

# USER MANUAL

METIS-ANALYZER

AMB8665-AT2 / 2607057283011

VERSION 2.4

DECEMBER 12, 2022

**WÜRTH ELEKTRONIK** MORE THAN YOU EXPECT

\*\*\*\*\*

## **MUST READ**

### **Check for firmware updates**

Before using the product make sure you use the most recent firmware version, data sheet and user manual. This is especially important for Wireless Connectivity products that were not purchased directly from Würth Elektronik eiSos. A firmware update on these respective products may be required.

We strongly recommend to include in the customer system design, the possibility for a firmware update of the product.

## Revision history

Manual version	SW version	Notes	Date
1.0	5.0.0.0	<ul style="list-style-type: none"><li>• Initial version</li></ul>	December 2016
2.0	5.0.0.0	<ul style="list-style-type: none"><li>• New corporate design and structure</li></ul>	November 2018
2.1	5.1.0.0	<ul style="list-style-type: none"><li>• Software tool contains new links to web site and manual</li></ul>	February 2019
2.2	5.2.0.0	<ul style="list-style-type: none"><li>• Added raw data logger function and hop counter column</li><li>• Fixed some errors in the parser</li></ul>	April 2019
2.3	5.2.3.0	<ul style="list-style-type: none"><li>• Updated address of Division Wireless Connectivity &amp; Sensors location</li></ul>	October 2019
2.4	5.2.5.0	<ul style="list-style-type: none"><li>• Updated tool to access new web page of Würth Elektronik eiSos</li><li>• Applied new manual style</li></ul>	December 2022

# Contents

<b>1</b>	<b>Functional description</b>	<b>4</b>
1.1	Ordering information . . . . .	4
<b>2</b>	<b>System requirements</b>	<b>5</b>
2.1	Supported operating systems . . . . .	5
2.2	.NET Framework . . . . .	5
2.3	Hardware requirements . . . . .	5
2.4	Internet connection . . . . .	5
2.5	Windows scaling settings . . . . .	6
2.6	Windows color schemes . . . . .	6
<b>3</b>	<b>Installation</b>	<b>7</b>
3.1	Driver installation for the receiver . . . . .	7
3.2	Software installation . . . . .	7
<b>4</b>	<b>Quick start</b>	<b>8</b>
4.1	Starting the program . . . . .	8
4.2	Connecting to the AMB8665-AT2 dongle . . . . .	9
4.3	Start recording . . . . .	9
4.4	Analysing a telegram . . . . .	10
4.5	Analysing an encrypted telegram . . . . .	11
4.6	Starting the RAW data logger . . . . .	13
<b>5</b>	<b>The user interface</b>	<b>14</b>
5.1	Main menu . . . . .	14
5.1.1	Connect button . . . . .	14
5.1.2	Disconnect button . . . . .	15
5.1.3	Open button . . . . .	15
5.1.4	Export button . . . . .	15
5.1.5	Key button . . . . .	15
5.1.6	RX mode selection . . . . .	16
5.1.7	Start button . . . . .	16
5.1.8	Pause button . . . . .	17
5.1.9	Stop button . . . . .	17
5.1.10	Filter button . . . . .	17
5.1.11	RawDataLogger . . . . .	18
5.1.12	Status . . . . .	18
5.1.13	Advanced button . . . . .	18
5.2	Packet list window . . . . .	18
5.2.1	Right click menu . . . . .	20
5.3	Advanced . . . . .	20
5.3.1	Message window . . . . .	21
5.3.2	wM-BUS Frame interpretation . . . . .	21
5.4	Whitelist, blacklist and AES key list . . . . .	23
5.5	Logfile . . . . .	24
5.6	Data files . . . . .	24

5.7	Manufacturers.txt . . . . .	24
<b>6</b>	<b>Supported Ci fields</b>	<b>25</b>
<b>7</b>	<b>FAQ - Frequently asked questions</b>	<b>26</b>
<b>8</b>	<b>Known issues</b>	<b>28</b>
<b>9</b>	<b>Restrictions</b>	<b>29</b>
<b>10</b>	<b>Important notes</b>	<b>30</b>
10.1	General customer responsibility . . . . .	30
10.2	Customer responsibility related to specific, in particular safety-relevant applications . . . . .	30
10.3	Best care and attention . . . . .	30
10.4	Customer support for product specifications . . . . .	30
10.5	Product improvements . . . . .	31
10.6	Product life cycle . . . . .	31
10.7	Property rights . . . . .	31
10.8	General terms and conditions . . . . .	31
<b>11</b>	<b>Legal notice</b>	<b>32</b>
11.1	Exclusion of liability . . . . .	32
11.2	Suitability in customer applications . . . . .	32
11.3	Trademarks . . . . .	32
11.4	Usage restriction . . . . .	32
<b>12</b>	<b>License terms</b>	<b>34</b>
12.1	Limited license . . . . .	34
12.2	Usage and obligations . . . . .	34
12.3	Ownership . . . . .	35
12.4	Firmware update(s) . . . . .	35
12.5	Disclaimer of warranty . . . . .	35
12.6	Limitation of liability . . . . .	36
12.7	Applicable law and jurisdiction . . . . .	36
12.8	Severability clause . . . . .	36
12.9	Miscellaneous . . . . .	36

# 1 Functional description

The **Wireless M-BUS Analyzer** is a tool for receiving and analyzing wireless M-Bus telegrams that comply with EN 13757-4:2013 transmitted by devices with role "meter" or "other". It supports both unencrypted and encrypted telegrams (supported encryption modes are: 0, 5, 7) in accordance with the OMS specification Vol2 V4.1.0 (draft June 2016) and EN13757-3:2013.

The data records in the telegrams are displayed in plain text by means of the integrated parser, which greatly simplifies the interpretation of a telegram. A review of the configuration settings or, for example, the meter readings can therefore be completed simply.

The **Wireless M-BUS Analyzer** is an excellent tool for analyzing errors and RF range of M-Bus devices. Thanks to the simplified representation and an integrated logging function, data can also be analyzed at a later time.

The software only works in combination with a licensed AMB8665-AT2 USB dongle. This USB dongle acts as the receiver for telegrams from the meters and supports the S-, T- and C-mode.

## 1.1 Ordering information

WE order code	Former order code	Description
2607057283011	AMB8665-AT2	868 MHz wM-BUS Analyzer with USB dongle

## 2 System requirements

Please check if your local system matches the Wireless M-BUS Analyzer's requirements.

### 2.1 Supported operating systems

The following operating systems are supported:

- Microsoft Windows 10, 32/64 bit
- Microsoft Windows 8, 8.1, 32/64 bit



Due to security and compatibility reasons older Microsoft Windows versions are not recommended and supported.

### 2.2 .NET Framework

Version 4.6.1 or newer of the Microsoft .NET Framework is required to use Wireless M-BUS Analyzer. Install this package if not yet installed on your system before starting the tool.

A download can be achieved through Microsoft Windows Update, Windows Features or with the offline packages from Microsoft. Please make sure you also install security patches available through Microsoft Windows Update for .NET frameworks.

### 2.3 Hardware requirements

- A minimum monitor resolution of 1360\*768 pixel is required. We recommend using a display with at least 1920\*1080 pixel for good user experience.
- We recommend using at least a state of the art quad core CPU and at least 8GB of RAM for good user experience.
- Enough storage for the tool (25 MB) and the filters, key lists, log and data files that will be created when using this tool.

### 2.4 Internet connection

You will need internet access if you want to search online for new software versions, firmware or driver versions for your device.



You must eventually configure your firewall and proxy settings to ensure internet access for the Wireless M-BUS Analyzer.

## **2.5 Windows scaling settings**

The selection of 100% scaling in Microsoft Windows is required. Different settings can result in inaccessible control elements.

## **2.6 Windows color schemes**

We recommend using the Microsoft Windows default color scheme to ensure the best user experience. Modified color schemes may result in unreadability of the tool's functions.



## 3 Installation

### 3.1 Driver installation for the receiver

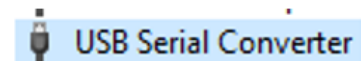
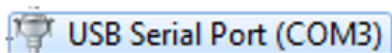
This step can be ignored if the most recent FTDI drivers have already been installed on the computer.

If not, the latest Virtual COM port (VCP) driver can be downloaded from the FTDI website ([www.ftdichip.com](http://www.ftdichip.com) → Drivers → VCP Drivers) and installed.



We recommend using the "setup executable" package which makes the installation automatically. Detailed install instructions are provided by FTDI.

After the installation please restart your PC (without connected AT2 dongle) also if there is no explicit restart request from the driver installation routine. After the reboot you may insert the AT2 USB dongle into a free USB port.



This will lead to one "USB Serial Port" device and one "USB Serial Converter" (naming may differ due to Windows language packs) which will be shown in the device manager. Each connected FTDI device will create an instance of these two devices in the device manager. If you update the drivers manually make sure both devices are updated.



Windows 7 has known issues with the USB Location IDs when using USB 3.0 ports. So if you have Windows 7 installed on your PC make sure you are using USB 2.0 ports and the only FTDI device connected to your PC is the AMB8665-AT2 dongle to avoid any problems.

### 3.2 Software installation

Simply extract the files out of the downloaded zip file to a location on your hard disk where you have full read/write access. This directory will contain all required files and folders as well as the associated documentation and licenses. It must be accessible (full access) by any user which is about to use this software.

## 4 Quick start



This chapter assumes that an AMB8665-AT2 USB dongle is connected to your PC and accessible as a virtual COM port and the FTDI driver is up-to-date.



You must not remove the AMB8665-AT2 USB dongle while the software is opened! Any other software must not block the COM port of the AT2 USB dongle.



To avoid problems accessing the virtual COM ports it is recommended to have the AMB8665-AT2 as the only FTDI device connected to your PC.

### 4.1 Starting the program

To start the program, double-click the application. You may also create a shortcut on your desktop. The application will then be displayed as shown in Figure 1. Your anti virus scanner may pop up with a warning because the analyzer needs internet access for updates.

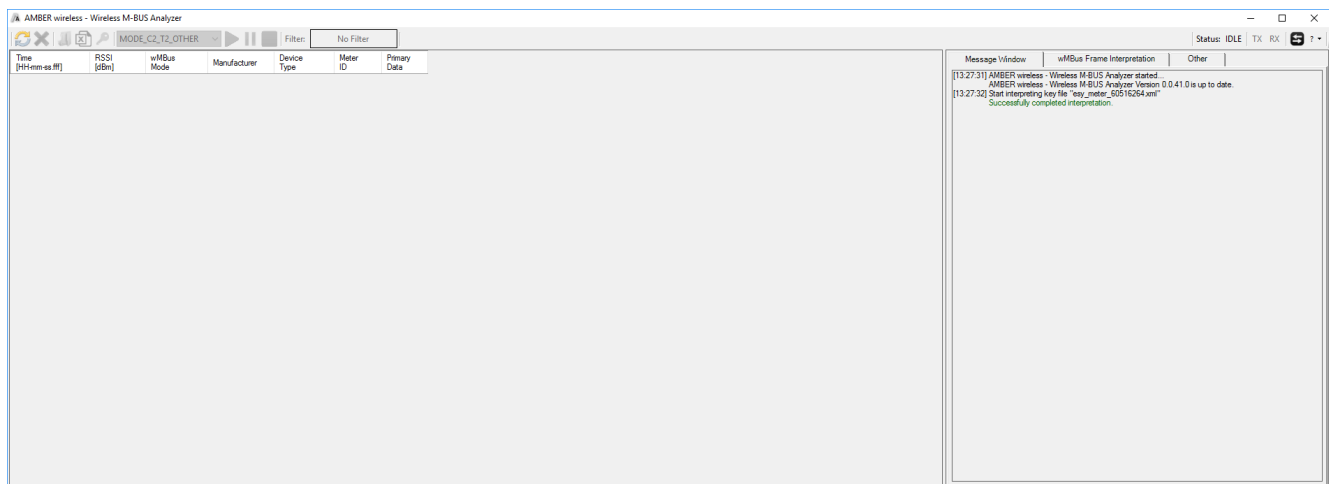


Figure 1: Wireless M-BUS Analyzer, Main window



When starting the Wireless M-BUS Analyzer the key list, whitelist and blacklist of the last usage are loaded. To use the filter feature, it has to be enabled again.

## 4.2 Connecting to the AMB8665-AT2 dongle

Before any action can be performed the Wireless M-BUS Analyzer has to be connected to the AMB8665-AT2 stick. To do so, click on the connect button.



The software searches for all connected FTDI-devices and checks their function and serial number. If a compatible devices (i.e. AMB8665-AT2) has been found, the functions of the Wireless M-BUS Analyzer are ready to use. In case of success a message is printed in the Message Window.

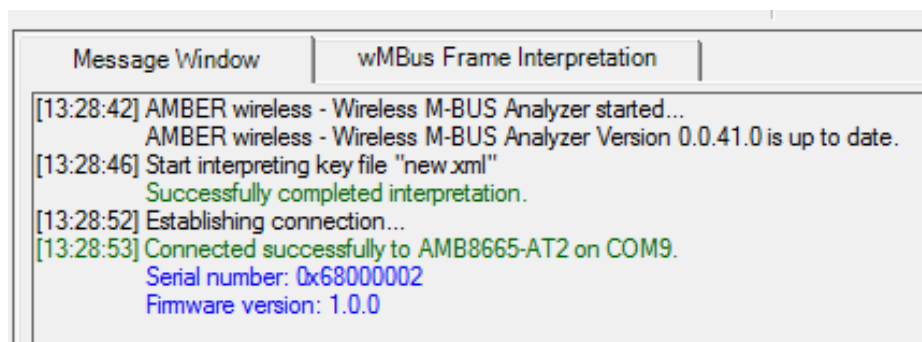


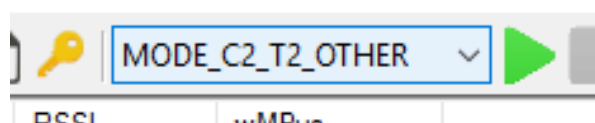
Figure 2: Success image after successful connection establishment

Now all functions of the Wireless M-BUS Analyzer are enabled.

## 4.3 Start recording

After successful connection to the AMB8665-AT2 USB dongle, please select the desired wM-BUS receive mode in the dropdown menu first.

Let us assume you want to receive a meter that sends in T-Mode, then the analyzer's default selection of **MODE\_C2\_T2\_OTHER** is just fine for receiving.



Now press the Play button to start recording and see the status field in the tooltip menu. It shows Status: ON instead of Status: IDLE.



Now any received frame that complies with EN13757-3 and -4 will be shown in the Packet List window.

## 4.4 Analysing a telegram

For this example let us assume the wM-BUS frame is not encrypted. Once you received any frames they will be shown in the Packet List window. Green frames will indicate unencrypted frames or frames that have been successfully decrypted before.

A telegram can be selected by clicking it in the Packet List window. All detailed information for the selected packet is then shown in the wMBUS Frame Interpretation window on the right side. Here you can view the parsed information of the selected telegram if it was parsed without errors.

Time [HH-mm-ss.fff]	RSSI [dBm]	wMBus Mode	Manufacturer	Device Type	Meter ID	Primary Data
15-11-25.703	-76	MODE_T2_OTHER	AMB	Room_sensor	26000106	239 *10 <sup>-1</sup> °C external temperatur
15-16-09.794	-65	MODE_T2_OTHER	AMB	Water	54000100	5.08.2016 09:00 normal time valid date (Type F/I/J)
15-16-32.733	-77	MODE_T2_OTHER	AMB	Room_sensor	26000106	241 *10 <sup>-1</sup> °C external temperatur

Figure 3: Part of the Packet List window

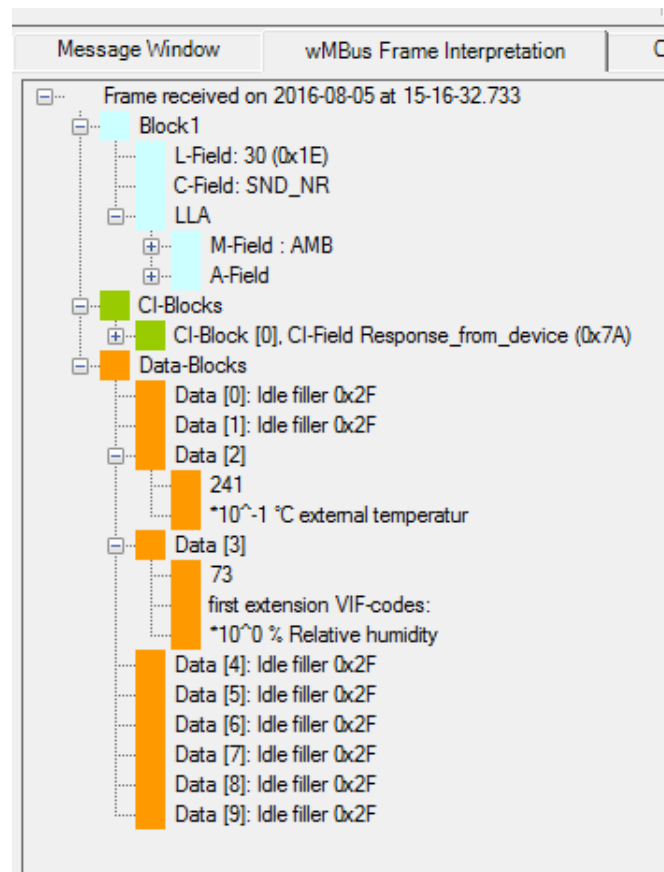


Figure 4: Display of detailed information on the selected telegram. View of Block 1, the Ci-Block(s) and data record header with parsed data

## 4.5 Analysing an encrypted telegram

Besides the approach of the unencrypted frame in the previous chapter you need to register the correct key so the software can decrypt and parse the frame.

N1.1	-65	MODE_T2_OTHER	ELS	Gas	12345678	2850427 *10 <sup>-2</sup> m³ volume
N1.1	-76	MODE_T2_OTHER	ELS	Gas	12345678	

As an example let us refer to OMS Vol2 Annex N chapter N1.1. Here we get the information that the AES Key of the Mode 5 encryption is as follows:

0x 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 11 (Note: hexadecimal notation)

Select the corresponding frame and choose Add AES Key option of the right-click menu.

Time [HH-mm-ss.fff]	RSSI [dBm]	wMBus Mode	Manufacturer	Device Type	Meter ID	Primary Data
N1.1	-65	MODE_T2_OTHER	ELS	Gas	12345678	2850427 *10 <sup>-2</sup> m³ volume
N1.1	-76	MODE_T2_OTHER	ELS	Gas	12345678	2850427 *10 <sup>-2</sup> m³ volume
N1.3	-65	MODE_T2_OTHER	ELS	Gas	12345678	2850427 *10 <sup>-2</sup> m³ volume
N1.3	-88	MODE_T2_OTHER	ELS	Gas	12345678	2850427 *10 <sup>-2</sup> m³ volume

Add to Whitelist  
Add to Blacklist  
Add AES Key

Add the AES key in the following form. The box Enter AES Key (hex) shall now contain the key as given by the meter manufacturer.

Enter AES Key (hex)

0x 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 11

Add to Whitelist  
Add to Blacklist  
Add to Key List

Now click Add to Key List. The tool will then prompt you to create a new AES key file (if an existing file is selected the content of this file will be discarded).

Select Save after entering a valid file name. This will then create a new file and store the key. Further the window is closed and the normal view is back again. If the correct key was entered the orange line will turn into green and the frame is decrypted and parsed.

N1.1	-65	MODE_T2_OTHER	ELS	Gas	12345678	2850427 *10 <sup>-2</sup> m³ volume
N1.1	-76	MODE_T2_OTHER	ELS	Gas	12345678	2850427 *10 <sup>-2</sup> m³ volume

Now, you can inspect the detailed frame information in the wMBus Frame Interpretation after selecting the corresponding line in the Packet List window.

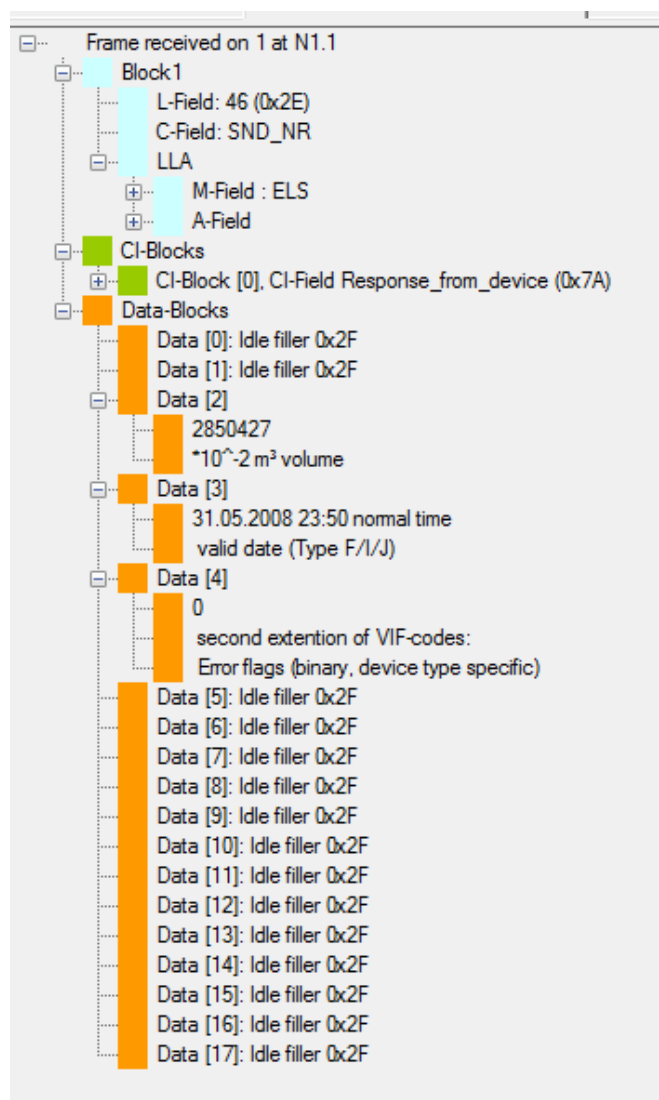


Figure 5: Interpretation of the example N1.1

## 4.6 Starting the RAW data logger

This option allows you to just record any received frame into a file. The parser will be disabled in this operation mode. To enable the raw data logger you must stop the recording in normal mode and then press the raw data logger button. Then you can start the recording. After recording, the recorded data can be loaded into the software tool for data analysis.

## 5 The user interface

Once the program has been started, a dialog application window appears.

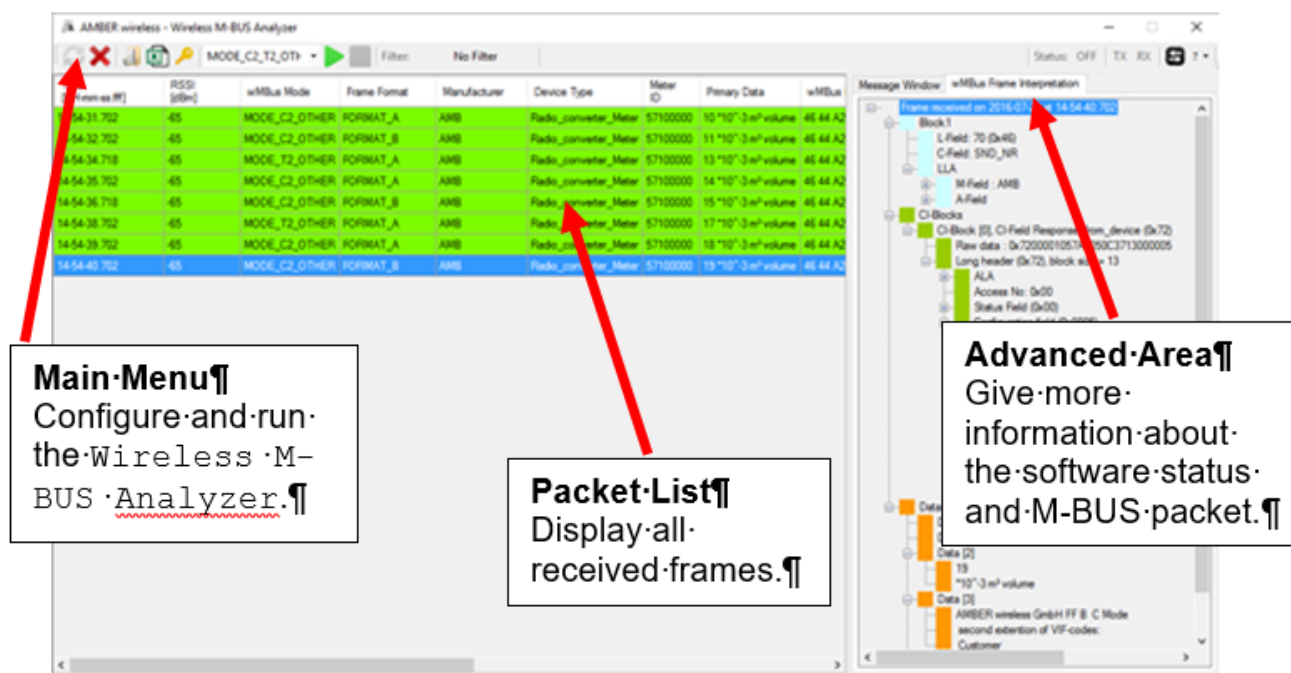


Figure 6: Wireless M-BUS Analyzer

### 5.1 Main menu

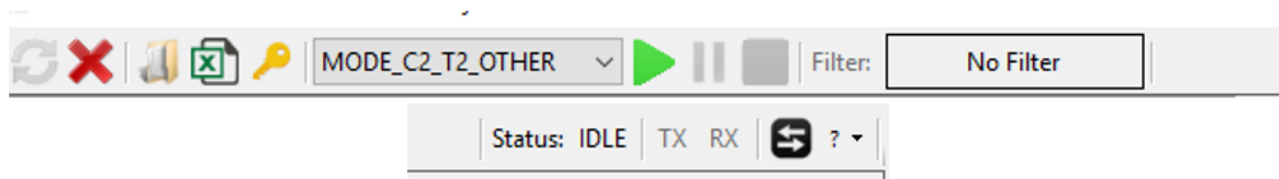


Figure 7: Main Menu

The menu bar at the top of the application screen is used to control the program. A description of the individual menu entries will be provided below.

#### 5.1.1 Connect button





The "**Connect**"-button connects the Wireless M-BUS Analyzer with the corresponding AMB8665-AT2 stick.

To do so, the tool searches for all connected FTDI-devices and checks their function and serial number. If a compatible devices has been found, the functions of the Wireless M-BUS Analyzer are ready to use.

### 5.1.2 Disconnect button



The "**Disconnect**"-button closes the open connection.

### 5.1.3 Open button



The "**Open**"-button reads previously received wM-BUS frame from a data file.

When the Wireless M-BUS Analyzer is connected to an AMB8665-AT2 stick and in RX mode, all received wM-BUS frames are stored in data files that can be found in the DATA-folder next to the Wireless M-BUS Analyzer program executable.

If the Wireless M-BUS Analyzer is idle mode, all previously received wM-BUS frames can be reloaded using this button.

### 5.1.4 Export button



The "**Export**"-button exports the received wM-BUS frames into an .xlsx-file

This button is only enabled in idle mode. (Status : IDLE)

### 5.1.5 Key button



The "**Key**"-button opens the menu to edit the whitelist, blacklist and the AES key list.

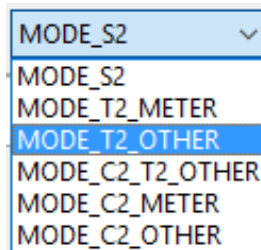
For more information about the handling of the whitelist, blacklist or the AES key list, please refer to chapter 5.4

### 5.1.6 RX mode selection



The "**RXmode**"-dropdown box allows to select a mode for the reception of wM-BUS frames.

This box is only enabled in idle mode. Here all available wM-BUS modes can be chosen. Please make sure you select the correct wireless M-BUS mode for receiving.



wM-BUS mode Sender	AMB8665-AT2 Receiver	Direction, Role
S1-m	MODE_S2	Meter → Other
S2	MODE_S2	Meter → Other
T1-meter, T2-meter	MODE_C2_T2_OTHER	Meter → Other
C1-meter, C2-meter	MODE_C2_T2_OTHER	Meter → Other
S2	MODE_S2	Other → Meter
C2-other	MODE_C2_METER	Other → Meter
T2-other	MODE_T2_METER MODE_S2	Other → Meter

Table 1: Selection of all available wM-BUS modes

### 5.1.7 Start button



If connected, the "**Start**"-button starts the reception of wM-BUS frames in the chosen mode.

The "Start" button is only enabled if the module is connected to the corresponding AMB8665-AT2 stick and the status is `Status:IDLE`. After pressing this button, the module is in RX mode and the wM-BUS frames can be received, the status changes to `Status:ON`. This button is only available in `Status:IDLE` mode.

### 5.1.8 Pause button



If connected and started, the "**Pause**"-button stops the reception of wM-BUS frames in the chosen mode. The "**Start**" button can then be used to proceed receiving.

Status will be changed to `Status:IDLE` and no frames can be received from the AMB8665-AT2 stick. This button is only available in `Status:ON` mode.

### 5.1.9 Stop button



The "**Stop**"-button stops the reception of wM-BUS frames and sets the Wireless M-BUS Analyzer in idle mode. Using the "Stop" button will clear the recorded frames upon restart using the "Start" button.

Status will be changed to `Status:IDLE` and no frames can be received from the AT2 USB dongle. This button is only available in `Status:ON` mode.

### 5.1.10 Filter button



The "**Filter**"-button allows to enable a whitelist and/or blacklist filtering.

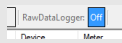
This button is only enabled / changeable in idle mode (`Status:IDLE`). The following filter modes are available and will be toggled with each click:

- let all frames pass (No Filter)
- let only frames pass that are part of the whitelist (Whitelist only)
- let only frames pass that are not part of the blacklist (Blacklist only)
- let only frames pass that are part of the whitelist and not part of the blacklist (Blacklist and Whitelist)

Make sure you have loaded the corresponding files when selecting a white or blacklist option. A whitelist with empty content will mean that the program will never show any frame in the `Packet List` window.

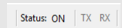
How to load or modify the whitelist or blacklist, we refer to chapter 5.4.

### 5.1.11 RawDataLogger



The "**RawDataLogger**"-button allows to enable or disable the RAW data logging function when the recording is not active.

### 5.1.12 Status



The "**Status**"-bar indicates the current status and the reception/transmission of a telegram.

The status bar consists of three parts:

- The status part indicates whether the USB-stick is in RX mode (ON) or not in RX mode (IDLE, OFF).
- The RX part quickly flashes when the stick has received a frame.
- The TX part has no function in this program version.

### 5.1.13 Advanced button



The "**Advanced**"-button shows/hides the advanced part of the Wireless M-BUS Analyzer.

The advanced button allows to hide the advanced part of the Wireless M-BUS Analyzer. In doing so, there is more space to display the data in the `Packet List` window.

## 5.2 Packet list window

ff]	RSSI [dBm]	wMBus Mode	Manufacturer	Device	Meter	...
	-65	MODE_T2_OTHER	ELS			
	-76	MODE_T2_OTHER	ELS			
	-65	MODE_T2_OTHER	ELS			
	-88	MODE_T2_OTHER	ELS			
	-65	MODE_T2_OTHER	ELS			
	-88	MODE_T2_OTHER	ELS			
	-65	MODE_T2_OTHER	QDS	Heat_Co		
	-88	MODE_T2_OTHER	QDS	Heat_Co		
	-65	MODE_T2_OTHER	ELS			
	-88	MODE_T2_OTHER	ELS			
	-65	MODE_T2_OTHER	TCH	Heat_Co		
	-88	MODE_T2_OTHER	TCH	Heat_Co		
	-91	MODE_T2_OTHER	MEH	Heat_Co		
	-83	MODE_T2_OTHER	AMB	Ele		
	-86	MODE_T2_OTHER				

Error Code  
Date [yyyy-MM-dd]  
☒ Time [HH-mm-ss.fff]  
☒ RSSI [dBm]  
☒ wMBus Mode  
Frame Format  
L-Field  
C-Field  
Address Type  
☒ Manufacturer  
☒ Device Type  
☒ Meter ID  
Encryption Mode  
☒ Primary Data  
wMBus Frame [hex]

Figure 8: Packet List window

All received telegrams are displayed in the Packet List window. The packets are classified using different colours.

Basic colour	Description
Orange	An encrypted telegram for which no key is available or the key is incorrect. Please insert the corresponding key or load the corresponding key list file.
Red	A packet which causes a parser error. Refer to the Error Code for detailed information.
Green	An unencrypted telegram or a telegram for which the correct key is available.



Non OMS conform telegrams may show wrong or invalid values in this window which may lead to errors while parsing. All manufacturer specific contents or blocks cannot be interpreted by the parser.



Please feel free to contact us if a frame caused a parser error. This will help us improving our software. Use the contact support link in the help menu and please append the raw data of the frame that is causing problems with the parser.

The information displayed here can be used to clearly identify a meter (manufacturer, ID, version, device type). All columns of this window can be hidden by right-clicking on the table

header and selecting/deselecting the respective column name ( see figure 9).

When the last row is selected, the window automatically scrolls down when new frames are received.

### 5.2.1 Right click menu

Time [HH-mm-ss.fff]	RSSI [dBm]	wMBus Mode	Manufacturer	Device Type	Meter ID	Primary D
V1.1	-65	MODE_T2_OTHER	ELS	Gas	12345678	2850427 *
V1.1	-76	MODE_T2_OTHER	ELS	Gas	12345678	
V1.3	-65	MODE_T2_OTHER	ELS	Gas	12345678	2850427 *
V1.3	-88	MODE_T2_OTHER	ELS	Gas	12345678	
V1.4	-65	MODE_T2_OTHER	ELS			27 *
V1.4	-88	MODE_T2_OTHER	ELS			
V3.3	-65	MODE_T2_OTHER	QDS	He		Unit
V3.3	-88	MODE_T2_OTHER	QDS	He		
V4	-65	MODE_T2_OTHER	ELS			sec
V4	-88	MODE_T2_OTHER	ELS			
V6	-65	MODE_T2_OTHER	TCH	Heat_Cost_Allocator	12345678	12345 Un
V6	-88	MODE_T2_OTHER	TCH	Heat_Cost_Allocator	12345678	
	-91	MODE_T2_OTHER	MEH	Heat_Cost_Allocator	00089240	
	-83	MODE_T2_OTHER	AMB	Electricity	12345678	100 *10^2
Invalid device type	-86	MODE_T2_OTHER				

Add to Whitelist  
Add to Blacklist  
Add AES Key  
Jump to last Telegram  
Copy to Clipboard  
Clear

Figure 9: Entering the AES key

The right click menu provides the following options:

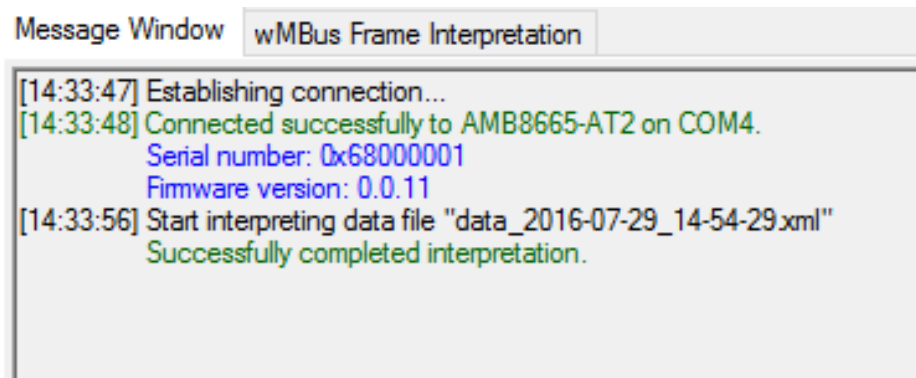
- Clear, this option will delete the entire table and the packet buffer of the software.
- Copy to Clipboard, this option will copy the content of the selected cell to the clipboard.
- Jump to last Telegram, this option will select the last row. When the last row is selected, the window automatically scrolls down when new frames are received.
- The Add to Whitelist option will open the menu to add the meter address of the currently selected packet to the whitelist (see chapter 5.4).
- The Add to Blacklist option will open the menu to add the meter address of the currently selected packet to the blacklist (see chapter 5.4).
- The Add AES Key option will open the menu to add the meter address of the currently selected packet to the AES key list (see chapter 5.4).

## 5.3 Advanced

The advanced area consists of the following parts.

- The Message Window that shows the content of the log file.
- The wM-Bus Frame Interpretation window that shows the data of the interpreted wM-BUS frame.

### 5.3.1 Message window



The Message Window displays all messages from the Wireless M-BUS Analyzer, such as successful connection feedback, errors and others.

### 5.3.2 wM-BUS Frame interpretation

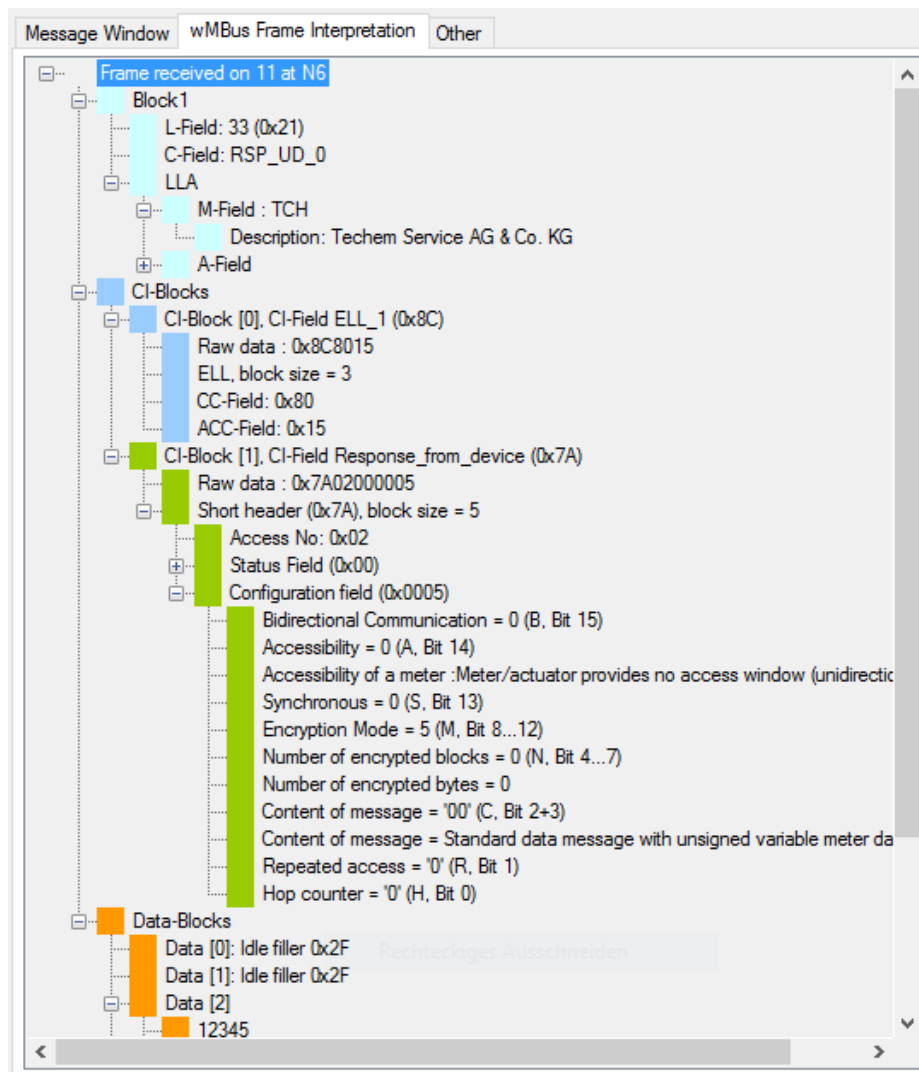


Figure 10: wM-BUS Frame Interpretation window

Once a telegram has been selected in the Packet List window, all available items of parsed information can be viewed in this window. The individual records can only be displayed for decrypted or non-encrypted telegrams. The content of the wM-BUS Frame Interpretation is linked to the currently marked element in the Packet List window.



In case of non OMS/NTA compliant telegrams the parser will not work and cannot show any "parsed Data". The same holds for frames that contain "manufacturer specific content".

For better visualization, the single blocks of the wM-BUS frame are coloured respective to the OMS specification documents (See OMS Vol2 Annex N). Please note that the encryption verification is shown in orange as it is interpreted by the data block parser. The OMS and EN13757 usually count this two bytes into the Transport Layer, not into the Application Layer.



## 5.4 Whitelist, blacklist and AES key list



When starting the wireless M-BUS Analyzer the key list, whitelist and blacklist of the last usage are loaded. To use the filter feature, it has to be enabled again.

To open the window to load or modify the whitelist, blacklist or AES key list press the Key button:



If data of a received frame shall be entered in a specific list, this menu can also be called by right-clicking onto the received frame in the Packet List window.

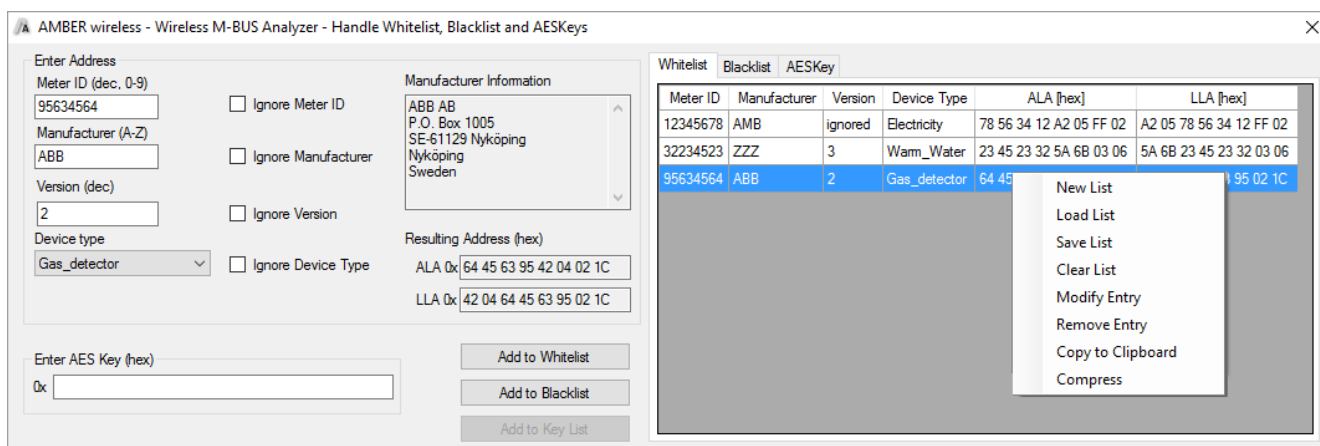


Figure 11: Window to handle the whitelist, blacklist and AES key list

To add an entry to a specific list, fill the data into the form in the left side and press the respective button. The buttons are only enabled when the entered data is valid.

If a ignore box is checked, the Add to Key List button is always disabled.

When pressing the corresponding add-button and if no file was created before, the Wireless M-BUS Analyzer asks for a filename to store the entered data on your computer.

Besides of this the tabs on the right side allow for list modification. To do so, select the respective tab on the right side and right-click to get the following options:

- **New List:** Create a new empty list and save it on your computer.
- **Save List:** If you have created a list in this editor it can be saved to a file. Be aware: Selecting an already existing filename will erase the content of the previous file.

- **Load List:** Load an existing list from a file that is already saved on your computer. Please note that the list has to be created by the Wireless M-BUS Analyzer before. Please note further that the file loaded has to have the right format, which means that when loading a file as whitelist, the file has to be in whitelist file format. Otherwise the loaded file is ignored.
- **Clear List:** If you have created a list in this editor it can be emptied.
- **Modify Entry:** The content of the selected entry is copied to the left window, such that it can be modified.
- **Remove Entry:** The content of the selected entry is removed from the list.
- **Copy to Clipboard:** The content of the selected cell is copied to the clipboard.
- **Compress:** Double entries are removed.

If the list of AES keys has been modified, all received frames in the **Packet List** window will be reparsed after the window was closed.

If the whitelist or blacklist have been modified, the new list will take effect only to new received frames. Thus all frames that have been received before are not touched.

## 5.5 Logfile

The log files will contain the content of the **Message Window** in form of a .txt file. Those files reside in the **LOG** subfolder.

With each new record session a new log file will be created. The log file contains all important information in case of a support case.

## 5.6 Data files

The data files will contain the recorded messages (after filtering) in form of a file in .xml format. Those files reside in the **DATA** subfolder.

Each new record session will create a new data file with the first received frame. For long record sessions a new file will be automatically created each 1500 messages.

Data files can be loaded into the **Wireless M-BUS Analyzer** for offline purposes using the **Open** button (see chapter 5.1.3).

Data files are automatically generated and read. Do not edit or change these files, do not create your own files.

## 5.7 Manufacturers.txt

This list represents the manufacturer coding as given by the DLMS. The DLMS will update its content aperiodically. The file can be found in the same folder as the executable of the **Wireless M-BUS Analyzer** and must not be modified by the user. Updates for this list are to be downloaded from the DLMS homepage "Flag Manufacturers ID".

## 6 Supported Ci fields

The following table contains the supported Ci-Fields. Unsupported Ci-Fields will not be parsed further, once it was detected.

Ci-Field value (hex)	Description	Supported since software version
0x50	Application Reset or Select, meter to other, no header	5.0.0.0
0x53	Application Reset or Select, meter to other, no header	5.0.0.0
0x54	Request of selected application, meter to other, no header	5.0.0.0
0x55	Command, meter to other, long header	5.0.0.0
0x5A	Command, meter to other, short header	5.0.0.0
0x5B	Command, meter to other, long header	5.0.0.0
0x66	Response of selected application, other to meter, no header	5.0.0.0
0x67	Response of selected application, other to meter, short header	5.0.0.0
0x68	Response of selected application, other to meter, long header	5.0.0.0
0x72	Response, other to meter, long header	5.0.0.0
0x7A	Response from device short header	5.0.0.0
0x8C	ELL I	5.0.0.0
0x8D	ELL II	5.0.0.0
0x8E	ELL III	5.0.0.0
0x8F	ELL IV	5.0.0.0
0x90	AFL, note only AFL with AFL.FCL.MF == '0' and AFL.FCL.FID == 0x0 are currently supported. All reserved fields of AFL and subfields must be implemented according to OMS 4.1.0 draft JUNE 2016	5.0.0.0



OMS Vol2 V4.0.2 does not support compact frames (and neither will V4.1.0). Therefore the full subset of "Compact Frames" is currently not supported (namely Ci=0x69, 0x6a, 0x6b and Ci=0x79, 0x7b, compact frames and format frames).

## 7 FAQ - Frequently asked questions

### **I have an AMB8465-M / AMB8465-AT / AMB8665-M / AMB8665-AT USB dongle. How can I use the new Wireless M-BUS Analyzer?**

AMB8465-M / AMB8465-AT / AMB8665-M / AMB8665-AT USB dongles are NOT compatible with the new tool.

You need to have the new AMB8665-AT2 USB dongle to use the new version of the Wireless M-BUS Analyzer. The label on the dongle needs to show "AMB8665-AT2" and the serial number needs to start with "104." followed by 6 other arbitrary digits.

### **I connected an AMB8665-AT2 USB dongle to my PC, but the Wireless M-BUS Analyzer cannot connect to the stick. What can I do?**

The Wireless M-BUS Analyzer searches for all FTDI devices connected to your PC and tries to open a COM port. Then it reads the chip info to authenticate the connected device.

If the Wireless M-BUS Analyzer cannot connect, there may be different reasons that are shown as error message in the Message Window.

- In case of a device authentication error (ERROR 706) please contact the support. The device is not supported, or it may malfunction. Please check before, whether the stick really is an AMB8665-AT2. See chapter 7.
- Please check in the device manager of Microsoft Windows, that the AMB8665-AT2 stick was detected (both devices) and that the corresponding driver is up to date. See chapter 3.1.
- Please check that the COM port is not blocked by another application.
- The FTDI Drivers may be outdated. See chapter 3.1.
- Windows 7 or older is used and there are multiple FTDI USB devices connected to the PC and the PC has USB 3.0 ports. See chapter 3.1.
- A USB hub is used or the USB cables are too long. In this case directly connect the USB dongle to your PC.

### **I received a wM-BUS frame, but the Wireless M-BUS Analyzer returns a parser error. What can I do?**

Please send us the log file, the received frame and the corresponding AES key (if needed). We check the frame and update the Wireless M-BUS Analyzer to be compliant to your frame, if needed.

Please check the error in the Message Window of the Wireless M-BUS Analyzer.

Fragmented wM-BUS frames using `AFL.FCL.MF != 0` or `AFL.FCL.FID != 0` are currently not

supported by the Wireless M-BUS Analyzer.

Please send the email and data to our support ticket system, that you can find on [www.we-online.com/wireless-connectivity](http://www.we-online.com/wireless-connectivity).

The Wireless M-BUS Analyzer will inform you at start-up as soon as a new version is available.

## 8 Known issues

- AES-CTR decryption could not be verified (no meters available for testing), so such meters may cause unexpected problems. If you own such a meter please help us improve our software and supply us the raw data and AES key for testing and verification.
- Windows 7 has known issues with the USB Location IDs when using USB 3.0 ports. So if you have Windows 7 installed on your PC make sure you are using USB 2.0 ports to avoid any problems or update your PC to Windows 8 or newer.
- In wM-BUS Modes using NRZ coding and Frame Format B the radio IC cannot perform continuous resynchronization when a frame contains blocks of more than 16 bytes of 0x00..00 or 0xFF..FF. This is a physical problem and there is no workaround on the receiver side for that. The transmitter shall make sure of either encryption the frame or re-ordering the data records in such a way that these long '1' or '0' sequences do not occur in NRZ coded content. Receiving such frames can lead to undefined behavior of AMB8665-AT USB dongle and/or PC software.

## 9 Restrictions

The following functions are not planned to be implemented in the near future:

- Recomposing and processing of fragmented frames as introduced by OMS Vol2 V4.0.2 is not supported (no meters available for testing). If you have such a meter or recorded **ALL** frame fragments please provide us this data (together with the AES key of the meter) so we can implement it into the Analyzer.
- Encryption Mode 13 (TLS) and "Security Management" Ci-Fields (Security Profile C)
- Any function or encryption mode in draft documents of EN13757, as for example EN13757-7:2016 draft (and still not released in June 2018).
- The `wireless M-BUS Analyzer` depends on complete and bit-error free wM-BUS frames complying to EN113757-3 and -4. Therefore the firmware of the AMB8665-AT2 will only forward those frames that were checked to be correct by checking the wM-BUS checksums contained in each frame. Those checksums are removed from the data that is sent to the PC software.
- The `wireless M-BUS Analyzer` or the AMB8665-AT2 firmware does not support debugging of wrong checksums or other non EN13757-4:2013 conforming parameters.
- OMS Vol2 V4.1.2 does not support compact frames. Therefore the full subset of "Compact Frames" is currently not supported (namely Ci=0x69, 0x6a, 0x6b and Ci=0x79, 0x7b, compact frames and format frames). Some of those frames need a second frame in order to be able to interpret the compact frame (so it's the same issue as for fragmented frames).

## **10 Important notes**

The following conditions apply to all goods within the wireless connectivity product range of Würth Elektronik eiSos GmbH & Co. KG:

### **10.1 General customer responsibility**

Some goods within the product range of Würth Elektronik eiSos GmbH & Co. KG contain statements regarding general suitability for certain application areas. These statements about suitability are based on our knowledge and experience of typical requirements concerning the areas, serve as general guidance and cannot be estimated as binding statements about the suitability for a customer application. The responsibility for the applicability and use in a particular customer design is always solely within the authority of the customer. Due to this fact, it is up to the customer to evaluate, where appropriate to investigate and to decide whether the device with the specific product characteristics described in the product specification is valid and suitable for the respective customer application or not. Accordingly, the customer is cautioned to verify that the documentation is current before placing orders.

### **10.2 Customer responsibility related to specific, in particular safety-relevant applications**

It has to be clearly pointed out that the possibility of a malfunction of electronic components or failure before the end of the usual lifetime cannot be completely eliminated in the current state of the art, even if the products are operated within the range of the specifications. The same statement is valid for all software sourcecode and firmware parts contained in or used with or for products in the wireless connectivity and sensor product range of Würth Elektronik eiSos GmbH & Co. KG. In certain customer applications requiring a high level of safety and especially in customer applications in which the malfunction or failure of an electronic component could endanger human life or health, it must be ensured by most advanced technological aid of suitable design of the customer application that no injury or damage is caused to third parties in the event of malfunction or failure of an electronic component.

### **10.3 Best care and attention**

Any product-specific data sheets, manuals, application notes, PCN's, warnings and cautions must be strictly observed in the most recent versions and matching to the products firmware revisions. This documents can be downloaded from the product specific sections on the wireless connectivity homepage.

### **10.4 Customer support for product specifications**

Some products within the product range may contain substances, which are subject to restrictions in certain jurisdictions in order to serve specific technical requirements. Necessary information is available on request. In this case, the field sales engineer or the internal sales person in charge should be contacted who will be happy to support in this matter.



## **10.5 Product improvements**

Due to constant product improvement, product specifications may change from time to time. As a standard reporting procedure of the Product Change Notification (PCN) according to the JEDEC-Standard, we inform about major changes. In case of further queries regarding the PCN, the field sales engineer, the internal sales person or the technical support team in charge should be contacted. The basic responsibility of the customer as per section 10.1 and 10.2 remains unaffected. All wireless connectivity module driver software "wireless connectivity SDK" and its source codes as well as all PC software tools are not subject to the Product Change Notification information process.

## **10.6 Product life cycle**

Due to technical progress and economical evaluation we also reserve the right to discontinue production and delivery of products. As a standard reporting procedure of the Product Termination Notification (PTN) according to the JEDEC-Standard we will inform at an early stage about inevitable product discontinuance. According to this, we cannot ensure that all products within our product range will always be available. Therefore, it needs to be verified with the field sales engineer or the internal sales person in charge about the current product availability expectancy before or when the product for application design-in disposal is considered. The approach named above does not apply in the case of individual agreements deviating from the foregoing for customer-specific products.

## **10.7 Property rights**

All the rights for contractual products produced by Würth Elektronik eiSos GmbH & Co. KG on the basis of ideas, development contracts as well as models or templates that are subject to copyright, patent or commercial protection supplied to the customer will remain with Würth Elektronik eiSos GmbH & Co. KG. Würth Elektronik eiSos GmbH & Co. KG does not warrant or represent that any license, either expressed or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, application, or process in which Würth Elektronik eiSos GmbH & Co. KG components or services are used.

## **10.8 General terms and conditions**

Unless otherwise agreed in individual contracts, all orders are subject to the current version of the "General Terms and Conditions of Würth Elektronik eiSos Group", last version available at [www.we-online.com](http://www.we-online.com).

## **11 Legal notice**

### **11.1 Exclusion of liability**

Würth Elektronik eiSos GmbH & Co. KG considers the information in this document to be correct at the time of publication. However, Würth Elektronik eiSos GmbH & Co. KG reserves the right to modify the information such as technical specifications or functions of its products or discontinue the production of these products or the support of one of these products without any written announcement or notification to customers. The customer must make sure that the information used corresponds to the latest published information. Würth Elektronik eiSos GmbH & Co. KG does not assume any liability for the use of its products. Würth Elektronik eiSos GmbH & Co. KG does not grant licenses for its patent rights or for any other of its intellectual property rights or third-party rights.

Notwithstanding anything above, Würth Elektronik eiSos GmbH & Co. KG makes no representations and/or warranties of any kind for the provided information related to their accuracy, correctness, completeness, usage of the products and/or usability for customer applications. Information published by Würth Elektronik eiSos GmbH & Co. KG regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof.

### **11.2 Suitability in customer applications**

The customer bears the responsibility for compliance of systems or units, in which Würth Elektronik eiSos GmbH & Co. KG products are integrated, with applicable legal regulations. Customer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of Würth Elektronik eiSos GmbH & Co. KG components in its applications, notwithstanding any applications-related information or support that may be provided by Würth Elektronik eiSos GmbH & Co. KG. Customer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences lessen the likelihood of failures that might cause harm and take appropriate remedial actions. The customer will fully indemnify Würth Elektronik eiSos GmbH & Co. KG and its representatives against any damages arising out of the use of any Würth Elektronik eiSos GmbH & Co. KG components in safety-critical applications.

### **11.3 Trademarks**

AMBER wireless is a registered trademark of Würth Elektronik eiSos GmbH & Co. KG. All other trademarks, registered trademarks, and product names are the exclusive property of the respective owners.

### **11.4 Usage restriction**

Würth Elektronik eiSos GmbH & Co. KG products have been designed and developed for usage in general electronic equipment only. This product is not authorized for use in equipment

where a higher safety standard and reliability standard is especially required or where a failure of the product is reasonably expected to cause severe personal injury or death, unless the parties have executed an agreement specifically governing such use. Moreover, Würth Elektronik eiSos GmbH & Co. KG products are neither designed nor intended for use in areas such as military, aerospace, aviation, nuclear control, submarine, transportation (automotive control, train control, ship control), transportation signal, disaster prevention, medical, public information network etc. Würth Elektronik eiSos GmbH & Co. KG must be informed about the intent of such usage before the design-in stage. In addition, sufficient reliability evaluation checks for safety must be performed on every electronic component, which is used in electrical circuits that require high safety and reliability function or performance. By using Würth Elektronik eiSos GmbH & Co. KG products, the customer agrees to these terms and conditions.

## 12 License terms

This License Terms will take effect upon the purchase and usage of the Würth Elektronik eiSos GmbH & Co. KG wireless connectivity products. You hereby agree that this license terms is applicable to the product and the incorporated software, firmware and source codes (collectively, "Software") made available by Würth Elektronik eiSos in any form, including but not limited to binary, executable or source code form.

The software included in any Würth Elektronik eiSos wireless connectivity product is purchased to you on the condition that you accept the terms and conditions of this license terms. You agree to comply with all provisions under this license terms.

### 12.1 Limited license

Würth Elektronik eiSos hereby grants you a limited, non-exclusive, non-transferable and royalty-free license to use the software and under the conditions that will be set forth in this license terms. You are free to use the provided Software only in connection with one of the products from Würth Elektronik eiSos to the extent described in this license terms. You are entitled to change or alter the source code for the sole purpose of creating an application embedding the Würth Elektronik eiSos wireless connectivity product. The transfer of the source code to third parties is allowed to the sole extent that the source code is used by such third parties in connection with our product or another hardware provided by Würth Elektronik eiSos under strict adherence of this license terms. Würth Elektronik eiSos will not assume any liability for the usage of the incorporated software and the source code. You are not entitled to transfer the source code in any form to third parties without prior written consent of Würth Elektronik eiSos.

You are not allowed to reproduce, translate, reverse engineer, decompile, disassemble or create derivative works of the incorporated Software and the source code in whole or in part. No more extensive rights to use and exploit the products are granted to you.

### 12.2 Usage and obligations

The responsibility for the applicability and use of the Würth Elektronik eiSos wireless connectivity product with the incorporated Firmware in a particular customer design is always solely within the authority of the customer. Due to this fact, it is up to you to evaluate and investigate, where appropriate, and to decide whether the device with the specific product characteristics described in the product specification is valid and suitable for your respective application or not.

You are responsible for using the Würth Elektronik eiSos wireless connectivity product with the incorporated Firmware in compliance with all applicable product liability and product safety laws. You acknowledge to minimize the risk of loss and harm to individuals and bear the risk for failure leading to personal injury or death due to your usage of the product.

Würth Elektronik eiSos' products with the incorporated Firmware are not authorized for use in safety-critical applications, or where a failure of the product is reasonably expected to cause severe personal injury or death. Moreover, Würth Elektronik eiSos' products with the incorporated Firmware are neither designed nor intended for use in areas such as military, aerospace, aviation, nuclear control, submarine, transportation (automotive control, train control, ship control), transportation signal, disaster prevention, medical, public information network etc. You

shall inform Würth Elektronik eiSos about the intent of such usage before design-in stage. In certain customer applications requiring a very high level of safety and in which the malfunction or failure of an electronic component could endanger human life or health, you must ensure to have all necessary expertise in the safety and regulatory ramifications of your applications. You acknowledge and agree that you are solely responsible for all legal, regulatory and safety-related requirements concerning your products and any use of Würth Elektronik eiSos' products with the incorporated Firmware in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by Würth Elektronik eiSos. **YOU SHALL INDEMNIFY WÜRTH ELEKTRONIK EISOS AGAINST ANY DAMAGES ARISING OUT OF THE USE OF WÜRTH ELEKTRONIK EISOS' PRODUCTS WITH THE INCORPORATED FIRMWARE IN SUCH SAFETY-CRITICAL APPLICATIONS.**

### **12.3 Ownership**

The incorporated Firmware created by Würth Elektronik eiSos is and will remain the exclusive property of Würth Elektronik eiSos.

### **12.4 Firmware update(s)**

You have the opportunity to request the current and actual Firmware for a bought wireless connectivity Product within the time of warranty. However, Würth Elektronik eiSos has no obligation to update a modules firmware in their production facilities, but can offer this as a service on request. The upload of firmware updates falls within your responsibility, e.g. via ACC or another software for firmware updates. Firmware updates will not be communicated automatically. It is within your responsibility to check the current version of a firmware in the latest version of the product manual on our website. The revision table in the product manual provides all necessary information about firmware updates. There is no right to be provided with binary files, so called "Firmware images", those could be flashed through JTAG, SWD, Spi-Bi-Wire, SPI or similar interfaces.

### **12.5 Disclaimer of warranty**

THE FIRMWARE IS PROVIDED "AS IS". YOU ACKNOWLEDGE THAT WÜRTH ELEKTRONIK EISOS MAKES NO REPRESENTATIONS AND WARRANTIES OF ANY KIND RELATED TO, BUT NOT LIMITED TO THE NON-INFRINGEMENT OF THIRD PARTIES' INTELLECTUAL PROPERTY RIGHTS OR THE MERCHANTABILITY OR FITNESS FOR YOUR INTENDED PURPOSE OR USAGE. WÜRTH ELEKTRONIK EISOS DOES NOT WARRANT OR REPRESENT THAT ANY LICENSE, EITHER EXPRESS OR IMPLIED, IS GRANTED UNDER ANY PATENT RIGHT, COPYRIGHT, MASK WORK RIGHT, OR OTHER INTELLECTUAL PROPERTY RIGHT RELATING TO ANY COMBINATION, MACHINE, OR PROCESS IN WHICH THE WÜRTH ELEKTRONIK EISOS' PRODUCT WITH THE INCORPORATED FIRMWARE IS USED. INFORMATION PUBLISHED BY WÜRTH ELEKTRONIK EISOS REGARDING THIRD-PARTY PRODUCTS OR SERVICES DOES NOT CONSTITUTE A LICENSE FROM WÜRTH ELEKTRONIK EISOS TO USE SUCH PRODUCTS OR SERVICES OR A WARRANTY OR ENDORSEMENT THEREOF.

## **12.6 Limitation of liability**

Any liability not expressly provided by Würth Elektronik eiSos shall be disclaimed.

You agree to hold us harmless from any third-party claims related to your usage of the Würth Elektronik eiSos' products with the incorporated Firmware, software and source code. Würth Elektronik eiSos disclaims any liability for any alteration, development created by you or your customers as well as for any combination with other products.

## **12.7 Applicable law and jurisdiction**

Applicable law to this license terms shall be the laws of the Federal Republic of Germany. Any dispute, claim or controversy arising out of or relating to this license terms shall be resolved and finally settled by the court competent for the location of Würth Elektronik eiSos' registered office.

## **12.8 Severability clause**

If a provision of this license terms is or becomes invalid, unenforceable or null and void, this shall not affect the remaining provisions of the terms. The parties shall replace any such provisions with new valid provisions that most closely approximate the purpose of the terms.

## **12.9 Miscellaneous**

Würth Elektronik eiSos reserves the right at any time to change this terms at its own discretion. It is your responsibility to check at Würth Elektronik eiSos homepage for any updates. Your continued usage of the products will be deemed as the acceptance of the change.

We recommend you to be updated about the status of new firmware and software, which is available on our website or in our data sheet and manual, and to implement new software in your device where appropriate.

By ordering a wireless connectivity product, you accept this license terms in all terms.

## List of Figures

1	Wireless M-BUS Analyzer, Main window . . . . .	8
2	Success image after successful connection establishment . . . . .	9
3	Part of the Packet List window . . . . .	10
4	Display of detailed information on the selected telegram. View of Block 1, the Ci-Block(s) and data record header with parsed data . . . . .	11
5	Interpretation of the example N1.1 . . . . .	13
6	Wireless M-BUS Analyzer . . . . .	14
7	Main Menu . . . . .	14
8	Packet List window . . . . .	19
9	Entering the AES key . . . . .	20
10	wM-BUS Frame Interpretation window . . . . .	22
11	Window to handle the whitelist, blacklist and AES key list . . . . .	23

## List of Tables

1	Selection of all available wM-BUS modes . . . . .	16
---	---	----

**Contact**

Würth Elektronik eiSos GmbH & Co. KG  
Division Wireless Connectivity & Sensors

Max-Eyth-Straße 1  
74638 Waldenburg  
Germany

Tel.: +49 651 99355-0  
Fax.: +49 651 99355-69  
[www.we-online.com/wireless-connectivity](http://www.we-online.com/wireless-connectivity)

**WÜRTH ELEKTRONIK** MORE THAN YOU EXPECT