User manual

DAS1800

High Speed Modular Data Acquisition Recorder



Sefram

a B&K Precision company

BK PRECISION

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Chapter 1
Safety and symbols

To ensure proper use of the unit, please observe the safety and operating requirements described in this manual. Specific warning signals appear throughout this manual to draw your attention to important points. Please read the following instructions in this chapter carefully before using your Data Acquisition System. The table below describes the symbols used on the device.

Symbol	Description
	Warning
	Earth ground
	Chassis ground
	Earth terminal
	Direct current (DC)
	Alternating and direct current (AC and DC)
	Consult the user manual

Table 1.1: Symbols on the device

The table below describes the symbols used in this manual:

Symbol	Description
	Warning of a danger to the user
	Important operating information
	General tip

Table 1.2: Symbols in the manual

Before powering up the device :

- Read and understand the safety and operating information in this manual.
- Follow all listed safety precautions.
- Operating the instrument with the wrong supply voltage voids the warranty
- Make all connections to the instrument before switching it on.
- Do not use the instrument in any way not specified in this manual or by SEFRAM. Failure to observe these precautions or warnings elsewhere in this manual constitutes a violation of the safety standards relating to the design, manufacture and intended use of the instrument. SEFRAM assumes no responsibility for any failure by the customer to comply with these requirements.

1.0.1 Category rating

IEC 61010 defines safety categories that specify the amount of electrical energy available and the surges that can occur on the electrical conductors associated with these categories. The category index is a Roman numeral from I, II, III or IV. This classification is also accompanied by a maximum voltage, which defines the expected voltage pulses and required insulation distances. The categories are as follows :

- **Category I (CAT I)** : defines measuring instruments whose measurement inputs are not intended to be connected to the mains. Environmental voltages are generally derived from an energy-limited transformer or battery.
- **Category II (CAT II)** : defines measuring instruments whose measurement inputs are intended to be connected to the mains supply via a standard wall socket or similar sources. Examples include portable tools and household appliances.
- **Category III (CAT III)** : defines measuring instruments whose measurement inputs are intended to be connected to a building's electrical network. Examples include measurements inside a building's electrical panel, or the wiring of permanently installed motors.
- **Category IV (CAT IV)** : defines measuring instruments whose measurement inputs are intended to be connected to a building's primary power supply or other external wiring.

Do not use this instrument in an electrical environment with a higher category than that specified in this manual. You must ensure that each accessory used with this instrument has a category classification equal to or higher than that of the device to maintain the category classification of the instrument. Failure to do so will reduce the category classification of the measuring system.

1.0.2 Power supply

This instrument is designed to be powered from a CATEGORY II main power supply environment. The main power supply must be 110 V RMS or 240 V RMS. Use only the power cord supplied with the instrument, and make sure it is suitable for your country of use.

If smoke is produced when the unit is switched on, unplug the power cord from the mains socket and any cables connected to the unit, and contact B&K Precision or Sefram Technical Service.

1.0.3 Ground the instrument



To minimize the risk of electric shock, the chassis of the instrument must be connected to a safety ground. The instrument is earthed via the earth conductor of the supplied power cable, which must be plugged into an approved three-conductor electrical socket. The power plug and the power cable coupling plug comply with IEC safety standards. Do not tamper with or disable the ground connection. Without the safety ground connection, all accessible conductive parts (including control buttons) may cause electric shock. If the unit is battery-powered, you must connect the chassis to earth when using it. Failure to use an approved, properly earthed plug and the supplied power cable may result in injury or death.

1.0.4 Do not operate instrument if damaged



If the instrument is damaged, appears to be damaged, or if any liquid, chemical or other material is found on or inside the instrument, remove the power cord from the instrument, remove the instrument from service, label it for further use and return it to SEFRAM for repair. Notify Sefram or B&K Precision of the nature of any contamination of the instrument.

1.0.5 Clean the instrument only in accordance with the instructions

Do not clean the instrument, its switches or terminals with abrasive cleaners, lubricants, solvents, acids/bases or other chemicals. Clean the instrument only with a clean, lint-free cloth. This instrument is not authorized for use as a component in a life-support device.

1.0.6 Servicing



The instrument housing must not be disassembled by operating personnel. Component replacements and internal adjustments must be carried out by qualified maintenance personnel trained in the risks involved when instrument covers and screen are removed.

Under certain conditions, even with the power cord removed, dangerous voltages may exist when covers are removed. To avoid injury, always unplug the power cord from the instrument, disconnect all other connections (measurement leads, computer interface cables, etc.), discharge all circuits and check that no dangerous voltages are present on conductors by using a voltage detection device in good working order before touching internal parts. Check that the voltage sensing device is working properly before and after measurements by testing with known voltage sources and by testing AC and DC voltages. Do not insert any objects into the ventilation or other openings of the instrument. In the event of a fault, dangerous voltages may be present at unexpected points in the circuits under test. Fuse replacement must be carried out by qualified service personnel trained in the instrument's fuse requirements and safe replacement procedures. Disconnect the instrument from the power line before replacing fuses. Replace fuses only with new ones of the types, voltage ratings and current ratings specified in this manual or on the back of the instrument. Failure to do so may result in damage to the instrument, a safety hazard or fire. Failure to do so will void the warranty. Do not substitute parts not approved by SEFRAM or modify this instrument. Return the instrument to Sefram or B&K Precision for service and repair to ensure that safety and performance characteristics are maintained.

1.0.7 Operating environment

The instrument is designed for use in pollution degree 2 indoor environments. The operating temperature range is 0 to 40 degrees Celsius and a relative humidity of 20% to 80%, non-condensing at an altitude < 2000 meters.

Measurements taken with this instrument may be out of specification if the instrument is used in environments that may include rapid changes in temperature or humidity, sunlight, mechanical vibration and/or shock, acoustic noise, electrical noise, strong electric fields or strong magnetic fields.



- Do not use in explosive or flammable environments (ATEX).
- Do not use the instrument in the presence of flammable gases or vapors, fumes or fine particles.
- In relative humidity conditions outside instrument specifications.
- In environments where there is a risk of liquid spillage onto the instrument, or where liquid may condense on the instrument.
- In air temperatures exceeding specified operating temperatures.
- In atmospheric pressures outside specified altitude limits, or where the surrounding gas is not air.
- In environments with restricted cooling air flow, even if air temperatures are within specifications.
- In direct sunlight.

1.0.8 Particular precautions



- Do not use this product for purposes other than those for which it is intended.
- To avoid electric shock, observe the following precautions when working with dangerous voltages:
- Before using the recording device, make sure that the instrument and the equipment required for its use (measuring lead, external box, accessories...) are in working order. Check cables for damage.
    - The instrument may only be used within the specified measuring ranges.
    - The instrument may only be used in the measurement circuit category for which it has been designed.
    - The instrument complies with EMC EN 61326. Otherwise, in rare cases, it may happen that an electrical device is disturbed by the electrical field of the instrument, or that the instrument is disturbed by an electrical device.
    - The instrument may only be operated by qualified personnel.
    - The test leads used to connect the instrument to the test points must comply with the standard.
    - To avoid the risk of shock, do not connect or disconnect measuring leads when they are connected to a source of electrical voltage.
    - Safety is no longer guaranteed if the instrument is modified or tampered with.
    - Do not place heavy objects on the instrument.
    - Do not block the flow of cooling air to the instrument.
    - Do not place a hot soldering iron on the instrument.
    - Do not pull on the instrument with the power cord or measuring leads connected.

Safety is not guaranteed in these cases, for example :

- Damage to the instrument
- After dropping the instrument
- Instrument measurements/tests that cannot be performed
- Unfavorable conditions over an extended period
- Damage during transport
- Battery leak

1.0.9 Concerning the exported devices in North America



This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.
Changes or modifications not expressly approved by SEFRAM or B&K Precision could void the user's authority to operate the equipment.

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Chapitre 2

Introducing the device

2.1 | Introduction

SEFRAM thanks you for your confidence in us and is pleased to present the DAS1800. This new-generation multi-channel Data Acquisition System is developed and manufactured in France. Its ability to record and analyze all types of electrical signals (sensors, electrical relays, electrical networks, etc.) makes it ideal for a wide range of industrial applications (maintenance, R&D, production, etc.). The choice of "à la carte" acquisition configurations gives the system great versatility, with the ability to capture microsecond events.

2.2 | Device description

The DAS1800 is a measurement system that can integrate up to 10 data acquisition modules in total, each with 4 or 8 analog measurement channels depending on type. The adjustable handle makes it easy to carry, and can be used as a kickstand when the unit is tilted.

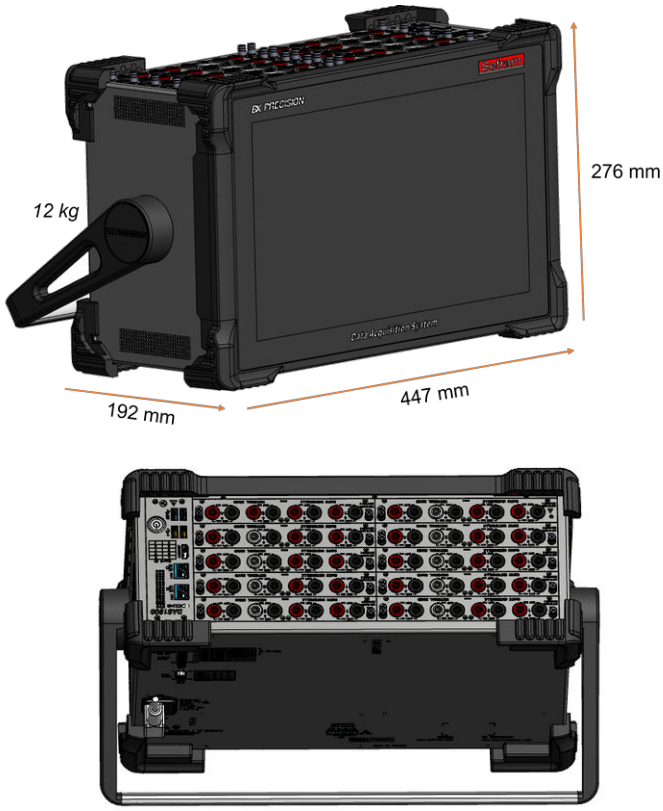


FIGURE 2.1 : General views

2.2.1 Supplied accessories

The device is provided with :



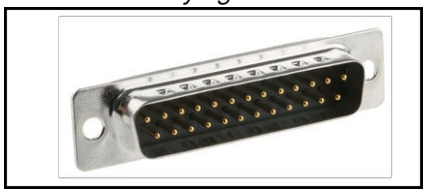
Main power cord (IEC)



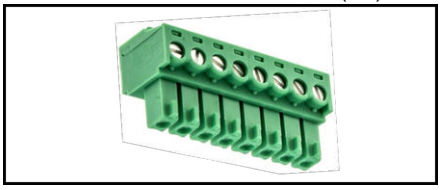
Carrying case



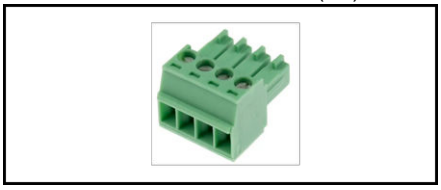
Sub-D15 HD connector (x1)



Sub-D25 connector (x1)



8-pin connector for external power supply output



4-pin connector (x8) (with multiplexed board)



Pair of male banana plug connectors (x4) (for universal and high-voltage acquisition boards)

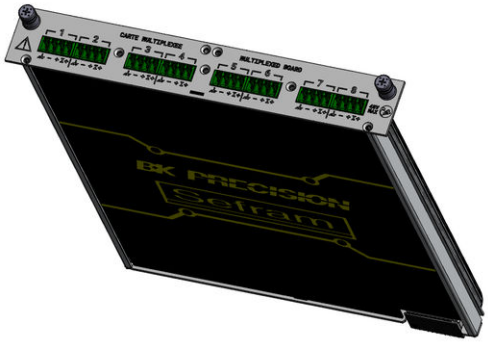
FIGURE 2.2 : Supplied accessories

2.2.2 Acquisition modules

When ordering the device, you can choose from four different types of modules : universal, multiplexed, high-voltage or high-impedance. Each has its own technical characteristics (see technical specifications section for details).



Universal module



Multiplexed module



High voltage module



High impedance module

FIGURE 2.3 : Acquisition modules

Specifications	Universal board	Multiplexed board	High voltage board	High impedance board
Number of channels	4 isolated single-pole channels	8 non-isolated differential channels	4 isolated differential channels	4 isolated single-pole channels
Maximum voltage	+/- 600V DC or 424V RMS	+/- 48V DC	+/- 1000V DC or 424V RMS	+/- 600V DC or 424V RMS
Maximum sampling rate	1MSa/s	5Sa/s	1MSa/s	1MSa/s
Bandwith	100kHz	1kHz	30 kHz	70 kHz
Input impedance	1MOhms	2MOhms	10MOhms	10MOhms
Safety catefory	CAT III 600V	CAT I 48V	CAT III 1000V / CAT IV 600V	CAT III 600V

TABLE 2.1 : Specifications

2.2.3 Interfaces

The various device interfaces are shown in the following diagrams :

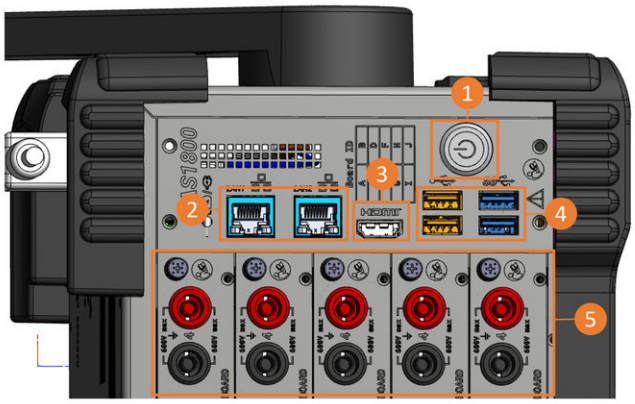


FIGURE 2.4 : View from above

Symbol	Description
(1)	On/off push-button
(2)	Ethernet port for connecting the device to a computer network (x2) (see remote control section)
(3)	HDMI port for transferring the screen display to an external display
(4)	USB port for connecting mouse, keyboard, USB sticks or Wi-Fi (option) (x4)
(5)	Acquisition boards

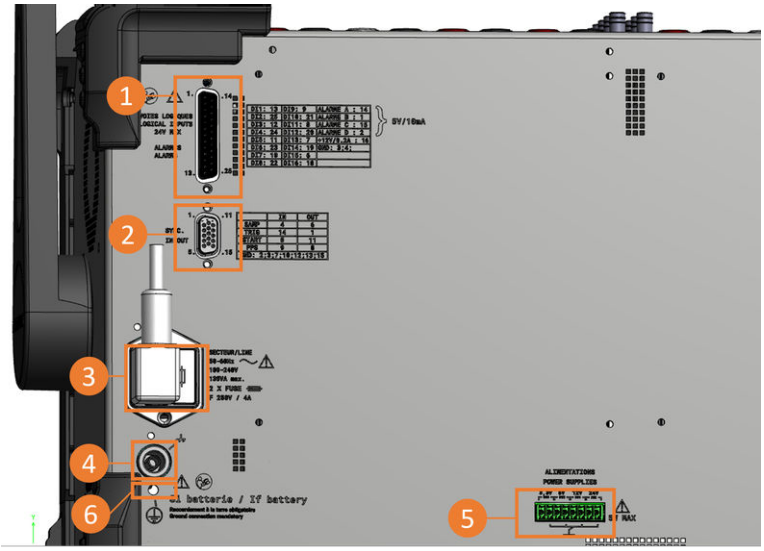


FIGURE 2.5 : Interfaces vue arrière

Symbol	Description
(1)	Sub-D25 connector for logical channel inputs and outputs (see logical channels section)
(2)	Sub-D15 connector for external synchronization (See external synchronization section)
(3)	Power supply
(4)	Chassis ground connector
(5)	External power supply
(6)	Protective earth terminal (battery operation)

2.2.4 Optional accessories

Optional accessories are listed below :

- Logic channel box : allows logic inputs/outputs to be transferred to an external module, increasing the maximum permissible voltage.
- Logic channel cable : allows inputs/outputs to be remotely connected to a standard banana plug cable
- Wi-Fi dongle : enables remote control or file transfer via Wi-Fi connection (available soon)

2.2.5 Factory option

- GPS/IRIG input : allows the instrument to be time-synchronized with a GPS/IRIG signal (available soon)
- Battery option : allows the instrument to work without power cord to a electrical grid

A battery charge status LED is present on the device.



FIGURE 2.6 : Battery LED

Status	Description
Off	No battery connected or insufficient mains supply
On continuously	Battery fully charged
Blinking at 0.5 Hz	The battery is charging
Blinking at 2.5 Hz	Battery error

2.3 | Interface and ergonomic

2.3.1 Touch control

The product is designed for smartphone-type touch screen use. The following movements are implemented:

- Single tap: performs an action
- Drag & drop: moves graphic objects
- 2-finger zoom
- Long press: displays a help tooltip

2.3.2 Sounds

Sound notifications indicate:

- Product startup
- Click for feedback
- Recording start and end

2.4 | Interface layout

2.4.1 Navigation

Navigation on the device is via the menu bars at the top of the page (main and secondary).

2.4.2 Status

The bar at the bottom indicates the device status:

- Registration status
- Error messages
- Date and time

2.4.3 Notifications

Notifications are classified into 2 levels of importance :

- High importance: a warning window opens in the center of the page. A user action is required to make it disappear. They are used for configuration or hardware errors.
- Low importance: a message bar appears at the top of the screen and disappears after a few seconds. It notifies the user of product events (end of recording, file saving, etc.).

2.4.4 User fields

The value of a user field is taken into account as soon as editing is complete. No further validation is required. When the value is incorrect, a red error message informs the user that the current value is invalid.

2.5 | Built-in help

2.5.1 Tool type

When you long-click on a button, a tooltip displays help on the corresponding action.

2.5.2 Help window

Clicking on the question mark icon opens a help window.

2.5.3 On-board user manual

The user manual is embedded in the product and available from any page by clicking on the manual button in the main menu bar at the top of the page.

2.5.4 Help video

Help videos are available from the "Home" page.

2.5.5 Step-by-step guides

Step-by-step guides are available on the "Home" page, to help you get the most out of your product.

Chapitre 3

Getting started

3.1 | Installing and removing acquisition modules

Module installation and removal must be carried out with the power off. When doing so, switch off the device and ensure that no cables are connected to the module inputs.

Add an acquisition module :

The module plugs into the device as a simple way. Simply follow the keyed connection **(1)** and guide the module to the backplane to connect to the connector **(2)**. Press to ensure a good connection. Once connected, use a Phillips screwdriver to tighten the two screws on either side of the module **(3).**

Modules are detected at startup.

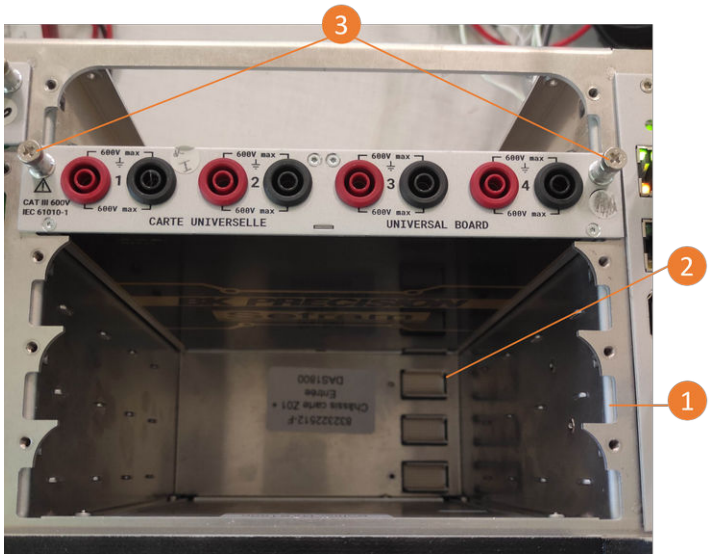


FIGURE 3.1 : Add an acquisition module

Remove an acquisition module :

To remove an acquisition module, loosen the two screws on either side of the board **(3)**. Pull on the module to disconnect it.

3.2 | File creation

Before starting a measurement campaign, we recommend that you organize your files in advance. To do this, go to "File Manager" in the navigation bar.

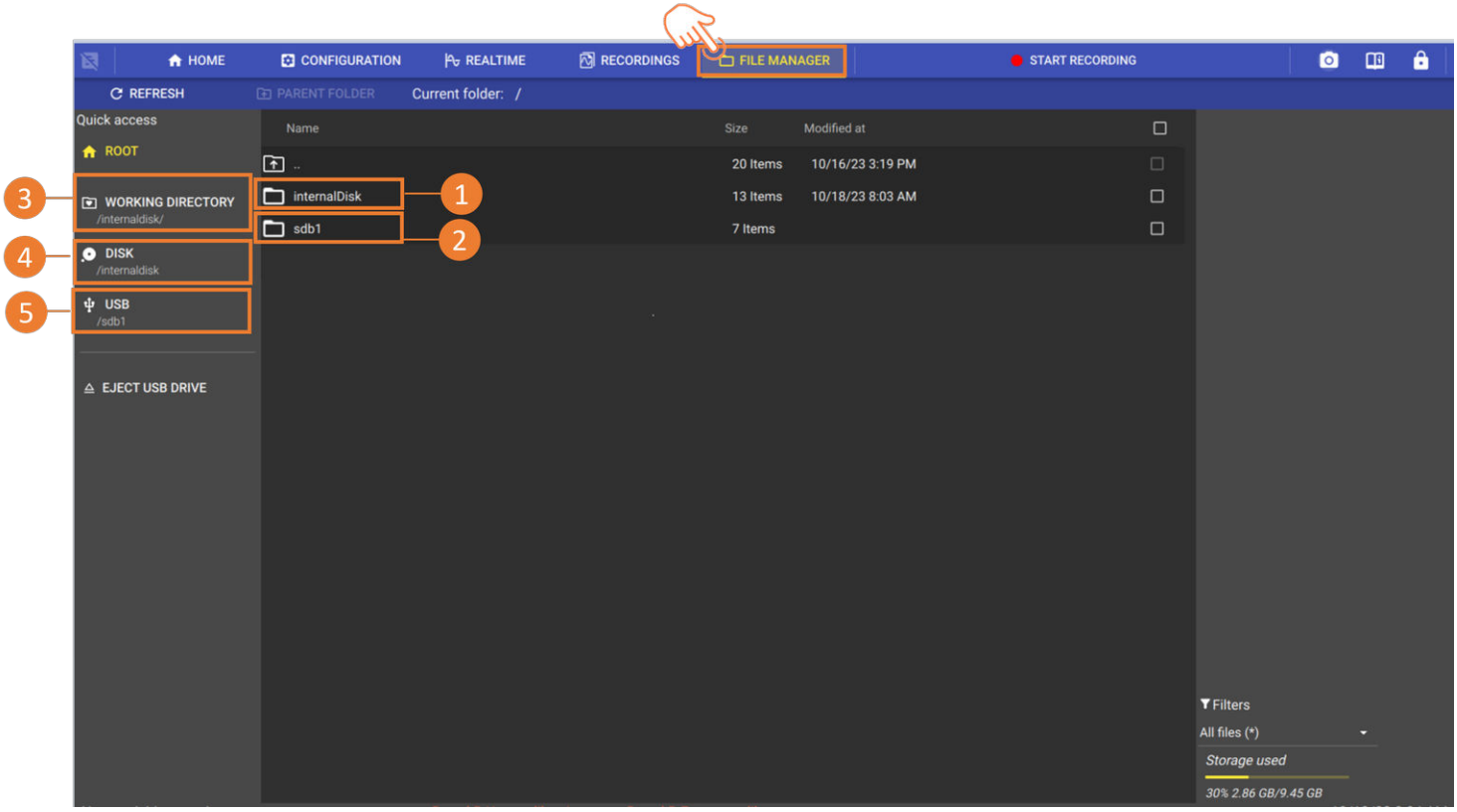


Figure 3.2: File Manager

"sda1" (solid drive a1) **(1)** corresponds to the contents of the device's disk memory. It is also available by pressing "DISK" **(4)**. If a USB stick is connected to the device, then a "sdb1" folder will be displayed, and will be available from this page. The contents of the USB stick are also available by pressing "USB" **(5)**. You can also access the contents of the working directory **(3)**.

3.2.1 Working directory

To create a measurement campaign folder and define it as a working directory, go to the disk memory folder "sda1".

The working directory is the defined location where all files (measurement records, configuration files, screenshots, bug reports) will be saved. Several folders can be created, but only one folder can be defined as the working directory at a time. It is not possible to define a folder on a USB stick as a working directory. By default, files are placed at the root of the hard disk:

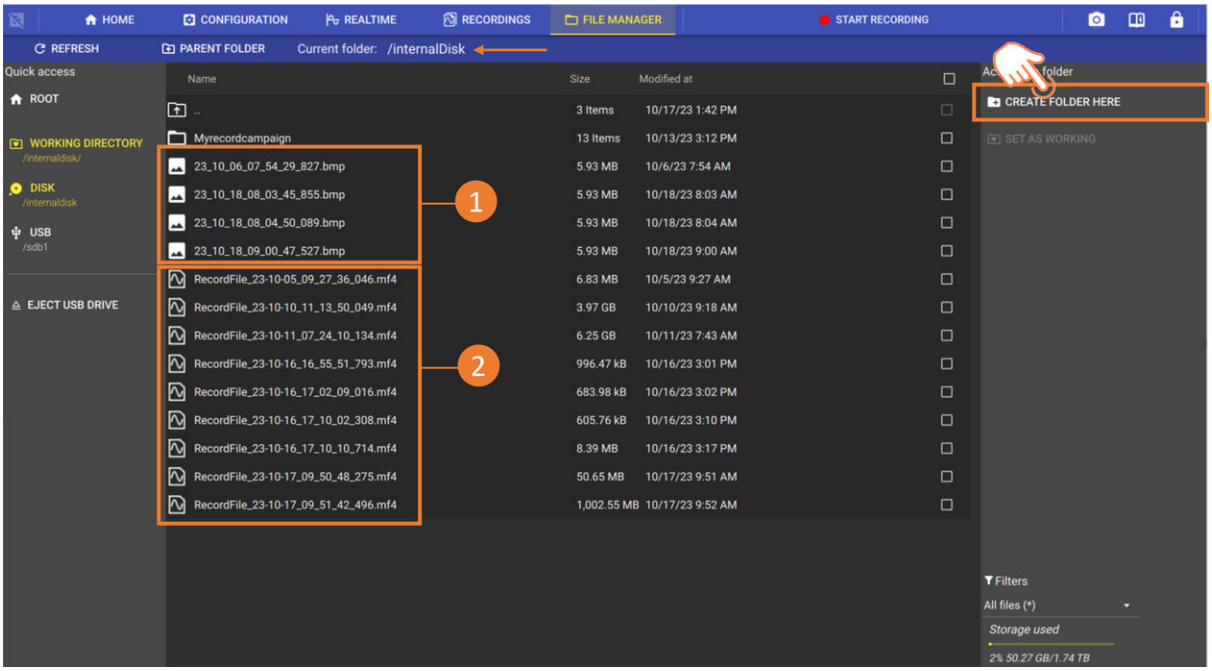


Figure 3.3: File creation

By default, screenshots **(1)** and measurement recordings **(2)** are at the root of the disk. Click on create a new folder, name and select it then click on "choose as working directory".

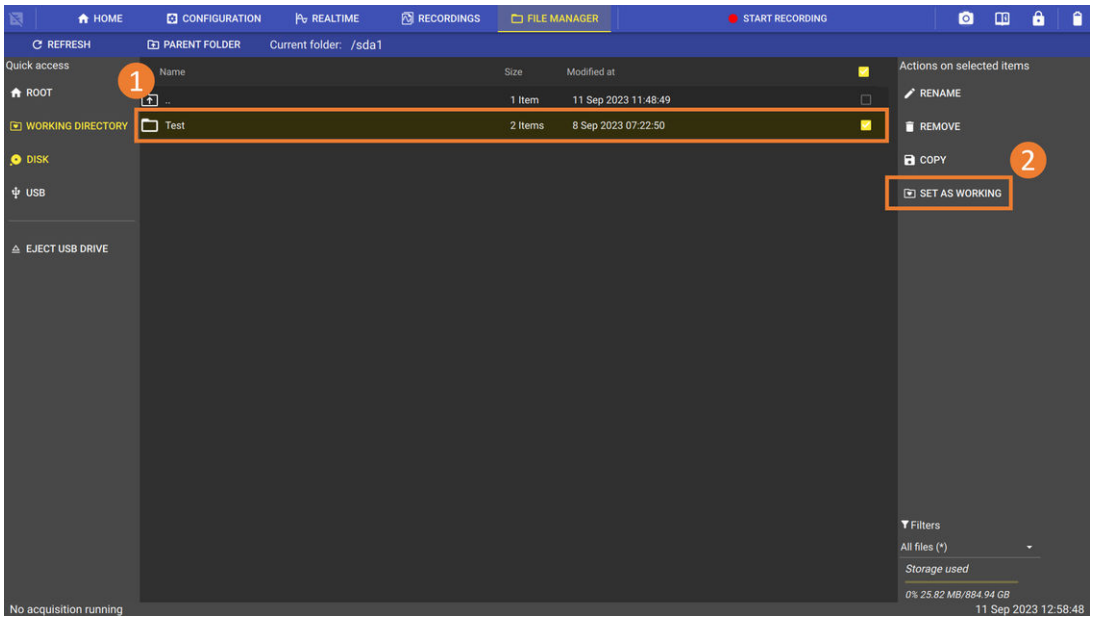


Figure 3.4: File creation as working directory

3.3 | Channels and measurements

A channel corresponds to a physical input to the device. It is identified by its Alias, which corresponds to its position on the instrument. For example, channel B3 corresponds to channel number 3 on acquisition board B (i.e. the second board).

A measurement is a direct input or calculation derived from a physical channel.
The type of measurement available depends on the property being measured and configuration of the physical channel. Examples include RMS, average, minimum, maximum, derivative and integral.

3.4 | Analog channel settings

To access acquisition board analog channel settings, use the main navigation bar by tapping on Configuration then Channels.

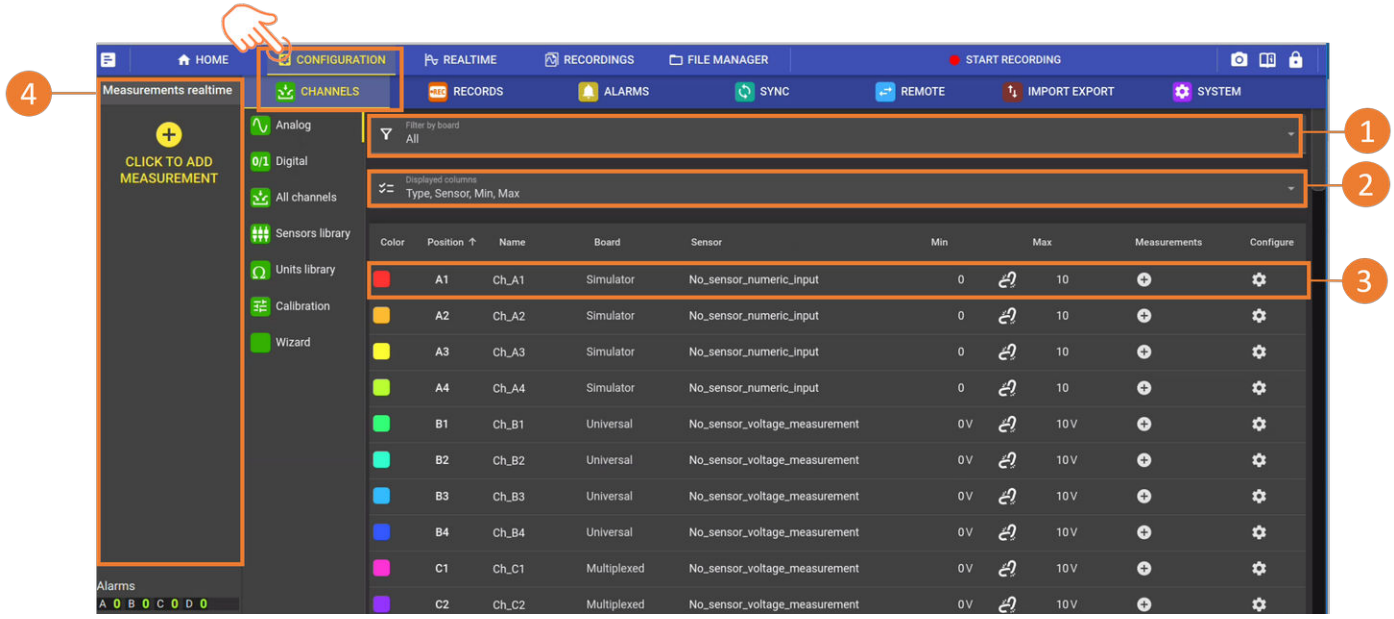


FIGURE 3.5 : Analog channel settings

On this page you can view the table containing all the parameters of the analog channels. It's possible to filter the display of channels by acquisition board)present on the device **(1)**, and to customize the display of information given in columns **(2)**. Single-channel parameters are displayed as rows in the table **(3)**. Most parameters can be edited from this table, allowing you to define all the settings required for your measurement. For example, referring to chanel A1 in the table above **(3)** :

- The *Position* column corresponds to the physical location of the channel and in the device (e.g slot A, channel 1).
- The *Name* column corresponds to the channel name (editable).
- The *Module* column corresponds to the type of acquisition board installed.
- The *Sensor* column defines the physical parameter to be measured by the channel. The default value is voltage measurement. First define the unit, then the sensor.



By default, a choice of sensors is present in the sensor library. You can add new sensors as required by clicking on the pencil symbol that brings you to the Sensor libraries section.

The Min and Max columns define the range measured by the channel. It has an impact on measurement accuracy (see accuracy section for more details). The button automatically centers zero between Min and Max terminals (editable).

The *Measurement* column defines which measurements associated with the channel will be activated for viewing and/or recording. Once validated, they appear in the left pane of the screen **(4)**. It is possible, for example, to record both the direct voltage and the RMS value of the same channel signal.

By pressing in the *configure* column, you open the complete page of channel parameters shown above.

By pressing directly on a measurement in the left pane **(4),** you can delete it, access the channel parameters or access the recording frequency settings.

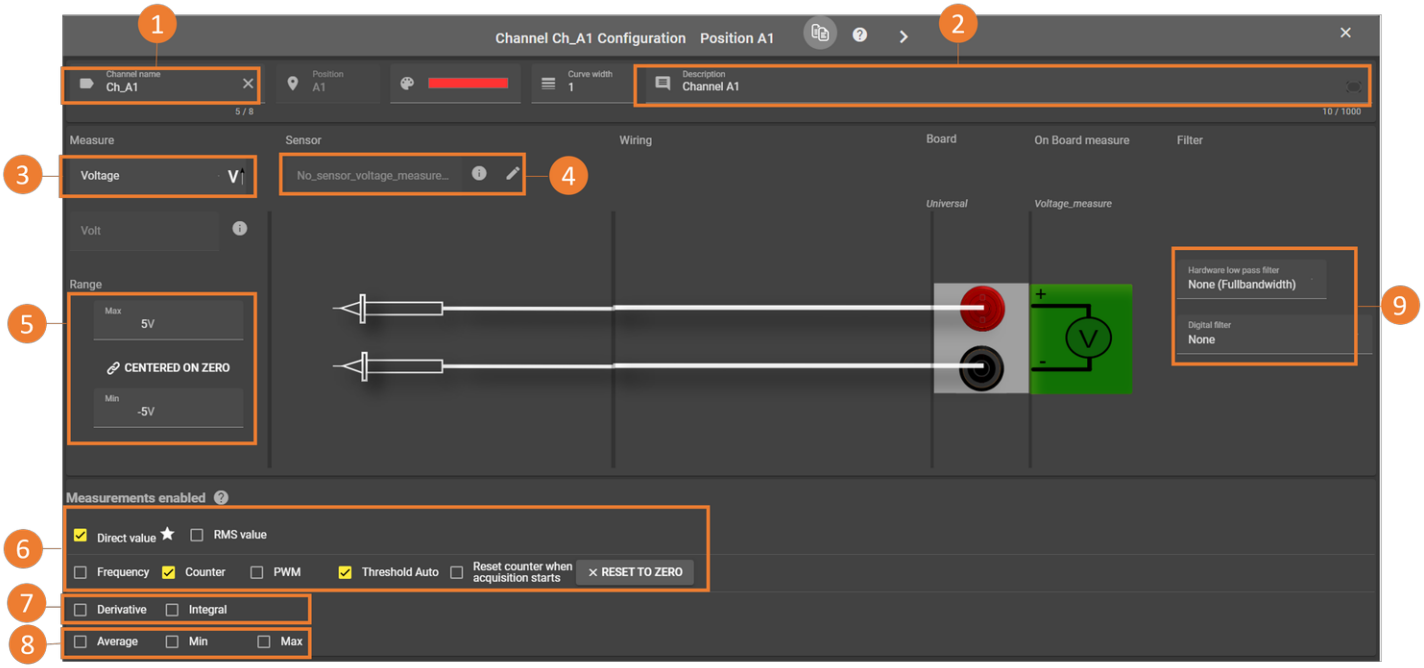


FIGURE 3.6 : Page configuration

Field (1) corresponds to the channel name, and you can also add a full description in field **(2)**. In the same way as above, define the physical quantity **(3)** you are going to measure, then the sensor used **(4).** To add a sensor not present in the library, click on the "pencil" icon, and go to the sensor library section for more details. Define the measurement range to be displayed, which will define the upper and lower limits for the on-screen graph, and select the zero point.

Please note that if the measured value is outside these limits, it will not be displayed on the screen.

Define the measurements to be displayed and/or recorded in frame **(6)**. Note that for the *frequency, counter and PWM* measurement, you need to set a detection threshold. For the *derivative and integral* measurement, be sure to define an integration period and amplitude **(7)**, which are essential for calculation. The *Average, Min and Max* measurements **(8)** plot the signal's minimum and maximum average values over a defined time period. The drop-down menu **(9)** lets you define a low-pass filter, which is ideal for attenuating/removing electronic noise induced by external disturbances on your measurement. See "How to attenuate noise on my signal" for more details. Total bandwidth depends on the type of filter used. To apply a cutoff frequency before 100Hz, use the keyboard to define

a digital filter (software processing). Alternatively, apply a hardware filter (signal input processing) from a choice of 100Hz, 1000Hz or 10,000Hz.

By pressing the icon shown below, you can duplicate all the parameters of the selected channel to other channels on the device.

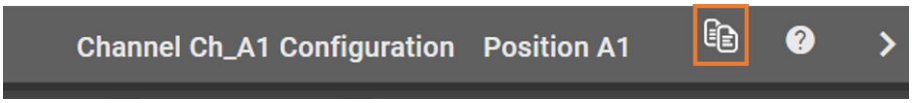


FIGURE 3.7 : Copying parameters from an analog channel

3.5 | Digital channels setting

Digital channels are accessible via the device's 25-pin D-Sub connector. To access digital channel settings, press Configuration > Channels > Digital.

The optional digital channel cable accessory allows all digital channels to be wired using standard banana plugs, giving you greater convenience when wiring your equipment.

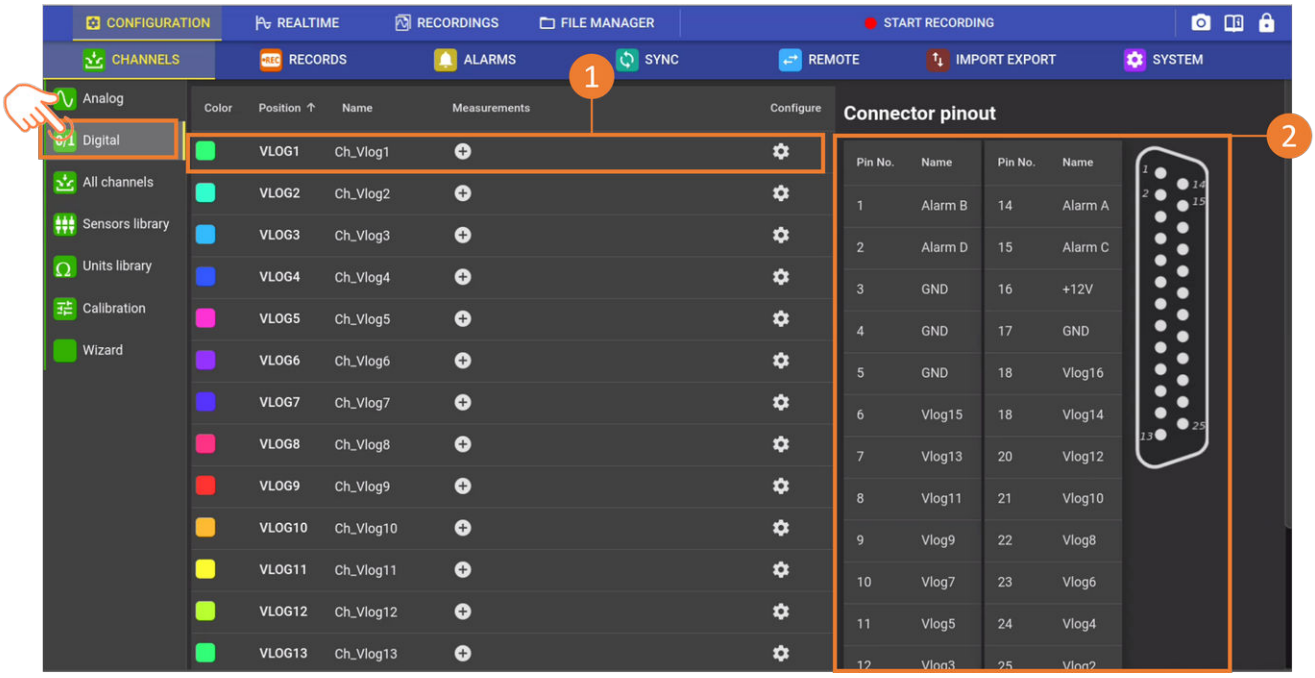


FIGURE 3.8 : Digital channels table

On this page, you'll find a table showing all logic inputs. Each channel is shown as a row **(1)**. The position column defines the corresponding pin on the physical connector. The complete connector schematic with associated pins is shown on the right-hand pane of the screen to guide your wiring **(2)**. It consists of :

3.5.1 16 logic inputs (Vlog)

To open all the parameters of a digital input, press the symbol  from the measure colomn :

The logic inputs can monitor all signals up to 24V. To increase the maximum permissible voltage, the Logic channel box option 917008000 is available.

The switchover threshold is between 1,2V and 2,8V.

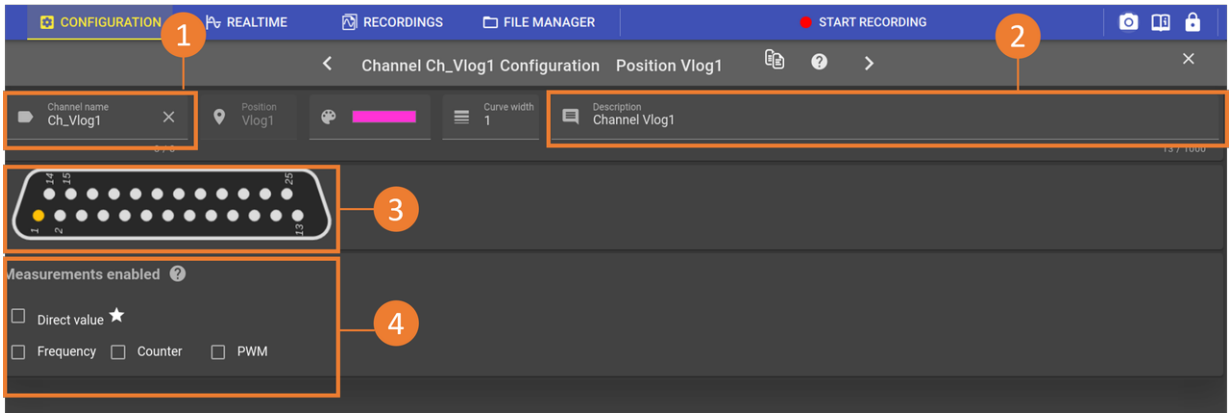


FIGURE 3.9 : Logic input channel parameters

Field **(1)** corresponds to the name of the digital channel ; you can also add a description in field **(2)**. The pin position on the connector is shown in diagram **(3)**. Next, define the type of measurands to be displayed and/or recorded **(4)**. Note that Frequency, Counter and PWM measurands will be available in a later version. You can also activate measurements from the table 3.8 thanks to the button  from the *Mesurand colomn.*

By pressing the icon shown below, you can duplicate all the parameters of the selected logic input on other channels of the device :

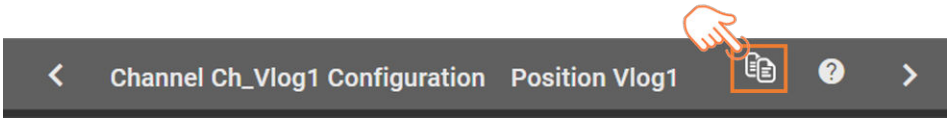


FIGURE 3.10 : Copying logic input parameters

3.5.2 Power Supply Outputs

The external power supply located on the 25-pin D-Sub connector provides a nominal voltage of 12V +/- 5% with a maximum delivered current of 200 mA (limited by resettable fuse).

For example, the power supply can be used to power a sensor.

There are also 3 others power supply outputs (3.3V, 5V, 12V, 24V) on the rear pannel (5W maximum) :



3.5.3 Alarm outputs

To set the parameters for the 4 alarm outputs, please refer to the section on alarms setting.

3.6 | Recording measurements

3.6.1 Recording file configuration

Recording file configuration is available from the menu *Configuration > Records > File info*

File name

The file name is a string of characters. All alphanumeric characters are allowed, with the exception of the following characters: " / | \ * : ? < >.

The file extension is .mf4 and is not configurable. It corresponds to the MDF4 (Measurement Data Format) recording format, standard ASAM (Association for Standardization of Measuring Systems).

Date suffix

If the box is checked, the file name will be automatically followed by the date and time of the start of recording (pressing the "Start recording" button, independently of any triggers) in the following format: _yy-MM-dd_HH_mm_ss_zzz, :

- yy → Last 2 figures of the year
- MM → issue of the month
- dd → day of the month
- HH → hours in 24h format
- mm → minutes
- ss → seconds
- zzz → milliseconds

For example, if the filename is set to "RecordFile" and the "Suffix by date" box is checked, we could have a file called: RecordFile_23-01-28_15_02_28_792.mf4 corresponding to a record from 28/01/2023 at 15:02:28.792.



Caution: If the "Suffix by date" function is deactivated, you must manually change the file name for each recording, **otherwise the last recording will systematically overwrite the previous one and you will lose your data**. We strongly recommend that you keep this function enabled to avoid any loss of recordings.

Recording file size or duration limit

In addition to triggers, it is also possible to add a limit to the recording file. This can be used, for example, to avoid obtaining a very large file if the event associated with the end-of-recording trigger is never reached.

If the "Enable record file size limit" checkbox is disabled, the DAS records for the maximum duration (available disk space).

If the box is checked, the user can configure the limit in 2 different ways:

- Memory size on disk → if the channel configuration changes (addition or deletion of measurements, change of recording frequency), the size limit will be retained and its equivalence in recording duration will be re-evaluated
- Recording duration → if the channel configuration changes, the recording duration will be retained and the size of the recording file will be reassessed.
- Please note that if you add measurements or increase the recording frequency, the corresponding file size will increase while retaining the recording time. The system will then limit the size to the available disk space, and the recording time cannot be retained.

User information

The user can add a certain amount of information to be included in the registration file:

- Author
- Department
- Project
- Subject
- Comments

Each of these fields is a character string. They can be left empty, but this has no influence on the file name or the recording sequence.

3.6.2 Sampling frequency



Only activated measurements can be taken into account for recording.

To set the recording frequency, go to *Configuration > Records > Sampling frequency*



FIGURE 3.11 : Setting recording frequencies

You can customize the information displayed using the displayed columns field **(1)**, and filter the channel display using the Filter by name field **(2)**. 4 different sampling frequencies can be set **(3)**.

The same measurement can be recorded at a single frequency. Two measurements of the same channel can have different sampling frequencies.

In the example shown in the table above, the direct voltage measurement of channel 1 is recorded at 1MHz, while the RMS measurement of channel 1 is recorded at 5kHz. Channel 2 forward voltage is recorded at 100Hz. All the other measurements shown in the table can be viewed in real time, but are not recorded, as they are not activated in a frequency group.

The sampling frequency is limited and depends on the acquisition card used (1MSa/s for the universal card). It is independent of the recording frequency. For example, if a recording is set to 1kSa/s on a universal card, the trigger will still be accurate to 1µs. Calculations are based on all samples present in the period Δt.

Depending on the type of measurement recorded and the acquisition card used, a maximum refresh rate is calculated in column **(5)**. If the user-defined recording frequency is higher than this value, the measurement will be oversampled. The same measurement point will be sampled several times, which can lead to a "plateau" effect on the measurement curve. It is therefore recommended not to exceed this limit. Depending on the configuration, an optimum recording frequency is proposed by default to avoid this behaviour.

3.7 | Start and stop settings

To set your acquisition trigger conditions, go to *Configuration > Records > Trigger.*

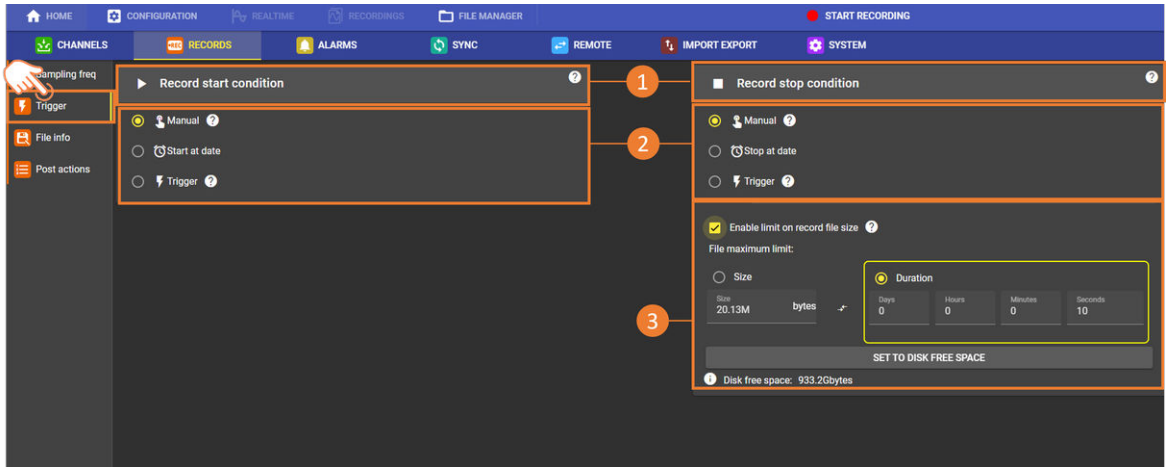


FIGURE 3.12 : Start and stop settings

Each record must be set up with a start condition and a stop condition **(1)**. For each, there are 3 different types of triggers : manual, date and trigger **(2)**.

3.7.1 Manual :

Users can start and stop recording themselves, using the start/stop button at the top right of the screen.

3.7.2 Start at date :

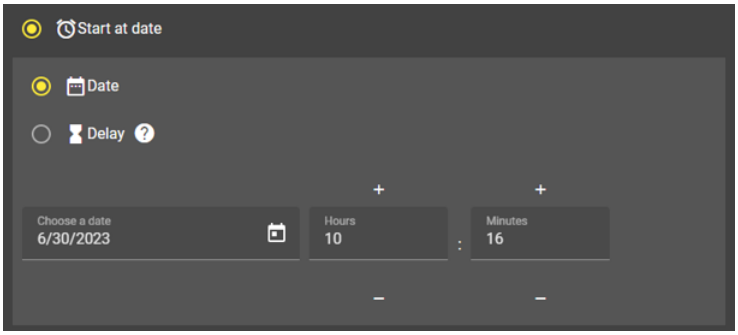


FIGURE 3.13 : Start a date

The user can define a calendar date at which recording starts and/or stops. Alternatively, you can set a timer before recording (start condition) and/or a recording duration (stop condition).

3.7.3 Trigger on level :

The user can program recording start and stop conditions according to the values measured on the analog and digital channels :



FIGURE 3.14 : Trigger on level

First define the physical channel and its associated measurement to which you want to apply the trigger condition **(1)**. Then describe the condition by selecting "level" in type, the ">" or "<" operation for the overshoot direction, and the threshold value **(2)**. In the example above, recording will be triggered if the "voltage" measurement on channel 1 exceeds 25V. It is possible to activate a duration on this condition. In this case, the user defines a time delay during which the condition must remain true for the condition to be validated. In the example above, exceeding the 25V threshold must last at least 1 second for recording to start/stop **(3).**

The filter prevents unwanted triggering caused by transient interference on the channel.

3.7.4 Trigger on slope (available in a later version)

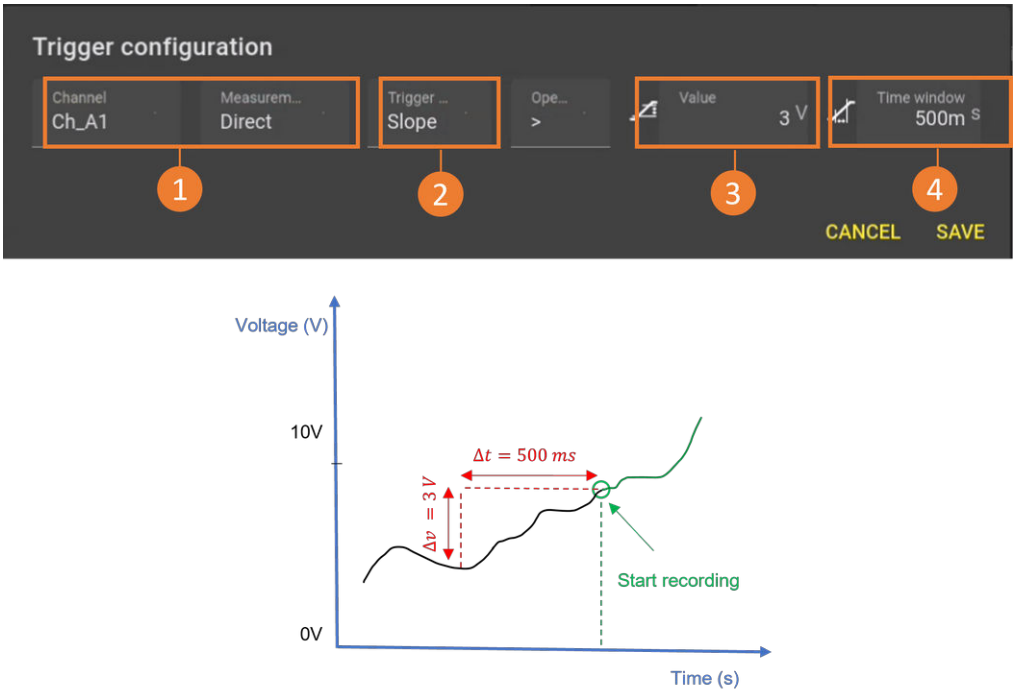


FIGURE 3.15 : Trigger on slope

To set up a slope trigger, also define the physical channel and associated measurement to which you wish to apply the recording condition **(1).** Choose slope **(2)** . The "+" or "-" sign in front of the amplitude value defines the direction of the slope **(3)**. In the example above, if the "voltage" measurement on channel 1 increases by more than 3V over a maximum sliding time window of 500ms **(4),** then the trigger condition is validated.

3.7.5 Trigger on window (avalaible in a later version)

To set up a window trigger, also define the physical channel and associated measurement to which you wish to apply the recording condition **(1).** Choose window **(2).**

Combination of trigger conditions

It is possible to combine several conditions on several channels which, once verified, will start/stop recording. When several conditions are set, the user selects the "AND" or "OR" connector :

- AND : All defined conditions must be true simultaneously for recording to start/stop.
- OR : At least one of the defined conditions must be true for recording to start/stop.

The set of conditions can include both analog and digital channels (in a later version). It is also possible to have two different conditions on two measurements of the same physical channel. Trigger and stop conditions can be set independently.

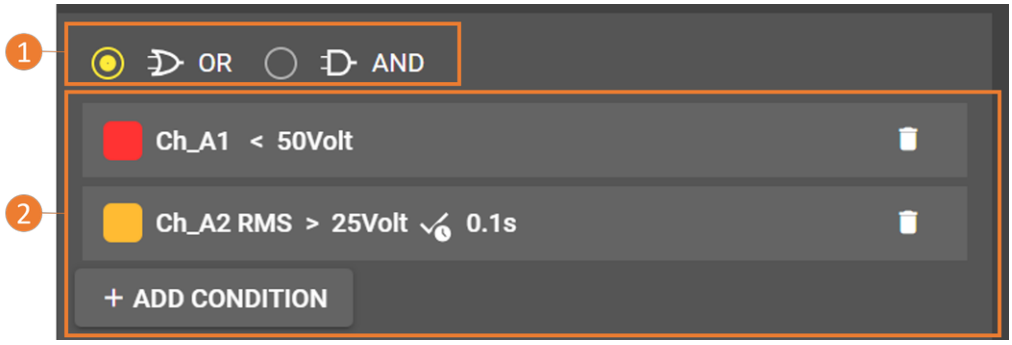


FIGURE 3.16 : Combination of conditions

In the example above, if one of the defined conditions is true, then recording is triggered **(1)**. If the voltage of analog channel 1 is less than 50V OR if the RMS value of channel 2 is greater than 25V for 100 ms, then recording is triggered **(2).**

3.7.6 Pre-trigger

When the start condition is a trigger or a combination of triggers, the user can configure a pre-trigger. This corresponds to a number of samples or a time to be recorded before the trigger condition. The user can configure the duration of this window **(1).** Please note that if the event before the pre-trigger duration has been met, its duration will be shorter unless the inhibit option **(2)** is enabled.

Example 60s pre-trigger without inhibit

If the event starts at 15s, recording will begin and the pre-trigger will only be 15s long.

Example 60s pre-trigger with inhibit

If the event occurs after 15s, recording will not start. The event must occur again after 60s to be taken into account ; recording will start and the pre-trigger will be 60s as defined by the user.

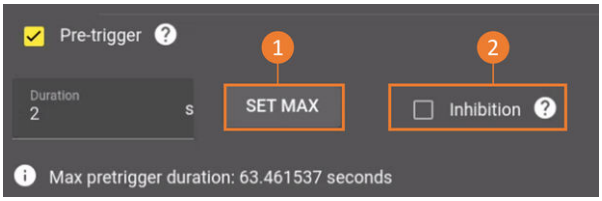


FIGURE 3.17 : Pre-trigger

By activating Inhibit **(2)**, triggering is ignored if the pre-trigger window is not full :

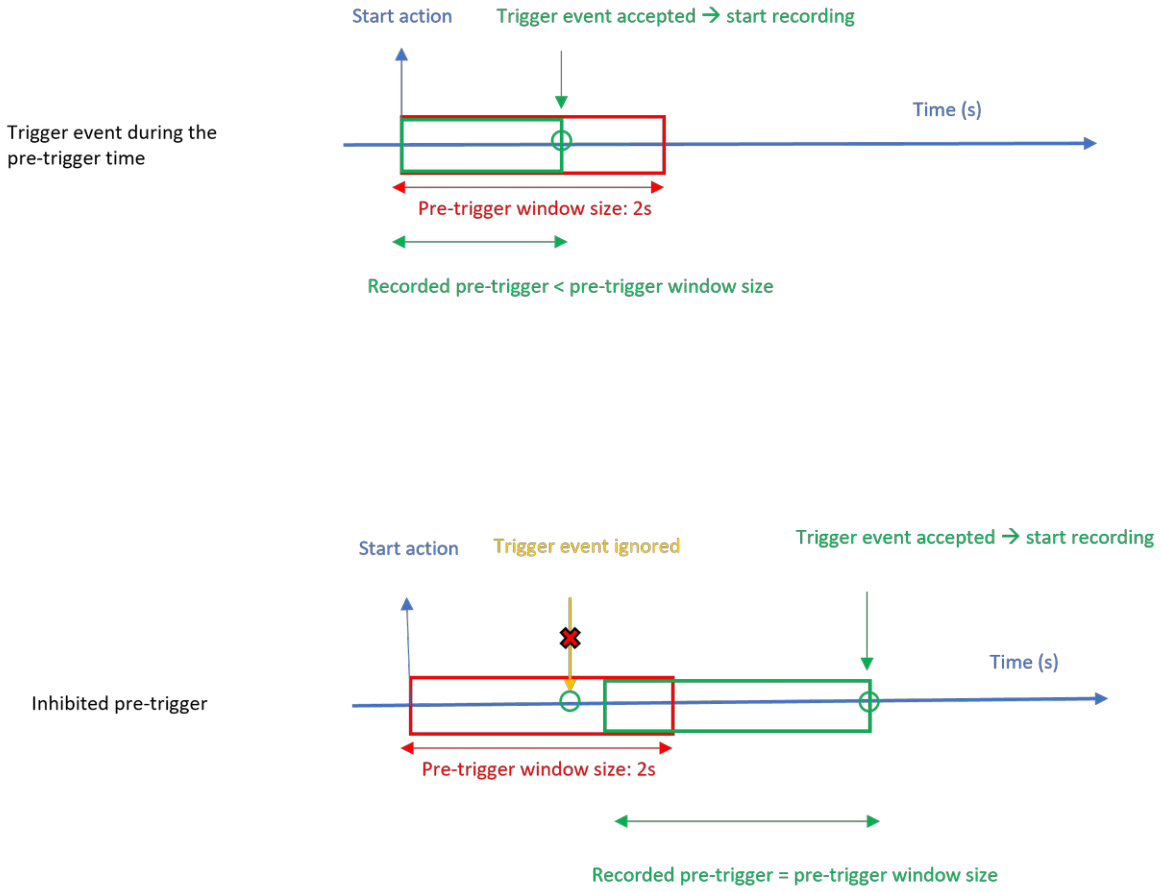


FIGURE 3.18 : Inhibit function

3.7.7 Post-trigger

The user can set a time during which the device continues to record after the stop condition has been triggered.

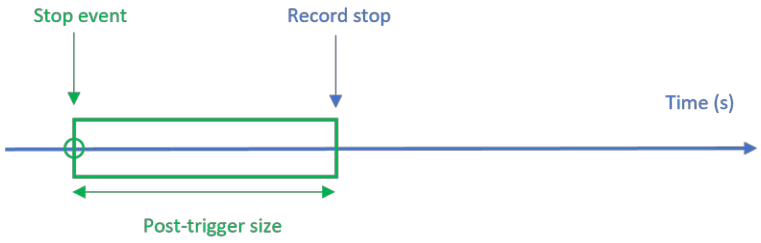


FIGURE 3.19 : Post-trigger

3.7.8 Setting save

You can save a acquisition configuration file **(1)** with all the parameters defined for an acquisition, it can be recalled later by importing it **(3)**:

- Measurement parameters (measured phenomenon, range, sensor, channel color, etc.)
- Recording parameters (recording frequency, triggers, file name)

- Settings for real-time pages

You can also save a system configuration file **(2)** that includes all system parameters, it can be recalled later by importing it **(3):**

- Network
- Time synchronization
- Screen
- Keyboard
- Sounds

You can reset the settings when necessary **(4).**



Figure 3.20: Creation of configuration file

When a configuration file is created, it is linked to the type and location of the measurement modules in the device. If the device configuration changes, the file is no longer compatible.

Chapitre 4
Measurement data display

4.1 | Real-time display

To view your measurements in real time, click on the "real time" tab in the main navigation bar :

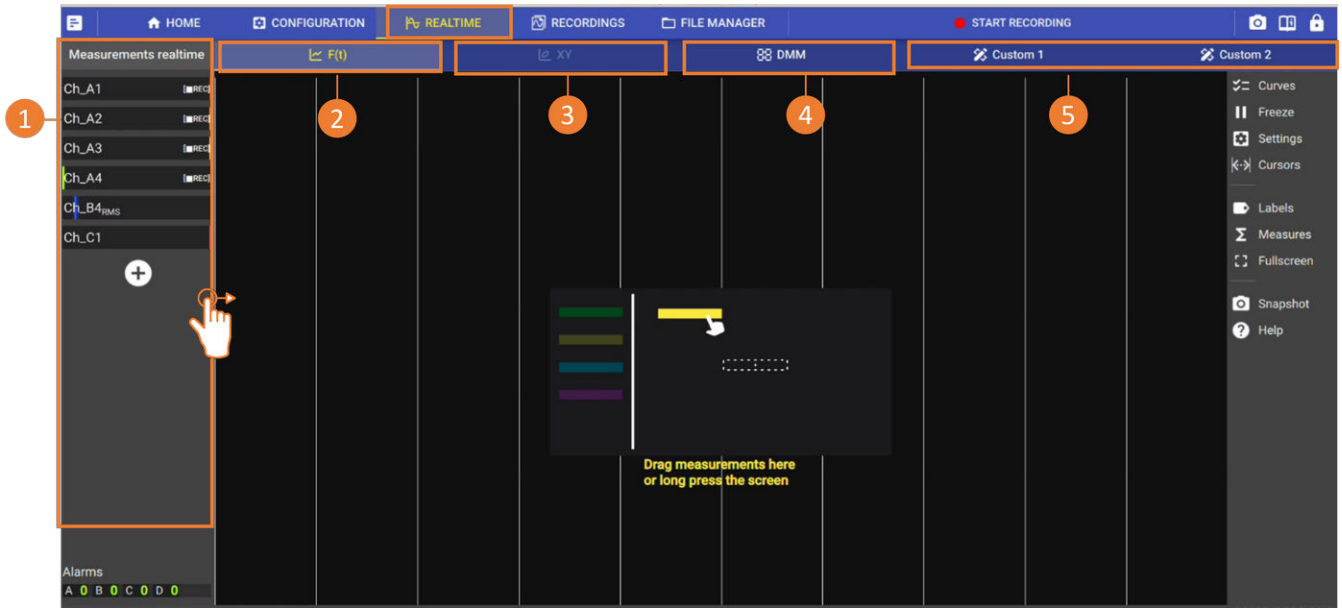


FIGURE 4.1 : Real-time data display

To view previously configured measurements, drag and drop them into the graph area **(1).**



You can also add or remove a measurement from the graph area by pressing and holding.

There are 4 real-time display modes :

- *F(t) :* oscilloscope mode to display measurements as a function of time in the form of a waveform **(2).**
- *XY (avalaible in a later version) :* mode to display one measurement as a function of another in the form of a curve **(3)**.
- *DMM :* multimeter mode for displaying the current numerical value of one or more measurements in digital form **(4)**.
- *Custom :* customizable display mode where measurements can be displayed in curve and numerical form **(5)**.

4.1.1 F(t) : Oscilloscope

See visualization and graphic analysis chapter

4.1.2 DMM display

DMM mode displays real-time measurements in digital format. In order to be visible, the value displayed is an average.



You can use the HDMI output on the unit to transfer the image to a display.



FIGURE 4.2 : DMM Display

To display measurements in numerical format, simply press and drag the measurement over the graphic area. A bar graph shows where the measured value lies in relation to the defined range.



Press on a measurement to access the channel, sampling frequency or average settings :

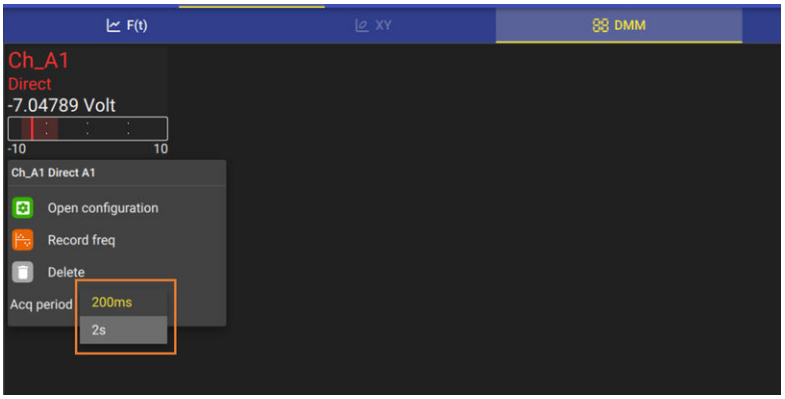


FIGURE 4.3 : DMM average period setting

The DMM average period can be set on 200ms or 2s. The number of samples used for the calculation depends on the acquisition module speed frequency. For instance, with an universal acquisition module, it will be 1 MSa/s.

Custom display

These two dashboards (custom 1 and custom 2) are fully configurable. They are saved in the configuration export. Up to 16 widgets can be displayed simultaneously. Widgets can be of different types.

- DMM : numeric format
- F(t) : Scrolling waveform display
- Live record : Full waveform display
- Image : import an image in jpg, png or svg format

The widgets and layout parameters allow you to create a synoptic supervision dashboard.

To perform an action, enter edit mode by clicking on 'Modify dashboard (1). Several functions will appear :

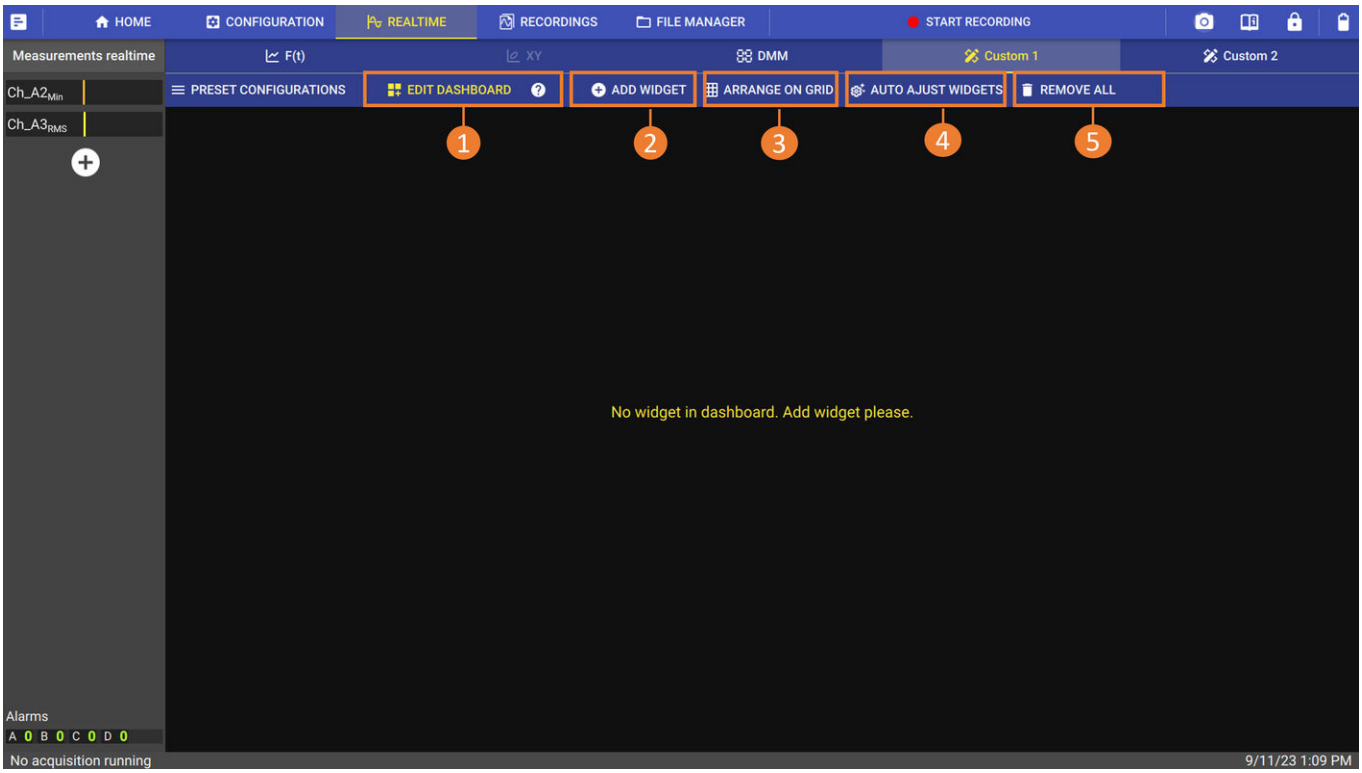


FIGURE 4.4 : Dashboard personalization

- Add widget : Create an additional widget. Default grid layout **(2).**
- Divide on a grid : Overwrites the current layout, setting all widgets to the same size and aligned on a grid. **(3).**
- Auto widget adjustment : Slightly adjusts the size of adjacent widgets to eliminate gaps **(4).**
- Delete all : removes all widgets from the dashboard **(5).**

To redesign widgets you can :
In touch navigation : in edit mode, pinch to change size and drag to move.
Mouse navigation : in edit mode, use the scroll wheel to change size and drag to move.

Go to 'Size and position' to resize on a single axis at a time.

4.2 | 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.

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

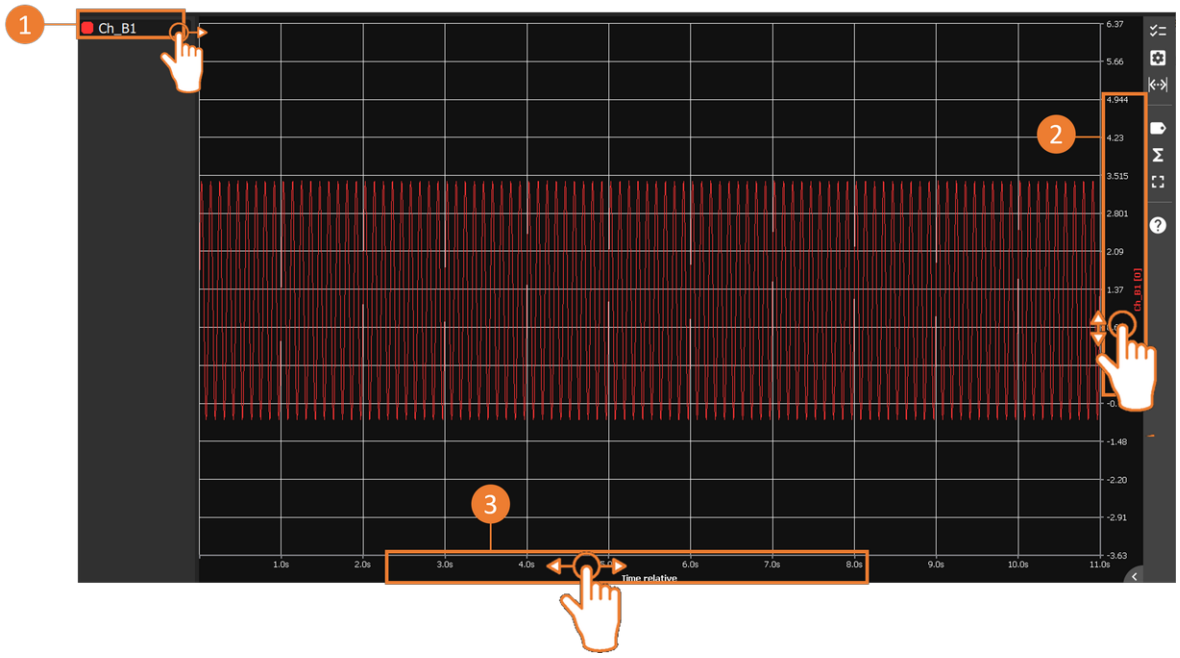


FIGURE 4.5 : Min and max settings for X and Y axes

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.

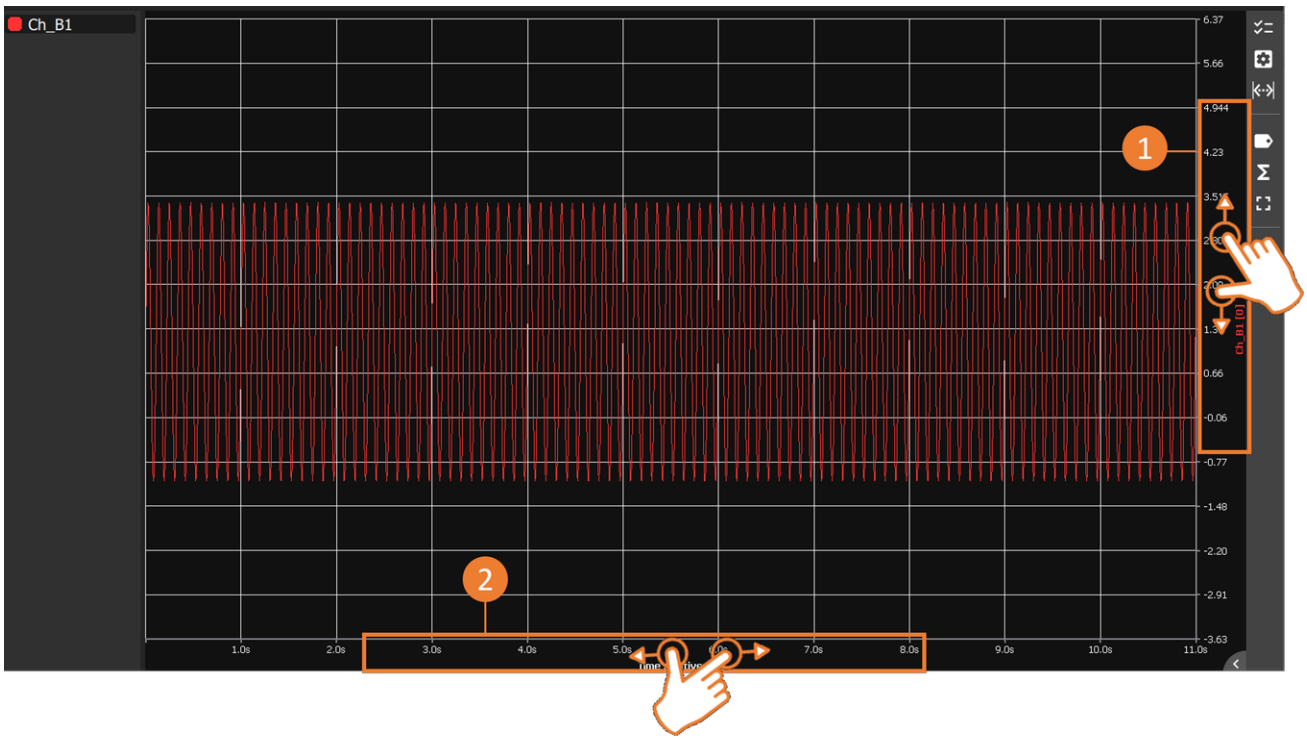


FIGURE 4.6 : Zooming in and out on X and Y axes

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.

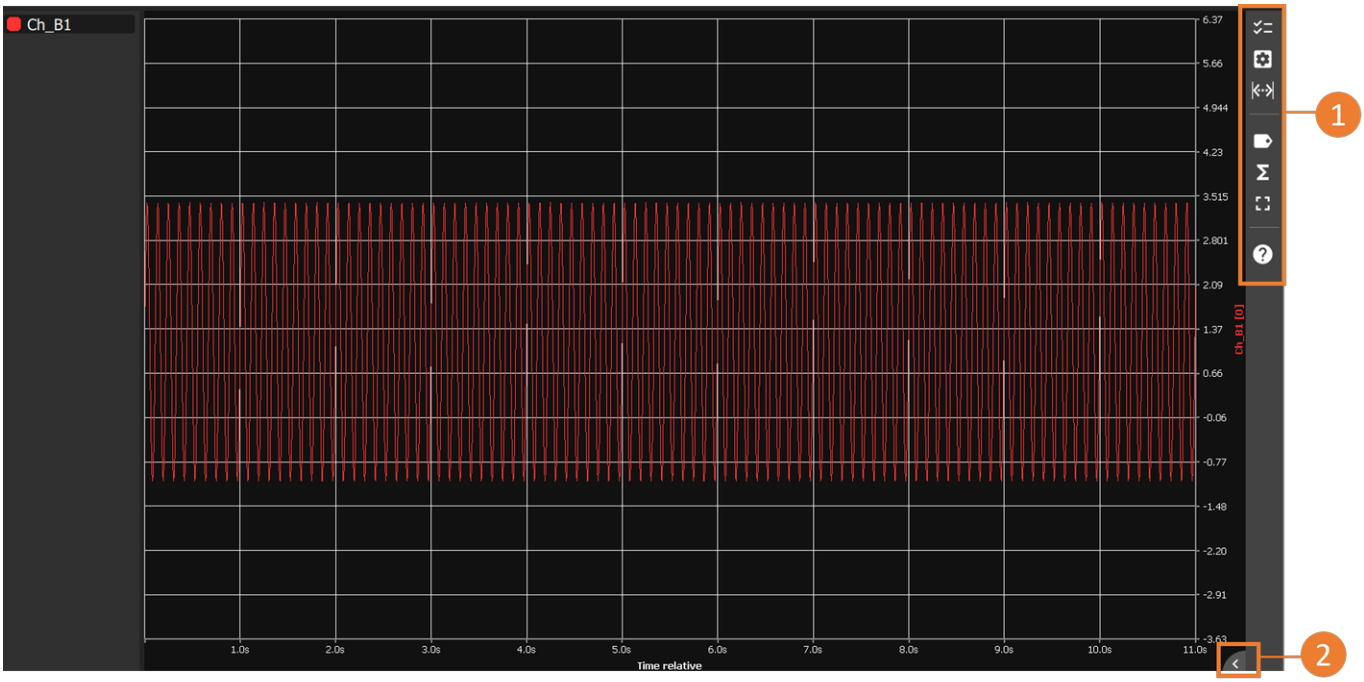


FIGURE 4.7 : Graphic display parameters

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
Σ	Displays/hides predefined mathematical calculations in real time (see mathematical calculations chapter)
	Displays/exits full-screen mode
	Opens the help window

Mathematical calculations take into account all measurement points displayed on the screen. If vertical cursors are displayed, the calculation will only take into account the points between the cursors.

4.3 | Recording analysis

To open a saved measurement file, go to "Recordings" in the main navigation bar.

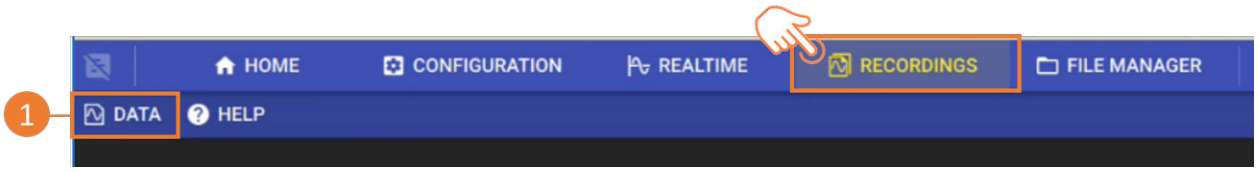


FIGURE 4.8 : Recording measurement file

By pressing data **(1)**, you can :

- Access all saved measurement files
- Convert the displayed measurement file to .csv format, which will be found in the file manager.

4.4 | File transfer

4.4.1 File retrieval via USB key

Plug a USB key into one of the device's ports. To retrieve a file from the device's hard disk and transfer it to your computer, go to "File Manager" from the main navigation bar. Press "DISK" to access the entire contents of the device's internal memory. Select the desired file **(1)** and press "COPY TO USB" **(2).** An "operation in progress" message will appear before the pasted file appears in "USB" **(3).**

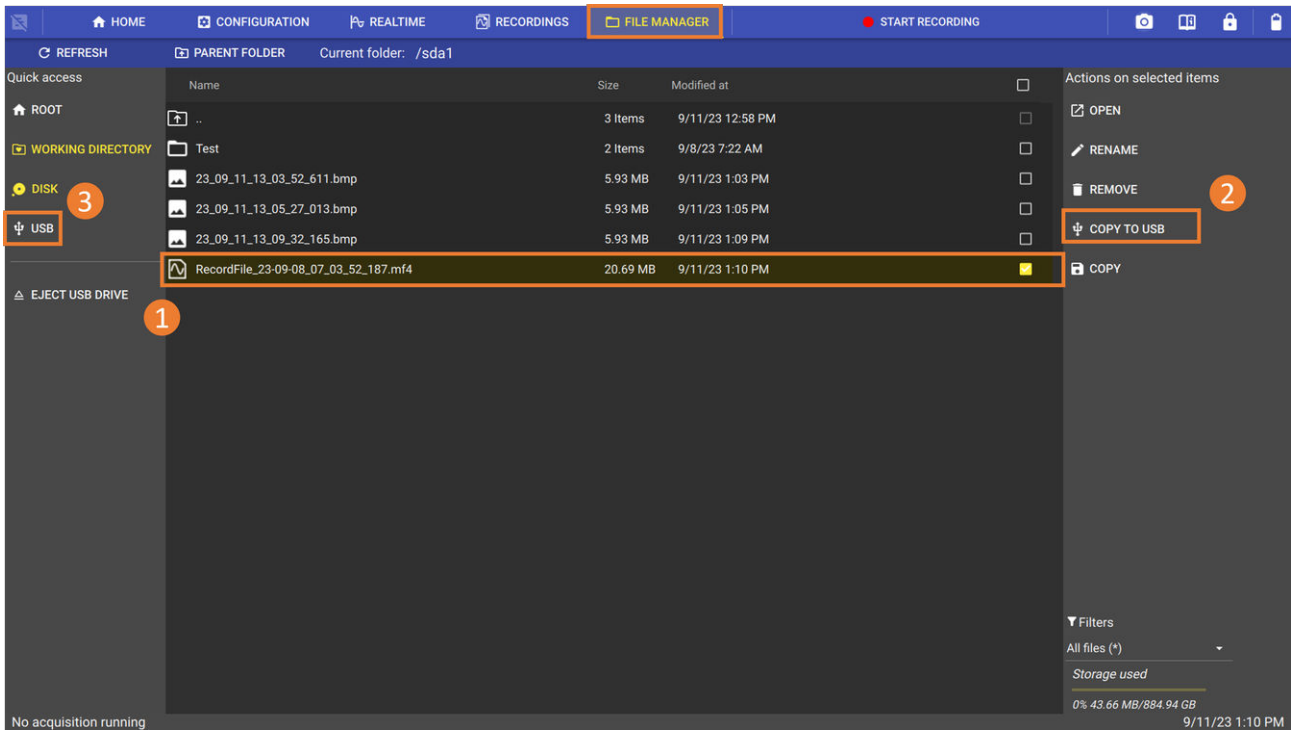


FIGURE 4.9 : Copy a file to a USB key

4.4.2 File transfer via FTP protocol (avalaible in a later version)

If you want to retrieve files from the device remotely, connect it to a computer network via the Ethernet port or Wi-Fi option. For more information, see remote control section.

Then go to Configuration > Remote > FTP
Activate the FTP protocol, setting a password if necessary.



By default, the connection is in anonymous mode on port 20 + 21.

Chapitre 5
Advanced features

5.1 | Sensors library

Each measurement is associated with a sensor.

To access the sensor library, go to *Configuration > Channel > Sensors library*

A table listing all sensors and their parameters is shown on this page.

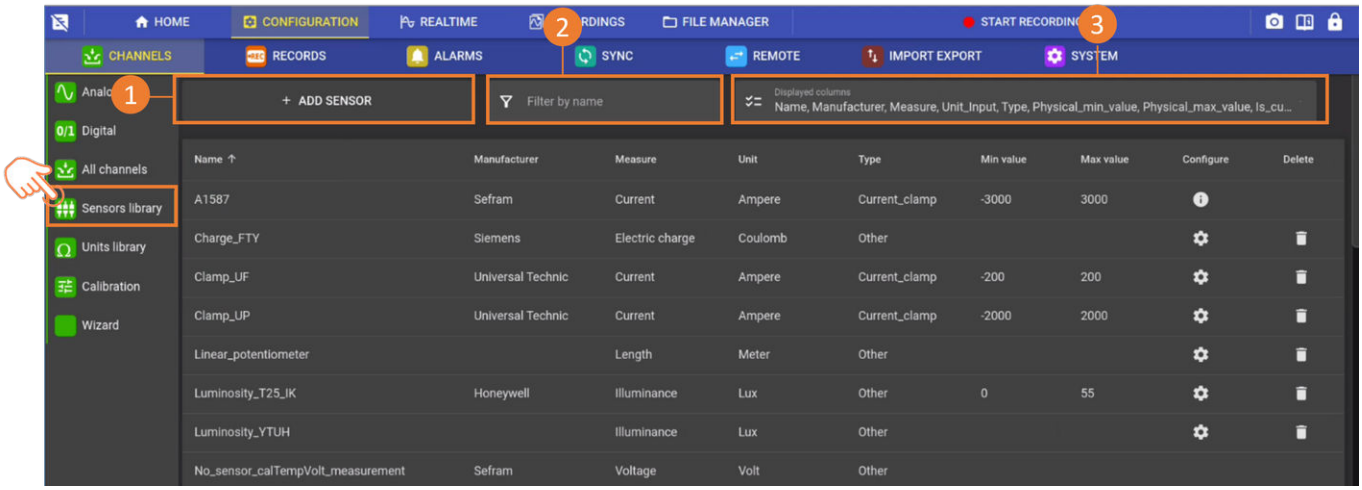


FIGURE 5.1 : Sensors library table

You can search for sensors already in the library by name **(1)** or filter the information given by column for each sensor **(2).** To modify the parameters of an existing sensor, press  **(3)**

5.1.1 How to add a 4-20 mA pressure sensor with 50 ohm shunt



To carry out a current measurement (excluding clamp), it is essential to have a shunt plugged in the channel input. A shunt is a resistor used to convert current into voltage, so that the measurement can be acquired by the device.

To create a new 4-20 mA pressure sensor, click on "Create sensor" and fill in the following parameters :

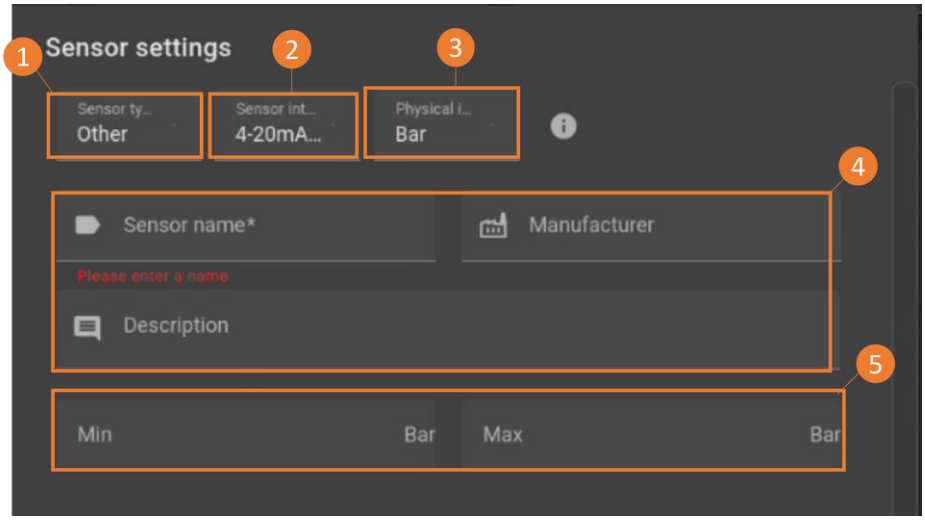


FIGURE 5.2 : 4-20 mA sensor settings

Set sensor type to "Other" **(1)** and sensor interface to 4-20mA_with_Shunt **(2)**. Enter the unit of the sensor's physical input **(3)**. Enter the associated information in the various fields (4).

If the unit is not available in the drop-down list, you can add it manually.

The Min and Max fields correspond to the display range of the measured variable (5). If the measured value is outside these limits, it will not appear on the display.

Next, define the conversion ratio of your sensor in volts, taking into account the conversion linked to the shunt.

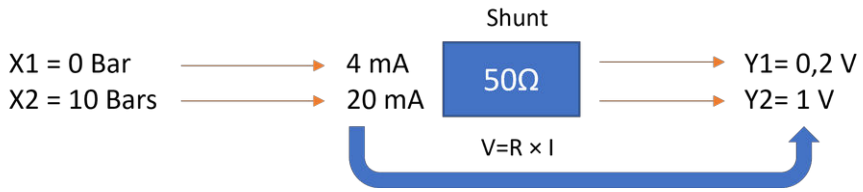


FIGURE 5.3 : 4-20mA sensor conversion ratio with 50 ohm shunt

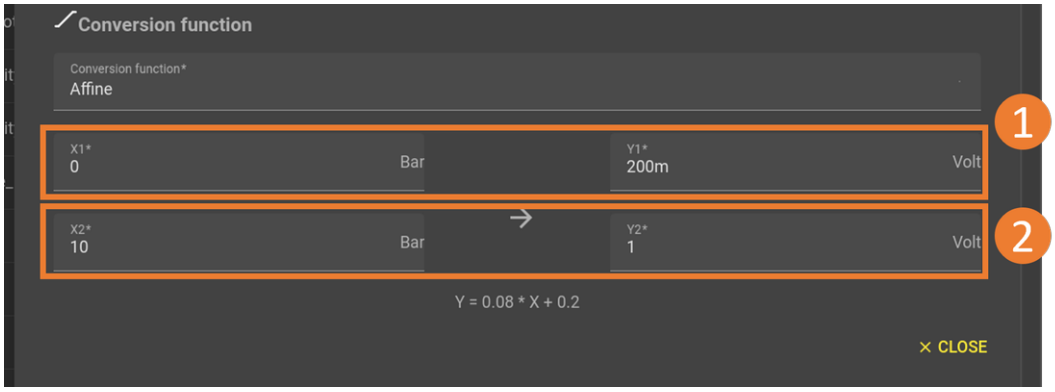


FIGURE 5.4 : Affine conversion settings

In the case of our sensor, when it measures 0 Bar, it delivers 4mA, which corresponds to 0.2V across shunt **(1)**. When it measures 10 Bar, the sensor delivers 20 mA, which corresponds to 1V across shunt **(2).**

5.2 | Alarms setting (available in a later version)

5.2.1 4 logic output (Alarms)

Alarms A, B, C and D send a TTL voltage signal when the set event occurs.

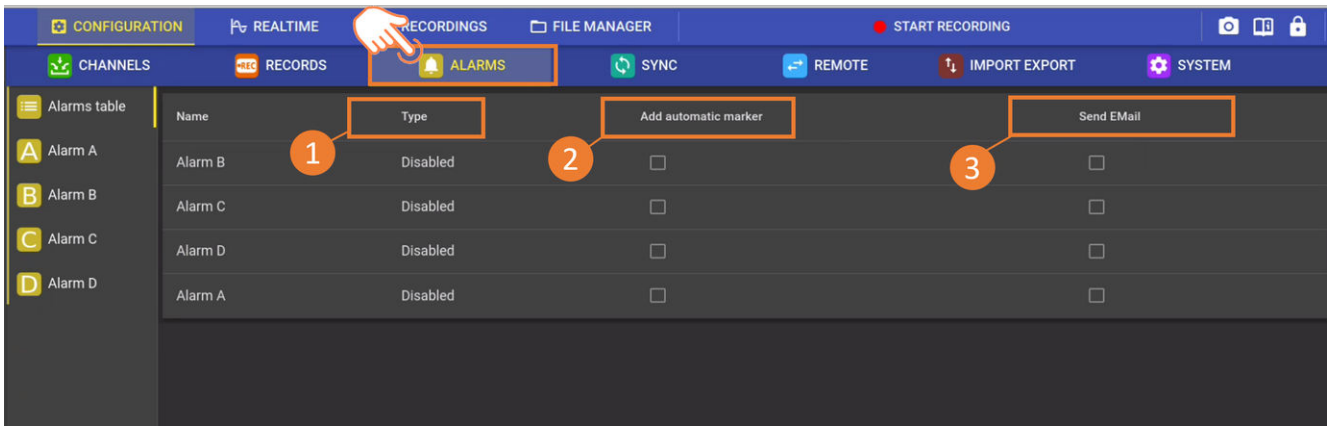


FIGURE 5.5 : Sorties alarmes

When activating a logic output, you must first define the alarm type **(1)** :

- Trigger condition : activation on event without starting/stopping recording
- Recording start : activation of measurement file recording during the event

5.3 | Remote control

To use the remote control functions, the device must be connected to a network. Please refer to the "Network settings" chapter for further information on configuration.

5.3.1 Web server

The system incorporates a web server function, enabling a connection to be established via the Internet from a web browser. To do this, enter the IP address in the browser address bar **(1).** You'll find the device's IP address in the "Status" section of the home menu **(2).**

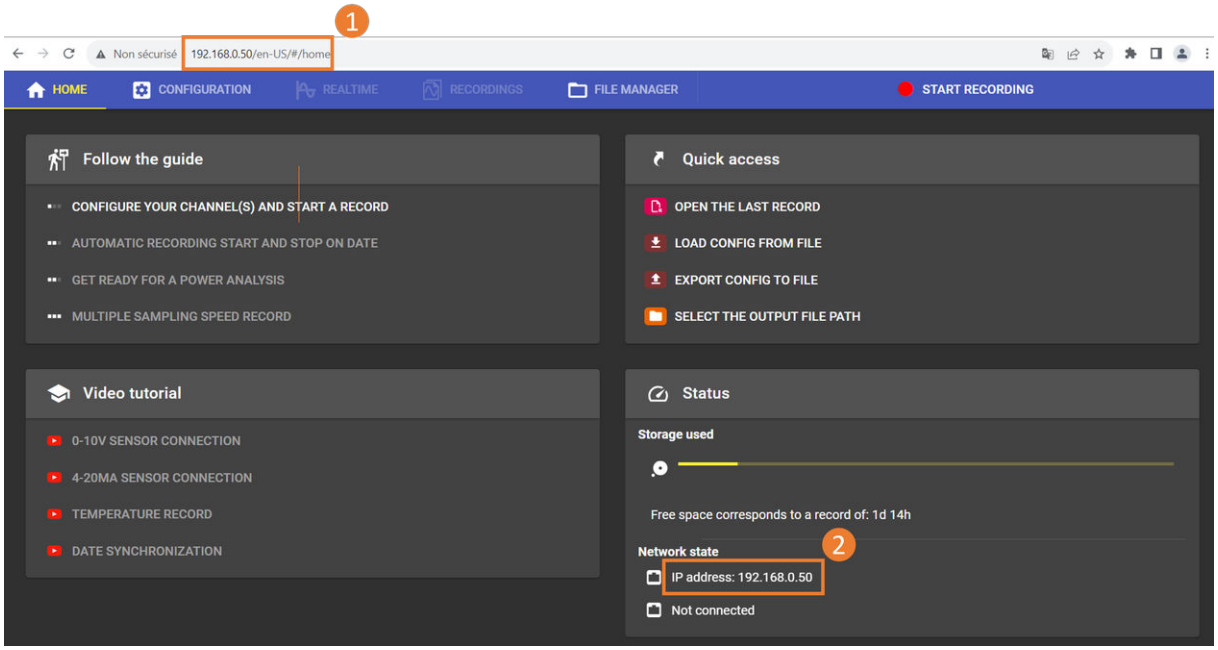


FIGURE 5.6 : Web server

Real-time visualization and file retrieval are not available. To view your measurement data in real time, use the VNC viewer® shown below.

VNC viewer®

You can also use the VNC viewer® utility, which is freely downloadable from the Internet. It lets you access your device remotely, with a duplicate of its complete interface on your computer screen.

Once downloaded, launch the utility and go to File > New connection **(1)**. Enter the device IP address in the VNC server field (**2).**

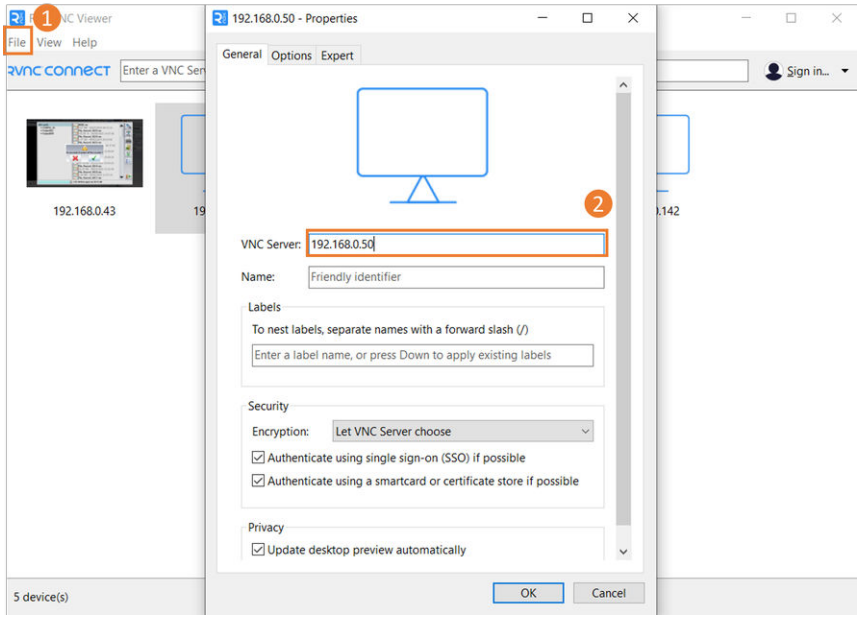


FIGURE 5.7 : New VNC viewer® connection

The new connection appears in the list, click to connect :



You can secure your connection with a password.

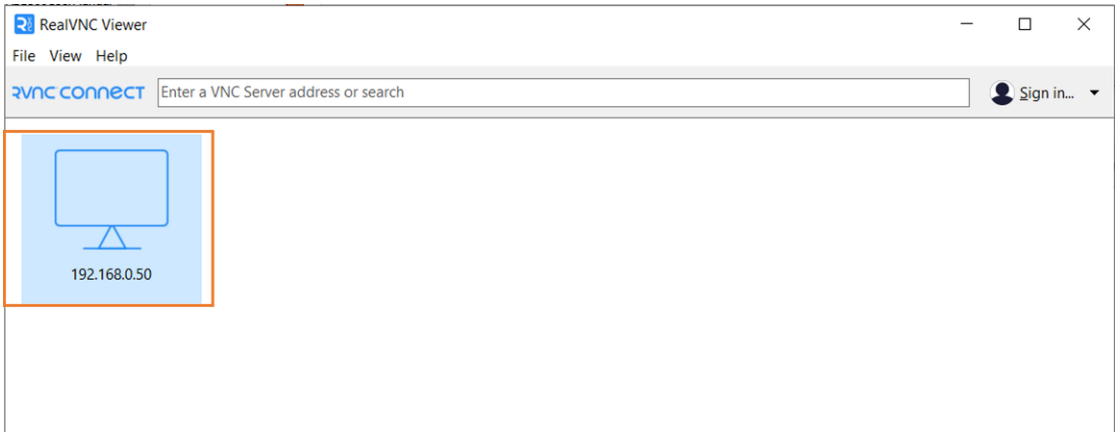


FIGURE 5.8 : Connection

You can then operate the device with full access to all functions :

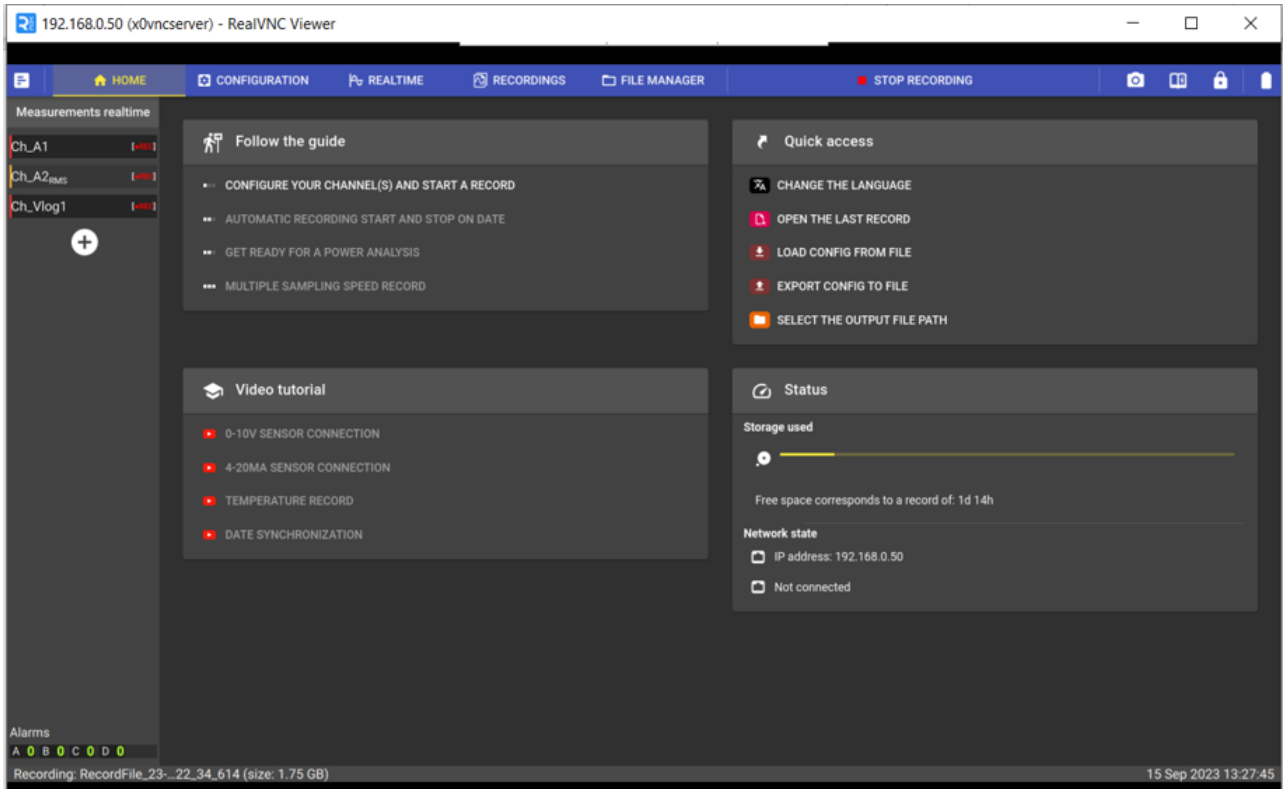


FIGURE 5.9 : VNC viewer® control

5.4 | SCPI protocol

SCPI (Standard Commands for Programmable Instruments) is a universal programming language for electronic test and measurement instruments, based on the IEEE 488.1 and IEEE 488.2 standards. Commands are ASCII textual strings which are sent to the instrument over the physical layer. Commands are a series of one or more keywords, many of which take parameters.

See wikipedia description

5.5 | Physical layer

SCIPI is based over the LAN interface that can be connected via a commercial RJ-45 cable to a network with TCP/IP protocol. The TCP port used is **23** (Telnet port).

5.6 | Command syntax

SCPI commands to an instrument may either perform:

- command operation (e.g. switching a power supply on)
- query operation (e.g. reading a voltage). Queries are issued to an instrument by appending a question-mark to the end of a command.

Use a semicolon (;) to separate multiple commands.

Abbreviating commands

The command syntax shows some characters in a mixture of upper and lower case. Abbreviating the command to only sending the upper case **has the same meaning as sending the upper and lower case command.**

For example, the command “DATe” could also alternatively be abbreviated “DAT”

5.6.1 Arguments

Some commands require an additional argument. Arguments are given after the command, and are separated by a space.For example, the command to set the trigger mode of an instrument to "normal" may be given as "TRIGger:MODe NORMal". Here, the word "NORMal" is used as the argument to the "TRIGger:MODe" command.

There are several types of data items:

- Alphanumerical data: 1 to 12-character words that can be alphabetical (upper or lower case) digital or the "-" character (95d). A word always starts with an alphabetical character. For example, for a non-digital parameter: S1M.
- Decimal digital data: Made of a significand and, possibly, an exponent, and displayed as a chain of ASCII-coded characters starting with a digit or a sign (+ or -).
- Text: Any chain of characters under 7-bit ASCII code, between quotation marks (") or apostrophes (’). For example: "Channel 1"

5.7 | Examples

```
>> Send : *IDN?
<< Rcv : DAS1800 V0.0.4 (N0012)

>> Send : VALID ?
<< Rcv : Ch_B1 ;Ch_B2 ;Ch_B3 ;

>> Send : *OPT?
<< Rcv : No options

>> Send : DAT ?
<< Rcv : 05,11,2022

>> Send : :DAT ?
<< Rcv : 05,11,2022

>> Send : :DATE ?
<< Rcv : 05,11,2022

>> Send : :RDC ?
<< Rcv : Ch_B1 Direct 1.12572;Ch_B2 Direct -0.756034;Ch_B3 Direct -1.78915;

>> Send : HOUrs ?
<< Rcv : 09,27,37

>> Send : FILE:NAMe ?
<< Rcv : RecordFile
```

5.8 | Programming dictionary

5.8.1 Requests list

HEADER	DESCRIPTION	RESPONSE	EXEMPLE
*IDN?	Identification request	SEFRAM, Product Name, Serial Numer, VersionMajor.VersionMinor	SEFRAM 8460 Version 4.7.2 (N:00010)
*OPT?	Idendtification of options	Number of acquition boardsSS	titi
:DATe?	Return the current date	Day,Month,Year	30,12,2022
:HOUrs?	Return the current time	Hour,Minutes,Seconds	09,53,37
RDC?	Read all measurements values	Measurement name, type and values separated by comma	Ch_B1 Direct 0.1514, Ch_B2 Direct 8.9716
REC?	Read recording state	“Waiting for start of record” or “Recording in progress”	Waiting for start of record
VALID?	Read list of all measurements enabled	Measurement name and type separated by comma	Ch_B1 Direct, Ch_B2 Direct
:FILE:NAMe?	Read record file name	File name string	MyFileName

Table 5.1: SCPI request description

5.8.2 Command list

HEADER	DESCRIPTION	PARAMETERS	EXEMPLE
*REM	Start remote control	-	*REM
*LOC	Stop remote control	-	*LOC
:MEMSpeed	Set recording frequency	Frequency (Hz)	:MEMSpeed 10000
:START:MANual	Start recording	-	:START:MANual
:STOP:MANual	Stop recording	-	:STOP:MANual
:SCREEN	Change current screen	REplay, SETUP, SCOpe	:SCREEN SCO
:FILE:NAMe	Set record file name	File name	:FILE:NAMe myFileName
:REB	Reboot the product	-	-
:VIEWer	Open a record file	File name	:VIEWer myFileName

Table 5.2: SCPI command description

5.9 | Examples

Bellow an example of a Python implementation

Listing 5.1: SCPI python implemntation exemple

```
import time
import telnetlib

TIMEOUT = 0.5    # Timeout on frame receive
PORT = 23

###################### Low level functions ######################

# Remove end of line chars to print
def extractCmd(cmd):
    cmd = cmd.replace("\n", "")
    cmd = cmd.replace("\r", "")
    return cmd

# Send a frame and wait for response
def sendFrame(tn, cmd):
    cmd = cmd + "\n"
    print(">> Send : " + extractCmd(cmd))
    tn.write(cmd.encode('ascii'))
    res = tn.read_until(b'\n', TIMEOUT).decode('ascii')
    if len(res) == 0:
        print("Timeout")
        time.sleep(1)
    else:
        print("<< Rcv  : " + res)
    return res

class scpi(object):

    def __init__(self, ip):
        self.tn = telnetlib.Telnet(ip, PORT, TIMEOUT)

    def runCmd(self, frame):
        return sendFrame(self.tn, frame)

    def __del__(self):
        self.tn.close()


scpiInst = scpi("192.168.0.110")
scpiInst.runCmd('*REM')
scpiInst.runCmd('*IDN?')
scpiInst.runCmd('VALID ?')
scpiInst.runCmd('*LOC')
```

5.10 | User interface

The DAS interface connection state and error queue can be montitored to help debuging.

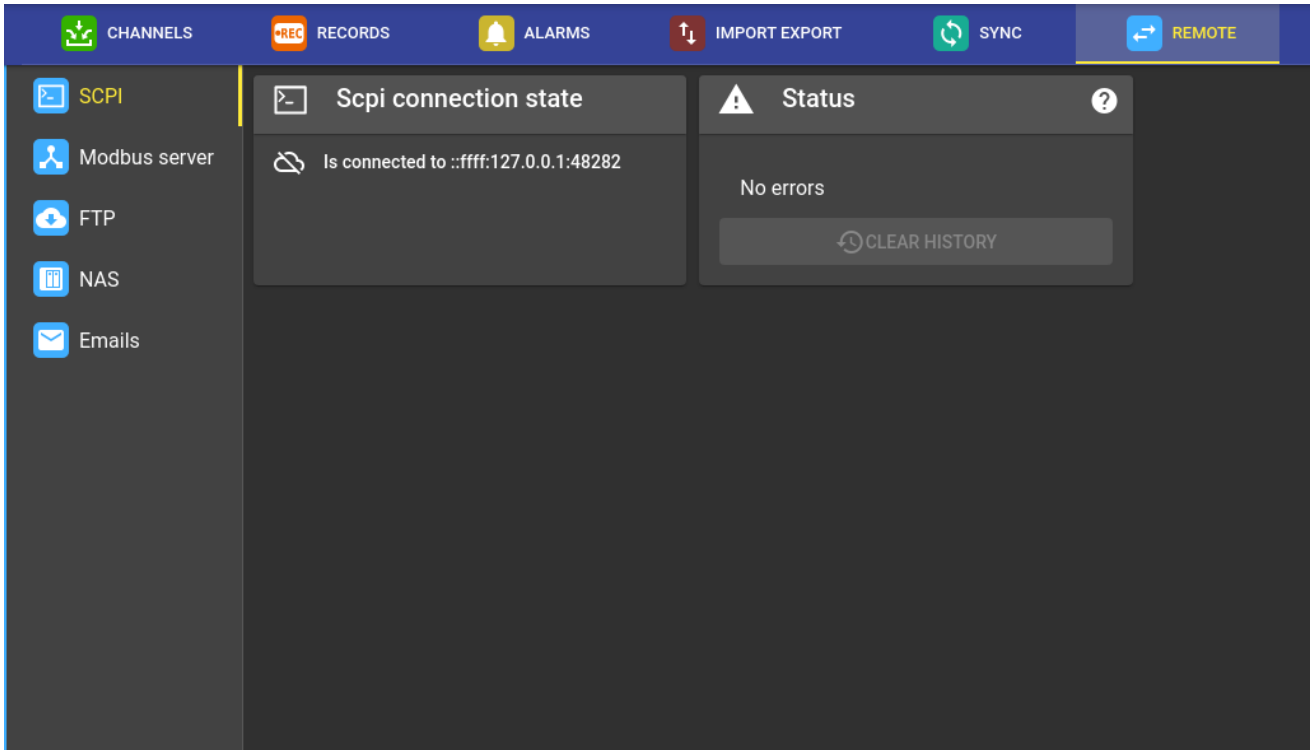


Figure 5.10: SCPI user interface

Chapter 6

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/.

6.1 | 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.

6.2 | 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.

6.3 | 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.

6.4 | 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

6.5 | Example

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

Listing 6.1: Exemple d'utilisation de la bibliothèque MDF4 en 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()
```

Chapitre 7
System

7.1 | Ergonomic settings

To set the general system settings, go to Configuration > System

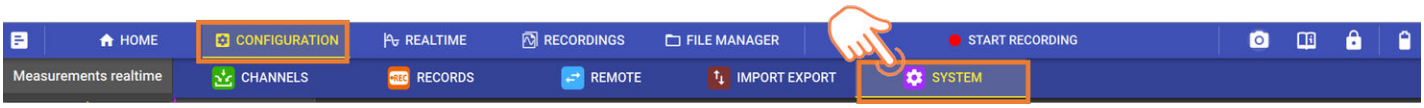


FIGURE 7.1 : Access to system settings

You'll then be able to adjust :

- **Screen :** brightness, screen saver
- **Touchscreen :** lock touchscreen or virtual keyboard
- **The keyboard :** regional keyboard selection
- **Sounds :** loudspeaker sound level

7.2 | Firmware update

It's essential to have the latest firmware version of your device to benefit from the latest improvements and fixes. To do this, go to the *Configuration > System > Version :*

There are 3 ways to update the device :

"Load from the web" **(1)** : the system must be connected to the Internet and will automatically fetch the latest update file from the url presented.

"Load from USB stick **(2) :** retrieve the update file from https ://www.sefram.com/en/software-updates.html and copy it to the root of a USB stick. Plug it into one of the device's USB ports and click on "Load from USB".

"Load from local file" **(3)** : load the configuration file from the device's internal file manager.

7.3 | Time setting

7.3.1 Manual

Select the system time manually.

This parameter is used if the system is isolated (without network) and loses its internal clock. The user can then manually enter the date.

7.3.2 NTP

The device features NTP : Network Time Protocol, a synchronization protocol via IP. NTP enables the device to set its time automatically. An Internet connection (or to a local NTP server) is required to operate.

To set up a local NTP server, contact your IT department, who will be able to help you.

7.3.3 Time zone

This parameter lets you define the time zone to which the device refers.

7.4 | Network settings

7.4.1 Ethernet

To connect your device to a network, go to Configuration > System > Network :

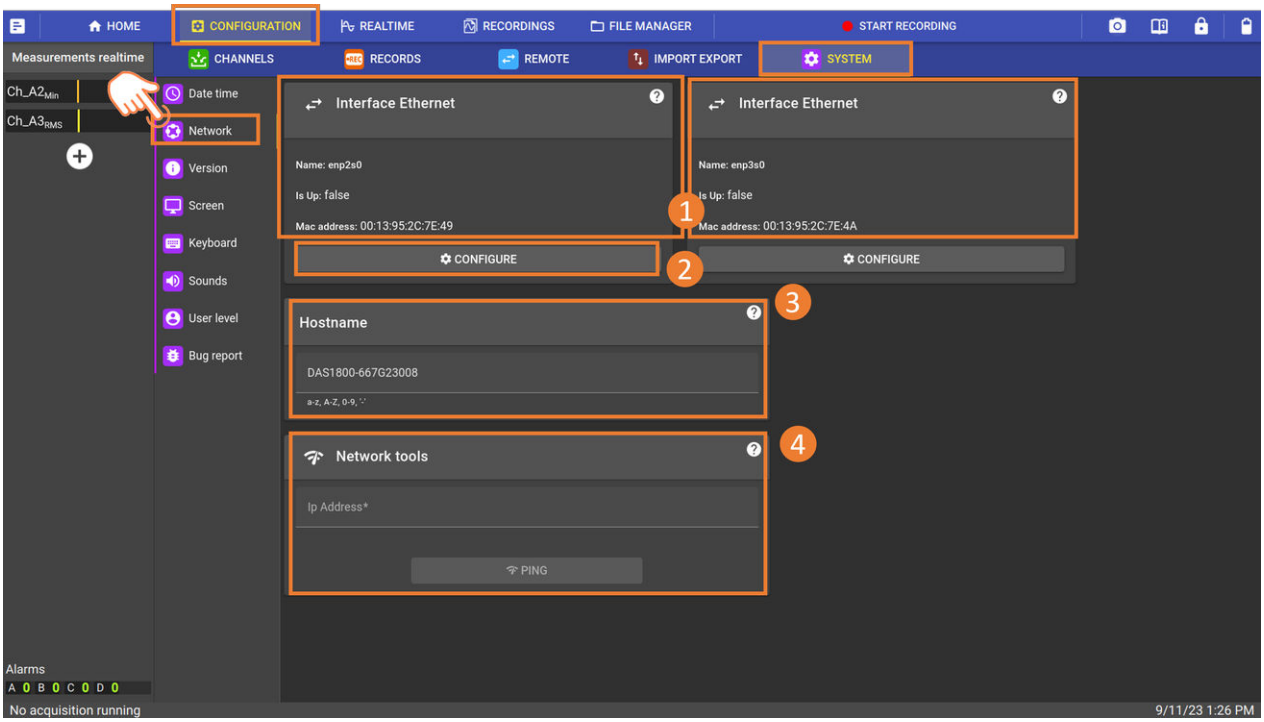


FIGURE 7.2 : Network configuration page

It is possible to configure 2 different Ethernet networks on the device simultaneously **(1)**. Give your network a name **(3)** . The name must begin with a letter and be at least 254 characters long. It cannot be composed solely of letters or numbers.

The device must be restarted for the new network name to take effect.

Several combinations can be used simultaneously by configuring the two networks to best support your application :

- Remote control (see remote control section for more information)
- Remote file retrieval (see FTP chapter for more information)*
- Connecting a camera with Ethernet interface*
- PTP connection for time synchronization between multiple devices (optional function*)

**Avalaible in a later version*

To configure the network, click on "Configure" **(2)**, and the following page will appear :

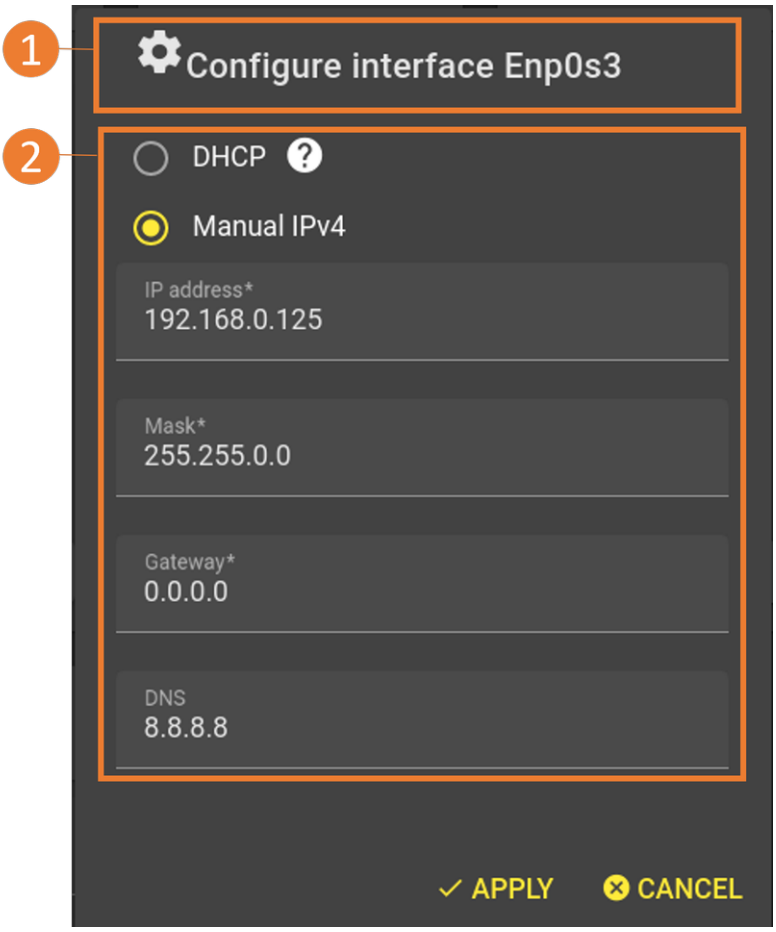


FIGURE 7.3 : Enp2s0 Interface

If your network is directly connected to a DHCP server via a router, you need to check DHCP mode **(1)**. Your network will automatically assign an available network address to your device, thus avoiding address conflicts.

In some cases, if the user does not have access to the corporate network, a point-to-point connection is required. This is an isolated connection between the PC and the device. In this case, set the network parameters manually **(2).**

Example of manual point-to-point network settings :

First, set up a fixed IP on your PC by following the steps below :

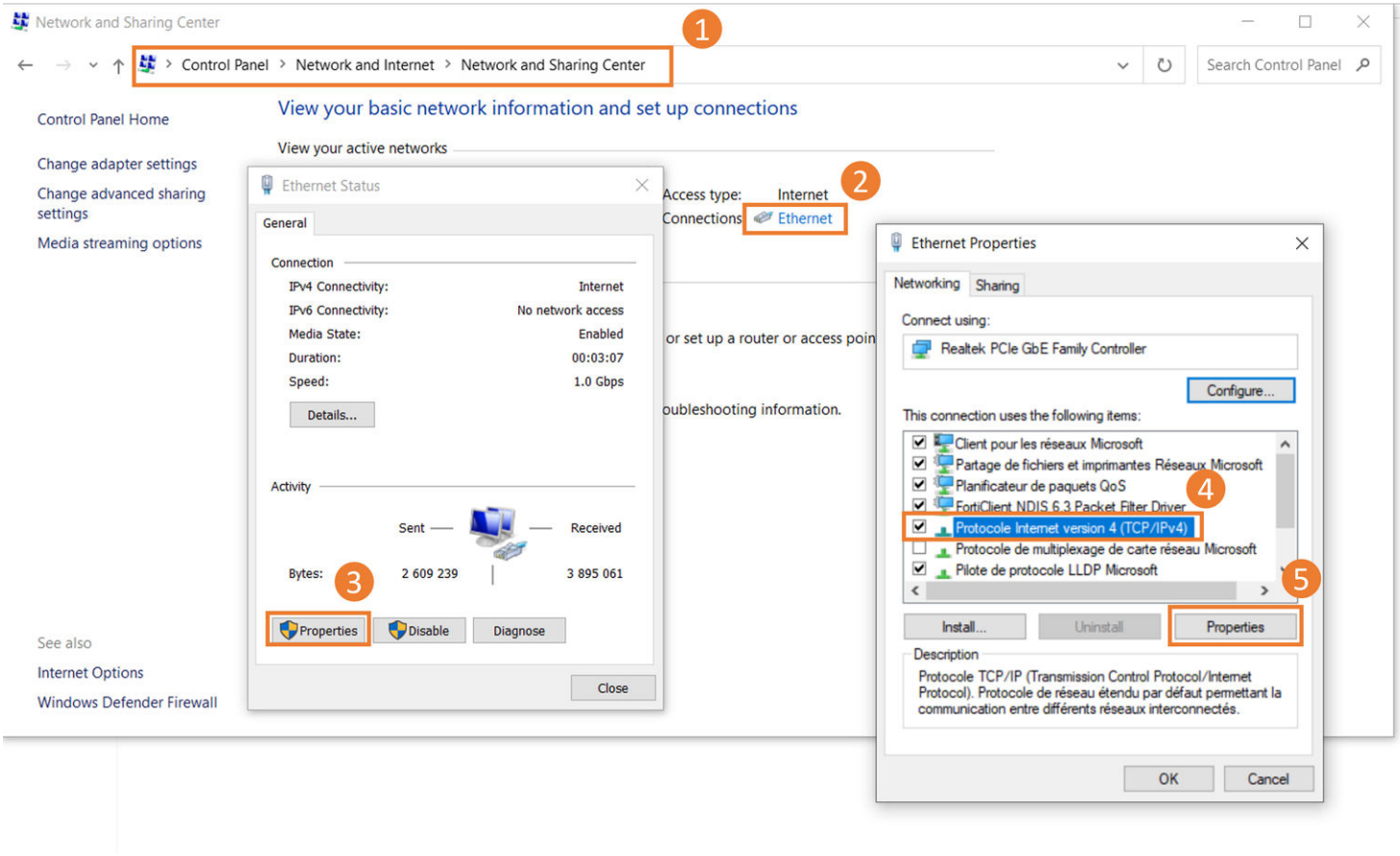
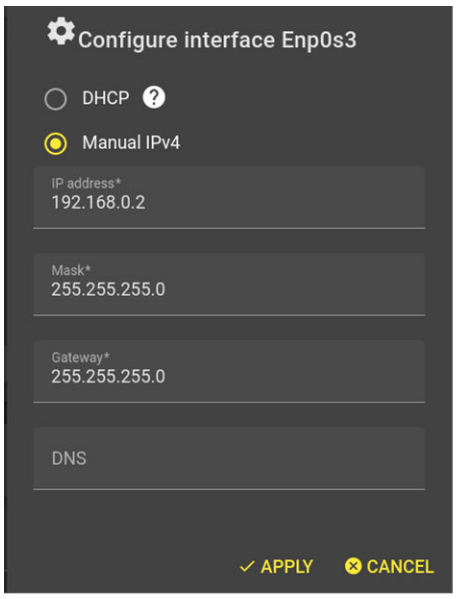
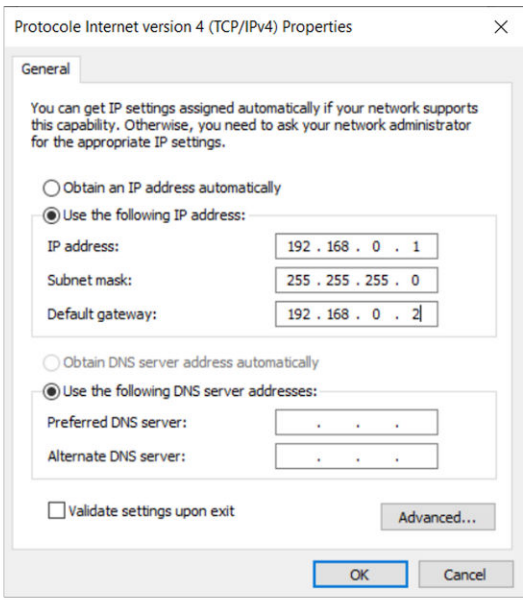


FIGURE 7.4 : Fixed IP address setting

The device is connected to the PC via ethernet cable, and the configurations are as follows :



Address IP configuration on DAS1800



Address IP configuration on PC

FIGURE 7.5 : Manual IP configuration of PC and the recorder

The configuration shown below is an example. If you have any doubts about your settings, please contact your IT department.

In a point-to-point connection, you can send SCPI commands using the supplied programming manual. This means you can edit and run your own script over an isolated connection.

7.5 | User level

Several user levels can be defined, giving access to more or less advanced functions and information. The aim is to simplify the user interface as required:

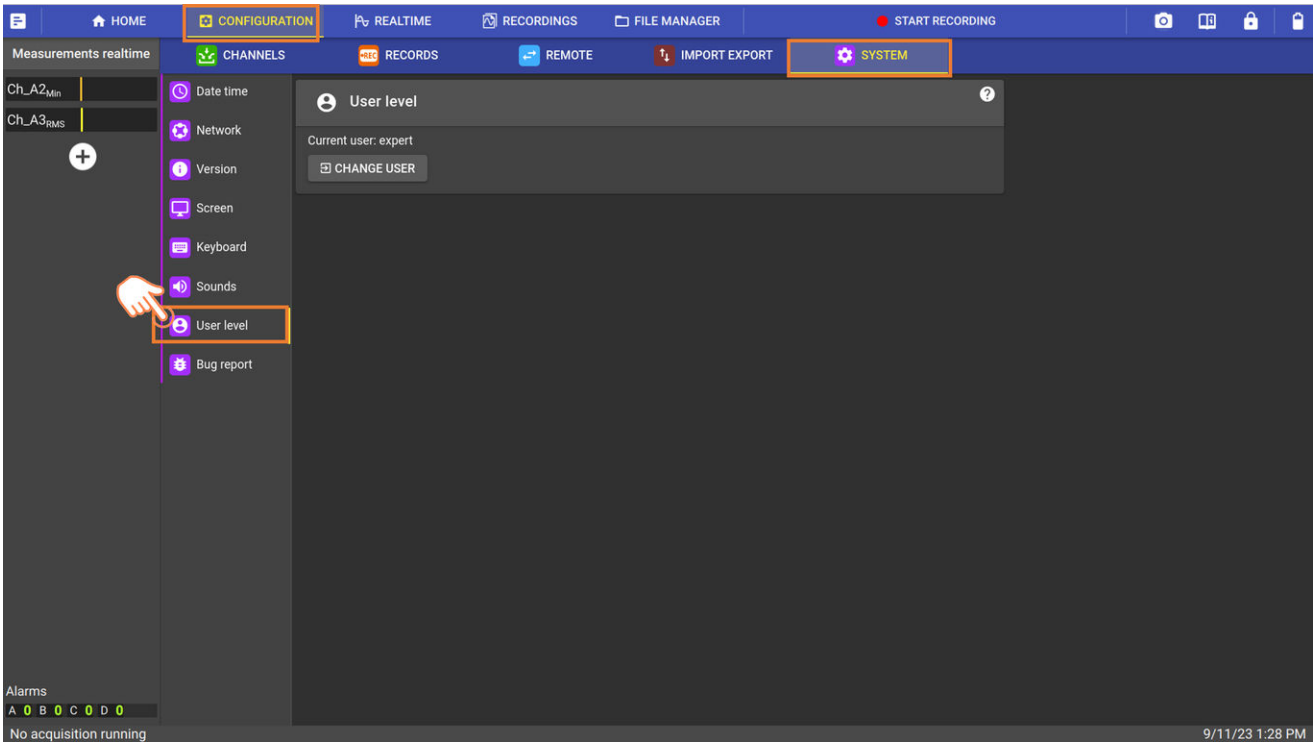


Figure 7.6: User level

7.5.1 Viewer level:

The device is virtually read-only. The user can only start or stop recording. He/she cannot modify any configuration (network, channels, trigger...) and has no access to the file manager.

For example, this mode is used when an operator has access to the device, but the configuration has been made by a third party. This limits the risk of tampering.

Normal level:

The interface functions available are those intended for standard use. The user has access to virtually all functions.

Expert level:

Certain functions or additional information become available.

Admin level:

This level is dedicated to your company's IT department or competent person. It gives access to network security parameters.

7.6 | Bug report

If you notice a malfunction while using the device, a dedicated bug report menu is available: *Configuration > System > Bug report*

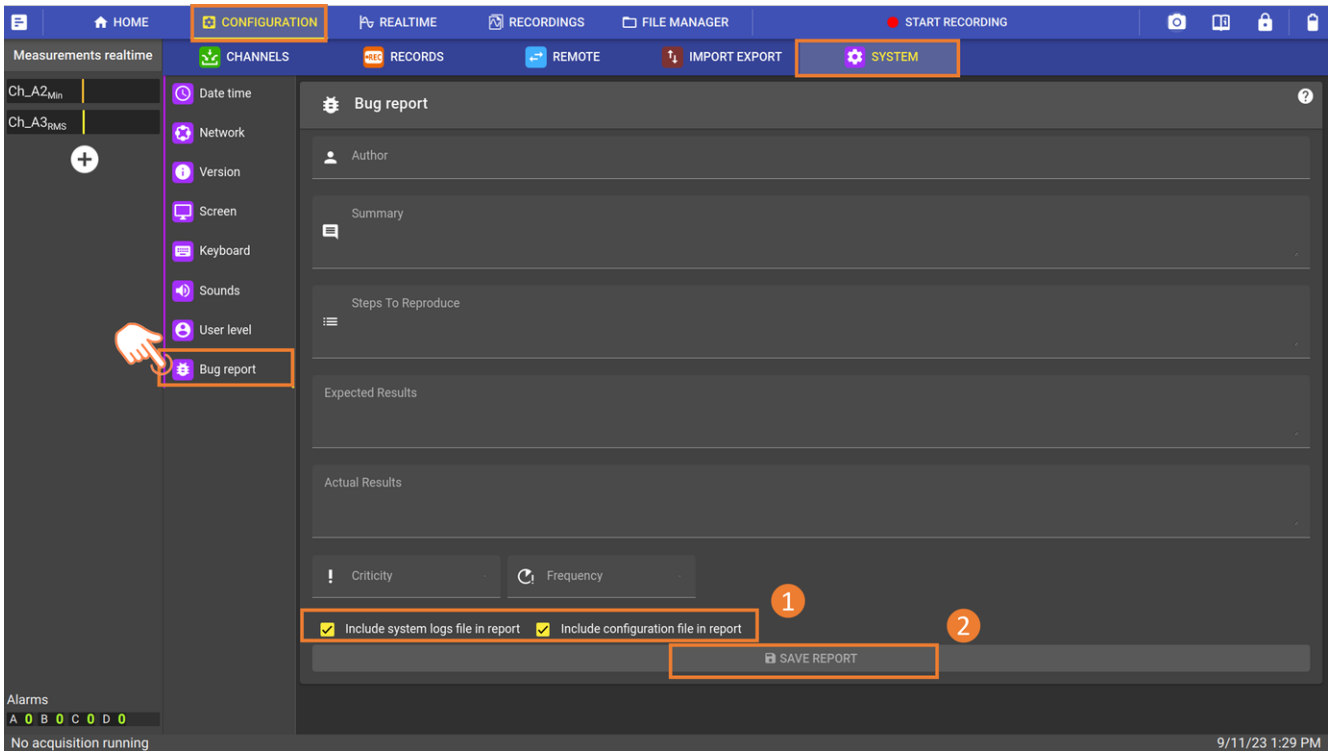


Figure 7.7: Créer un rapport de bogue

Fill in the various fields, providing as much detail as possible. If you suspect a software problem, please check the boxes to include the system and configuration files in the report **(1).** This will give SEFRAM all the information it needs for a complete diagnosis.

Then press "Save Report" **(2)**, which will create a compressed folder of type xxxx.bugreport in the working directory available from the file manager (see file manager chapter for more information).You can retrieve the file via a USB key or via the network (FTP or web server, see network settings and remote control chapters for more information). Then send the file to SEFRAM's support department: support@sefram.com or support@bkprecision.com for customers in North America.

If any doubt, please contact SEFRAM telephone at 04 77 59 01 01. For customers in North America, please contact B&K Precision at 800-462-9832 (US & CAN toll free).

Chapter 8

Technical specifications

Specifications, base unit

Note: All specifications apply to the unit after a temperature stabilization time of 30 minutes over an ambient temperature range of 23 °C ± 5 °C.

Data Acquisition System		
Recording (files written to SSD)		
Max Sampling Rate[1]	1 MSa/s up to 40 channels	
Recording Groups	4	
Write Speed	120 MB/s (7 GB/min)	
File Format	ASAM MDF4 (.mf4)	
File Size Limit	90% of disk capacity	
At End of Acquisition	Notify, rearm trigger	
Real Time Measure		
Display Mode	F(t)	Roll mode: 100 ms/div to 10 min/div Scope mode: 10 µs/div to 50 ms/div
	DMM	Acquisition time: 200ms (10 NPLC[2] at 50Hz), 2s (100 NPLC[2] at 50Hz)
	Record live view	Typical Refresh period 2s, Zoom Mode
	Custom	2 Customizable Views Widgets: F(t), RecLive F(t), DMM, Picture
File Viewer		
Open File Time (typical)	10 sec per 100 GB of file	
Subplot	16 axis	
Cursors	Horizontal, vertical	
Measurements	On the data displayed or between cursors	
	Min, Max, Pk to Pk, Frequency, RMS, Rising time	
Trigger System		
Compute Period	1 µs	
Source	Analog channel, external source, manual, date/time, delay (on start), duration (on stop), AND/OR combination of channels (128 max)	
On Analog Channel	Edge (rising, falling, both), Threshold (above, below), windows (in, out)	
Pre-trigger	128 Msamples	
Post-trigger	1000 s maximum	

Digital I/O	
Input	
Number of Channels	16
Max Voltage	24 V
Threshold	1.2 V to 2.8 V
Sampling Interval	1 µs (1 MSa/s) each channel
Output	
Number of Channels	4
Output Characteristics	TTL 5 V, 10 mA
Trigger Source	Analog/Digital channels, acquisition start/stop, disk full
Power Supply[3]	+ 12 V ± 5 %, 200 mA

(1) For D18-UNI4 and D18-HIZ4 Module
(2) NPLC: Number of power line cycles
(3) Used to power the isolated digital input board
(4) Time with only the 1st frequency group used

Power Supply Rail	
Maximum Power Consumption	5 W
Output Characteristics	+ 3.3 V ± 5%, 500 mA
	+ 5 V ± 5%, 500 mA
	+ 12 V ± 5%, 400 mA
	+ 24 V ±5 %, 200 mA

Synchronization I/O		
On Synchronization Connector (SUB-D 15 HD pin)		
Input	Signal level	TTL 3.3 V
	External trigger	Pull-up resistor: 10 kΩ Rising edge sensitive Minimum pulse width: 100 µs
	External start/stop	Pull-up resistor: 10 kΩ Rising edge sensitive for start Falling edge sensitive for stop Minimum pulse width: 500 ms
Output	Signal	TTL 3.3 V
	Trigger	1 ms positive pulse at trig event
	Start/stop	Set when record is launched

Software Feature		
Remote Access	VNC for remote monitoring and control	
	Web server	
	File management	FTP, SFTP
	Bench automation	SCPI command port (23 or 5025)
Sensor Library	Predefined sensors and user created	
Date and Time	Manual, NTP	
Software Update	Through web or USB	
Languages	English, French	

General	
Internal Solid State Memory	2 TB SSD 3D TLC NAND
Operating Temperature	0 °C to 40 °C (32 °F to 104 °F)
Storage Temperature	-20 °C to 60 °C (-4 °F to 140 °F)
Display	15.6" TFT LCD full HD 1920x1080
Power Supply	110 VAC to 240 VAC, 50 to 60 Hz (150 VA max)
Interfaces	2 USB3.0, 2 USB 2.0 , 2 LAN 1Gbps, HDMI
Battery (optional)	Non removable, Lithium-ion
Battery Life (typical)	3 ½ hrs - One D18-UNI4 module installed 1 ½ hrs - Ten D18-UNI4 modules installed
Weight	11 lbs (5 kg) base unit + battery option 1.21 lbs (550 g) each module
Safety	N 61010-1 (2010) + A1 (2019)
Electromagnetic Compatibility	IEC 61326-1 (2021)
Dimensions (W x H x D)	19.1" x 11" x 7.9" (485 x 280 x 200 mm)
Warranty	3 Years
Supplied Accessories	Power cord, SUB-D 25 pin male connector and back shell, SUB-D 15 HD pin male connector and back shell, 8 pin connector, rugged carrying case

Specifications, measurement Modules

Note: All specifications apply to the unit after a temperature stabilization time of 30 minutes over an ambient temperature range of 23 °C ± 5 °C.

Universal Module (D18-UNI4)		
Number of Channels	4	
Input Type	Isolated single ended input - 4mm Banana Plug	
Voltage		
Max. Input Voltage	± 600 VDC or 424 Vrms	
Range	19 Ranges: ± 500 µV / 1 mV / 2.5 mV / 5 mV / 10 mV / 25 mV / 50 mV / 100 mV / 250 mV / 500 mV / 1 V / 2.5 V / 5 V / 10 V / 25 V / 50 V / 100 V / 250 V / 600 V	
DC Accuracy[1]	≤ ± 25 mV	± 0.1% of full range + 10 µV[2]
	± 25 mV to ± 500 mV	± 0.1% of full range + 10 µV
	≥ ± 1 V	± 0.06% of full range
Offset Drift	± 50 ppm/°C ± 1 µV/°C	
Input Impedance	1 MΩ for ranges ≥ ± 1 V, 25 MΩ for ranges ≤ ± 0.5 V	
Input Capacitance	150 pF	
Intrinsic Noise[3] (standard deviation in % of the span)	≤ ± 1 mV	< 0.2%
	± 2.5 mV to ± 10 mV	< 0.1%
	± 25 mV to ± 500 mV	< 0.05%
	≥ ± 1 V	< 0.02%
CMRR	≤ ± 500 mV	> 85 dB
	≥ ± 1 V	> 70 dB
Crosstalk	> -90 dB	
Isolation	CH to CH and CH to GND, > 100 MΩ at 650 VDC	
Safety	CAT III 600 V	
Bandwidth and Filters		
Bandwidth (-3 dB)	≤ ± 2.5 mV	1 kHz
	± 5 mV to ± 25 mV	10 kHz
	± 50 mV to ± 500 mV	60 kHz
	≥ ± 1 V	100 kHz
Analog Filter	2nd Order(-20 dB/dec)	100 Hz, 1 kHz, 10 kHz
Digital Filter	IIR 4th order (-80 dB/dec)	0.01 Hz to 10 kHz
	Type	Low-pass
	Filter	Butterworth
Data Acquisition		
ADC	16 bit – SAR	
Sampling Interval	1 µs (1 MSa/s) each channel	
Temperature (Thermocouple)		
Compute Frequency	4 ms	
Cold Junction	Uncompensated, internal, external (other channel)	
	Accuracy[4]: ± 1.25°C	
Type	J	-210 °C to 1200 °C (-346 °F to 2192 °F)
	K	-250 °C to 1370 °C (-418 °F to 2498 °F)
	T	-200 °C to 400 °C (-328 °F to 752 °F)
	S	-50 °C to 1760 °C (-58 °F to 3200 °F)
	B	200 °C to 1820 °C (392 °F to 3308 °F)
	E	-250 °C to 1000 °C (-418 °F to 1832 °F)
	N	-250 °C to 1300 °C (-418 °F to 2372 °F)
	R	-50°C to 1768°C (-58 °F to 3214 °F)

Time and Counting		
Threshold	Set by user, auto	
Duty Cycle	10% minimum – (minimum pulse width, 20 µs)	
Counter	48 bits	
Frequency	0.1 Hz to 100 kHz	
	Accuracy: 0.01% reading, 0.1 Hz to 10 Hz 0.05% reading, 10 Hz to 100 kHz	
PWM	Absolute error: 0.1% from 0.1 Hz to 1 kHz 0.5% from 1 kHz to 5 kHz	
TRMS		
Compute Period	Compute on the 1 Ms/s data flow Each period until 100 Hz 10 ms between 100 Hz and 10 kHz	
Accuracy (Sine wave ≥ 1 V)	10 Hz to 2 kHz	± 0.1% of full range
	2 kHz to 10 kHz	± 0.3% of full range
Other		
Current	Through shunt or clamp	
Sensor	0 to 10 V, 4 to 20 mA (with external shunt), duty cycle or frequency sensor, other user defined settings	
Calculations	Min – max – avg on Δt	

High Impedance Module[5] (D18-HIZ4)		
Voltage		
Input Impedance	10 MΩ for ranges ≥ ± 1 V, 25 MΩ for ranges ≤ ± 0.5 mV	
Intrinsic Noise[3] (standard deviation in % of the span)	≤ ± 1 mV	< 0.2%
	± 2.5 mV to ± 10 mV	< 0.1%
	± 25 mV to ± 500 mV	< 0.05%
	≥ ± 1 V	< 0.05%
Bandwidth and Filters		
Bandwidth	≤ ± 2.5 mV	1 kHz
	± 5 mV to ± 25 mV	10 kHz
	± 50 mV to ± 500 mV	60 kHz
	≥ ± 1 V to ± 10 V	20 kHz
	≥ ± 25 V	80 kHz

(1) Direct measure taken on DMM at 10 (50 Hz) / 12 (60 Hz) NLPC (200 ms) and full bandwidth
(2) Only when offset adjustment has been performed after installing a new module. Otherwise accuracy is ± 0.1% of full range + 20 µV
(3) Measure ± short circuit termination to 50 Ω on chassis during 1 sec at the fastest acquisition speed and full bandwidth
(4) Only when cold junction adjustment has been performed after installing a new module. Otherwise accuracy is ±3 °C
(5) For all other specs, refer to the universal module specifications

Specifications, measurement Modules

Note: All specifications apply to the unit after a temperature stabilization time of 30 minutes over an ambient temperature range of 23 °C ± 5 °C.

Multiplexed Module (D18-MUX8)		
Number of Channels	8	
Input Type	Non-isolated differential input – 4 pin terminal block, Part: Phoenix Contact MC 1.5/ 4-ST-3.5	
Voltage		
Maximum Input Voltage	± 48 VDC between CH to GND and between 2 poles on a channel	
Range (16 ranges)	± 500 µV / 1 mV / 2.5 mV / 5 mV / 10 mV / 25 mV / 50 mV / 100 mV / 250 mV / 500 mV / 1 V / 2.5 V / 5 V / 10 V / 25 V / 48 V	
Admissible Common Mode	≤ ± 1 V	± 3 V
	≥ ± 2.5 V	± 48 V
DC Accuracy[1]	≤ ± 10 mV	± 0.1% of full range + 5µV
	≥ ± 25 mV	± 0.04% of full range
Offset Drift	± 50 ppm/°C ± 0.5 µV/°C	
Input Impedance	2 MΩ for ranges ≥ ± 1 V, 25 MΩ for ranges ≤ ± 0.5 V	
Input Capacitance	150 pF	
Intrinsic Noise[2] (standard deviation in% of the span)	≤ ± 1 mV	< 0.15%
	± 2.5 mV to ± 10 mV	< 0.05%
	≥ ± 25 mV	< 0.01%
CMRR	> 70 dB	
Crosstalk	> -90 dB	
Bandwidth and Filters		
Bandwidth (-3 dB)	1 kHz	
Digital Filter	IIR 4th order (-80 dB/dec)	0.01 Hz to 500 Hz
	Type	Lowpass
	Filter	Butterworth
Data Acquisition		
ADC	18 bit – SAR	
Sampling Interval	200 µs (5 kSa/s) each channel	

Temperature (RTD)		
Compute Frequency	4 ms	
Current	Pt100	1.0 mA
	Pt200	0.5 mA
	Pt500	0.2 mA
	Pt1000	0.1 mA
Temperature Range	-200 °C to +850 °C (-328 °F to 1562 °F)	
Wiring	2 wires	Max. corrective resistance 50 Ω
	3 wires	Max. 3-wire resistance, 50 Ω
	4 wires	
Measurement Range (7 Ranges)	± 10 °C, ± 25 °C, ± 65 °C, ± 130 °C, ± 200 °C, [-200 °C, +380 °C], [-200 °C, +850 °C]	
Accuracy	3 wires	0.1% of the range ± 0.3 °C
	4 wires	± 0.1% of the range ± 0.2 °C

(1) Direct measure taken on DMM at 10 (50 Hz) / 12 (60 Hz) NLPC (200 ms) and full bandwidth
(2) Measure ± short circuit termination to 50 Ω on chassis during 1 sec at the fastest acquisition speed and full bandwidth

Temperature (Thermocouple)		
Compute Frequency	4 ms	
Cold Junction	Uncompensated, internal, external (other channel)	
	Accuracy[3]: ± 1.25 °C	
Type	J	-210 °C to 1200 °C (-346 °F to 2192 °F)
	K	-250 °C to 1370 °C (-418 °F to 2498 °F)
	T	-200 °C to 400 °C (-328 °F to 752 °F)
	S	-50 °C to 1760 °C (-58 °F to 3200 °F)
	B	200 °C to 1820 °C (392 °F to 3308 °F)
	E	-250 °C to 1000 °C (-418 °F to 1832 °F)
	N	-250 °C to 1300 °C (-418 °F to 2372 °F)
	R	-50°C to 1768°C (-58 °F to 3214 °F)
Resistance		
Compute Frequency	4 ms	
Wiring	2 wires	Max. corrective resistance 50 Ω
	3 wires	Max. 3-wire resistance, 50 Ω
	4 wires	
Measurement Range (4 Ranges)	300 Ω (1 mA), 1500 Ω (0.5 mA), 5k Ω (0.2 mA), 10 kΩ (0.1 mA)	
Accuracy	± 0.1% of the range ± 0.1 Ω	
Time and Counting		
Threshold	Set by user, auto	
Minimum Pulse Width	1 ms	
Counter	32 bits	
Other		
Current	Through shunt or clamp	
Sensor	0 to 10 V, 4 to 20 mA (with external shunt), other user defined settings	

(3) Only when cold junction adjustment has been performed after installing a new module. Otherwise accuracy is ±3 °C

Chapter 9

Metrology

9.1 | Calibration

You are in possession of a measuring instrument for which the metrological conditions of measurement are defined in the specifications of this manual. Climatic and environmental conditions limit the specifications of your instrument. SEFRAM checks the characteristics of each instrument individually on an automatic rack during manufacture. Adjustment and verification are guaranteed within the framework of ISO9001 certification by measuring instruments connected to COFRAC (or equivalent in ILAC reciprocity). The advertised characteristics are deemed stable for a period of 12 months from first use, under normal conditions of use. We recommend checking after 12 months, without exceeding 24 months of use. Then every 12 months beyond 24 months. When checking characteristics, it is advisable to respect average climatic conditions (23℃ +3℃ - 50(+20)%RH) and to operate your equipment for 30 minutes beforehand. We advise you to have this verification carried out by our After-Sales Service to ensure the best possible service and preserve the measurement quality of your instrument. When a product returns to SEFRAM or B&K Precision, a full service is provided, including an internal upgrade to keep pace with the latest developments, and a software upgrade. In the event of any deviation from specifications, your instrument will be adjusted to regain its original characteristics.

Chapter 10
Servicing

10.1 | For users not based in America

10.1.1 Warranty

Your instrument is guaranteed for three years (36 months) parts and labor against any manufacturing defect or operating hazard. This warranty begins on the date of delivery and ends 1095 calendar days later. If the device is covered by a warranty contract, the latter supersedes or replaces the warranty conditions listed above. The warranty conditions applicable by SEFRAM are available on the website www.sefram.com, the general warranty conditions prevail over the present one which is a summary. This warranty does not cover defects resulting from abnormal use, handling errors or storage conditions outside the defined range.

In the event of a warranty claim, the user must return the device concerned to our factory at his or her own expense following the return procedure indicated on our website: https://www.sefram.com/services.html

SEFRAM Instruments SAS

Service Après-vente

32, Rue Edouard MARTEL

BP 55

42009 SAINT-ETIENNE CEDEX 2

For customers in North America, please return the device to the address mentionned below and follow the instructions given on our website https://www.bkprecision.com/support

B&K Precision Corp.

: 22820 Savi Ranch Parkway

Yorba Linda,CA 92887

bkprecision.com

714-921-9095

The device must be accompanied by a detailed description of the fault, and must be returned with all standard accessories (cords, plugs, etc.). Consumables (batteries, etc.) and optional accessories (case, bag, etc.) are guaranteed for 3 months against manufacturing defects. Components such as LCD screens and touch panels are only guaranteed for normal use. Wear and tear, accidental breakage due to impact or abnormal use are not guaranteed*. *See the conditions for acceptance of a touch screen below. Factory-installed options are guaranteed for the same duration as the device. The ssd hard disk is guaranteed for 2000 complete write cycles. The battery (if the battery option is present) is guaranteed for 200 charge/discharge cycles. The remaining warranty period in the event of product replacement or repair is:

- Time remaining to cover warranty period
- If the device warranty < 90 days, the replaced part is guaranteed for 90 days.

The warranty period for after-sales service outside the appliance warranty period is 3 months. All spare parts become the property of the user, and replaced parts become the property of SEFRAM. In the event of insurance coverage, the product becomes the property of the insurance company at its exclusive request. Otherwise it remains the property of the user. The warranty applies only to equipment manufactured and supplied by SEFRAM. Any intervention or modification carried out by the user or by a third party without prior authorization from the company will invalidate the warranty. The user is responsible for returning the device to our premises. He must therefore ensure that the packaging provides adequate protection during transport. We recommend using the original packaging. The customer is responsible for taking out the necessary transport insurance. SEFRAM reserves the right to refuse poorly-packaged products, and not to offer repairs if the breakage is due to transport. Particular case of the battery: if a Li-ion battery is fitted to this device. It must not be transported outside the unit. Under no circumstances should it be replaced by the user. It must be replaced at the factory, so that the charging system and protective devices can be checked. This equipment must be transported in accordance with international guidelines for the carriage of equipment containing hazardous materials.

10.1.2 After-sales contact

Help with operation and malfunctions:

In the event of a malfunction, please check the software version of your device first, or contact our technical support if you have problems using it.

+33 (0)4 77 59 01 01

Or send an e-mail to:

support@sefram.com or support@bkprecision.com (For North America customers)

10.1.3 In case of breakdown

In the event of a breakdown, please return your equipment together with the RMA document previously registered on our website to https://www.sefram.com/services.html or https://www.bkprecision.com/support

You can call our customer service department at:

+33 (0)4 77 59 36 91 or 800-462-9832 (US & CAN toll free)

Or contact:

services@sefram.com or https://www.bkprecision.com/support/request/technician

10.1.4 Packaging

The packaging for this product is entirely recyclable. Thanks to its design, it enables your instrument to be transported in the best possible conditions. We draw your attention to the fact that the original packaging must be over-packed, if it is to be used for transport by air, road or post. We recommend keeping the original packaging for all transport.

10.1.5 LCD Display Defects

Your SEFRAM device is equipped with an active matrix color LCD display. This screen is sourced from reputable manufacturers. Under current technical manufacturing conditions, these manufacturers are unable to guarantee 100% correct operation of the pixels in the display area. They specify a number of defective pixels on the screen surface. SEFRAM's quality department has made installation of your instrument's display conditional on compliance with the manufacturers' acceptance conditions.

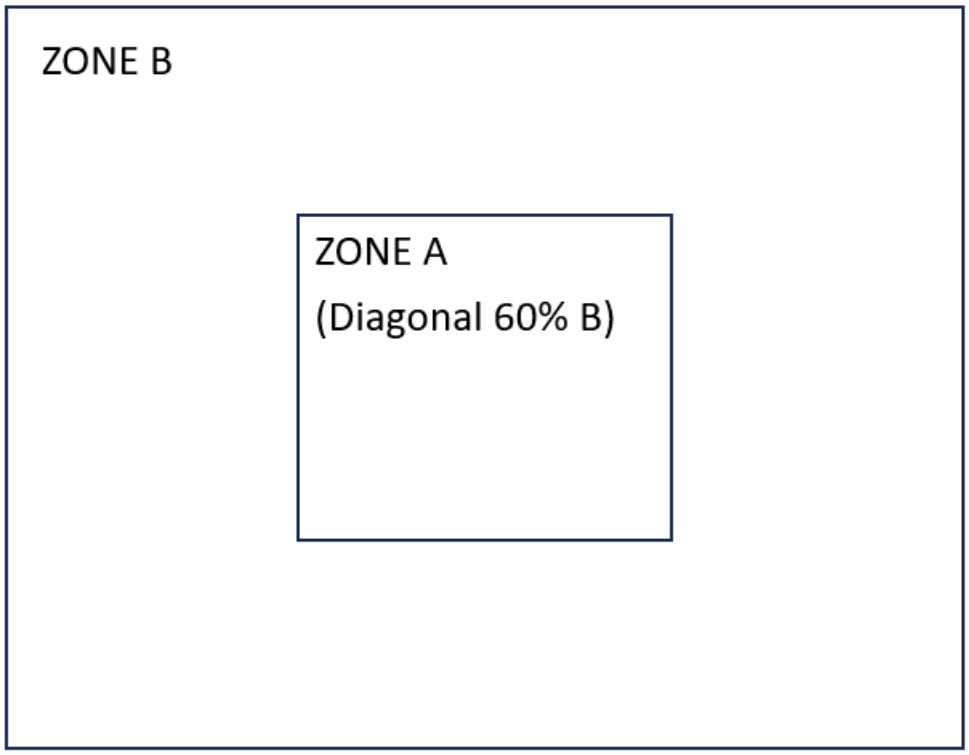


Figure 10.1: Display areas

Acceptance criteria:

- Zone A (central zone): fewer than 5 defective pixels in total and fewer than 3 contiguous pixels.
- Zone B (total screen area): less than 9 defective pixels over the entire screen area, with Zone A conditions met.

Defective pixels are defined as a point on the screen that remains unlit or lights up in a color other than the one expected. The contractual warranty only applies to the device in your possession if the above criteria are not met. This applies both at the time of delivery and during the warranty period.

10.2 | For users based in America

10.2.1 Warranty

Please go to the support and service section on our website at bkprecision.com to obtain an RMA #. Return the product in the original packaging with proof of purchase to the address below. Clearly state on the RMA the performance problem and return any leads, probes, connectors and accessories that you are using with the device. Non-Warranty Service: Please go to the support and service section on our website at bkprecision.com to obtain an RMA #. Return the product in the original packaging to the address below. Clearly state on the RMA the performance problem and return any leads, probes, connectors and accessories that you are using with the device. Customers not on an open account must include payment in the form of a money order or credit card. For the most current repair charges please refer to the service and support section on our website. Return all merchandise to B&K Precision Corp. with prepaid shipping. The flat-rate repair charge for Non-Warranty Service does not include return shipping. Return shipping to locations in North America is included for Warranty Service. For overnight shipments and non-North American shipping fees please contact B&K Precision Corp. Include with the returned instrument your complete return shipping address, contact name, phone number and description of problem.

B&K Precision Corp.

: 22820 Savi Ranch Parkway

Yorba Linda,CA 92887

bkprecision.com

714-921-9095

The device must be accompanied by a detailed description of the fault, and must be returned with all standard accessories (cords, plugs, etc.). Consumables (batteries, etc.) and optional accessories (case, bag, etc.) are guaranteed for 3 months against manufacturing defects. Components such as LCD screens and touch panels are only guaranteed for normal use. Wear and tear, accidental breakage due to impact or abnormal use are not guaranteed*. *See the conditions for acceptance of a touch screen below. Factory-installed options are guaranteed for the same duration as the device. The ssd hard disk is guaranteed for 2000 complete write cycles. The battery (if the battery option is present) is guaranteed for 200 charge/discharge cycles. The remaining warranty period in the event of product replacement or repair is:

- Time remaining to cover warranty period
- If the device warranty < 90 days, the replaced part is guaranteed for 90 days.

The warranty period for after-sales service outside the appliance warranty period is 3 months. All spare parts become the property of the user, and replaced parts become the property of B&K Precision. In the event of insurance coverage, the product becomes the property of the insurance company at its exclusive request. Otherwise it remains the property of the user. The warranty applies only to equipment manufactured and supplied by B&K Precision. Any intervention or modification carried out by the user or by a third party without prior authorization from the company will invalidate the warranty. The user is responsible for returning the device to our premises. He must therefore ensure that the packaging provides adequate protection during transport. We recommend using the original packaging. The customer is responsible for taking out the necessary transport insurance. B&K Precision reserves the right to refuse poorly-packaged products, and not to offer repairs if the breakage is due to transport. Particular case of the battery: if a Li-ion battery is fitted to this device. It must not be transported outside the unit. Under no circumstances should it be replaced by the user. It must be replaced at the factory, so that the charging system and protective devices can be checked. This equipment must be transported in accordance with international guidelines for the carriage of equipment containing hazardous materials.

10.2.2 Packaging

The packaging for this product is entirely recyclable. Thanks to its design, it enables your instrument to be transported in the best possible conditions. We draw your attention to the fact that the original packaging must be over-packed, if it is to be used for transport by air, road or post. We recommend keeping the original packaging for all transport.

10.2.3 After-sales contact

Help with operation and malfunctions or breakdown :

In the event of a malfunction, please check the software version of your device first, or contact our technical support if you have problems using it.

support@bkprecision.com

10.2.4 Elements of tactile acceptance

Your SEFRAM device is equipped with an active matrix color LCD display. This screen is sourced from reputable manufacturers. Under current technical manufacturing conditions, these manufacturers are unable to guarantee 100% correct operation of the pixels in the display area. They specify a number of defective pixels on the screen

surface. SEFRAM's quality department has made installation of your instrument's display conditional on compliance with the manufacturers' acceptance conditions.

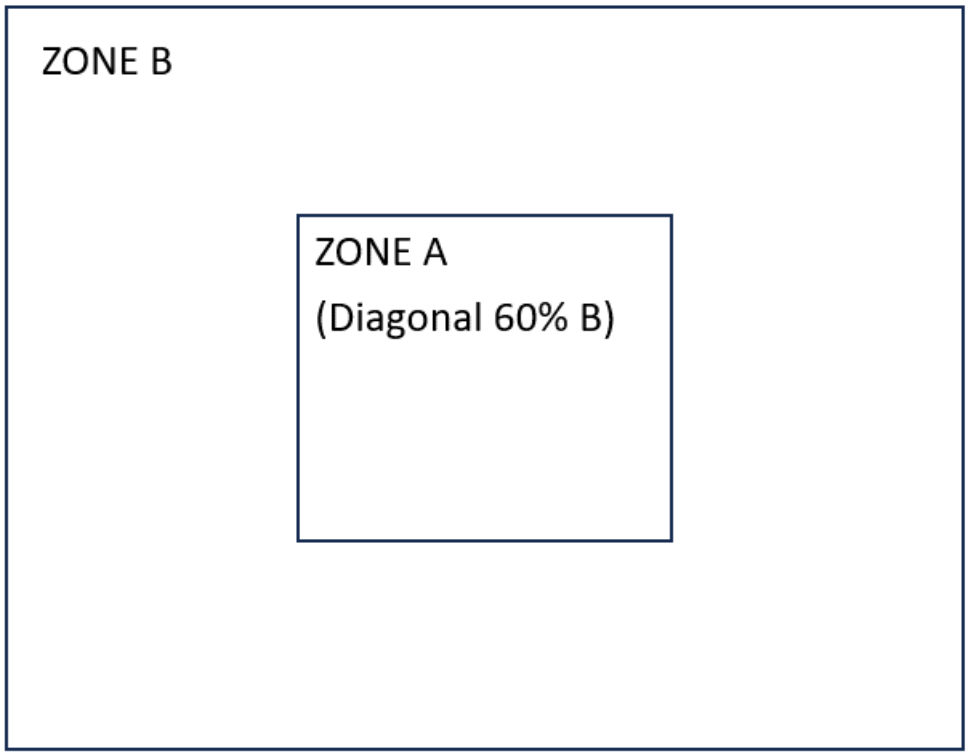


Figure 10.2: Display areas

Acceptance criteria:

- Zone A (central zone): fewer than 5 defective pixels in total and fewer than 3 contiguous pixels.
- Zone B (total screen area): less than 9 defective pixels over the entire screen area, with Zone A conditions met.

Defective pixels are defined as a point on the screen that remains unlit or lights up in a color other than the one expected. The contractual warranty only applies to the device in your possession if the above criteria are not met. This applies both at the time of delivery and during the warranty period.

Chapitre 11

Annexes

11.1 | Revisions

Version and date	Firmware version associated	Modified chapters	Modification type
1.0 / October 2023	1.0.x	All	Document creation