User Documentation

SONAPHONE HR-DataReader

Computer software for display, evaluation and export of high-resolution measurement data and route-based data

Translation of the German Original

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1 Introduction

This section is intended to explain function, structure and representations of this documentation to simplify handling of this documentation.

1.1 Notes on this documentation

Purpose

This documentation constitutes an integral part of the product and contains important advice on safe operation as well as all information on intended and efficient use. Thus, any person using the product must have read and understood this documentation.

Accessibility

The staff working with this product must have constant access to this documentation to prevent handling errors and guarantee trouble-free operation.

Up-to-dateness

Every effort has been made to ensure that the information contained in this documentation is complete and correct at the time of release. This documentation describes all units and functions known at the current point of time.

1.2 Representations in this documentation

Illustrations

Illustrations used in this documentation do not always contain all details or special cases. They only represent the relevant information.

Tips

Tips are marked as follows:

> ⓘ Tips describe specific information or particular features that might not be evident, even for experienced users. The neglect of a tip poses no direct safety risk. However, it can lead to workflow disruptions.

General icons

The following general icons are used for visual emphasis:

Icon	Function
	Indicates a link to external contents.

Inputs and outputs

Certain recurring symbols or descriptions marking possible inputs and outputs for users are used as follows:

Input/output	Representation
Button	**Button**
Dialog window	`Window`
User interface element	**GUI element**

2 Safety instructions

No alterations to the software

Do not alter the supplied software or commission software alterations to third parties. The software may not be disassembled, decrypted or decompiled in full or in part.

Data loss

The loss of measurement data may lead to incomplete measuring chains or misinterpretations.

- Always make sure to backup measurement data regularly on external data media.

Cyber security measures

Based on analysis of vulnerabilities according to IEC 62443-4-1 and IEC 62443-4-2, no cyber security measures are necessary for the product.

However, a cyber attack on the product and its environment can never be completely ruled out. Thus, we strongly recommend to implement safety measures (e.g. anti-virus programs, firewalls, access restrictions) against potential cyber attacks within the product environment.

3 Description of the HR-DataReader

This section describes use, system requirements and user interface of the SONAPHONE HR-DataReader .

The information in the following sections relates to HR-DataReader version V1.4. Descriptions and operation may differ slightly in other versions.

3.1 Intended use

The SONAPHONE HR-DataReader is a computer software for display, evaluation and export of high-resolution measurement data that have been recorded with a SONAPHONE handheld unit and the LevelMeter app / AssetExpert app.

The SONAPHONE HR-DataReader may be installed and used on personal computers with a Windows operating system.

3.2 Prohibited use

Any use not approved by SONOTEC GmbH is prohibited and may lead to injury or damage to property.

SONOTEC GmbH accepts no liability for damage caused by prohibited use of the product.

Prohibited are in particular:

- Use of the software within a hardware or software environment that does not match the System requirements.
- Unauthorized modifications of the software.
- Transfer of the software to third parties with or without financial remuneration.
- Public distribution of the software.
- Rental or sub-licensing of the software.

3.3 System requirements

SONAPHONE

- SONAPHONE – Ultrasonic testing device
- SONAPHONE MeasurementCore V2.0
- SONAPHONE LevelMeter app V2.0 (with activated “High-resolution data” option)
- SONAPHONE AssetExpert app V2.0
- HR DataLicense for LevelMeter app and AssetExpert app

PC

Minimum requirements	
Operating system	Windows 7 service pack 1
RAM	4 GB
Available hard disk space	8 GB (for installation)
Additional software/environment	MATLAB Runtime R2019b (version: 9.7)

Recommended system requirements	
Operating system	Windows 10
RAM	8 GB
Available hard disk space	Minimum 500 GB (depending on the volume of measurement data)
Processor (CPU)	x64 (multicore CPU)

3.4 User interface

Structure

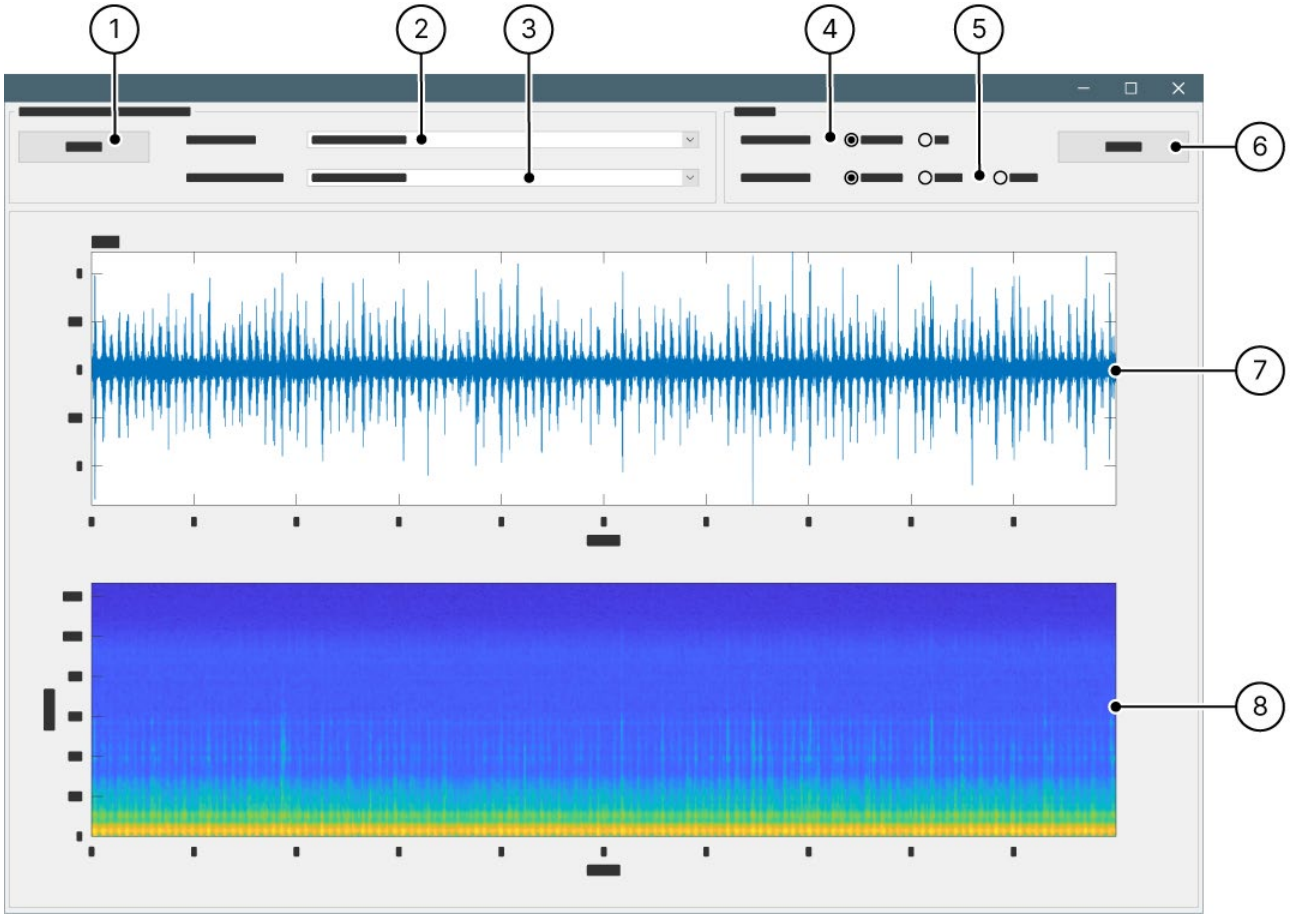


Figure 1: User interface of the SONAPHONE HR-DataReader

Description

No.	Type	Description/function
1	**Load**	Opens a dialog window for selection of an archive folder.
2	**Select folder / Select route**	• Shows a list of all folders in the selected archive. • Shows the name as defined in the LevelMeter app / AssetExpert app and the automatically assigned ID of each folder. • For selection of a folder.
3	**Select measurement**	• Shows a list of all measurements in the selected folder. • Shows the automatically assigned number and ID of each measurement. The ID consists of [folder ID/measurement ID] • For selection of a measurement.

No.	Type	Description/function
4	**Measurement**	For defining the content to be exported. • **Selection:** the current measurement or the selected segment (zoom) of the current measurement • **All:** all measurements contained in the opened archive.
5	**Output format**	Defines the export format of the measurements. (see “Export formats”)
6	**Export**	Opens a dialog window for: • selection of a saving location and • execution of the export.
7	Time signal	Displays the measurement values graphically as audio signal (sampling rate over time).
8	Spectrogram	Displays the frequency range of the measurement values between 1 … 128 kHz graphically over time.

Export formats

The following export formats are available for exporting the measurement data:

Format	Description	Characteristics
*.mat	The measurement data are saved in the proprietary MATLAB format.	Contains two variables (vectors): • t: time in seconds • y: amplitude values (raw data)
*.csv	The measurement data are saved as structured text. CSV = Comma-separated values	Two columns: 1. time in seconds 2. amplitude values (raw data)
*.wav	The measurement data are saved as audio file.	• 32 Bit • 256 kHz

4 Working with the HR-DataReader

This section contains instructions on working with the SONAPHONE HR-DataReader. The structure and order of these instructions follow the typical (recommended) work flow.

4.1 Installation and startup

The SONAPHONE HR-DataReader shall be installed on a desktop computer that fulfills the requirements listed under System requirements.

4.1.1 Installation of required components

Installing MATLAB Runtime

ATTENTION

Mind the MATLAB Runtime version!

The SONAPHONE HR-DataReader can only be used if the release R2019b (version: 9.7) of MATLAB Runtime has been installed on the personal computer.

- Please mind the required version of MATLAB Runtime during download and installation.

1. Download the release R2019b (version: 9.7) from the MathWorks website to the personal computer (see: https//de.mathworks.com/products/compiler/matlab-runtime.html)
2. Extract the downloaded ZIP file on the personal computer.
3. In the archive folder, double-click the installation file (setup.exe).
4. Follow the instructions and steps of the install wizard.

For further information, please see the MATLAB Runtime installation software documentation.

Installing the HR DataLicense for the LevelMeter app and AssetExpert app on the SONAPHONE handheld unit

1. Download the license file to the personal computer.

   ⓘ The link for downloading the license file will be sent by email after purchase of the license.

2. Connect the SONAPHONE handheld unit to the desktop computer via USB.
3. Transfer the license file (*.lic) to the SONAPHONE handheld unit and install.

   ⓘ Instructions for installation of extended licenses may be found in the user documentation of the SONAPHONE handheld unit (section “Managing SONAPHONE apps”).

4.1.2 Download and extraction

Procedure

1. Download the application archive (ZIP file) to the personal computer.

   ⓘ The link for downloading the application archive file will be sent by email after purchase of the license.

2. Extract the application archive on the personal computer.

4.1.3 Activation

Description

During the first startup, the software needs to be registered with an activation key and activated.

ⓘ **Internet connection required**
For registration and activation of the software, an internet connection is required.

Procedure

1. Double-click the program file (SONAPHONE_HR_DataReader.exe).
   → The program automatically checks whether the correct MATLAB Runtime version has been installed on the personal computer.
   → After successful confirmation, the `Product Registration and Activation` dialog window opens.
2 Enter the activation key in the **Activation Key** field.

   ⓘ The activation key will be sent by email after purchase of the license.

3. Click the **Activate** button.
   → The validity of the activation key is checked. After successful confirmation, the SONAPHONE HR-DataReader is activated and starts up.

Using the demo version

1. Do not fill in the **Activation Key** field.
2. Close the `Product Registration and Activation` window.
   → The Software is started as demo version. The remaining usage days are displayed in the `License Status` window.

ⓘ The demo version may be used for 30 days. After expiration of the usage time, it is not possible to use the software again on the same computer without purchasing a license.

4.1.4 Starting up the HR-DataReader

Procedure

1. Double-click the program file (SONAPHONE_HR_DataReader.exe).
   → The program automatically checks whether the correct MATLAB Runtime version has been installed on the personal computer.
   → After successful confirmation, the SONAPHONE HR-DataReader starts up.

ⓘ **Creating a shortcut**
To simplify further startups of the software, a shortcut to the program file (SONAPHONE_HR_DataReader.exe) may be placed on the taskbar or the desktop of the personal computer.

4.2 Preparing measurement data evaluation

High-resolution data will be recorded with a SONAPHONE handheld unit and the LevelMeter app provided that:

- the fee-based “HR DataLicense for LevelMeter App” extended license has been installed on the SONAPHONE handheld unit.

  ⓘ Instructions for installation of extended licenses may be found in the user documentation of the SONAPHONE handheld unit (section “Managing SONAPHONE apps” -> “Installing and updating”).

- recording of high-resolution data is activated in the LevelMeter app.
  (see: Configuring settings in the SONAPHONE LevelMeter app)

Measurement management in the LevelMeter app

The individual measurements will be saved in folders. For structured collection and export of measurements, an individual folder may for instance be created for each point of measurement to be checked, each application or each daily route.

(see: Managing folders in the SONAPHONE LevelMeter app)

4.2.1 Transferring measurement data to a PC and unzipping the data package

Procedure

1. In the LevelMeter app, export a ZIP file of the particular folders.
   (see: Exporting a ZIP file with the SONAPHONE LevelMeter app)
2. Transfer the exported ZIP file from the SONAPHONE handheld unit to the computer.

   Instructions for data transfer may be found in the user documentation of the SONAPHONE handheld unit (section “Managing data”).
3. Extract the transferred ZIP file on the computer.

   → The folder can be selected and loaded into the software.

Structure of the unzipped archive folder

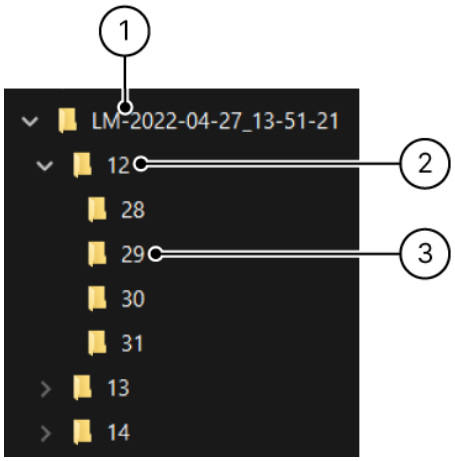


Figure 2: Structure of the archive folder (example)

No.	Type	Description/function
1	Archive	Contains all data (folders and measurements) selected for export from the LevelMeter app.
2	Folder	Contains the measurements saved with the LevelMeter app in the particular folder.
3	Measurement	Contains all data of a measurement (levels, audio signal, additional data, ...).

4.2.2 Loading measurements

ⓘ Archives must be unzipped before opening.

Opening an archive folder

1. Click the **Load** button.
   → The `Select folder to open` dialog window opens for selection of the saving location.
2. Navigate to the saving location of the archive folder.
3. Select the particular archive folder.
4. In the dialog window, click the **Select folder** button.
   → The first measurement in the first folder of the archive is loaded and displayed in time signal and spectrogram.

   ⓘ If the loaded measurement does not contain high-resolution data, the time signal will display a warning message.

   ⓘ If the loaded measurement does not contain any measurement data due to an error, the time display and the spectrogram will display a warning message.

Selecting folders

If an opened archive contains multiple folders with measurements, the folder with the particular measurements may be selected.

1. Click the **Select folder** list.
   → A list of all folders contained in the opened archive opens. The folders are displayed with name and ID.
2. Click the particular folder.
   → The folder is selected. The first measurement in the folder is loaded and displayed in time signal and spectrogram.

> ⓘ If the loaded measurement does not contain high-resolution data, the time signal will display a warning message.

> ⓘ If the loaded measurement does not contain any measurement data due to an error, the time display and the spectrogram will display a warning message.

Selecting a measurement

If a selected folder contains multiple measurements, the particular measurement may be selected.

1. Click the **Select measurement** list.
   → A list of all measurements contained in the selected folder opens. The measurements are displayed with their ID and the folder ID.
2. Click the particular measurement.
   → The measurement is loaded and displayed in the time signal and spectrogram.

> ⓘ If the loaded measurement does not contain high-resolution data, the time signal will display a warning message.

> ⓘ If the loaded measurement does not contain any measurement data due to an error, the time display and the spectrogram will display a warning message.

4.3 Evaluating measurement data

Measurement data may be viewed and analyzed in the time signal and spectrogram. The time signal segment may be zoomed in individually for detailed analysis of amplitudes and/or frequencies in selected areas.

4.3.1 Reading out measurement values

Within the time signal

Within the time signal, the measurement values may be read out as follows:

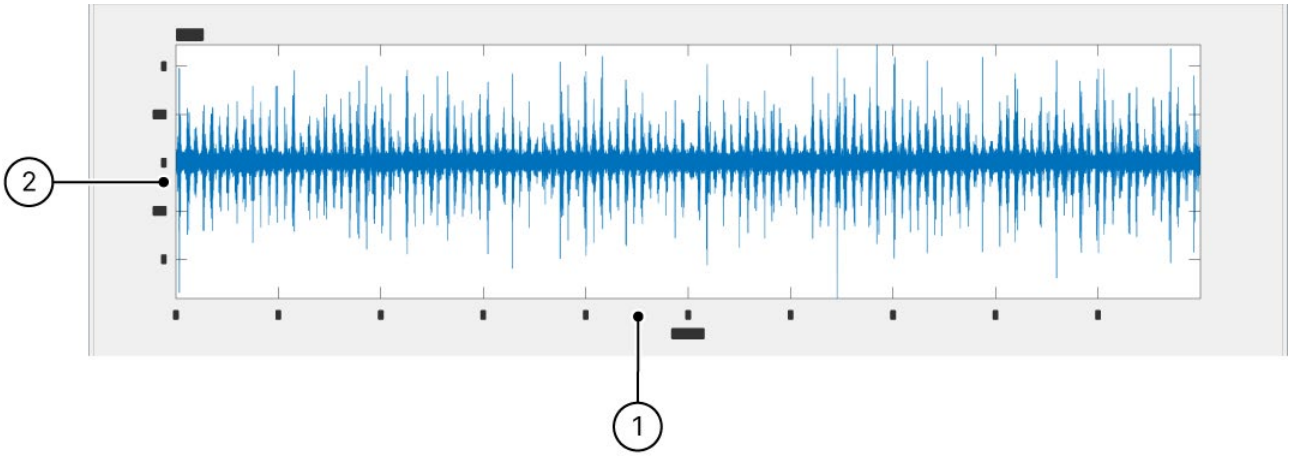


Figure 3: Time signal axes

No.	Type	Description/function
1	Time	Shows the length of the measurement or the selected segment in seconds.
2	Amplitude	Shows the amplitude of the sampling values (sampling rate 256 kHz, 24 Bit) in the value range of -2^{23} ... $+2^{23}$.

Within the spectrogram

Within the spectrogram, the measurement values may be read out as follows:

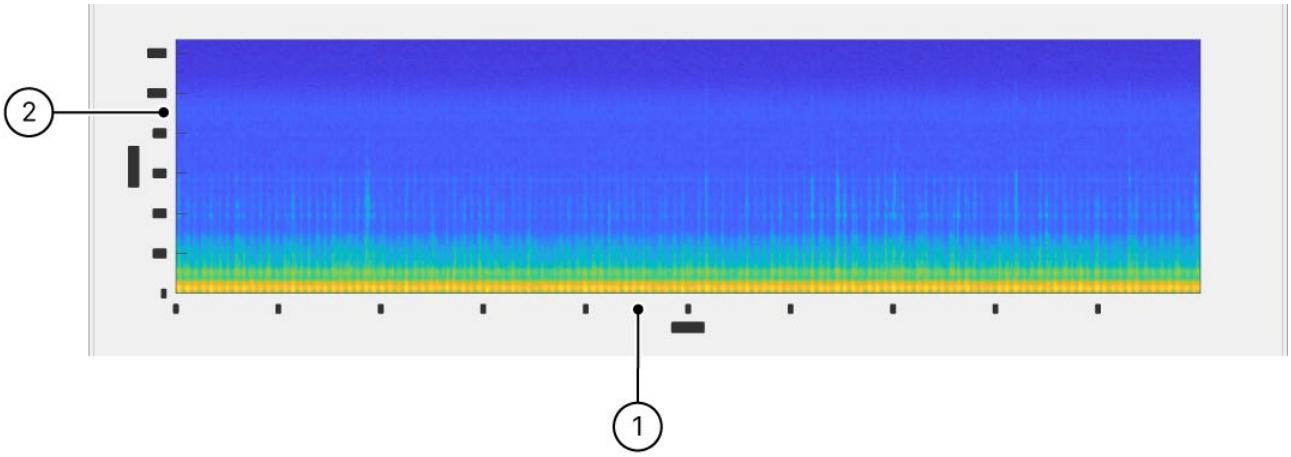


Figure 4: Spectrogram axes

No.	Type	Description/function
1	Time	Shows the length of the measurement or the selected segment in seconds.
2	Frequency	Shows the amplitude distribution of the measurement signal within the frequency range of 1 ... 128 kHz.

Distribution of the colors (color map)

The colors within the spectrogram are assigned as follows:

- blue = smallest amplitude of the measurement signal
- yellow = largest amplitude of the measurement signal

> ⓘ **Standardized display**
> The colors of the spectrogram are distributed according to a standardized display. It is not possible to manually assign amplitude values to color ranges.

4.3.2 Adjusting the time signal segment (zoom)

Description

For detailed analyses and evaluations of amplitudes and frequencies, the segment of the diagram axes of the time signal may be adjusted (zoomed in).
Modifications of the time axis segment (X direction) are also applied to the spectrogram.

Both axes

The segment of the X- and Y-axes may be adjusted as follows:

Enlarging the segment

- Position the mouse pointer on the diagram and turn the mouse wheel.
- Click the diagram with the mouse.
- Draw a rectangle over the diagram while pressing the mouse button.

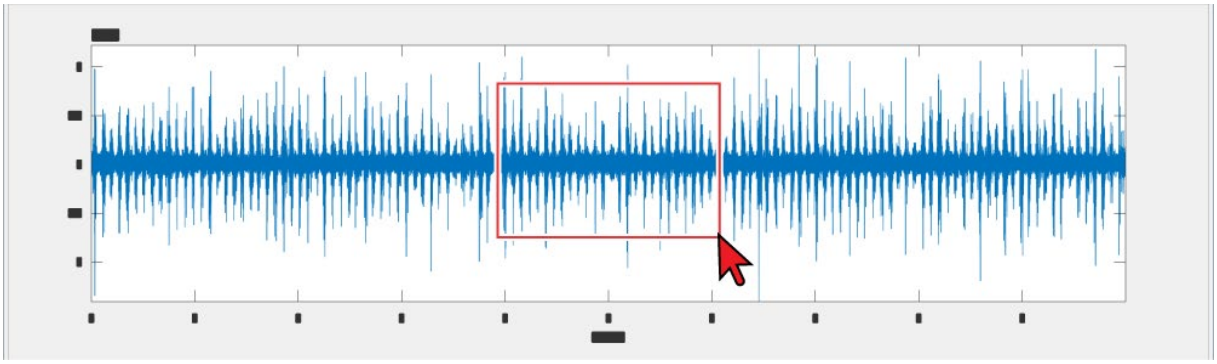


Figure 5: Zoom function – Enlarging a segment

Shrinking the segment

- Position the mouse pointer on the diagram and turn the mouse wheel in the opposite direction.
- Keep pressing the Shift key and click on the diagram with the mouse.
- Use the right mouse button to click on the diagram and select the item **Zoom out** in the appearing context menu.

Resetting the zoom

- Double-click the diagram.
- Use the right mouse button to click on the diagram and select the item **Restore View** in the appearing context menu.

X-axis

The segment of the X-axis may be adjusted as follows:

Enlarging the segment

In the diagram, draw a horizontal line over the particular area while pressing the mouse button.

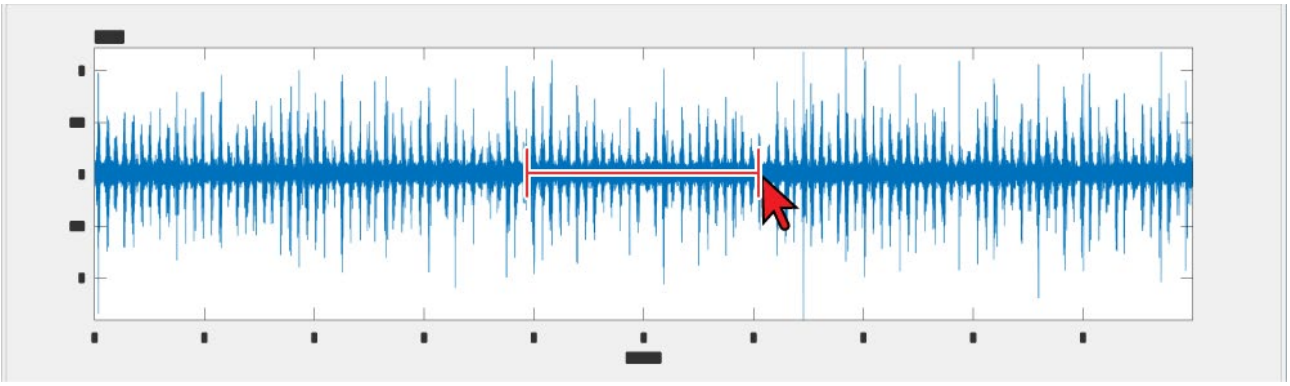


Figure 6: Zoom function – Enlarging a segment of the X-axis

> **Limiting the zoom function**
> Use the right mouse button to click on the diagram and activate the **Horizontal Zoom** item in the appearing context menu to limit the zoom function to the X-axis.

Resetting the zoom

- Double-click the diagram.
- Use the right mouse button to click on the diagram and select the item **Restore View** in the appearing context menu.

Y-axis

The segment of the Y-axis may be adjusted as follows:

Enlarging the segment

In the diagram, draw a vertical line over the particular area while pressing the mouse button.

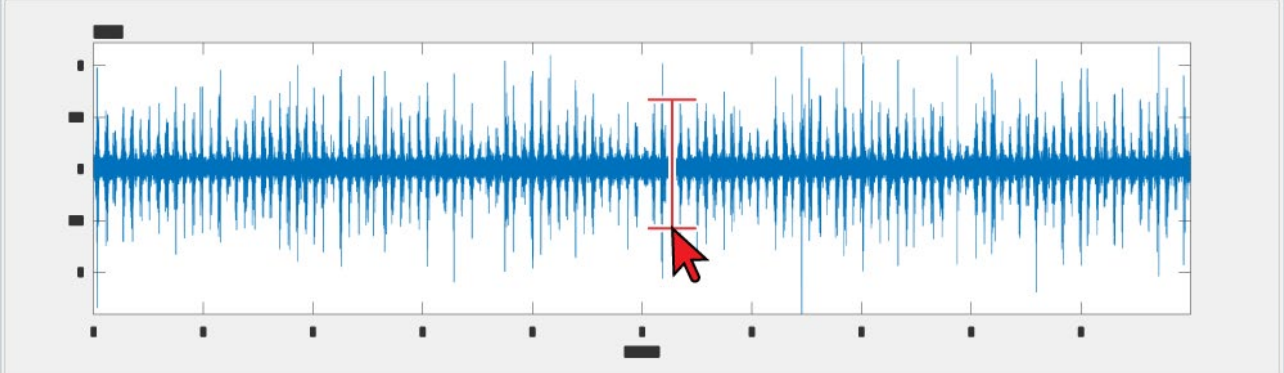


Figure 7: Zoom function – Enlarging a segment of the Y-axis

> **Limiting the zoom function**
> Use the right mouse button to click on the diagram and activate the **Vertical Zoom** item in the appearing context menu to limit the zoom function to the Y-axis.

Resetting the zoom

- Double-click the diagram.
- Use the right mouse button to click on the diagram and select the item **Restore View** in the appearing context menu.

4.4 Exporting measurement data

Description

With the export function of the HR-DataReader, single measurements, a segment of a loaded measurement as well as all measurements of an open archive folder may be saved in differing formats.

Selected measurement

1. Open the archive folder with the particular measurement.
2. Select the measurement folder.
3. Select the particular measurement.
4. In the **Export** area, activate the **Measurement: Selection** option.
5. Select the particular export format.
6. Click the **Export** button.
   → The `Save file` dialog window opens.
7. In the dialog window, navigate to the particular saving location.
8. Optional: Enter a customized file name.
9. Click the **Save** button.
   → The measurement is exported to the selected saving location.

Segment of a selected measurement

1. Open the archive folder with the particular measurement.
2. Select the measurement folder.
3. Select the particular measurement.
4. Adjust the segment of the time axis.
5. In the **Export** area, activate the **Measurement: Selection** option.
6. Select the particular export format.
7. Click the **Export** button.
   → The `Save file` dialog window opens.
8. In the dialog window, navigate to the particular saving location.
9. Optional: Enter a customized file name.
10. Click the **Save** button.
    → The measurement segment is exported to the selected saving location.

All measurements of an archive folder

1. Open the particular archive folder.
2. In the **Export** area, activate the **Measurement: All** option.
3. Select the particular export format.
4. Click the **Export** button.
   → The `Select folder to open` dialog window opens.
5. In the dialog window, navigate to the particular saving location.
6. Click the **Select folder** button.
   → All measurements of the open archive folder are exported to the selected saving location.

4.5 Further processing CSV measurement data (Excel)

Description

In some systems (e.g. Excel installations with German language) CSV data exported from HR DataReader are not imported correctly. Background: The use of the decimal character is not internationally standardized.

The following section does not describe any software functionality of HR DataReader. It explains one possibility to import CSV data into Excel and to adjust separators for individual needs. If necessary, the procedure can also be applied to imports into other systems (e.g. in MATLAB software).

Requirements

1. Excel Version: mind. 1808 (Build 10401.20025).

> ⓘ Please note:
> The total number of rows in an Excel worksheet is limited to 1,048,576. If this number is exceeded, the data cannot be imported or can only be imported partially.

2. Ensure that files do not exceed the maximum permitted number of data records. If necessary, divide the data records into several files before reading them in.

Import CSV data into Excel

1. Open Excel, create a new file and click on any cell.
2. Switch to the **Data** tab and click the **From Text/CSV** button.

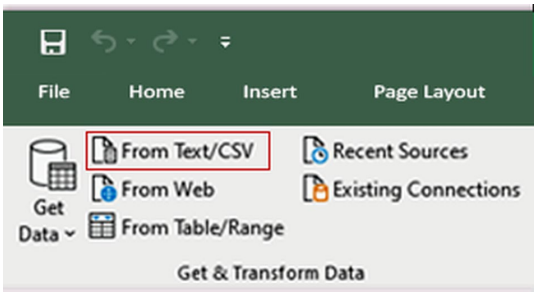
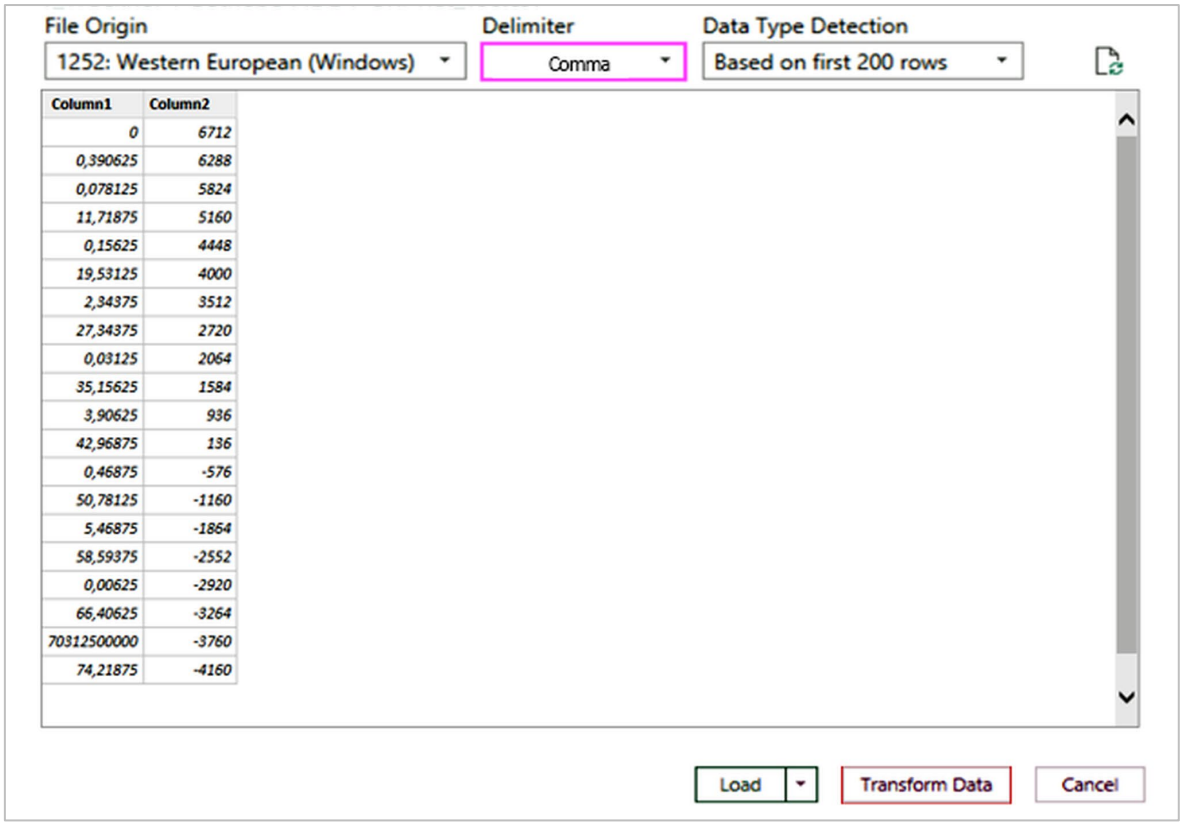


Figure 8: Load data “From Text/CSV”

→ The `Import Data` dialog box opens.

3. Select the desired file and click on the **Import** button.
   → The `Transform data` dialog box opens.

4. Select “comma” (alternatively “semicolon”) as the separator.



Column1	Column2
0	6712
0,390625	6288
0,078125	5824
11,71875	5160
0,15625	4448
19,53125	4000
2,34375	3512
27,34375	2720
0,03125	2064
35,15625	1584
3,90625	936
42,96875	136
0,46875	-576
50,78125	-1160
5,46875	-1864
58,59375	-2552
0,00625	-2920
66,40625	-3264
70312500000	-3760
74,21875	-4160

Figure 9: Select separator and “Transform Data”

5. Click on the **Transform Data** button.
   → The `Query Editor` is opened and the data is displayed in columns.

6. Delete the entry **Changed type** in the `Query Settings` (window on the right).

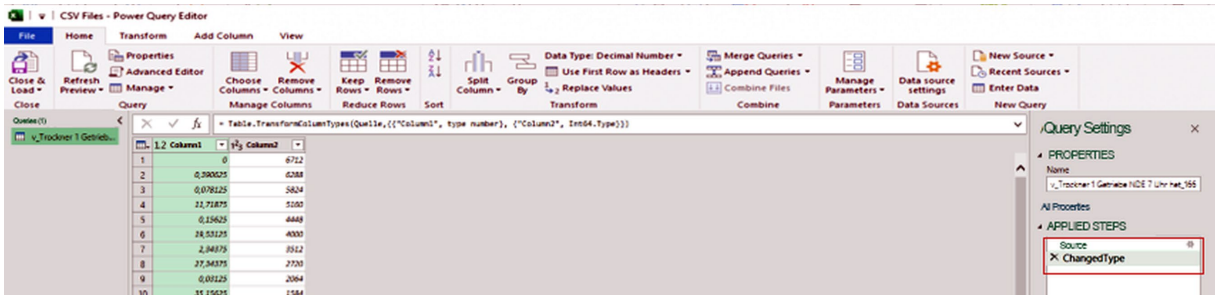


Figure 10: Delete entry “Changed Type”

→ The first data column is marked.

7. Optional: Select the first column.
8. Switch to the **Transform** tab field.
9. Search for the **Text Column** section (see figure) and click on the **Parse** button.
   → A selection box opens with two options.
10. Select the **JSON** option.

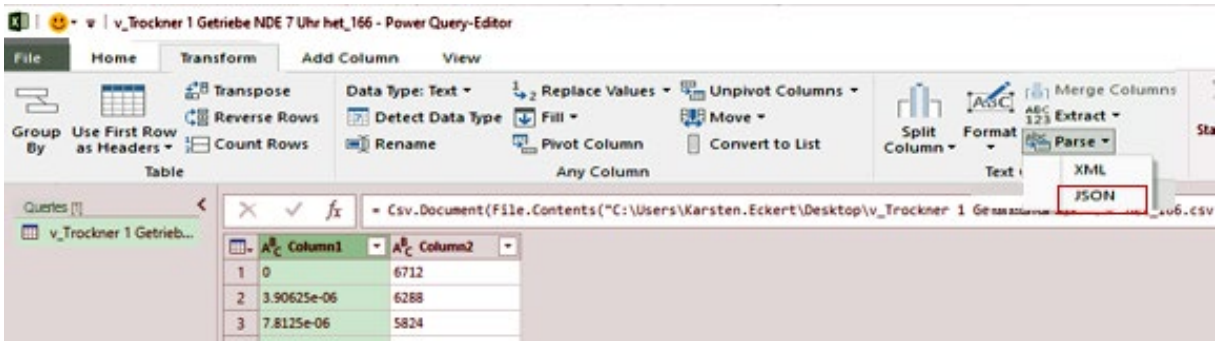


Figure 11: Select option “JASON”

11. Switch to the **Home** tab field.
12. To close the `Query Editor` and to load the data, click on the **Close & load** button.

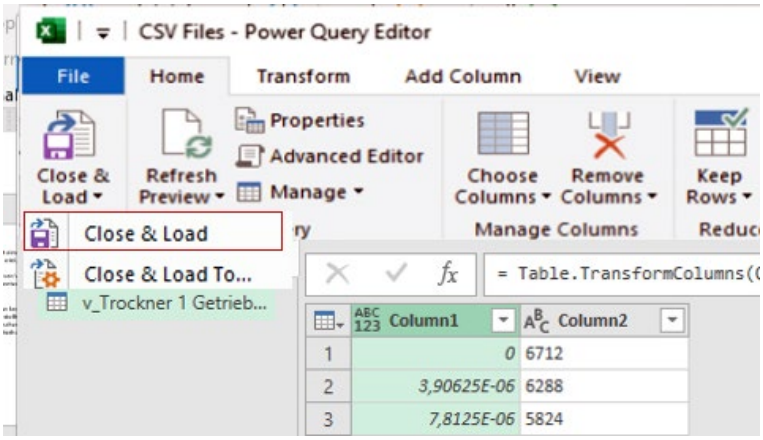


Figure 12: End query with “Close & Load” button

→ The query is finally executed and data is loaded.
→ The data can be saved and further processed.

5 Warranty

Condition at delivery

The software has been thoroughly tested at the manufacturer's site and is a state-of-the-art product that adheres to all applicable safety regulations at the time of delivery.

Warranty

SONOTEC GmbH will eliminate all software deficiencies that result from software bugs free of charge. For this, files will be provided to update or replace the software.

Exceptions

Defects resulting from improper use of the software are exempt from warranty.

Responsibility of the user/operator

It lies within the responsibility of the users to ensure that the product has been installed and set-up properly and is used in a manner that does not impair safe operation.

Operating errors

Operating errors can never be completely ruled out by the manufacturer. SONOTEC GmbH is in no way liable for any direct or indirect damage caused by operating errors (e.g. damage on software and/or hardware, damage by downtime, damage by malfunction as well as damage or loss of measurement and test data).

Quality of captured data

The determination of valid test results, their interpretation and the actions derived therefrom are exclusively subject to the personal responsibility of the users. SONOTEC GmbH does not guarantee the correctness of determined test values and/or test results. SONOTEC GmbH does not assume liability for any faults or damages that might occur due to further use of determined test and measurement values.

6 Copyright and contact

Copyright

Contact

Manufacturer

SONOTEC GmbH
Thüringer Str. 33
06112 Halle (Saale), Germany
Phone: +49 345 13317-0
mySONAPHONE@sonotec.de
www.sonotec.eu

USA

SONOTEC US Inc.
10 Newton Pl., Ste. 100
Hauppauge, NY 11788
USA
Phone: +1 631 4154758
sales@sonotecusa.com
www.sonotecusa.com