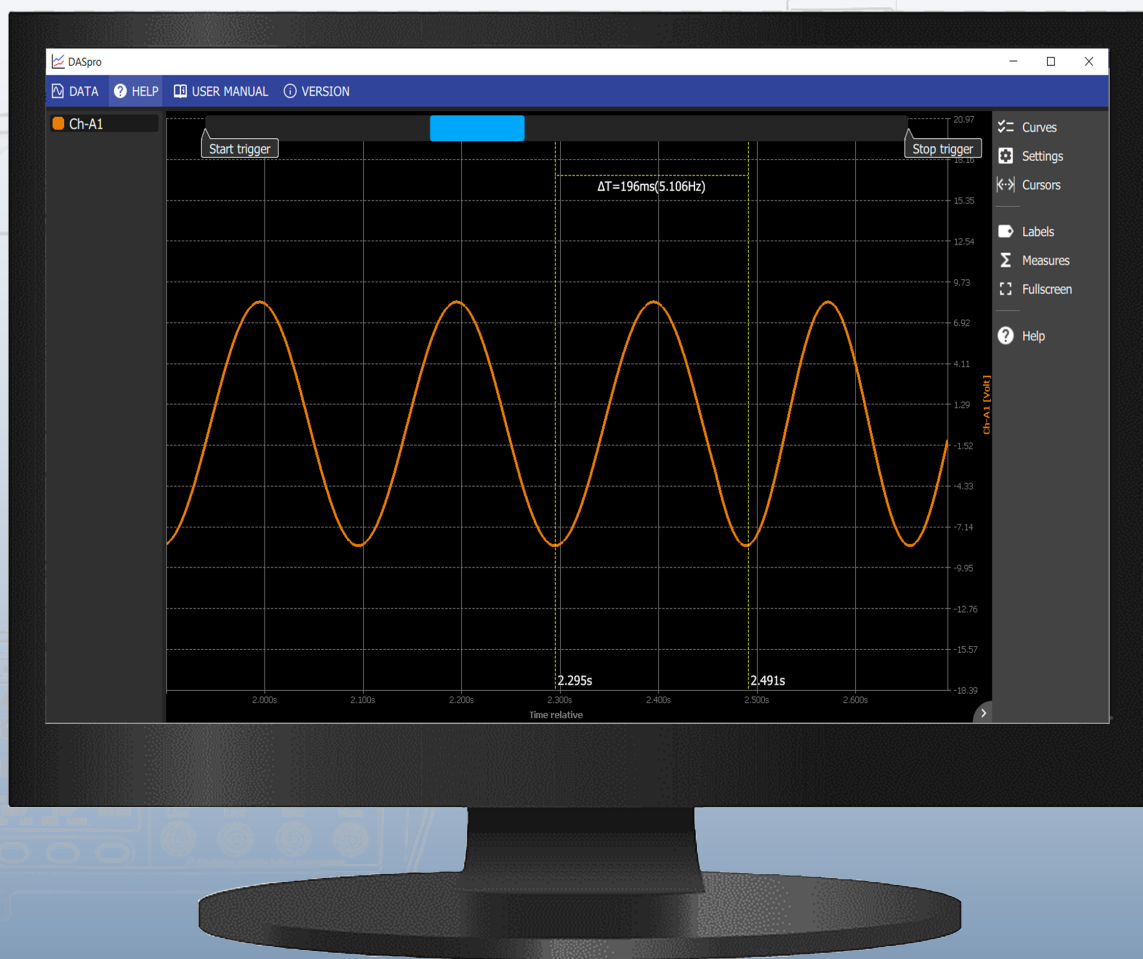


User manual

DASpro



Sefram

a B&K Precision company

BK PRECISION

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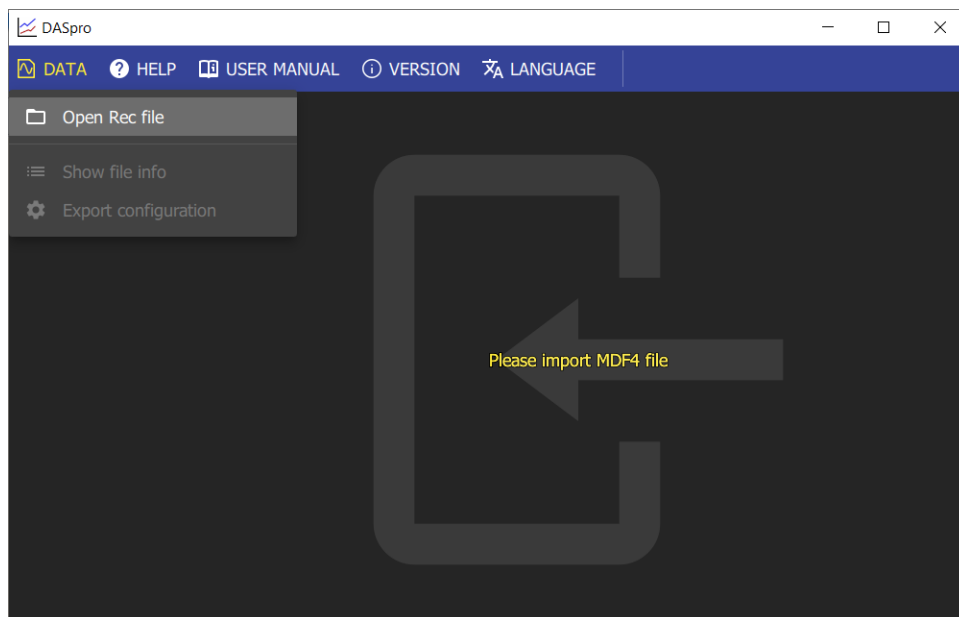
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Chapter 1

Introduction

The software is available and free to download on our website www.bkprecision.com

To open a record file, go to “DATA” and open “Rec file”. You can also drag and drop an “MDF4” file into the DASpro window.



Chapter 2

Post-analysis

2.1 | Visualization and graphical analysis



The user interface for viewing $F(t)$, or analyzing a recording on the device or on a PC (via DASpro software) is similar.

You can download the DASpro software from your DAS1800's web server by clicking the "DOWNLOAD DASPRO" button.

To display the measurement, drag-and-drop it into the graph area (1), and adjust the desired scale using the various touch gestures :

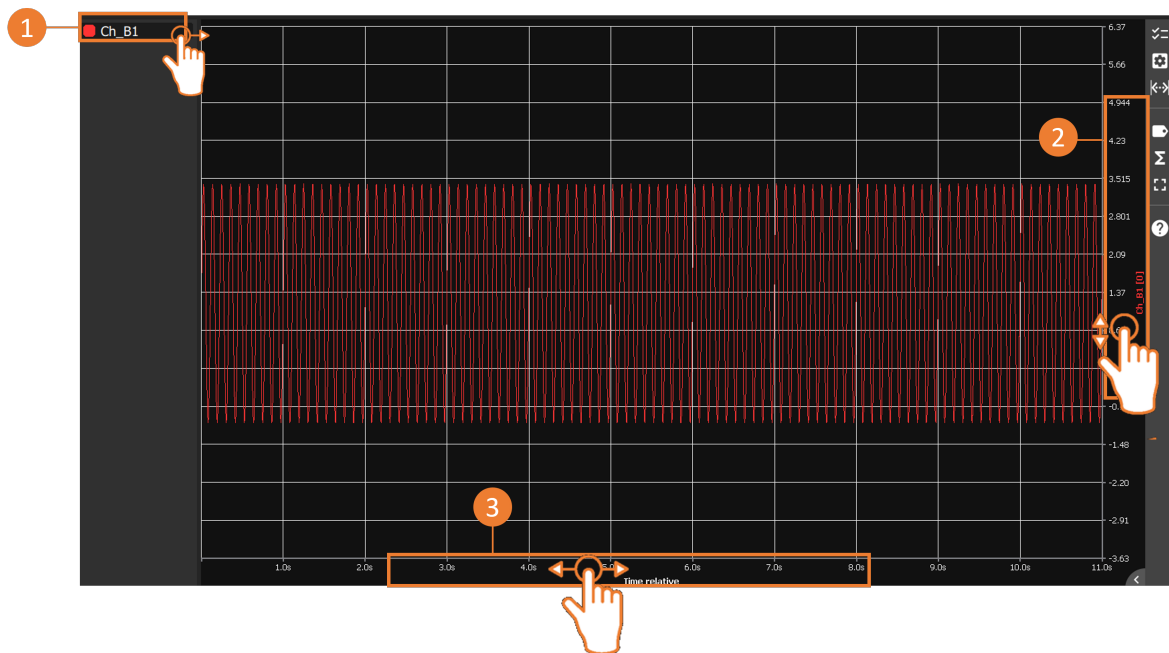


FIGURE 2.1 : Min and max settings for X and Y axes

You can set the minimum and maximum limits by sliding on the axis (2). The same applies to the x-axis (time) (3).



A short press on each axis opens a settings window, where you can manually enter the limits. From this menu, you can, for example, perform an "auto zoom" on the Y axis to automatically center the measurement, or add an additional scale on the Y axis.

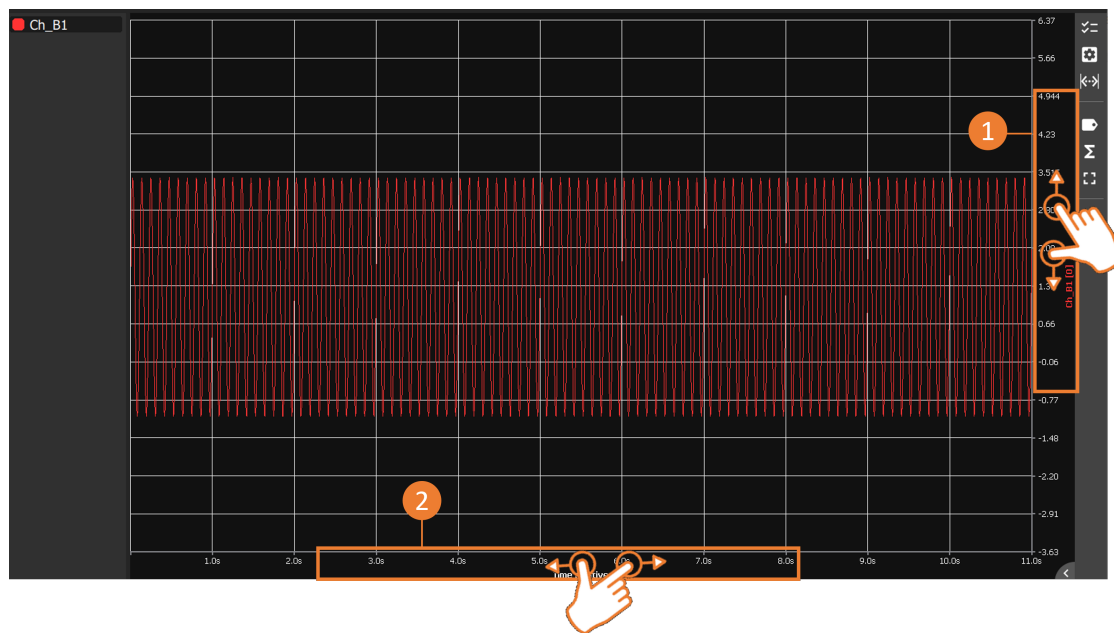


FIGURE 2.2 : Zooming in and out on X and Y axes

By moving the thumb and forefinger closer or further apart on the Y ordinate axis (amplitude), it's possible to zoom in and out between the defined limits **(1)**. The same applies to the X-axis, to change the time base **(2)**.



On a computer or if a mouse is connected to the device, use the mouse wheel to perform this function, positioning the cursor on the desired axis.

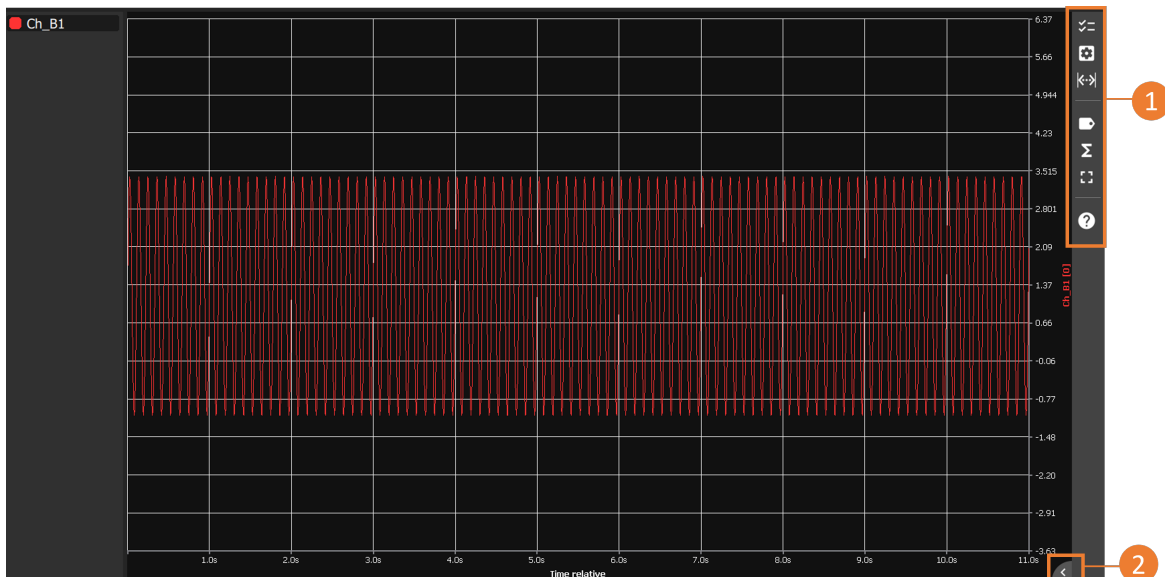









FIGURE 2.3 : Graphic display parameters

On the vertical bar to the right of the screen, a set of parameters is available **(1)**. Use the arrow at the bottom right of the screen to open the text description of each parameter **(2)**.

Symbol	Description
	Selects the measurements to be displayed in the graphics area
	Allows you to set display parameters : division of the graphics area into several screens, choice of colors, background image, etc.
	Shows/hides vertical and horizontal cursors
	Displays/hides full name of displayed measurement(s) with access to display parameters
	Displays/hides predefined mathematical calculations in real time
	Displays/exits full-screen mode
	Opens the help window



The mathematical calculations take into account all the points of the measurand displayed on the screen. To avoid corrupting the result of the calculations, the time base must be adjusted (ZOOM function) to get as close as possible to the actual shape of the signal. If vertical cursors are displayed, the calculation will only take into account the points between the cursors.

2.2 | Mathematical calculations

This function lets you select a type of mathematical calculation on one or more channels, or perform several calculations on the same channel. The function is activated in the F(t) menu on the "Real Time" main page.

Definitions

Press the "Measurements" button in the pane to the right of the graph to open the calculation window. Pressing the "\sumMesures" button opens the "Measurements" window (1) on the graph.

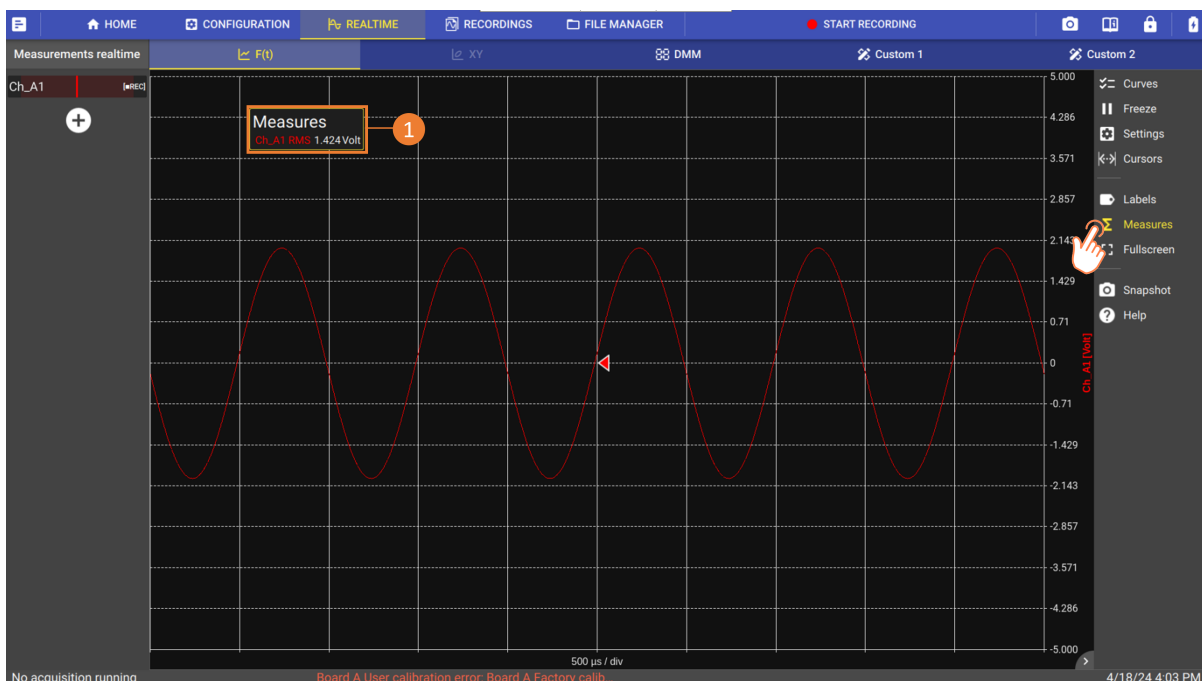


FIGURE 2.4 : Measurement function

Click on the "Measurements" window to open the calculation settings manager.

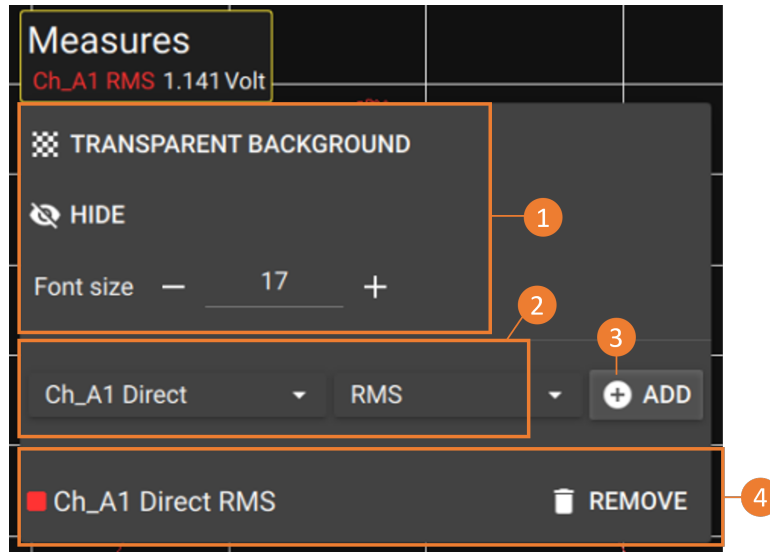


FIGURE 2.5 : Calculation settings

1. Window display management
2. Channel and calculation type selection
3. Add" button to display the calculation selected in (2)
4. List of calculations displayed on F(t) screen



The calculation takes into account only the values displayed on the screen. If you use vertical cursors, the window will change its name to "Measure between cursors", and the calculation will take into account only the values between the cursor boundaries.

The display is in a rectangle above the diagrams, in which :

- Channel and measurand name
- Calculation type
- Calculation value

The calculations are performed in real time and the display of the results is updated every 300 ms. The calculation is done on the 1000 points displayed on the screen. The resolution in time is therefore 0.1%.

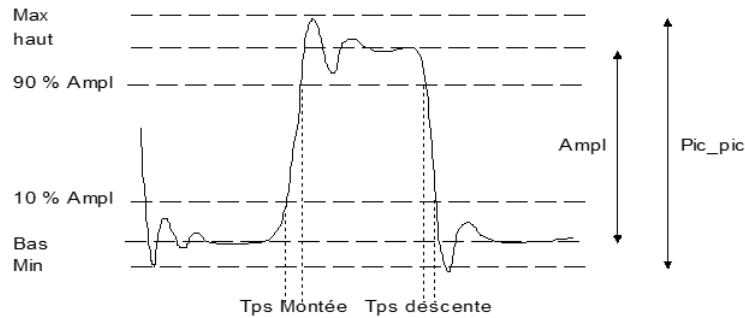


The mathematical calculations take into account all the points of the measurand displayed on the screen. In order to not corrupt the result of the calculations, it is necessary to adjust the time base (ZOOM feature) to get closer to the real shape of the signal. If vertical cursors are displayed, the calculation will only take into account the points between the cursors.

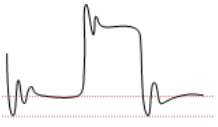
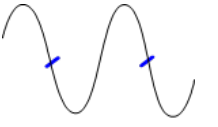
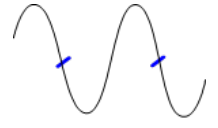
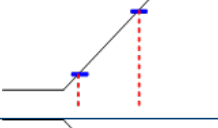
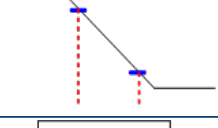

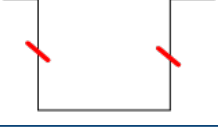
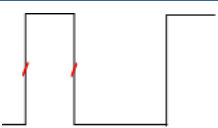
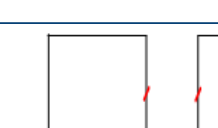
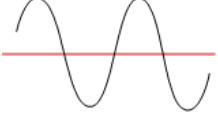
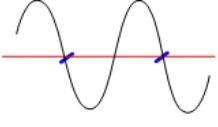
Type of calculation

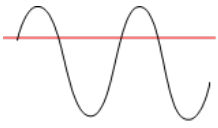
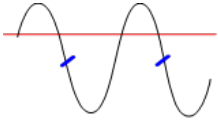
20 different mathematical calculations are offered, divided into 3 categories :

- Amplitude : minimum, maximum, peak-to-peak, low, high, amplitude, over oscillations
- Time : frequency, period, rise and fall times, positive and negative widths, positive and negative duty cycles
- Calculation : mean value, cyclic mean, RMS and cyclic RMS



Explanatory diagram	Maths functions	Calculation	Comments
	Minimum		This is the lowest peak of the negative voltage
	Maximum		This is the highest positive voltage peak
	Peak to Peak	$Max - Min$	
	Bottom		This is the most common value beyond the center.
	Top		This is the most common value beyond the center.
	Amplitude	$Top - Bottom$	
	Positive overshoot	$\frac{Max - Haut}{Amplitude} \times 100$	

	Negative overshoot	$\frac{Bas - Min}{Amplitude} \times 100$	
	Frequency	$\frac{1}{Period}$	Average frequency
	Period	$\frac{N \text{ Duration full period}}{N}$	Average duration of a complete cycle calculated over as many periods as possible
	Rise time	$\begin{aligned} T1 &= 10\% \text{ Amplitude} \\ T2 &= 90\% \text{ Amplitude} \\ \text{Rise time} &= T2 - T1 \end{aligned}$	
	Descent time	$\begin{aligned} T1 &= 90\% \text{ Amplitude} \\ T2 &= 10\% \text{ Amplitude} \\ \text{Rise time} &= T2 - T1 \end{aligned}$	
	Positive pulse width	<i>Measures the time of the 1st positive pulse. It is performed at 50% of the amplitude</i>	
	Negative pulse width	<i>Measures the time of the 1st negative pulse. It is performed at 50% of the amplitude</i>	
	Positive duty cycle	$\frac{\text{Positive pulse duration}}{Period}$	
	Negative duty cycle	$\frac{\text{Negative pulse duration}}{Period}$	
	Average	$Moy = \frac{1}{N} \times \sum_{i=1}^N V_i$ <i>N : Total number of points</i>	Calculation over the entire graphical window
	Cyclic average	$Moy = \frac{1}{(N_2 - N_1)} \times \sum_{i=N_1}^{N_2} V_i$ <i>N2 - N1 : Number of points between whole periods</i>	Calculation over as long a period as possible

	RMS	$RMS = \sqrt{\frac{1}{N} \sum_{i=1}^N (V_i)^2}$	Calculation over the entire graphical window
	RMS cycle	$RMS = \sqrt{\frac{1}{(N_2 - N_1)} \sum_{i=N_1}^{N_2} (V_i)^2}$	

2.3 | Analyzing a Record

To open a saved measurement file, go to “Drive” from the main navigation bar.

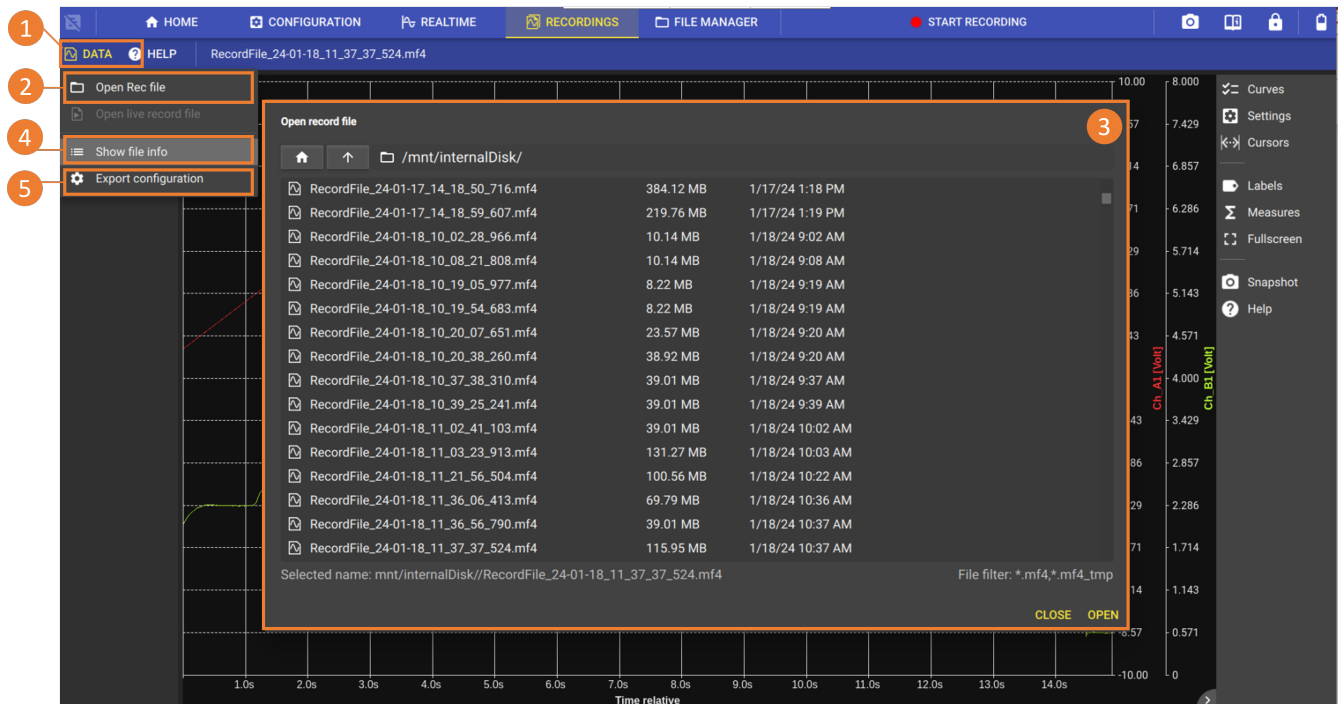


FIGURE 2.6 : Saved file list

By pressing “Data” (1), you can :

- Access all saved files by pressing “Open Record” (2). The list of all the records on the internal disk of the DAS (3) will open, select the file to read and press «Open».
- Access all saved files by pressing “Open Record” (2). The list of all the recordings on the internal disk of the DAS (3) will open, select the file to be played and press «Open»
- Export configuration (5) used for registration

2.4 | Exporting a record file

In the “DATA” menu, click on the “Export data” button (1)

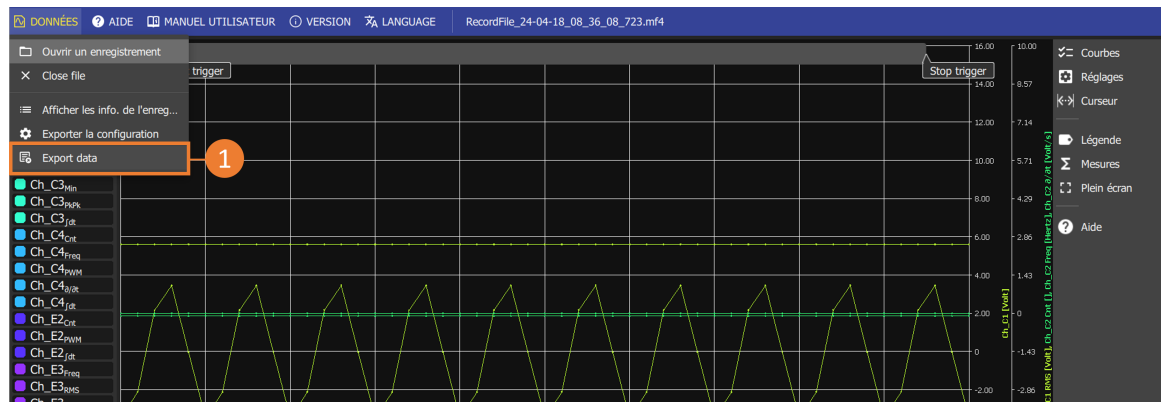


FIGURE 2.7 : Select file for export

Measurand selection :

Measurands in the file are grouped by recording frequency (1). Select the measurands to be exported from the drop-down list (2) by ticking the associated box (3). Check the box corresponding to a frequency group to export all associated measurands.

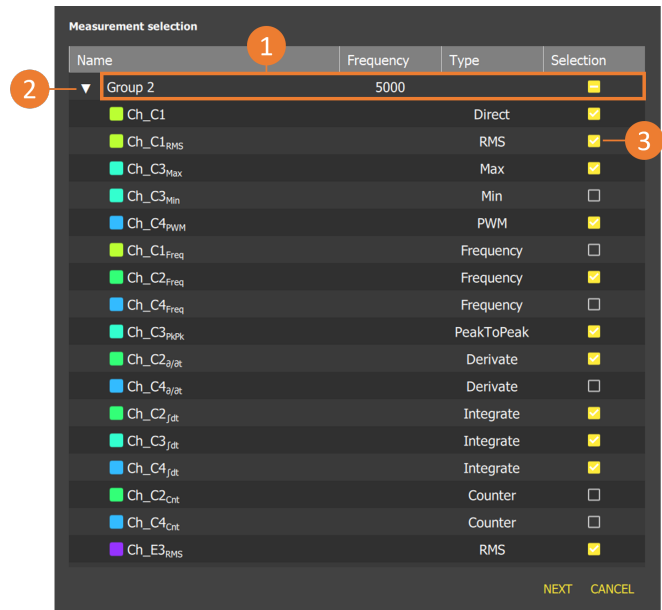


FIGURE 2.8 : Selecting data for export

Confirm your selection by pressing the “Next” button.

Recording period :

This interface allows you to shorten a recording by modifying the start and/or end date. The time bar displayed in blue represents the selected portion of time. By default, the entire duration of the recording is selected. To modify the recording start date, move the left cursor (2). To change the recording end date, move the cursor to the right. The selected start and end dates, together with the corresponding duration, are displayed below the time bar. By default, dates are displayed absolutely in the format YYYY/MM/DD HH :MM :SS :ms. To display dates relative to the start of the recording, check the “Relative time” box at the bottom of the interface.

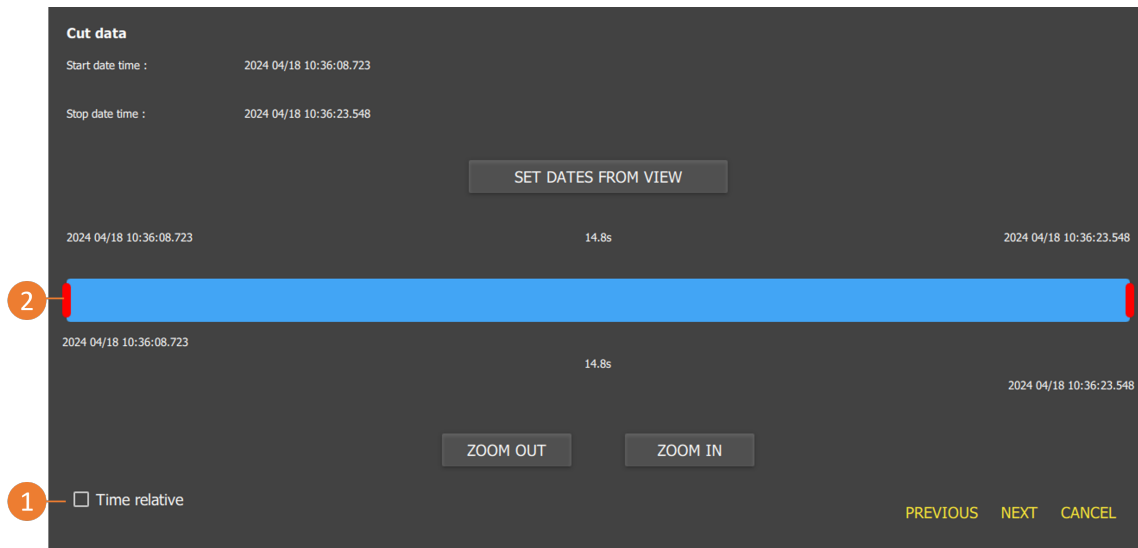


FIGURE 2.9 : Select export period



You can click on the start or end date to modify it from a dedicated interface.

To select a small portion of the recording, it may be necessary to zoom in on the time bar. Click on the ZOOM FORWARD button to zoom in on the selected portion of time. The time bar occupies all available space, and the selectable start and end dates at the top of the time bar are updated with the selected start and end dates.



The **SET DATES FROM VIEW** button is used to select the start and end dates corresponding to the portion of time displayed in the PLAYER tab.

Resampling :

The export process offers the option of resampling the data. All data will be resampled at the specified frequency. The resampling frequency can be defined in two different ways :

- Resample data at a new frequency : the user defines the resampling frequency directly. The maximum frequency is 1MHz. The minimum frequency is set so that the file contains a minimum of 100 samples. If the original file size is less than 100 samples, it will not be possible to downsample the data.
- Resample data according to the time base of a measurand : the resampling frequency will be that of the group associated with the measurand.

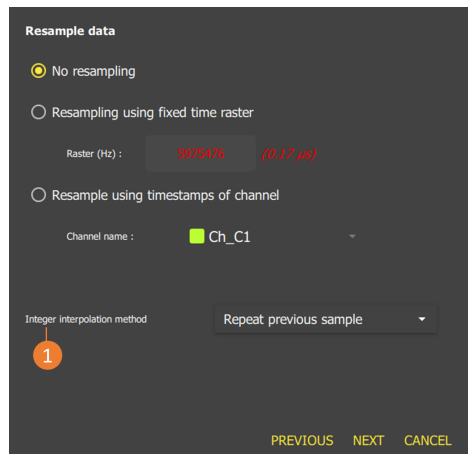


FIGURE 2.10 : Resampling

The interpolation list **(1)** is used to select the method for linking samples :

- Repeat previous simple : Samples will be added taking into account the value of the previous sample. The curve will then take the form of a step
- Linear : Samples will be adjusted to link previous and subsequent samples in a linear fashion.

Conversion :

Select output file format :

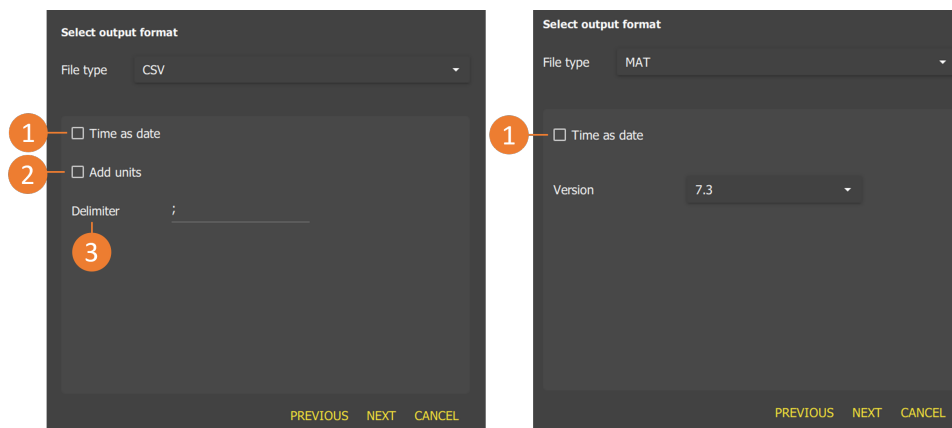


FIGURE 2.11 : Selection of format

- CSV format : maximum file size limited to 5M samples.
 - Absolute dates **(1)** : display time absolutely or relative to start of recording.
 - Add units **(2)** : add a line under the measurand name containing the units.
 - Delimiter **(3)** : character used to delimit file columns.
- MAT format :
 - Absolute dates **(1)** : display time absolutely or relative to the start of the record
 - Version : MAT file version

Chapitre 3

MDF4 file format

Measurement Data Format version 4 (MDF4) is an ASAM file standard for storing measurement data in a binary file format. For more information about the MDF4 file format, please visit <https://www.asam.net/standards/detail/mdf/wiki/>.

3.1 | Format

The MDF contains both raw measurement data and the metadata needed to interpret the raw data. The metadata contains, for example, information for converting the raw data into usable physical quantities, or the names of ASAM-compliant signals. The file is organized in binary blocks, where each block consists of a number of adjacent bytes that can be viewed as a record or data structure.

3.2 | Version and compliance with ASAM standard

Our file format follows the MDF 4.1.1 standard, and can be verified using MDF Validator 2.9.10.

3.3 | Interoperability

Our MDF4 files can be read by the following tools :

- Flexpro
- NI DIAdem
- Matlab + Vehicle Network Toolbox
- Python Asammdf
- Turbolab MDF4-LIB

Other software may be able to open our files if they support the MDF4 standard, but we haven't tested them.

3.4 | Functionality

Main MDF4 features in our devices :

- File description fields : allow users to store information about the context of their measurements
- File history : saves the file creation date
- Marker : time markers added by the user
- Raw data : the raw data saved against the conversion functions defined in the header
- Time synchronization information : information on the source and accuracy of time synchronization
- Attachment : the DAS configuration file is included in the registration file as a backup of the device configuration.
- Lane information : lane identifier, short and long lane names, and color of layout
- Subsampling calculated on the fastest frequency group

3.5 | Example

Here's an example of a Python implementation using the Asammdf library to open an MDF4 record

Listing 3.1 : Example of using the MDF4 library in Python

```
from asammdf import MDF

mdf = MDF('sample.mdf')
speed = mdf.get('WheelSpeed')
speed.plot()

important_signals = ['WheelSpeed', 'VehicleSpeed', 'VehicleAcceleration']
# get short measurement with a subset of channels from 10s to 12s
short = mdf.filter(important_signals).cut(start=10, stop=12)

# convert to version 4.10 and save to disk
short.convert('4.10').save('important_signals.mf4')

# plot some channels from a huge file
efficient = MDF('huge.mf4')
for signal in efficient.select(['Sensor1', 'Voltage3']):
    signal.plot()
```