EN - User's manual

CHAUVIN ARNOUX

L411
L412
L461

Data loggers

Measure up

Thank you for purchasing this **L411**, **L412** or **L461 data logger**.

For best results from your instrument:
- **read** these operating instructions carefully,
- **comply** with the precautions for use.

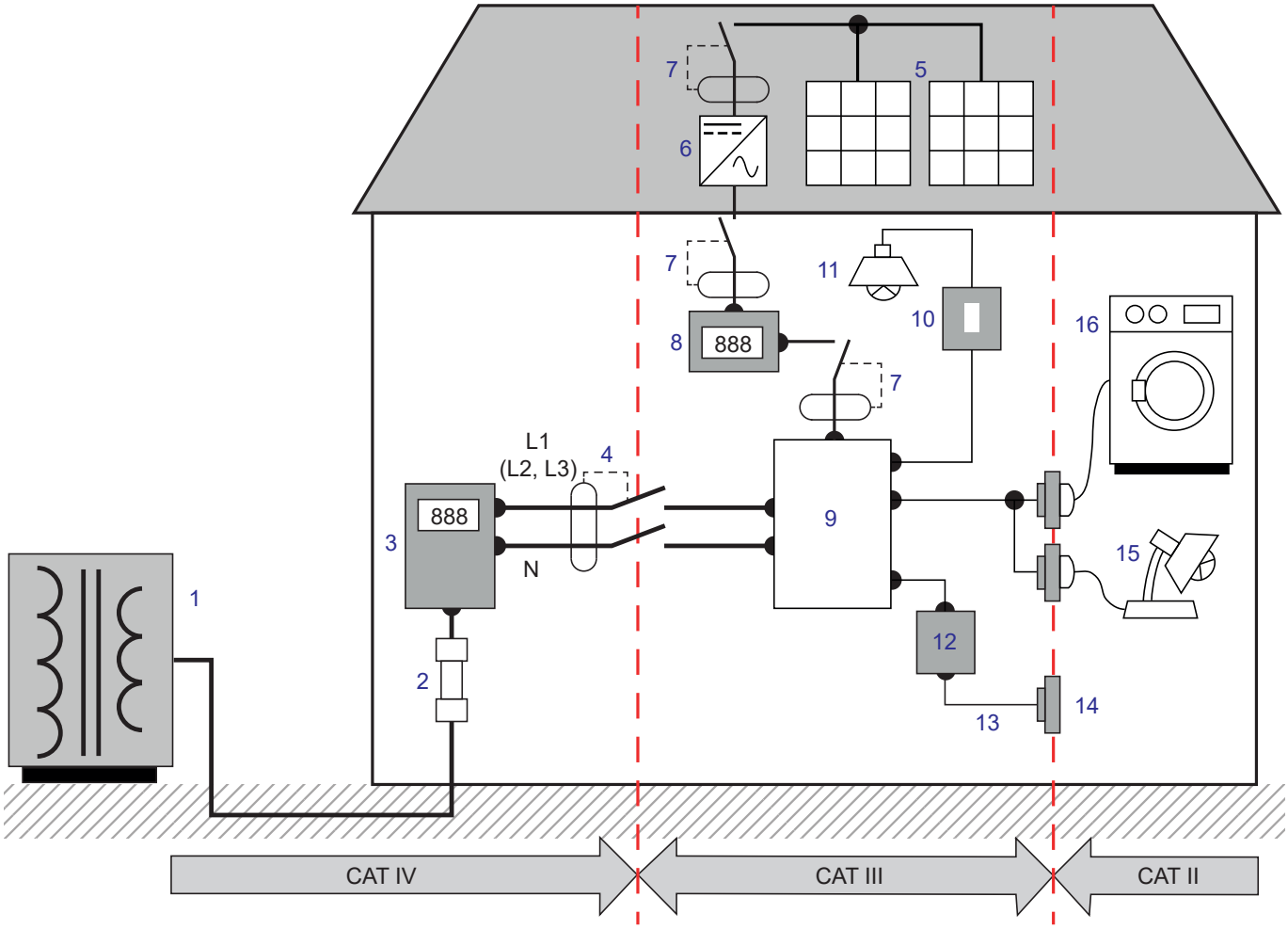
	WARNING, risk of DANGER! The operator must refer to this user's manual whenever this danger symbol appears.
	WARNING! Risk of electric shock. The voltage applied to parts marked with this symbol may be hazardous.
	Useful information or tip.
	Battery.
	Strong magnetic field.
	Equipment protected by double insulation.
	Application to or removal from bare conductors at hazardous voltages not authorized. Type B current sensor according to IEC/EN 61010-2-032.
	The product is declared recyclable following an analysis of the life cycle in accordance with standard ISO 14040.
	Chauvin Arnoux has designed this instrument in the context of a global Eco-Design approach. A life cycle analysis was carried out to master and optimise the impact of this product on the environment. More precisely, the product exceeds the requirements of regulations as regards recycling and valuation.
	The CE marking certifies that the product is in compliance with the requirements applicable in the Union European, in particular as regards Low Voltage Directive 2014/35/EU, Electromagnetic Compatibility Directive 2014/30/EU, Radio Equipment Directive 2014/53/EU, and Restriction of Hazardous Substances Directives 2011/65/EU and 2015/863/EU.
	The UKCA marking certifies that the product is in compliance with the requirements applicable in the United Kingdom as regards Low Voltage, Electromagnetic Compatibility, and Restriction of Hazardous Substances.
	The rubbish bin with a line through it means that in the European Union, the product must undergo selective disposal in compliance with Directive WEEE 2012/19/UE. This equipment must not be treated as household waste.

CONTENTS

Definition of measurement categories

- Measurement category IV (CAT IV) corresponds to measurements taken at the source of low-voltage installations.
  Example: power feeds, meters and protection devices.
- Measurement category III (CAT III) corresponds to measurements on building installations.
  Example: distribution panel, circuit-breakers, stationary machines or fixed industrial devices.
- Measurement category II (CAT II) corresponds to measurements taken on circuits directly connected to low-voltage installations.
  Example: power supply to domestic appliances and portable tools.

Example to identify locations of measurement categories



1	Low voltage supply source	9	Distribution board
2	Service fuse	10	Light switch
3	Tariff meter	11	Lighting
4	Mains circuit breaker or isolator switch *	12	Junction box
5	Photovoltaic panel	13	Power socket wiring
6	UPS	14	Socket outlets
7	Circuit breaker or isolator switch	15	Plug-in lamps
8	Generation meter	16	Household appliances, portable tools

*: The mains circuit breaker or isolator switch may be installed by the service provider. If not, the demarcation point between CAT IV and CAT III is the first isolating switch in the distribution board.

PRECAUTIONS FOR USE

These instruments comply with the following safety standards:

- L411: IEC/EN 61010-2-032 for voltages up to 600 V in category IV or 1000 V in category III,
- L412: IEC/EN 61010-2-30 and current sensors comply with IEC/EN 61010-2-032.
- L461: IEC/EN 61010-2-30 for voltages up to 1000 VAC in category IV or 1500 V DC in category III and the leads comply with IEC/EN 61010-031.

Failure to observe the precautions for use may lead to a risk of electric shock, fire, explosion, and/or destruction of the instrument and of the installations.

- The operator and/or the responsible authority must carefully read and clearly understand the various precautions to be taken in use. Sound knowledge and a keen awareness of electrical hazards are essential when using this instrument.
- L461: Use only the supplied or specified accessories (voltage leads, current sensors, mains adaptor, etc.).
  - When assembling an instrument with leads, crocodile clips or mains adaptor, the nominal voltage for a single measurement category is the lowest of the nominal voltages assigned to the individual components.
  - When connecting a current sensor to a measuring instrument, account must be taken of any potential feedback of voltage from the measuring instrument to the current sensor and therefore of the common mode voltage and acceptable measurement category at the current sensor secondary.
- Before each use, check the condition of the insulation on the leads, housing, and accessories. Any item of which the insulation is deteriorated (even partially) must be set aside for repair or scrapping.
- Do not use the instrument on networks whose voltage or category exceeds those mentioned.
- Do not use the instrument if it seems to be damaged, incomplete, or poorly closed.
- Use personal protection equipment systematically.
- L461: When handling leads and crocodile clips, do not place fingers beyond the physical guard.
- If the instrument gets wet, dry it before connecting it.
- All troubleshooting and metrological checks must be performed by competent, accredited personnel.

1. GETTING STARTED

1.1. DELIVERY CONDITION

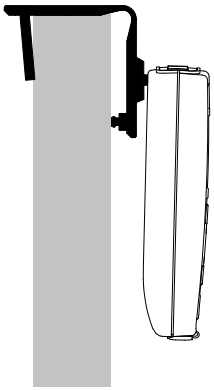
L411 data logger with MiniFlex sensor
Delivered in a cardboard box with:
- three AA or LR6 alkaline batteries,
- a USB-micro USB cable,
- a USB-mains adapter (2 A, 5 V, 10 W USB-A),
- a multilingual quick start guide,
- a multilingual safety data sheet,
- a verification certificate.

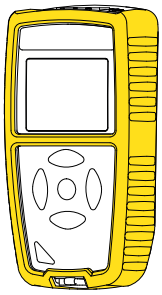
L412 Data Logger with 2 current sensor inputs
Delivered in a cardboard box with:
- three AA or LR6 alkaline batteries,
- a USB-micro USB cable,
- a USB-mains adapter (2 A, 5 V, 10 W USB-A),
- a multilingual quick start guide,
- a multilingual safety data sheet,
- a verification certificate.

L461 data logger with voltage input for solar panels
Delivered in a cardboard box with:
- three AA or LR6 alkaline batteries,
- a USB-micro USB cable,
- a USB-mains adapter (2 A, 5 V, 10 W USB-A),
- two crocodile clips (one black and one red) 1500 V category III or 1000 V category IV,
- two straight-straight banana-banana safety leads (one black and one red) 3 metres long, 1500 V category III or 1000 V category IV,
- a multilingual quick start guide,
- a multilingual safety data sheet,
- a verification certificate.

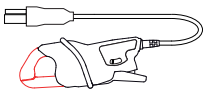
1.2. ACCESSORIES

- Data Logger Transfer application software (freely downloadable see § 5)
- Dataview Application Software
- Multi-purpose mounting accessory
- Carrying bag
- Protective sheath

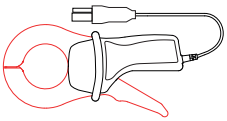




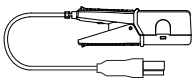
For the L412:
- MN93 clamp
- MN93A clamp



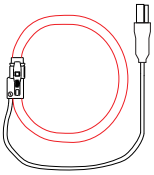
- C193 clamp



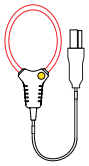
- MINI 94 clamp



- AmpFlex® A193 450 mm
- AmpFlex® A193 800 mm



- MiniFlex MA194 250mm
- MiniFlex MA194 350 mm
- MiniFlex MA194 1000 mm



1.3. SPARES

- A USB-micro USB cable,
- A USB-mains adapter (2 A, 5 V, 10 W USB-A),
- Set of 2 safety cables, black and red, banana-banana straight-straight and 2 crocodile clips.

For accessories and spares, check out our Website:
www.chauvin-arnoux.com

1.4. INSERTING THE BATTERIES

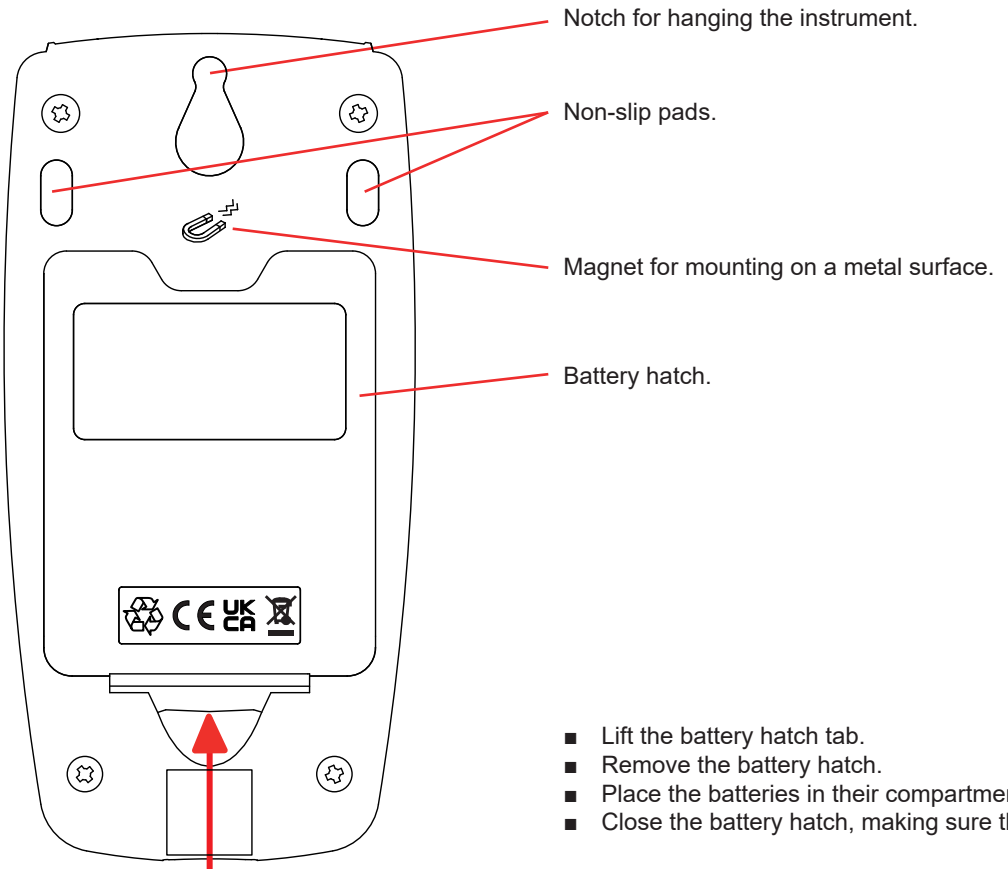


Figure 1

- Lift the battery hatch tab.
- Remove the battery hatch.
- Place the batteries in their compartment, respecting their polarity.
- Close the battery hatch, making sure that it is fully and correctly closed.

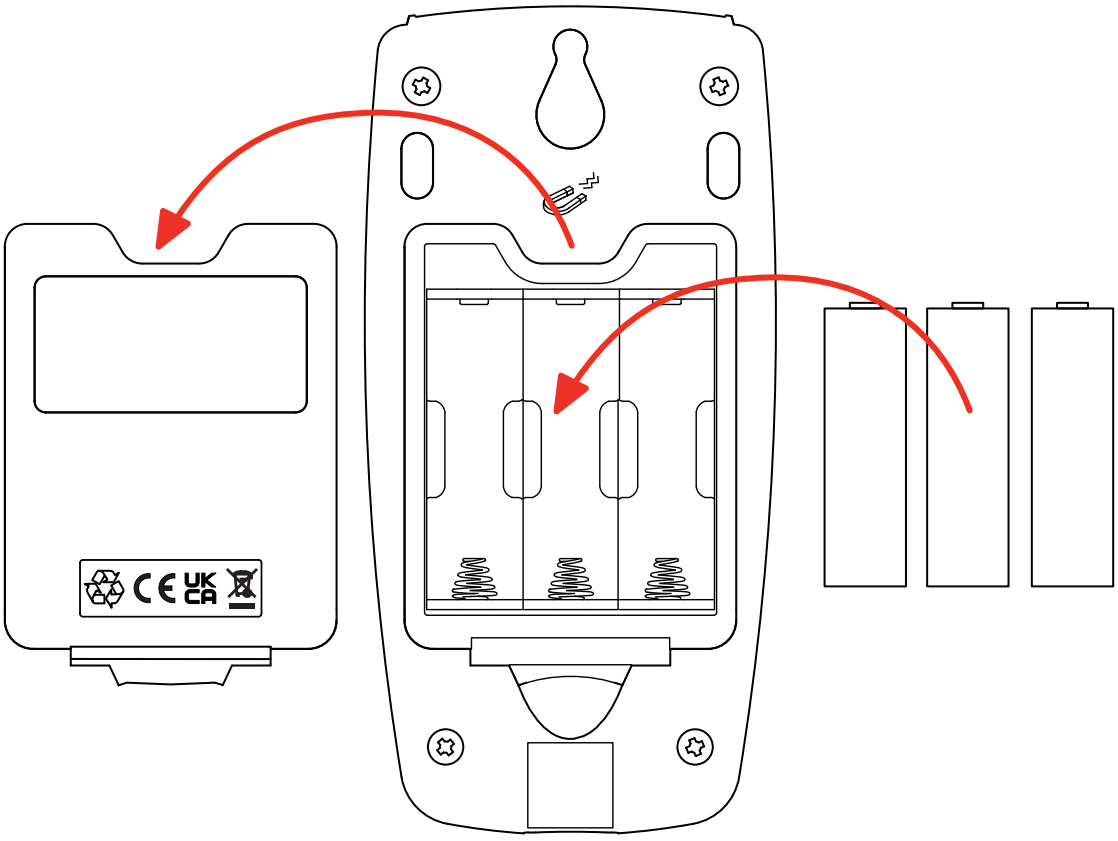


Figure 2

2. INSTRUMENT OVERVIEW

2.1. L411

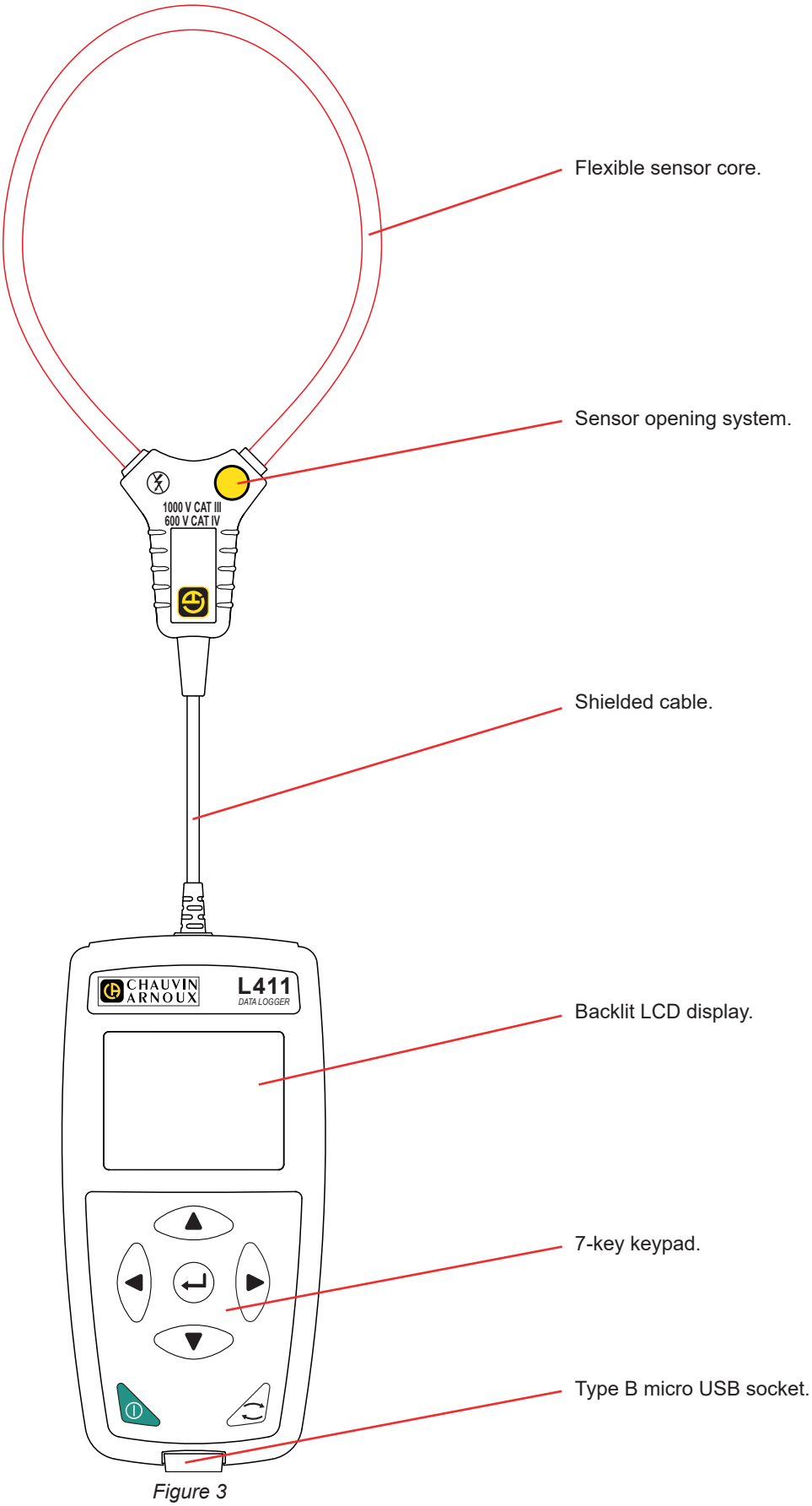


Figure 3

2.2. L412

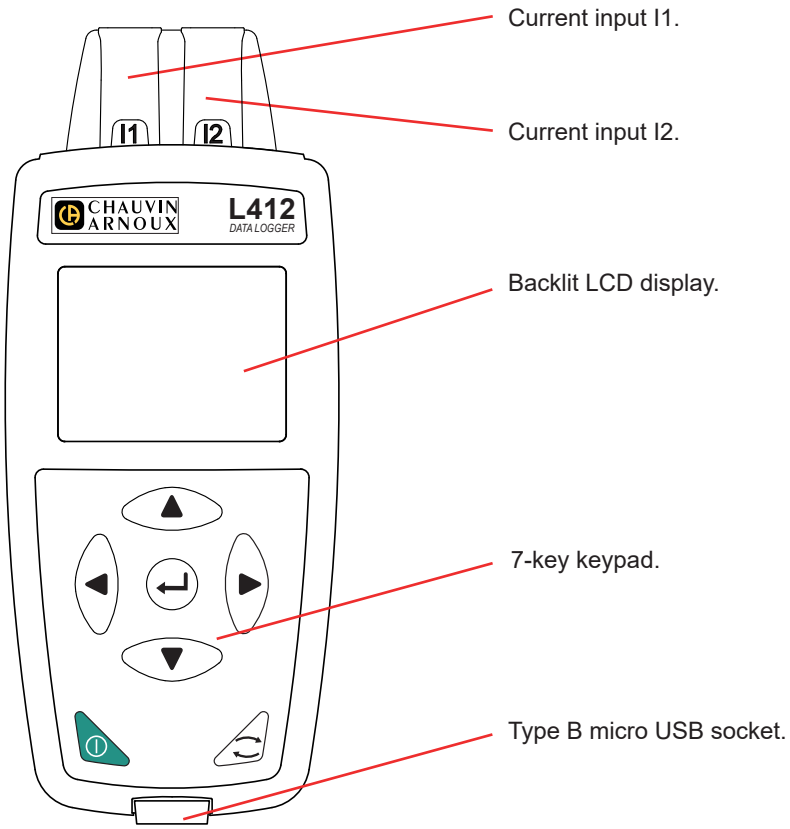


Figure 4

2.3. L461

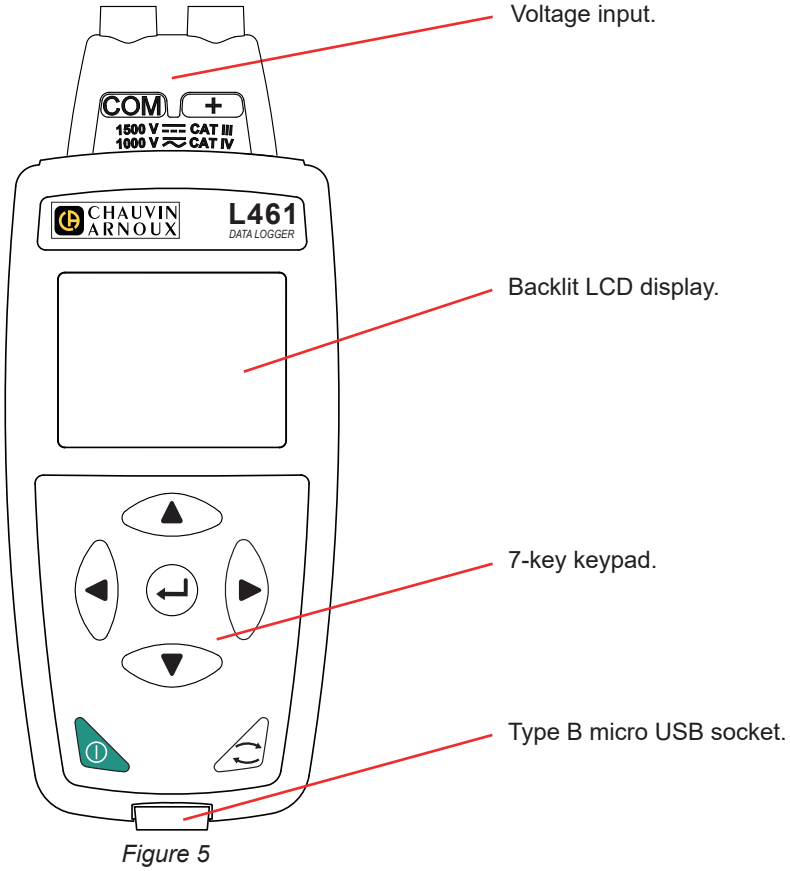


Figure 5

2.4. DESCRIPTION

The L411, L412 and L461 are single or dual channel data loggers. They are powered by batteries or from the mains via a USB cable. They can record up to 200 recording sessions.

The L411 can record AC currents on one channel, from 0.4 to 3,600 Aac.
The L412 can record AC currents on two channels, from 10 mAac to 25,000 Aac.
The L461 can record AC or DC voltages on one channel, from 10 to 1200 Vac and 10 to 1700 Vdc. It is particularly dedicated to monitoring distribution and solar panel voltages.

They can communicate with a PC via USB or via Wi-Fi.

2.5. KEY FUNCTIONS

Key	Description
⏻	**On / Off button** A long press turns the instrument on or off. The instrument cannot be turned off while a recording is in progress or pending, or when the device is connected to an external power supply.
⇄	**Select Button** This starts or stops a recording or allows the Wi-Fi mode to be chosen.
▶◀▲▼	**Navigation keys** Used to configure the instrument and browse the data displayed.
↵	**Enter key** In configuration mode, selects a setting to change. In select mode, starts or stops a recording. It also allows the type of Wi-Fi to be chosen.

Table 1

Pressing any key turns on the display backlighting for 3 minutes.

2.6. LCD DISPLAY

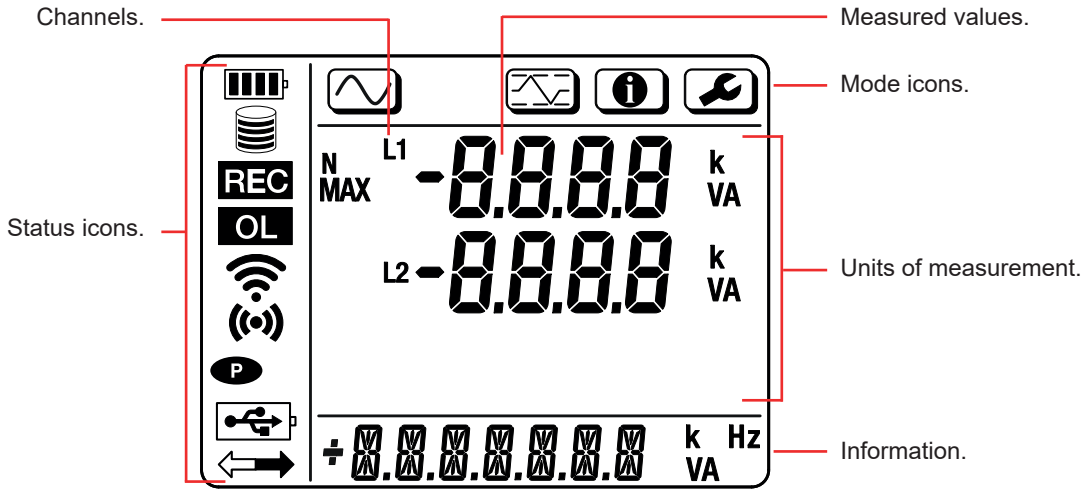


Figure 6

2.6.1. STATUS ICONS

Icon	Description
	Indicates battery status. When blinking, batteries need to be changed.
	Indicates memory filling.
REC	When steady, normal mode recording is in progress. When blinking slowly (once every 5 seconds), extended mode recording is in progress. When blinking rapidly (once every 2 seconds), a recording is scheduled.
OL	Indicates an out-of-range value that cannot be displayed. When it is blinking, for the L412, it indicates that the two current sensors are not identical.
	Indicates active Wi-Fi at the access point. When blinking, a transmission is in progress.
	Indicates active Wi-Fi at the router. When blinking, a transmission is in progress.
P	Indicates the instrument's automatic shutdown function is disabled.
	When on and steady, it indicates that the instrument is powered by USB. When it blinks, the USB link is active.
	Indicates the instrument is being controlled remotely (by a PC, smartphone or tablet).

Table 2

2.6.2. MODE ICONS

Icon	Description
	Measurement mode
	Maximum mode.
	Information mode.
	Configuration mode.

Table 3

2.7. MOUNTING

As recorders, the instruments are intended to be installed for a fairly long period in a technical room.

They must be placed in a well ventilated room whose temperature must not exceed the values specified in § 6.8.

It can be mounted on a flat vertical ferromagnetic surface using the magnets incorporated in its housing.

 The strong magnetic field of the magnets can damage your hard drives or medical devices.

2.8. EXTERNAL POWER SUPPLY

The instrument is powered by batteries but it can also be powered from the mains via a USB - micro USB cable, plugged either into a PC or into a wall outlet via a mains adapter.

- Open the elastomer cover that protects the micro-USB socket.
- Connect the supplied USB-micro USB cable to it.
- Connect the cable to the supplied USB-AC adapter.
- Plug the adapter into a mains outlet.

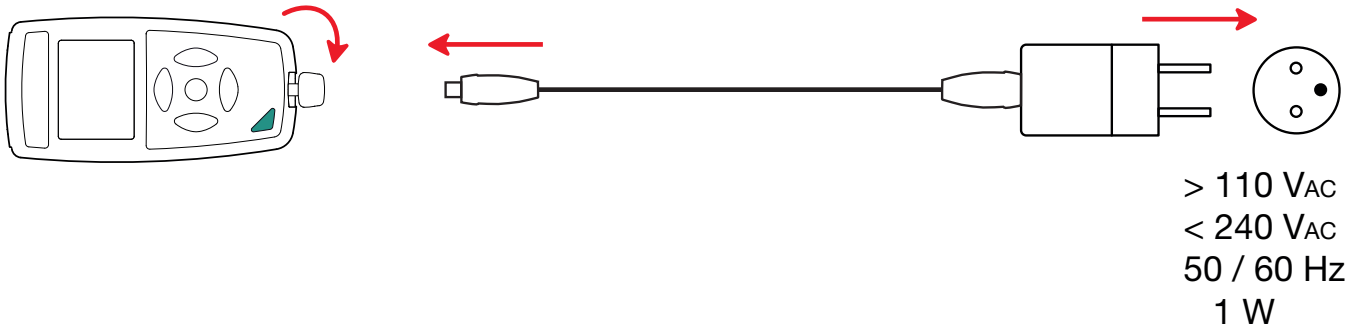


Figure 7

The  symbol is displayed.

3. OPERATION

Before recording, the instrument must be configured. This involves the following steps:
- L461: Select an AC or DC signal.
- Establish a Wi-Fi link with the PC (this link is not essential if you are using a USB link).
- L411 and L412: set the rated primary current.
- Select the aggregation period.
- Choose the type of recording.
- It is also possible to reset the configuration.

This configuration is made in Configuration mode (see § 3.2) or with the Data Logger Transfer application software (see § 5).

To connect the instrument to the PC, you can use the USB link or the Wi-Fi link (to be configured).

In order to avoid accidental changes, the instrument cannot be configured while recording or if there is a recording pending.

3.1. TURNING THE INSTRUMENT ON AND OFF

To start the instrument, press and hold the **On/Off** button.
TTo turn the instrument off, press and hold the On/Off button again. The instrument cannot be turned off while a recording is in progress or pending, or when the device is connected to an external power supply.

When the instrument is running on batteries, it turns off automatically after a period with no keypad activity and no recording in progress. This time is set using the Data Logger Transfer application software.

It is also possible to switch the instrument to permanent mode, with Data Logger Transfer. The Ⓟ symbol is displayed and the appliance no longer turns off.

If there is no action by the user, the instrument switches to standby mode after three minutes, this duration can be programmed at 3, 10 or 15 minutes via the Data Logger Transfer application software. It continues to make measurements but they are no longer displayed.

The blue display backlight turns on at startup. It turns off after one minute. It turns on again when a key is pressed or when the USB is connected.

3.2. CONFIGURING THE INSTRUMENT

Several main functions can be configured directly on the instrument. For full configuration, use the Data Logger Transfer software application (see § 5).

To enter Configuration mode from the instrument, press the ◄ or ► keys until the symbol is selected.

One of the following two screens will appear:

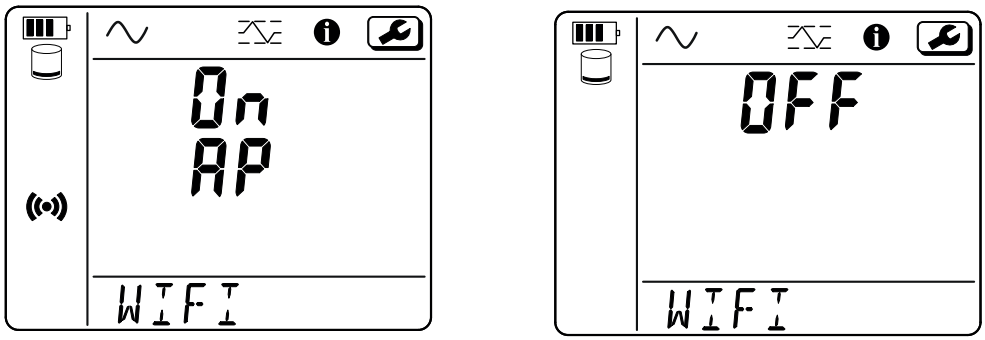


Figure 8

If the instrument is already being configured from the Data Logger Transfer software, it is not possible to enter Configuration mode on the instrument. In this case, when an attempt is made to configure it, the instrument displays **LOCK**.

3.2.1. AC/DC (L461)

For the L461, the first screen displayed is the screen used to choose the type of signal measured: AC or DC.

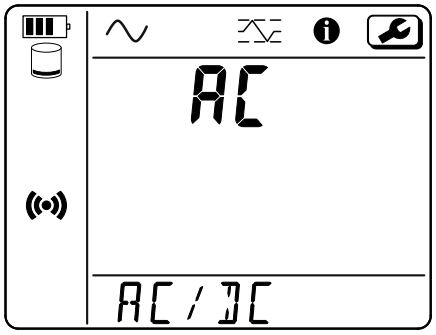


Figure 9

Press the ↵ key to switch from AC to DC.

Press the ▼ key to go to the next screen.

3.2.2. WI-FI

For the Wi-Fi to operate, the battery must be sufficiently charged (or), or the instrument must be connected to the external power supply.

Press the ↵ key to activate or deactivate the Wi-Fi. If the battery is too low, the instrument indicates it and activation is not possible.

The Wi-Fi connection lets you connect to your PC and then to any other instrument such as a smartphone or a tablet.

1) Wi-Fi access point connection procedure

- Press the **Select** ⟳ key first. The instrument displays **START REC. PRESS ENTER TO START RECORDING** ↵.
- Press the ⟳ key a second time and the instrument displays:
  - **WIFI ST. PRESS ENTER FOR WIFI ST** ↵,
  - or **WIFI OFF. PRESS ENTER FOR WIFI OFF** ↵
  - or **WIFI AP. PRESS ENTER FOR WIFI AP** ↵.

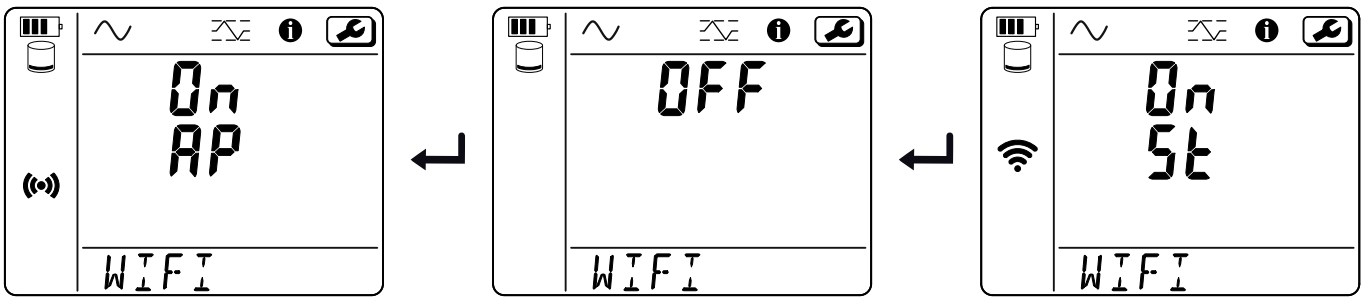


Figure 10

Change with the ↵ key to select **WIFI AP**.
Your instrument's IP address, shown in the information menu, is 192.168.2.1 3041 UDP.

- Connect your PC to the instrument's Wi-Fi.

In the Windows status bar, click the connection symbol.

Select your instrument from the list.

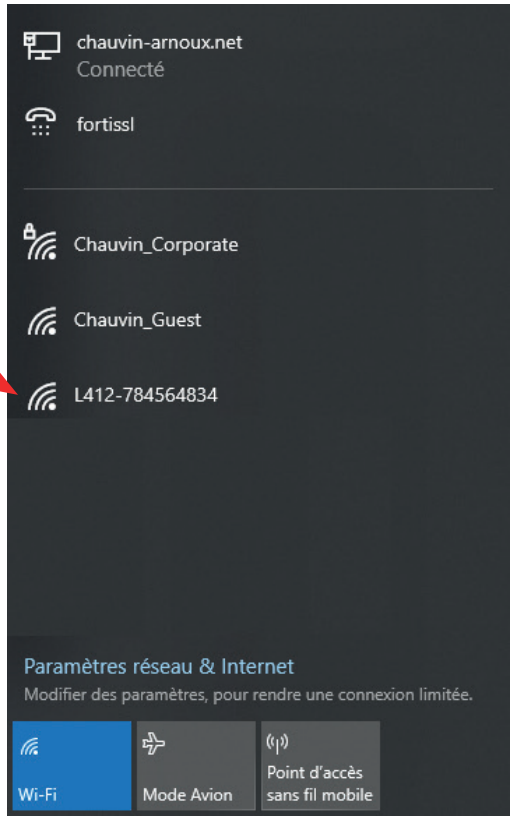


Figure 11

- Start the Data Logger Transfer software application (see § 5).
- Go to **Instrument**, **Add an instrument**, **L411, L412 or L461**, to **Wi-Fi access point**.

This connection to the Data Logger Transfer software application lets you:
- configure the instrument,
- access real-time measurements,
- upload the recordings,
- change the access point SSID name and secure it with a password,
- enter the SSID and password for a Wi-Fi network to which the instrument can connect,
- enter the DataViewSync ™ (IRD server) password, allowing access for the instrument to separate public or private networks.

If the username and password are lost, you can reset the factory configuration (see § 3.2.6)

2) Configuration of the Wi-Fi router connection

The Wi-Fi router connection will allow you to access your instrument from a smartphone or tablet, or even from DataViewSync ™ (IRD server) through a public or private network.

- To do this, connect the instrument to the PC via USB. For security reasons, it is not possible to modify the Wi-Fi connection when you are in Wi-Fi.
- Go to **Instrument**, **Add an instrument**, **Data Logger, L411, L412 or L461**, in **USB**. Select your instrument and confirm.
- In Data Logger Transfer, go to the configuration menu  , **Communication** tab and check **Connect to router**, port 3041, UDP protocol.
- In the **Wi-Fi router settings** box, enter the network name (SSID) and the password. The SSID is the name of the network you want to connect to. It may be the network of your smartphone or tablet in hotspot mode. To find the network, search by clicking Scan. Select the network. Check the connection by clicking **Test**.
- Click **OK** to confirm.

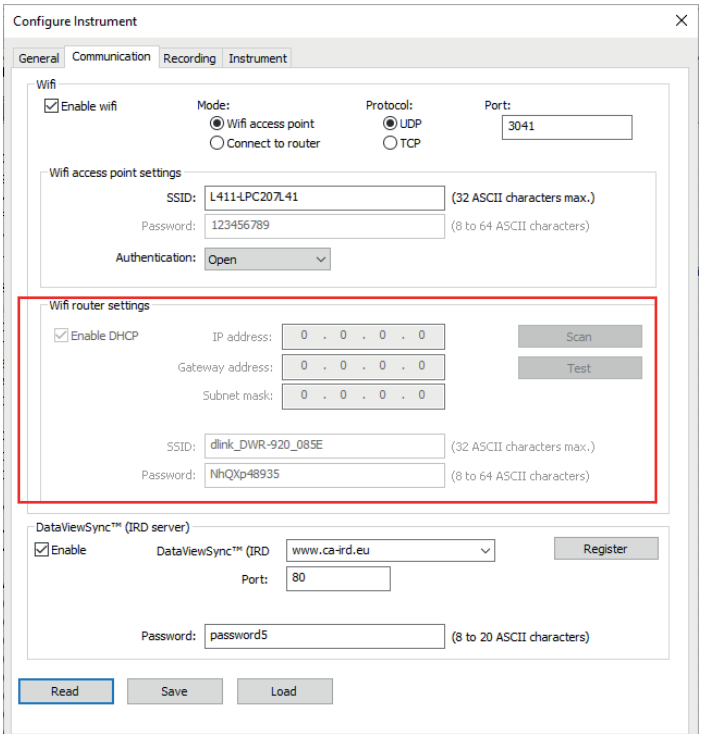


Figure 12

- The instrument automatically switches to **WIFI ST.** If this does not happen, press the instrument **Select** button twice, then the button twice to switch to **WIFI ST**.
  Your instrument connects to this Wi-Fi network.
  The Wi-Fi access point connection is lost.

  Once the instrument is connected to the network, you can find its IP address in information mode .
- Connect the PC to the router as explained Figure 11.
- In Data Logger Transfer, change the connection to **Ethernet (Wi-Fi)** and enter the IP address of your instrument, port 3041, UDP protocol.
  This lets you connect several instruments on the same network.

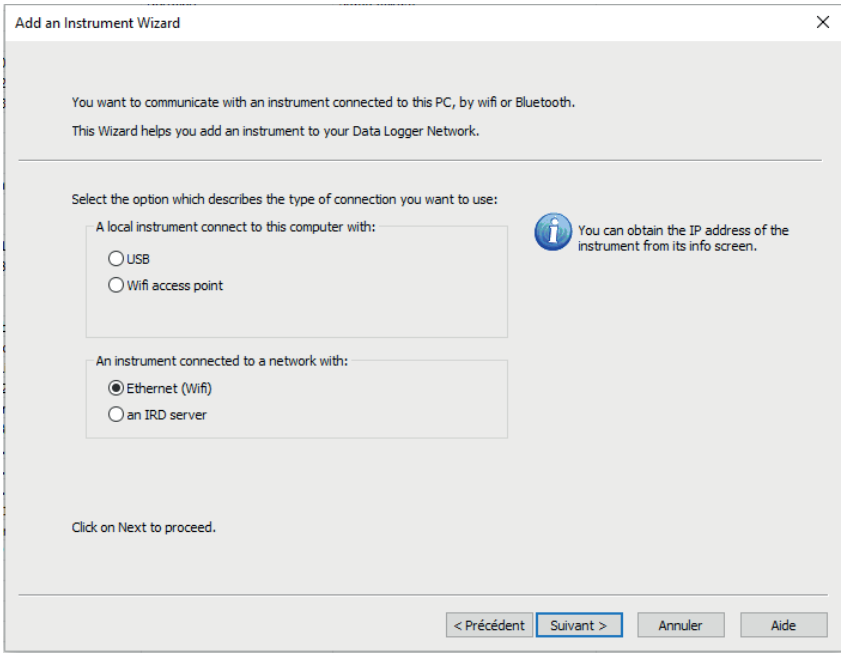


Figure 13

3) Configuration of the DataViewSync ™ (IRD server) connection

- To connect the instrument to the DataViewSync ™ (IRD server), it must be in **WIFI ST** and the router to which it is connected must have internet access to be able to access the DataViewSync ™ (IRD server).
- To configure the DataViewSync ™ (IRD server), connect the instrument via USB to the Data Logger Transfer software.
- Go to the Configuration menu  , **Communication** tab. Enable the DataViewSync ™ (IRD server) and enter the password that will be used to connect afterwards.

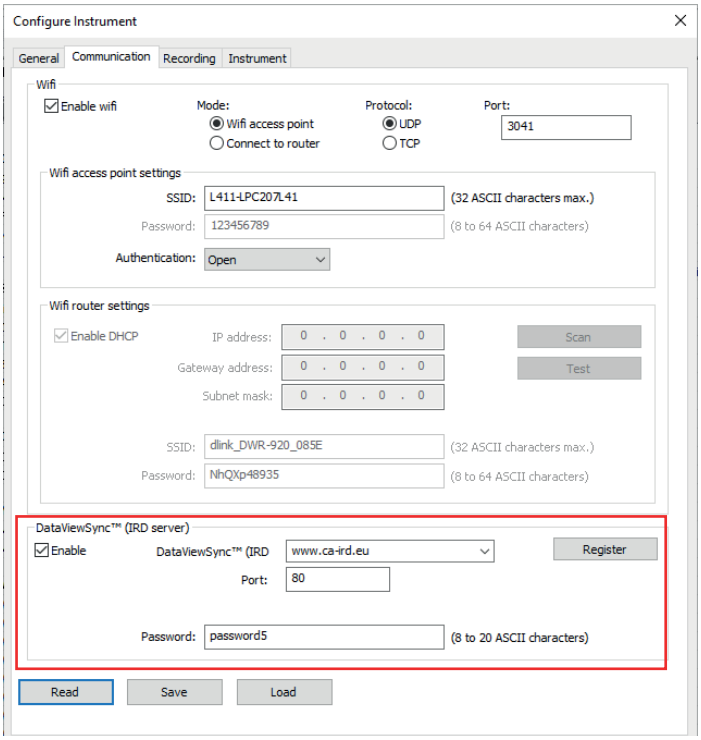


Figure 14

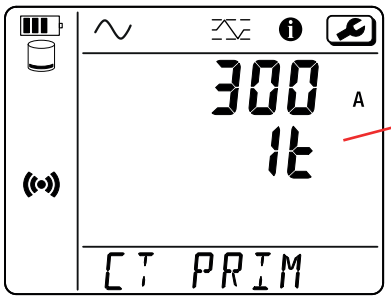
- Click **Register** to confirm.

4) Connecting to the DataViewSync ™ (IRD server)

- In Data Logger Transfer, change the connection by clicking on  then on **DataViewSync ™** (IRD server).
- Enter the DataViewSync ™ (IRD server) address (the same one chosen during setup), the instrument serial number and the password you set in the previous step.
- Click **Next** to confirm.

3.2.3. RATED PRIMARY CURRENT (L411, L412)

Press the ▼ key to go to the next screen.



Number of turns the toroid makes around the conductor.

Figure 15

For the L412:
- Connect the current sensor(s).
- The current sensor is automatically detected by the instrument.
- If two current sensors are connected, they must be identical.

For AmpFlex® or MiniFlex sensors, press the ↵ key to select 300 or 3000 A.
For the other sensors, configuration is done via Data Logger Transfer.

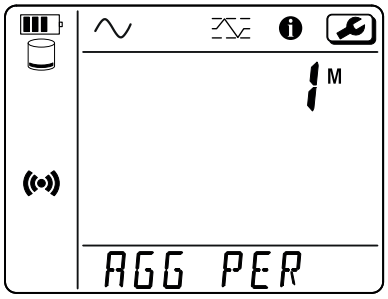
The rated currents of the current sensors are as follows:

Sensor	Rated current	Choice of gain	Number of turns
C193 clamp	1000 A	×	×
AmpFlex® A193 MiniFlex MA194	300 or 3,000 A	✓	1, 2 or 3 to be configured in Data Logger Transfer
MN93A clamp 5 A calibre	5 to 25,000 A	to be configured in Data Logger Transfer	×
MN93A clamp 100 A calibre	100 A	×	×
MN93 clamp	200 A	×	×
MINI 94 clamp	200 A	×	×

Table 4

3.2.4. AGGREGATION PERIOD

Press the ▼ key to go to the next screen.



To change the aggregation period, press the ↵ key: 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30 or 60 minutes.

Figure 16

3.2.5. EXTENDED RECORDING MODE

Press the ▼ key to go to the next screen.

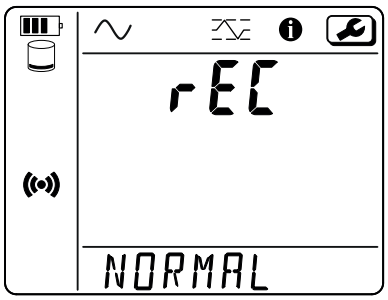


Figure 17

When the instrument is recording, it may go into standby between two measurements. This can significantly increase its battery life.
In **NORMAL** mode, the instrument is never in standby.
In **EXTEND** mode, the instrument goes to sleep and wakes up a few seconds before each measurement to take the measurement but without displaying it. It makes 4 measurements per aggregation period instead of one measurement per second. Its standby time therefore depends on the aggregation period. This mode makes it possible to increase the battery life of the instrument but there are fewer measurements and a loss of information between the measurements. See § 9.1.3.

Press the ↵ key to choose **NORMAL** or **EXTEND**.

3.2.6. RESET

Press the ▼ key to go to the next screen.

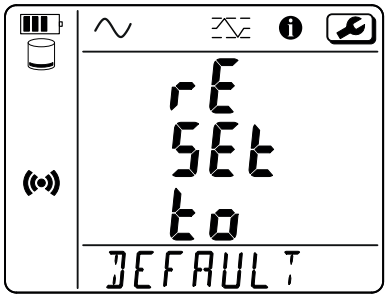


Figure 18

To reset the instrument to the default Wi-Fi configuration (direct Wi-Fi, password deleted), press the ↵ key.
The instrument asks for confirmation before performing the reset. Press the ↵ key to confirm and any other key to cancel.

3.3. REMOTE USER INTERFACE

The remote user interface runs on a PC, tablet or smartphone.

It enables:
- consulting the instrument's information,
- establishing a Wi-Fi router connection,
- synchronising date and time,
- scheduling a recording.

- Enable Wi-Fi on the instrument. The remote user interface can work with an access point Wi-Fi link (((•))) or a router Wi-Fi link ᯤ but not the DataViewSync ™ (IRD server) link.
- On a PC, tablet or smartphone, connect as you would to your instrument's Wi-Fi network (see § 3.2.2).
- In a web browser, enter http://IP_address_instrument.
  For a Wi-Fi access point connection (((•))), enter http://192.168.2.1
  For a Wi-Fi router connection ᯤ, the address is indicated in the information menu (see § 3.4).

The following screen will be displayed (which differs depending on the instrument model):

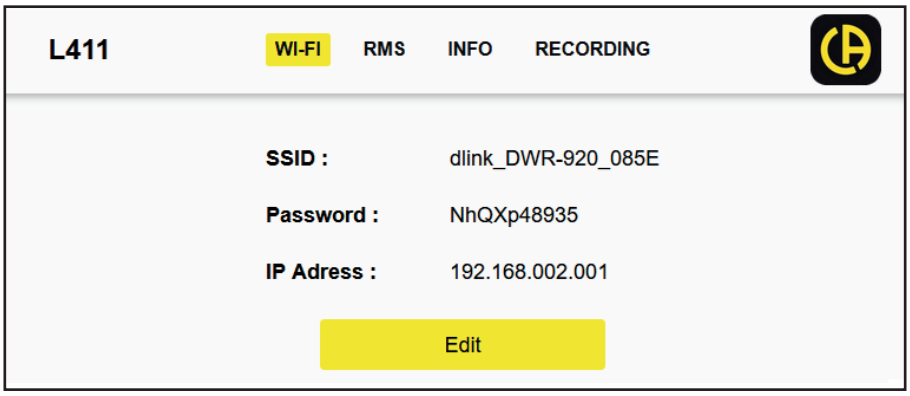


Figure 19

To enter the SSID and password, click on **Edit**.

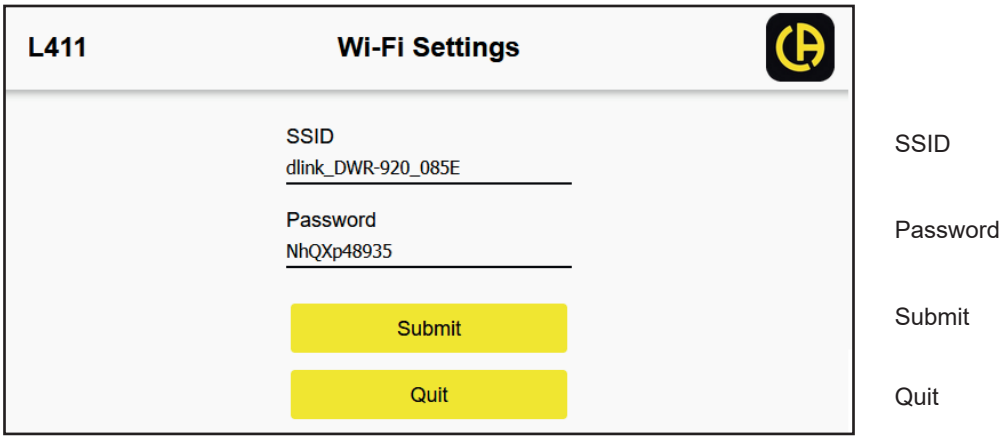


Figure 20

Fill in the fields then click on **Submit**.

Press the second button to view the measurements:

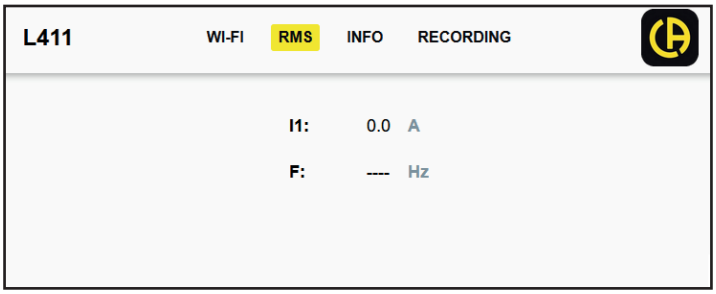


Figure 21

Press the third button to view the instrument's information:

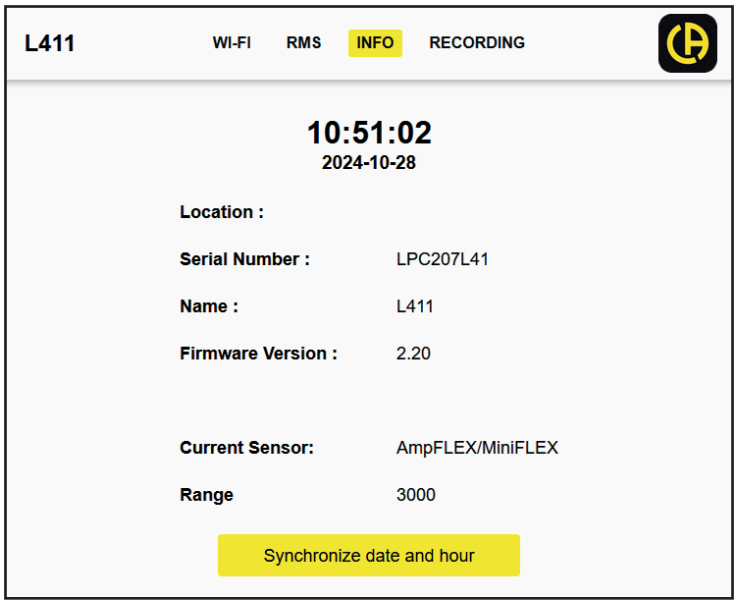


Figure 22

Press **Synchronize date and hour** to synchronise your instrument's date and time with your PC, tablet or smartphone.

Press the fourth button to view information about the current recording or the last recording made.

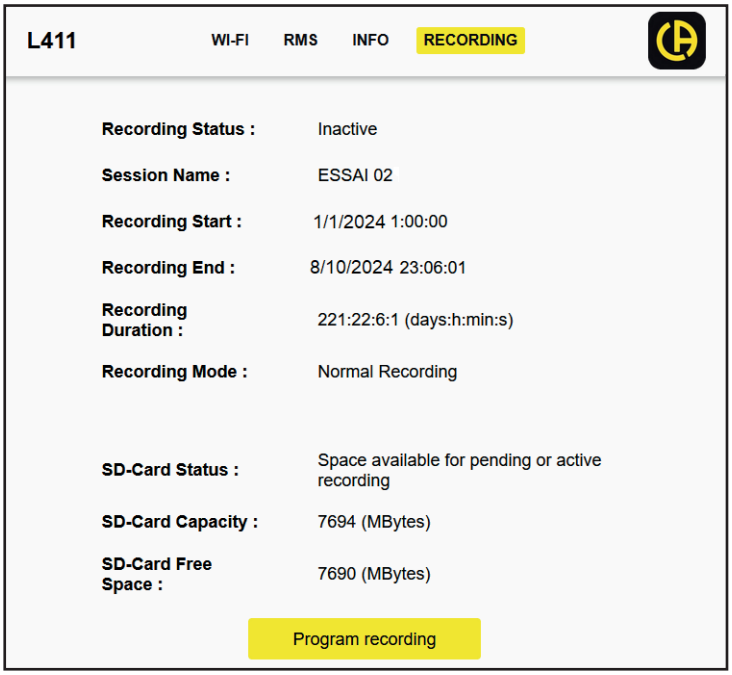


Figure 23

Press **Program recording** to programme a recording.

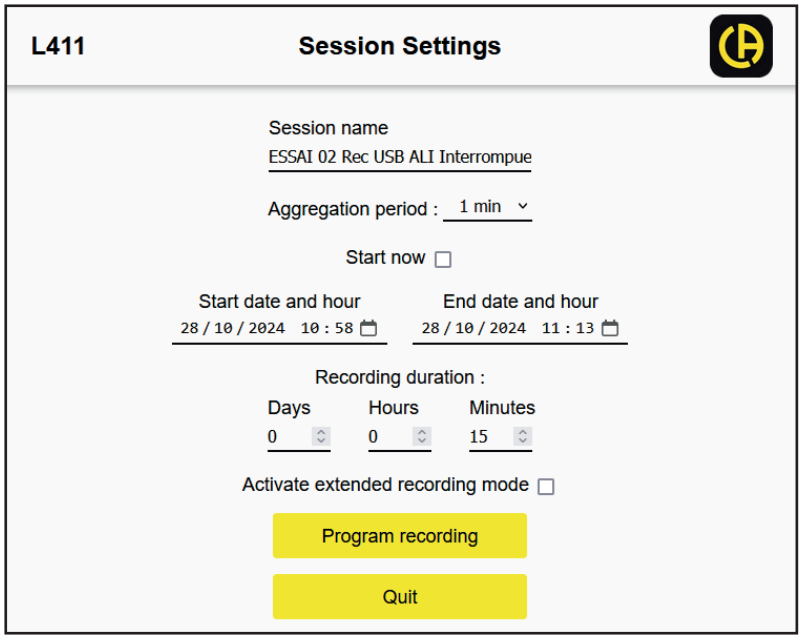


Figure 24

Session Name

Aggregation period

Start now

Start date and time
End date and time

Recording duration
Days Hours Minutes

Enable extended mode recording

Start recording

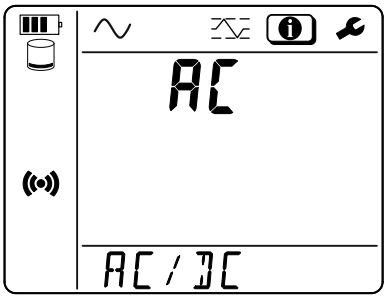
Quit

3.4. INFORMATION

To enter Information mode, press the ◄ or ► keys until the symbol is selected.

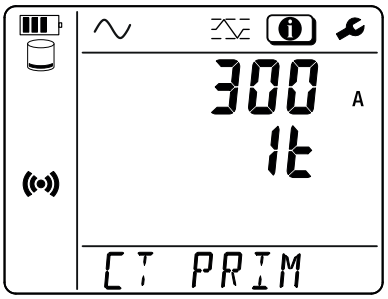
Using the ▲ and ▼ keys, scroll through the instrument information:

- AC/DC signal type (L461)



▼

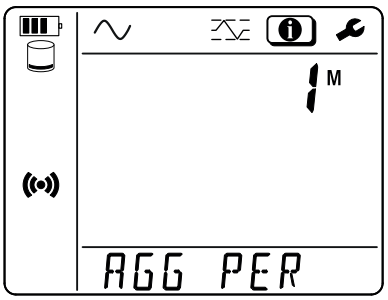
- Rated primary current (L411 and L412)



- C193 clamp 1000 A
- AmpFlex® or MiniFlex: 300 or 3,000 A
- MN93A clamp 5 A calibre: 5 A changeable
- MN93A clamp 100 A calibre: 100 A
- MN93 clamp 200 A
- Mini 94 clamp: 200 A

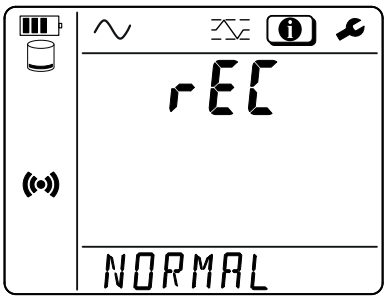
▼

- Aggregation period



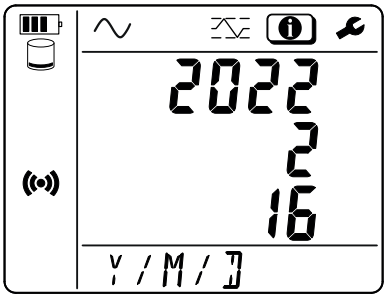
▼

- Recording type
  Normal or extended



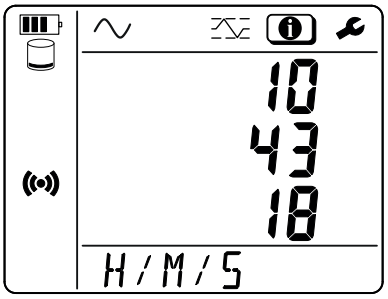
▼

- Date
  Year, month, day



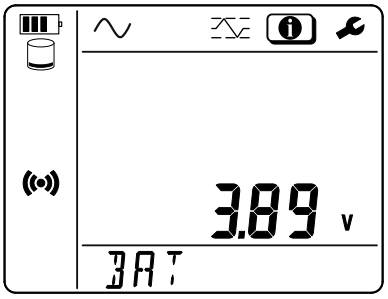
▼

- Time
  Hour, minute, second



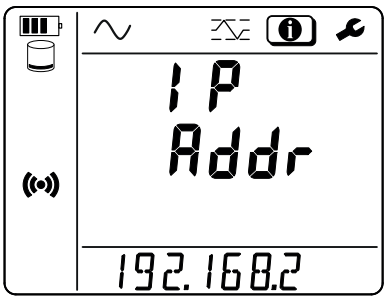
▼

- Battery voltage



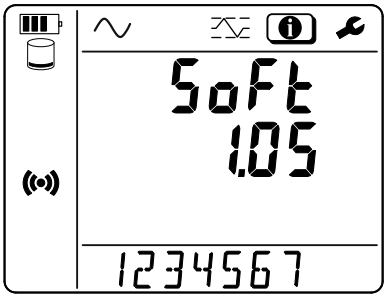
▼

- IP address (scrolling)
  192.168.2.1 3041 UDP



▼

- Software version and scrolling serial number.



4. USE

Once the instrument has been configured, it is ready for use.

4.1. CONNECTIONS

When you make connections to live networks, in particular type B current sensors, you must use personal protective equipment.

Current clamps and flexible current sensors are used to measure the current flowing in a cable without opening the circuit. They also isolate the user from dangerous voltages present in the circuit.

The choice of the current sensor to use depends on the current to be measured and the diameter of the cables.
When installing current sensors, point the arrow on the sensor towards the load.

When a current sensor is not connected, the instrument displays - - - -.

4.1.1. L411

- Press the sensor opening system.
- Clamp the cable to be measured. As much as possible, the cable should be centred inside the core.
- Close the core. A "click" will confirm that it is closed correctly.

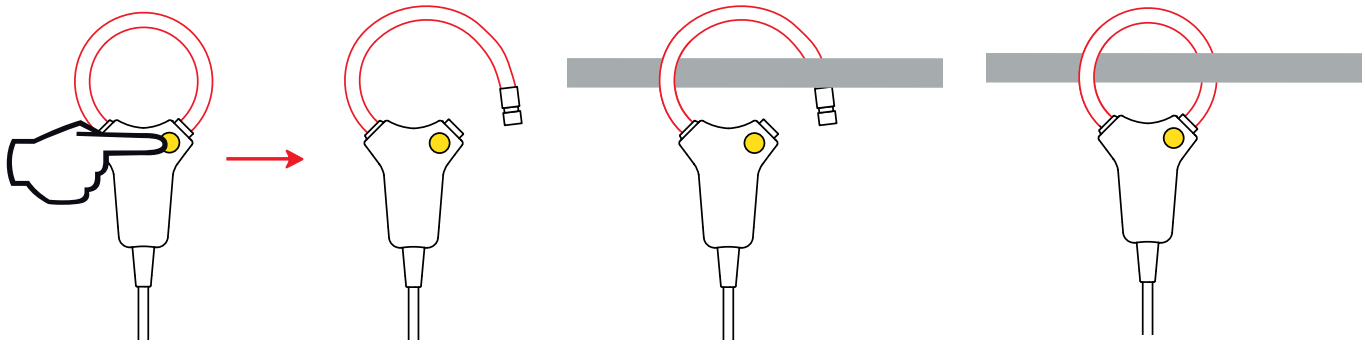


Figure 25

To remove the sensor, press the opening system. Remove the sensor from the cable to be measured and then close it again.

4.1.2. L412

- Connect the first current sensor to terminal **I1**.
- If applicable, connect the second current sensor to terminal **I2**.

If two current sensors are connected, they must be identical.

- Press the clamp tab to open the clamp's jaws.
- Then clamp the cable to be measured. As much as possible, the cable should be centred inside the clamp jaws.
- The arrow on the clamp housing should point in the assumed direction of current.
- Release the tab and make sure that the jaws are properly closed.

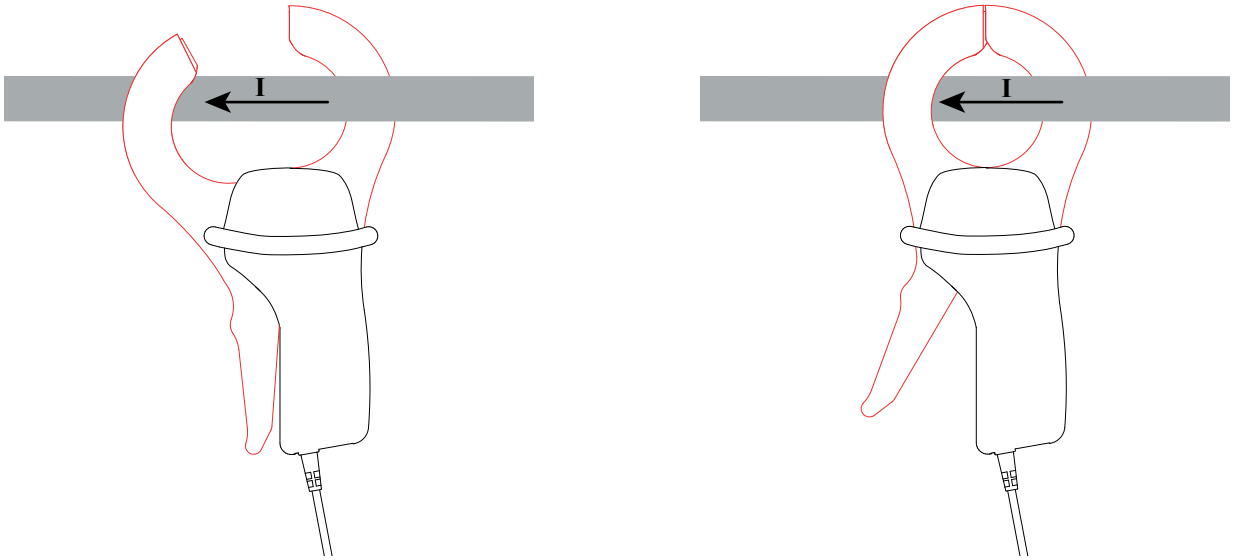


Figure 26

L461

- Connect the black safety lead to the **COM** terminal.
- Connect the red safety lead to the **+** terminal.
- Connect the leads to the voltage to be measured.

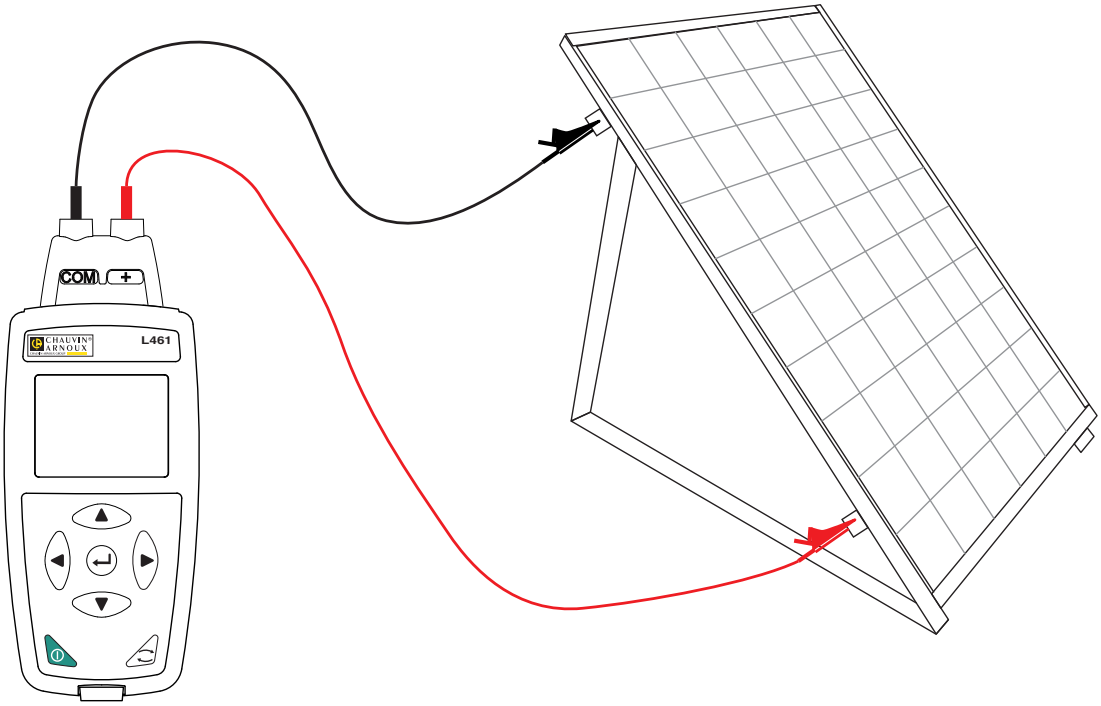


Figure 27

4.2. RECORDING

To start a recording:

- Check that there is enough space in memory (, , or but not , see § 6.14).
- Press the **Select** key first. The instrument displays **START REC. PRESS ENTER TO START RECORDING** . If it displays **SD CARD FULL**, the memory is full and recordings cannot be made.
- Confirm with the key. The **REC** symbol blinks for 5 seconds Then it stays on if the recording is normal or it blinks every 5 seconds if the recording is extended.

To stop recording, follow the same procedure.

- Press the **Select** key. The instrument displays **STOP REC. PRESS ENTER TO STOP RECORDING**.
- Confirm with the key. The REC symbol disappears.

Recordings can be managed from Data Logger Transfer (see § 5).

During a recording, it is not possible to modify the configuration of the instrument.

4.3. MEASURED VALUE DISPLAY MODES

The instrument has two measurement display modes, and , represented by the icons at the top of the display. To switch from one mode to another, use the ◄ or ► keys.

The displays can be accessed as soon as the instrument is turned on but the values are at zero. As soon as voltage or current is present at the inputs, the values are updated.

4.3.1. MEASUREMENT MODE

This mode is used to display the values in real time.

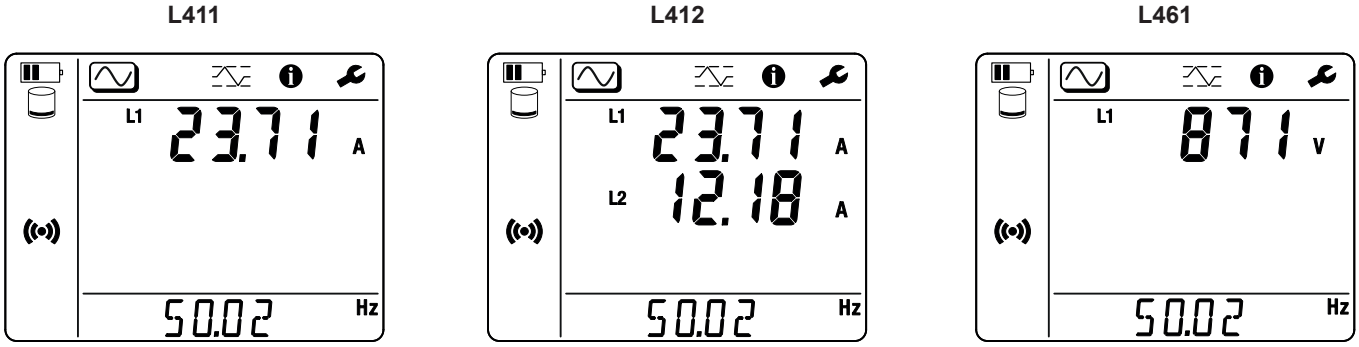


Figure 28

For the L412, if the current sensor is not detected, the measurements are not defined (displays - - - -).

For the L461, if it is a continuous measurement, instead of frequency, the instrument displays **DC**.

4.3.2. MAXIMUM MODE

This mode displays the maximum aggregated values of the measurements.

Depending on the option selected in Data Logger Transfer, these may be the maximum aggregated values for the recording in progress or the maximum aggregated values of the last recording, or the maximum aggregated values since the last reset to zero.

L411 **L412** **L461**

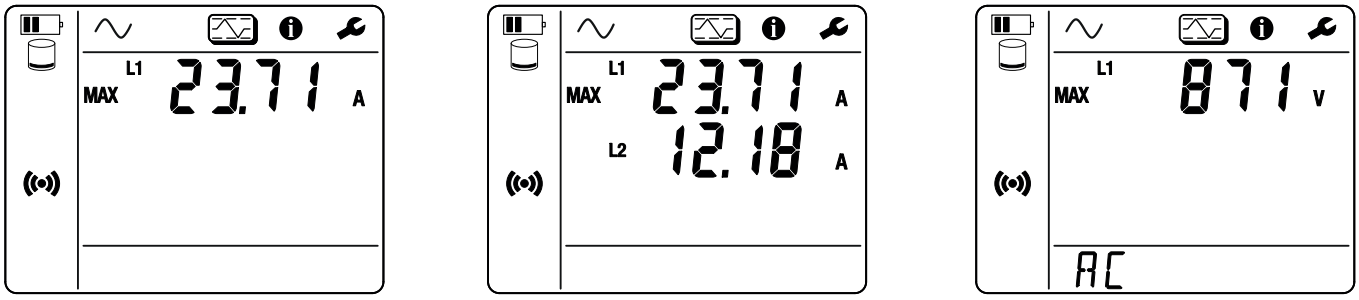


Figure 29

For the L461, the maximum DC values may be negative.

5. DATA LOGGER TRANSFER SOFTWARE

5.1. FUNCTIONS

The Data Logger Transfer application software allows you to:

- Connect the instrument to the PC via USB or Wi-Fi.
- Configure the instrument: give a name to the instrument, choose the automatic power-off time, lock the **Select** button on the instrument, set the date and time, and format the SD card.
- Configure communication between the instrument, PC and network.
- Configure recordings: choose their names, duration, start and end date, aggregation period and the type of recording.
- Configure the instrument: choose AC/DC (L461), choose the frequency, configure the current sensors (L411 and L412), select whether MAX values are aggregated or not. This configuration can be password protected.

The Data Logger Transfer software application also allows you to open recordings, upload them to a PC, export them to a spreadsheet, view the corresponding curves and create and print reports.

It also allows the internal software of the instrument to be updated when a new update is available.

5.2. INSTALLING DATA LOGGER TRANSFER

1. Download the latest version of Data Logger Transfer from our website.
www.chauvin-arnoux.com

Go to the **Support** section and perform a search for **Data Logger Transfer**.
Download the software to your PC.
Launch **setup.exe**. Then follow the installation instructions.

You must have administrator rights on your PC to install the Data Logger Transfer software.

2. A warning message similar to the one below appears. Click **OK**.

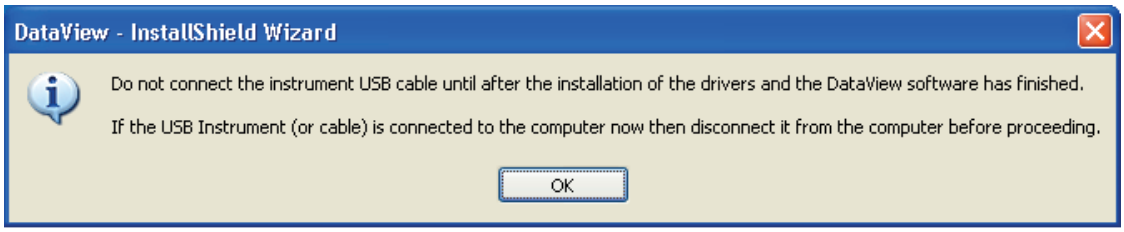


Figure 30

Installing the drivers may take some time. Windows may even indicate that the program is no longer responding, although it is still running. Wait until it is finished.

3. When driver installation is finished, the dialogue box **Installation successful** is displayed. Click **OK**.

4. The **Install Shield Wizard completed** window then displays. Click **Finish**.

5. If necessary, restart the computer.

A shortcut has been added to your desktop 

or in the Dataview directory.

You can now open Data Logger Transfer and connect your instrument to the computer.

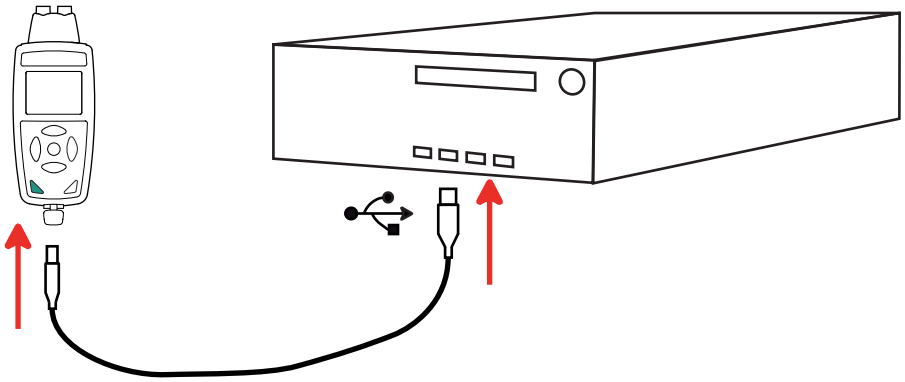


Figure 31

For background information on using Data Logger Transfer, see the software Help.

6. TECHNICAL SPECIFICATIONS

6.1. REFERENCE CONDITIONS

Parameter	Reference conditions
Ambient temperature	23 ± 2°C
Relative humidity	45 to 75% RH
Preheating	The instrument must have been powered up for at least one hour.
Common mode	Without (the instrument is powered by batteries).
Magnetic field	< 40 A/m AC
Electric field	0 V/m AC
Harmonics	< 0.1%

Table 5

6.2. GENERAL ELECTRICAL SPECIFICATIONS

Intrinsic uncertainties are expressed in % of reading (R) with an offset in number of points:
± (a % R + b)

Inom = I rated

6.3. ELECTRICAL SPECIFICATIONS OF THE L411

Specific reference conditions

Frequency: 50 ± 0.1 Hz or 60 ± 0.1 Hz
No DC component
Conductor centred in current sensor, no external conductor

Current measurement specifications

Range	300 A		3,000 A	
Specified measurement range	0.40 - 99.99A	90.0 - 360.0 A	2.0 - 99.99A	0.900 - 3.600 kA
Resolution	10 mA	100 mA	100 mA	1 A
Intrinsic uncertainty	±(1 %R + 10 ct)	±(1 %R + 4 ct)	±(1 %R + 5 ct)	±(1 %R + 4 ct)

Table 6

For the 300 A range, above 400 A, the instrument displays **OL**.
For the 3,000 A range, above 3,800 A, the instrument displays **OL**.

Current sensor threshold

Below the threshold, the displayed measurement is set to zero.

Rated current	Number of turns	Threshold
3,000 A	1	1 A
	2	0.5 A
	3	0.4 A
300 A	1	0.24 A
	2	0.12 A
	3	0.08 A

Table 7

See also current sensor limitation page 34.

Frequency measurement specifications

Specified measurement range	45.00 - 65.00Hz
Resolution	0.01 Hz
Intrinsic uncertainty	± 0.1 Hz

Table 8

Outside the measuring range, the instrument displays **- - - -**.

6.4. ELECTRICAL SPECIFICATIONS OF THE L412

Specific reference conditions

Current: No DC component
Frequency: 50 ± 0.1 Hz or 60 ± 0.1 Hz
Conductor centred in current sensor, no external conductor

Specifications of the current sensors

Refer to the safety data sheet supplied with the current sensor or to the user's manual.

The measurement ranges are those of the current sensors. Sometimes they may differ from the ranges measurable by the instrument.

The measurement range of the L412 is [0.2% Inom; 120% Inom]
The uncertainty of the L412 is ± (1 % R + 0.1 % Inom)
where Inom: nominal current of the current sensor.
R: reading the measurement

The total uncertainty is the sum of the uncertainty of the instrument and the uncertainty of the current sensor.

6.4.1. C193 CLAMP

Specified measurement range	1.00 - 49.99 A	50.00 - 99.99A	90.0 - 99.99A	0.900 - 1.200 kA
Resolution	10 mA	10 mA	100 mA	1 A
Intrinsic uncertainty	±(1 %R + 2 ct)	±(0.5 %R + 1 ct)	±(1 %R + 1 ct)	±(1 %R + 1 ct)

Table 9

Above 1200 A, the instrument displays **OL**.

6.4.2. MN93 CLAMP

Specified measurement range	0.50 - 99.99A	90.0 - 240.0 A
Resolution	10 mA	100 mA
Intrinsic uncertainty	±(1 %R + 10 ct)	±(1 %R + 1 ct)

Table 10

Above 240 A, the instrument displays **OL**.

6.4.3. MN93A CLAMP

Specified measurement range 100 A range	0.200 - 99.99A	9.00 - 99.99A	90.0 - 120.0 A
Resolution	1 mA	10 mA	100 mA
Intrinsic uncertainty	±(1 %R + 2 ct)	±1 %R	

Table 11

Above 120 A, the instrument displays **OL**.

Specified measurement range 5 A range	0.010 - 0.249 A	0.250 - 6.000 A
Resolution	1 mA	1 mA
Intrinsic uncertainty	±(1.5 %R + 1 ct)	±1 %R

Table 12

Above 6 A, the instrument displays **OL**.

Measurement units and range for the MN93A clamp
MN93A 5A measuring range: 5 to 25,000 A

Measurement range	999.9	9.999	99.99	999.9	9.999	99.99
Unit	mA *	A	A	A	kA	kA

Table 13

*: for Data Logger Transfer software application only

6.4.4. MINI 94 CLAMP

Specified measurement range	00.10 - 99.99 A	90.0 - 240.0 A
Resolution	10 mA	100 mA
Intrinsic uncertainty	±(0.6 %R + 1 ct)	±(0.3 %R + 1 ct)

Table 14

Above 240 A, the instrument displays **OL**.

6.4.5. MINIFLEX / AMPFLEX®

Range	**300 A**		**3,000 A**	
Specified measurement range	0.50 - 99.99A	90.0 - 360.0 A	2.0 - 99.99A	0.900 - 3.600 kA
Resolution	10 mA	100 mA	100 mA	1 A
Intrinsic uncertainty	±(1 %R + 20 ct)	±(1 %R + 4 ct)	±(1 %R + 10 ct)	±(1 %R + 4 ct)

Table 15

The uncertainty given is the sum of the uncertainty of the L412 and the MiniFlex or AmpFlex sensor.
For the 300 A range, above 400 A, the instrument displays **OL**.
For the 3000 A range, above 3800 A, the instrument displays **OL**.

Limitation of AmpFlex® and MiniFlex (L411 and L412)
As with all Rogowski sensors, the output voltage of AmpFlex® and MiniFlex is proportional to the frequency.
A high current at high frequency can saturate the current input of the instruments.

To avoid saturation, it is necessary to satisfy the following condition:

$$\sum_{n=1}^{n=\infty} [n.\ I_n] < I_{nom}$$

Where I_{nom} is the range of the current sensor
n the order of the harmonic
I_n is the current value for the harmonic of rank n

For example, the input current range of a dimmer must be one fifth of the current range selected on the instrument.

This requirement does not take into account the limitation of the instrument's bandwidth, which may lead to other errors.

6.4.6. CURRENT SENSOR THRESHOLDS

Below the threshold, the displayed measurement is set to zero.

Sensor	Rated current	Number of turns	Display threshold
C193 clamp	1000 A	-	0.50 A
MN93 clamp	200 A	-	0.10 A
MN93A clamp	5 A	-	2.5 mA *
	100 A	-	50 mA
MINI 94 clamp	200 A	-	50 mA
AmpFlex® A193 MiniFlex MA194	300 A	1 turn	0.24 A
		2 turns	0.12 A
		3 turns	0.08 A
	3,000 A	1 turn	1 A
		2 turns	0.5 A
		3 turns	0.4 A

Table 16

*: this value is to be multiplied by the ratio (between 5 and 25,000A)

Specifications of frequency measurement on channel 1

Specified measurement range	45.00 - 65.00Hz
Resolution	0.01 Hz
Intrinsic uncertainty	± 0.1 Hz

Table 17

Outside the measuring range, the instrument displays **- - - -**.

6.5. ELECTRICAL SPECIFICATIONS OF THE L461

Specific reference conditions

Input impedance: 7 MΩ per input
Maximum continuous overload: 1800 V AC or DC

DC measurement specifications

AC component < 1% DC component

Specified measurement range	±10.0 - 999.9V	± 900 - 1700 V
Resolution	100 mV	1 V
Intrinsic uncertainty	±(1 %R + 5 ct)	±(1 %R + 1 ct)

Table 18

Above 1800 V DC, the instrument displays **OL**.

AC measurement specifications

Frequency: 50 ± 0.1 Hz or 60 ± 0.1 Hz
Crest factor: $\sqrt{2}$
DC component < 1% AC component
Sinusoidal signal

Specified measurement range	10.0 - 999.9V	900 - 1200V
Resolution	100 mV	1 V
Intrinsic uncertainty	±(1 %R + 5 ct)	±(1 %R + 1 ct)

Table 19

Above 1300 Vac, the instrument displays **OL**.

Voltages < 0.2 VAC are set to zero.

Frequency measurement specifications

Specified measurement range	45.00 - 65.00Hz
Resolution	0.01 Hz
Intrinsic uncertainty	± 0.1 Hz

Table 20

Outside the measuring range, the instrument displays **- - - -**.

6.6. VARIATION IN THE OPERATING RANGE

6.6.1. L411

Influence quantities	Area of influence:	Quantity Influenced	Influences
Temperature	-20 to +50°C	Current	± 400 ppm/°C
		Time	0.034 ± 0.006 ppm/°C
Relative humidity	30 to 85% RH	Current	±(1 %R + 2 ct)
Power supply on batteries	3.6 to 4.8 V	Current	±(1 %R + 1 ct)
Power supply over USB	4.4 to 5.25 V	Current	±(1 %R + 1 ct)
Common mode rejection AC 50/60 Hz	0 to 1,000 V	Current	2 mA/V
Non-sinusoidal signal with harmonics < 6 kHz	Phase chopping variable speed drive	Current	1%
	Square		1%
	Diode bridge		Not supported
Crest factor	1.4 to 2	Current	1%
	2 to 3		1% of full scale
Frequency	45 to 65 Hz	Current	± 0.05 %/Hz
Adjacent external conductor carrying an AC current at 50/60 Hz	conductor in contact with the sensor	Current	> 40 dB typical
	conductor near snap mechanism		> 33 dB
Position of conductor in the sensor		Current	≤ 2.5 %
Electric field	10 V/m 100 MHz to 1 GHz	Current	< 2% of full scale

Table 21

6.6.2. L412

Influence quantities	Area of influence:	Quantity Influenced	Influences
Temperature	-20 to +50°C	Current	± 400 ppm/°C
		Time	0.034 ± 0.006 ppm/°C
Relative humidity	30 to 85% RH	Current	±(1 %R + 2 ct)
Power supply on batteries	3.6 to 4.8 V	Current	±(1 %R + 1 ct)
Power supply over USB	4.4 to 5.25 V	Current	±(1 %R + 1 ct)
Non-sinusoidal signal with harmonics < 6 kHz	Phase chopping variable speed drive	Current	1%
	Square		1%
	Diode bridge		Not supported
Crest factor	1.4 to 2	Current	1%
	2 to 3		1% of full scale
Frequency	45 to 65 Hz	Current	± 0.05 %/Hz
External conductor		Current	See the specifications of the current sensor
Position of conductor		Current	
Magnetic field		Current	
Electric field	10 V/m 100 MHz to 1 GHz	Current	< 2% of full scale

Table 22

Disturbed signals
The bandwidth of the following signals must be < 6 kHz. The current is between 5% and 50% of the rated value.

Signal type	Sensor	Typical influence
Phase chopping variable speed drive	MN93A	< 1%
	MA194	**< 3%**
Square	MN93A	< 1%
	MA194	**< 3 %**

Table 23

Signals from a bridge rectifier with a DC component are not supported by L411 and L412.

6.6.3. L461

Influence quantities		Area of influence:	Quantity Influenced	Influences
Temperature		-20 to +50°C	VDC	± 52 mV/°C
			VAC	± 110 ppm/°C
			Time	0.034 ± 0.006 ppm/°C
Relative humidity		30 to 85% RH	V	±(1 %R + 2 ct)
Power supply on batteries		3.6 to 4.8 V	V	±(1 %R + 1 ct)
Power supply over USB		4.4 to 5.25 V	**V**	±(1 %R + 1 ct)
Common mode rejection	AC	0 to 1000 VAC	VDC	65dB
	DC	-1000 to 1000 VDC	VAC	65dB
Serial mode rejection	AC	0 to 800 VAC	VDC	47dB
	DC	-500 to 500 VDC	VAC	47dB
Frequency		45 to 65 Hz	VAC	± 0.05 %/Hz

Table 24

6.7. POWER SUPPLY

6.7.1. BATTERIES

The instrument is powered by 3 alkaline batteries type AA or LR6
Battery weight: Approx. 3 x 26 g

Consumption: 120 mA max

Battery life with new batteries is:
- 3 days recording without Wi-Fi
- 1 day with Wi-Fi enabled
- When recording in **EXTEND** mode without Wi-Fi:
  - 2 weeks for a 1 minute aggregation period
  - 3 weeks for a 2 minutes aggregation period
  - 10 weeks for a 10/15 minutes aggregation period

When power is off, the real time clock is retained for more than 120 days.
When the batteries are exhausted, the configuration is retained for 5 years.

The instrument can also be powered by rechargeable batteries, but the battery life will be shorter. Use NiMH type AA or LR6, 2500 mAh.

6.7.2. VIA USB

The instrument can also be powered via a USB - micro USB cable, plugged either into a PC or into a wall socket via an AC adapter.

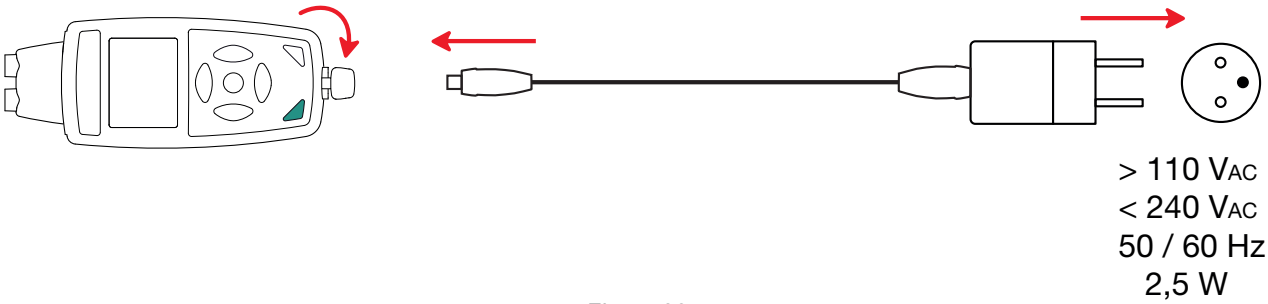


Figure 32

Operating range: 4.4 to 5.25 V
Power: 0.6 W max

6.8. ENVIRONMENTAL SPECIFICATIONS

- **Temperature and relative humidity**

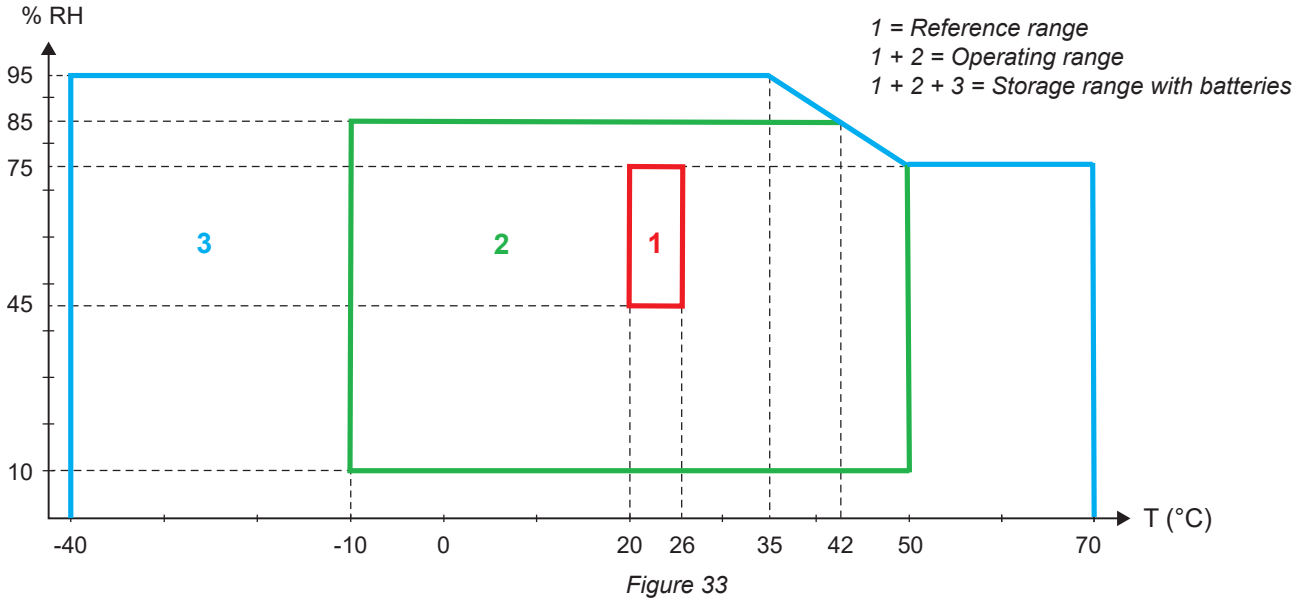


Figure 33

- For indoor use.
- **Altitude**
  - Operation: 0 to 2,000 m;
  - Storage: 0 to 10,000 m

6.9. WI-FI

2.4 GHz IEEE 802.11 B/G/N band
Tx power: +15.1 dBm
Rx sensitivity: -96.3 dBm
Security: open / WPA2

6.10. MECHANICAL SPECIFICATIONS

6.10.1. L411

- Dimensions: 147 × 72 × 34mm approx.
- Cable: 1.20 metres long
- Current sensor: 350 mm long
- Weight: Approximately 340 g
- Degree of protection provided by the enclosure according to IEC 60529
  - IP 54 for the instrument
  - IP 67 for the current sensor

6.10.2. L412

- Dimensions: 172 × 72 × 34mm approx.
- Weight: Approximately 300 g
- Degree of protection provided by the enclosure according to IEC 60529:
  - IP 54 when the instrument is not in use
  - IP 20 when the instrument is connected

6.10.3. L461

- Dimensions: 178 × 72 × 34mm approx.
- Weight: Approximately 300 g
- Degree of protection provided by the enclosure according to IEC 60529:
  - IP 54 when the instrument is not in use
  - IP 20 when the instrument is connected

6.11. COMPLIANCE WITH INTERNATIONAL STANDARDS

The instruments comply with the EN 62479 standards for EMF.

6.11.1. L411

The instrument complies with standard IEC/EN 61010-2-0322 for a voltage of 600 V in category IV or 1000 V in category III pollution degree 2.

6.11.2. L412

The instrument complies with standard IEC/EN 61010-2-030, degree of pollution 2.

6.11.3. L461

The instrument complies with standard IEC/EN 61010-2-030 for a voltage of 1000 VAC in category IV or 1500 VDC in category III pollution degree 2.
The leads and crocodile clips comply with IEC/EN 61010-031 for a voltage of 1000 V in category IV or 1500 V in category III pollution degree 2

6.12. ELECTROMAGNETIC COMPATIBILITY

Emissions and immunity in an industrial environment compatible with IEC/EN 61326-1 or BS EN 61326-1.

With the AmpFlex® and MiniFlex, the typical influence on the measurement is 0.5% of full scale with a maximum of 5 A.

6.13. RADIO EMISSIONS

The instruments are in compliance with directive RED 2014/53/EU and with FCC regulations.
FCC certification number for the Wi-Fi: QOQWFM200.

6.14. MEMORY

The instrument contains a micro-SD card with a capacity of 8 GB formatted FAT32. This card allows recording for 100 years, but the number of recording sessions is limited.

The memory symbol on the display indicates that it is full:

-  : number of sessions ≤ 50,
-  : number of sessions > 50,
-  : number of sessions > 100,
- : number of sessions > 150,
-  : number of sessions > 200,

Recording sessions can be downloaded and/or deleted individually via the Data Logger Transfer application software.

7. MAINTENANCE

Except for the batteries, the instrument contains no parts that can be replaced by personnel who have not been specially trained and accredited. Any unapproved work or replacement of any part by equivalents may seriously compromise safety.

7.1. CLEANING

Disconnect anything connected to the instrument and switch it off.

Use a soft cloth, moistened with soapy water. Rinse with a damp cloth and dry quickly with a dry cloth or forced air. Do not use alcohol, solvents, or hydrocarbons.

Do not use the instrument if the terminals or the keypad are wet. Dry it first.

Ensure that no foreign body interferes with the current sensor snap-on system.

7.2. BATTERY REPLACEMENT

The symbol indicates the remaining battery capacity. When the symbol is empty, all the batteries must be replaced.

- Disconnect all connections to the instrument's measurement inputs and switch it off.
- To avoid losing the time, power the device via USB while replacing the batteries.
- Refer to § 1.4 to proceed with the replacement.

Old batteries must not be treated as household wastes. Take them to the appropriate collection point for recycling.

7.3. UPDATING THE FIRMWARE

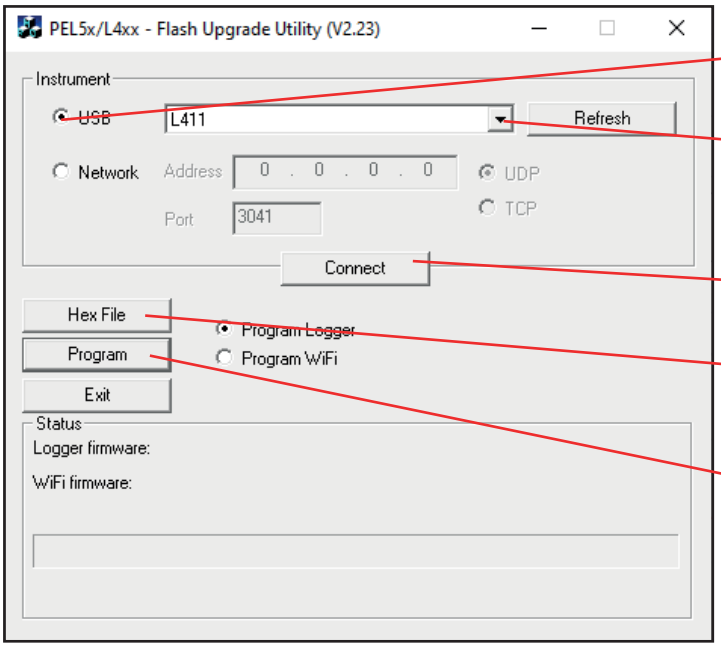
To make sure that it provides the best possible service in terms of performance and technical developments, Chauvin Arnoux offers the opportunity to update the firmware of this instrument.

Updating firmware may reset the configuration to zero and cause loss of the date and recorded data. As a precaution, back up the data in memory on a PC before updating.

Our site:
www.chauvin-arnoux.com

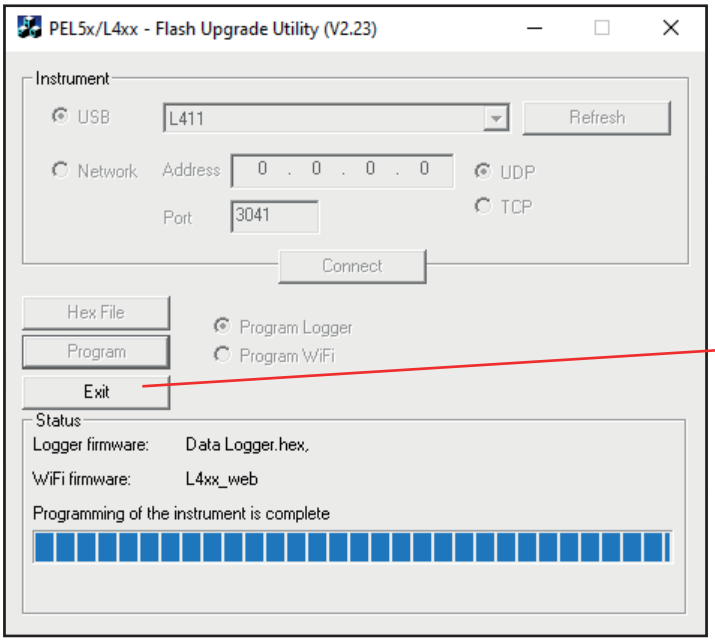
Then go to the **Support** section then **Download our software** then do a search for **L411** or **L412** or **L461**.

- Download the zip file that contains the new firmware and the FlashUp installation utility.
- Connect the instrument to your PC via the supplied USB - micro-USB cable.
- Unzip the zip file.
- Launch **FlashUp.exe**.



- Check the USB box.
- Select your instrument from the drop-down list. If you can't find it in the list, click **Refresh**.
- Click on **Connect** to connect your instrument.
- Click **HexFile** and specify the path to the **Data Logger.hex** file.
- Click **Program**. Writing the firmware takes about 5 minutes. The window shows the progress. The device displays **FLASHUP**.

Figure 34



- When writing is finished, click **Exit** - the FlashUp window closes. Unplug the USB cable from the instrument, switch it off and then on again.

Figure 35

7.4. REPLACING THE SD CARD

If, when you press the **Select** ↻ key to start a recording, the instrument displays:

- **INSERT SD CARD**,
- **SD CARD WRITE PROTECT**,
- **SD CARD ERROR**,

the SD card of the instrument has encountered a problem.

If this occurs, connect your instrument to the Data Logger Transfer application software. In the configuration function, you can then format the SD card.

If this does not solve the problem, you will need to replace the SD card.

Replacing the SD card

- Disconnect all connections to the instrument and turn it off.
- Turn the instrument over and unscrew the 4 screws using a Phillips screwdriver.

Before opening the instrument, be sure to take all necessary precautions against electrostatic discharge (ESD).

- Open the instrument and lay the bottom aside

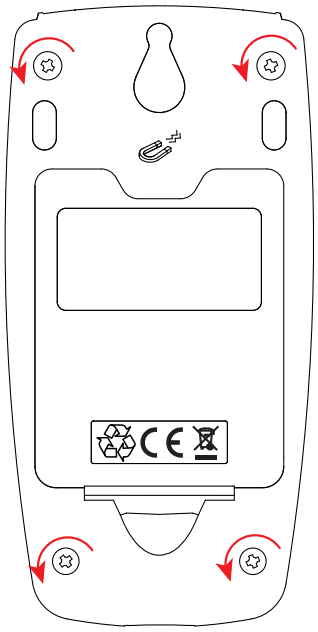


Figure 36

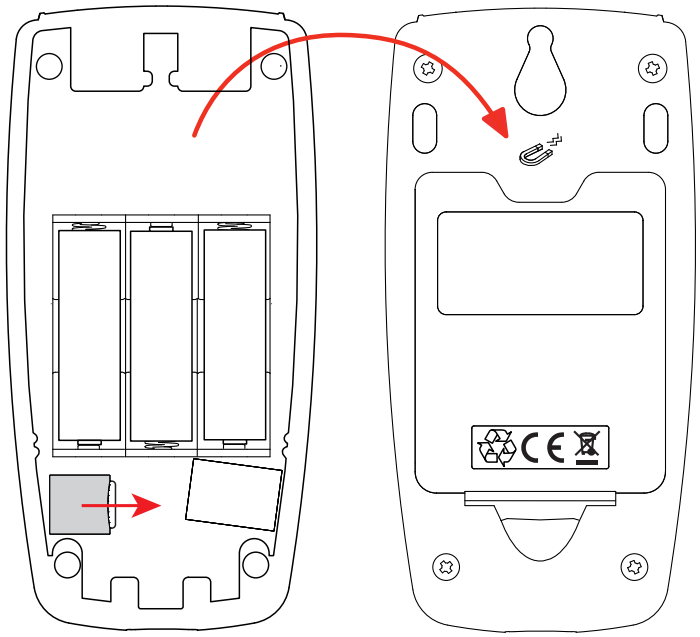


Figure 37

- Push the micro-SD card slot to the right to unlock it.
- You can then open it, and lift it and then take out the micro-SD card by sliding it upwards.
- Insert the new SD card, formatted to FAT 32, into the slot by sliding it into the guides. Foolproofing in the guides ensures that the card is inserted in the right direction. Push the card in all the way.
- Push the micro-SD card slot down then push it to the left to lock it.
- Replace the bottom of the instrument, make sure it is completely and correctly closed, and then screw the 4 screws back on.

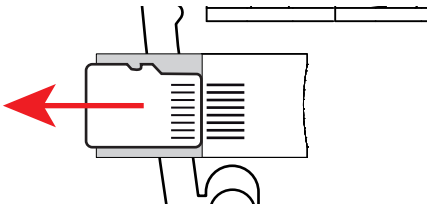


Figure 38

7.5. MESSAGES

The main messages concern Wi-Fi.

AP CONFIG TCPIP FAILED	AP Mode: TCP/IP configuration failed
AP DHCP SERVER FAILED	AP Mode: Failed to start DHCP server
AP MODE START FAILED	AP Mode: Failed to start AP mode
AP POWER MODE FAILED	AP mode: Max power saving mode configuration failed
AP SCAN FAILED	AP Mode: Network scan failed
AP SET PASSWORD FAILED	AP Mode: Failed to set AP mode password
AP UDP SERVER FAILED	AP Mode: Failed to start UDP server
AP TCP SERVER FAILED	AP Mode: Failed to start TCP server
CONFIG AP	Configures the module for operation as an access point
CONFIG DHCP	Configures the modules for the DHCP server
CONFIG HTTP SERVER	Configures the modules for the HTTP server
CONFIG ST	Configures the module for ST mode (router)
CONFIG TCP	Configures TCP settings
CONFIG TCP SERVER	Configures the TCP server settings
CONFIG TCPIP	Configures the TCP/IP settings
CONFIG UDP/TCP SERVER	Configures the modules for UDP/TCP server

CONFIG UDP SERVER	Configures the UDP server settings
CONNECT SSID	Connection to an SSID server
DISABLED	Disabled by user
FLASHING Wi-Fi MODULE	Programming the Wi-Fi module
HTTP SERVER FAILED	Failed to start HTTP server
INIT FAILURE	Initialisation failed
NO CONFIG TCPIP RSP	STA mode: No TCP/IP response configuration
NO CONFIG TCPIP EVT	STA mode: No TCP/IP event configuration
NO GET MAC EVT	No response from MAC event
NO GET MAC EVT	No response from MAC address
NO HELLO RSP	No Hello response
NO OP MODE RSP	No response to set operating mode (STA or AP)
NO POWER MODE RSP	STA mode: No response to set maximum power saving mode
NO RADIO ON EVT	STA mode: No response to Radio On event
NO RADIO ON RSP	STA mode: No radio activation response
NO RESPONSE	Module did not respond to hard reset
NO SET MAC RSP	No response to setting MAC address
NO SET PASSWORD RSP	STA mode: No response to setting Wi-Fi password
NO SYNC RSP	No sync response
POWER ON	Powering up the module
POWER MODE AP	Set power mode for Wi-Fi AP operation
POWER MODE ST	Set power mode for ST Wi-Fi operation
RADIO ON	Activation of the radio in the module
RADIO ON AP	Activate radio
RADIO ON FAILED	AP Mode: Radio Power On failed
RESETTING MODULE	Resetting the module
SET 80211 MODE	Set 802.11 operating mode
SET 80211 MODE FAILED	Failed to set 802.11 operating mode
SET AP MODE FAILED	AP Mode: Failed to set AP mode
SET AP PASSWORD	Set AP mode password
SET PASSWORD	Set password to use when connecting to an existing SSID
SETTING BPS RATE	Set the BPS of the module
SETTING OPERATING MODE	Setting the module operating mode
SSID SCAN AP	Scan SSID
SSID ERROR	Failed to connect to specified SSID
START AP SERVER	Start the server in AP mode
START TCP AP SERVER	Start the TCP server for operation in AP mode
START TCP SERVER FAILED	STA Mode: Failed to start TCP server
START UDP AP SERVER	Start the UDP server for operation in AP mode
START UDP SERVER FAILED	STA Mode: Failed to start UDP server
START UDP/TCP AP SERVER	Start UDP/TCP servers in APs mode
VALIDATE FAILED	Validation failed
VALIDATING MAC	Checking the validity of the MAC address
WAITING FOR BOOT EVENT	Waiting for the module to send a boot event message
WAIT FOR HELLO MSG	Waiting for module greeting
WAITING FOR SYNC	Waiting for module synchronisation messages

8. WARRANTY

Except as otherwise stated, our warranty is valid for **24 months** starting from the date on which the equipment was sold. The extract from our General Terms of Sale is available on our website.
www.chauvin-arnoux.com/en/general-terms-of-sale

The warranty does not apply in the following cases:

- Improper use of the instrument or use with incompatible equipment;
- Modifications to the instrument without the explicit authorisation of the manufacturer's technical department;
- Work performed on the instrument by a person not approved by the manufacturer;
- Adaptation to a particular application not anticipated in the definition of the instrument or not indicated in the user's manual;
- Damage caused by shocks, falls or floods.

9. APPENDIX

9.1. MEASUREMENT FORMULAS

9.1.1. AGGREGATION

Aggregated quantities are calculated by the Data Logger Transfer software application for a defined period according to the following formulas based on “1 s" values.

The aggregation can be an average or a quadratic average.

Quantities	Formulas
AC RMS voltage	$V_L = \sqrt{\frac{1}{N} \times \sum_{x=0}^{N-1} V_{Lx}^2}$
DC voltage	$V_L = \frac{1}{N} \times \sum_{x=0}^{N-1} V_{Lx}$
AC RMS current	$I_L = \sqrt{\frac{1}{N} \times \sum_{x=0}^{N-1} I_{Lx}^2}$

Table 25

N = number of "1 s" values during the aggregation period concerned (1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30 or 60 minutes).

9.1.2. NORMAL MODE

In normal mode, there was a "1 s" measurement every second and the aggregation covers 60 measurements, giving an accurate result.

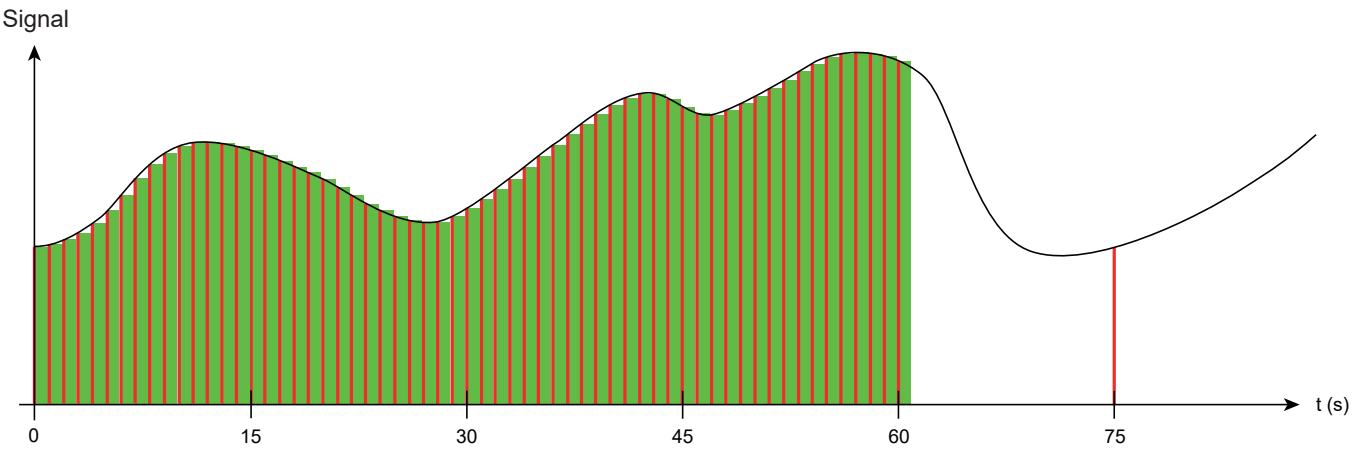


Figure 39

9.1.3. EXTENDED MODE

In extended mode, the interval between measurements, S, is a quarter of the aggregation period.

For example, for an aggregation period of one minute, the "1 s" measurement will be made every 15 seconds. The 4 "1 s" measurements will then be aggregated.

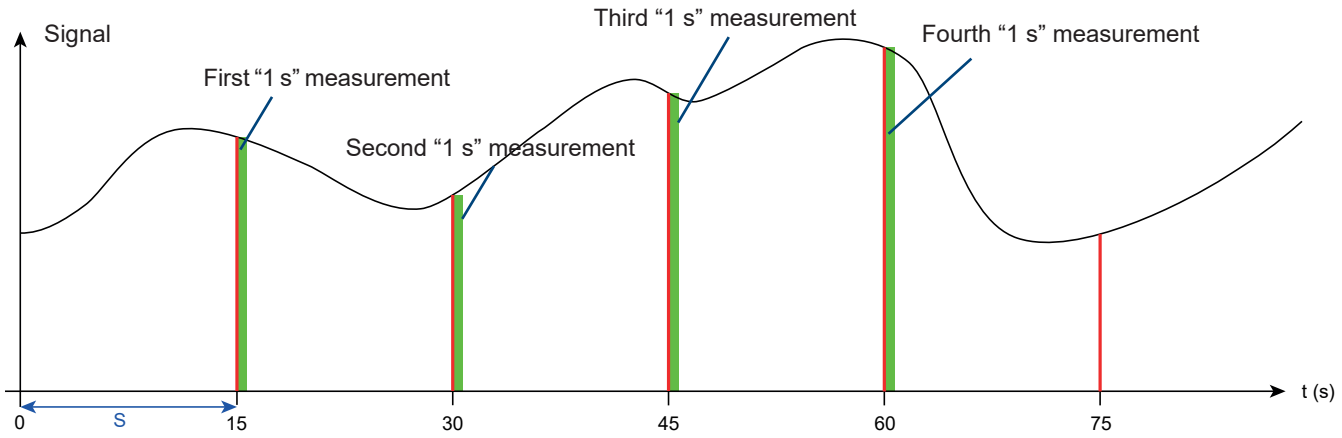


Figure 40

FRANCE
Chauvin Arnoux
12-16 rue Sarah Bernhardt
92600 Asnières-sur-Seine
Tél : +33 1 44 85 44 85
info@chauvin-arnoux.com
www.chauvin-arnoux.com

INTERNATIONAL
Chauvin Arnoux
Tél : +33 1 44 85 44 38
export@chauvin-arnoux.fr

Our international contacts
www.chauvin-arnoux.com/contacts

CHAUVIN ARNOUX