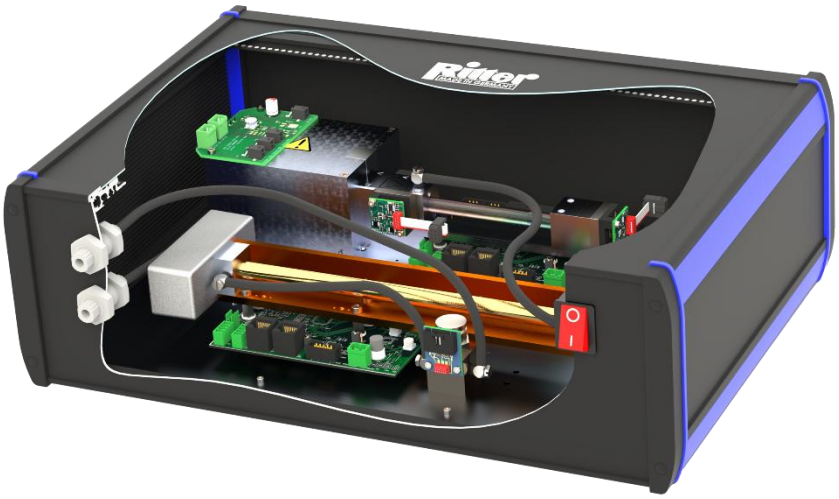

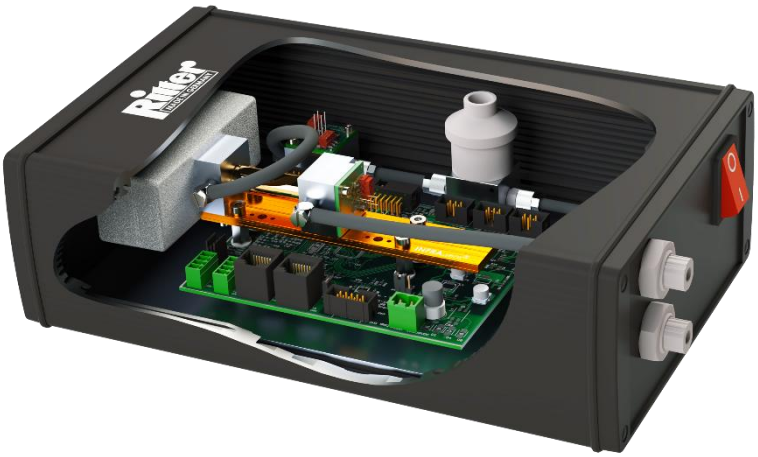

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Instruments engineering
Measuring instruments

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1. General

The data acquisition software “MARS light” (Multi Analyser Research Software) enables data logging of all relevant parameters from the sensor in a table and chart view.

Features of the *General User Mode* [1] of this software:

- Reading of all parameters
- Setting zero and end-points for the gas channels
- Activation and deactivation of the radiation sources of the sensor.

INFORMATION

a) For changing of calibration coefficients and some other critical parameters, the *Advanced User Mode* must be activated → see par. 5.5 „Password Manager“

b) This documentation has been prepared with the greatest possible care. **However, it is intended for specialist personnel who are familiar with the principles of gas measurement technology.** Basic questions about measurements of gas concentrations, cross-sensitivities etc. can therefore not be answered with this documentation. Please consult the relevant technical literature in this regard.

2. Scope of Supply

No. of Items	Item
1	Document folder including … • Calibration Certificate • Data Sheets • Software Manual
1	Sensor in aluminium table top casing
1	Plug-in power supply unit Input: 100-240 V-AC, 50/60 Hz, 0.4 A Output: 24 V-DC, 0.5 A, 12 W or 36 W (H_2S / UVRAS sensor)
1	Data acquisition software (on USB flash drive)
1	Connection cable: sensor ⇒ PC Standard: USB V2.0 A/B, 1 m Option: RS232, 3 m
3 m	Viton tubing $Ø_i$ 4 mm / $Ø_o$ 6 mm

[1] Available user modes see par. 5.5 „Password Manager“ item (2)

3. System Requirements

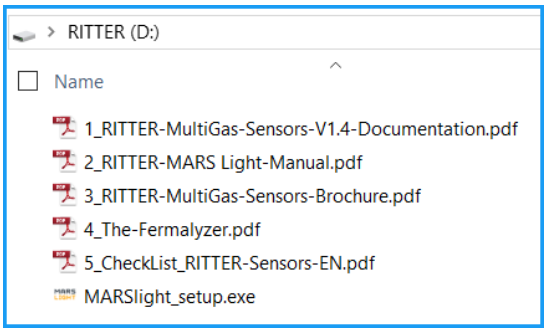
- PC with operating system Windows® 10 or higher
- Recommended processor performance: ≥ 2 GHz
- Recommended random access memory (RAM): ≥ 4 GB
- 1 x USB port
- Monitor 17'' (optimised for monitor resolution of 1280x 1024 pixels or higher)

4. Setup of Software

a) Execute the **setup procedure of the sensor** as described in the provided Sensor Documentation, par. 4 "Setup".

b) The software is provided on an USB flash drive. Insert the USB drive into the appropriate port of the computer and open the file directory.

c) Start the software "MARSlight_setup.exe" by **right mouse click** and **execute with administrator rights.**



d) If **several sensor modules are installed** (e.g. 1 x IR module + 1 x UV module), the application must be opened several times according to the number of modules in several instances.

For your information: If the data from many sensor modules shall be logged, the data acquistion software "XLogger" is available. This software enables the acquisition of up to 40 sensor modules and the visualisation of all measurement results in one instance. This software works internally with a CANBus communication. For connection to the USB port of a computer, a converter from CANBus to USB protocol must be installed inside of the sensor casing. However, this option must be ordered **in advance**.

5. Software Features

5.1. Data Logging Tab

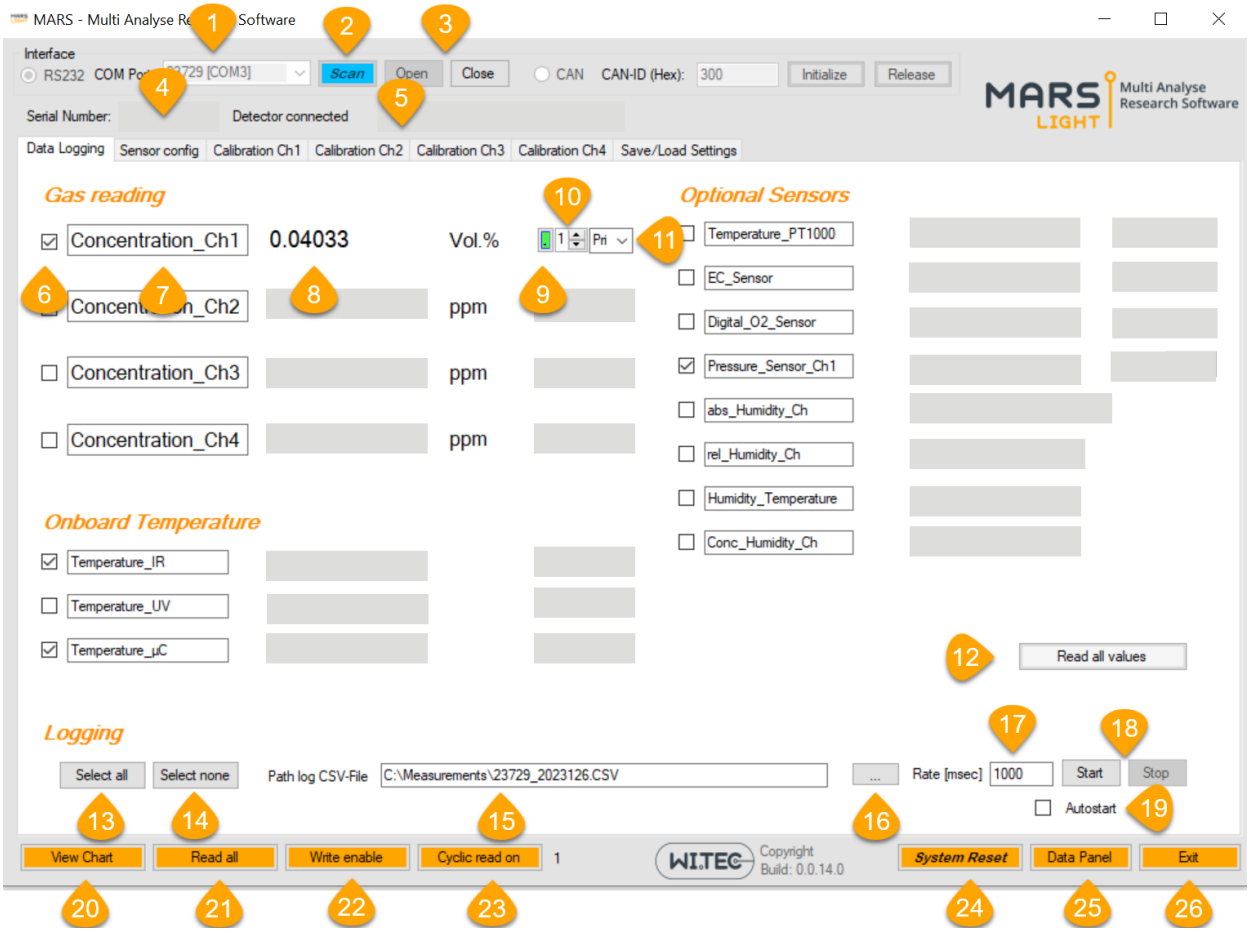


Figure 1: Data Logging Tab

1. Selects the serial COM port
2. Scans available sensor(s) and port(s)
3. Opens / closes selected COM port; reads configuration of sensor
4. Display of connected serial number
5. Display of sensor configuration
6. Selects / de-selects channel for logging and chart view
7. Channel and function designators, free editable (stored in configuration)
8. Measurement values ppm, ppb, or Vol.%
9. Colour for the plotted line (chart view)
10. Thickness of the plotted line (chart view)
11. Selects primary or secondary axis (chart view)
12. Reads all measurement values
13. Selects all channels for logging and chart
14. De-selects all channels for logging and chart view
15. Storage path and file name for data logging file
16. Select storage path with MS Explorer
17. Time interval for logging the data in milliseconds, minimum 100 msec
18. Starts / stops data logging into *.csv file
19. N/A
20. Opens chart view in separate window
21. Reads all measurement values
22. Opens the password manager (see par. 5.5)
23. Starts measurement cycle independently from data logging. Useful for chart view and direct feedback values
24. Restarts the complete sensor (Software reset)
25. Shows a Front Panel View with the main important readings
26. Closes the software and store all relevant settings

5.2. Sensor Configuration Tab

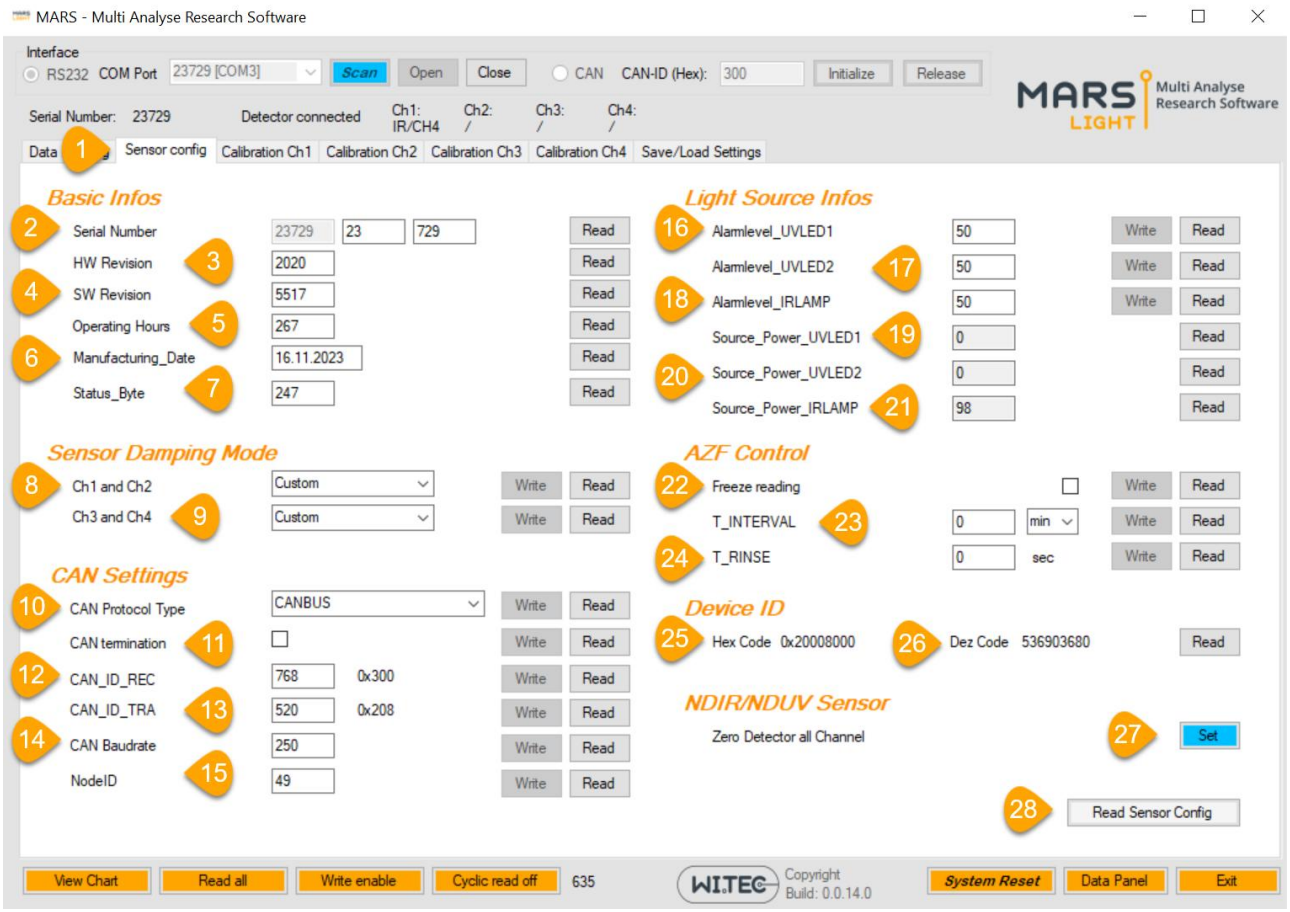


Figure 2: Sensor Configuration Tab

1. Sensor configuration tab active
2. Serial number from connected sensor
3. Hardware revision Sensor
4. Firmware revision Sensor
5. Operating hours since assembly
6. Manufacturing date of assembly
7. Status Byte shows the actual system status (see details 5.2.1)
8. Gas-channel 1 and 2 damping configuration (see details 5.2.2)
9. Gas-channel 3 and 4 damping configuration (see details 5.2.2)
10. CAN Protocol selection to CANbus or CANopen
11. CAN termination sets a 120 Ω resistor between lines CAN-H and CAN-L
12. CAN Receive address (slave address)
13. CAN Transmit address (Master address)
14. CAN Baudrate can be set to [125k, 250k, 500k, 1000k]
15. NodeID only for CANopen communication
16. Set alarm UVLED1 level in percent to change Status byte if the value is below the threshold
17. Set alarm UVLED2 level in percent to change Status byte if the value is below the threshold
18. Set alarm IRLAMPlevel in percent to change Status byte if the value is below the threshold
19. Shows the actual intensity level in percent
20. Shows the actual intensity level in percent
21. Shows the actual intensity level in percent
22. **A**uto-**Z**ero **F**unction Control (see details par. 5.2.3):
    Freezes last sensor measurement data prior to starting the calibration process thus preventing the alarm of a possible external alarm function
23. Interval time for the automatic zero calibration [min, h, d]
24. Rinse/purge time with zero-gas [sec]

5.2.1. Status Byte

(acc. fig. 2 no. 7)

IR detected	n/a	n/a	n/a	IR Level error	n/a	n/a	n/a	Status code		Status LED
Bit0	Bit1	Bit2	Bit3	Bit4	Bit5	Bit6	Bit7	hex	dez	
0	1	1	1	1	1	1	1	7F	127	red
1	1	1	1	1	1	1	1	FF	255	red
1	1	1	1	0	1	1	1	F7	247	green

5.2.2. Damping Mode

(acc. fig. 2 no. 8 and 9)

Setting	Response time	Signal Performance
Slow	30 sec	High
Medium	6 sec	Normal
Fast	3 sec	Normal
Peak	1 sec	Low
Custom*	TBD	TBD

5.2.3. AZF Control (Auto-zero Function)

(acc. fig. 2 no. 22 to 24)

The auto-zero function provides an automatic time-controlled zero-point adjustment with air or Nitrogen for long-term stable measurements. It requires the built-in auto-zero module type “AZM-Air” or “AZM-N_2” which must be installed in the sensor casing. During the auto-zero adjustment the gas to be analyzed flows uninterupted from the gas inlet port of the casing to the outlet port thus bypassing the sensor’s measurement cuvette.

Please note: The auto-zero function remains active and the entered values remain valid even after the software has been disconnected from the sensor or the software has been exited. The auto-zero function is deactivated only after switching off the sensor. After switching on the sensor, the auto-zero function is reactivated with the previously entered values for interval and rinsing time.

Auto-zero Module “AZM-Air”

Auto-zero Module “AZM-N_2”

(22) Freeze reading

Some systems are set up so that the sensor data triggers external functions (alarm, valves, etc.). In order to prevent such unintentional trigger signal, the

last measurement value can be frozen. The freezing time is set to double the rinsing time as standard.

Once the zero-point adjustment has been completed, the gas to be measured is re-routed automatically through the sensor cuvette and the current value measured at that time is transmitted.

(23) The interval time for the automatic zero calibration can be set alternatively in minutes, hours or days. The interval time is preset to 1 hour. For setting an individual interval time, the “Write” function must be enabled. For enabling this function, the user level “Advanced” or “Production” must be activated → see details in para. 5.5 “Password Manager”.

(24) It is recommended to set a rinsing / purging time with zero gas of approx. 30 sec. For setting an individual rinsing / purging time, the “Write” function must be activated. For using this function, the user level “Advanced” or “Production” must be activated → see details in para. 5.5 “Password Manager”.

The **Auto-zero Function** can be **deactivated** by entering zero values “0” for both the Interval Time and the Rinse Time. Shut down the software then and switch off the sensor unit. Afterwards, the sensor must be switched on again the software re-started.

5.3. Calibration Channel [x] Tabs

The content of the four *Calibration Tabs* for the different channels/gases is identical. The functions of these tabs are explained in the tab “Calibration Ch1” (Figure 3) representing all other calibration tabs.

In these tabs the zero-point and end-point calibrations can be performed as described in the following.

5.4. Zero- and End-point calibradtion

For highly accurate gas measurements a regular check of the zero-point and end- (span-) point is necessary.

Recommended recalibration intervals:

a) IR sensors:

- Zero-point: Weekly with inert gas, e.g. Nitrogen
  The setting of the zero-point is described in par. 5.4.1 below.
- End-point (full scale): Every 3 months with suitable calibration gas
  The setting of the end-point is described in par. 5.4.2 below.

b) UV sensors:

- Zero-point:
  - Concentrations < 300 ppm: Every 48 hours with inert gas, e.g. Nitrogen
  - Concentrations ≥ 300 ppm: Every 24 hours with inert gas, e.g. Nitrogen

  The setting of the zero-point is described in par. 5.4.1 below.
- End-point (full scale): Every 3 months with suitable calibration gas
  The setting of the end-point is described in par. 5.4.2 below.

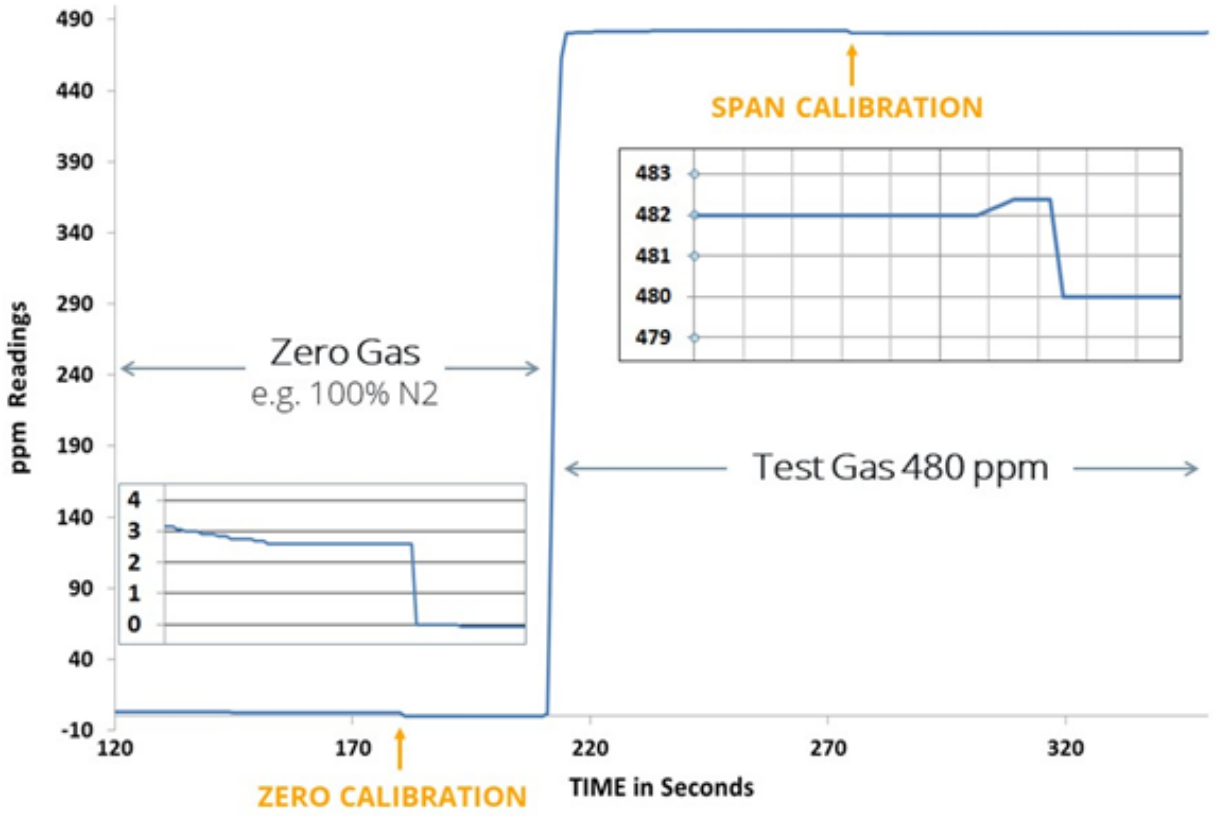


Figure 3: Concentration readings during zero and span point calibration

5.4.1. Zero-point calibration

In general:

a) The sensor module for which the zero-point is to be set must be purged with a gas that does not contain the target gas.

b) Recommended purging time and flow rate of zero-gas: ≥1 min @ 1 ltr/min.

c) Recommended zero-gas: N2, Ar, H2, clean air)

d) Recommended concentration of target gas after zero-point calibration:
Stable reading of <<1% F.S. – see item (4) in below screen shot

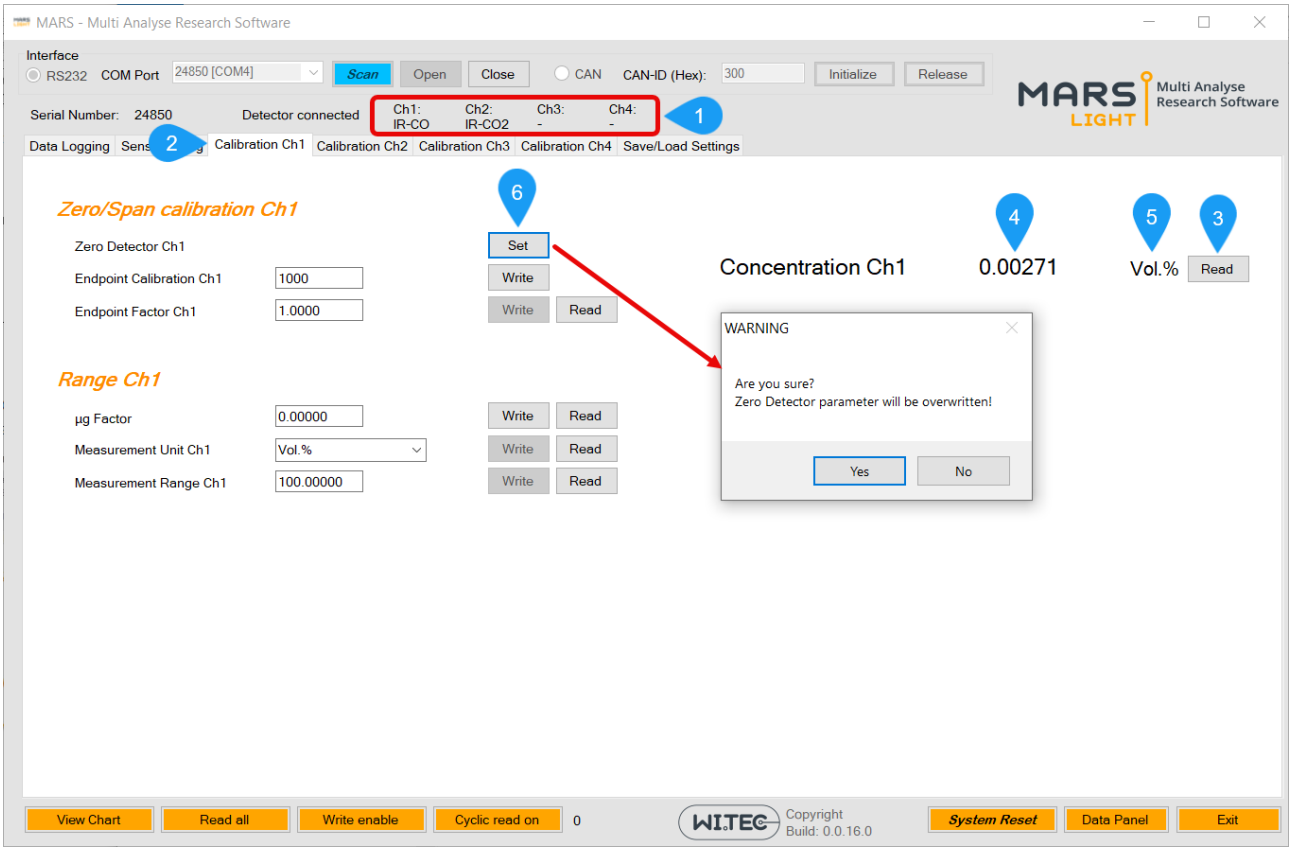


Figure 4: Zero-point calibration

(1) Assignment of gases to channels
(also stated in the provided calibration certificate of the sensor)

(2) Selection of respective channel for the desired gas to recalibrated

(3) Initiates reading of actual value while purging with zero-gas

(4) Indication of actual concentration during calibration

(5) Indication of concentration unit

(6) Sets actual calibration value → setting must be confirmed by “Yes” in subsequent warning message

5.4.2. End-point calibration

In general:

a) For setting the end-point it is highly recommended to use a certified test gas.
b) The concentration of the test gas must not deviate more than 10% from full scale (F.S.).
c) Before performing the end-point calibration, it is important to perform a zero-point calibration with an inert gas according to par. 5.4.1 to set the offset to zero.
d) Recommended purging time and flow rate of test gas: ≥1 min @ 1 ltr/min.
e) Recommended concentration of channel to be calibrated after end-point calibration: Stable reading (<<1% F.S.) of indicated concentration in item (6) in below screen shot

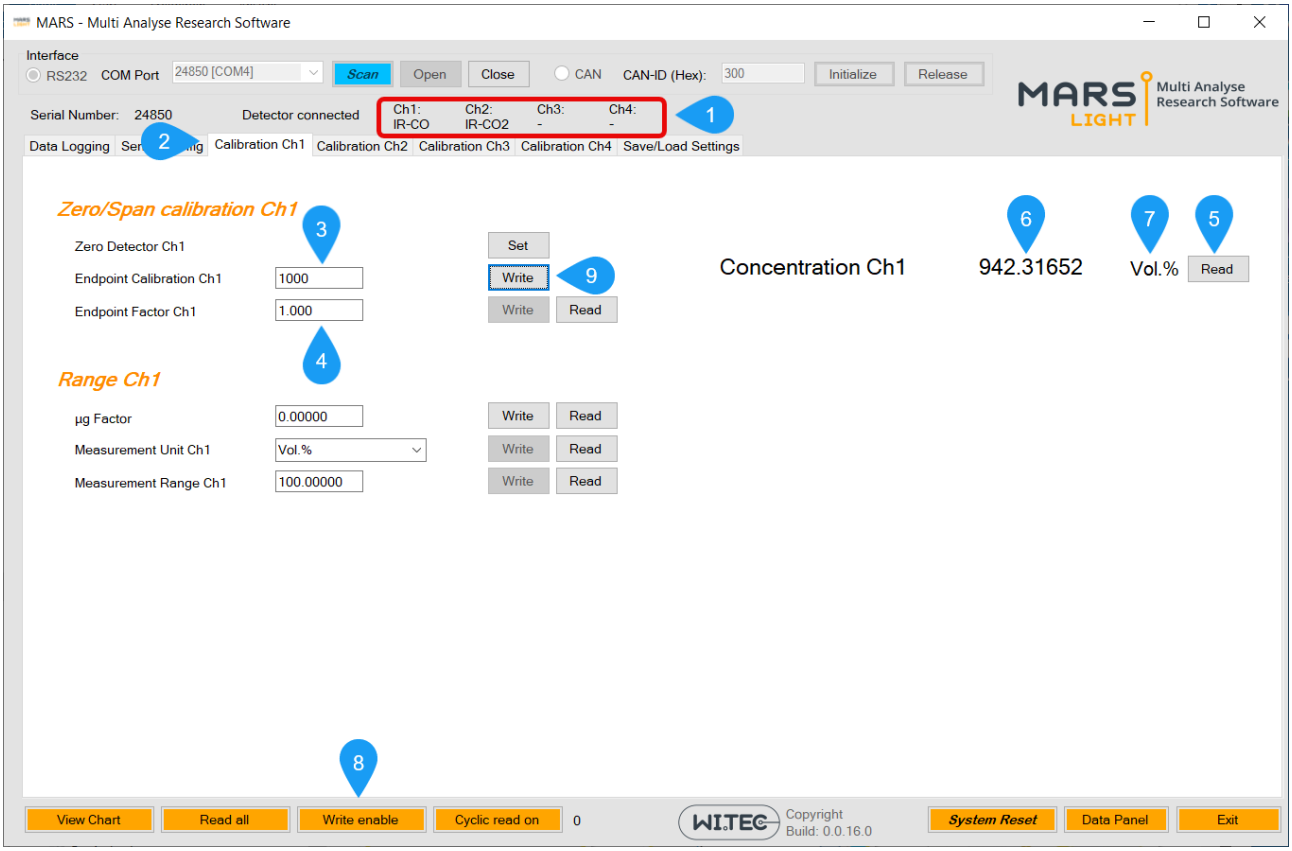


Figure 5: End-point calibration

(1) Assignment of gases to channels
(also stated in the provided calibration certificate of the sensor)
(2) Selection of respective channel for the desired gas to recalibrated
(3) Enter the concentration of the test gas and click “Write”
(4) If applicable: Option for entering a custom end-point calibration factor, factory default: 1.000
(5) Initiates reading of actual value while purging with test gas
(6) Indication of actual concentration during calibration
(7) Indication of concentration unit
(8) Enables “Write” mode according to par. 5.5 “Password Manager” prior to setting the end-point

(9) When the indicated concentration displayed in item (6) of "*Figure 5: End-point calibration*" matches the test gas concentration entered in item (3) click "Write" to perform the end-point calibration.

5.5. Password Manager

For setting/saving/loading the sensor parameters, the "Write" mode must be enabled. This mode can be **enabled in any tab**; the screen shot below shows the tab "Save/Load Settings as an example.

Please note: Changing of sensor parameters might cause significant measurement errors if not performed correctly. Therefore, this function is password protected. **It is highly recommended to reveal the passwords to specialist personnel only who are familiar with the principles of gas measurement technology** and/or to set new passwords by the admin (see item 4 below).

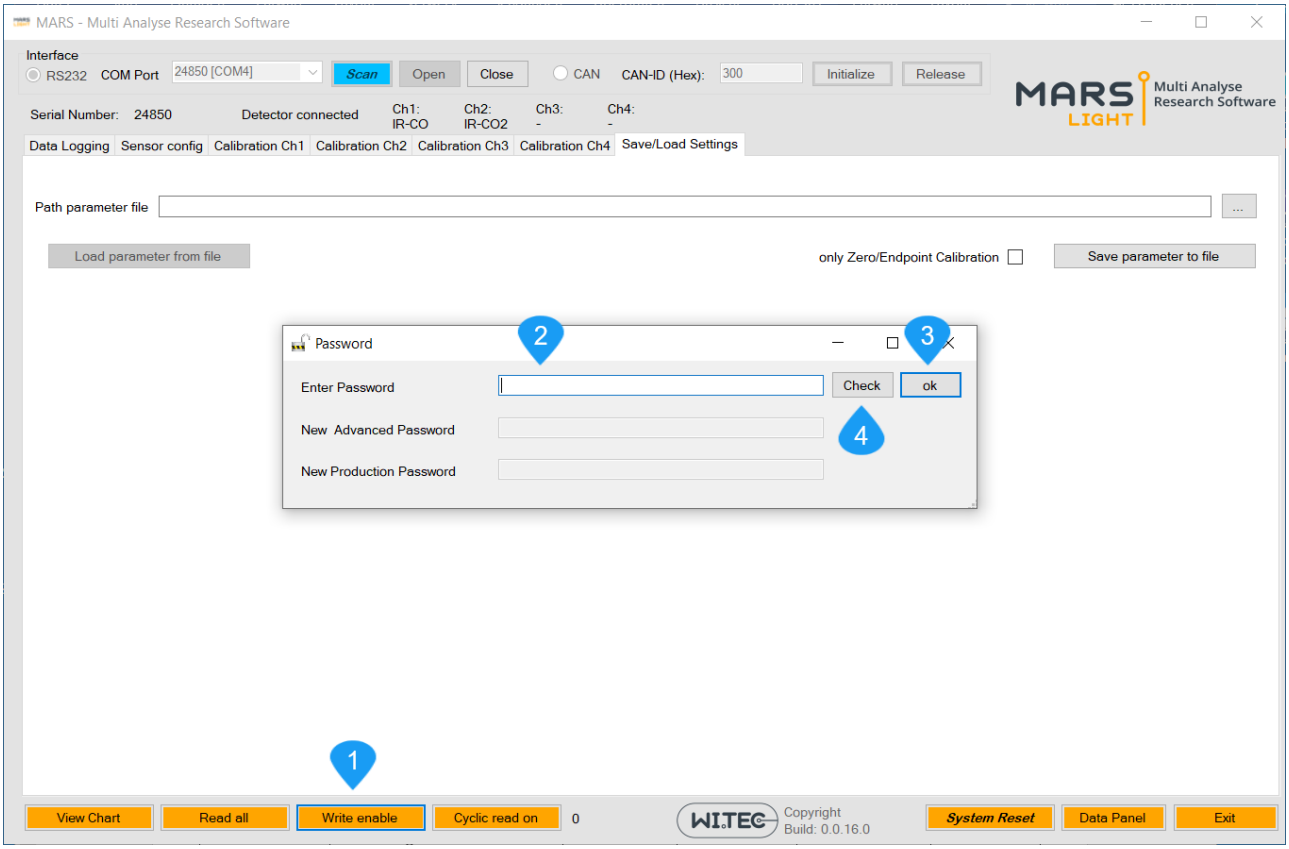


Figure 6: Password Manager

1. Click "Write enable" to open the password manager
2. Select the user level:
   a) Standard: No password
   b) Advance: **Adv123**
   c) Production: **Exp456**

   See table of functions for each level in the following par. 5.5.1 "User Levels"
3. Click "ok" after having selected the required level and entered the respective password. After having enabled the "Write" mode, the button name changes to "Write disable".

4. After having entered the “Production” password, the Admin can set new passwords.

5.5.1. User Levels

Function	User Level “Standard”	User Level “Advanced”	User Level “Production”
Read DataLogging	X	X	X
Read Sensor Config	X	X	X
Set Zero/Endpoint calibration	X	X	X
Read Calibration Ch[x]	X	X	X
Save sensor parameter to XML	X	X	X
Set Alarm Level Light Source		X	X
Set AZF Function		X	X
Set Measurement Unit/Range		X	X
Load Parameter from XML		X	X
Sensor Diagnoses values [ADC, Modulation]		X	X
Set Sensor damping values			X
Set CAN settings			X
Set Endpoint factor direct			X
Ext. sensor tab [calibration ext. Sensors]			X
Bootloader mode [Firmware tab]			X
Set new passwords			X

5.6. Save/Load/Change Settings Tab

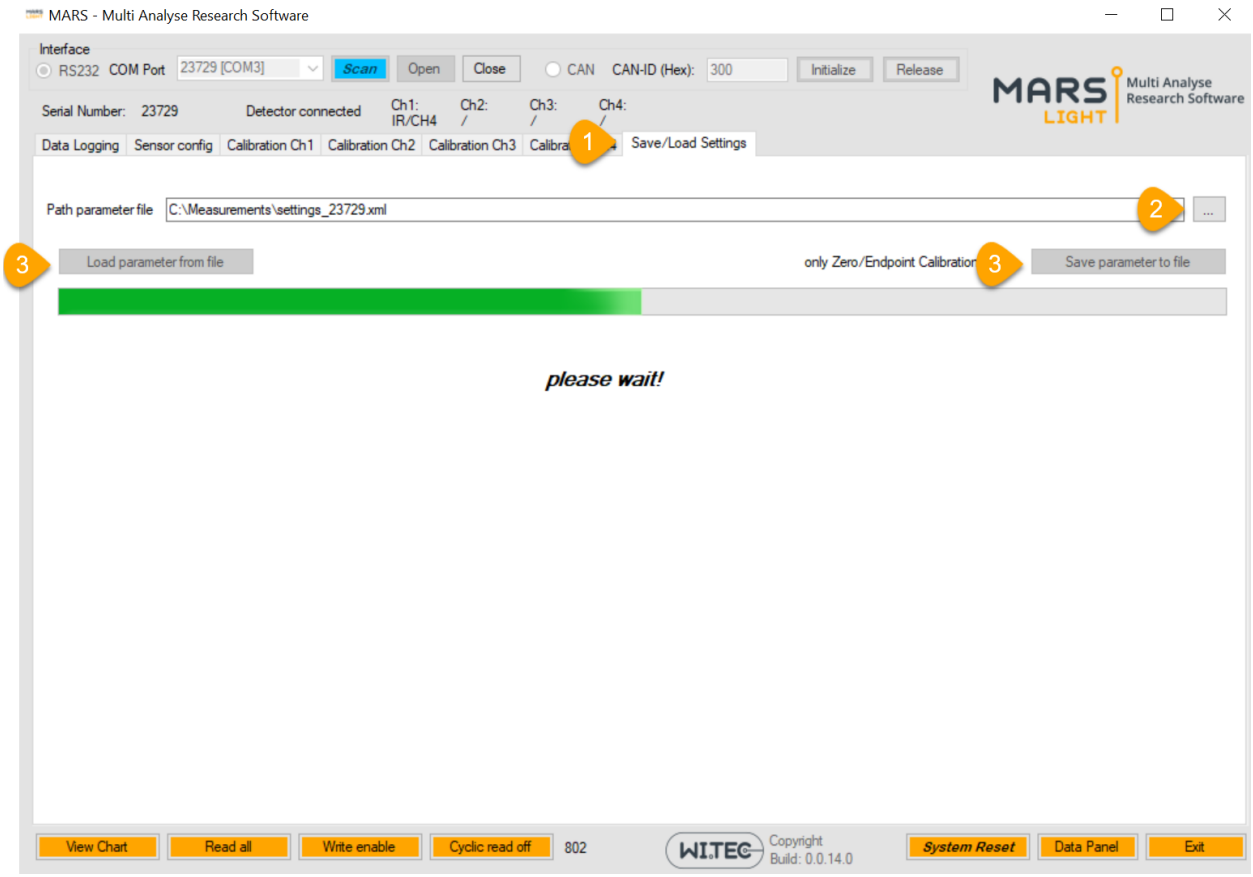


Figure 7: Save/Load Settings Tab

For saving/loading/changing the sensor settings, a password has to be entered first according to par. 5.5 “Password Manager”

1. Save/Load Settings tab. All sensor parameters can be saved or loaded via an *.xml file

2. Select the desired path to save the sensor settings to or to load them from the selected path.

3. Save or Load the parameter

Please note:

- The *.xml file can be edited with a standard XML viewer
- **It’s highly recommended to save the sensor settings before changing settings.**

6. Connecting the Sensor and Starting a Measurement

6.1. RS232 and USB Protocol

Connect the sensor to the COM port using the provided data cable and switch it on.

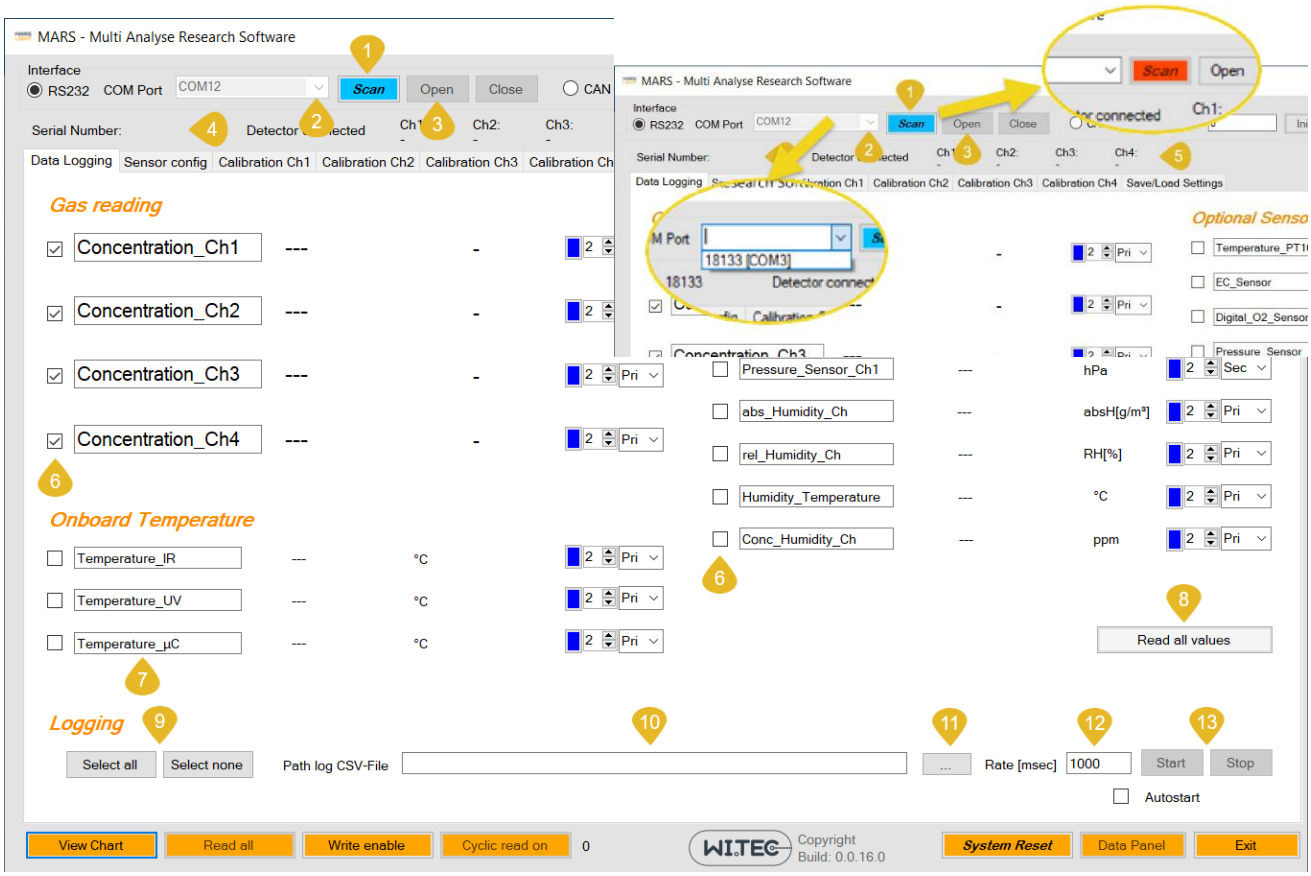


Figure 8: Initialization of the sensor with USB and RS232 protocol

(1) Click the button [Scan]. The colour changes from blue to red while scanning the COM ports of your PC. When ready, the button changes to blue again.

(2) Click the dropdown menu and select the sensor's serial number which is stated on the sensor label located at the bottom side of the sensor casing.

(3) Click the button [open].

If **several sensor modules are installed** (e.g. 1 x IR module + 1 x UV module) and the application is opened several times in several instances, please switch to the other instances one after the other and repeat steps (1) to (3) there.

(4) Indication of serial number

(5) Indication of sensor configuration

(6) Click the checkboxes of the corresponding gas channels or the button (9) [Select all/ Select none].
The assignment of the measurement channels is stated in the provided *Calibration Protocol*. Example:

Measurement Channels

Channel	Gas	Range	Sample Cell (Cuvette)
Ch1	--	--	--

Ch2	CO_2 (in CH_4)	0 – 100 %	50 mm
Ch3	CH_4 (in CO_2)	0 – 100 %	50 mm
Ch4	--	--	--

(7) Indication of temperatures:
- Temperature of IR sensor
- Temperature of UV sensor
- Temperature of main board

(8) Reads all values

(9) Selects /de-selects all channels for logging and chart view

(10) Enter manually a storage path and file name for data logging file

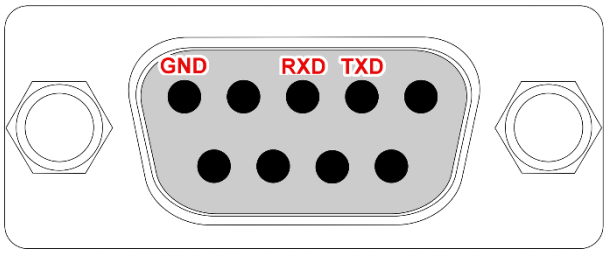
(11) Select storage path and file name for the data logging file with Microsoft Explorer

(12) Choose a measurement interval (min. 100 ms).

(13) Click on the button [start]. When selecting an existing data file, the user can decide to override the file or to add the new data to the already existing data. Click the button [Stop] to terminate the recording to the data file.

6.2. RS232 Interface

- View to the socket at casing:
- Connecting cable supplied:
  - D-sub 9
  - Serial 1:1
  - Male/male
  - Length 1.8 m

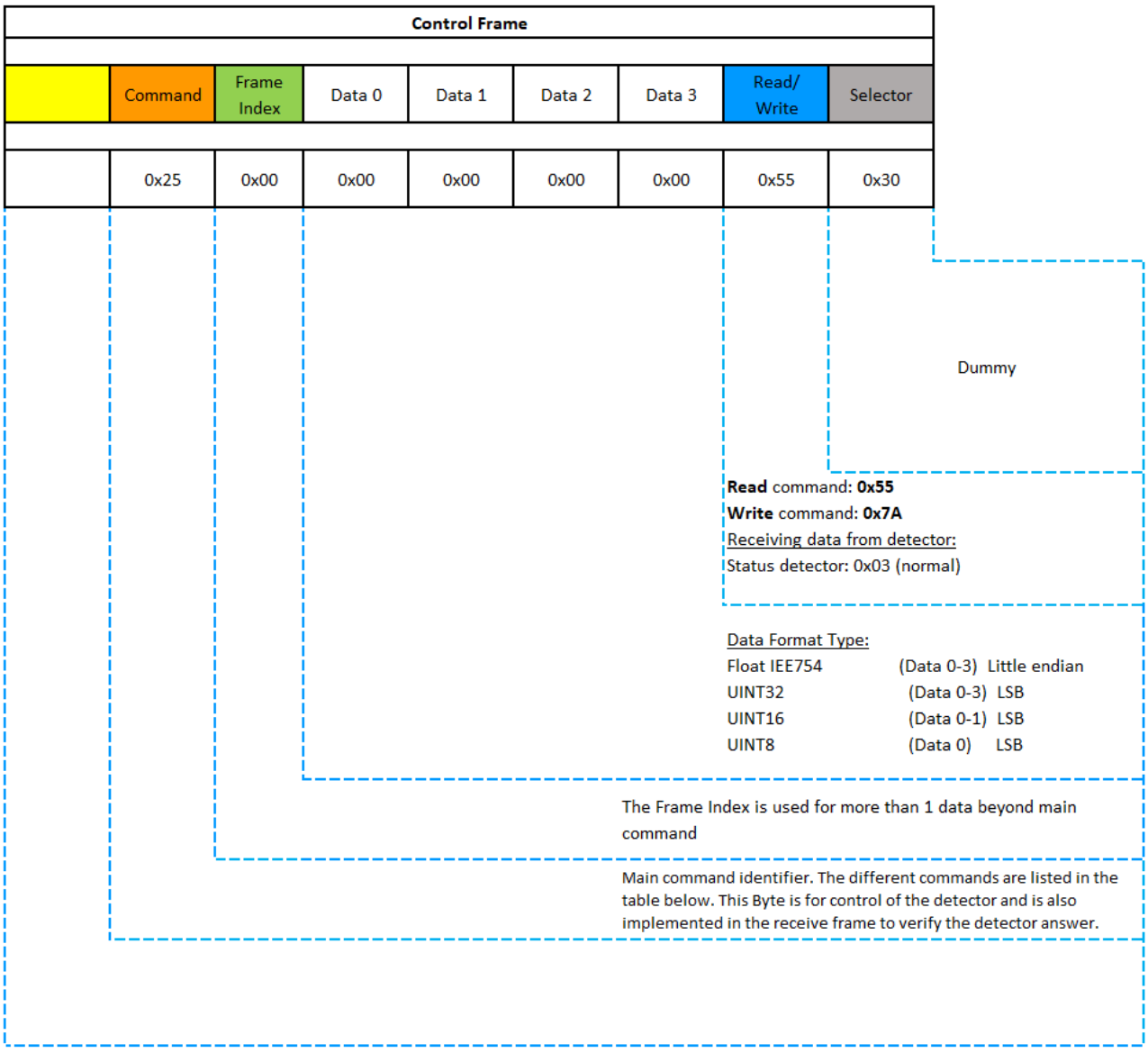


6.3. RS232 Communication Protocol

6.3.1. Settings

Baudrate	115200 Baud
Databits	8
Stopbit	1
Parity	None
Data Format (input)	UINTx: LSB First Float – IEE754 Data Format: Little Endian
Data Format (output)	ASCII String with max. 15 Bytes incl. CR/LF

6.3.2. Protocol basic (to detector)



The detector answers with an ASCII String followed by a CR and LF code for separation. For example, please note the diagram below. The incoming data from the detector can be displayed with a simple terminal program (Hterm ect.) or with the more comfortable MARS Tool (Wi.Tec)

read Concentration CH1	to detector	0x17	0x00	0x00	0x00	0x00	0x00	0x55	0x00
	from detector	ASCII Data [ppm (Vol. %)] + [CR + LF]							

read Temperature CH1	to detector	0x18	0x00	0x00	0x00	0x00	0x00	0x55	0x00
	from detector	ASCII Data [°C] + [CR + LF]							

CR – Carriage return (0x0D)

LF – Line feed (0x0A)

6.3.3. Command List

Normal operating mode
These commands are important for the main function of the detector.

Description	Cmd	Frame Index	Format Type	Unit	Access
Concentration CH3 – CH4	0x0F	0-1	FLOAT	ppm[Vol.%]	Read
Concentration CH1 – CH2	0x17	0-1	FLOAT	ppm[Vol.%]	Read
Temperature CH1 (IR Detektor)	0x18	0	FLOAT	°C	Read
Temperature CH2 (ext.pt1000)	0x1F	0	FLOAT	°C	Read
Temperature CH3 (UV Detektor PCB)	0x1A	0	FLOAT	°C	Read
Temperature CH4 (µController Board)	0x20	0	FLOAT	°C	Read
Set zero detector [**all** Channel] zeropoint stored*	0x11 or [0x08]	0	UINT8		Write
Set zero calibration channel 1 zeropoint stored*	0x11	1	UINT8		Write
Set zero calibration channel 2 zeropoint stored*	0x11	2	UINT8		Write
Set zero calibration channel 3 zeropoint stored*	0x11	3	UINT8		Write
Set zero calibration channel 4 zeropoint stored*	0x11	4	UINT8		Write
Set Span Calibration CH1 – CH4	0x60	0-3	FLOAT	ppm[Vol.%]	Write
Read/Write Span Calibration factor CH1-4	0x63	0-3	FLOAT	1,00 Factory setting	RW
Electrochemical sensor output	0x1D	0	FLOAT	Vol.%[ppm]	Read
Set Span calibration EC Sensor	0x1D	1	FLOAT	Vol.%[ppm]	Write
Reset Span calibration EC Sensor	0x1D	2	UINT8		Write
Set Offset Calibration EC Sensor	0x1D	3	FLOAT	Vol.%[ppm]	Write
Digital O2 sensor concentration	0x1D	5	FLOAT	Vol.%	Read
Digital O2 sensor Span calibration	0x1D	6	FLOAT	Vol.% Example:20.95	Write
Digital O2 sensor Offset calibration	0x1D	7	UINT8		Write
Digital O2 sensor Reset calibration	0x1D	8	UINT8		Write
Set Offset pt1000	0x1F	1	FLOAT	°C	rw

Set Gain pt1000	0x1F	2	FLOAT	°C	rw
Pressure Sensor out (optional)	0x19	0	FLOAT	mbar	Read
Humidity Sensor out 1 (optional)	0x1B	0	FLOAT	RH[%]	Read
Humidity Sensor out 2 (optional)	0x1B	1	FLOAT	g/m³	Read
Humidity Sensor out 3 (optional)	0x1B	2	FLOAT	ppm	Read
Humidity Sensor temperature (optional)	0x1C	0	FLOAT	°C	Read
AZF* Function – Freeze reading	0x73	0	UINT8		Write
AZF Function – Rinse time	0x73	1	UINT16	sec	rw
AZF Function – Interval time	0x73	2	UINT16	hours	rw
AZF Function – Switch Valve/Pump	0x73	3	UINT8	ON(1)/OFF(0)	Write
Set UV1 LED on	0x25	0	UINT8		Write
Set UV1 LED off	0x27	0	UINT8		Write
Set UV2 LED on	0x26	0	UINT8		Write
Set UV2 LED off	0x28	0	UINT8		Write
Set IR Source on	0x29	0	UINT8		Write
Set IR Source off	0x30	0	UINT8		Write

*AZF – Auto Zero Function (Option)

6.3.4. Sensor Raw Signals

Description	Cmd	Frame Index	Format Type	Unit	Access	Range
ADC Raw CH1 reference	0x14	0	FLOAT	V	Read	0-1,25V
ADC Raw CH1 sensor	0x15	0	FLOAT	V	Read	0-1,25V
ADC Raw CH2 reference	0x10	0	FLOAT	V	Read	0-1,25V
ADC Raw CH2 sensor	0x13	0	FLOAT	V	Read	0-1,25V
ADC Raw CH3 reference	0x10	1	FLOAT	V	Read	0-1,25V
ADC Raw CH3 sensor	0x13	1	FLOAT	V	Read	0-1,25V
Modulation CH1	0x16	0	FLOAT		Read	0-1
Modulation CH2	0x16	1	FLOAT		Read	0-1
Modulation CH3	0x12	0	FLOAT		Read	0-1
Modulation CH4	0x12	1	FLOAT		Read	0-1
Electrochemical sensor raw value	0x1D	4	UINT16		Read	0-4096

6.3.5. Setup and Sensor Information

LED 1 Mode AC / DC / Pulse	0x21	0	UINT8		rw	0/1/2
LED 1 On Time	0x21	1	UINT16	sec	rw	
LED 1 Cycle Time	0x21	2	UINT16	min	rw	
LED 2 Mode AC/DC	0x22	0	UINT8		Read	0/1
IR Lamp Frequency	0x23	0	UINT16	Hz	rw	0-10
Filter Depth of Modulation CH3,CH4	0x35	0	UINT8		rw	0-255
Filter Depth of Concentration CH3,CH4	0x35	1	UINT8		rw	0-255
Filter Depth of Modulation CH1,CH2	0x35	2	UINT8		rw	0-255
Filter Depth of Concentration CH1,CH2	0x35	3	UINT8		rw	0-255
LED1 Current	0x36	0	UINT16	µA	rw	0-20000µA
LED2 Current	0x38	0	UINT16	µA	rw	0-20000µA
Serial Number	0x40	0	UINT16		Read	
Config ID	0x62	0	UINT32		Read	See table (S.8)
Hardware Revision	0x41	0	UINT16		Read	
Software Revision	0x0b	0	UINT16		Read	
Operating hours	0x43	0	UINT16	h	Read	
Measurement Range CH1	0x47	2	FLOAT	ppm [Vol.%]	Read	
Measurement Range CH2	0x47	3	FLOAT	ppm [Vol.%]	Read	
Measurement Range CH3	0x47	0	FLOAT	ppm [Vol.%]	Read	
Measurement Range CH4	0x47	1	FLOAT	ppm [Vol.%]	Read	
Measurement Unit CH1	0x61	2	UINT16		Read	0 – ppm 1 – Vol%
Measurement Unit CH2	0x61	3	UINT16		Read	
Measurement Unit CH3	0x61	0	UINT16		Read	
Measurement Unit CH4	0x61	1	UINT16		Read	
Source Power LED1	0x49	0	UINT8	%	Read	0-100%
Source Power LED2	0x49	1	UINT8	%	Read	0-100%
Source Power IR LAMP (EDL)	0x49	2	UINT8	%	Read	0-100%
Status Byte	0x50	0	UINT8			See table (S.7)
TK Comp. zero point CH1 [ON/OFF]	0x57	3	UINT8		write	
TK Comp. end point CH1 [ON/OFF]	0x58	3	UINT8		write	
TK Comp. zero point CH2 [ON/OFF]	0x59	3	UINT8		write	

TK Comp. end point CH2 [ON/OFF]	0x5A	3	UINT8		write	
TK Comp. zero point CH3 [ON/OFF]	0x5B	3	UINT8		write	
TK Comp. end point CH3 [ON/OFF]	0x5C	3	UINT8		write	
TK Comp. zero point CH4 [ON/OFF]	0x5D	3	UINT8		write	
TK Comp. end point CH4 [ON/OFF]	0x5E	3	UINT8		write	
Channel Merging CH1 to CH2 ON/OFF	0x37	6	UINT8		rw	
Channel Merging CH3 to CH4 ON/OFF	0x33	7	UINT8		rw	
Software System Reset	0x04	0	UINT8		write	

6.3.6. Customer specific data fields

not implemented now

Description	Cmd	Frame Index	Format Type		Access	Range
Count of active variables	0x95	0	UINT16	Customer specific data area 1	R/W	0-65535
Data 0		1				
Data 1		2				
Data 2		3				
Data 3		4				
Data 4		6				
Data 5		7				
Data 6		8				
Data 7		9				
Data 8		10				
Data 254		255				
Data 0		1				
Data 1		2				
Data 2		3				
Data 3		4				
Data 4		6				

Example for transmitting the Endpoint Calibration for Channel 3 (UV low) (CAN BUS & RS232)
Concentration = 6050,00ppm (certified gas bottle)
Measured concentration = 6021,00ppm

Set Span Calibration CH3	to detector		0x60	0x02	0x00	0x10	0xBD	0x45	0x7A	0x30
	from detector	ASCII String: 1.00482 + [CR + LF]								

The detector sends the calculated compensation factor back. The compensation factor in this example is **1,00482**. This factor is stored in the internal EEprom.

$$Mod = \frac{\frac{ADC\ Raw\ CH1ref}{ADC\ Raw\ CH1ref@zero} - \frac{ADC\ Raw\ CH1mess}{ADC\ raw\ CH1\ mess@zero}}{\frac{ADC\ Raw\ CH1ref}{ADC\ Raw\ CH1ref@zero}}$$

6.3.7. Description of Status Byte

IR/EDL detected	NA	UV LED 1 detected	UV LED 2 detected	IR/EDL Level error	NA	UV LED 1 Level error	UV LED 2 Level error			
Bit0	Bit1	Bit2	Bit3	Bit4	Bit5	Bit6	Bit7	**Status code bin**	**Status code hex**	**Status code dec**
0	1	0	0	1	1	1	1	1001111	4F	79
1	1	0	0	1	1	1	1	11001111	CF	207
1	1	0	0	0	1	1	1	11000111	C7	199
0	1	1	0	1	1	1	1	1101111	6F	111
0	1	1	0	1	1	0	1	1101101	6D	109
0	1	1	1	1	1	1	1	1111111	7F	127
0	1	1	1	1	1	0	0	1111100	7C	124
0	1	1	1	1	1	0	1	1111101	7D	125
0	1	1	1	1	1	1	0	1111110	7E	126
1	1	1	0	1	1	1	1	11101111	EF	239
1	1	1	0	0	1	0	1	11100101	E5	229
1	1	1	0	0	1	1	1	11100111	E7	231
1	1	1	0	1	1	0	1	11101101	ED	237
1	1	1	1	1	1	1	1	11111111	FF	255
1	1	1	1	0	1	0	0	11110100	F4	244
1	1	1	1	0	1	0	1	11110101	F5	245
1	1	1	1	0	1	1	1	11110111	F7	247
1	1	1	1	0	1	1	0	11110110	F6	246
1	1	1	1	1	1	0	0	11111100	FC	252

For example:
CO2 Sensor without UV sample cell
IR Lamp is detected, and signal level are in normal range > 50 % intensity
Statusbyte code: 0xC7
IR Lamp is detected, and signal level are under signal threshold 50% intensity
Statusbyte code: 0xCF

6.3.8. Description of Config ID

Config ID (0xCH1MT,CH2MT,CH3MT,CH4MT,CH1GT,CH2GT,CH3GT,CH4GT)		
Index	Gastype (GT)	Measurement Type (MT)
0	none	none
1	SO2	UV
2	CO2	IR
3	CO	UV+IR
4	NO	WLD
5	NO2	Pressure
6	N2O	Temperature
7	H2S	external sensor
8	CH4	
9	CnHm	
a	Cl2	
b	HC	
c	CLO2	
d	O3	
e	SF6	
f	CF4	

For example:

Config ID: 0x20102010
Gas Channel 1 IR and CO2
Gas Channel 2 none
Gas Channel 3 UV and SO2
Gas Channel 4 none

Description of Config ID
For Software Version newer V0.0.147.18548

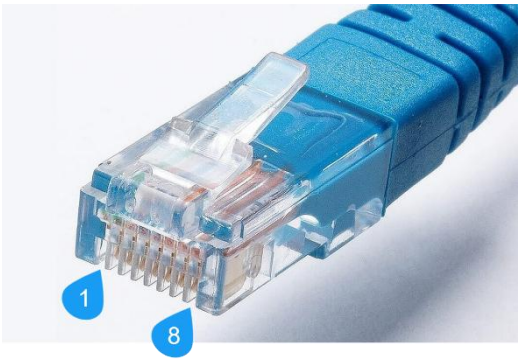
Config ID (0xCH1MT,CH2MT,CH3MT,CH4MT,CH1GT,CH2GT,CH3GT,CH4GT)		
Index	Gastype (GT)	Measurement Type (MT)
0	none	none
1	SO2	UV
2	CO2	IR
3	CO	UV+IR
4	NO	WLD
5	NO2	Pressure
6	N2O	Temperature
7	H2S	external sensor
8	CH4	
9	CnHm	
a	Cl2	
b	H2O	
c	CLO2	
d	O3	
e	SF6	
f	CF4	

For example:

Config ID: 0x20102010
Gas Channel 1 IR and CO2
Gas Channel 2 none
Gas Channel 3 UV and SO2
Gas Channel 4 none

6.4. CANBus Protocol

a) Pin assignment:



RJ45-lead	Signal	Description	Colour *)
1	CAN_GND	Ground	white
2			brown
3			green
4	CAN_H	Dominant High	yellow
5	CAN_L	Dominant Low	grey
6			pink
7			blue
8			red

*) Wire colours of the included connection cable

b) Initialization of the sensor

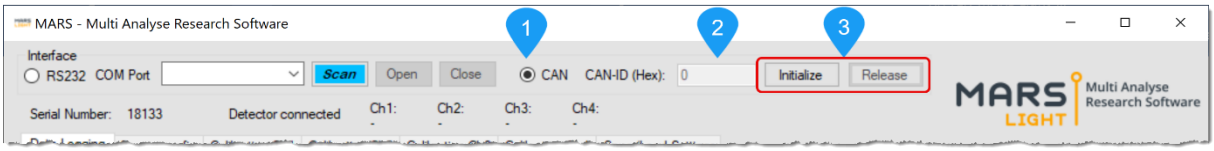


Figure 9: Initialization of the sensor with CANBus protocol

(1) Select the “CAN” interface.

(2) Input the CAN-ID “300”, if not already set by default.

(3) Initialize: Click on the button “Initialize”
Release: Click on the button “Release”

> If several sensor modules are installed (e.g. 1 x IR module + 1 x UV module) and the application is opened in multiple instances, please switch to the other instances and repeat steps (1) to (3) there.

Then proceed as described in par. 6.1 (4) to 6.1 (13)

7. Panel View with Data Panel

The *Panel View* enables the user to show the relevant measurement signals in the front panel design mode. This can be useful to demonstrate measurements or run diagnostics on the sensor.

Please note: Before activating the *Panel View*, a connection with the sensor must be established first (see par. 6).

To open the *Data Panel*, click the button [Data Panel] (see figure 1, button no. 25).

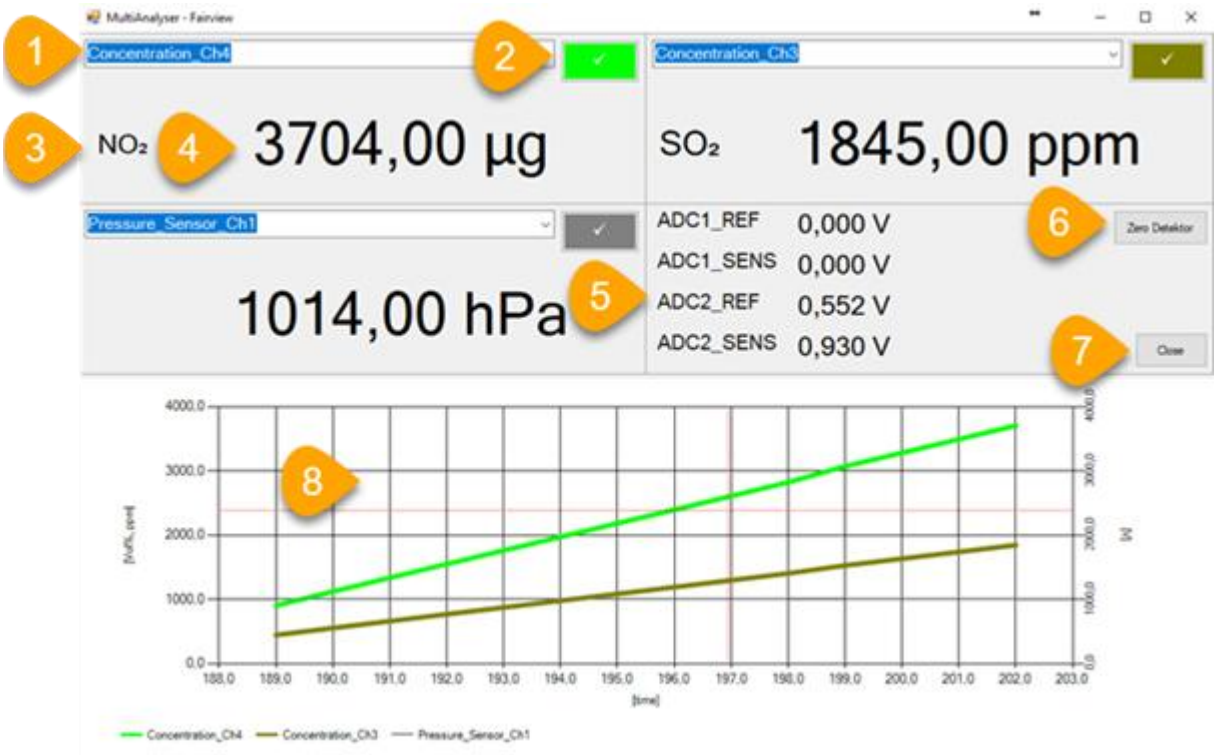


Figure 10: Data Panel View

(1) Data Channel Selection

(2) Activate/ deactivate data logging

(3) Gas component of the selected channel

(4) Actual gas concentration reading

(5) Raw data values (preamp signals)

(6) Sets all channels to zero (with inert gas N_2, H_2)

(7) Closes the *Panel View*, all settings will be saved

(8) Signal plot

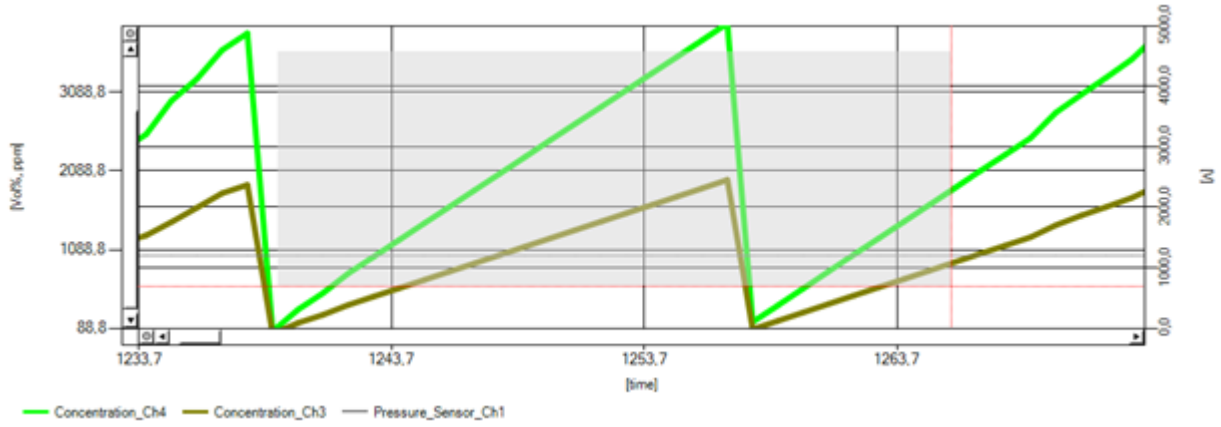


Figure 11: Data Panel with zoom function

If you keep the left mouse button pressed you can select an area you want to zoom in → see grey area in above figure.

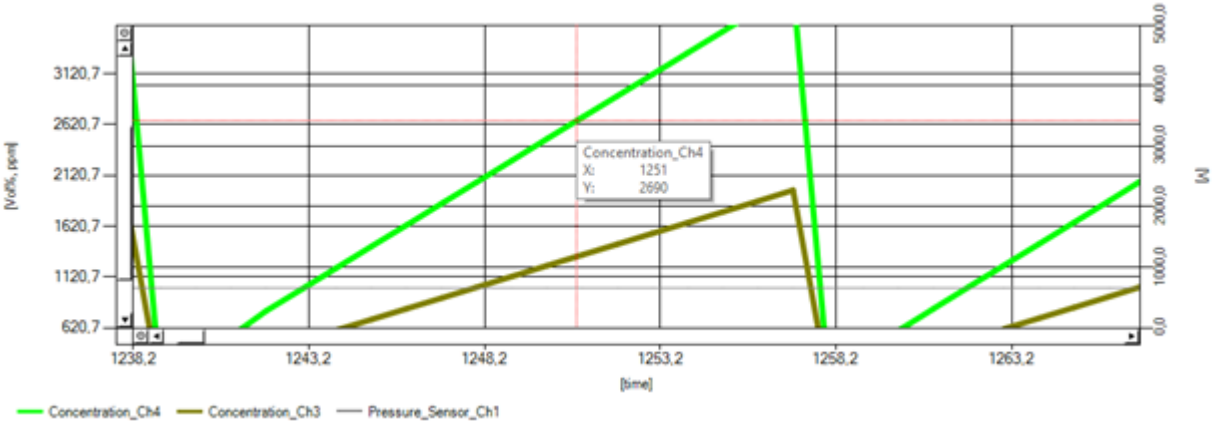


Figure 12: Data panel with label

Navigate the cursor to a position on the graph to display detailed information.