the graph on the right.

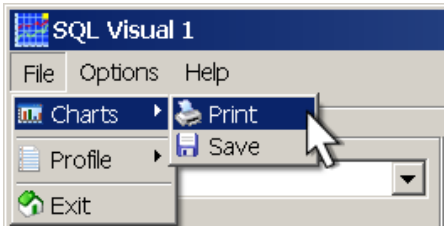
You can zoom or reduce the diagram by pressing the shift-key and the left mouse-key to raise a rectangle to the right or the left.



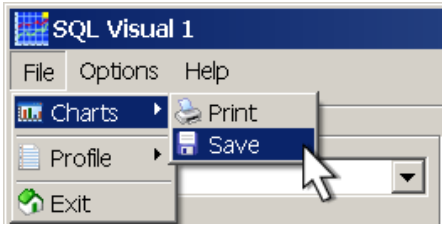
With the right mouse button down, you move the diagram timeline.



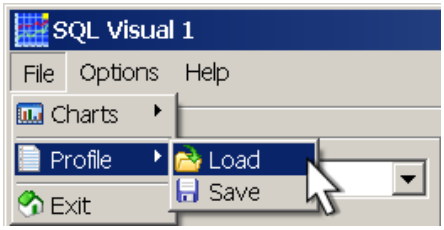
It is recommended to synchronize the four graphs chronologically for comparing these graphs better. Decisive therefore are the timing settings within the first graph.
The time-based synchronization of the four graphs takes place by choosing „Synchronize” under “Options”.
The subsequent graphs will be adapted according to the period of the supreme graph.



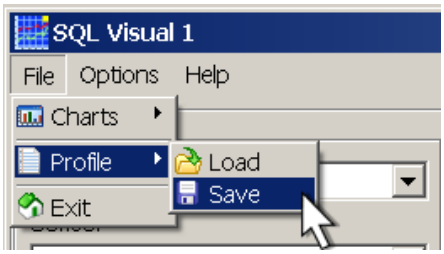
Opens the standard-printer-menu and prints all diagrams.



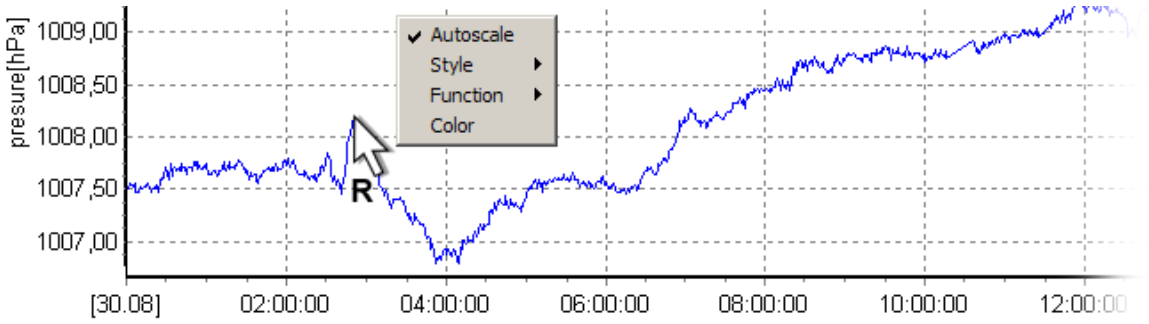
Saves every diagram separately in common graphic formats.



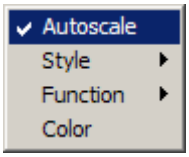
Loads a previously saved setting-profile of a vp1-file.



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

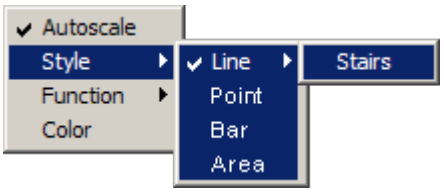


Right-click in the diagram-display opens a selection dialog for setting of the diagram display.



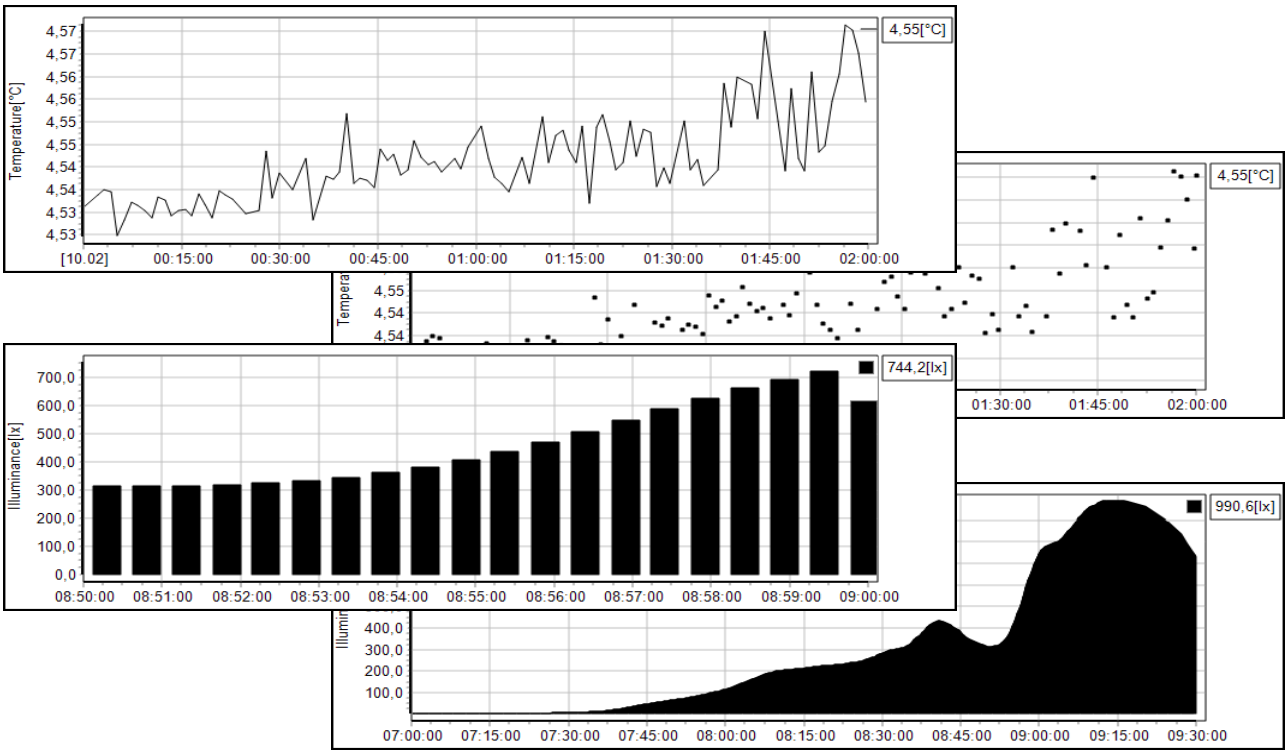
If “Autoscale” is enabled (default), the y-axis will be scaled in reference to the displayed measurement values, otherwise the y-axis will be scaled in reference to the measuring range of the sensor (see 5.4.1).

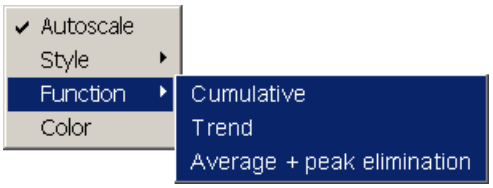
Note: If time periods without stored measurement values exist, this can only be seen in the point view (see next page).



The stair diagram presents the switching points better.

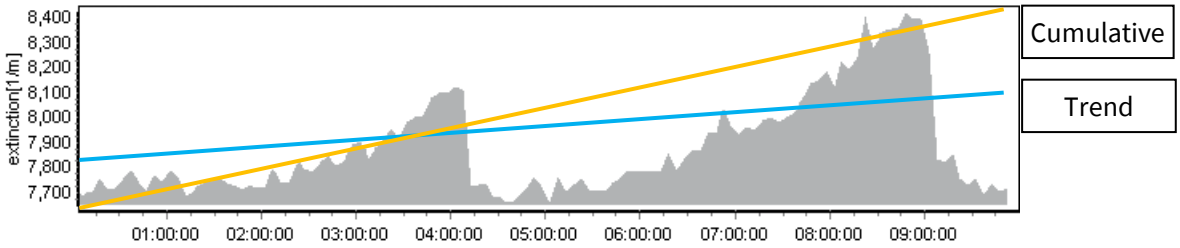
Peak   Stair

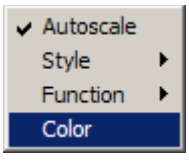




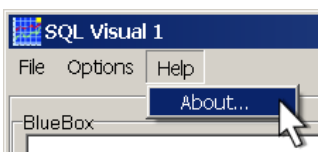
Setting with which functions will be attached to the graph. Available are the representation of cumulative value („**Cumulative**“) and the tendency value („**Trend**“). For both functions graphs will be pictured in the diagram.

Average + peek elimination see *4.3.1 Mean Value Settings with Outlier Suppression*





Selection of a graph colour: After selection by click with the left mouse-key the selection window will be shown. The graph is then displayed in the selected colour.



Opens a window with the software version number. If you have questions to GO Systemelektronik, please specify this software version number.

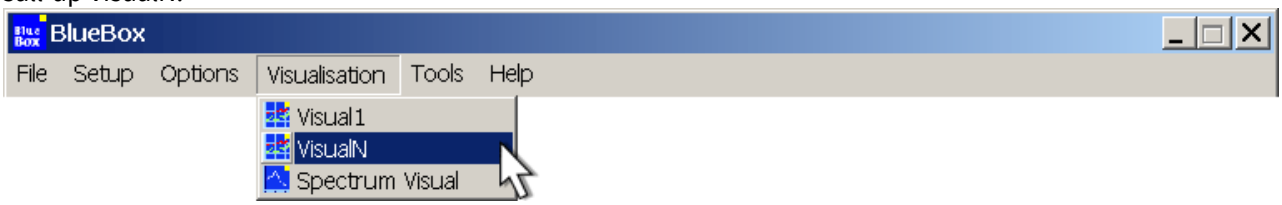
4.3 VisualN

Program version: 4.2.7.0

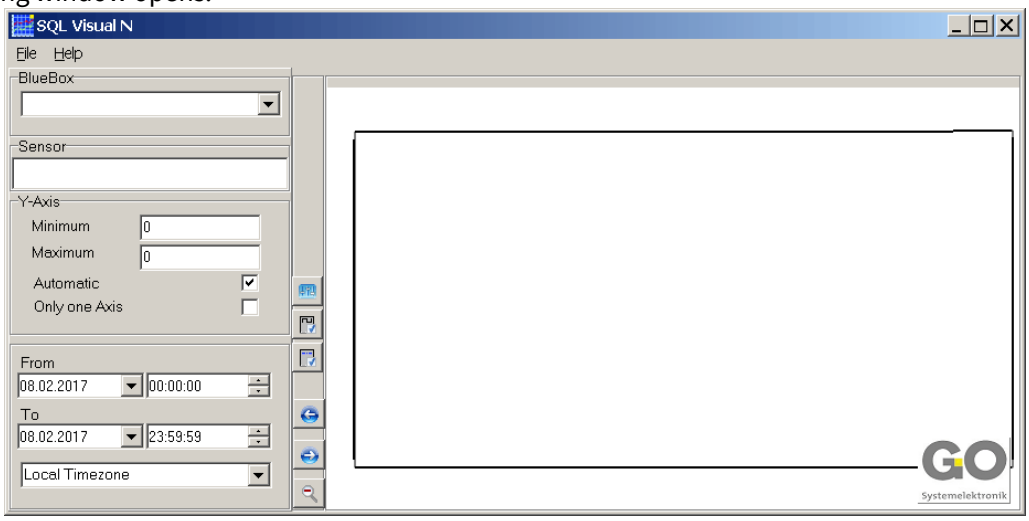
VisualN displays the measurement values of multiple sensors from a database in one chart. Each sensor will be displayed with a different-coloured graph. Graph, chart and legend have the same colour.

Note: If the queried database is updated during the program runtime, the display is also updated.

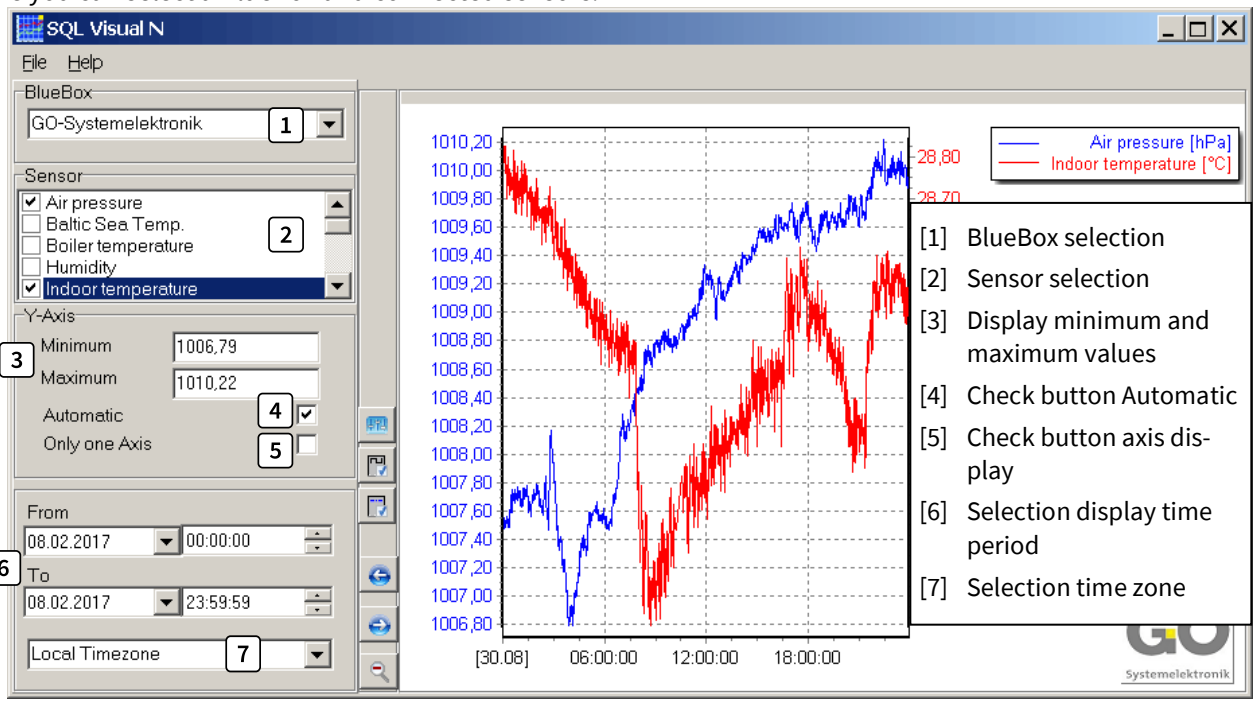
Call-up VisualN:



The following window opens:



Here you can select a BlueBox and connected sensors.




Open the window of the mean value settings.
see *4.3.1 Mean Value Settings with Outlier Suppression*


Switches the graph display back and forth between oblique and straight lines.

Peak   Stair

The stair line presents the switching points better.


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

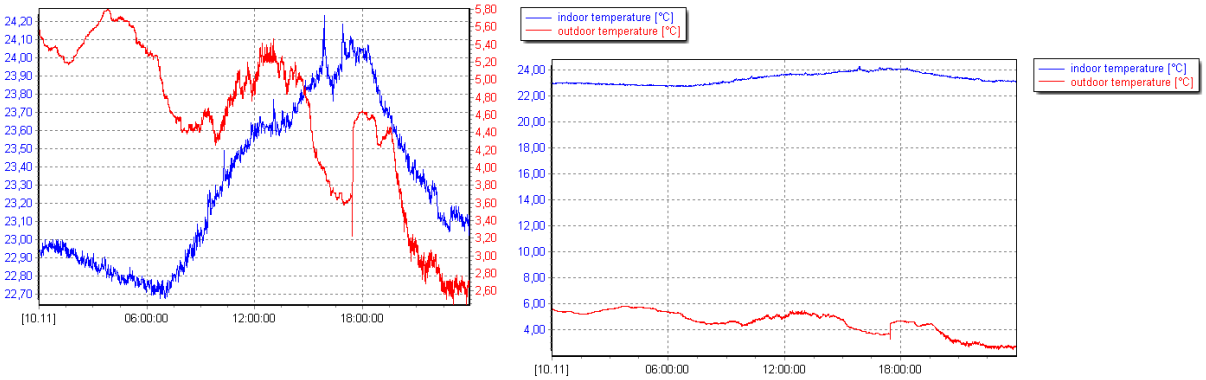

Sets the display period back by one day.


Sets the display period forward by one day.

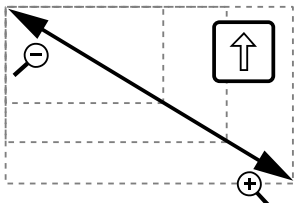

Resets the zoom value to 1.

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 sensor values are scaled to one y-axis.

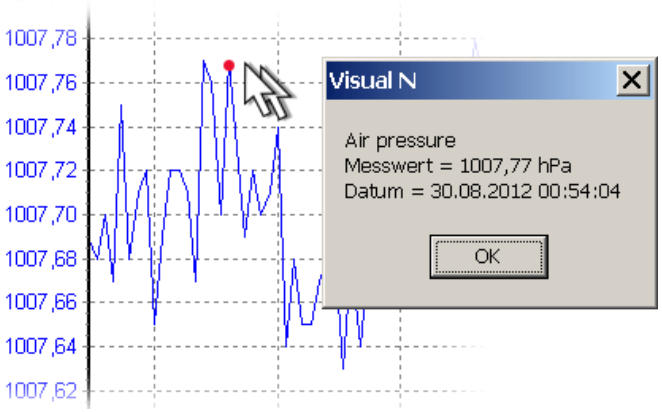
Because of the better comparability it is recommended to select “just one axis” if several sensors of the same parameter should be shown in the diagram. Then the diagram has just one y-axis.



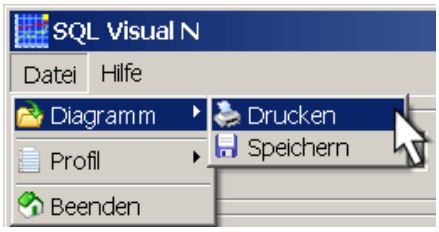
You can zoom or reduce the diagram by pressing the shift-key and the left mouse-key to raise a rectangle to the right or the left.



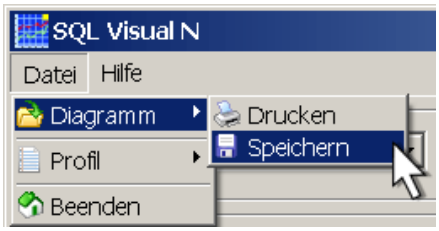
A red dot appears at the position of a selected graph (selection by clicking on the graph) that is closest to the mouse cursor.
The key combination Ctrl+Del deletes the measurement point in the database and thus also in the display (⚠ not to be undone).
Double click opens a window with the measurement value, the date and the time (with used GPS also the position data) of the measuring point below the red point.



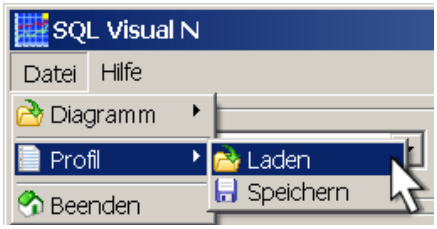
Note: If time periods without stored measurement values exist, this can better be seen in the point view in Visual1 (see 4.2 Visual1).



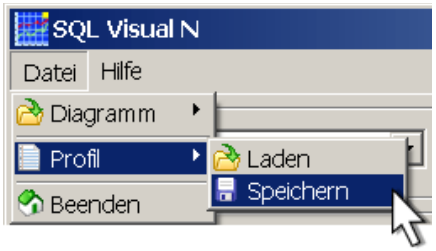
Opens the standard-printer-menu and prints the diagram.



Saves the diagram in common graphic formats.



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



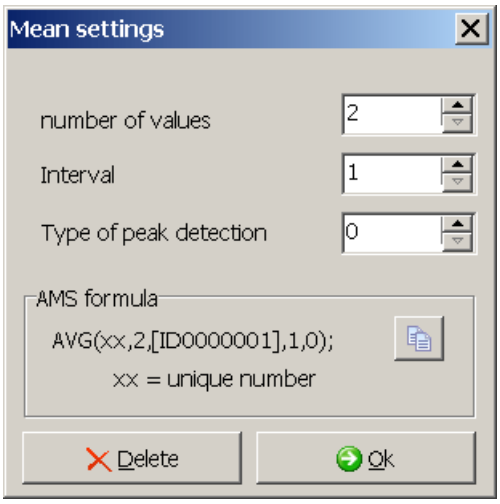
Saves a previously saved setting-profile (=current state of the VisualN window) as vpn-file.

Opens a window with the software version number. If you have questions to GO Systemelektronik, please specify this software version number.

4.3.1 Mean Value Settings with Outlier Suppression

Button of the mean value adjustments

Here you can determine how a moving average is calculated and how outliers are suppressed.



Cancels the effect of the mean settings.
You can also click on .

Calculates the mean values and displays them graphically.

Number of values Number of parameter values from which the moving average is calculated, minimum is 2.

Interval Mean value interval*
The mean value is only calculated with those measurement values at which the respective distance of the recording times is greater than or equal to the interval. 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. Values less than the measurement interval are thus ineffective.

Type of outlier/peak detection

0	No outlier suppression

The measurement values determined with *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.

* Do not confuse with the measurement interval.

AMS Formula entry

This field displays the corresponding AMS formula entry.

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

xx = individual identification number of the average calculation (0 to 9999) Each identification number can only be assigned once within a BlueBox.
If all previous average calculations have already been transferred to the BlueBox, a matching identification number is inserted automatically.

b = Number of measurement values to be averaged.

[Sensor-ID] = measurement value of the sensor

d = Interval

e = Type of outlier detection

Click on  copies den formula entry into the clipboard.

5 AMS – Advanced Managing Software

Programmversion: 4.1.4.0

5.1 Introduction AMS

The Advanced Managing Software provides direct access to a BlueBox and its working parameters. The most important tool of AMS is the integrated formula language AMS Formula (see 5.5 AMS Formula).
Precondition for the operation of AMS is the BlueBox SQL software installed with the installation package. For example, e.g. with AMS you can call up only BlueBox systems which have already been registered into the assigned database with the BlueBox SQL software.

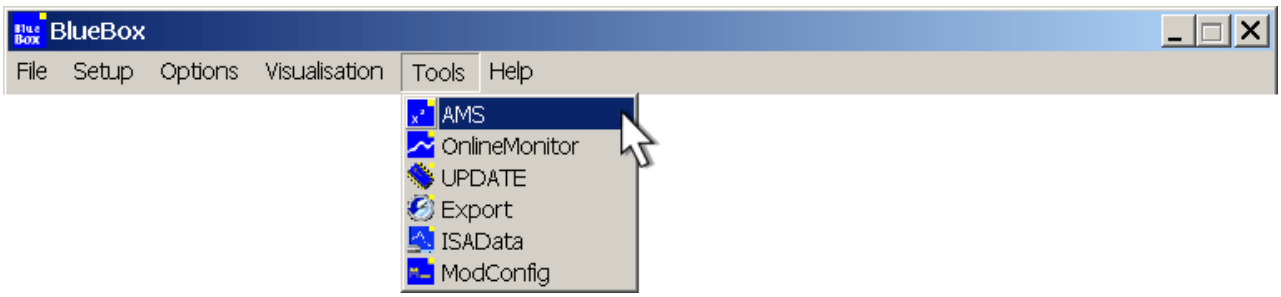
Note: Some Modifications carried out by AMS are saved directly in the BlueBox.
It is recommended to save the settings (see 5.3.2).

Properties of AMS (excerpt):

- Configuration of system and communication functions
- System monitoring
- Sensor setting incl. sensor calibration
- Mathematical functions for the calculation of measurement values
- Logical links between sensors and actuators (PLC functionality)
- Setup of virtual (calculated) sensors
- Notification by e-mail and SMS for freely-definable events
- Freely definable time-controlled functions
- Change variables via SMS

5.2 Call-Up AMS

In general you start AMS from the BlueBox SQL Software.

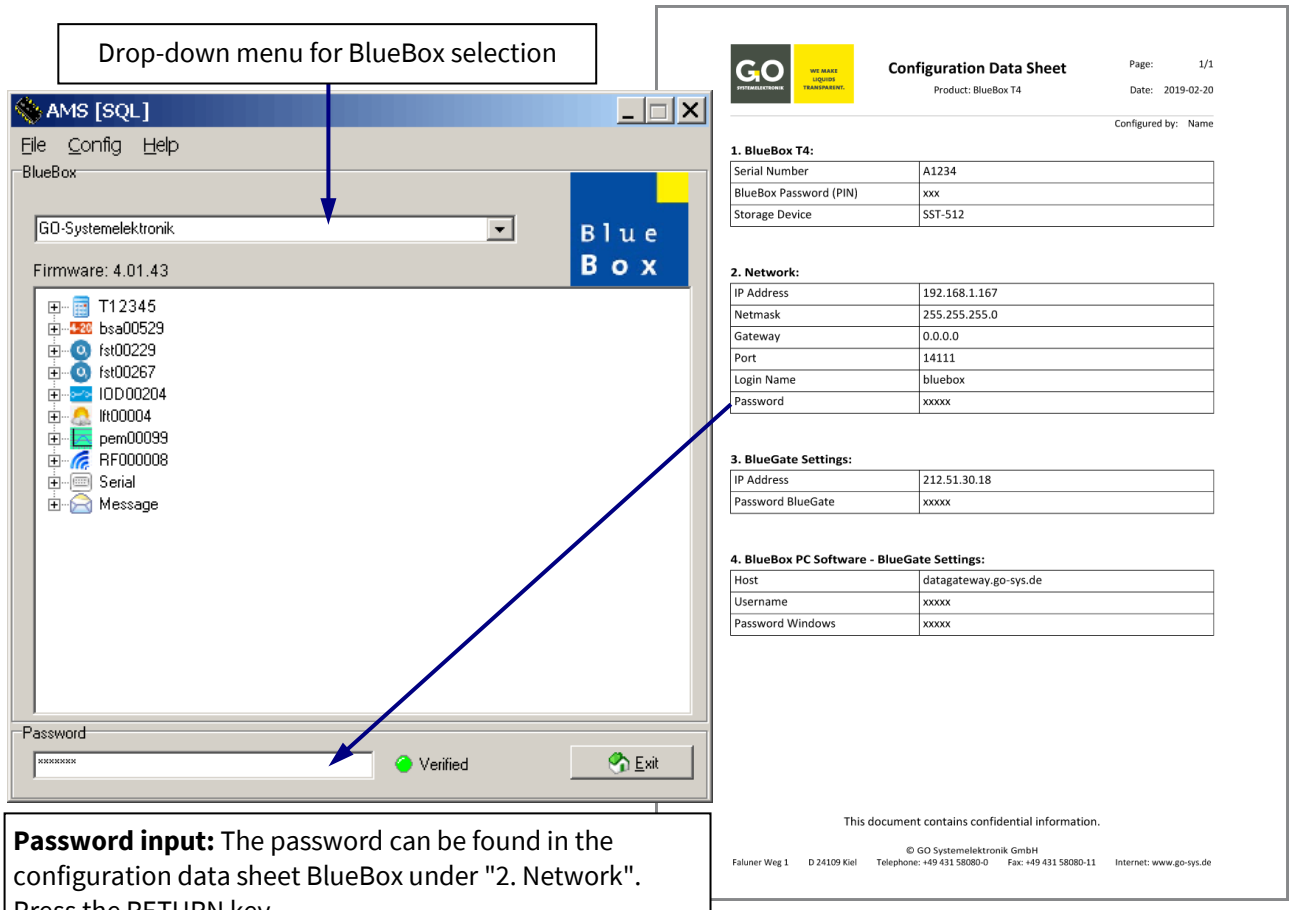


You can also start AMS from the Windows-Explorer. If not otherwise specified at installation, the AMS.exe is stored in the folder C:\Program Files\BlueBox.

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.



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.

To change settings on the BlueBox the associated network password has to be entered.
The network password is printed on the configuration data sheet provided with each BlueBox.

If the password is invalid, an error message appears.

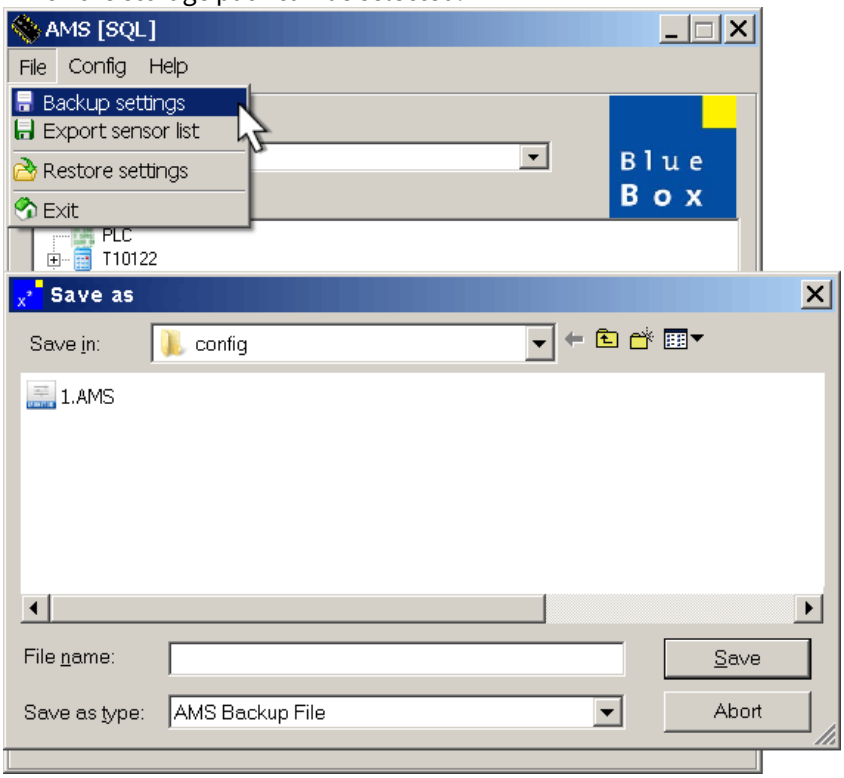
If you have not entered a correct password, you cannot change settings or view calibration values or raw data

Click on <OK> and enter the password again.

5.3.2 File

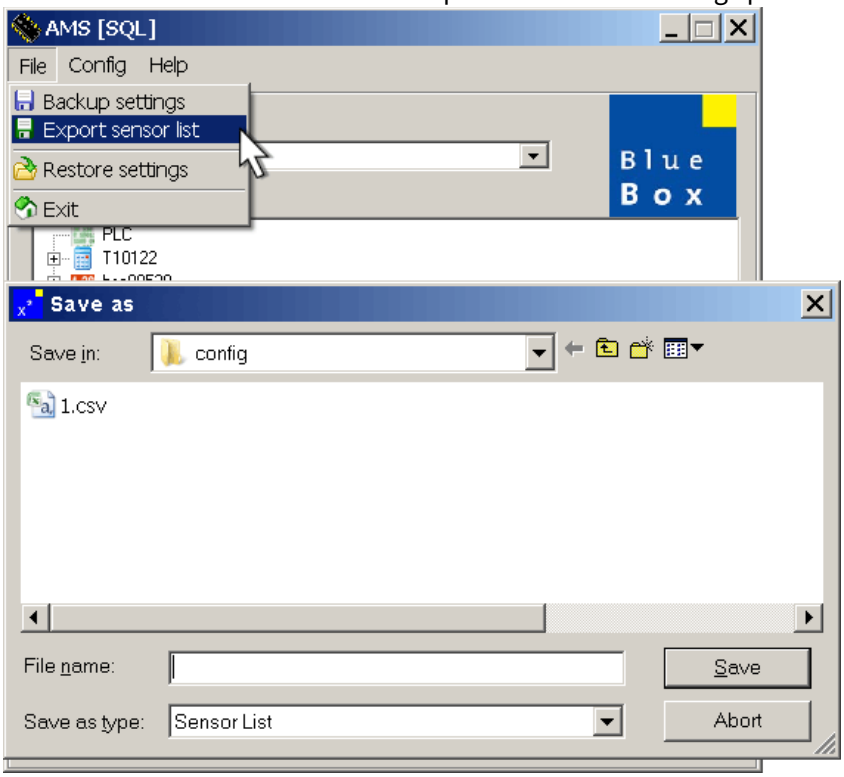
5.3.2.1 Backup Settings

Here you can save formulas and virtual sensors as an AMS Backup File.
A window opens in which the storage path can be selected.



5.3.2.2 Export Sensor List

Here you can save the sensor list as a csv-file. A window opens in which the storage path can be selected.



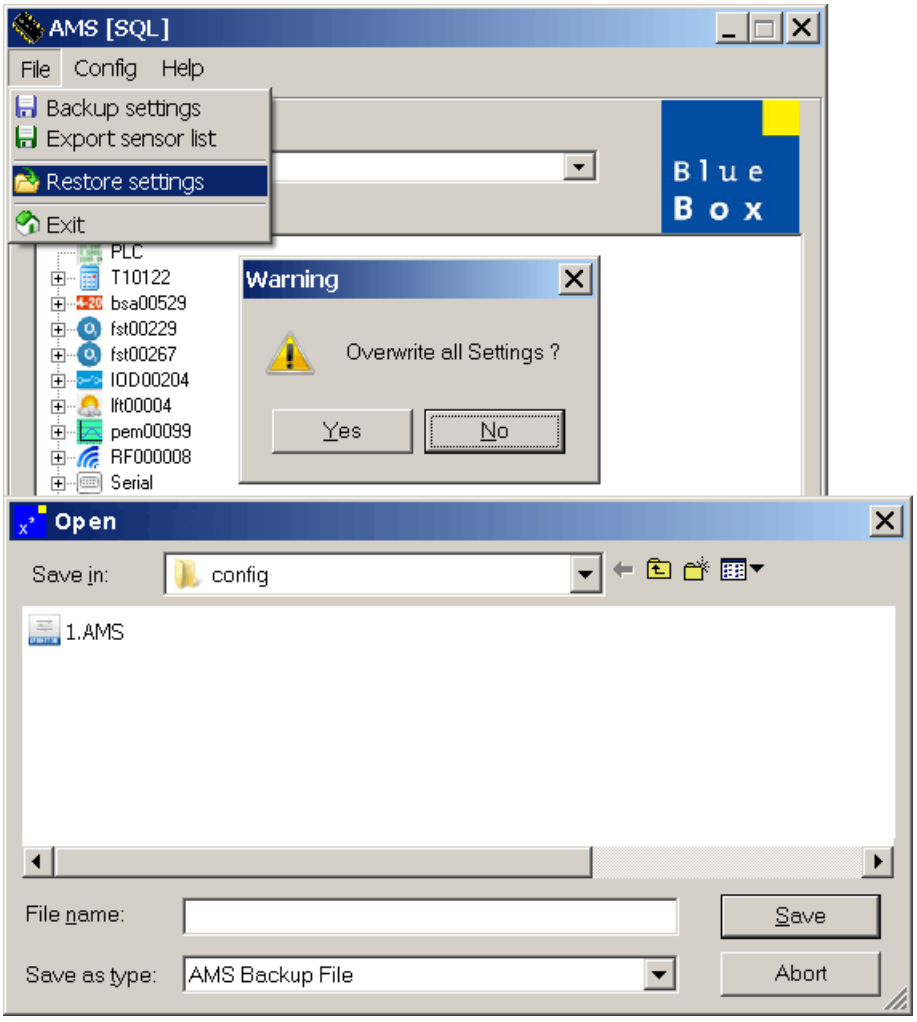
The data in a csv-file is separated by a semicolon. It is recommended to open these files with a program that displays the data in a clearly arranged way. see *Appendix F – Opening of a csv-File*

5.3.2.3 Restore Settings

Here AMS backup files (see 5.3.2.1) to can be restored, i.e. the settings will be transferred back to the BlueBox, current settings will be overwritten.

After selecting "Restore settings", a warning window appears, asking if the settings should be overwritten.

Note on a possible operation error: Please note the warning and decide carefully whether you want to overwrite the settings.

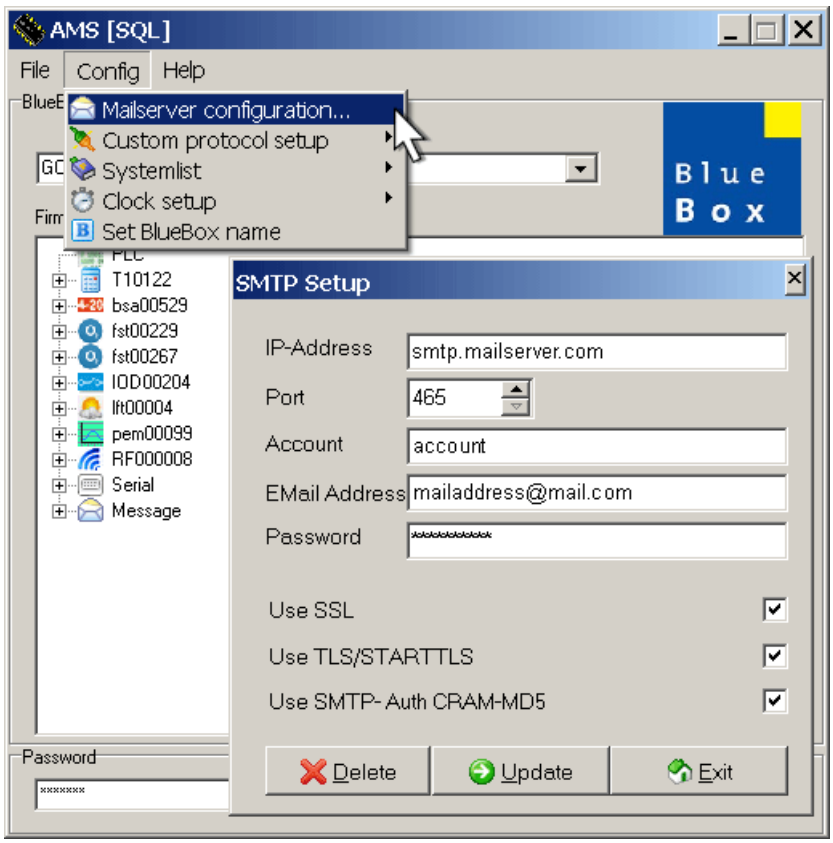


If you want to overwrite all settings, click on <Yes> to open a new window in which the storage path for the files to be restored is to be specified.

5.3.3 Configuration

5.3.3.1 Mailserver Setup

Here you specify the mail server settings. From this e-mail address e-mails will be sent by the BlueBox.



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.

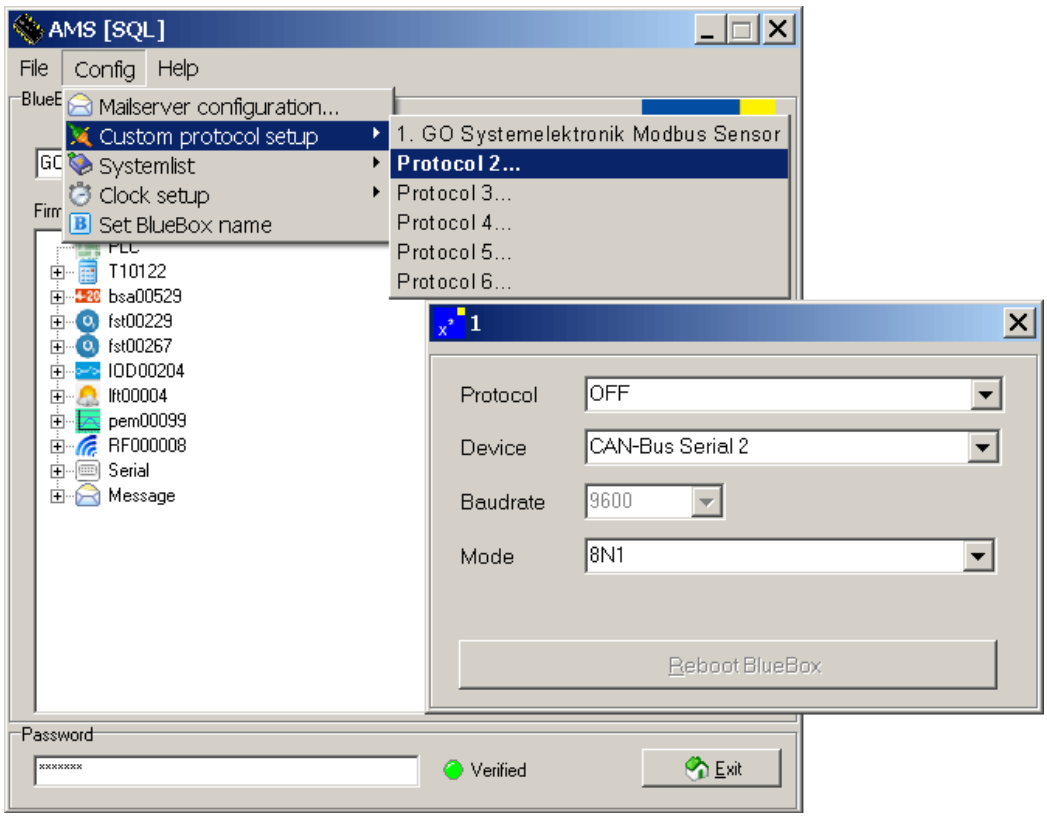
Use TLS/STARTTLS ☑ E-mails are encrypted with TLS/STARTTLS.

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.

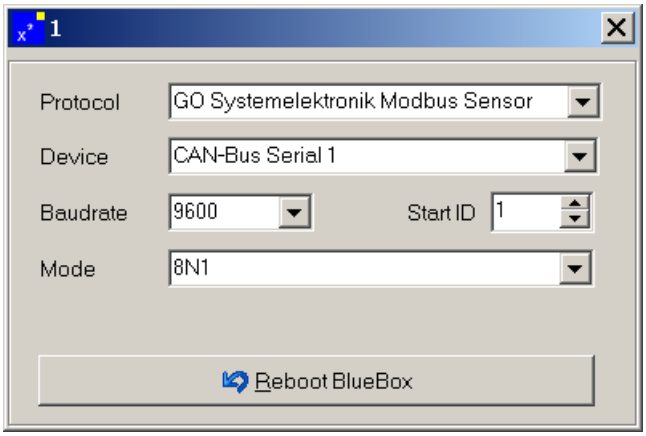
5.3.3.2 Custom Protocol Setup



With these settings external devices are connected (e.g. sensors via the CAN-bus serial module* or GO Modbus Sensors).

Up to and including AMS program version 4.01.48:
After a protocol change, the BlueBox has to be rebooted.
After a device (interface) change, the BlueBox has to be rebooted.

Example Connection of GO Modbus Sensors
This example shows the default settings.
The actual settings result from the respective configuration of the Modbus sensor.
For more information about setting up GO Modbus sensors with the BlueBox PC Software please contact GO Systemelektronik.

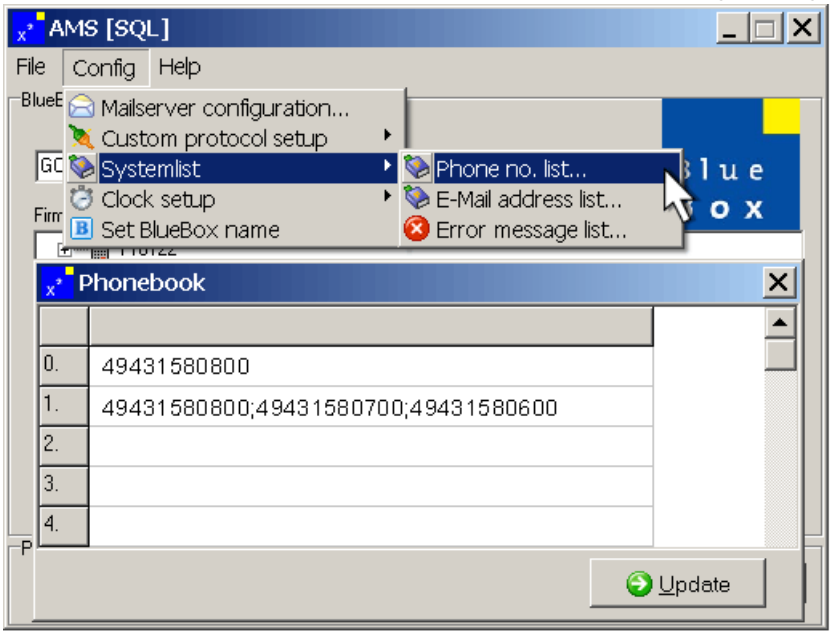


* see *6.2 ModConfig*

5.3.3.3 System Lists

5.3.3.3.1 Phone Number List

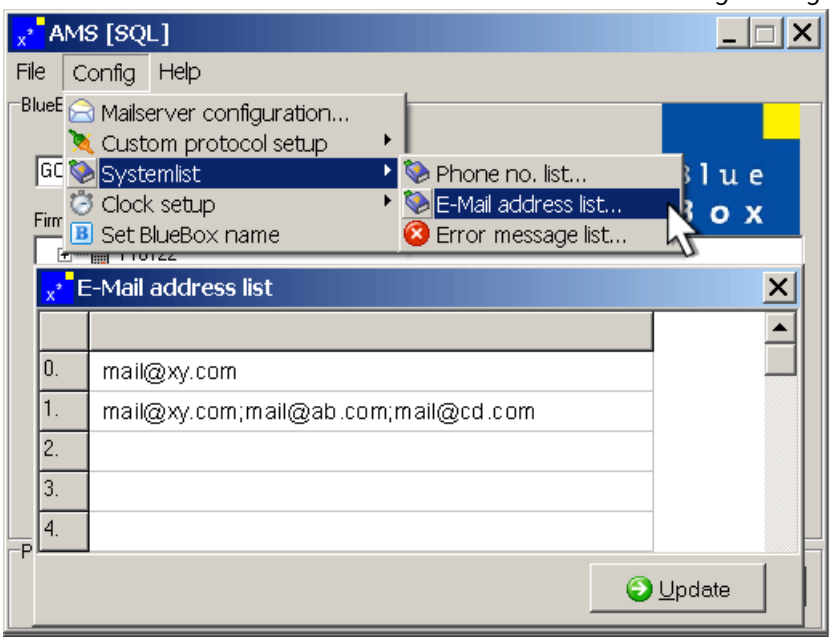
When sending SMS messages with AMS, you can refer to the corresponding telephone numbers via the line number. see *5.4.2 Sending Messages by E-mail and SMS*



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 various telephone numbers* in one line, separated with a semicolon. Click on <Update> to transfer the telephone number list to the BlueBox.

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 line number. see *5.4.2 Sending Messages by E-mail and SMS*

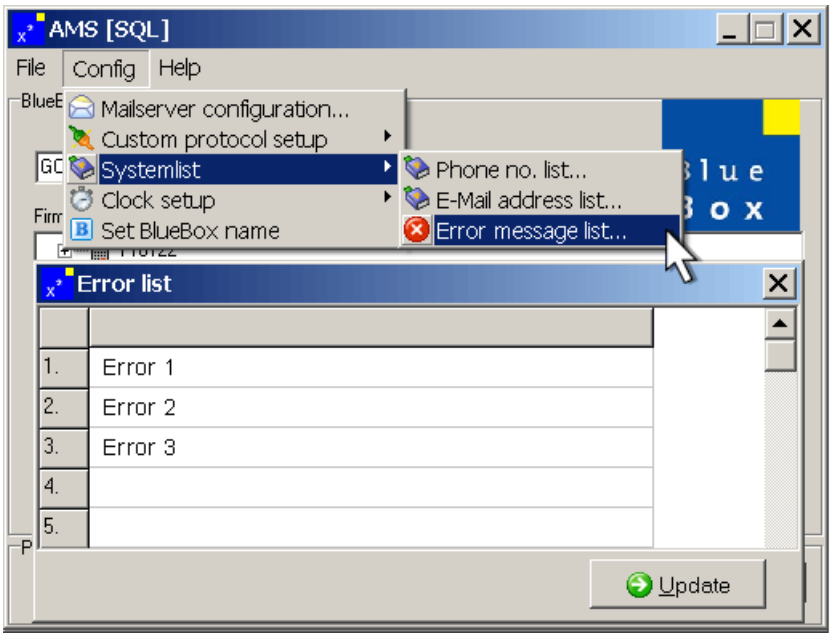


Here you can enter and delete e-mail addresses. You can also enter various e-mail addresses* in one line, separated with a semicolon. Click on <Update> to transfer the e-mail address list to the BlueBox.

* max. 90 characters – Row 1. in this example has 35 characters

5.3.3.3.3 Error Message List (user-defined)

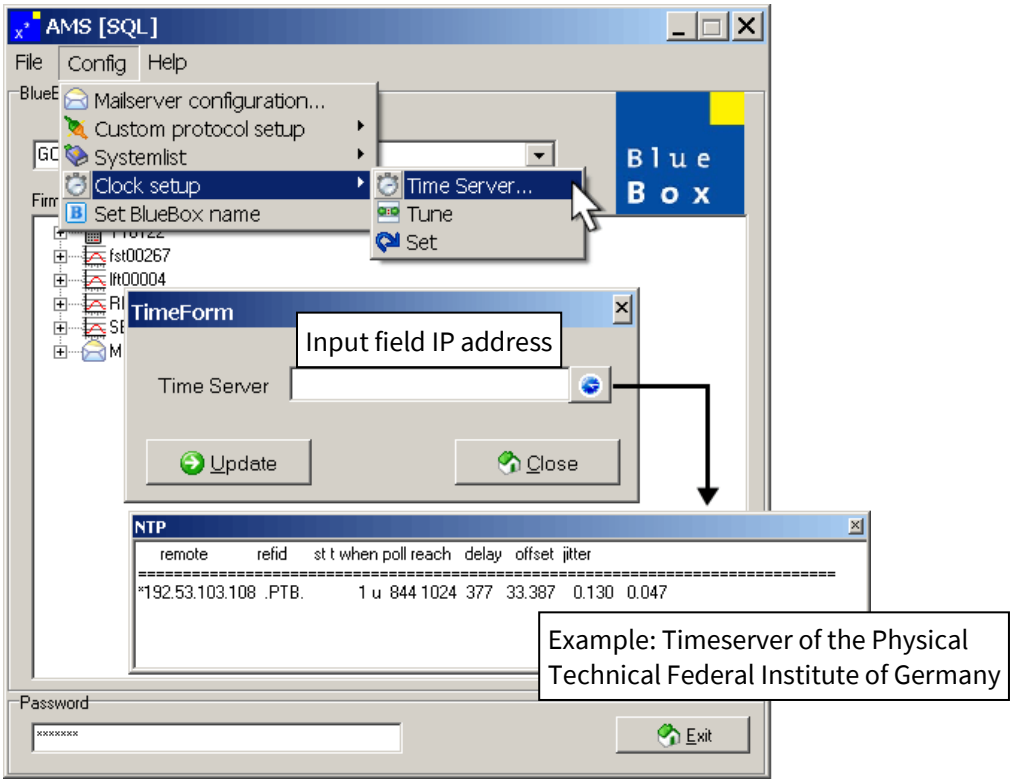
With AMS Formula you can set user-defined error messages.
see *Appendix H - List of the AMS Formula Elements* there *15. Error (user-defined)*



In this window you can define error messages.
Click on <Update> transfers the error message list to the BlueBox.

5.3.3.4 Clock Setup

5.3.3.4.1 Time Server

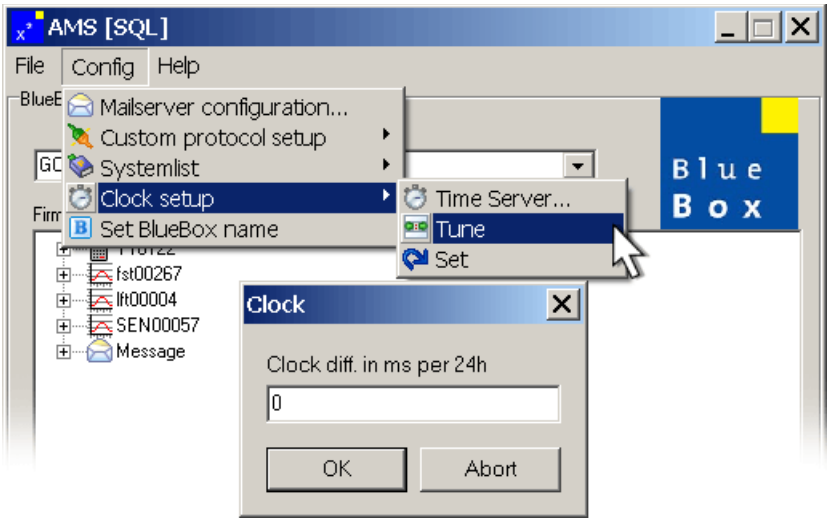


To have the exact time at the BlueBox, there is the possibility to synchronize the BlueBox with an exact time server. You enter the IP address of the time server in the input field.

Transfers the entered IP address to the BlueBox.

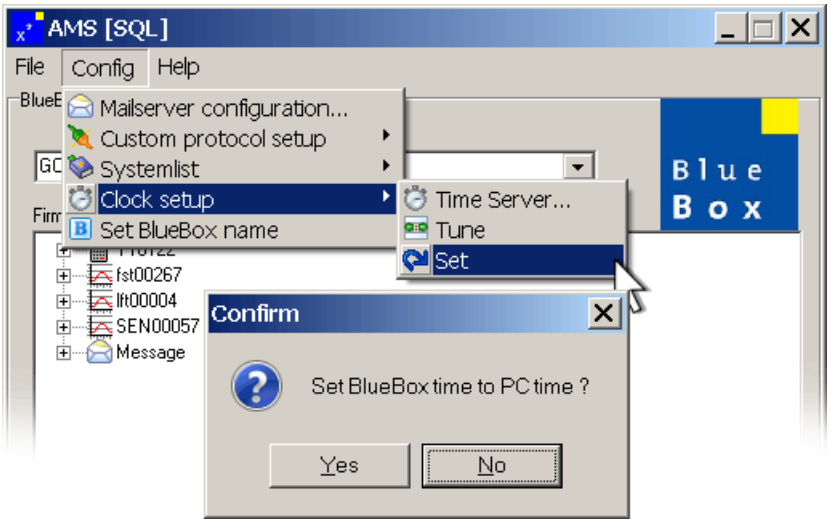
Displays the current setting and the status of the time server.

5.3.3.4.2 Clock Tuning



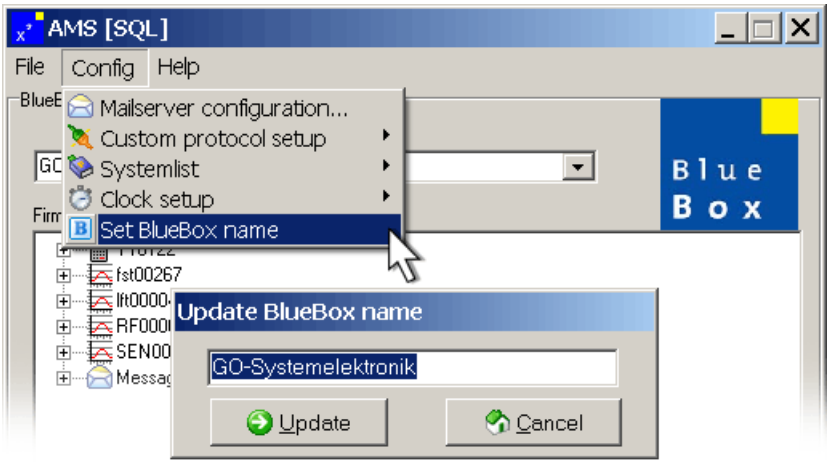
In order to calibrate the internal clock of the BlueBox, the time variation within 24 hours of the internal clock has to be entered here. The internal clock is then faster (positive value) or slower (negative value). The value has the unit milliseconds (ms). Only useful if no time server is specified!

5.3.3.4.3 Clock Setting



Sets the GMT time of the BlueBox[1] to the GMT 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 Changing BlueBox Name

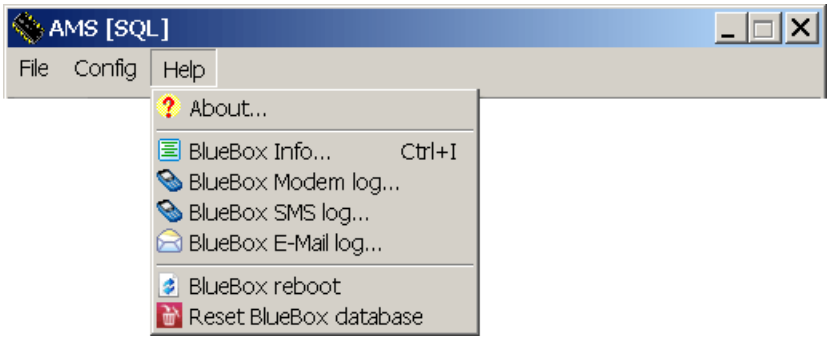


Here you can change the name of a BlueBox. see also 3.2.1 und 3.2.2

Update — Saves the name change and closes the window.

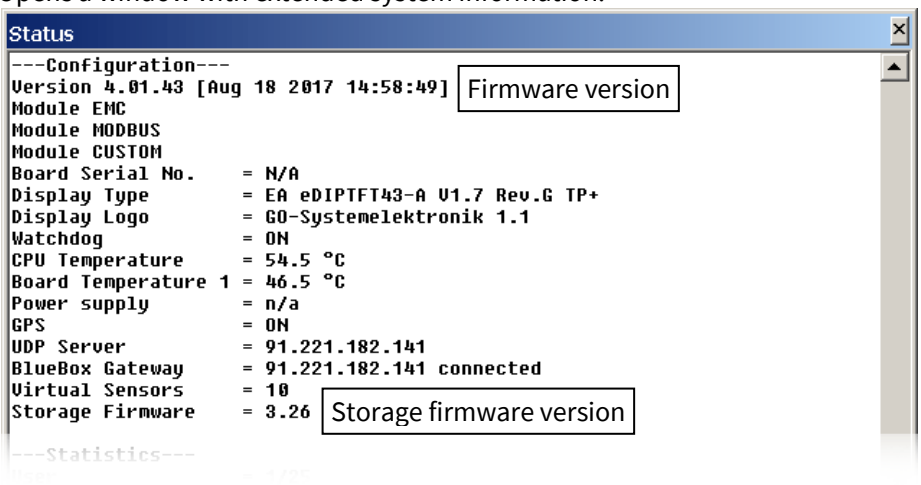
[1] displayed clock time of the BlueBox +/- time zone
[2] displayed clock time of the computer +/- time zone

5.3.4 Help



About Opens a window with the AMS software version number. If you have questions to GO Systemelektronik, please specify this software version number.

BlueBox Info… Ctrl+I Opens a window with extended system information.



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

BlueBox SMS log… Opens a log of the SMS sent and received with the message function.
see 5.4.2 *Sending Messages by E-mail and SMS*

BlueBox E-Mail log… Opens a log of the emails sent with the message function.
see *5.4.2 Sending Messages by E-mail and SMS*

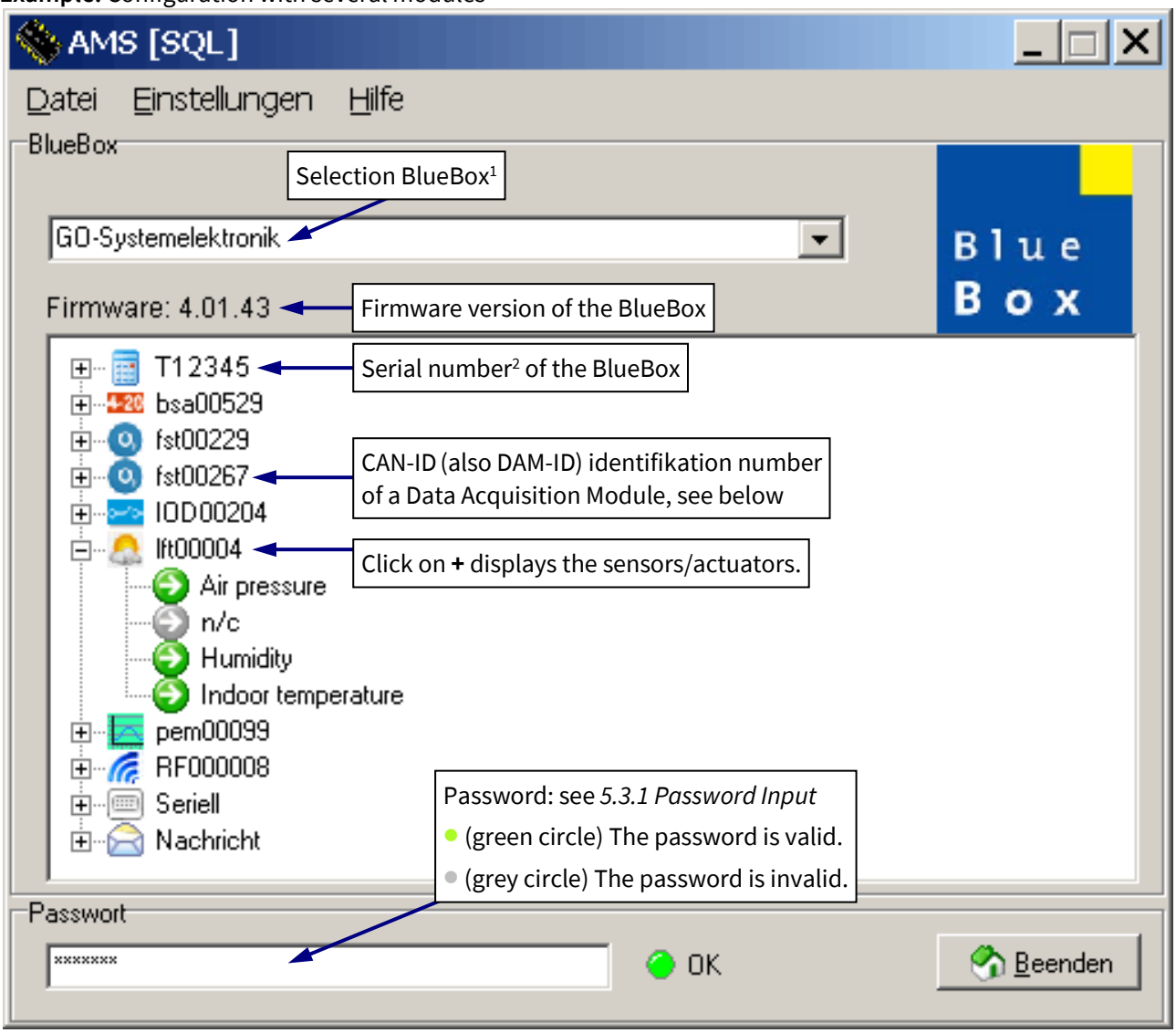
BlueBox reboot Restarts the current BlueBox. confirmation needed

Reset BlueBox database Deletes all measurement data on the BlueBox. confirmation needed

5.4 The AMS Start Window

Open the AMS Start Window, e.g. with the program BlueBox SQL.

Example: Configuration with several modules



A DAM is a Data Acquisition Module (sensor module or actuator module). Up to 16 sensors/actuators can be connected to one DAM.

Identification numbers[2]

- **CAN-ID** (also DAM-ID) = Identification number of a Data Acquisition Module
  (3 letters + 5 digits, uniquely defined for each sensor, factory presetted)
- Real sensor: **Sensor-ID** = CAN-ID + sensor number
  (uniquely defined for each sensor, factory preset)
- Virtual sensor: **Sensor-ID** = 00[3] + Serial number of the BlueBox + Sensor number
  (uniquely defined for each sensor, factory preset)

[1] Strictly speaking, no BlueBox is selected, but a name assigned to the BlueBox (see *3.2.1 Settings of an Existing BlueBox* there *BlueBox name* [1]) and therewith a BlueBox. The input is auto completive.

[2] Strictly speaking no number, because it has letters.

[3] „00“ means „zerozero“

Standard symbols:

 Symbol of the virtual sensors

 Symbol of the two internal current outputs, the two internal relay outputs and the two internal pulse inputs.

 Symbol of the serial interface[1]

 Symbol of the messages (e-mail und SMS)

 As long as a message condition[2] is fulfilled, the message symbol is a warning sign.

 Specific symbols of the external modules

There are 6 different sensor symbols with the following meanings:

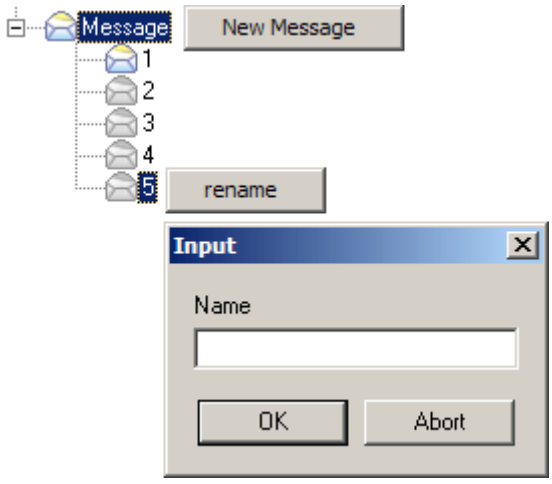
	green	The sensor works.
	grey	The sensor is not active. Sensors are not active if in the sensor setup window the sensor name is set to **n/c** (not connected). see 5.4.1
	red	Sensor error
	blue with magnifying glass	Waiting for the first measurement value
	Warning sign	The value of a virtual sensor is outside the measurement range limits[3] 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.

[1] BlueBox T4: CAN1–6 | BlueBox TS: CAN1

[2] see *5.4.2 Sending Messages by E-mail and SMS*

[3] see *5.4.1 Sensor Setup* there *Min. Value* and *Max. Value*

Message list:



Message highlighted in blue:
Right click in the selection field and click on <New message> generates a new message.
Messages without entry will not be saved.
Messages without entry have grey symbols.

Name of the message (here 5) highlighted in blue :
Right click in the selection field and click on <rename> opens an input window for a new message name.

The names are only stored locally on the PC. If the names of the messages are queried from other PCs, the name changes made here are invalid.

Double-click on a message symbol opens the message window.

As long as a message condition is fulfilled, the message symbol is a warning sign.

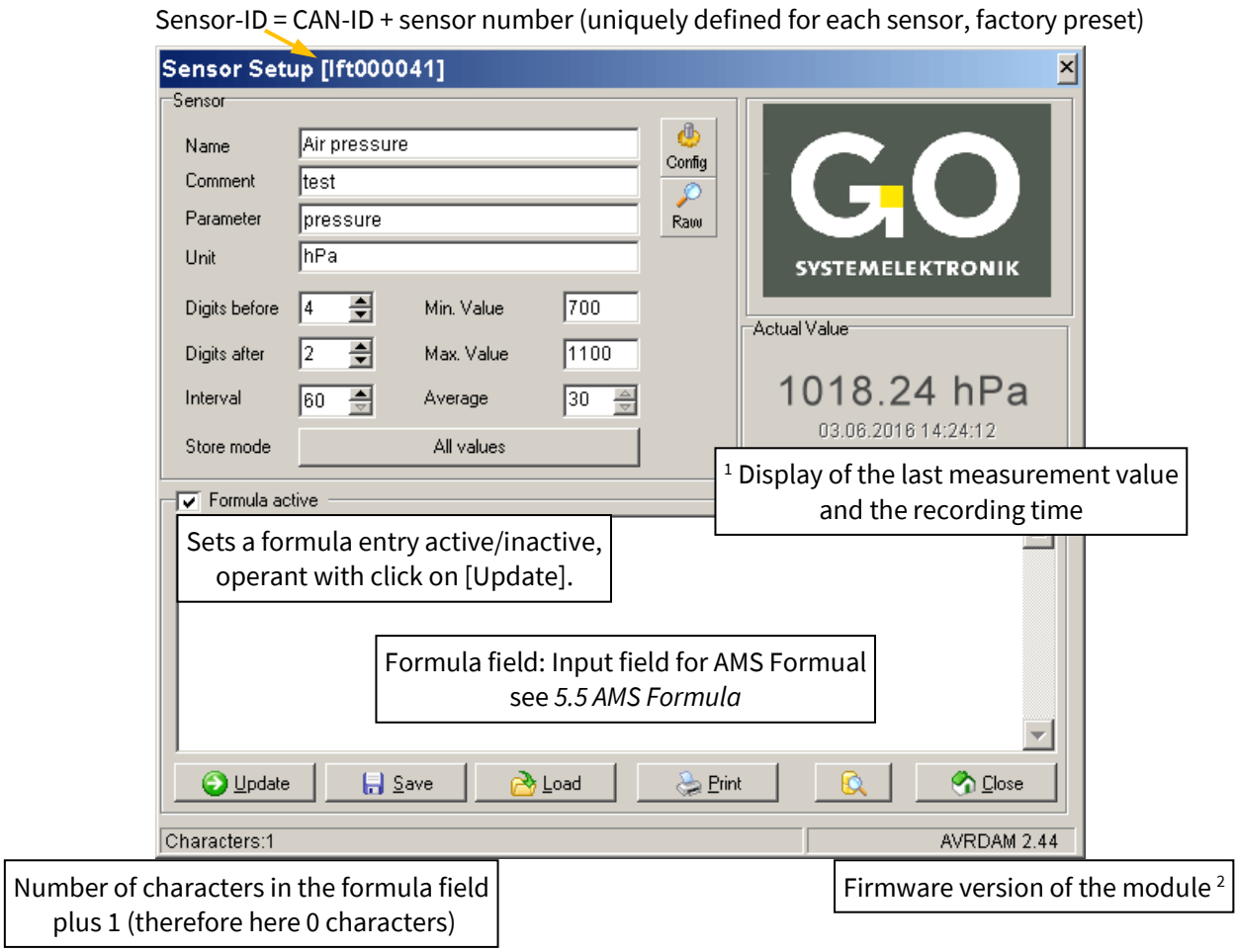
see *5.4.2 Sending Messages by E-mail and SMS*

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

5.4.1 Sensor Setup

using the example of a real sensor

Double-click the name of a sensor in the AMS Setup Window (see 5.4).
The following window opens.



Designation The entries take effect after the Enter key has been pressed or an active window element has been clicked.

Name Name of the sensor, max. 20 characters
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.

Comment Any comment text for AMS and BlueBox SQL Software[3] max. 20 characters

Parameter Name of the measured parameter max. 20 characters

Unit Unit of the measurement value
More than 5 characters can't be displayed at the BlueBox display.

[1] In the case of sensors connected via radio modules, a battery charge status display of the sensor radio module is additionally visible here. The state of charge is symbolized in red, yellow and green, a question mark symbolizes a missing connection.

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

[3] In older software versions, here it was also possible to determine how a measurement value is stored in the database. The setting is now made via the <All values> button.

Calibration and raw value display

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

Displays the uncalibrated[1] value (raw value) of the Sensors, as received by the sensor module.

For some sensors (e.g. oxygen, pH, Redox) and for analogue actuators the recalibration button is visible. Clicking this button opens the input window for reference values for quick recalibration of the sensor/actuators.

For sensors connected via radio modules, this button opens a display of the Battery state of charge, the radio signal strength and the radio signal quality of the sensor radio module.

Measurement value settings The entries take effect immediately.

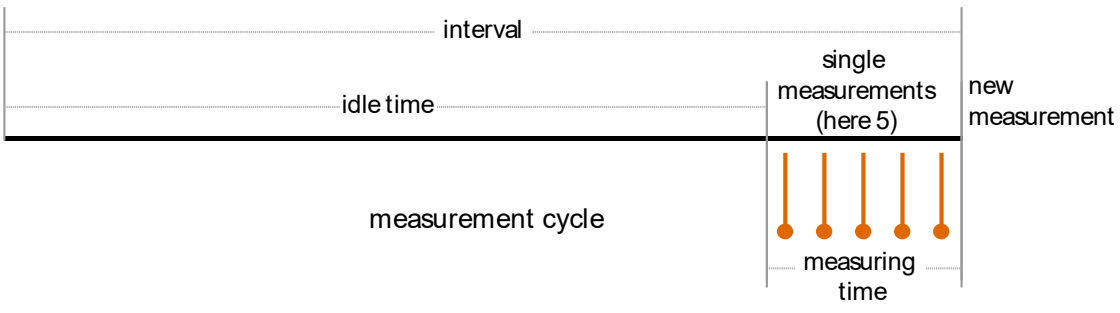
Digits before Number of integer places of the displayed value

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 [2]

Min. Value
Max. Value Lower limit of the measuring range / Upper limit of the measuring range
If the measurement value underruns or overruns the range, the measurement value is displayed and saved for real sensors. For virtual sensors underrun and overrun is marked by a **<** or **>**, only the entered Min. Value or the entered Max. Value is then saved, in the AMS start window; the sensor symbol appears as a warning sign ⚠.[3]

Average Number of single measurements from which the arithmetic mean is derived.
This arithmetic mean is the recorded measurement value.



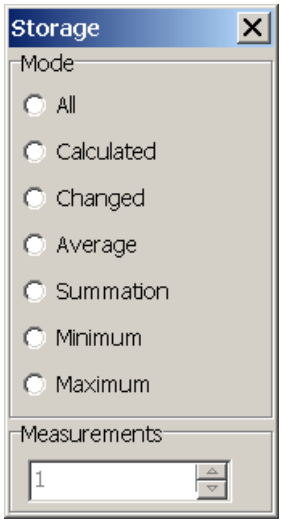
[1] Strictly speaking, the sensor value is already precalibrated at the sensor module.

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

[3] The entries in [Min. Value] and [Max. Value] also affect the bar display on the left side of the BlueBox display in the 1-way mode. see *Manual BlueBox T4* there *8.1.1 Parameter Display 1-way*

Display and save mode

Opens a menu where you can specify how measurement values[1] are displayed in AMS and OnlineMonitor, and stored in the BlueBox - and thus later in the database.
The button is also a status indicator.



Entries take effect when the window is closed (Click on ☒).

- **All** – The result of the formula field entry is added as an offset value to the measurement value and thus displayed and saved.
  If the measurement value of a sensor is used in the formula of the sensor itself, only the offset-free value[2] should be used, i.e. the summation of the subsequent measurement values is prevented.
- **Calculated** – The result of the formula field entry is not used as offset value, the calculated value is displayed and stored.
- **Changed** – The **offset-afflicted** measurement value is stored only when the value is changed, but at least one value per hour is stored (minimum data stock). Displayed is the offset-afflicted measurement value.
- **Average** – The **offset-afflicted** measurement value is the average of n measurement values (n = entry in the Measurements input field). Displayed is the offset-afflicted measurement value.
- **Summation** – The **offset-afflicted** measurement value is the sum of n measurement values (n = entry in the Measurements input field). Displayed is the offset-afflicted measurement value.
- **Minimum** – The **offset-afflicted** measurement value is stored as the lowest measurement value of n measurements (n = entry in the Measurements input field). Displayed is the offset-afflicted measurement value.
- **Maximum** – The **offset-afflicted** measurement value is stored as the highest measurement value of n measurements (n = entry in the Measurements input field). Displayed is the offset-afflicted measurement value.

Virtual sensors

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

Specific actuator features (also applies to analogue actuators, such as current outputs)

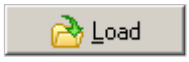
1. Mode • **All**: A change in the actuator state (= actuator value) is always saved, regardless of the interval setting.
2. Mode • **All**: If the actuator value changes in the interval, this actuator value is saved and the interval restarts.
3. Mode • **Changed**: Although this mode saves storage space, it makes the debugging of module failures difficult. Avoid this mode for alarm-related applications whose error statuses can be important in error analysis.
4. After a restart of the BlueBox, an actuator without an active formula entry generates values only after the interval has elapsed; with active formula entry, the actuator values are generated immediately.
5. The average value (see 5.4.1) should always be set to 1.

[1] Also applies to the state values of actuators.
[2] Formula element [!abc123456] The exclamation mark stands for the offset-free measurement value.

Button bar

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

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



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

Opens a window to print these sensor-settings.

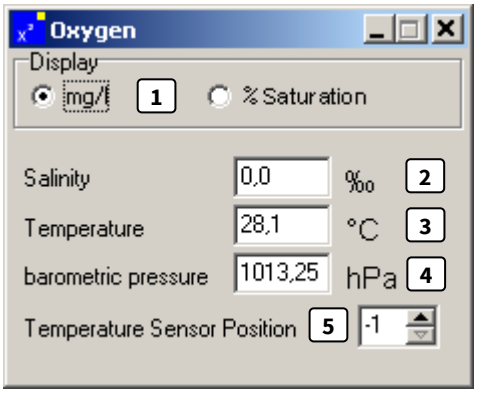
Opens a list of the current variables with their current values.

Closes the sensor setup window.

5.4.1.2 Sensor Calibration

5.4.1.2.1 Calibration Example Oxygen

Sensor setup



[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*.

5.4.1.2.2 Recalibration Example Oxygen (galvanic)

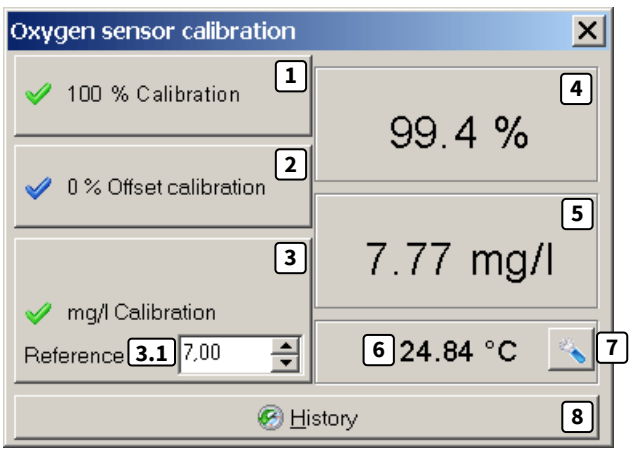
Article number 461 4000

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 settings



* 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]

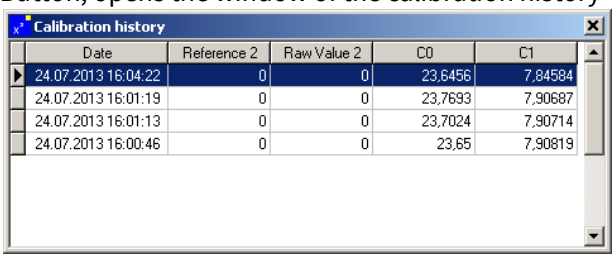
[4] Display of the current measurement value in % saturation

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

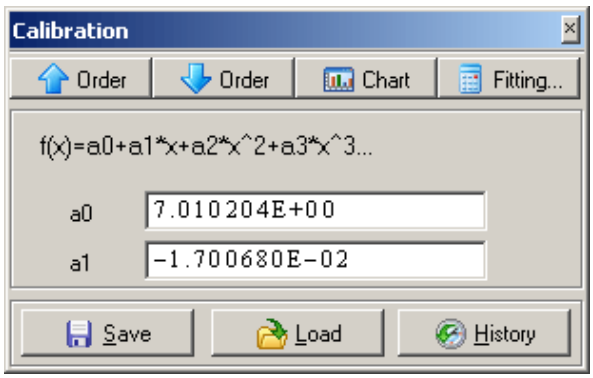
c. Click button [2]. ⇨ The offset calibration is completed.

[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

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

Sensor setup



Description as *5.4.1.2.5 Multi-Point Calibration*

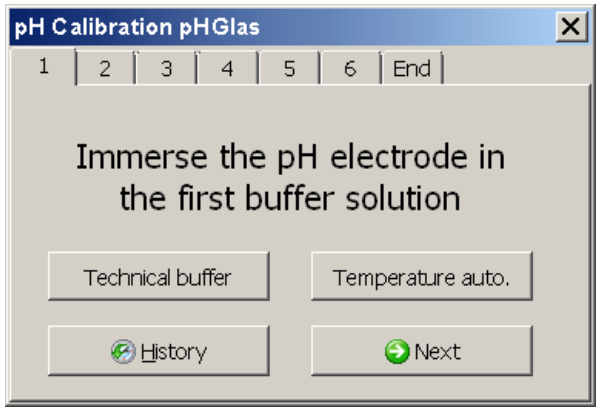
Note: The calibration of electrochemical pH and ISE sensors is usually done with the convenient recalibration function (see below). In special cases, you can enter the calibration polynomial here directly or change the polynomial directly.

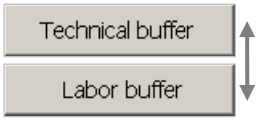
5.4.1.2.4 Recalibration Example pH

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



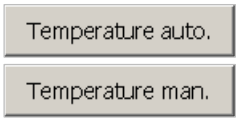


Input of the type of buffer solutions

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.

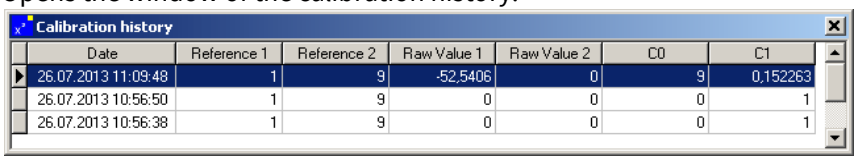


Determines the type of temperature compensation.

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

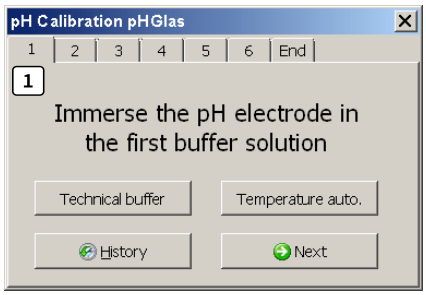
Temperature man. ⇨ The temperature compensation is carried out manual, i.e. the temperature is entered from a menu.

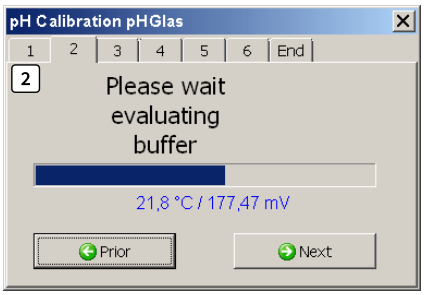
Opens the window of the calibration history.

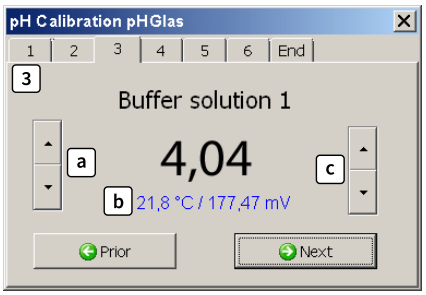


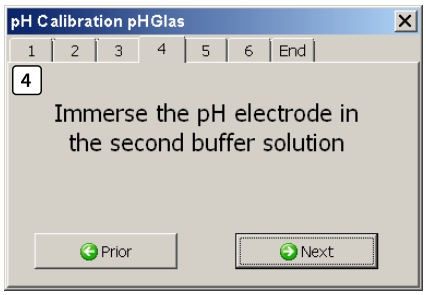
Open the next window and starts the calibration procedure.

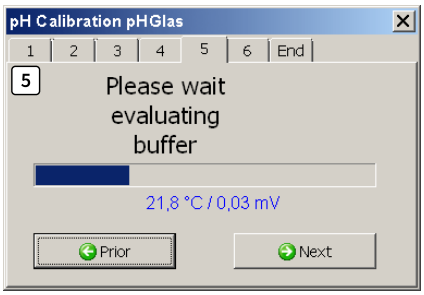
Procedure:

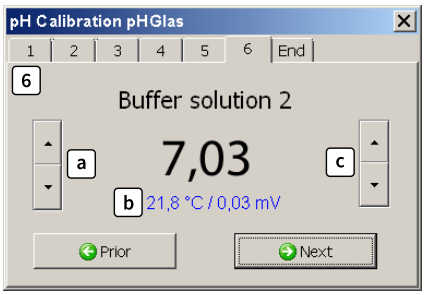


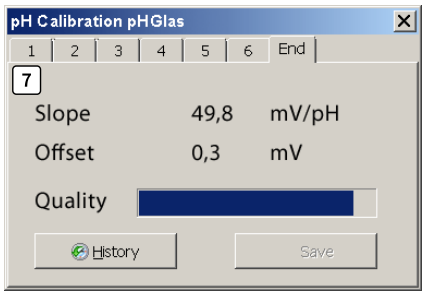












[1] Select the type of buffer solution and the type of temperature compensation, see previous page. Immerse the pH sensor in the first buffer solution and before immersing rinse the electrode in clean tap water. Click on <Next>.

[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>.

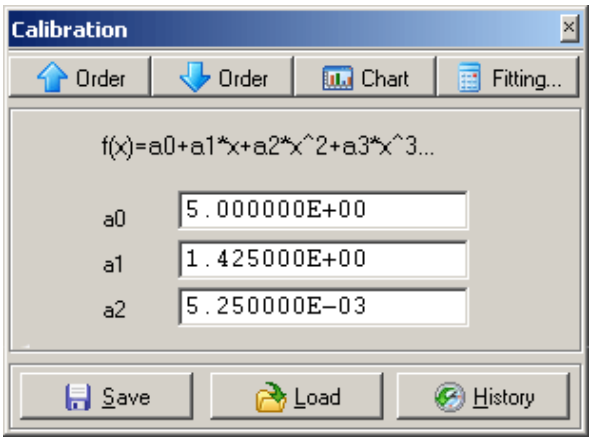
[5] Wait until the detection of the second buffer solution is completed.

[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.

5.4.1.2.5 Multi-Point Calibration

Sensor setup



Direct coefficient setting for the calibration polynomial (see also the next page).
Already existing coefficients are displayed.

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

Reduces the number of calibration coefficients.

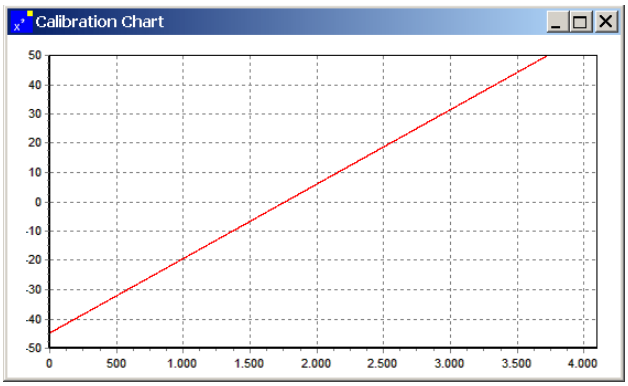
Opens a window that displays the assignment of the raw values to the measurement values graphically.

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.



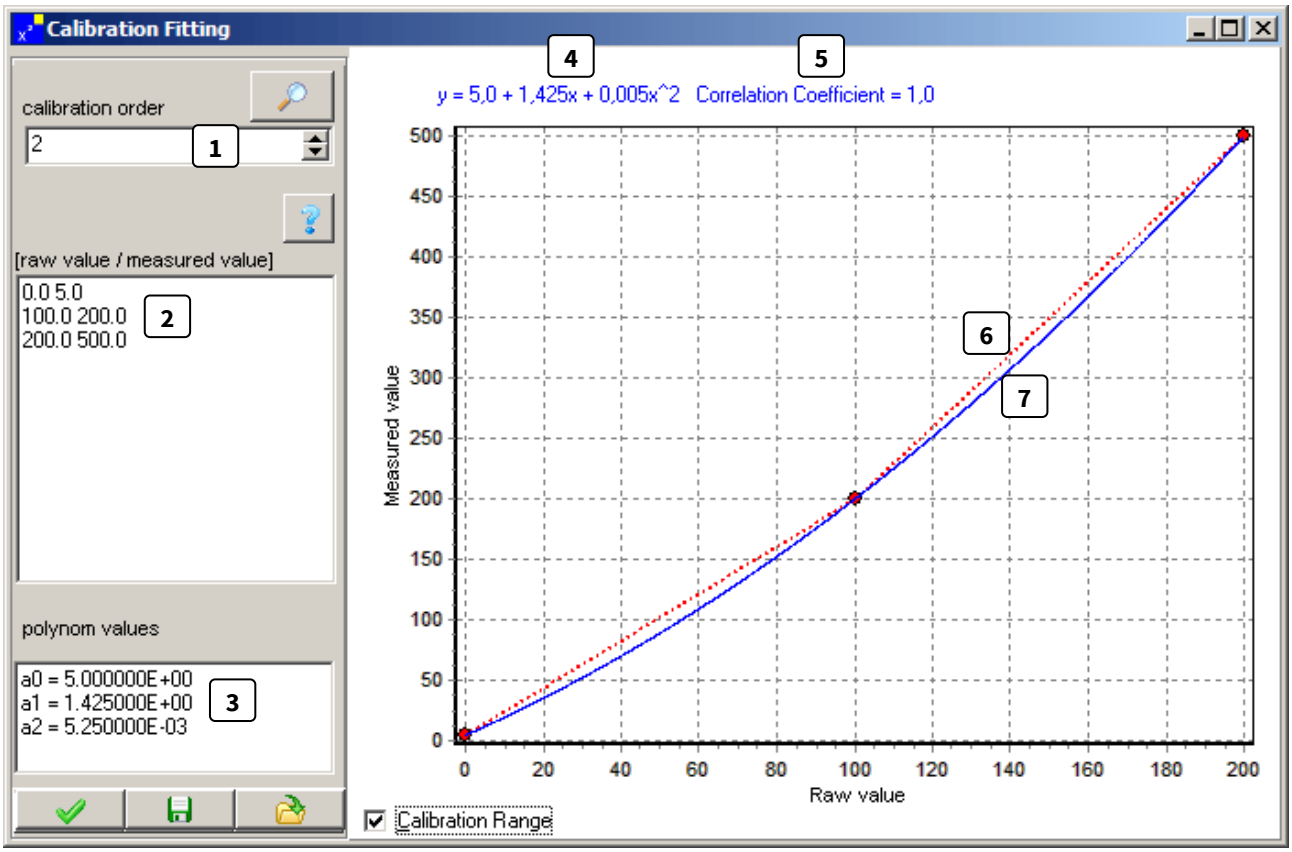
Assignment of the raw values (x-axis) to the measurement values (y-axis)
Example of a degree 1 polynomial

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

[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.

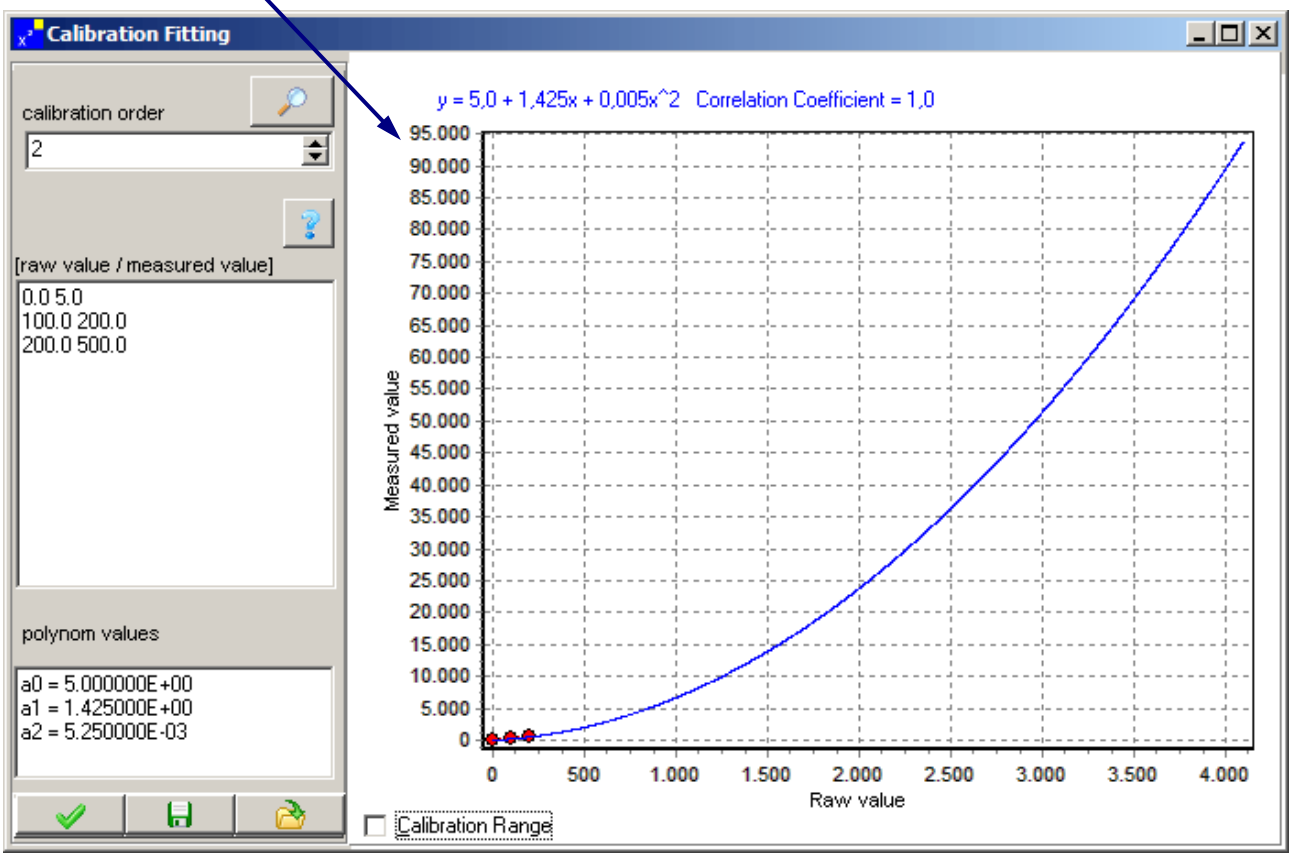
Transfers the calibration function to the sensor.

Saves the calibration values as .cal-file.

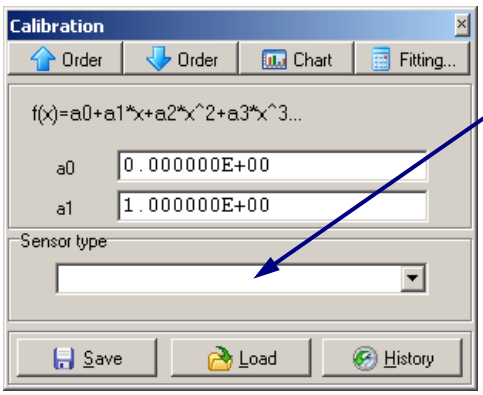
Loads an already existing .cal-file.

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.



5.4.1.2.5.1 Specifics Pulse Input



The calibration window of the two pulse inputs has the additional selection menu "Sensor type".

Possible selection:

- Static input
- Frequency (Positive edge)
- Frequency (Negative edge)
- Frequency (debounced max. 20 Hz)

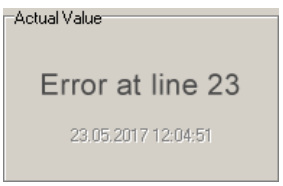
5.4.1.3 AMS Status Messages

Some status messages are displayed in the Sensor Setup window instead of the measurement value.

Status	Description	Display Sensor Setup
0	Sensor sends data.	Measurement value
1	Sensor sends no data.	**No Data**
2	A new sensor is recognized (temporary at sensor initialization).	**Wait**
3	Sensor-ID assigning (temporary at sensor initialization).	**Wait**
4	Measurement value is unreliable. (currently only for spectrometers)	**[Measurement value]**
5	Measurement value is under the detection limit.	Measurement value
6	Sensor calibration failure (only BlueMon)	Measurement value
30	Formula error	**Error at line n**
31	Unknown sensor is used in the formula.	**? Sensor**
32	Measurement value is not been saved.	Measurement value
33	Default calculation time for for- and while loops is exceeded.	**Calc Timeout**
50	Minimal measurement value underrunned (virtual sensor)	**< minimal measurement value**
51	Maximal measurement value overrunned (virtual sensor)	**> maximal measurement value**
52	Internal communication error	**COM**
53	Underrun of the lower limit of the AD converter	**ADC min.**
54	Overrun of the upper limit of the AD converter	**ADC max.**
55	General device error	**Dev Error**

The values in this column can be queried using AMS Formula.
see *Appendix H – List of the AMS Formula Elements* there *2. Sensors*

Error message of a formula error
Faulty formulas will be shown at their processing as **Calc Error**. *



* Before software version 3.6.3 and the BlueBox firmware version 2.77 only “Calc Error” is displayed.

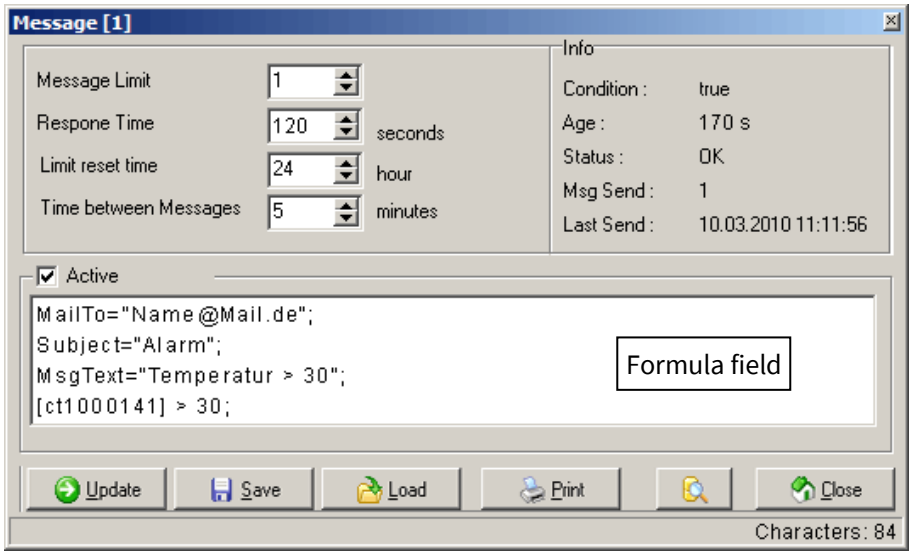
5.4.2 Sending Messages by E-mail and SMS

Call-up see *5.4 The AMS Start Window*

AMS enables you to send messages with e-mail and SMS. The message is sent when a message condition* defined by an AMS formula entry is fulfilled after a setted response time. A message condition can be any result of a formula calculation.

If the message condition is fulfilled and a response time is exceeded, the message is sent.

Example: Window of the message 1 **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 the value of 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: — **OK**: The formula is syntactic error-free.
Calc Error: The formula has one syntax error at least.
After clicking Update

Msg Send: — Number of previously sent messages

Last Send: — Date and time of the last message sent

* ⓘ In addition, the message is sent if the AMS status is not 0, note this when setting the *Message Limit* (see above).
If the message contains a measurement sensor value, for some AMS status messages the corresponding *Display Sensor Setup* is sent instead of the measurement value. see *5.4.1.3 AMS Status Messages*

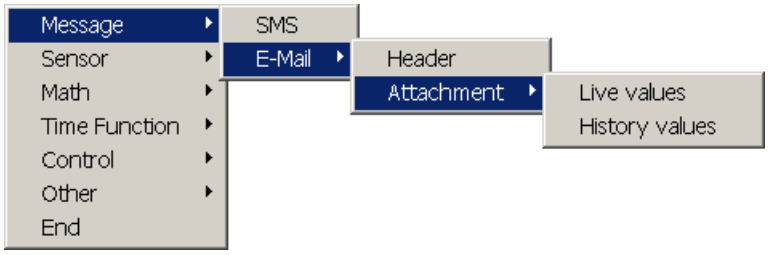
☑ **Active**	The formula is active, operant with click on [Update].
☐ **Active**	The formula is inactive, operant with click on [Update].

Example entry in the formula field:

Mailto="Name@Mail.de";	Mail address [1]
Subject"Alarm";	Subject [2] of the mail
MsgText="Temperatur > 30";	Mail text[3]
[ct1000141] > 30;	Message condition for sending a 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 5.5.2)



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]";*

Formula element	Description
MsgText="*Text***"**	Message text[3] of the e-mail or the SMS
PhoneNo="*Telephone number***"**	International telephone number without 0, the telephone number of GO Systemelektronik would then be 4943158080 Various telephone numbers are separated by a semicolon.[1]

[1] max. 90 characters
[2] The e-mail must have a subject.
[3] The e-mail/SMS must have a text, max. 150 characters.

PhoneNo="*n***"**	Exactly one entry n from the telephone number list *see 5.3.3.3.1 Telephone Number List*
MailTo="*Mail address***"**	Mail address = Destination address Various mail addresses are separated by a semicolon.[1]
MailTo="*n***"**	Exactly one entry n from the mail address list *see 5.3.3.3.1 Mail Address List*
Subject="*Text***"**	Subject[1] of the e-mail
MailAttachment="[LIVE]"	Attachment of the e-mail is a csv-file[2] with the current measurement values of all sensors and actuators which are displayed in the parameter display on the display of the BlueBox (see *Manual BlueBox T4* there *8.2.1.6 Display*).
MailAttachment="[*Sensor-ID***,***n***d** *or n***h]"**	Attachment of the e-mail is a csv-file[2] with the measurement values of the sensor determined with Sensor-ID from the past period determined by nd or nh. nd = n days (n = 1 to 30) nh = n hours (n = 1 to 24) Multiple selection of sensors possible: "[ID1,nd] [ID2,nh] [ID3,nd]..."

Specifics e-mail:

- If an e-mail cannot be sent, the e-mail will be sent again after 120 s.
- If an e-mail cannot be sent within 12 h, this e-mail will be deleted

- **Specifics SMS:**
- Sending an SMS is only possible if the BlueBox has a SMS-compatible modem and the SMS card is enabled for SMS messaging.
- If the receiving telephone of an SMS message returns an SMS with the message text **SMS RECIEVED** in capital letters, the sending of further SMS messages is interrupted.

  Precondition:
  1. The telephone number of the resending reception telephone is in the telephone number list of the BlueBox. see *5.3.3.3.1 Telephone Number List*
  2. Since sending the last SMS message from the BlueBox, at least 30 s and at most 30 min have elapsed.

  As soon as the message condition is no longer fulfilled, this interruption is cancelled.
  The receipt of the back SMS is entered in the SMS log.

Note: You can use an SMS to change variable values on a BlueBox. see *5.5.2 Variables*

[1] The e-mail must have a subject.

[2] The opening of a csv file with a spreadsheet program is described in *Appendix F – Opening of a csv-File*.

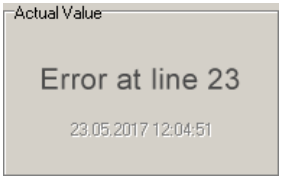
5.5 AMS Formula

AMS Formula allows amongst others the manipulation of sensor data and actuators, the creation of virtual calculated sensors (as opposed to real sensors) and the sending of messages by e-mail and SMS. The formula code is written to the formula input field and transferred to the BlueBox.

Note: If an offset value is entered in the formula input field of a sensor and this offset shall be removed, it must be ensured that the formula field must be completely empty. Spaces must also be deleted.[1]

Note: After transferring the content of a formula field on the BlueBox this content will only be permanently stored on the CompactFlash card after 30 seconds. So the BlueBox can be safely booted after a formula related crash.

Error message of a formula error
Faulty formulas will be shown at their processing as **Calc Error**. [2]



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.
- **Uppercase** and lowercase letters are differentiated (**case sensitive**).
- **Decimal separator** is the **point**.
- **;** (Semicolon) marks the end of a statement.
- **#** marks the following characters of the line as a comment.
- The **argument of a function** will be included with **round brackets**.
  In calculation formulas round brackets express a priority of an arithmetic operation over other in the arithmetic sequence. Multiple interleaving is allowed.
- A **block of statements** will be started with an opening **curly bracket {** and will be ended with a closing curly bracket **}** .
  In conditional statements, you must define statement blocks when more than one statement has to be executed. That means: if (condition) {statement1;statement2;...;statementn;}

[1] Applies to very old versions:
If an offset value is entered in the formula input field of a sensor, this offset will remain active even in case of deactivation of the formula. To disable the offset value you enter **0;** as offset value, otherwise a reboot is necessary.

[2] Before software version 3.6.3 and the BlueBox firmware version 2.77 only “Calc Error” is displayed.

5.5.2 Variables

The variables in AMS Formula are user-defined. Max. Number of variables per BlueBox: 700[1]

- **Variables**

  ⇨ Can only contain floating point numbers up to 64 bits long (float double), therefore the largest decimal number is 2^{65}-1 = 36 893 488 147 419 103 231

  ⇨ Variables have by definition the start value 0.

  ⇨ Variables are global.

  ⇨ Can be changed with a SMS message to the BlueBox.
  Precondition: The phone number of the sending phone is in the phone number list of the BlueBox.
  see *5.3.3.3.1 Phone Number List*
  Syntax: SET *Variablename Value*

- **Variable names**

  ⇨ Only consist of ASCII letters and ASCII digits.

  ⇨ The first character must be a letter.

  ⇨ Uppercase and lowercase letters are differentiated in the variable name (case sensitive).

  ⇨ The maximum length is 30 characters.

  ⇨ Cannot begin with the character string of AMS formula elements.[2]

- **Variable types**
  There are three types of variables:

  ⇨ **Standard variables**, the content will be deleted with the shutdown of the BlueBox and set on restart to 0 (zero).

  ⇨ **Permanently stored variables** are stored every 10 minutes on the BlueBox permanently, they are marked by a preceding underscore (example: _Name).

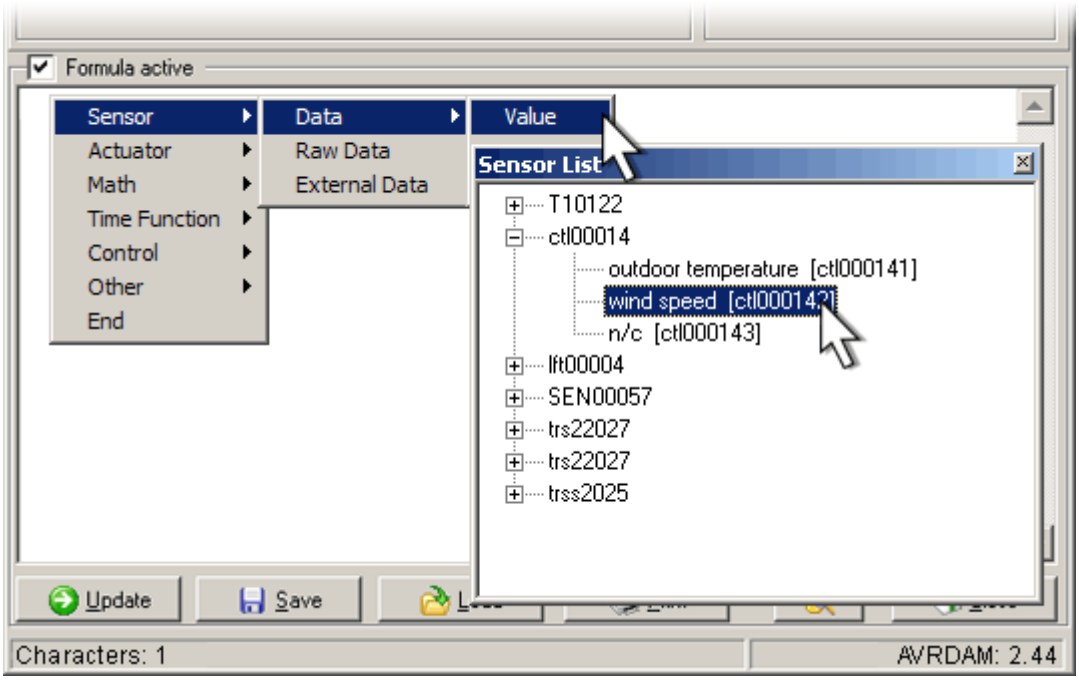
  ⇨ **At BlueBox adjustable permanently stored variables** can be changed on the display of a BlueBox, they are marked by a preceded dollar sign (example: $name).
  The suffix ". MIN", ".MAX" or ".RESOLUTION" limits the adjustable value and determines the changing steps.
  Example: `$Name.MIN = -5;` `$Name.MAX = 10;` `$Name.RESOLUTION = 0.01;`
  The dollar sign does not appear on the menu operation buttons.

Note: The current variables with their values can be queried in the sensor setup via the button.

[1] from Softwareversion 4.01.49
[2] Also here uppercase and lowercase letters are differentiated.

5.5.3 The AMS Formula Input Assistance

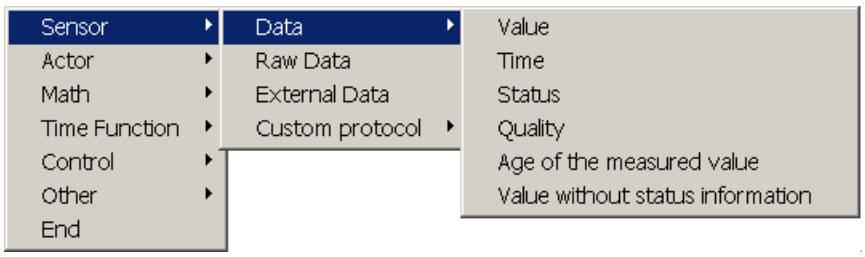
Example: Reference to a sensor measurement value



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.
Example: Double-click on a sensor in the sensor list inserts the sensor identification into the formula field.

5.5.3.1 Elements of the Formula Input Assistance

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



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]

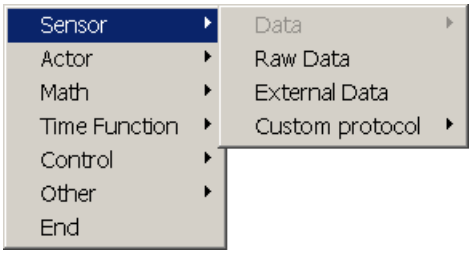
Time Opens a selection list of all sensors of the current BlueBox, click on an entry sets a reference to the recording time of the last measurement value of the selected sensor (hhmmss), displayed time is the Greenwich Mean Time of the system. Example [lft000044.TIME]

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 5.4.1.3 AMS Status Messages).
Example [lft000044.STATUS]

Quality Opens a selection list of all sensors of the current BlueBox, clicking on an entry sets a reference to the SQI (spectral quality index) of an application-specific parameter from spectral data. Example [lft000041.SQI]

Age of the measurement value Elapsed time in seconds since the last measurement value was recorded. Example [lft000041.SEC]

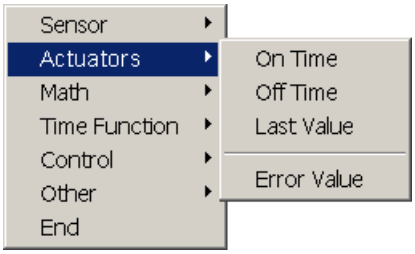
Value without status information Measurement value of the sensor without consideration of the sensor status Example [lft000041.VAL]



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 CAN-ID + sensor number.
[*CAN-ID + sensor number] Recognizable by the asterisk.

Custom protocol Entry **CUSTOMn[m]** – nth measurement value received via the user protocol m.



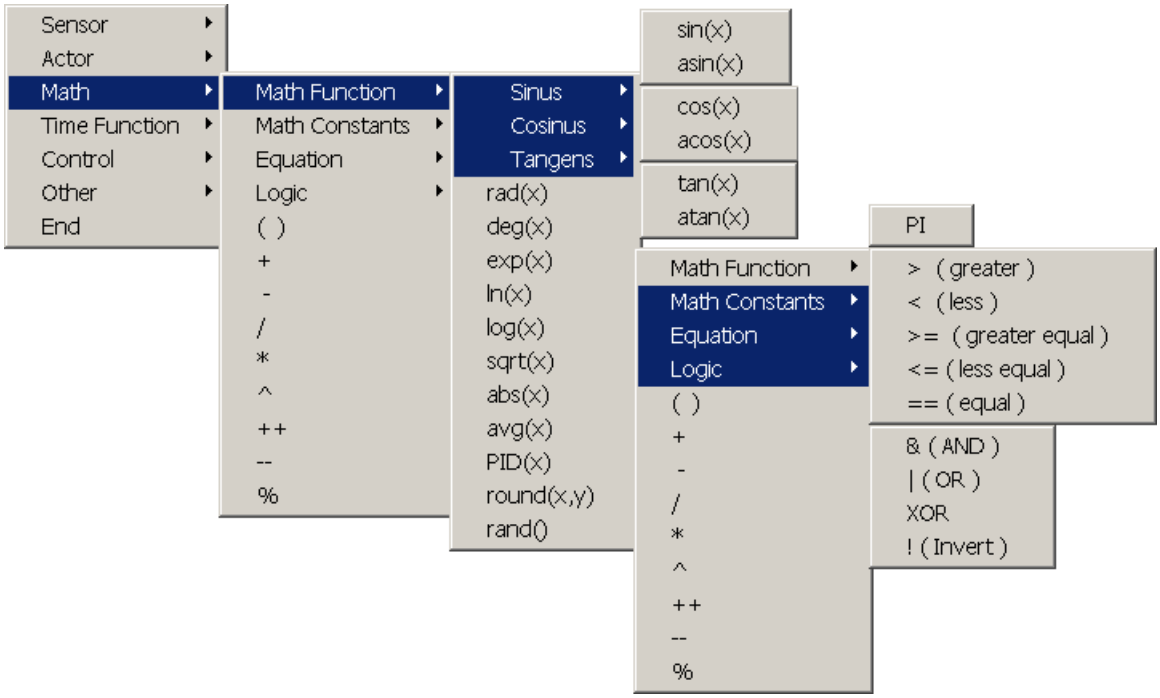
On Time Entry **ONTIME** – Time in seconds since the actor is switched-on.

Off Time Entry **OFFTIME** – Time in seconds since the actor is switched-on.

Last Value Entry **LASTVALUE** – Last actuator status Status >0.5 actor switched-on.
Status <0.5 actor switched-off.

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

Various mathematical operators, functions and the like are available for calculating a formula.
Most of the listed positions should be known, for better understanding they are listed here in their order:



Trigonometric functions

sinus	sinus function sin(x)
cosine	cosine function cos (x)
tangent	tangent function tan(x)

Inverse trigonometric functions

asin(x)	arcus sinus
acos(x)	arcus cosine
atan(x)	arcus tangent

Angular dimensions

rad(x)	radian measure, also: radian (e.g.: 60° is π/3 rad, also circa 1.0472 rad)
deg(x)	degree, conversion from radian to degree (rad -> grad)

Exponential function

exp(x)	exponential function, whose basis is the Euler's number e: e^x

Logarithm function

Logarithm are the inverse function of the exponential function.

ln(x)	logarithm naturalism, log (x)
log(x)	log10 (x)

Root function

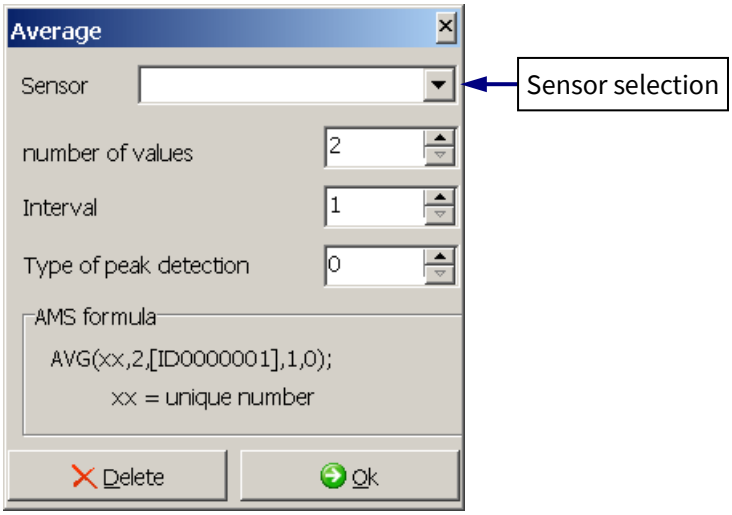
sqrt(x)	**square** root of x

Absolute value

abs(x)	Absolute value of x. When calculating this value positive real digits and the zero will be unchanged, at negative real numbers the leading sign will be switched to +.

Mean value adjustments with outlier suppression
avg(x)

The window of the mean value settings opens.



Here you can determine how a moving average is calculated and how outliers are suppressed.

Delete — Cancels the effect of the mean settings.
You can also click on ✕.

Ok — Calculates the mean values and displays them graphically.

Number of values — Number of parameter values from which the moving average is calculated, minimum is 2.

Interval — Mean value interval*
The mean value is only calculated with those measurement values at which the respective distance of the recording times is greater than or equal to the interval. 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. Values less than the measurement interval are thus ineffective.

Type of outlier/peak detection

0	No outlier suppression

The measurement values determined with *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.

* Do not confuse with the measurement interval.

AMS Formula entry This field displays the corresponding AMS formula entry.

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

xx = individual identification number of the average calculation (0 to 9999) Each identification number can only be assigned once within a BlueBox.
If all previous average calculations have already been transferred to the BlueBox, a matching identification number is inserted automatically.

b = Number of measurement values to be averaged.

[Sensor-ID] = measurement value of the sensor

d = Interval

e = Type of outlier detection

PID controller

PID(String) Entry **PID(*1,Value,SOLL,P,I,D*);**

The PID controller has a proportional, an integral and a differential share of the control effect. The respective strength of the portion of the control action 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.

Invariable

PI π=3,14159265

Comparing operators

In particular comparing operators are necessary for settings of switching points for sensors.

> greater than

< less than

>= greater or equal

<= less or equal

== equal

Logic operations

For the setting of switching points for sensors logic operations can be used also:

& and

| or

XOR exclusive or

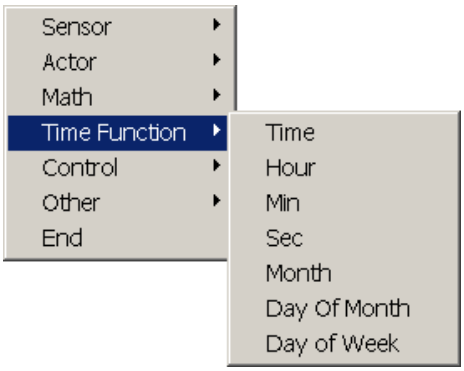
! Bit-inverting

A truth table can help to explain the logical links given above.

OR			XOR			AND		
a	b	y	a	b	y	a	b	y
0	0	0	0	0	0	0	0	0
0	1	1	0	1	1	0	1	0
1	0	1	1	0	1	1	0	0
1	1	1	1	1	0	1	1	1

Arithmetic operators

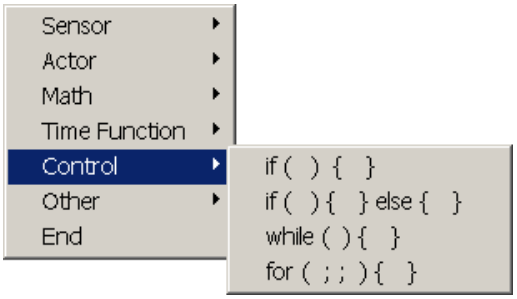
( )	preferred execution of the basic arithmetic operation in brackets
+	addition
-	subtraction
/	division
*	multiplication
^	potency, a notation for the repeated multiplication of a real number with oneself, a^n
++	addition of 1 (+1)
--	subtraction of 1 (-1)
%	modulo-operator, rest of an integer division



The information refers to the time of the BlueBox.

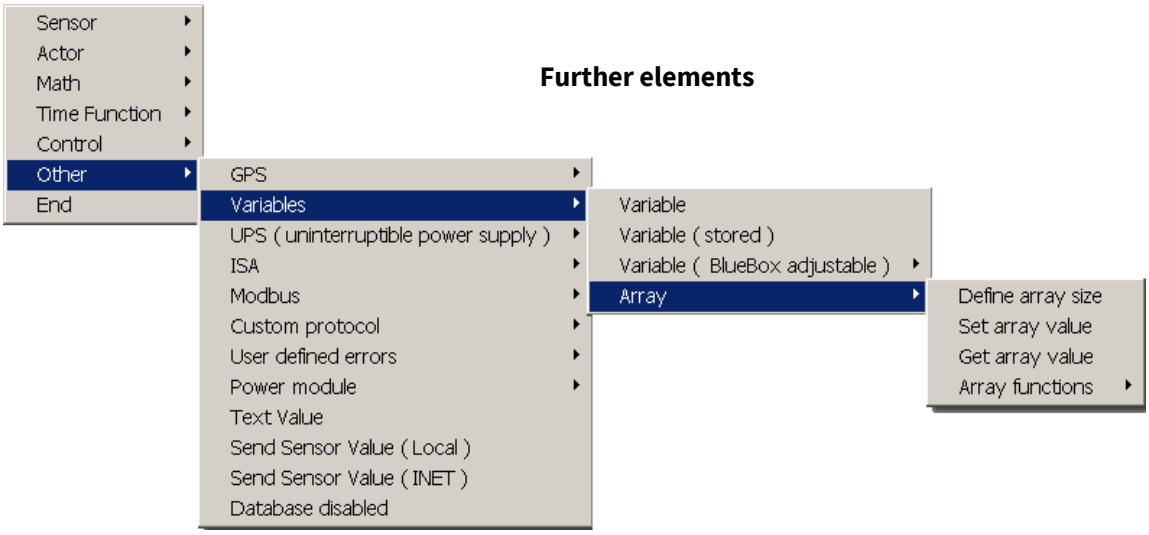
Time	TIME	current time (Local time)
Hour	HOUR	current hour
Min	MIN	current minute
Sec	SEC	current second
Month	MONTH	current month
Day of Month	DAYOFMONTH	current day of month
Day of Week	DAYOFWEEK	current day of week

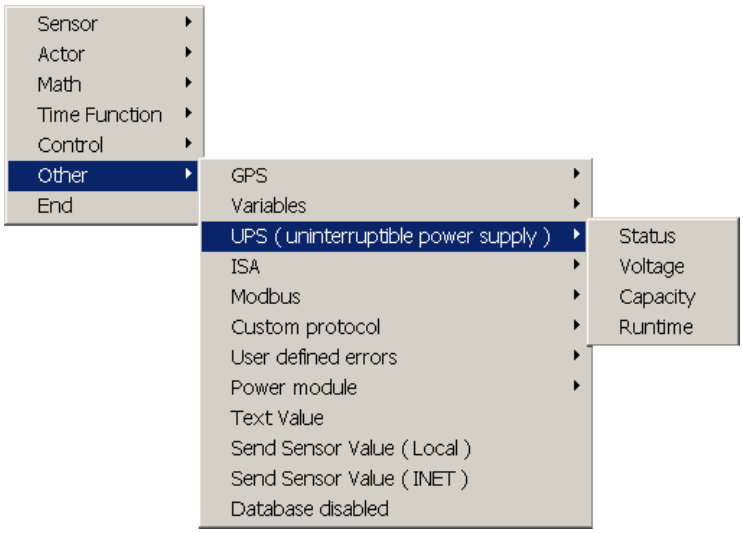
0 corresponds Sunday
1 corresponds Monday,
2 Tuesday
etc.

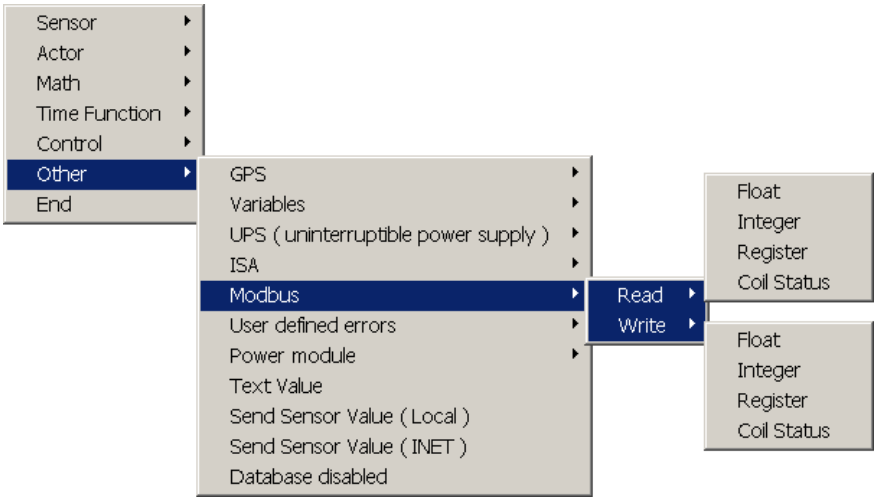


Conditional statements

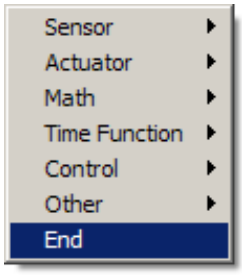
Further elements







Reads values out of the Modbus-Register. Writes values into the Modbus-Register.

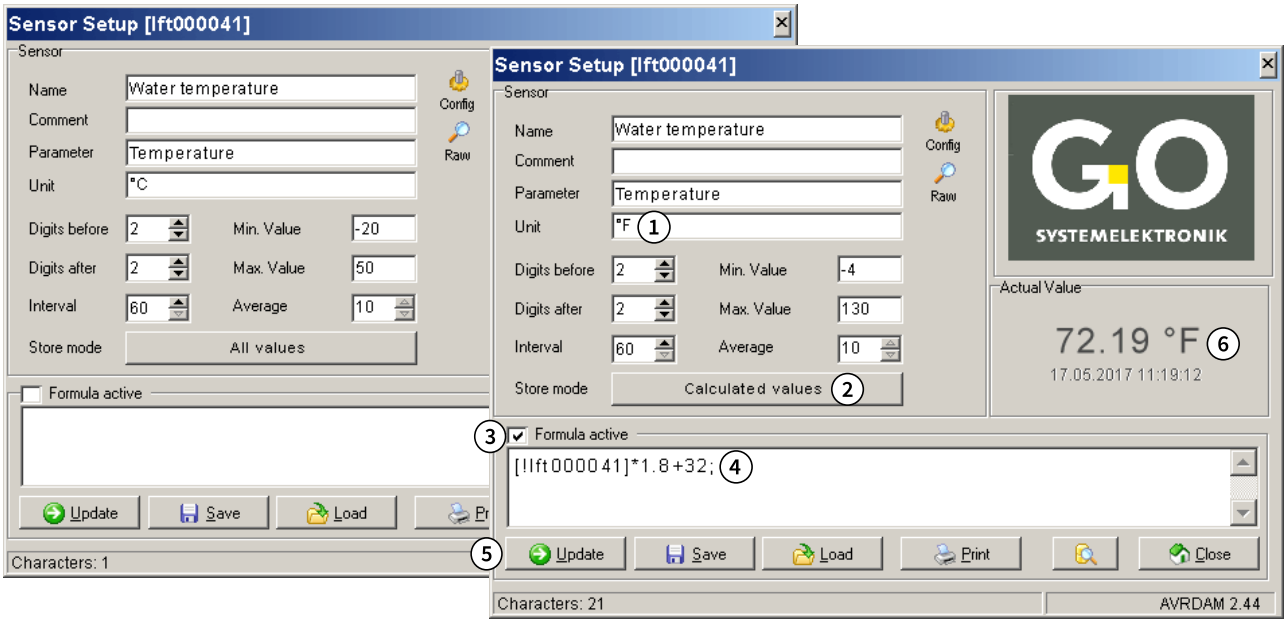


A complete list of the AMS Formula elements you see at: *Appendix H – List of the AMS Formula Elements*.

5.6 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 Calculated 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 *5.4.1.2.6 Multi-Point Calibration* there *Calibration Fitting*

Name	*Diff. Inside Outside*	Sensor name, retrieved by the other BlueBox programs.
Comment		see 5.4.1.1
Parameter	*Temperature*	Parameter name
Unit	*°C*	Parameter unit

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

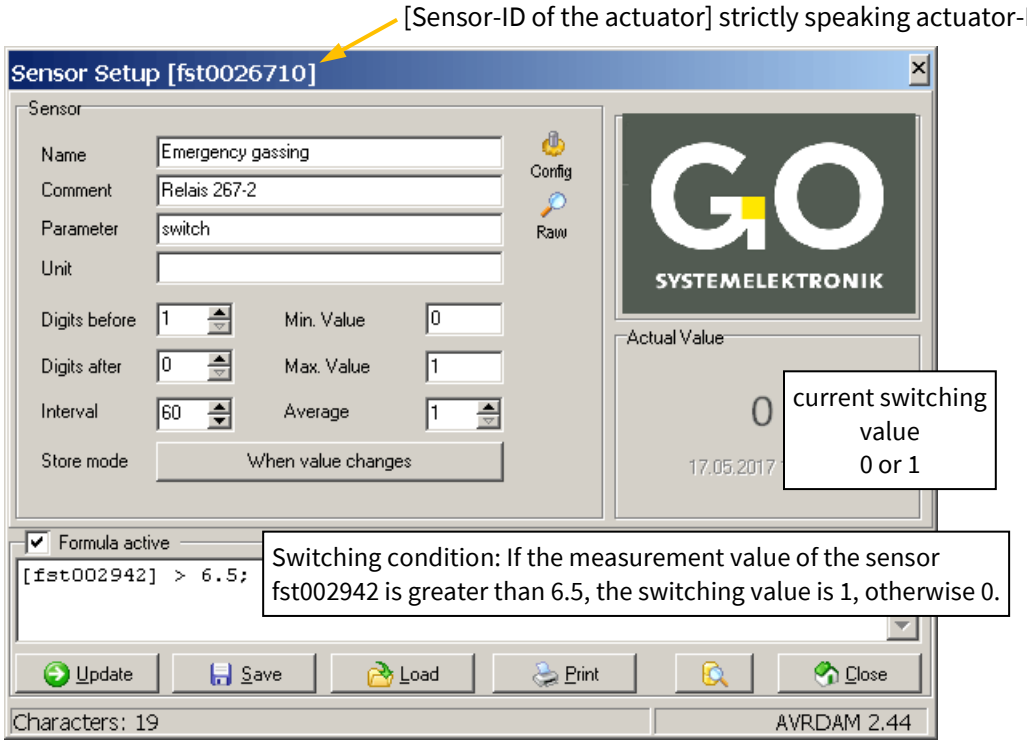
[lft000044]-[ct1000141];
Subtraction: measurement value of sensor lft000044 minus measurement value of sensor ct1000141
; (Semicolon) marks the end of the statement

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

* Unlike real sensors, this also applies to the stored value. If the underrun/overrun is marked with < or >, the entered minimum or maximum measurement value is saved. The sensor symbol also appears as a warning sign ⚠ in the AMS Start Window.

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).
At calibratable actuators* a window for multipoint calibration opens. see 5.4.1.2.6

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.

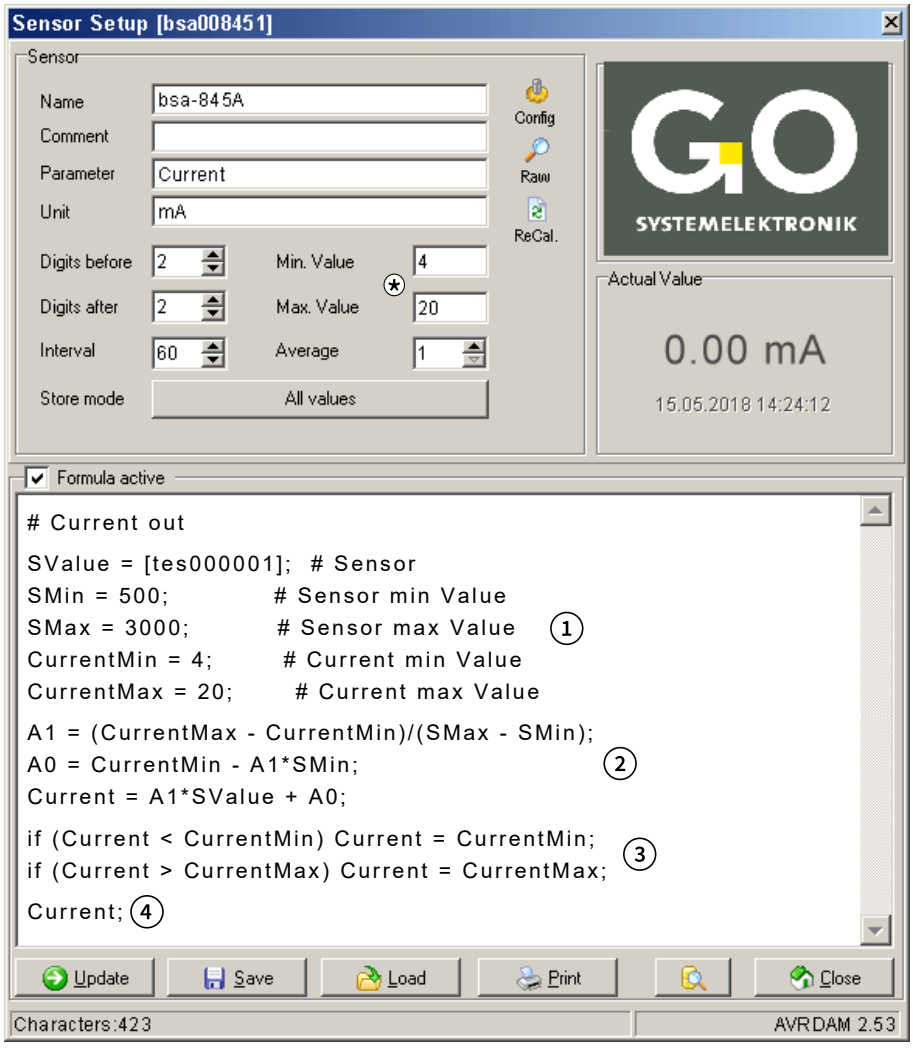
When value changes — The actuator value is only stored if the value is changed, but at least one value per hour is stored (minimal dataset).

Update — Transfers the formula to the BlueBox.

* Additional a ReCal button for fast recalibration appears her.

5.6.4 Settings of a Current Output

A current output is an analogue actuator and is parameterized similar to a sensor. The measurement values of 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 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.

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

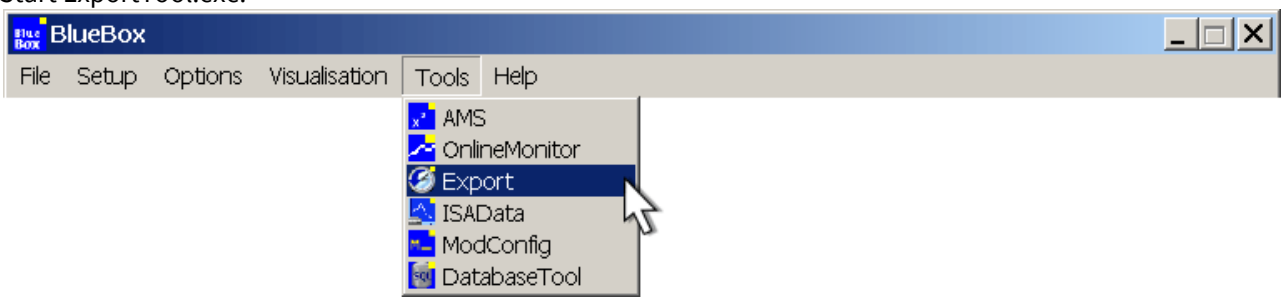
6 Programs for Data Transfer and Configuration

6.1 ExportTool

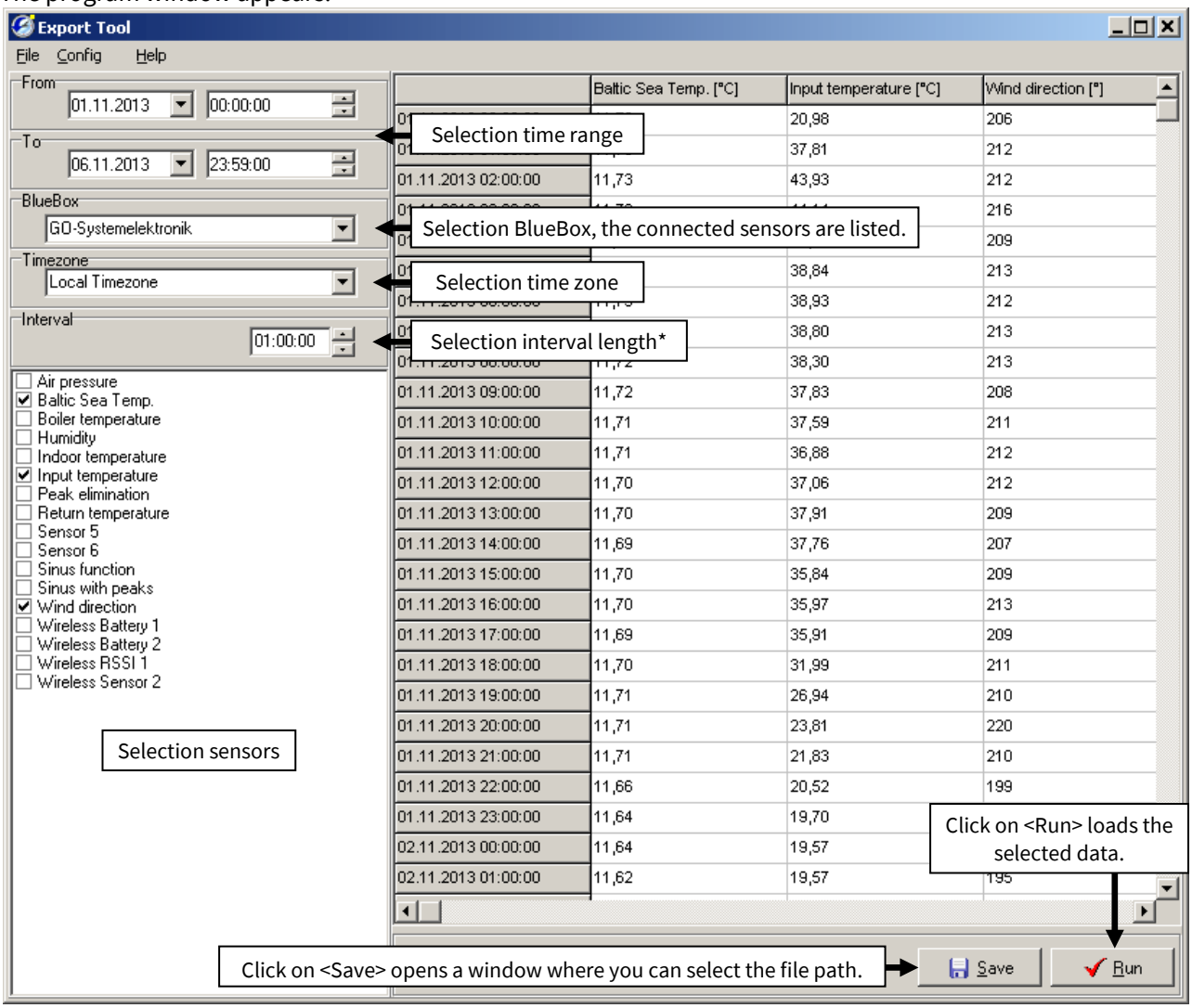
Program version: 4.1.0.0

The program ExportTool.exe exports selected measurement values from the database in the txt- and csv-file format.

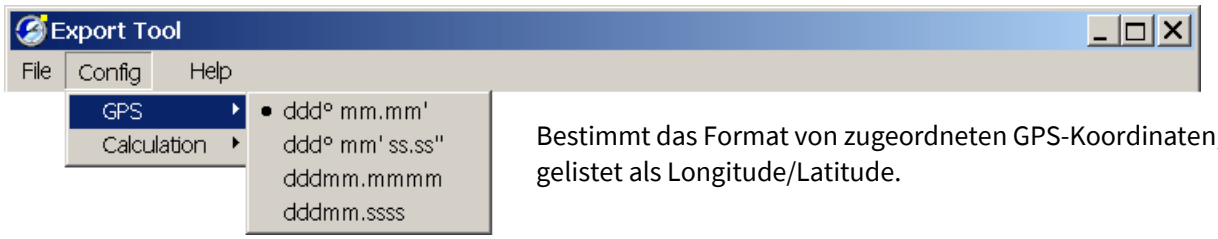
Start ExportTool.exe:



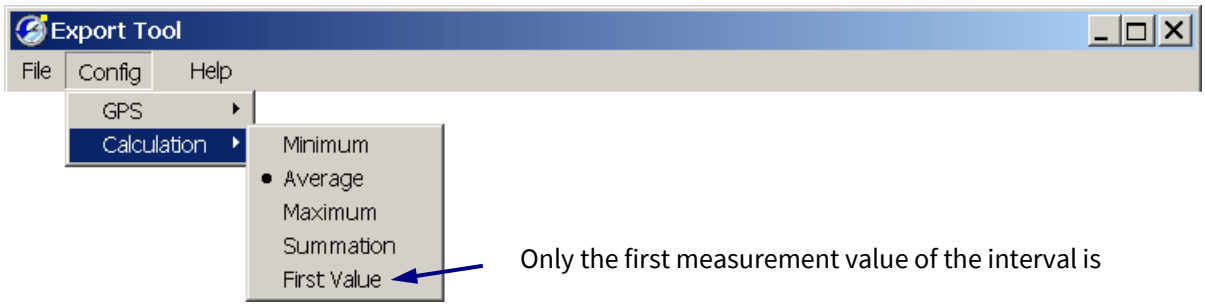
The program window appears:



* Time period of accounted measurement values (see next page).

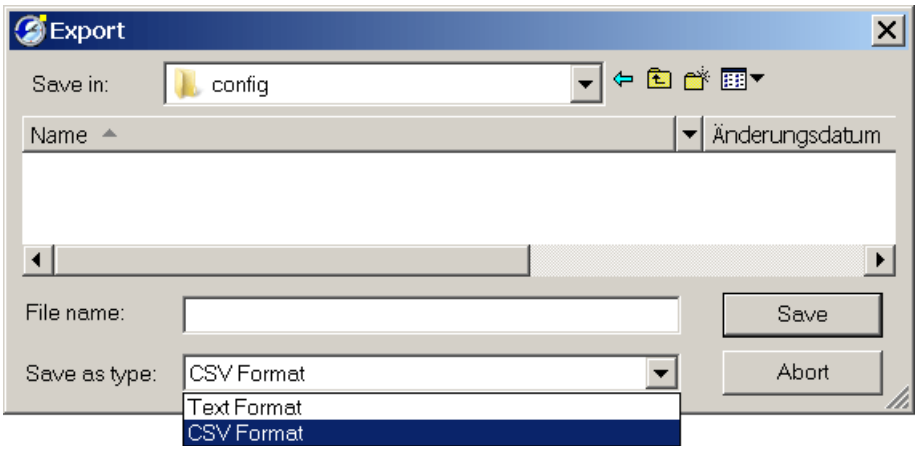


Bestimmt das Format von zugeordneten GPS-Koordinaten, gelistet als Longitude/Latitude.



Only the first measurement value of the interval is

Determines the method of calculating of the values collected in the time interval.



You can save the data as txt- or csv-file.

In this csv- or txt-file the data is separated with a semicolon. 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*

6.2 ModConfig (Modbus Client Configuration)

Program version: 4.3.3.0

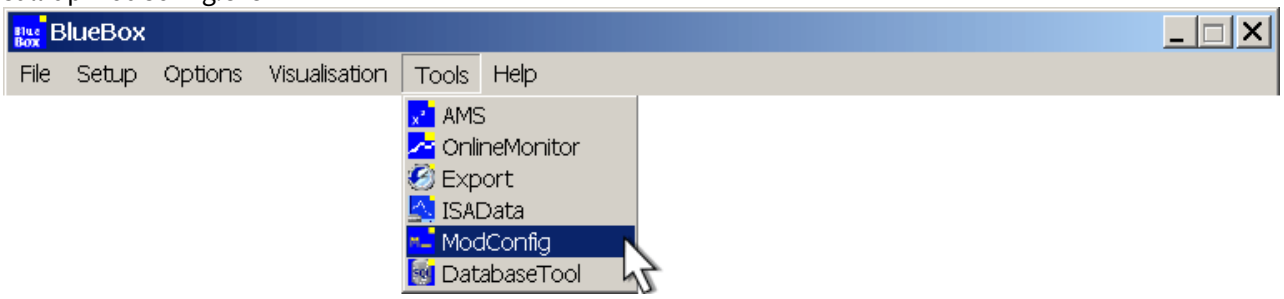
Note: Extended descriptions are available as service documentations.
Contact GO Systemelektronik.

Available Modbus interfaces of the BlueBox:

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

6.2.1 Starting MODConfig.exe

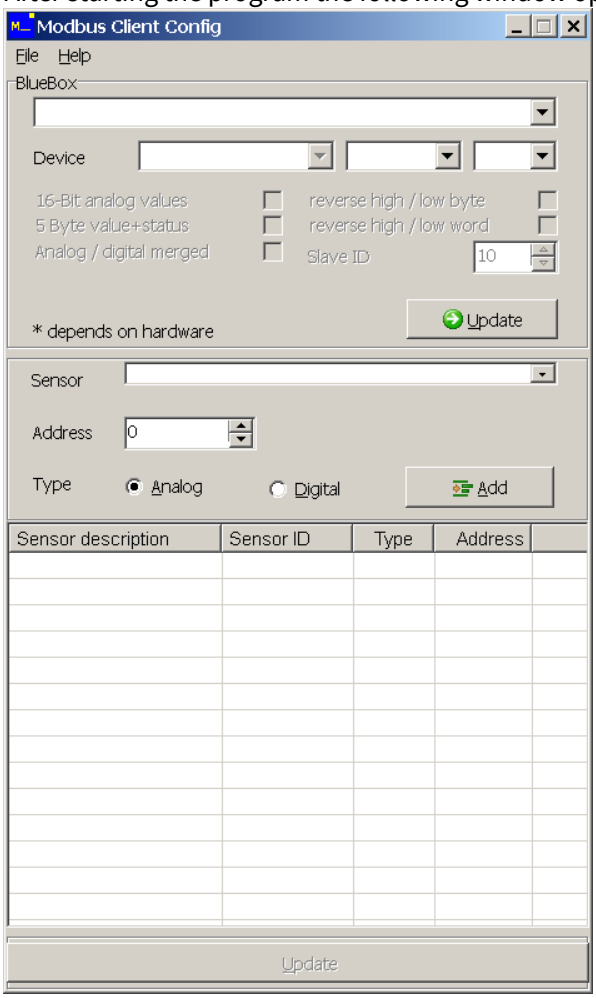
Call-up ModConfig.exe



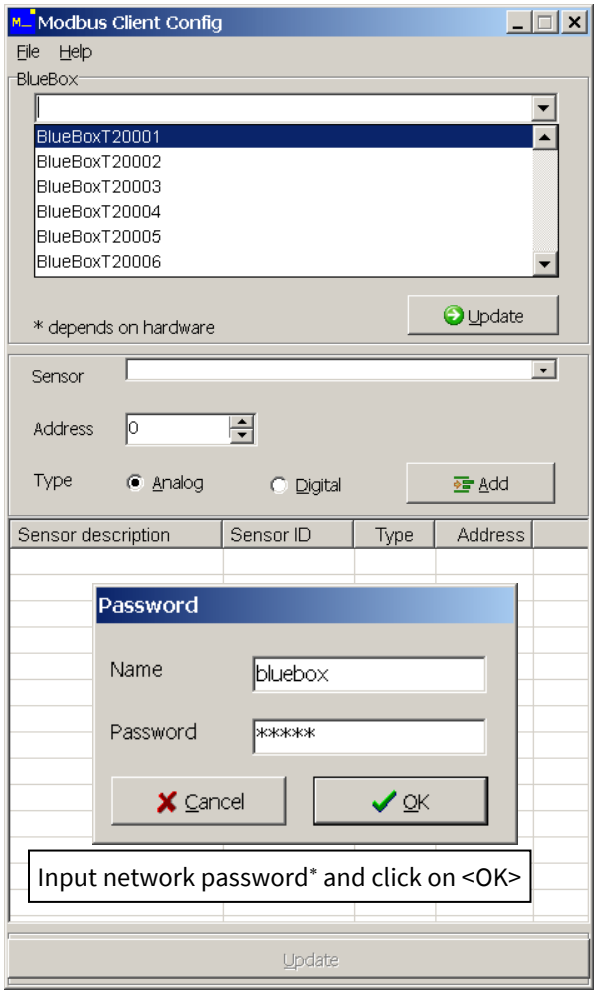
If nothing else was specified during installation, **ModConfig.exe** is located in the folder:

C:\Program Files\BlueBox

After starting the program the following window opens.



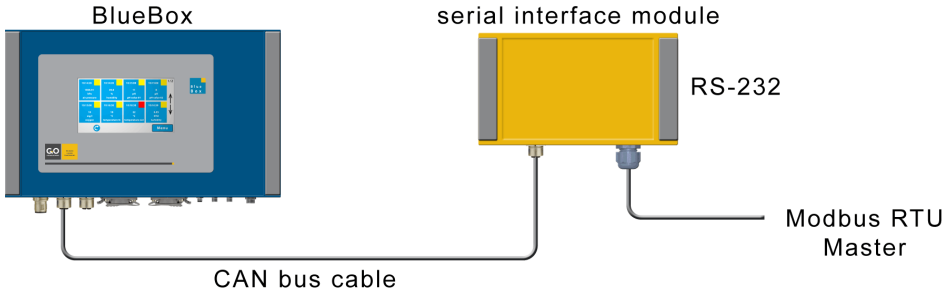
Select a BlueBox.



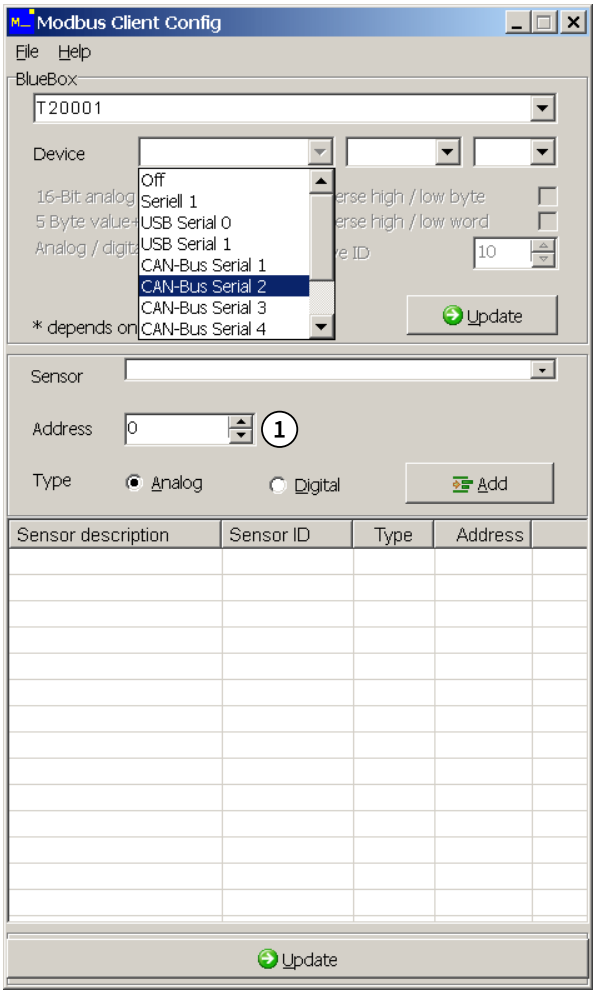
Input network password* and click on <OK>

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

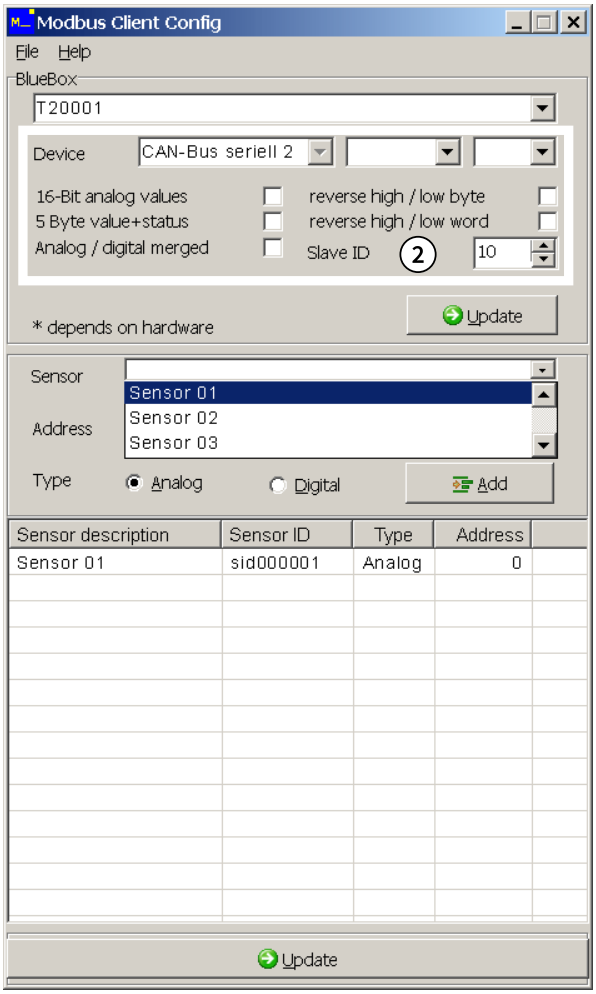
6.2.2 CAN-bus with External Serial Interface Module



Select CAN-Bus Serial 2.



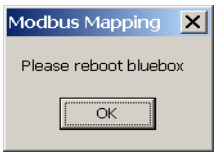
Select Sensor and click Add



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

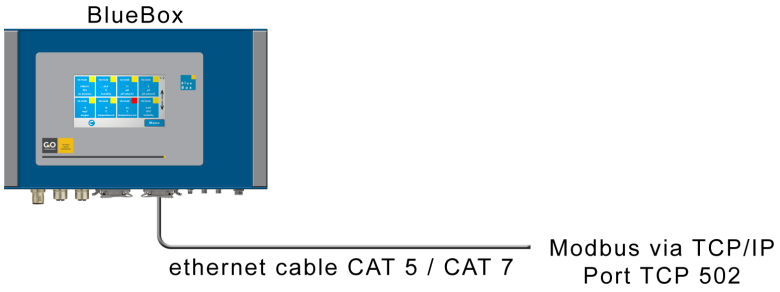
① 0 equates register 30001 for analogue Sensors and register 10001 for Digital Sensors for many masters/clients.

② Apply the change by clicking on Update
After changing these items you will be prompted to reboot the BlueBox.



If you want to connect an additional module, please select CAN-Bus Serial 3.
CAN-Bus Serial 1 is reserved for internal serial interface.
If you get the error message "Unsupported firmware", update the firmware, in this case please contact GO Systemelektronik.

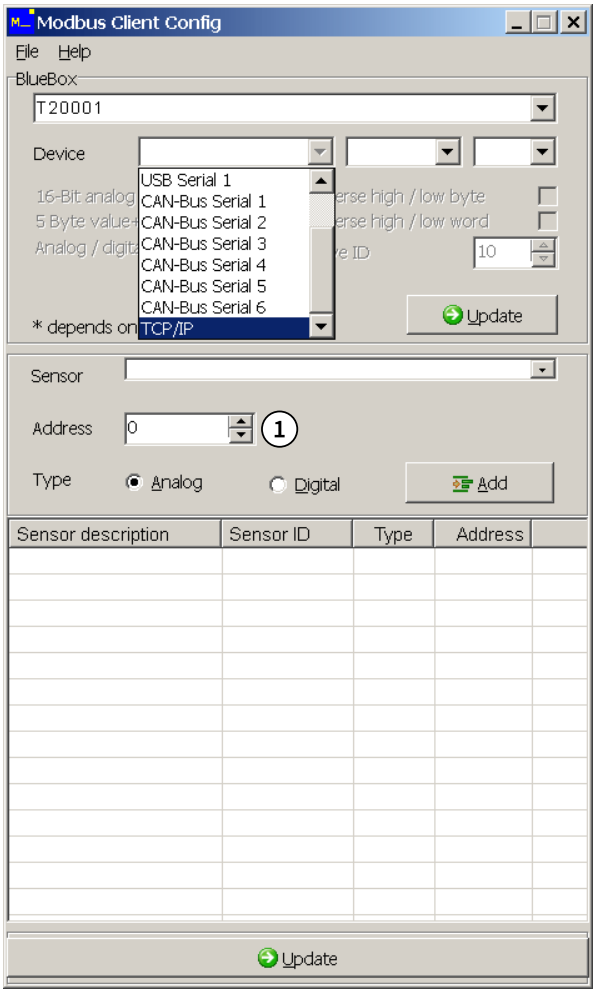
6.2.3 Ethernet via TCP/IP



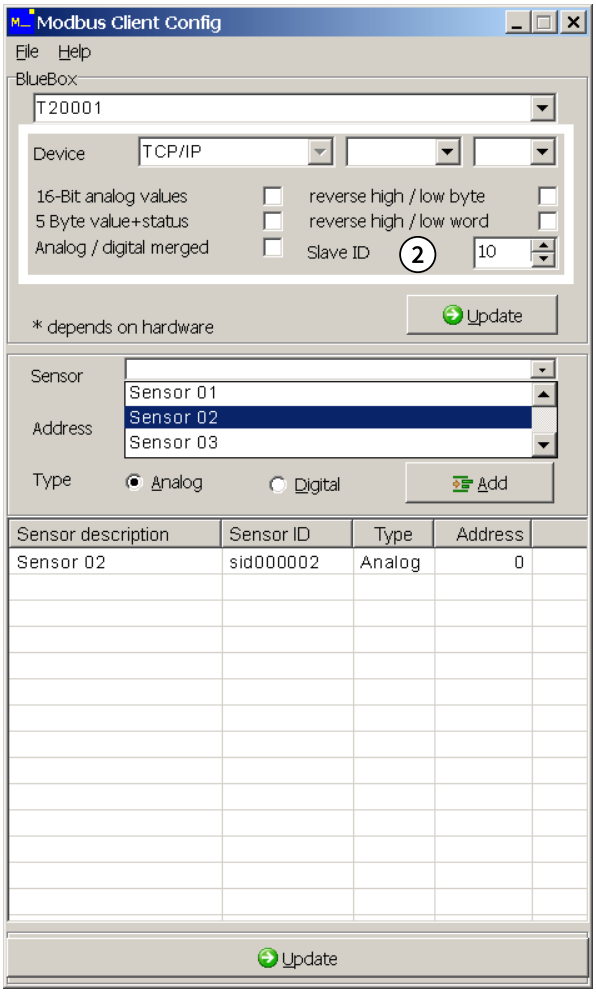
The MODBUS TCP/IP interface is only accessible from the private network addresses:

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 

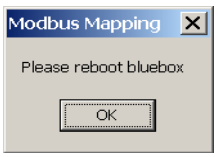


Click on <Update> transfers the settings to the BlueBox.

① 0 equates register 30001 for analogue Sensors and register 10001 for Digital Sensors for many masters/clients.

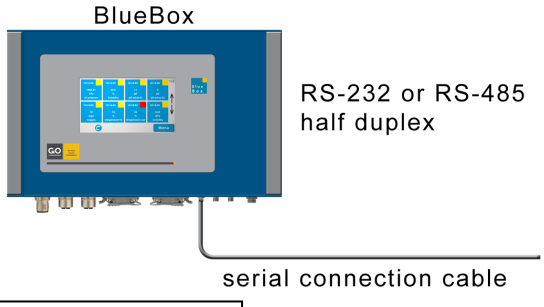
② Apply the change by clicking on 

After changing these items you will be prompted to reboot the BlueBox.



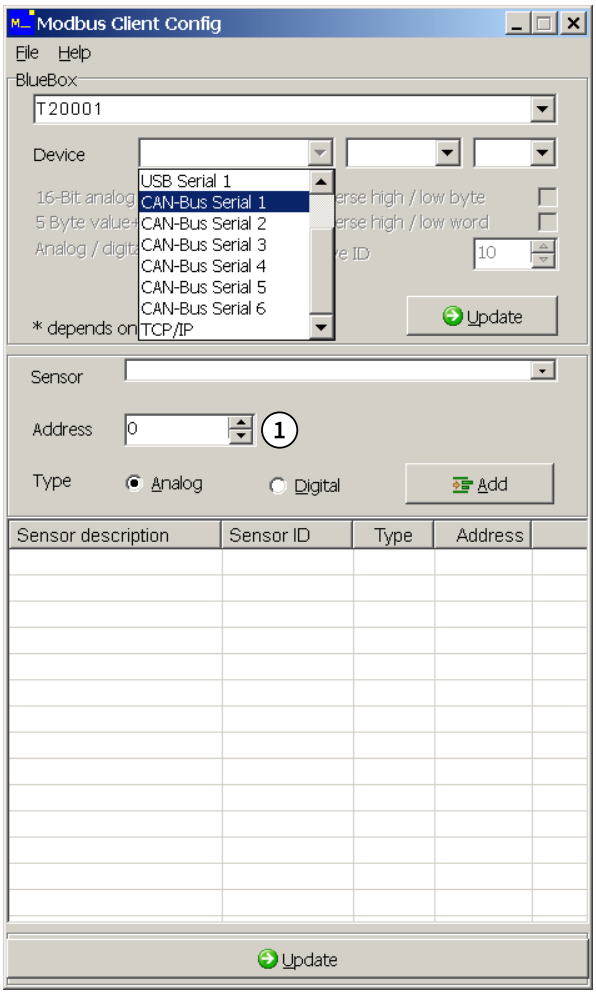
If you get the error message "Unsupported firmware", update the firmware, in this case please contact GO Systemelektronik.

6.2.4 Internal Serial Interface

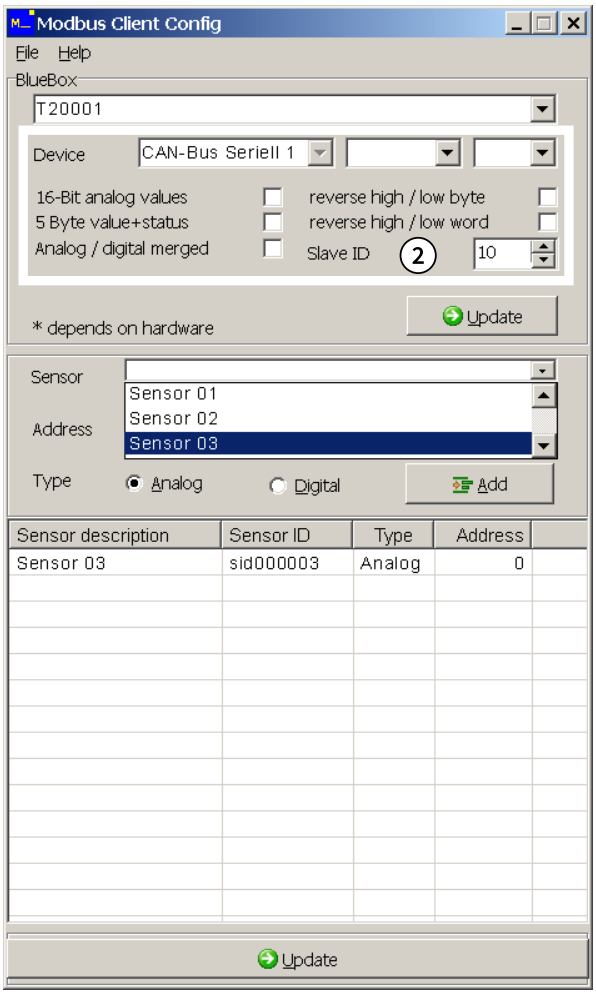


Note: On the BlueBox R1, Panel and RS, select [Serial 1] here.

Select CAN-Bus Serial 1



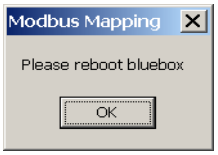
Select Sensor and click Add



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

① 0 equates register 30001 for analogue Sensors and register 10001 for Digital Sensors for many masters/clients.

② Apply the change by clicking on Update
After changing these items you will be prompted to reboot the BlueBox.



If you get the error message "Unsupported firmware", update the firmware, in this case please contact GO Systemelektronik.

6.2.5 Configuring the Sensors

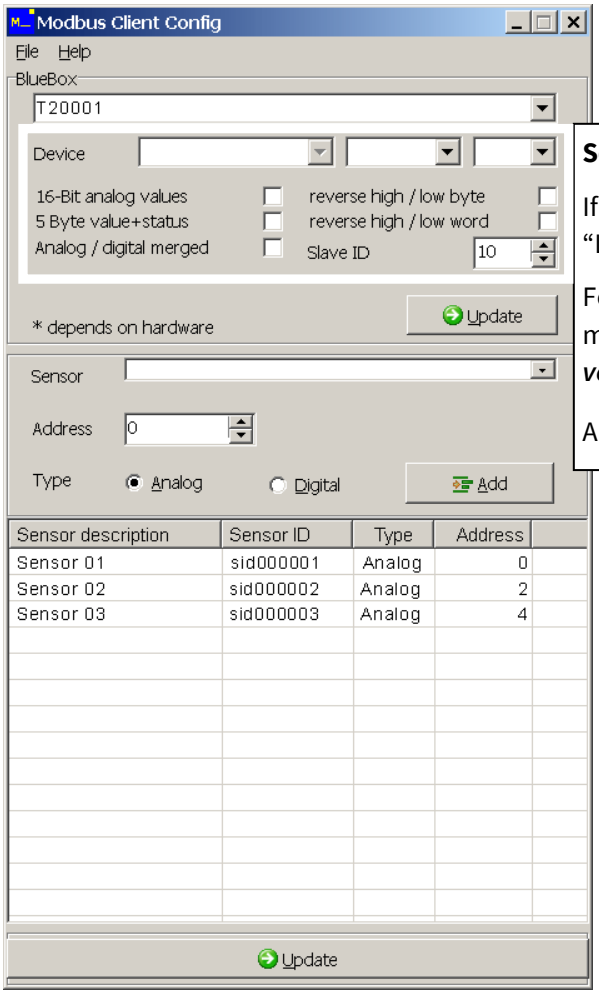
Via the Address drop-down menu you can assign an ascending address to the selected sensor. (For the analogue sensors the addresses are increased by 2 and the digital sensors increased by 1, i.e. for an analogue measurement always two 16 Bit registers are read out.)

It is necessary to transmit the assigned addresses to the technicians of the counter device. It is recommended to create a table together.

For each sensor you still have to select whether the sensor is either analogue (e.g. temperature) or digital (e.g. a float switch).

The already selected sensors are listed in the Sensor drop-down menu. Analogue sensors are marked blue and digital sensors are marked green.

You can change or extend the table at any time. However, you must always inform the technician of the counter device.



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 

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

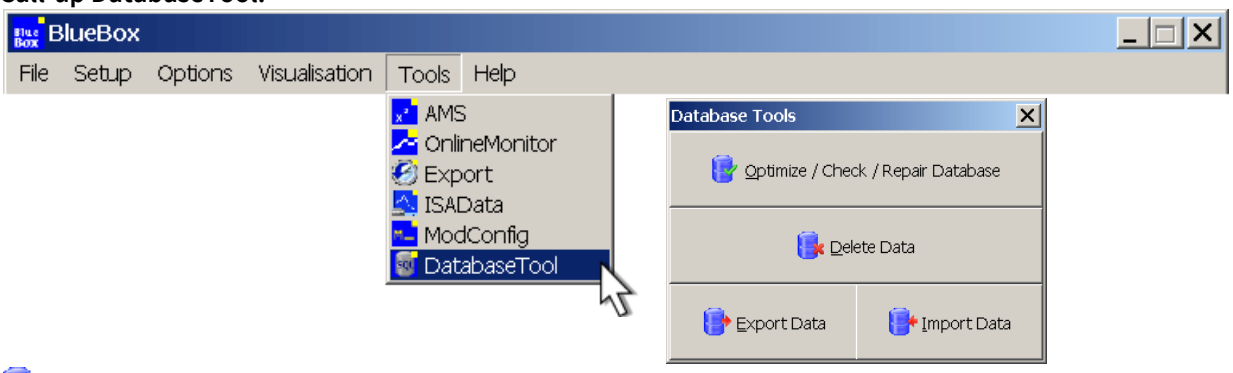
6.2.6 Configuration Settings Save and Load

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.

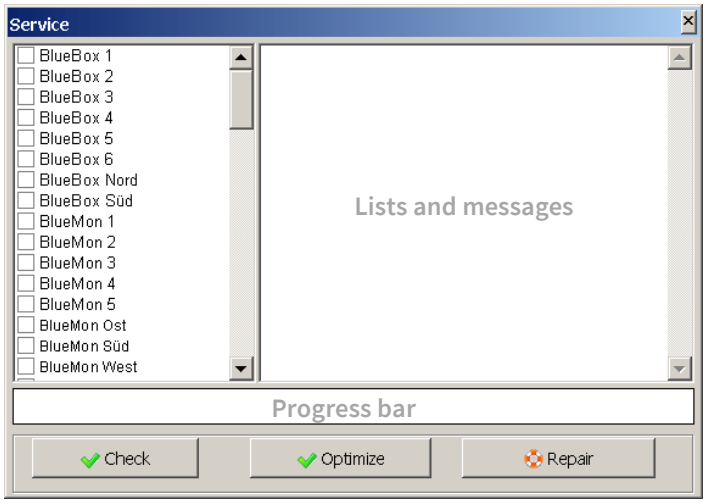
6.3 DatabaseTool

Program version: 4.2.3.0

Call-up DatabaseTool:



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

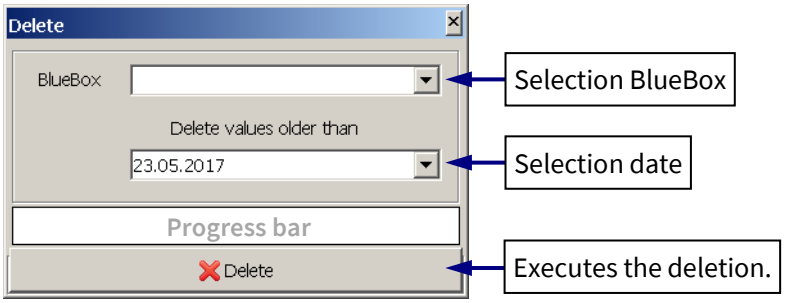


Check: Checks the database for errors and displays an error list.

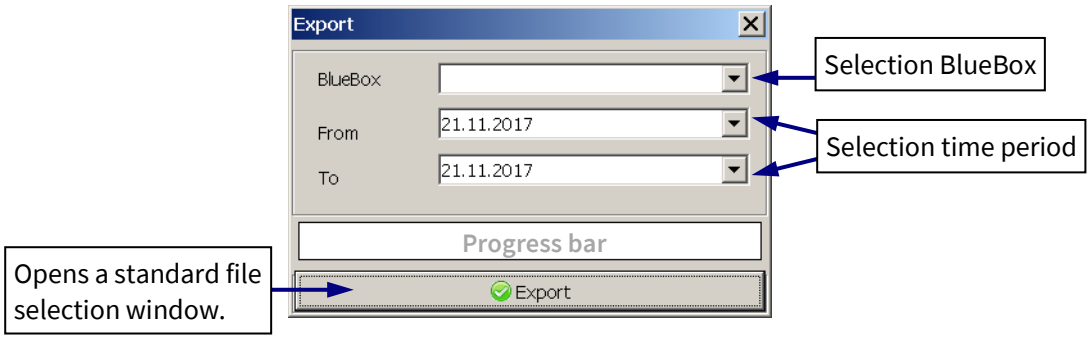
Optimize: Browses the database for deleted records and deletes them.

Repair: Repairs and compresses the database

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



Export Data — Exports selected data of a selected period into bsql-format.



Import Data — Opens a standard selection window for importing selected bsql-data into the database.

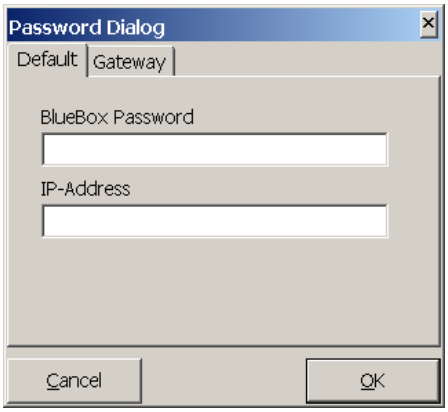
6.4 BlueBox Backup

Program version: 4.2.3.0

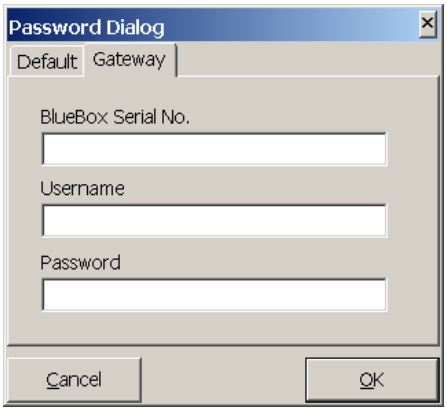
The program BlueBox backup stores all the data, except the measurement data, of a BlueBox in a bck-file. From this file, GO Systemelektronik creates a new GO CompactFlash card for a BlueBox.

Precondition is an active LAN connection between BlueBox and a PC or an active gateway connection with the BlueBox.

You can call up BlueBoxBackup from the Windows Explorer. If not otherwise specified at installation, the **BBBackup.exe** is in the folder **C:\Program Files\BlueBox**.
Click on <Start> opens an input field.



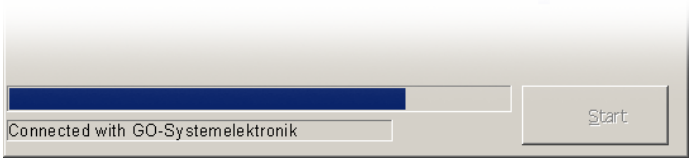
You can perform the backup via a direct LAN connection or via a gateway (if applicable, see 3.2.2).



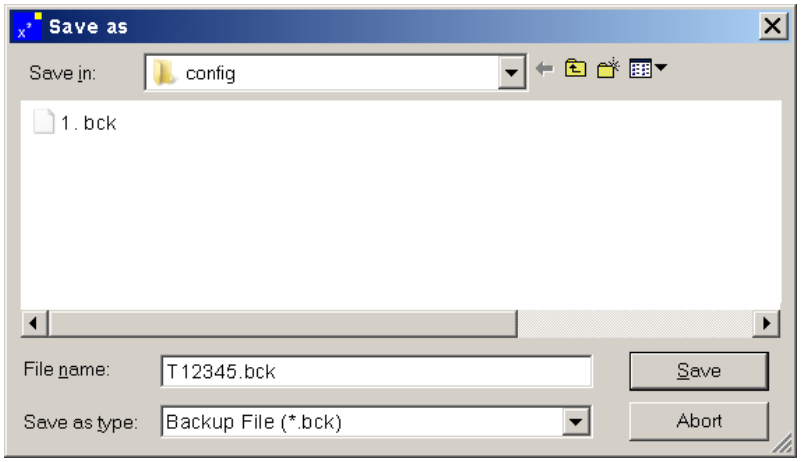
Default (LAN): Input of the network password of the BlueBox and the IP address of the BlueBox (see *Appendix G* there *2 Network*).

*__Gateway:__ Input of the serial number of the BlueBox, and username and password from the gateway settings (see 3.2.2).

Click on <OK> starts the backup.



The progress of the backup is displayed with a progress bar.



A window opens where you can select the file storage path.

* Precondition: entered password at Default (LAN), see left

6.5 USB Import (BlueBox T4/TS only)

Program version: 4.2.3.0

If not otherwise specified at installation, the **USBImport.exe** is located in the folder:

C:\Program Files\BlueBox

Transfer of measurement data from a BlueBox to a database by means of a USB stick[1]

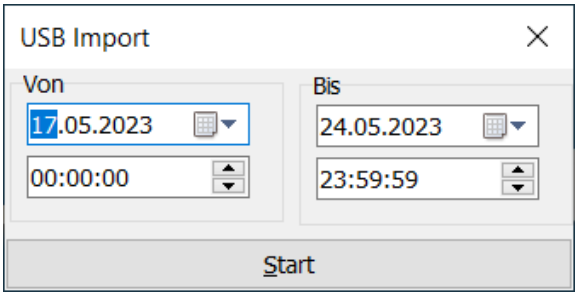
Precondition:

1. The USB memory stick containing a folder "Database[2]" on the first level was previously plugged into the USB port of a BlueBox. The BlueBox then automatically transfers all measurement data of the BlueBox into the "Database" folder.
2. The BlueBox was set up on the target system with the BlueBox SQL Software (see *3.2.2 Setup of a New BlueBox*). Hence there is already an allocated database.

Plug the USB memory stick into a USB port of your computer. Start the program USBImport.exe.
Select a time range. Measurement data that had been recorded during this period is transmitted into the correct database after click on <Start>.

USBImport.exe program window:

The time is UTC.

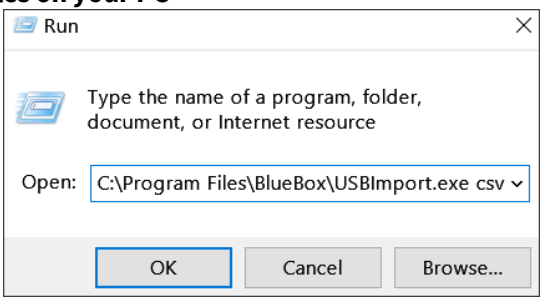


Transfer of measurement data from the USB stick into csv-files on your PC

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 programme 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.



Program version: 4.3.0.11

6.6 BCDriver (BlueBox Communication Driver)

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[3] 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.

[1] strictly speaking: USB storage device

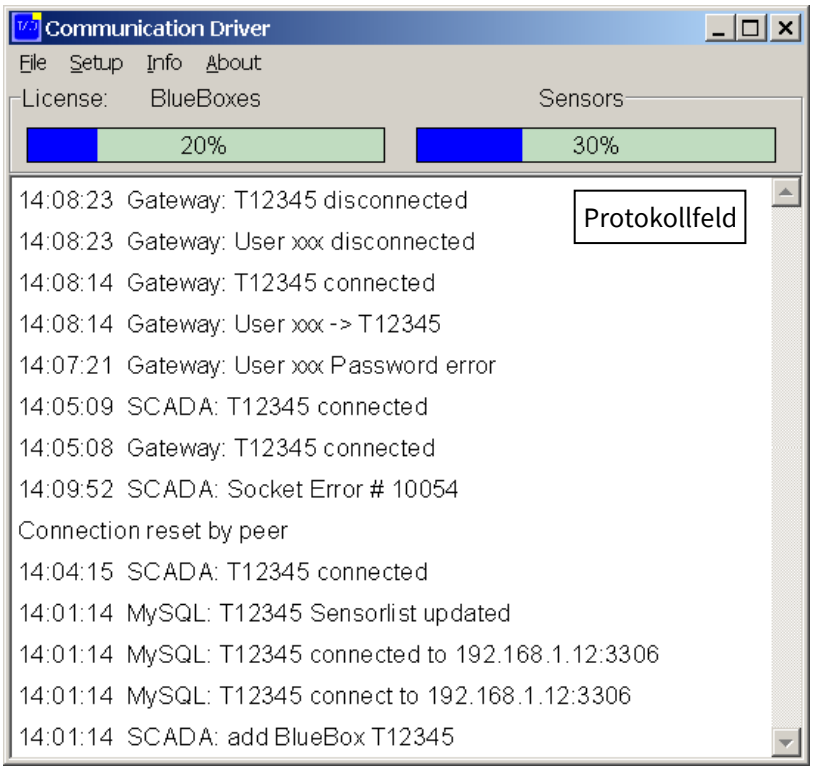
[2] note upper and lower case

[3] In server operation (see *Appendix C – BlueBox PC Software in Server Operation*) licenses are first searched locally on the com-

Unless otherwise specified during installation, **BCDriver.exe** is located in the folder:

C:\Program Files\BlueBox

Start the program, 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 U DP - 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 – I P address of the BlueBox

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

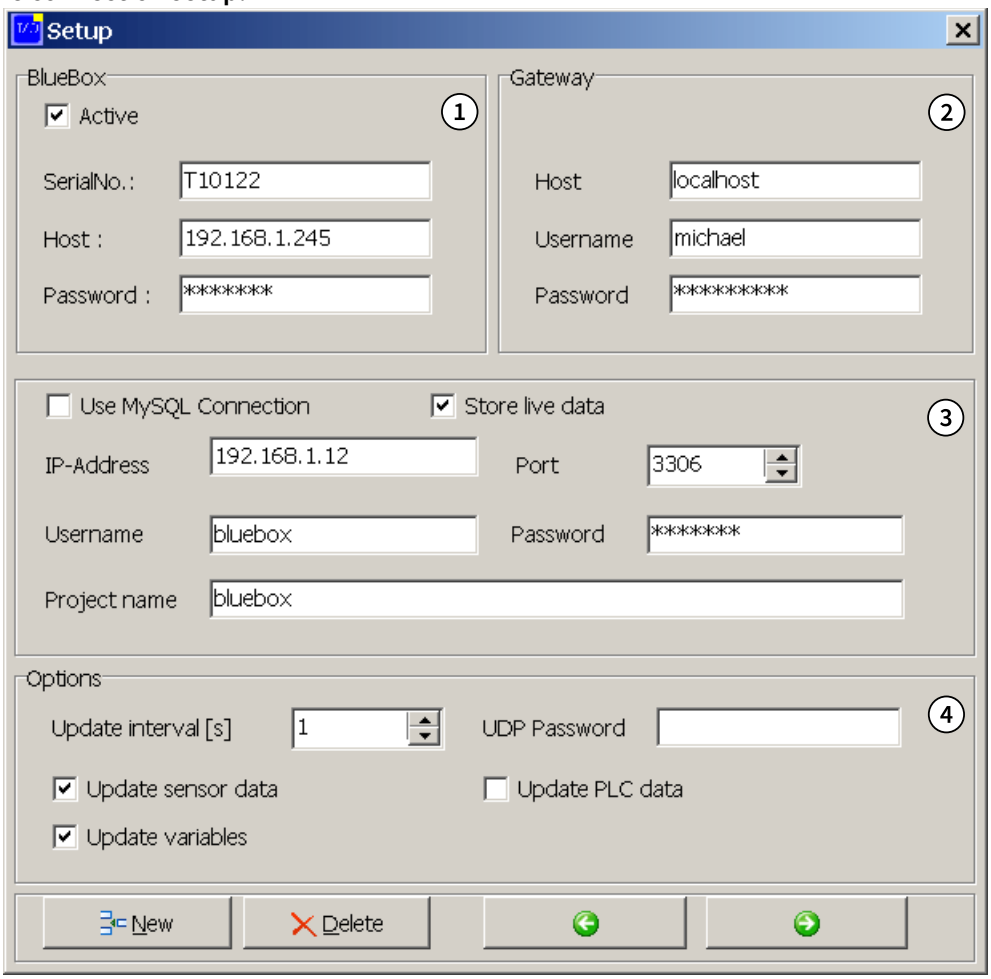
- 10.0.0.0/8 Class A network
- 172.16.0.0/12 Class B network
- 192.168.0.0/16 Class C network

puter. If there is no license here, the server is searched.

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 data-base (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 MySQL™ Server*

☑ **Use MySQL Connection**	MySQL connection With the MySQL 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 MySQL Server
Port	Port number of the MySQL Server, default address 3306
Username	User name of the MySQL Server, default name root
Password	Port number of the MySQL Server
Project name	Project name = Name of the database see *3.2.2 Setup of a New 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 T4* there *8.2.1.1.5.1 UDP Settings*
☑ **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.

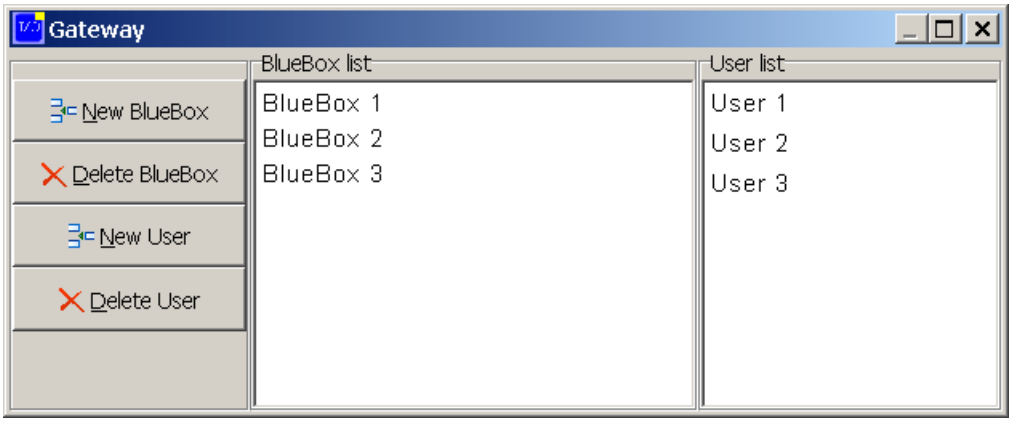
Saves the changes.

Cancels the process, the changes are not saved.

6.6.2 Integrated Gateway

Call-up gateway settings:

Window of the gateway settings:



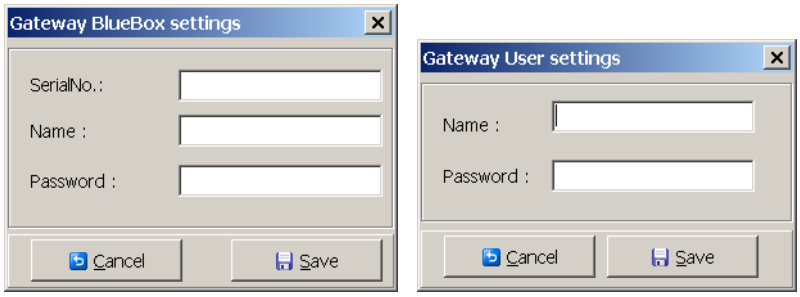
The BlueBox Systems that can be connected via the integrated gateway are listed here with their assigned user names.

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 T4* there *8.2.1.1.5.2 Gateway Settings (Internet)*.

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.

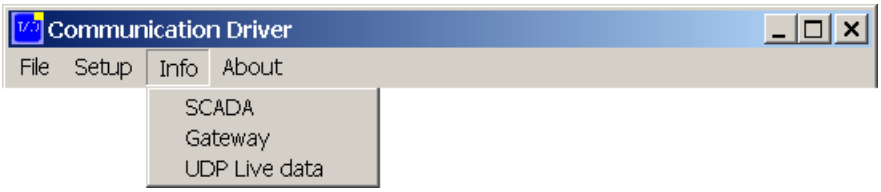


Saves the entries.

Cancels the process, the entries are not saved

6.6.3 Info

Call-up protocol windows:



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*

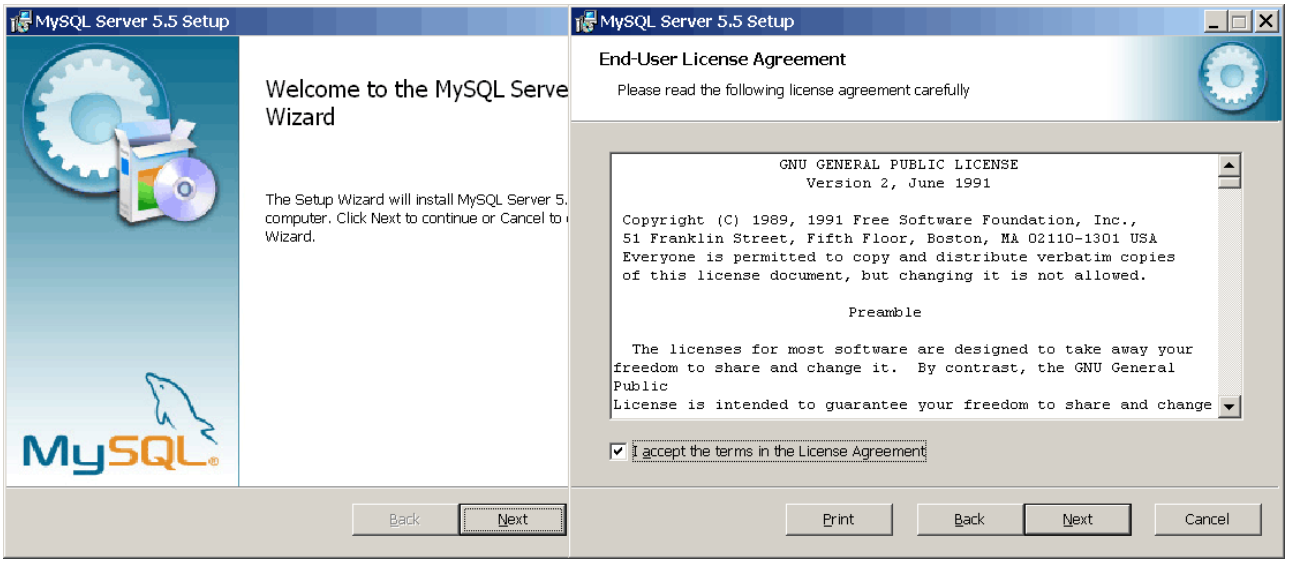
Appendix A – Installation MySQL™ Server

1 Preparation installation MySQL Server

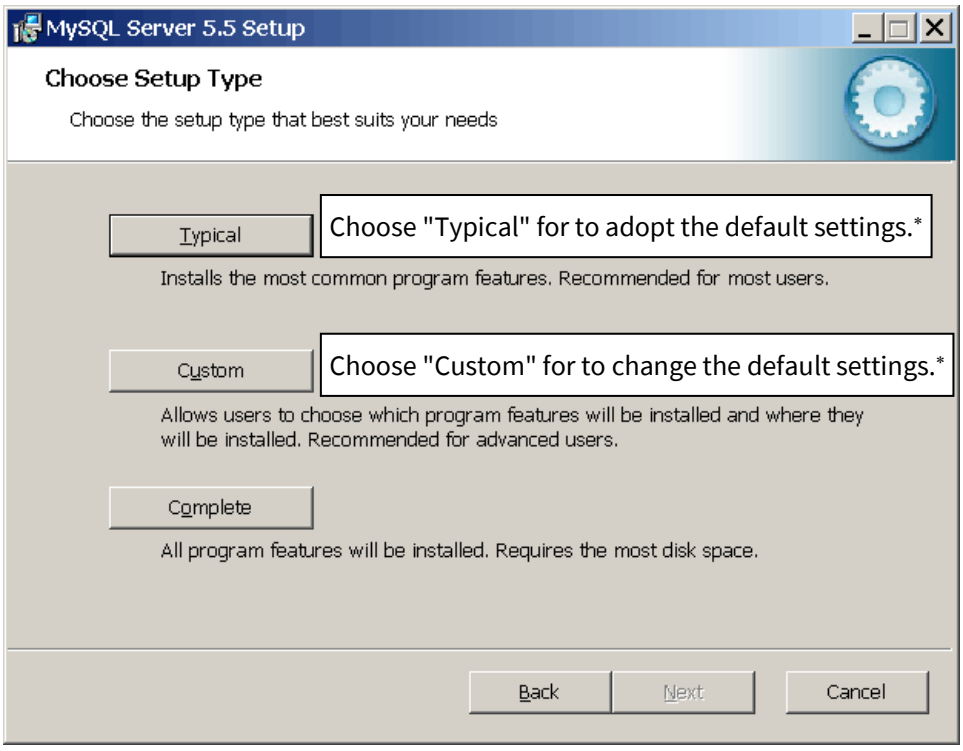
The installer for the MySQL server is stored on the USB memory stick:

- **BlueBox Install\1. MySQL Server Installation\mysql-5.5.8-win32.msi** (32-bit-version)
  or
- **BlueBox Install\1. MySQL Server Installation\mysql-5.5.9-winx64.msi** (64-bit-version)

Start the installation program and follow the instructions.



Click on Next

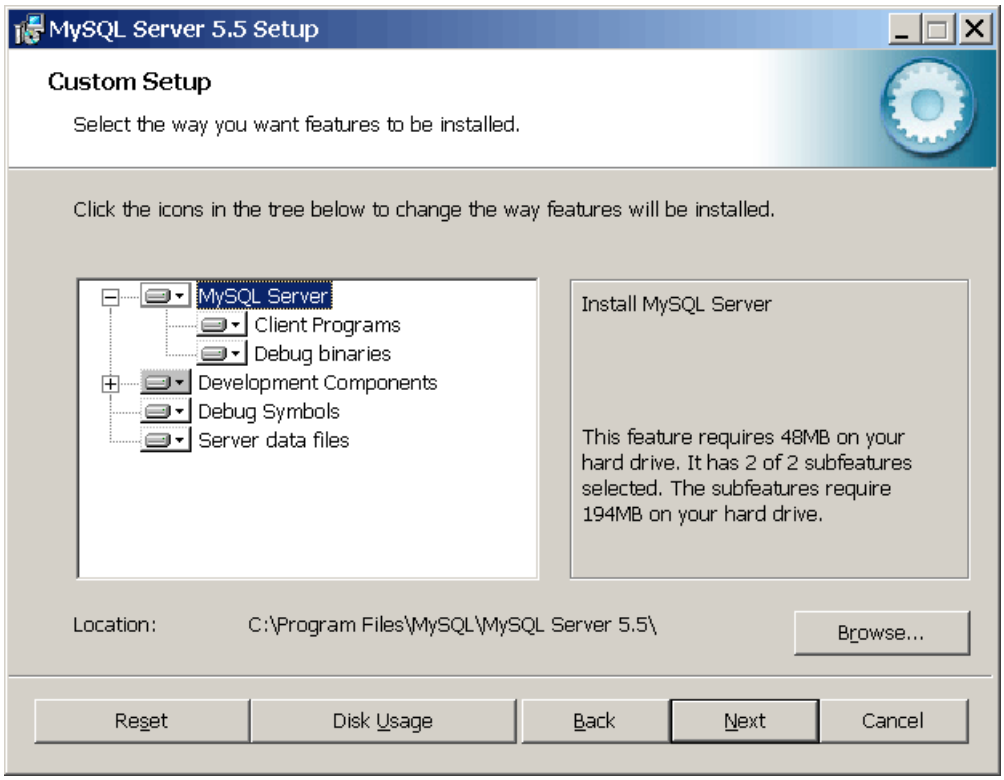


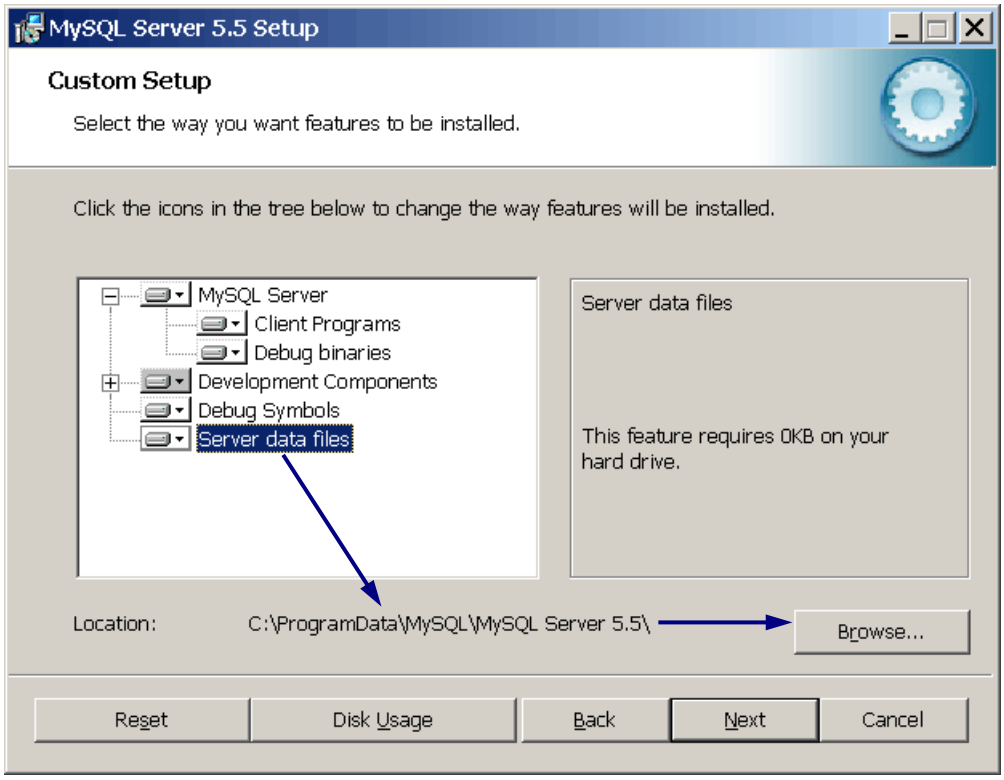
1.1 Typical selection leads to **2 Installing MySQL Server**.

* GO Systemelektronik recommends to change the default settings (see next page).

1.2 Selection Custom

Here you can determine the storage paths.



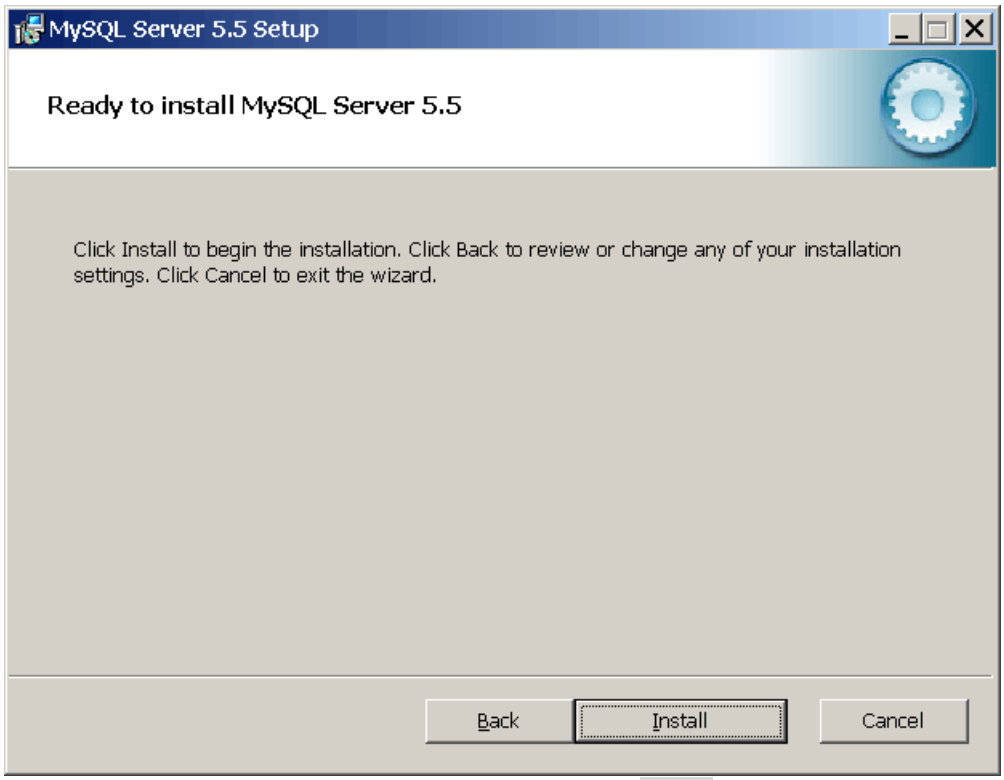


The database is created in the default setting of Windows 7 in a hidden directory. To access it with Windows Explorer, you may need to change the Windows folder options.
It may be helpful to note the location.

It is recommended to create the database in a different and accessible directory.

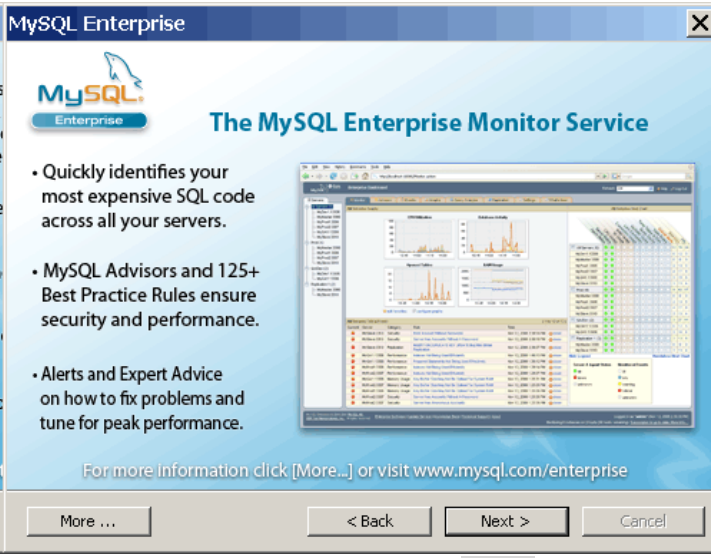
Click on Next leads to 2 Installation MySQL Server.

2 Installation MySQL Server

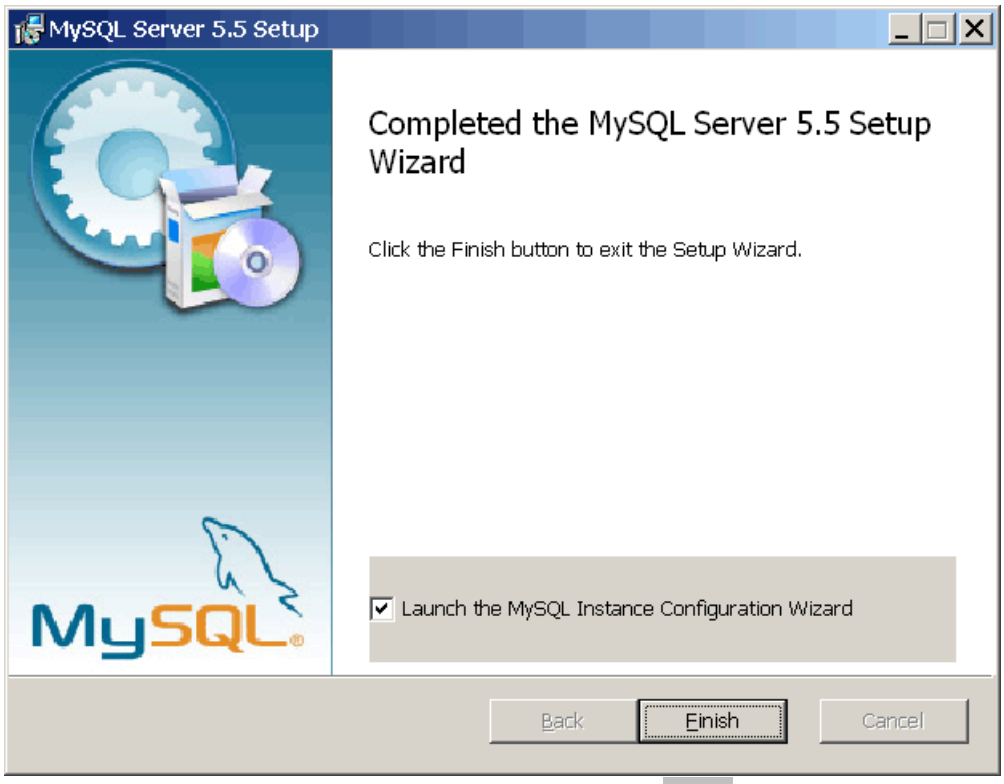


Click on Install

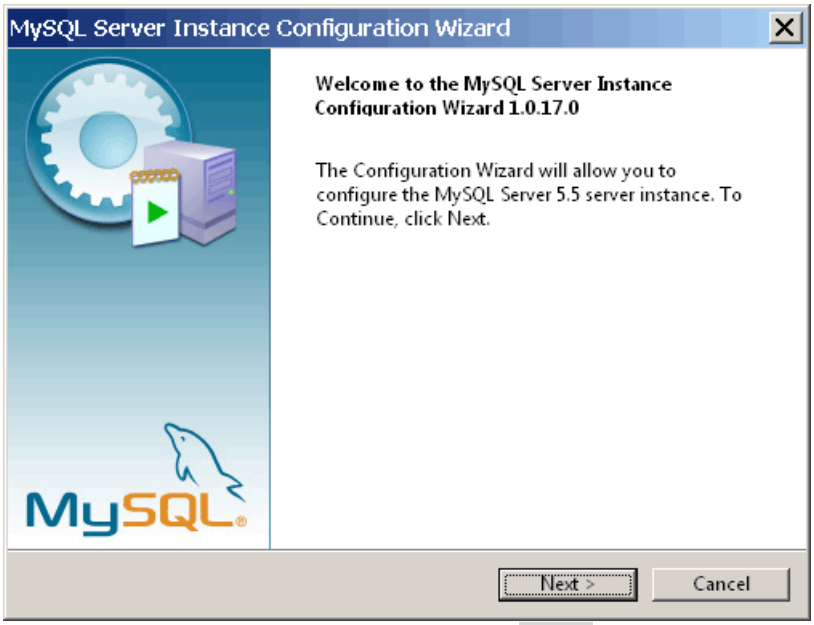
Click on Next >



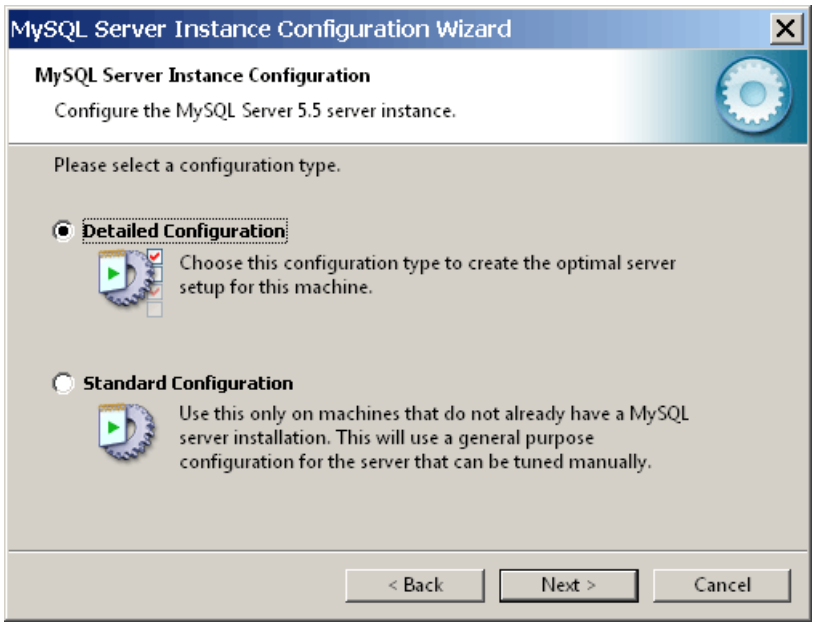
Click on Next >

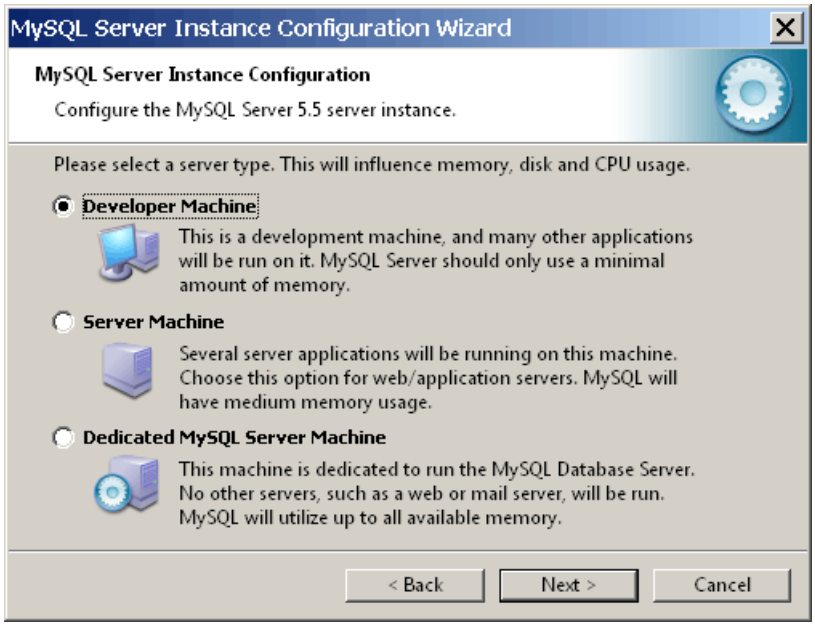


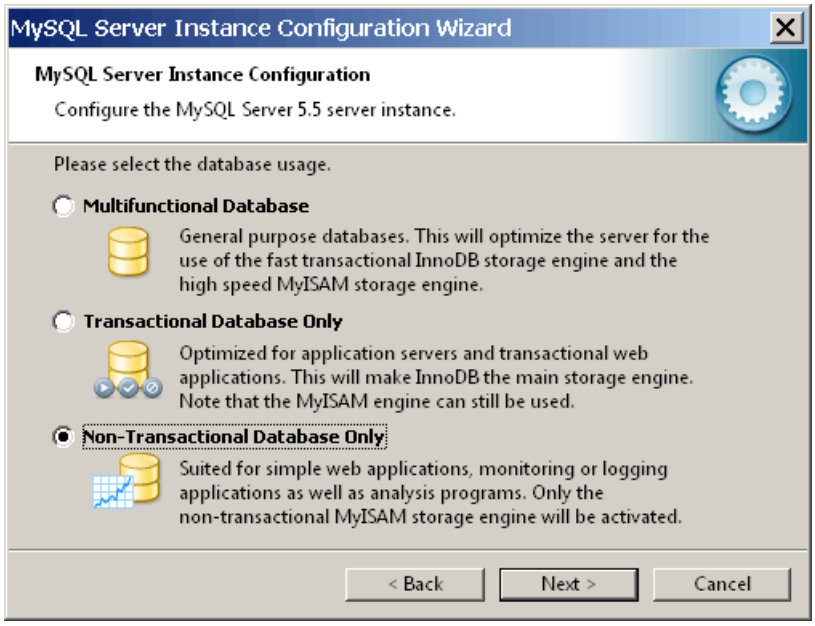
Click on Finish



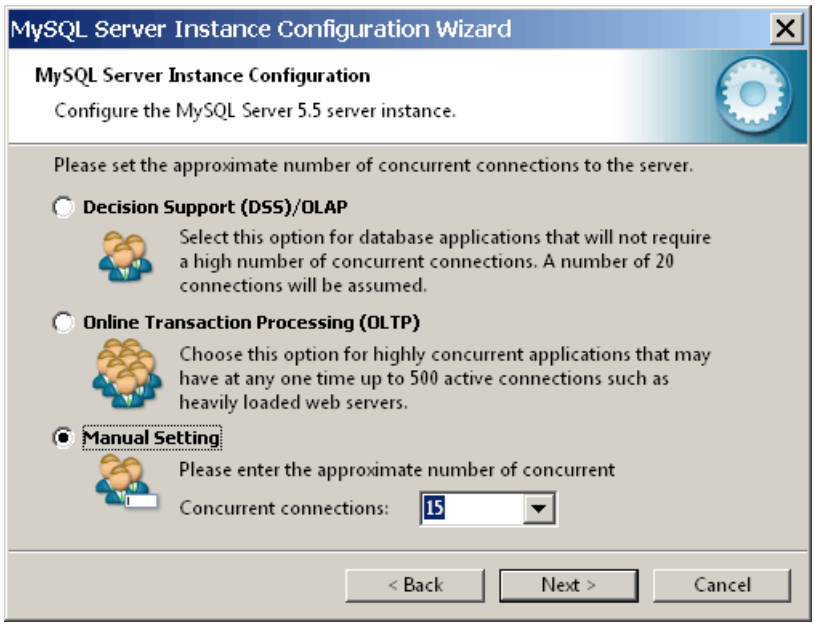
Click on Next >

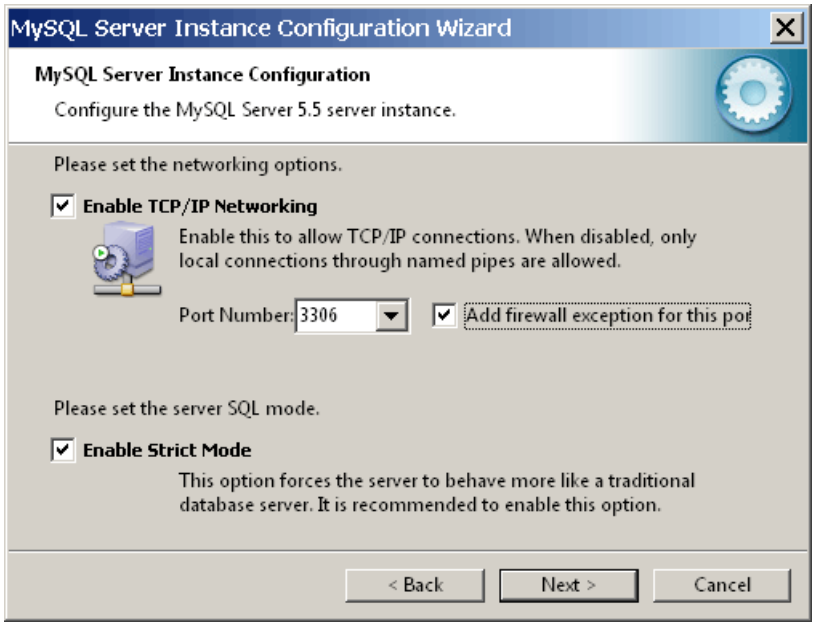


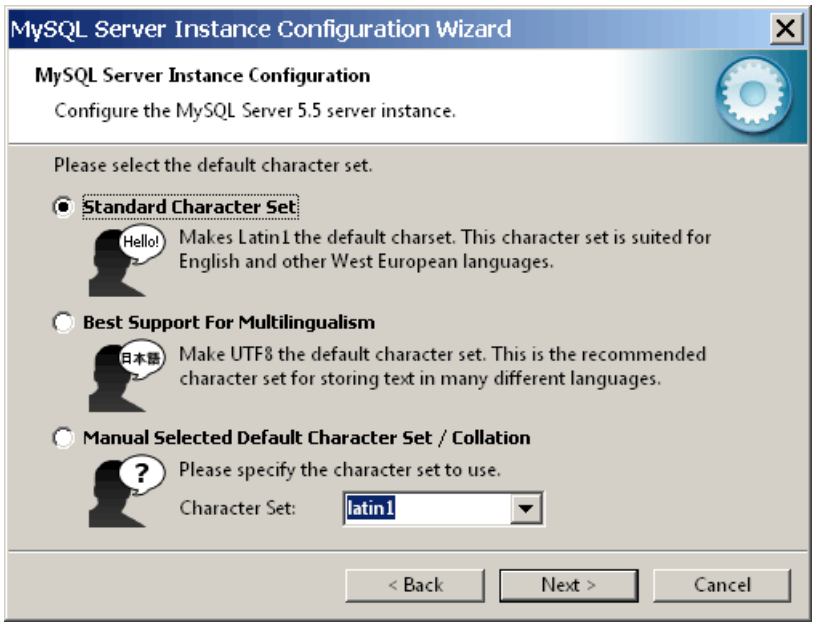




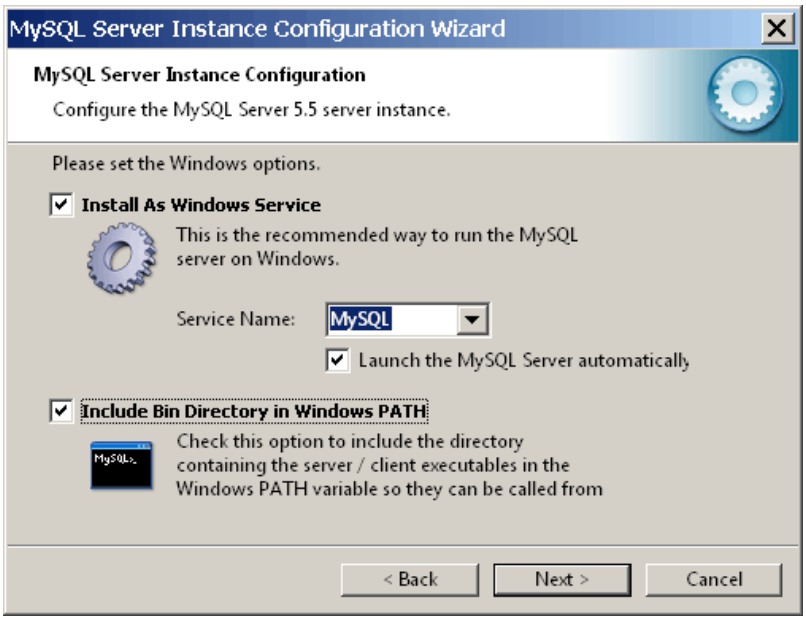
Click on Next >







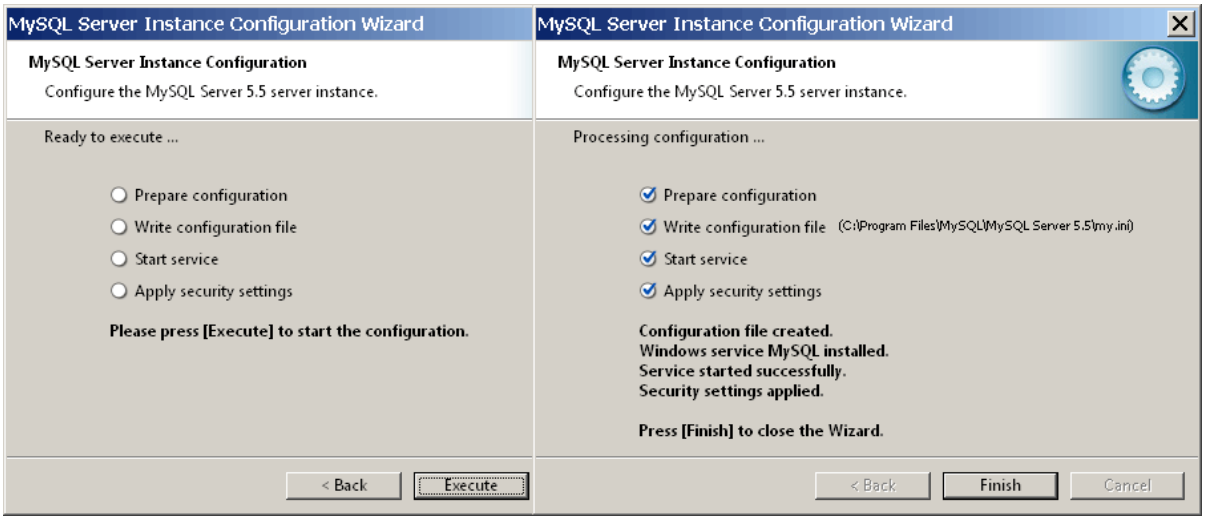
Click on Next >



Click on Next >

Click on Next >

The password entered here is required for the installation of the BlueBox PC Software. Please note the password.



Click on Execute

Click on Finish finishes the installation.

Appendix B – Installation of the BlueBox PC Software

The BlueBox PC software can be installed on Windows systems up from Windows 7.
A MySQL™ Server is mandatory necessary for the running of the BlueBox PC Software, see *Appendix A - Installation MySQL™ Server*.

Programs* of the BlueBox PC Software:

File name	Program name	
AMS.exe	AMS	standard
BBBackup.exe	(BlueBox) BackUp	standard
bcdriver.exe	BCDriver	standard
BlueBoxSoft.exe	BlueBox (SQL)	standard
control.exe	BlueBox SCADA	optional
DatabaseTool.exe	Database Tools	standard
ExportTool.exe	Export Tool	standard
ISAData.exe	ISA Data	optional
ModConfig.exe	(ModConfig) Modbus Client Configuration	optional
OnlineMonitor.exe	Online Monitor	standard
Spectrum_Visual.exe	Spectrum Visual	optional
SQLCheck.exe	SQLCheck	standard
unins000.exe	BlueBox Uninstall	standard
UpdateDatabase.exe	UpdateDatabase	standard
USBImport.exe	USBImport	standard
visual_N.exe	VisualN	standard
visual1.exe	Visual1	standard
Additionally: CodeMeter software – Protection software against unauthorized use		standard

You need the USB memory stick from GO Systemelektronik and the dongle stick from GO Systemelektronik. The USB-Dongle and the CodeMeter software together protect the BlueBox PC Software against unauthorized access.

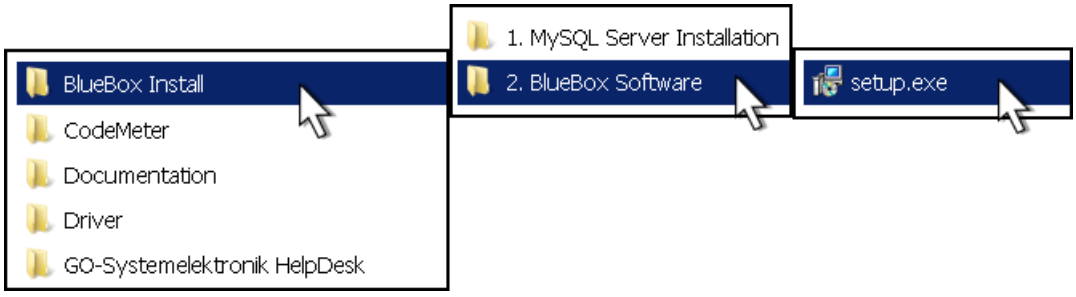
USB memory stick

USB-Dongle

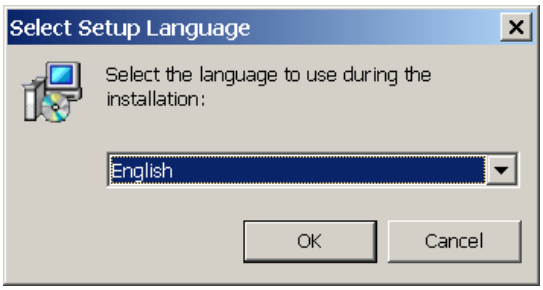
* Standard programs and the most important optional programs

The USB memory stick contains the program data.
To operate the software, you need the USB dongle.
Put the USB memory stick into a USB slot of your PC. Open the USB memory stick.

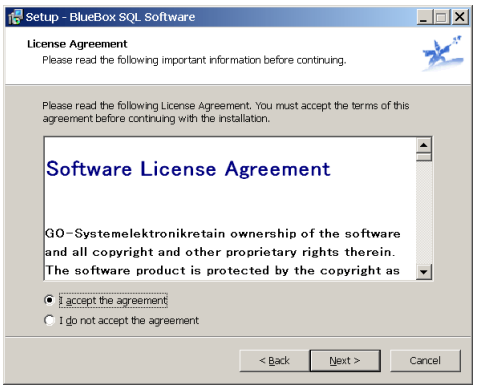
Double-click “setup.exe”.

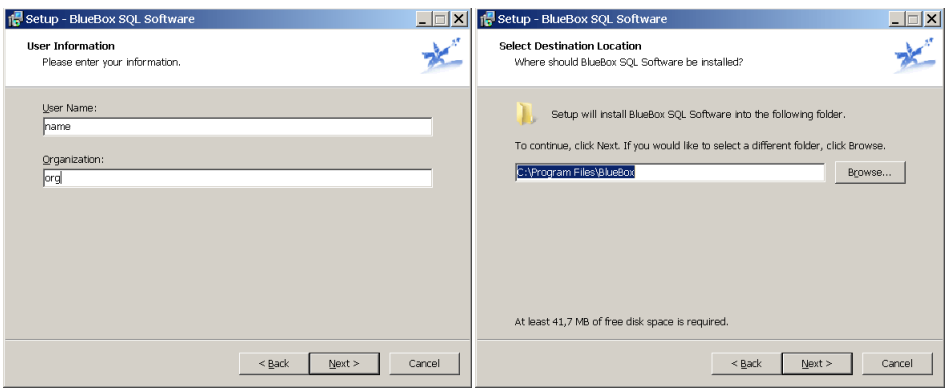


Choose your language.

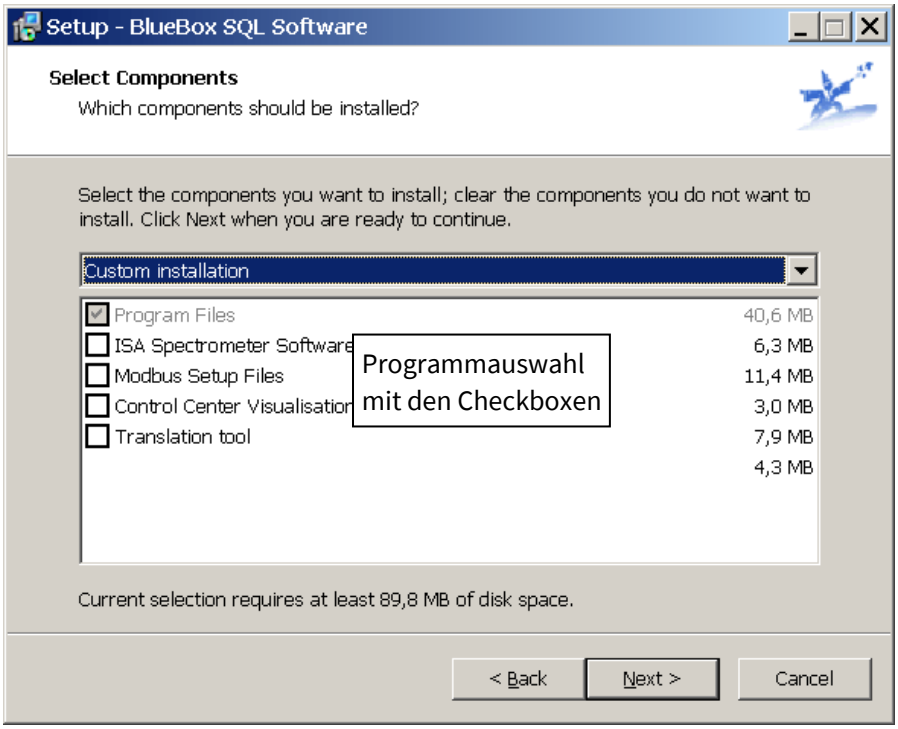


Click <OK >





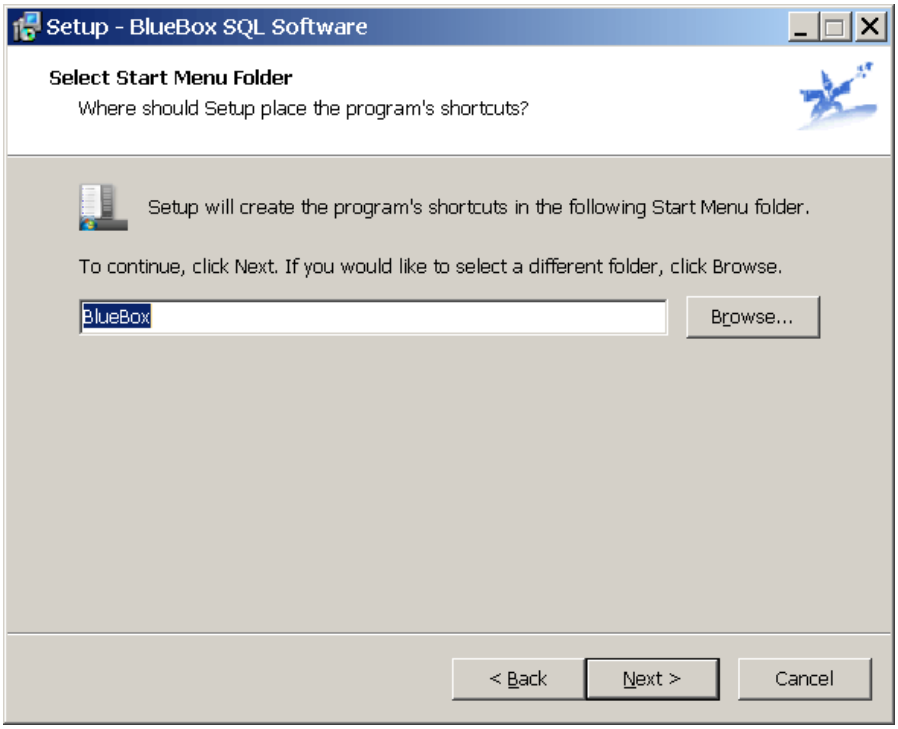
Click on <Next>



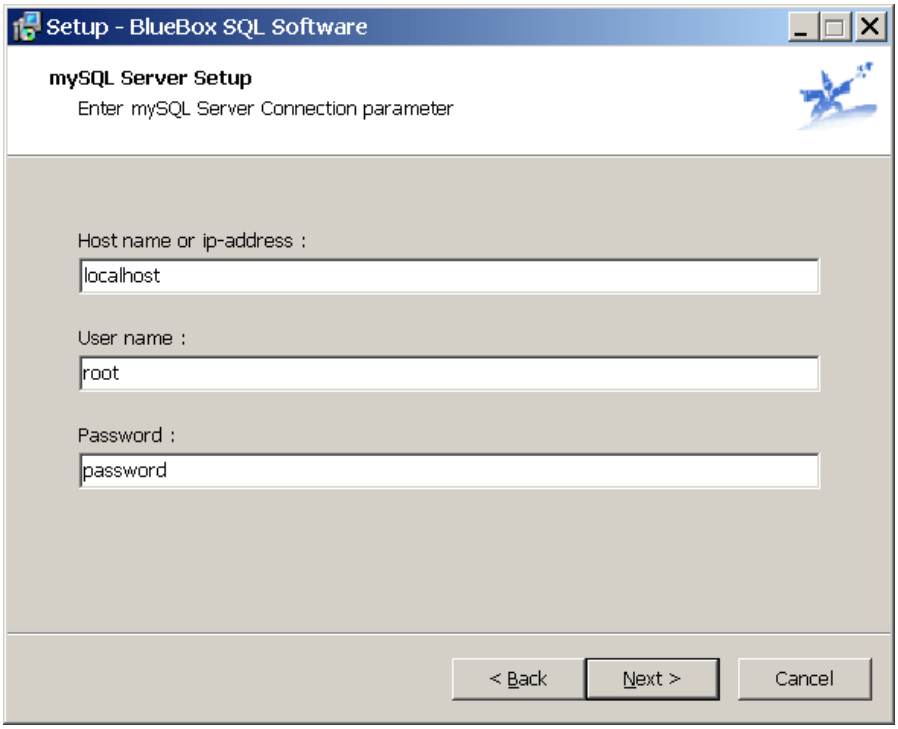
“Program Files” is always activated and installs the BlueBox PC Software. Even if the BlueBox PC Software is already installed, new software versions will be installed.

Select additional programs if desired.

Click on <Next >



Click <Next >

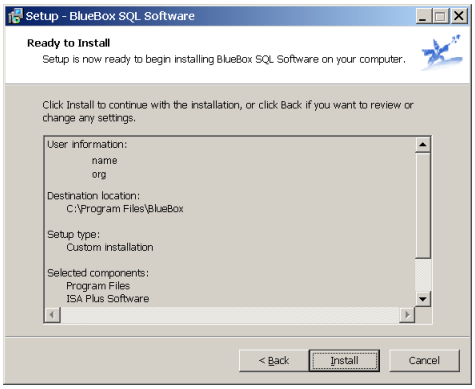


Host name or ip-address: The IP-address of your MySQL™ Server. If the server runs at the present PC you have to enter „localhost“.

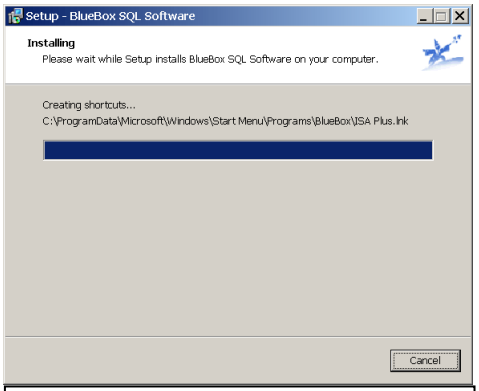
User name: Root name of the MySQL™ Server, here the standard name „root“.

Password: Password of the MySQL™ Server, was assigned during the installation of the server.

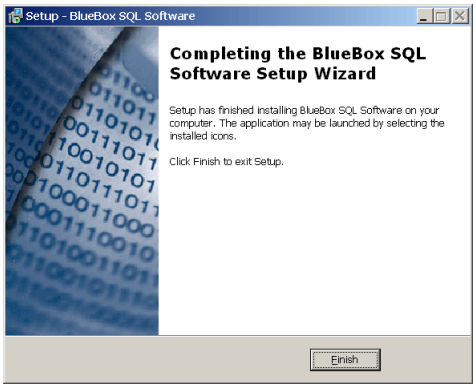
Click <Next >



Click <Install>



If the Codemeter software is not installed on your PC, the Codemeter installer will run now.



Click on <Finish>

The installation is completed.

Before starting the software, put the USB-Dongle into a USB slot of your PC.
The USB-Dongle protects the BlueBox PC Software against unauthorized use.

USB-Dongle

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

	Program Files „C:\Program Files\BlueBox“		Windows 7 start menu
	Config		BlueBox
	Profiles	1	AMS
1	AMS.exe	2	BCDriver
x	BBBackup.exe	3	BlueBox
2	bcdriver.exe	6	ISAData
3	BlueBoxSoft.exe	8	Online Monitor
4	DatabaseTool.exe	9	Spectrum
5	ExportTool.exe	11	Uninstall
6	ISAData.exe	15	Visual1
7	ModConfig.exe	14	VisualN
8	OnlineMonitor.exe		Hilfsprogramme
9	Spectrum_Visual.exe	10	Aktualisiere Datenbank Format
10	SQLCheck.exe	4	DatabaseTool
11	unins000.exe	5	Daten Export
12	UpdateDatabase.exe	7	Modbus Einstellungen
13	USBImport.exe	12	UpdateDatabase
14	visual_N.exe	13	USBImport
15	Visual1.exe		

Hilfsprogramme = Utility

Aktualisiere Datenbank Format = Update database format

Daten Export = Data export

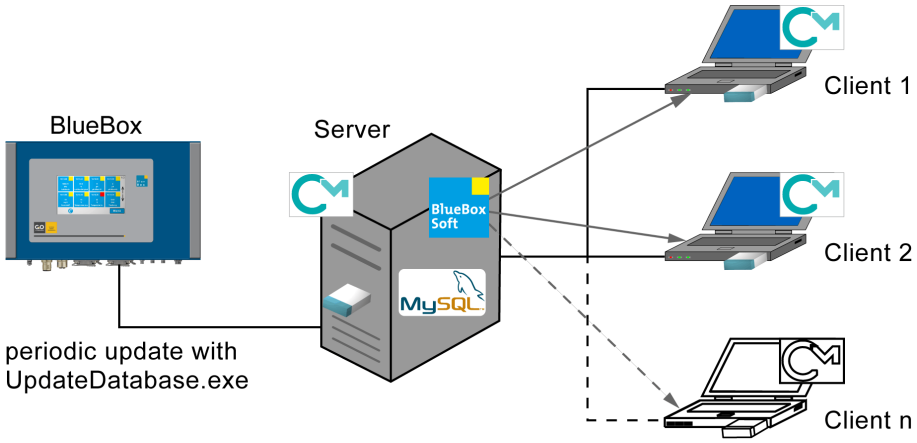
Modbus Einstellungen = Modbus settings

Appendix C – BlueBox PC Software in Server Operation

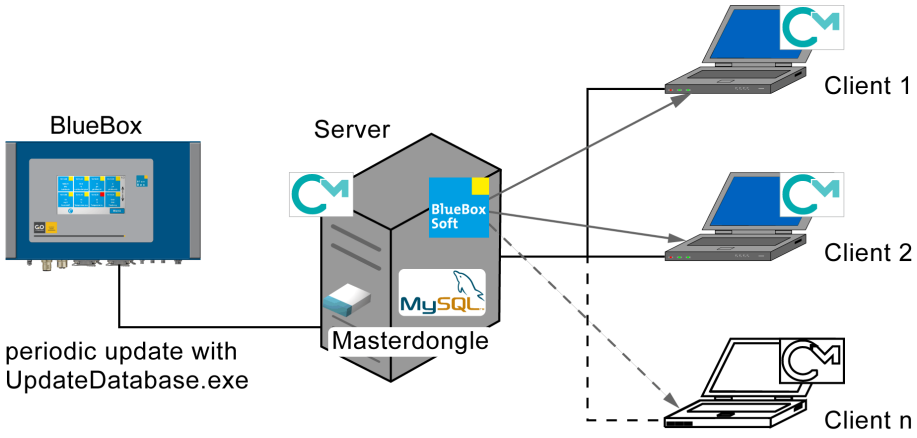
1 Overview

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

1. The server and each client have a dongle, the number of connected clients is unlimited.



2. The server has a masterdongle, the number of connected clients depends on the license.



The MySQL™ Server must be installed on the server.

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

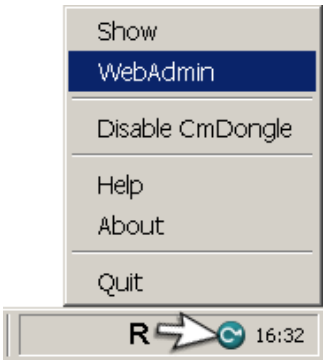
The BlueBox-Software must be installed on the server. It could be installed on each client, generally you apply a link to the BlueBox software at the server.

Note: The periodic update of the SQL database with the data of the BlueBox take place with the program UpdateDatabase.exe.

see *Appendix E – UpdateDatabase: Setup Periodic Database Update*

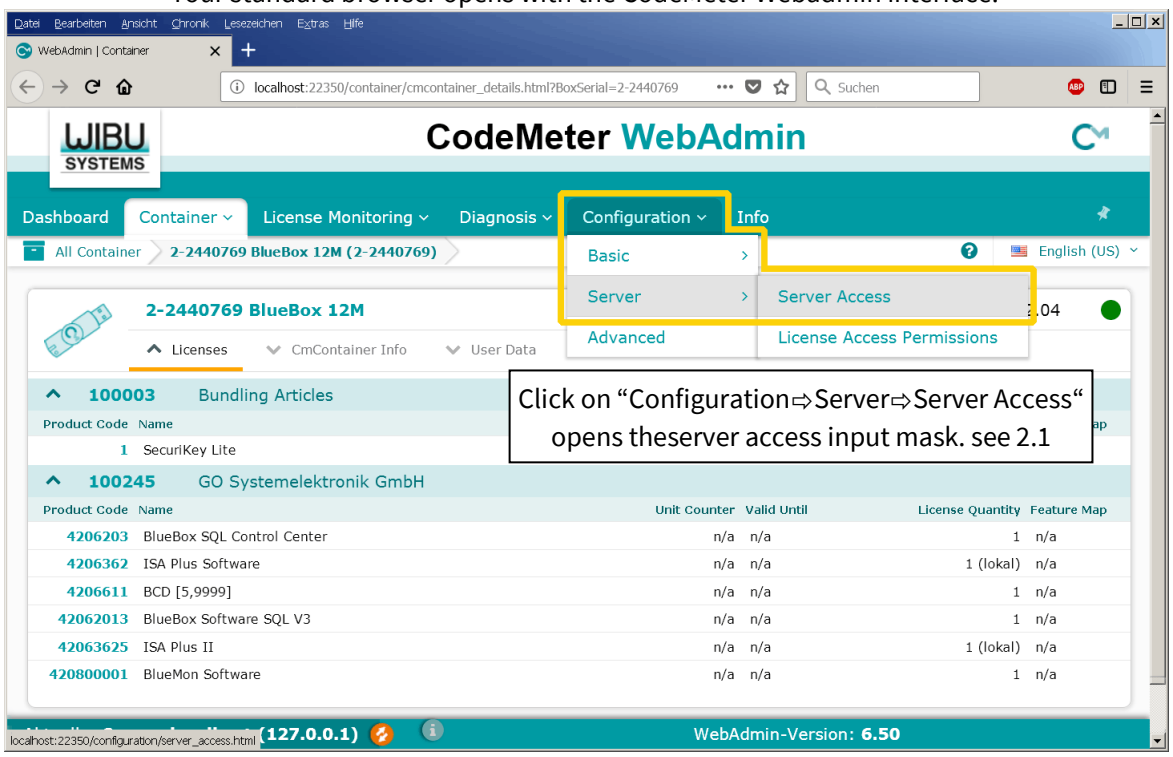
2 CodeMeter software settings for operation with masterdongle

So that the clients can use the masterdongle, the following settings of the CodeMeter Software at the server* have to be done.



Click with the right mouse button on the CodeMeter symbol in the Windows Taskbar.
Click with the left mouse button on the list entry "Webadmin".

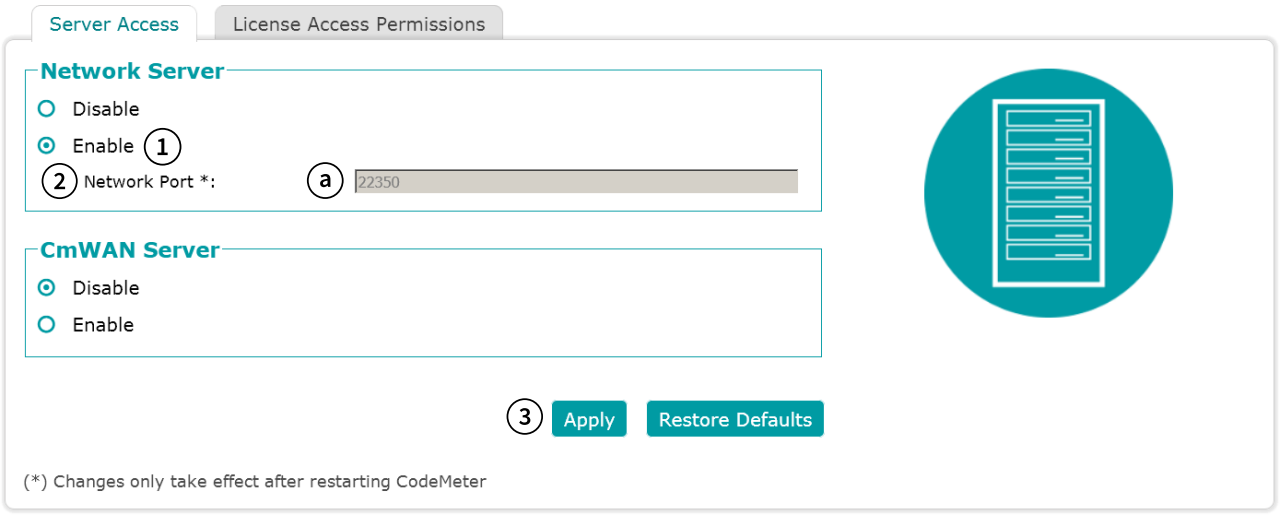
Your standard browser opens with the CodeMeter Webadmin interface.



* Server means here the Codemeter License Server, which runs on the computer with the master dongle. This computer can also be a client in the company network.

2.1 Settings of the CodeMeter Software at the server

Input mask for Server Access:



To activate a CodeMeter Server, please proceed as follows:

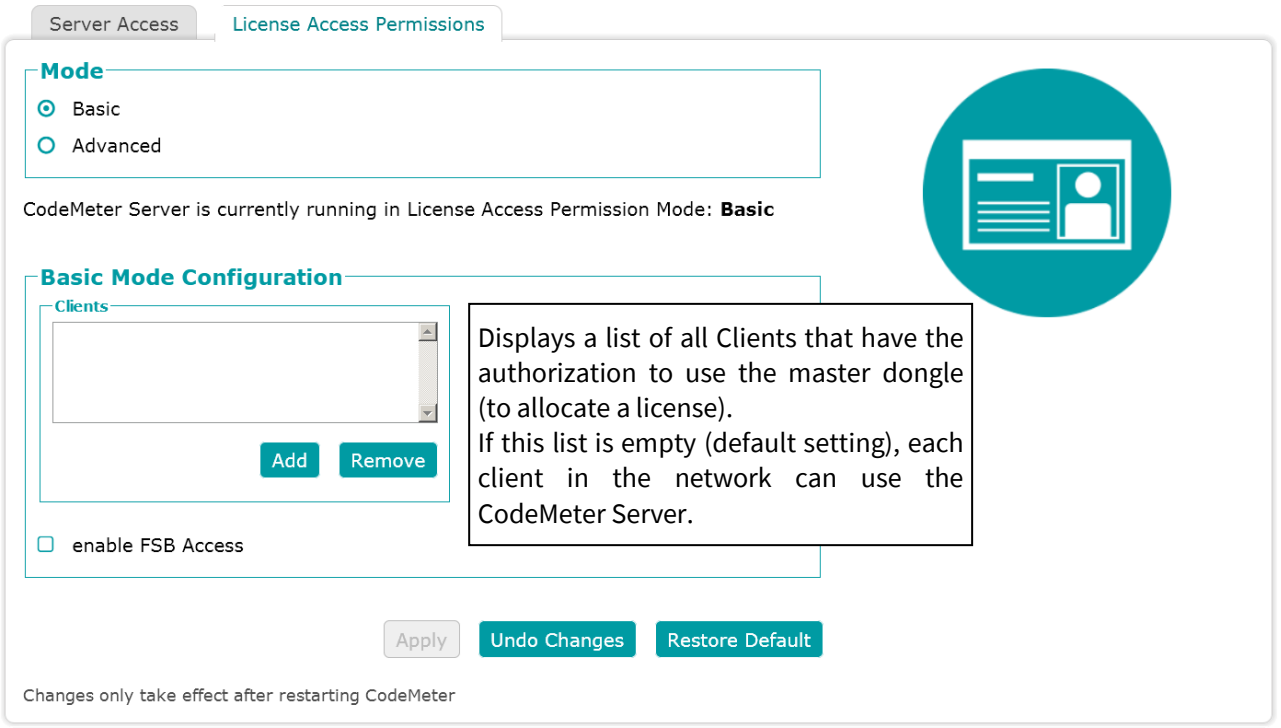
① Click the <**Enable**> radio button.
Then this PC provides its CodeMeter licenses with the service "CodeMeter License Server" on the network.

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.
ⓐ You are able to change the port number under **Configuration⇨Advanced⇨Extra**. However, make sure that all “CodeMeter License Server” services use this port.

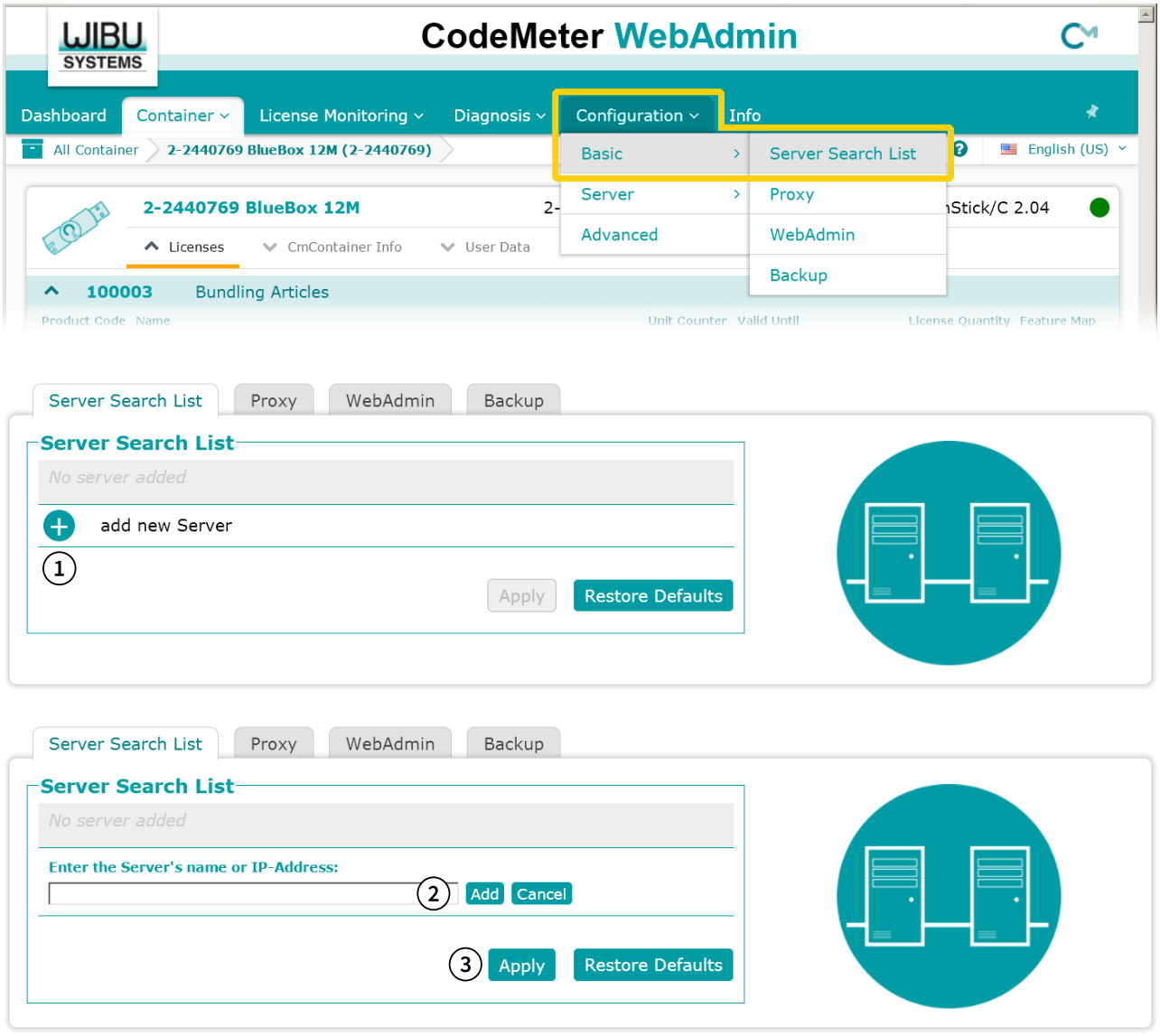
③ Click on <**Apply**> saves the changes.
(Click on <Restore Defaults> restores the default settings.)

2.1.1 Fix 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

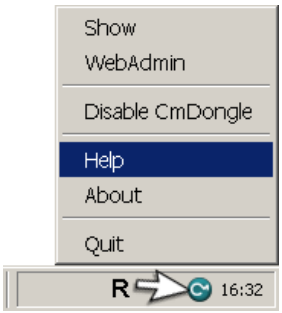


① Click the **Plus Sign**, an input field opens.

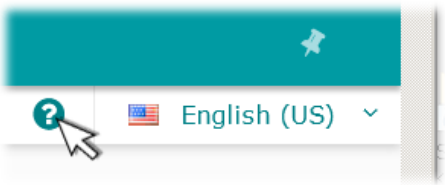
② Enter the computer name or IP address of the server in this field.
Click on <**Add**> to add the server to the server search list.

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

For a complete description of the WebAdmin interface you see at:



Windows Taskbar



WebAdmin Interface

Appendix D - Requesting a Dongle Upgrade for a License Upgrade

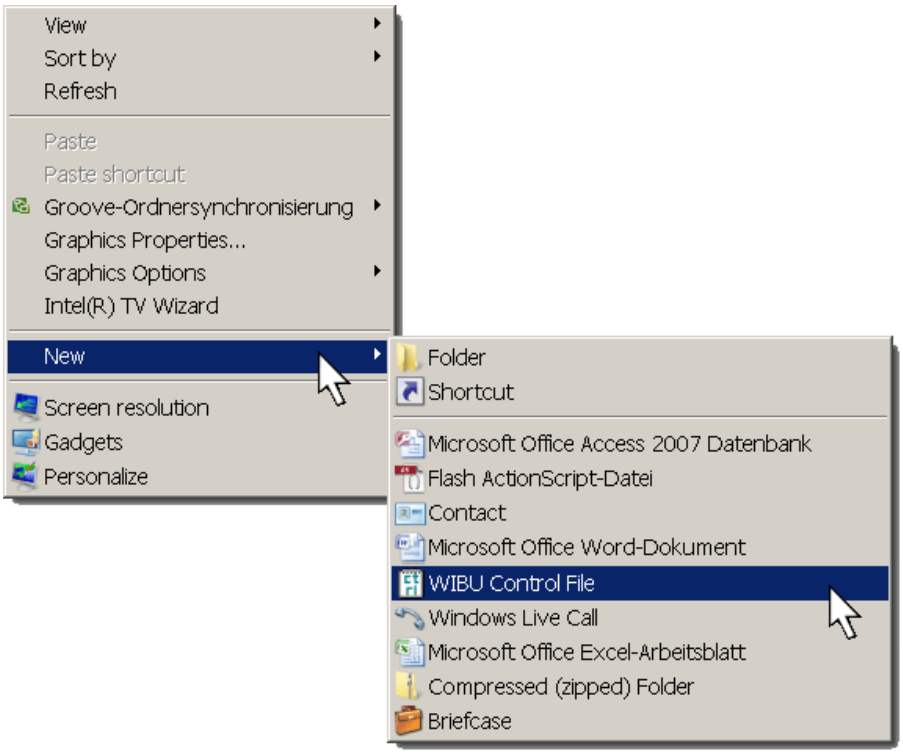
Precondition:

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

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

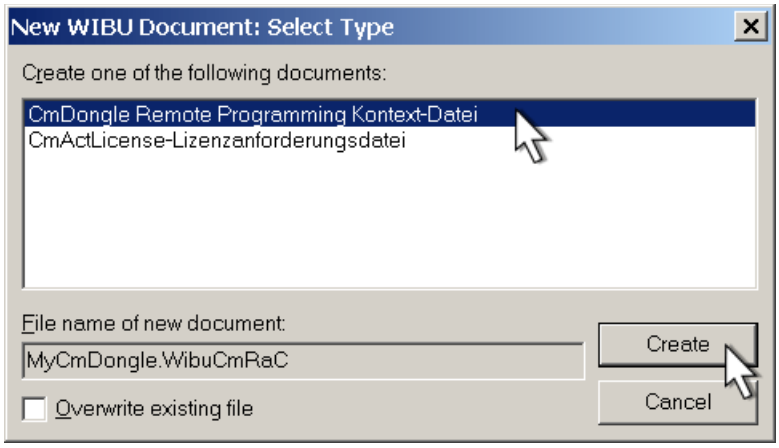
1. Call-up of “WIBU Control File”

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



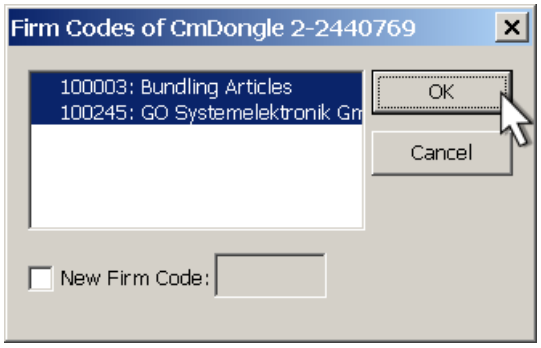
2. Document selection

Select the entry “CM Stick Remote Programming Kontext-Datei”. “CM Stick Remote Programming Kontext-Datei” denotes a license file. Click on “Create”.



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

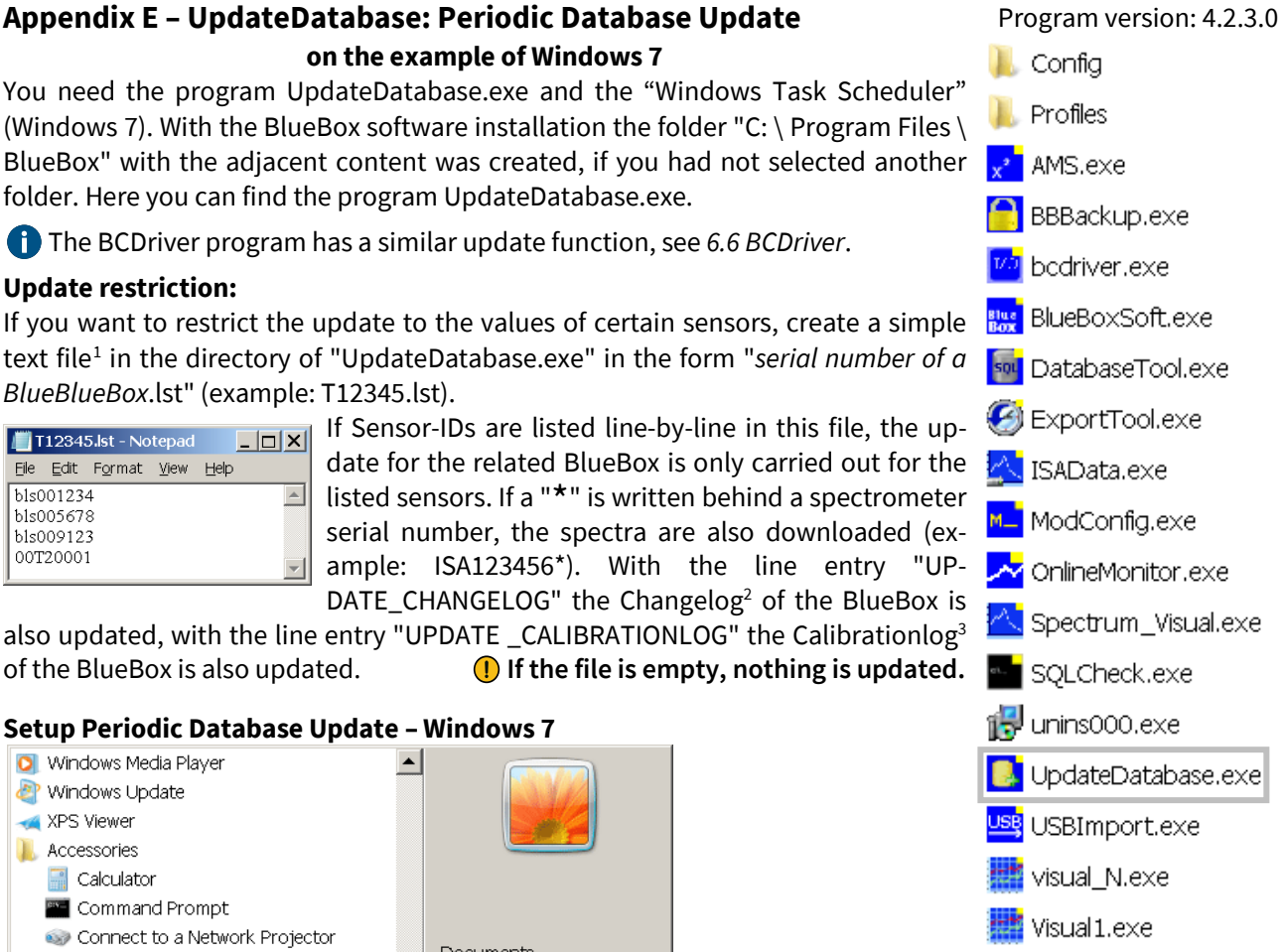
Within short time you will get a new license file back. Open this file with a double-click. The license will be extended automatically.

Appendix E – UpdateDatabase: Periodic Database Update

Program version: 4.2.3.0

on the example of Windows 7

You need the program UpdateDatabase.exe and the “Windows Task Scheduler” (Windows 7). With the BlueBox software installation the folder "C: \ Program Files \ BlueBox" with the adjacent content was created, if you had not selected another folder. Here you can find the program UpdateDatabase.exe.



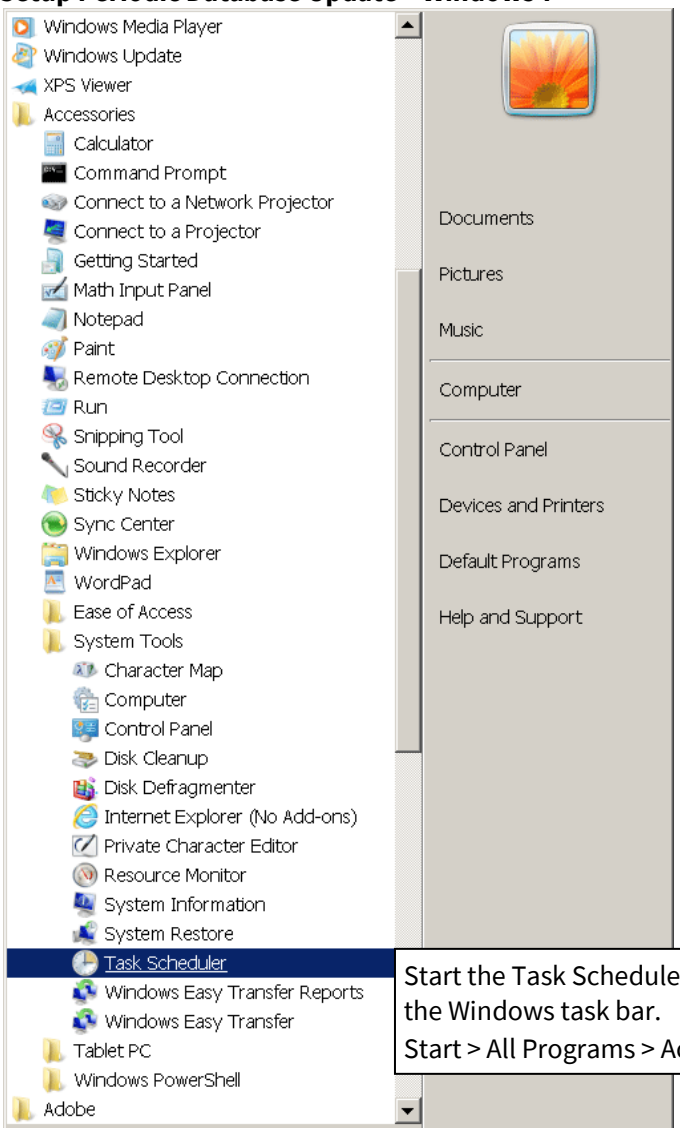
The BCDriver program has a similar update function, see *6.6 BCDriver*.

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 – Windows 7

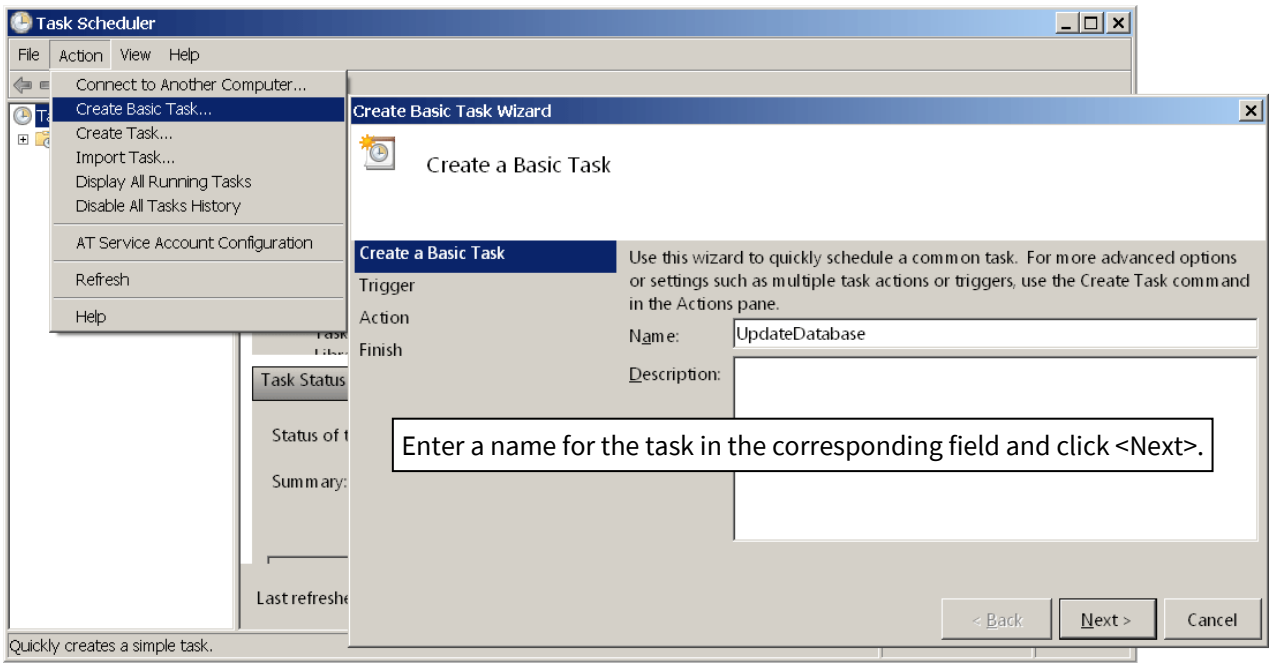


Start the Task Scheduler window with click on the Start button on the Windows task bar.
Start > All Programs > Accessories > System Tools > Task Scheduler

[1] e.g. made with the Windows Notepad text editor

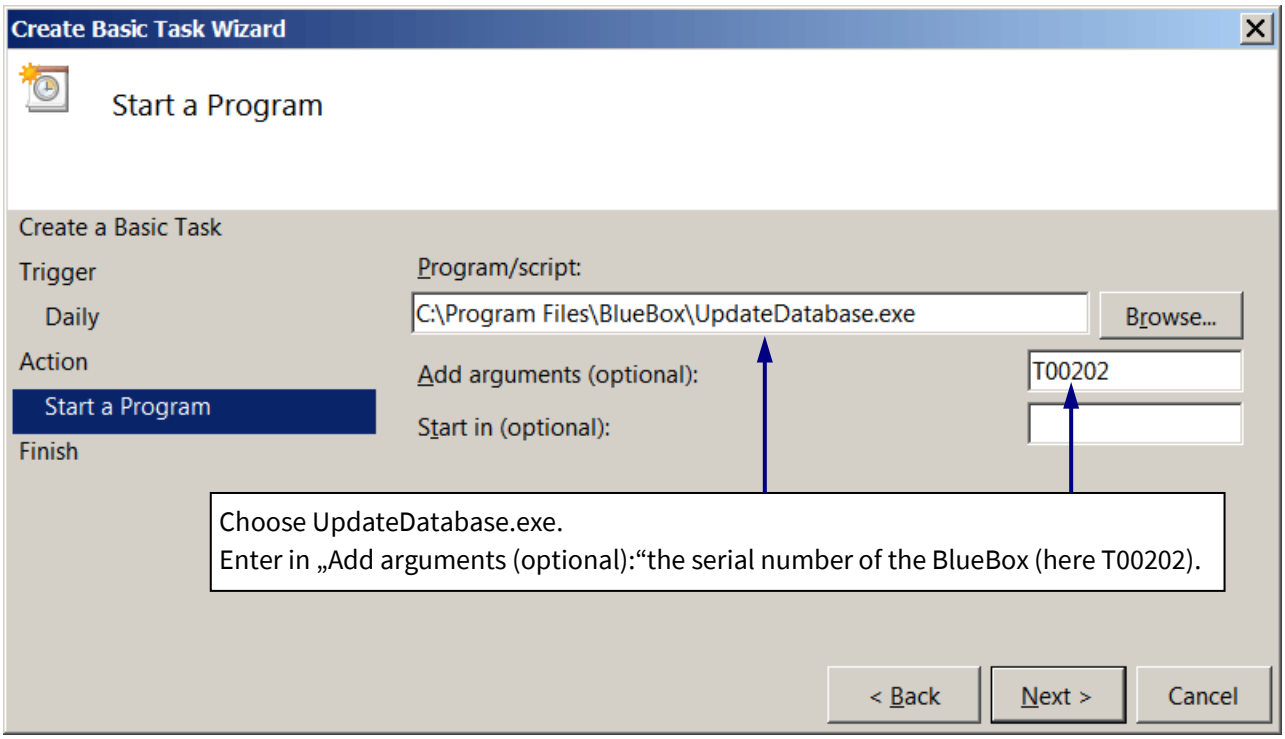
[2] see 3.6 System Information

[3] see 3.5 Sensor Info

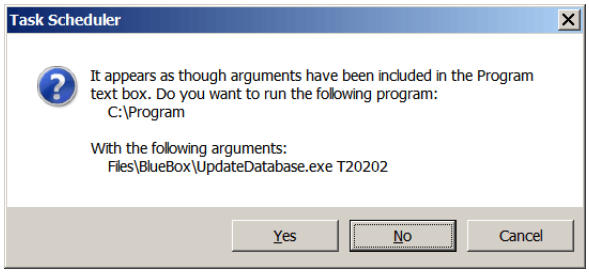


Select in the following two windows as a Trigger (triggering moment) "Daily"
and as an action "Start this program"

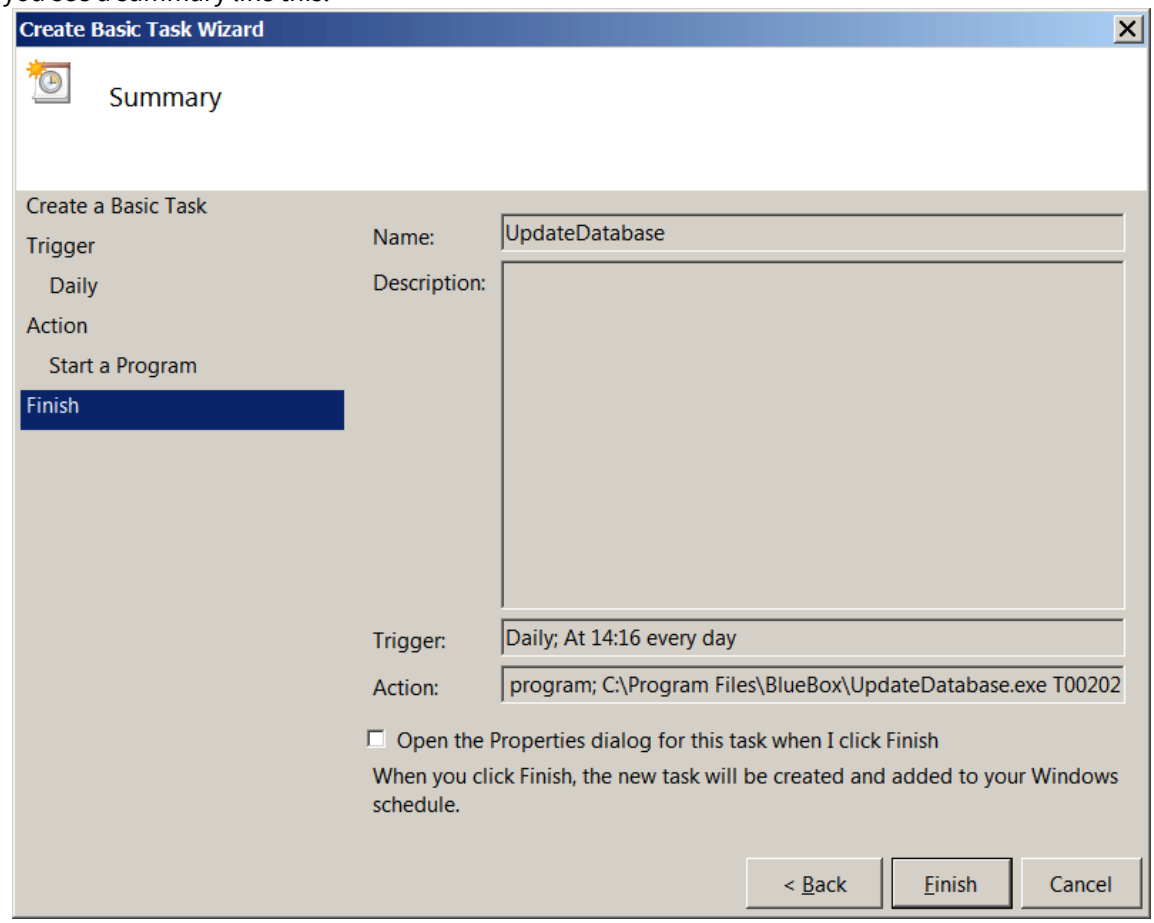
.



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



Then you see a summary like this:



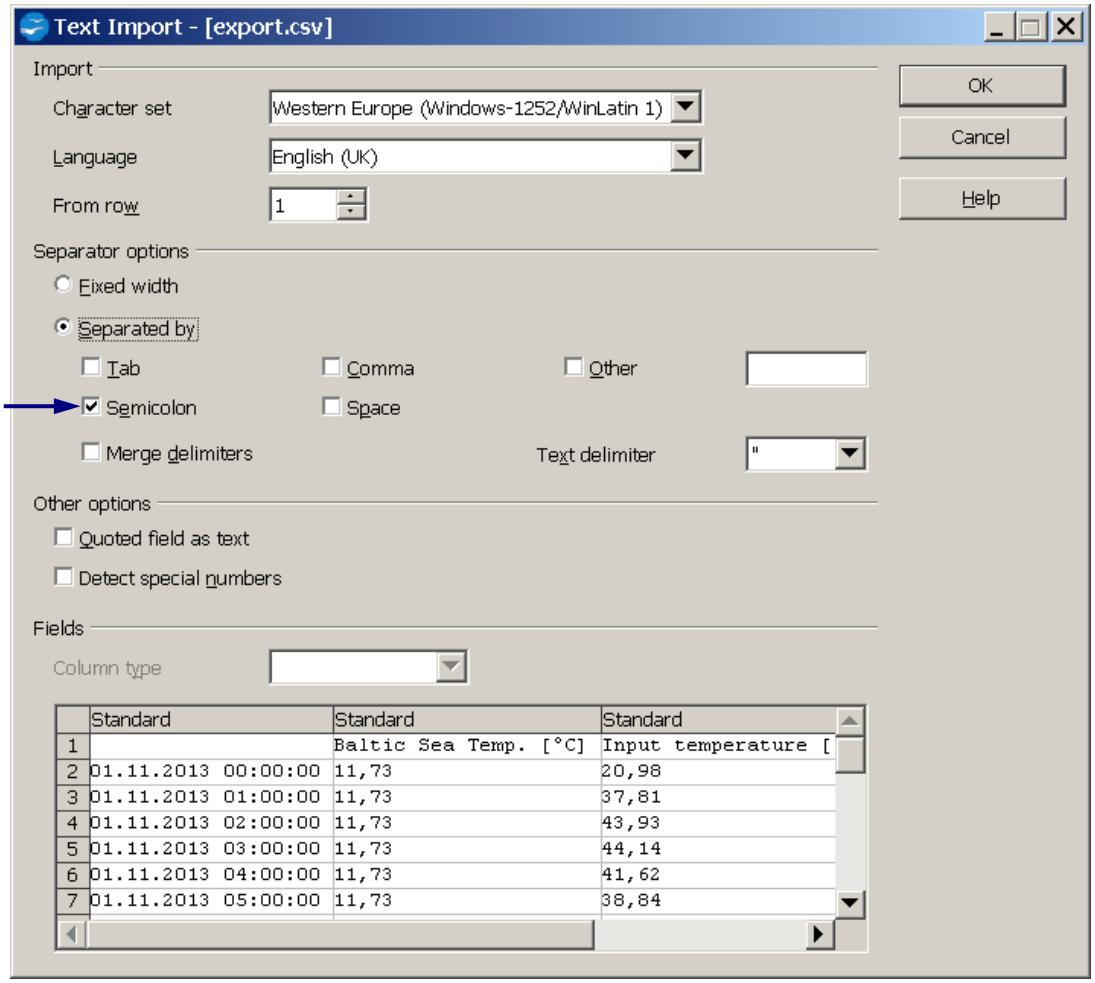
After click on <Finish> the periodic update is established.

Going further, please refer to your Windows documentation.

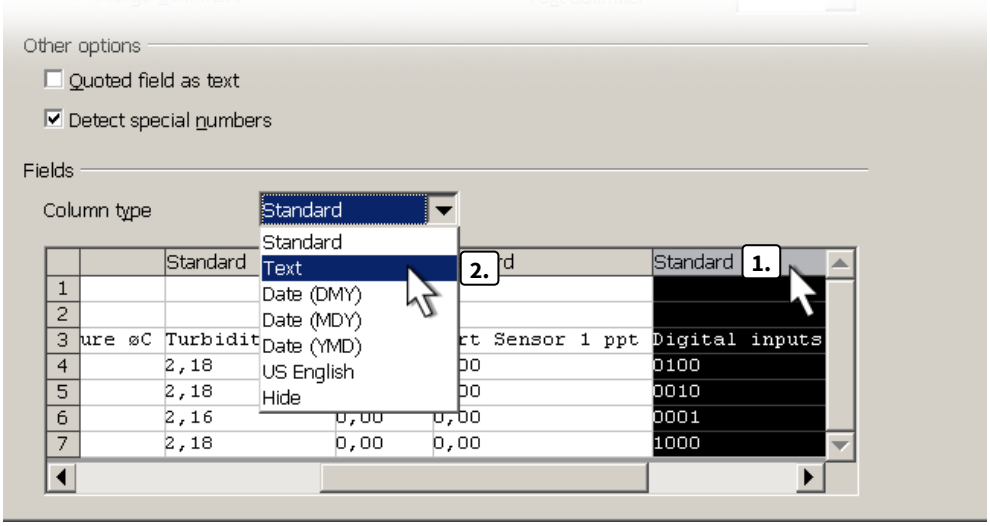
Appendix F – Opening of a csv-File

The data in a csv file 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 of a csv-file with the program Calc from the OpenOffice package.



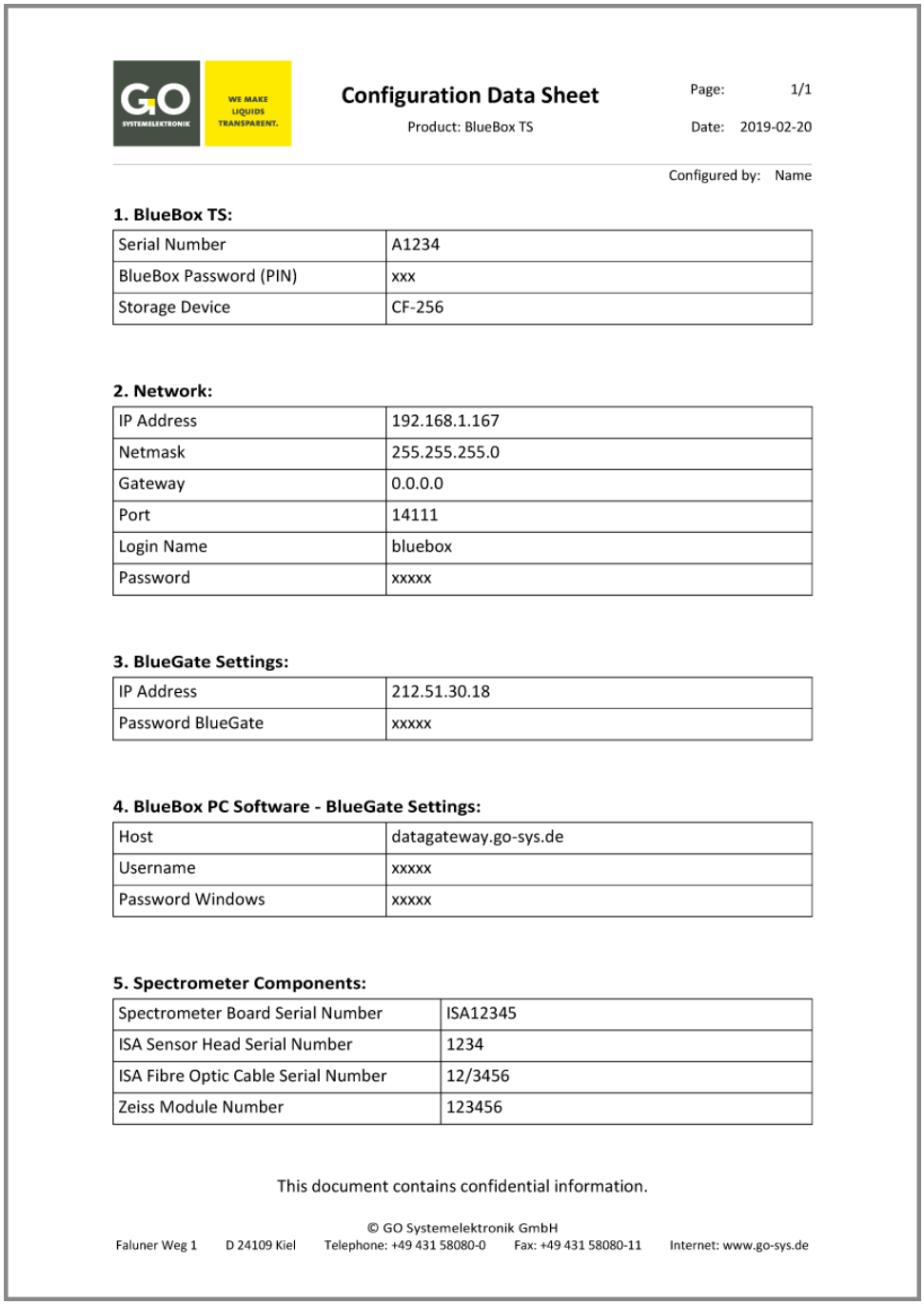
Columns with entries with leading zeros (for example on digital inputs) must be converted when opened in the text format. Otherwise, leading zeros are ignored.



Appendix G – The Configuration Data Sheet

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

Example BlueBox TS *:



Configuration Data Sheet

Product: BlueBox TS

Page: 1/1

Date: 2019-02-20

Configured by: Name

1. BlueBox TS:

Serial Number	A1234
BlueBox Password (PIN)	xxx
Storage Device	CF-256

2. Network:

IP Address	192.168.1.167
Netmask	255.255.255.0
Gateway	0.0.0.0
Port	14111
Login Name	bluebox
Password	xxxxx

3. BlueGate Settings:

IP Address	212.51.30.18
Password BlueGate	xxxxx

4. BlueBox PC Software - BlueGate Settings:

Host	datagateway.go-sys.de
Username	xxxxx
Password Windows	xxxxx

5. Spectrometer Components:

Spectrometer Board Serial Number	ISA12345
ISA Sensor Head Serial Number	1234
ISA Fibre Optic Cable Serial Number	12/3456
Zeiss Module Number	123456

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

* The BlueBox TS is a BlueBox T4 with integrated spectrometer sensor unit.

1. BlueBox TS:

Serial Number	A1234
BlueBox Password (PIN)	xxxxx
Storage Device	CF-256

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 Model and size of the internal memory of the BlueBox, here CF-256 (CF = CompactFlash, 256 = 256 MB)
⇨ set at the factory, changeable by replacing

2. Network:

IP Address	192.168.1.167
Netmask	255.255.255.0
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 Netmask of the BlueBox
⇨ set at the factory, changeable

Gateway Default gateway of the Blue Box
⇨ set at the factory, changeable

Port Network Port of the BlueBox
⇨ 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 needed to access the BlueBox via the AMS software.
⇨ set at the factory, not changeable

* 14111 / or when encryption is enabled 14110

3. BlueGate Settings:

IP Address	212.51.30.18[1]
Password BlueGate	xxxxx

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

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

4. BlueBox PC Software - BlueGate Settings:

Host	datagateway.go-sys.de
Username	xxxxx
Password Windows	xxxxx

If the BlueBox is accessed via a gateway (e.g. a UMTS connection), you have to enter these access data in the BlueBox SQL Software.
see *3.2.2 Setup of a New BlueBox*

Only for a BlueBox with integrated spectrometer sensor unit (BlueBox TS)

5. Spectrometer Components:

Spectrometer Board Serial Number	ISA12345
ISA Sensor Head Serial Number	1234
Fibre Optic Cable Serial Number	12/3456
Zeiss Module Number	123456

ISA Spectrometer Board Serial Number Serial number of the spectrometer board
⇨ set at the factory, not changeable

ISA Sensor Head Serial Number Serial number of the sensor head
⇨ set at the factory, not changeable

Fibre Optic Cable Serial Number Serial number of the sensor head cable
⇨ set at the factory, not changeable

Zeiss Module Number Serial number of the Zeiss spectrometer module
⇨ set at the factory, not changeable

[1] IP-Address of the GO webserver (default address)
[2] changeable only at the default address

Appendix H – List of the AMS Formula Elements

valid from BlueBox firmware version: 3.00.18

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. Sensors	Description
[*Sensor-ID*]	Measurement value of a sensor or status of an actuator
[**!***Sensor-ID*]	Measurement value of a sensor without offset
[*****Sensor-ID*]	Measurement value of a sensor of an other 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**
[*Sensor-ID*.**VAL**]	Measurement value of the sensor without considering the sensor status
[*Sensor-ID*.**TIME**]	GMT time of the day of the last measurement value of this sensor (format hhmmss)
[*Sensor-ID*.**SEC**]	Time in seconds since last measurement value
[*Sensor-ID*.**SQI**]	SQI (Spectral Quality Index)of an application-specific parameter out of spectral data
[*Sensor-ID*.**RSSI**]	Reception power of a radio sensor, 0 to 255

Status	Description
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.
5	Measurement value is under the detection limit.
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 (virtual sensor)
51	Maximal measurement value overrunned (virtual sensor)
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

[*Sensor-ID*.**LQI**]	Reception quality of a radio sensor, 0 to 255
[*Sensor-ID*.**BAT**]	Battery voltage of a radio sensor, 2 V to 3.5 V
ⓘ	Combinations possible, e.g. [!%1.VAL]

3. Reserved words/characters	Description
pi	Number Pi; π
AND or &	Logic operation AND
OR or |	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;

4. 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 degrees to radians
deg(*x***)**	Converts radians to degrees
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 (*Value***,***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

5. Averaging	**Description**
AVG(*N***)**	Current value of averaging with the identification number N (0 to 9999)
AVG(*N***,***b***,[***Sensor-ID***])**	Moving averaging; N = identification number; b = number of averaged measurement values
AVG(*N***,***b***,[***Sensor-ID***],***d***,***e***)**	Moving averaging with outlier suppression; N = identification number; b = number of averaged measurement values; d = average interval (no entry d = 1); e = type of outlier suppression (no entry e = 0) see page 68
	Each identification number N may only be assigned once within a BlueBox.

6. 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
ℹ	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 2 min). After a restart, the controller continues where it left off.

7. Arrays	Description
ARRAY_SIZE(*n***)=***x*	Defines the array size. Array n can take x measurement values (n = 0 to 9) (x = 1 to 10000).
ARRAY_SIZE(*n***,***s***)=***x*	Defines the array size and the storage behaviour Array n (n = 0 to 9) can take x (x = 1 to 10000) measurement values. If s = 1, the array is saved on the BlueBox beyond a restart. * If s = 0, the array is initialized with a restart at 0.
ARRAY(*n***,***x***)**	Query or storage of measurement values in Array n (n = 0 to 9) at position (x= 0 to 9999)
STAT_MEAN(*n***,***x***)**	Arithmetic mean of the first x (x = 1 to 10000) measurement values of array n (n = 0 to 9)
STAT_VARIANCE(*n***,***x***)**	Variance of the first x (x = 1 to 10000) measurement values of array n (n = 0 to 9)
STAT_SD(*n***,***x***)**	Standard deviation of the first x (x = 1 to 10000) measurement values of array n (n = 0 to 9)
STAT_SORT(*n***)**	Sorts the array n (n = 0 to 9) on the size of the value
ℹ	A maximum of 10 arrays may be defined in a BlueBox. Each array may contain a maximum of 10000 values.

8. 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

* Storage interval 2 min

9. 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')

10. Modbus	Description
MODF(*x***)**	Modbus measurement value (float) read or write x >= 0 < 200
MODR(*x***)**	Modbus Register (2-Byte) read or write x >= 0 < 400
MODI(*x***)**	Modbus Integer (4-Byte) read or write x >= 0 < 200
	Can be accessed via Modbus using the commands READ_HOLDING_REGISTER(3), WRITE_SINGLE_REGISTER(6) and WRITE_MULTIPLE_REGISTER

11. 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.

12. 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

13. Hardware BlueBox	Description
$CPU	PC104 CPU temperature
$MAIN	PC104 mainboard temperature
$CURRENT	Current consumption of a BlueBox Power up module
$VOLTAGE	Voltage BlueBox Power up module
$STATE	Switch state BlueBox Power up module
$SHUTDOWN(“*nn*:*nn*“)	BlueBox shutdown and restart, e.g. at 10:30

14. GPS (NMEA 183) Article-No. 380 1000	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)

15. 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)*

16. 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
GPSSEND()	Sends the current GPS position as a network broadcast
GPSSEND(“*a.b.c.d***“)**	Sends the current GPS position to the IP address a.b.c.d

17. System	Description
NOSAVE()	Suppresses saving, sending and printing of measurement values (or values for virtual sensors).
NOSTATUS()	Resets the error status of a formula Warning, error control must be programmed then!
IGNORE()	Suppresses saving, sending, printing and displaying of measurement values (or values for virtual sensors).

18. E-Mail/SMS	Description
MsgText=“*Text***“**	Message text of the e-mail or the SMS, the e-mail/SMS must have a text (max. 150 characters)
PhoneNo=“*Telephone number***“**	International telephone number without 0, the telephone number of GO Systemelektronik would then be 49431580800 Various telephone numbers are separated by a semicolon (max. 90 characters).
PhoneNo=“*n***“**	Exactly one entry n from the telephone number list see *5.3.3.3.1 Telephone Number List*
MailTo=“*Mail address***“**	Mail address = Destination address Various e-mail addresses are separated by a semicolon (max. 90 characters).
MailTo=“*n***“**	Exactly one entry n from 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.
MailAttachment="[LIVE]"	Attachment of the e-mail is a csv-file with the current measurement values of all sensors and actuators which are displayed in the parameter display on the display of the BlueBox (see *Manual BlueBox T4* there *8.2.1.6 Display*).
MailAttachment="[*Sensor-ID***,***n***d** *or* ***n***h]"**	Attachment of the e-mail is a csv-file with the measurement values of the sensor determined with Sensor-ID from the past period determined by nd or nh. nd = n days (n = 1 to 30) or nh = n hours (n = 1 to 24) Multiple selection of sensors possible: "[ID1,nd] [ID2,nh] [ID3,nd]..."

19. User protocol	Description
CUSTOM[*n*]	n-th measurement in the string which has been received from the user protocol 1. Protocol "Space codes" receives the string "14.4 17.5 19:33 20.1". The command CUSTOM [2] would return the value 17.5.
CUSTOM1[*n*]	n-th measurement value which was received via the user log 1
CUSTOM2[*n*]	n-th measurement value which was received via the user log 2
CUSTOM3[*n*]	n-th measurement value which was received via the user log 3

20. ISA	Description
ISA="*CAN-ID***"**	CAN-ID = CAN-ID of a spectrometer 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 of the spectrometer status**

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

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.

Notes on the compatibility of older Spectrometers

The **CAN-ID** of a current spectrometer (external spectrometer module and BlueBox TS) begins with ISA in capital letters, e.g. ISA00001. The **CAN-ID** of an older spectrometer begins with isa in small letters.

ISA0(1)	for older spectrometers: value of the DualBeam photometer
ISA.REFERENCE	for older spectrometers: invalid