

EN - User Manual

**CA 5292 CA 5292-BT**  
**CA 5293 CA 5293-BT**



**PORTABLE 100,000-CTS GRAPHIC MULTIMETERS**

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# 1. GENERAL INSTRUCTIONS

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Thank you for purchasing a CA5292/CA5293. For best results from your instrument:

- read this user manual carefully,
- comply with the precautions for use.

## 1.1. Precautions and safety measures

This device is compliant with safety standard IEC 61010-2-033, the leads are compliant with IEC 61010-031. Failure to observe the safety instructions may result in electric shock, fire, explosion, or destruction of the instrument and of the installations.

### 1.1.1. Symbols



WARNING! Risk of electric shock. The voltage on the parts marked with this symbol may be dangerous.



WARNING, DANGER! The operator should refer to this user's manual whenever this danger symbol appears.



Equipment protected throughout by double or reinforced insulation.



Earth terminal.



The rubbish bin with a line through it indicates that, in the European Union, the product must undergo selective disposal in compliance with Directive WEEE 2002/96/EC. This equipment must not be treated as household waste



The CE marking indicates conformity with European directives, in particular LVD and EMC.



USB

**IP 67**

IP 67 (Not in operation; if the instrument is immersed, it must be dried, in particular the terminal block, before it can be used again).



Important instruction.

### 1.1.2. Definitions of the measurement categories

**Measurement category II** corresponds to measurements taken on circuits directly connected to low-voltage installations.

*Example: power supply to domestic electrical appliances and portable tools.*

**Measurement category III** corresponds to measurements on building installations.

*Example: distribution panel, circuit-breakers, machines or fixed industrial devices.*

**Measurement category IV** corresponds to measurements taken at the source of low-voltage installations.

*Example: power feeders, meters and protection devices.*

### 1.1.3. Precautions for use

<ul style="list-style-type: none"><li>• The operator and/or the responsible authority must carefully read and clearly understand the various precautions to be taken in use.</li><li>• Do not use the instrument in an explosive atmosphere or in the presence of inflammable gas or smoke.</li><li>• Do not use the instrument on networks with a rated voltage or category higher than those mentioned.</li><li>• Do not use the instrument if it seems damaged, incomplete or incorrectly closed</li><li>• Keep your hands and fingers away from the unused terminals of the device. When handling sensors or test probes, do not place fingers beyond physical finger guard.</li></ul>	<ul style="list-style-type: none"><li>• All elements on which the insulation is damaged (even partially) must be put out of service for repair or disposed at waste.</li><li>• Respect the environmental conditions of use.</li><li>• Use personal protection equipment when conditions require it.</li><li>• When handling the leads, the probe tips, and the crocodile clips, keep your fingers behind the physical guards.</li><li>• Comply with the environmental conditions of use.</li></ul>
--	--

## 2. GETTING STARTED

### 2.1. Delivery condition

Check completeness of the delivery against your order.

Delivered in a cardboard box with:

- Operating directions in 11 languages on CD-ROM with SX-DMM software
- Getting started guide on paper (available on CD)
- 1 set of safety leads (red and black) with double insulation probe tip ( $\varnothing$  of the probe tips: 4mm) 1,000V CAT III 20A
- 1 set of 4 AA/R6 Ni-MH storage batteries
- 1 5VDC, 2A mains/USB adapter (100-240V, 50/60Hz, 0.5A) with a USB power cord
- 1 statement of manufacturer's measurements
- Optical USB communication lead
- 1 carrying bag

### 2.2. Accessories and spares

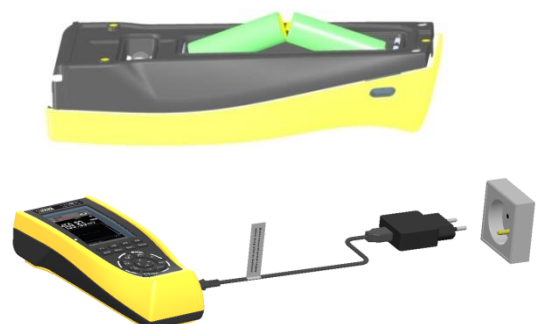
- Current clamps (see CHAUVIN ARNOUX catalogue)
- Two-wire Pt100 temperature probe (HX0091)
- Two-wire Pt1000 temperature probe (HA1263)
- K thermocouple with banana adapter (P011021067)
- Metrology software for Windows (HX0059B)
- Set of rechargeable batteries (HX0051B)
- HV probe (SHT40KV)
- CMS clamp (HX0064)
- Bluetooth key (P011102112)
- Multifix adapter for DMM (P01102100Z)
- External charger for Ni-MH storage batteries
- Fuse 1,000V 11A >20kA 10x38mm (Get in touch with our Manumasure Regional Technical Centre)
- Kit of test accessories for DMM (P01295459Z)
- Carrying case with Multifix (HX0052C)


For the accessories and spares, consult our web site: [www.chauvin-arnoux.com](http://www.chauvin-arnoux.com)


### 2.3. First use

#### 2.3.1. Replacement (primary or storage batteries)

1. Disconnect the instrument from all sources of current
2. Unscrew the 3 screws on the back
3. Open the lower housing with a screwdriver
4. Remove the seal protecting the batteries (primary or rechargeable)
5. Insert the batteries, paying attention to the polarity
6. Close the housing and screw the screws back in
7. Check the type in Setup/Pw supply/type (alkaline or NiMH)






To switch the instrument on, press the  key.  
Make sure that the batteries are adequately charged.

 When the instrument is off and connected to mains using the USB adapter provided, the LEDs of the switch blink to indicate that the instrument is charging.

### 2.3.2. System settings

- **Language**




To select the language in which the menus of the multimeter are displayed:

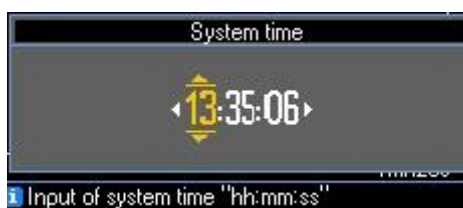
1. Press the  key
2. Select the  menu
3. Select 

4 combinations of two languages are available: English/Italian, English/Spanish, English/ German and English/French. As default, the multimeter contains English/French. The other combinations are available as updates of the internal program, by downloading the multimeter loader from: [www.chauvin-arnoux.com](http://www.chauvin-arnoux.com)

- **Clock**

To change the date and time:

1. Press the  key
2. Select the  menu
3. Select 



## 3. INSTRUMENT OVERVIEW

### 3.1. Device description

The CA5292 and CA5293 are self-contained portable digital multimeters, specially designed to group in a single instrument the following electrical measurement functions:

- AC, DC, and AC+DC voltage measurement
- Low-impedance AC voltage measurement
- AC, DC, and AC+DC current measurement
- Frequency measurement
- Resistance measurement
- Capacitance measurement
- Temperature measurement



### 3.1.1. Switch



Changing from one setting to another resets the measurement mode. Around the switch, a fixed orange LED indicates which function is selected and an orange LED flashes for setup. During the charging cycle (OFF), each function LED lights by turns to indicate charging in progress.

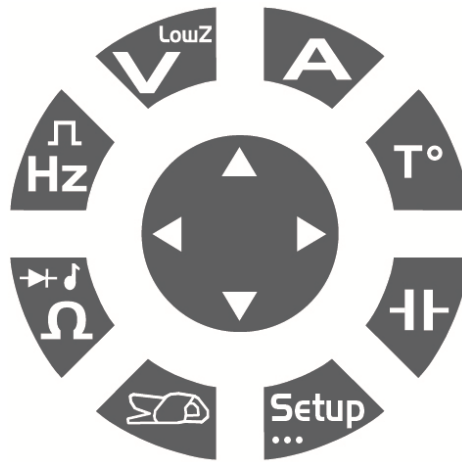
In the centre, a "4 position" navigator is used for:



1. navigating up and down, to:
  - select a menu or a function,
  - manually select the range or graphic scale under "**Range**,"
  - increment or decrement the selected variable.



2. navigating right and left, to:
  - move from one selected variable to another



	Short press	Successive short presses or selection by F1, F2, F3, or F4
	AC, DC or AC+DC RMS current measurement	
	Temperature measurement T and selection of the unit (°C, °F, K)	Selection of the types of sensor: <ul style="list-style-type: none"> <li>- Pt 100 or Pt 1000</li> <li>- TCJ or TCK</li> </ul>
	Capacitance measurement	
	Current measurement by clamp, selection of AC, DC, or AC+DC coupling	Configuration of the "Clamp" menu: type of measurement, ratio, and unit
	Resistance measurement, audible continuity measurement, 100 Ohm range, diode test	Selection of the continuity, 100Ohm or diodes functions
	Frequency measurement	
	AC voltage measurement (AC RMS) and selection of coupling	AC, DC, AC+DC, VlowZ
	SETUP, on 3 levels	Setup 1/3, Setup 2/3, Setup 3/3

### 3.1.2. Keypad

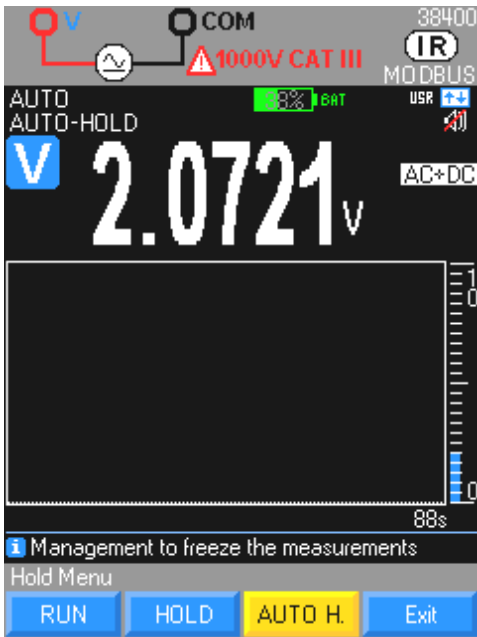
The keypad has the following function keys:



The keys are taken into account and applied when pressed. If the key press is validated, the instrument beeps. The active keys on a long press are identified by "...": **Meas...**, **Mem...**, **Setup...**

	Short press	Long press
<b>Hold</b>	Hold of the display. Selection of RUN, HOLD or Auto HOLD.	
<b>Meas..</b>	Measurement menu with 3 levels.	Reset for SURV/PEAK/REL and CNT
<b>Mem...</b>	Start/Stop storage.	Selection of the files and configuration of the records.
<b>Range</b>	Choice of automatic or manual range change.	

### 3.1.3. Display



Display of the wiring diagram of the terminal block as a function of the measurement
Digital display: <ul style="list-style-type: none"> <li>- of the quantity measured, - of the value measured,</li> <li>- of the type of measurement, etc.</li> </ul>
Secondary display: <ul style="list-style-type: none"> <li>- in graphic form</li> <li>- or in the form of 3 display units</li> </ul>
Scrolling information
Properties of the F1, F2, F3, and F4 keys

### 3.1.4. Principal quantities measured

- VLowZ AC voltage measurement at low impedance (VLowZ)
- VAC AC voltage measurement
- VAC/DC DC or AC+DC voltage measurement at high impedance (V)
- A Current measurement A (AC, DC, AC+DC)
- Hz Frequency measurement
- Ω Resistance measurement
- C Capacitance measurement
- T° Temperature measurement
- % Measurement of relative value or duty cycle
- ♪ Continuity, diode test

### 3.1.5. Secondary quantities measured

For the secondary quantities measured, refer to table in the appendix.



### 3.1.6. Units

- V Volt
- A Ampère
- Hz Hertz
- $\Omega$  Ohm
- F Farad
- °F Degree Fahrenheit
- °C Degree Celsius
- K Kelvin
- ms millisecond
- k kilo (k $\Omega$  - kHz)
- M Méga (M $\Omega$  - MHz)
- n nano (nF)
- p pico (pF)
- $\mu$  micro ( $\mu$ V -  $\mu$ A -  $\mu$ F)
- m milli (mV - mA - mF)
- % Percentage

### 3.1.7. Symbols

---

**AC** Measurement of the RMS AC signal

---

**DC** Measurement of the DC signal

---

**AC + DC** Measurement of the TRMS AC and DC signal

---

**AUTO** Automatic range switching

---

$\Delta$  Values relative to a reference

---

**REF** Presence of a reference value in memory

---

**HOLD** Storage and display of stored values

---

**MAX** Maximum value

---

**AVG** Mean value

---

**MIN** Minimum value

---

**PK+** Maximum peak value

---

**PK-** Minimum peak value

---

**.run r.un ru.n** Capacitance meter, acquisition in progress

---

**----** Frequency measurement impossible

---

**O.L** Overshoot of the measurement capacities

---

**V** Volt

---

**Hz** Hertz

---

**F** Farad

---

**°C °F K** Degree Celsius, degree Fahrenheit, kelvin

---

**A** Ampere

---

**%** Percentage














---

**$\Omega$**  Ohm

---

**ms** millisecond

---

	Symbol of the prefix nano-
	Symbol of the prefix pico-
	Symbol of the prefix micro-
	Symbol of the prefix milli-
	Symbol of the prefix kilo-
	Symbol of the prefix méga-
	Symbol of the audible continuity measurement
	Symbol of the measurement and testing of a semiconductor junction
	Symbol of the Zener diode
	Warning, possibility of electric shock (*)
<b>LEADS</b> Function selected incompatible with the connection of the lead	
	Bluetooth communication
	USB communication
	MLI 300Hz filter

(\*) When voltages exceeding 60 VDC or 25 VAC are measured, the symbol flashes on the display unit.

## 3.2. Getting started

### 3.2.1. Power supply via the charger

This is on the side of the instrument, using the specific cord connected to the mains-USB adapter supplied, or directly connected to a USB port on your PC.

### 3.2.2. Powering up, down



Press the key opposite, on the left front panel of the instrument, to switch it on or off. A switching-off page reports the switching off of the active multimeter.

### 3.2.3. Automatic current measurement detection

The number of input terminals is limited to 3: **V**, **COM**, **A**. Connecting the lead to the "Ampere" terminal automatically selects the corresponding function.



When a change of function from the control keypad is incompatible with the connection of the lead, an audible and visual alert is triggered (LEADS).


The current measurement is made in automatic range mode over the whole span.

### 3.2.4. Automatic power down

Validate the function by the **Standby** menu of the SETUP menu: the instrument automatically switches itself off after 30 minutes of operation if, during this period, nothing is done on the front panel and the multimeter is not moved.



Automatic switching off is disabled in :


- **Surveillance** mode → SURV
- **Record** mode → MEM
- **Communication** mode  (isolated USB optical link, Bluetooth)
- when the quantity measured (Voltage or Current) on the inputs of the multimeter exceeds the danger threshold.

### 3.2.5. Alert signal

An intermittent audible signal is emitted:

- in the "Voltage" setting, when the range is exceeded (**MANUAL** and **AUTO** mode - last range)
- in the "Current" setting, when the range is exceeded (**MANUAL** mode), starting from a measurement of 10 Amperes
- when the connection of the leads is incompatible with the function selected
- when the danger thresholds are exceeded (if the function is validated)

When the range is exceeded, the audible signal is accompanied by display of the "O.L" acronym.

When the  symbol is activated:

- the voltage on the "Volt" input exceeds **60 VDC** or **25 VAC**
- the current injected between the "Ampere" terminal and **COM** exceeds **10A**
- the range (voltage or current) is exceeded in **MANUAL** mode

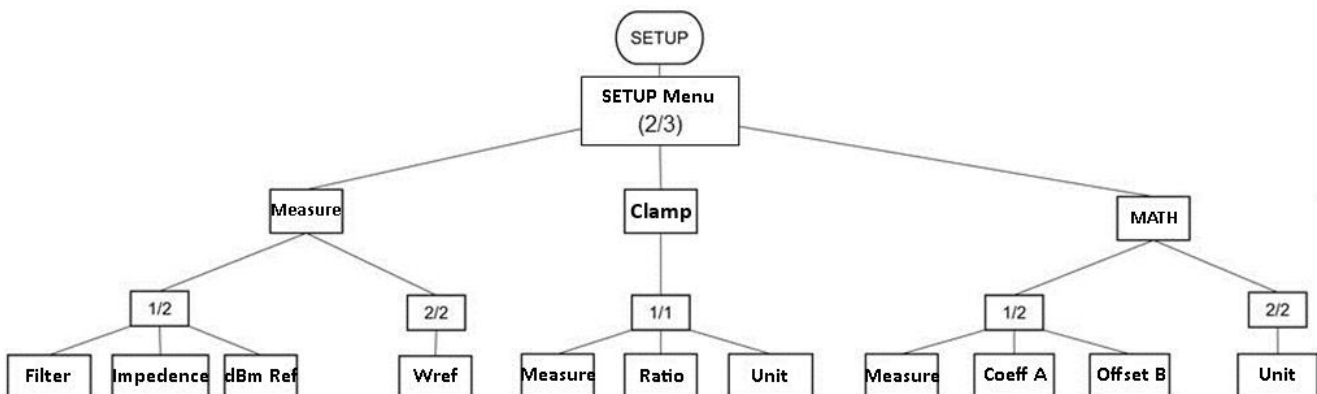
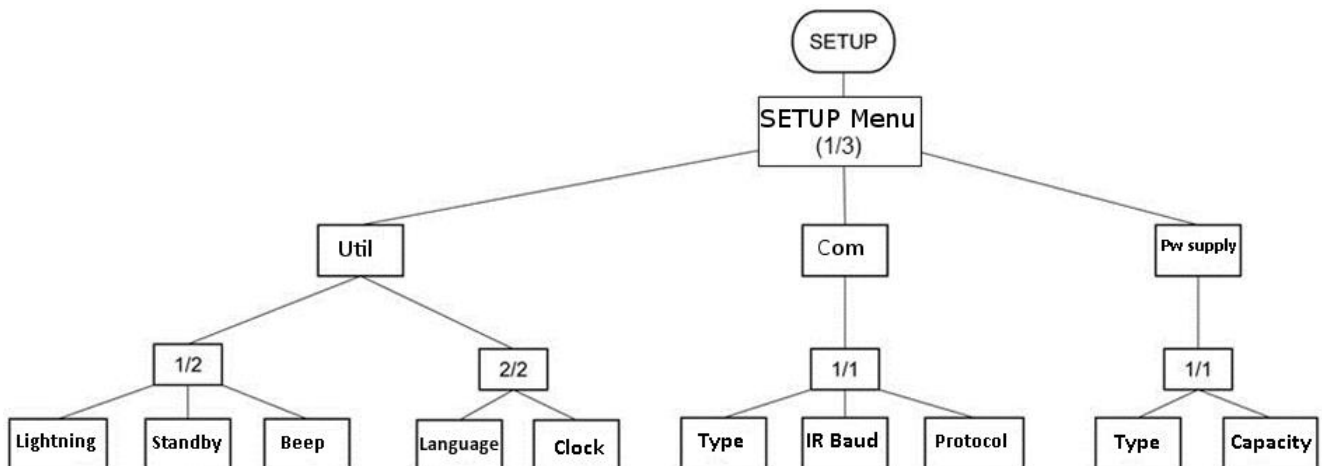
## 4. USE

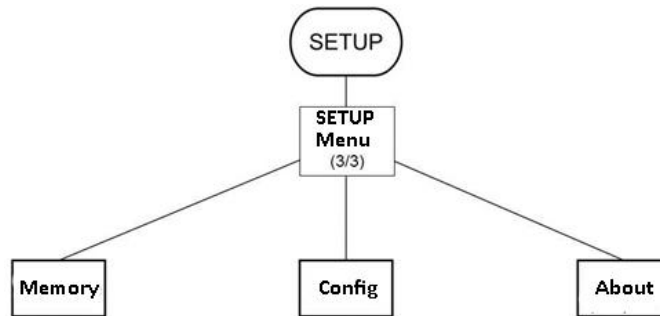
### 4.1. Description of the SETUP menu



The **SETUP** menu configures the parameters of the multimeter according to the conditions of use and user's preferences.

This menu proposes the main settings or configuration of the multimeter on **3** levels. The configurations are stored when the multimeter is switched off if the **USER (USR)** mode is active; or with the configuration frozen by the user in **LOCKED** mode. If this is not the case (**BASIC** mode), the instrument starts up with the **PLANT** configuration parameters. The menu that is not available is greyed out.





#### 4.1.1. SETUP 1/3: general configuration of the multimeter



- **Util.** : utility for adjusting the lighting, the standby mode, the audible beep of the keys, the language, and the internal clock on 2 configuration levels.
- **Com.** : for communication and adjustments of the IR/BT type, then the IR rate in baud, and the protocol, MODBUS or SCPI.
- **Pw supply** : identifies the type of internal power supply used in the instrument, either Ni-MH battery (capacity) or alkaline battery.

#### Util 1/2: Display



- **Lighting** selection of 3 levels of back-lighting of the display unit in order to limit the power consumption of the multimeter, as follows: Eco, Normal, Max  
The default level of extinction of the back-lighting is ECO, after 1min if there has been no action on the front panel of the multimeter. An internal accelerometer makes it possible to wake up the multimeter by simply touching the product with the adjustment selected.
- **Standby** validation (default: yes) or not of automatic switching off after 30 min, if there has been no action on the front panel of the multimeter.  
In the SURV, MEM, or Communication mode, automatic switching off is not validated.

For your safety, automatic switching off is disabled when the quantities measured (voltage, current) on the input exceed the danger thresholds.

- **Beep** : validation (default) or not of the emission of an audible signal (beep) when :

- a key is pressed
- there is a voltage on the "V" input exceeding 60 VDC or 25 VAC,
- a stable measurement is captured in AUTO HOLD

☞ The audible signal is maintained even when the buzzer is deactivated:

- In a continuity test
- When a range is exceeded (voltage or current)
- For a measurement of 10A or more
- When there is an incompatibility between the connections of the leads and the function selected
- When the supply voltage (battery) is too low blinking of the red batt indicator
- The audible signal is maintained when the function is changed while recording is in progress (low pitched beep)

## Util 2/2: Language and clock



- **Language** : Selection of one of the two languages loaded. Four combinations of two languages are available: English/Italian, English/Spanish, English/German, and English/French. As default, the multimeter contains English/French. The other combinations can be downloaded from: [www.chauvin-arnoux.com](http://www.chauvin-arnoux.com)



- **Clock** : Is used to set the system date and time. They are set

using the  and  keys

## Com 1/1: Communication parameters



- **Type** : IR/BT : choice of communication :

- IR/USB
- Bluetooth (if the instrument has the option)

- **IR Baud** : parameterizing of the infrared transmission rate from among 9600/19200/38400 (default) baud; the other transmission parameters are fixed (8 data bits, 1 stop bit, no parity)

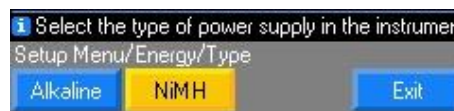
- **Protocol** : choice of MODBUS or SCPI

## Energy 1/1: Characterization of the power supply



- **Type** : choice of type :

- Ni-MH battery
- Alkaline primary battery



- **Capacity** : parameterizing of the capacity of the storage battery in mAh; the charge on the default primary batteries is 2500mAh.

1. Place the storage batteries in the multimeter, then connect the charger.
2. The LEDs light alternately around the switch to indicate that charging is in progress.
3. Press ON to switch the multimeter on and track the course of the charging by plateau.

Average charging time: 6h (with 2500mAh storage batteries).

After 1h of recharging, the multimeter is ready for measurements, by pressing ON again; the level of the plateaus acquired is valid only after a full charge of the instrument.

#### 4.1.2. SETUP 2/3: Configuration of the measurement parameters

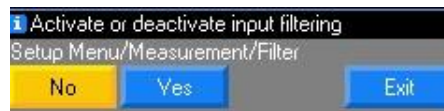


- **Measure** : configures the filter, the impedance, the reference in dBm and in power W.
- **Input** : configures the type of input, current or voltage, the ratio indicated on the clamp, and the unit (default is A).
- **Math** : configures the type of measurement assigned to the mathematical channel and the values and unit of A and B of the function  $Ax+B$ .

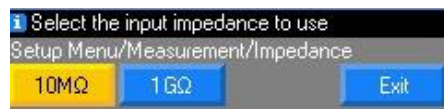
#### Measurement 1/2: Configuration of the measurement parameters



- **Filter** : 300 MHz MLI filter for measure on variator



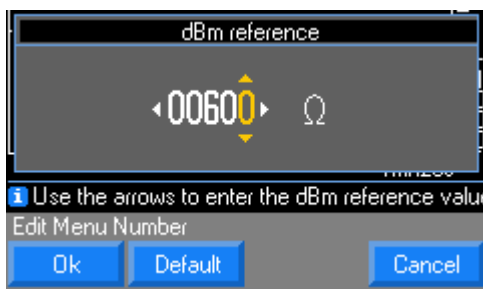
- **Impedance** : choice of desired input impedance



**10MΩ** 10 MΩ

**1GΩ** only in 100mVDC and 1000mVDC

☞ As default, 10mV range = 10MΩ, 1,000mV range = 10MΩ



- **dBm Ref** : adjustment of the reference in dBm Adjustment of the reference resistance (dBm REF) between 1Ω and 10000Ω, for measurements in dBm from voltage VAC or VAC+DC

- Selection of a digit by the navigation key and modification of the digit

- Validation of the reference resistance in dBm and exit from the menu by "Ok"

The dBm measurement calculates the power delivered to a reference resistor, referred to 1 mW. It is calculated as follows:  $P = \frac{(V_{measured})^2}{R}$ , Pref = 1 mW

$$dBm = 10 \log\left(\frac{P}{P_{ref}}\right) = 10 \log\left(\frac{1000 \times V_{measured}^2}{Reference\ resistance}\right)$$

☞ Default value 600Ω.

Reminder: a measurement of 0dBm with a reference resistance of 600Ω is made using a voltage of 0.7746 VAC.

## Measurement 2/2: configuration of the measurement parameters (cont'd)



- **W Ref** : resistive power reference W

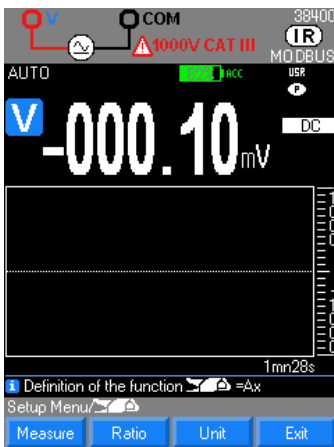
Adjustment of the reference resistance (ref) between 1Ω and 10,000Ω, for resistive power measurements. The calculation performed is:

$$\frac{(\text{measured voltage})^2}{\text{Ref (unit W)}}$$

$$(\text{measured current})^2 \times \text{Ref (unit W)}$$

☞ Default value 50 Ω.

## CLAMP 1/1: Parameterizing of the clamp function



- The **Clamp** function ( $y = Ax$ ) enables the user, measuring a current with a current clamp in:

- Volts x V/A
- Ampères x A/A

to assign the ratio (or transformation ratio) and the appropriate unit, in order to obtain a direct reading of the measured current.

Depending on the quantity measured, the device calculates the function  $Ax$  associated with it.

The programming is in 3 stages:

1. Selection of the quantity measured, Measurement (V, A)
2. Definition of the ratio A displayed on the clamp Val1/ Val2 or: xxxx.XA/xxxx.XV (default is 1A/1V)
3. Definition of the physical unit to be displayed (default is A)

☞ The ratio A and the unit can be programmed for each quantity measured (V, A).

## MATH: Parameterizing of the MATH function



- The **Math** function ( $y = Ax + B$ ) enables the user, measuring any physical quantity in:

- Volts (process 0-10V or high-voltage probe, for example)
- Ampères (4-20mA current loop or current clamp, for example)
- Frequency (measurement of flow rates, speeds of rotation, for example)
- Ohms (resistive position sensor, for example)

to convert it and assign the appropriate unit, in order to obtain a direct reading of the original quantity on the instrument.

Depending on the quantity measured, the device calculates the MATH function associated with it.

The programming is in 4 stages :

1. Selection of the quantity measured (V, A, Ω, Hz)
2. Definition of the coefficient A of the function  $y = Ax + B$
3. Definition of the coefficient B of the function  $y = Ax + B$
4. Definition of the physical unit to be displayed by the navigator (Upper-case and lower-case)

☞ The coefficients A and B and the unit can be programmed for each quantity measured (V, A, Ω, Hz).



### 4.1.3. SETUP 3/3: Configuration and customization



- **Memory** : retrieval of files, of the number of records (10,000 for the CA5292 and 30,000 for the CA5293), and of the frequency of recording (from every 0.3s up to 23:59:59).
- **Config** : choice of retrieval of the PLANT configuration, of the User (USR), Basic (default), or Locked (LCK) start-up mode.
- **About** : indicates the traceability of the multimeter: serial number, software versions and Hardware version.

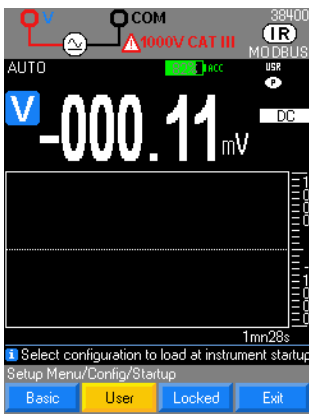
#### Memory



Reminder :

- of the files recorded
  - of the maximum number of records per file (10,000 for the CA5292 and 30,000 for the CA5293),
  - of the frequency of recording (from every 0.3s up to 23:59:59).
- ☞ A maximum of 10 recorded sequences on the CA5292 and 30 recorded sequences on the CA5293

#### Config



Choice of recall :

- **Factory** : of the PLANT configuration
- of the **Basic** (default **Basic**), **User** (**User**), or **Locked** (**Locked**) start-up mode.
  - In the **Basic** mode, the multimeter starts up in its elementary configuration (default values) and Volt function (AC+DC).
  - In the **User** mode, the instrument restarts in the configuration it was in when last switched off.
  - In **Locked** mode, the instrument restarts in the configuration it was in when locked. A password must be entered and confirmed at the time of locking. This password will enable the user to return to the **User** mode. To unlock, simply enter the password.

☞ Restart configuration given assuming no leads connected. If they are connected, the connections will be taken into account in the selection of the function.

#### About



Multimeter traceability information:

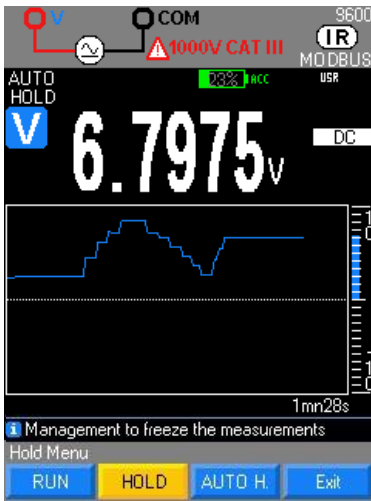
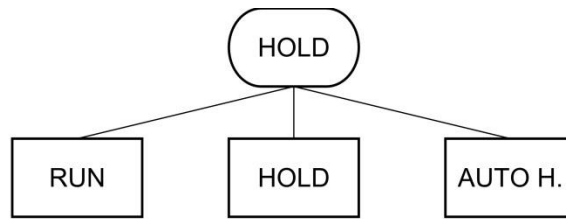
- serial no.
- software versions
- hardware version



## 4.2. Description of the "Keypad" keys

### 4.2.1. HOLD key: Management and hold of the display

#### Hold



Three operating modes are possible:

- the **RUN** mode → HOLD inactive
- the **HOLD** mode → [F2]
- the **AUTO HOLD** mode → [F3]

- The **HOLD** mode freezes the screen with the main measurement in progress and the history curve as they were when the HOLD key was pressed. The instrument continues to manage the measurements on the secondary display unit (**REL** mode).

☞ The type of range selection remains the same: AUTO or MANUAL depending on the configuration when this mode was entered.

☞ The curve resumes at zero when RUN is pressed.



- The **AUTO HOLD** mode automatically freezes on the screen the main measurement in progress each time a stable measurement is detected. It is confirmed by the emission of an audible beep (if the "No beep" configuration was not selected in the Configuration menu).

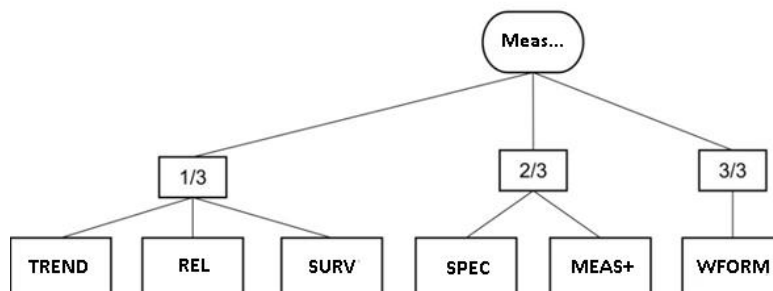
The stored values remain displayed until the next stable measurement is made (measurement different by  $\pm 100$  digits) or until the **AUTO HOLD** mode is exited by **RUN**.

The instrument continues to manage the measurements and to display them in the graphic window or on the secondary display unit (**REL** mode).

☞ The type of range selection remains the same (in AUTO or MANUAL) depending on the configuration when this mode was entered. The **AUTO HOLD** mode is available only for V and A measurements.

### 4.2.2. MEAS key: Advanced measurements

#### Meas..



## MEAS 1/3



3 levels of advanced measurements are possible

The **TREND** : selects graphic display of the screen for the quantity measured vs time. The arrows can be used to change the depth of acquisition of the graph, from

- 1mn28s to 1h13mn20s. A search for the min and max of the main measurement is made for the duration represented by one pixel horizontally. These two values are used to trace a vertical segment from the min to the max. The keys can be used to change the measurement range.

- **REL** : takes the main measurement in progress as reference. It is transcribed on the secondary display unit: REF.

- The main display continues to indicate the instantaneous measured value, as does the bargraph.

- The  $\Delta$  secondary display indicates the absolute difference between the instantaneous measured value and the recorded reference.

- The  $\Delta\%$  secondary display indicates the relative difference in % between the instantaneous measured value and the recorded reference.

Management of the ranges is "AUTOmatic" or "MANUal" depending on the configuration when the mode was entered.

The  $\Delta$  and  $\Delta\%$  display units are managed in the same range.

In the "AUTO" mode, they cannot fall below the range of the reference when the REL mode was entered.

E.g.: Measurement of a voltage of VDC with a reference set to x V:

When the mode is active, a long press on key [F1] Init or [F2] Enter Ref opens a window for setting reference REF. The navigation keys are used to modify the digits.

Reset of REF by a long press on Meas ...



- **SURV** : monitors the variations of a signal, recording the extremes (MIN, MAX) of the main measurement and calculating its mean (AVG).

For each quantity stored, the multimeter records the corresponding date and time.

When the SURV mode is entered by Start [F1], the last MIN and MAX measurements are erased, then initialized with the present measurement; to stop this mode, press [F2] stop; [F3] to look up.

AVG is the calculated mean of all measurements made since the activation of the SURV mode.

The recorded data can be looked up by pressing Look up key [F3].



In the SURV mode:

- management of the MANU or AUTO range management cannot be selected.
- the present measurement, the MIN value, and the MAX value are presented in the ranges best suited to each of them.

The recorded data are accompanied by the date and time, along with the surveillance range.

Please update your multimeter before starting a SURVeillance campaign (automatic synchronization).

Reset of the MIN/MAX values by a long press on Meas ...



**MEAS 2/3**

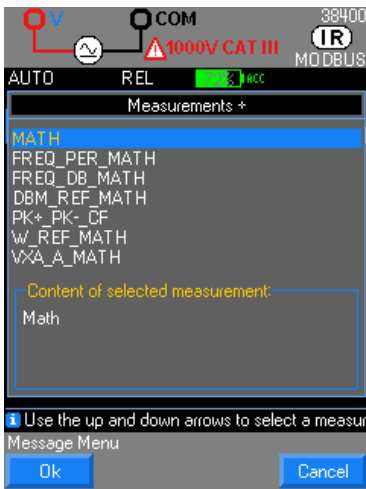


- **SPEC** : directly displays the tolerance of the measurement in progress; there is no need to search for it and calculate it.

From the main measurement, the display:

- recalls the specifications ( $x\% L \pm n D$ ) according to the type of measurement, the range selected and the frequency (in AC and AC+DC)
- calculates the range in which the true value lies, if the device is within its tolerance:

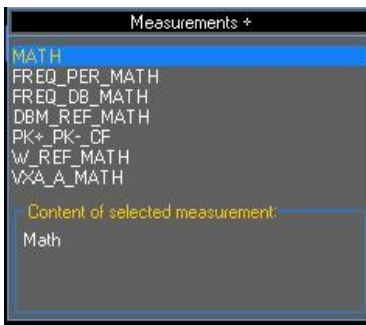
SMIN value → minimum specification  
 SMAX value → maximum specification



- **MEAS+** : gives access to the secondary measurements.

Choice of secondary functions on display units 2, 3, and 4 by selection using the navigator, according to the main measurement, and validation by OK. A long press on MEAS... is used to exit from this menu.

☞ When a main measurement is chosen, the last secondary functions selected are reactivated.



Opposite, example of measurements available in VAC+DC.

When **dB** measurements are activated, the value currently measured is taken as reference voltage (V ref). The calculation is as follows:  
 $20 \log_{10} (V \text{ measured} / V \text{ ref})$ .

☞ The reference voltage (V ref) can be reset by a long press on Meas...

The MATH function is displayed when its parameters allow (see the MATH Function menu).

For dBm measurements and resistive power calculations, refer to the menu for the adjustment of the associated reference resistances (**dBm REF**, **W REF**) and the calculation formulas. See SETUP 2/3.

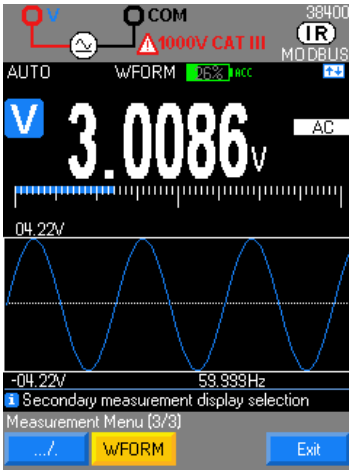


The power calculation **VxA** (VA) requires a third connection on the A input (connected to the same circuit), in order to measure simultaneously:


- the voltage (main display unit)
- the current (display unit 3), measurement always made in AC+DC.

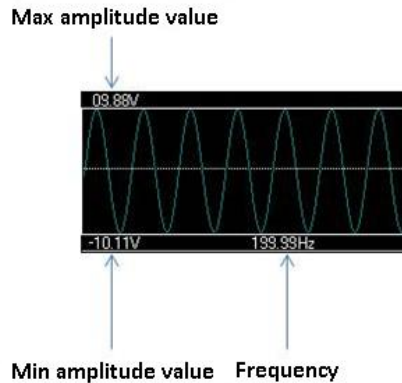
The link to the COM input must be short and of large diameter, in order to limit the voltage drop, which influences the Volt measurement.

**MEAS 3/3**

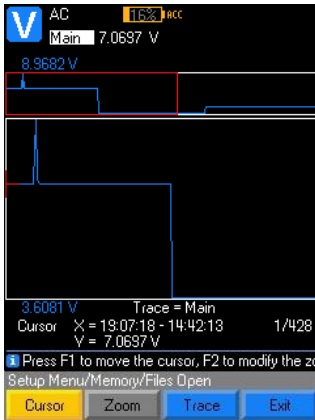


- **WFORM** : The WFORM mode is available only in AC, for frequencies between 10 and 600Hz. It is used to display waveforms. When the frequency does not lie within the measurement interval, or cannot be measured, the multimeter indicates "Frequency out of bounds...". In the other failure cases, the multimeter indicates "Automatic adjustment failed".

With weak signals, it may be necessary to change to **MANUAL** mode to reach the most sensitive ranges using the s.



**4.2.3. Mem key: storage of the measurements, recording mode**



- The MEM mode records the content of the digital display(s) in the memory of the device at a pre-programmed rate.
  - A short press on **Mem...** starts a recording series.
  - The MEM symbol is displayed in yellow during the whole recording period; it is accompanied by the number of records made.
  - Another short press on **Mem...** stops the storage of the measurements and displays the file name entry menu.
  - Pressing OK or Cancel without entering a name assigns the default file name YYYYMMDD\_HHMMSS.
  - The number of values to be stored for a measurement campaign can be programmed: recording then stops automatically.
  - The records and the configuration can be looked up by a long press on **Mem...**
- Another press on **Mem...** recalls a series of records.

Recording capacity 30 000 measurements	CA5293	30 000 measurements maximum per sequence	1 à 30 sequences (depending on memory available)
	CA5292	10 000 measurements maximum per sequence	1 à 10 sequences (depending on memory available)

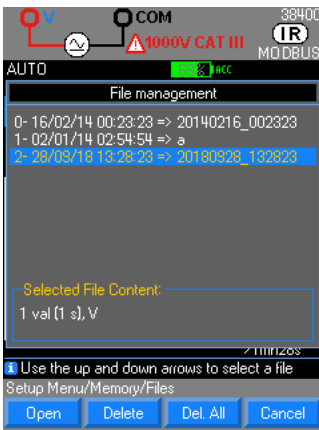


In this stage, it is possible to list the files and to configure the maximum number of records according to the version and the recording frequency or interval (1s is default).

- Select the Files menu in the MEM function to display the list of successive records.
- Each record is identified by its date and its start time.

The default name can be changed; entering a 16-character file name is proposed

- Look-up of the recorded files under [F1] Files and selection by the navigator, then possibility:



- of opening the selected sequence [F1],
- of deleting a selected sequence [F2],
- of deleting all recorded sequences [F3]
- Select the Files menu in the MEM function to display the list of successive records.

Each record is identified by its date, its start time, and the name entered by the user.

The selection of a record is accompanied:

- by the number of values recorded,
- by the recording interval
- by the function in which they were made,
- by the secondary functions present during the recording, if any.

The number of recording sequences is limited to 10 or 30 depending on the version of the instrument.

- Programming the number of records

Defining a number of records for a measurement campaign makes it possible to stop recording automatically.

Selection of the max number of records using the navigator (30,000 or 10,000 measurements max.); as default [F2], 10,000 records

If **MEAS+**, **SURV**, or **REL** secondary measurements are programmed, it will be necessary to make allowance for them in the depth of recording selected.


- Programming the recording frequency
- Selection of the digit to be modified by the navigator key.
- Modification of the value by the keys:



Validation of the number of records by **Ok** [F1]



Validating **Freq.** by the [F3] key opens a menu for adjustment of the recording interval in hours, minutes, seconds

- Modification of the value using the  keys of the navigator
- Validation of the interval of recording of the measurements and exit from the successive menus by the Ok key [F1].

The recording rate is from every 0.3s to 23h, 59min, 59s.

Default recording interval 1s.



- Recall of a recording campaign

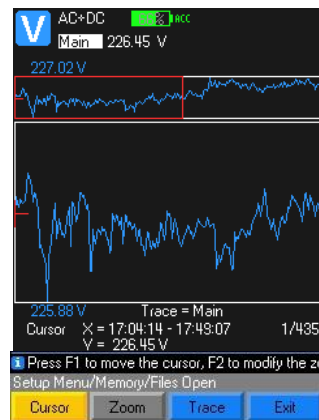
The curve displayed is adapted to the graphic window according to its min. and max. values and the number of records.

- Selection of the Main function, by default, and display with Cursor selected.
- Displacement of the cursor by the navigator
- moves the zoomed part (icon present, if a zoom is active)
- activates, deactivates a zoom (icon present, if a zoom is possible)
- Zoom of the trace by selection of the zone in red border in the upper part of the record
- But access to the secondary measurements to be displayed by pressing TRACE, then selection by keys [F2] to [F4],
- Selection of the function to be displayed

Example :

- Main function : **V**
- Secondary function : **FREQ, dB, MATH**

If storage has been started, MEM is incremented. A change of function is impossible, and an



attempt is reported by a low-pitched beep. Only the SETUP menu can still be opened. The acquisition in progress must be stopped (press MEM) to modify a parameter, a function, or a configuration.

#### 4.2.4. Range key : Management of ranges



Three operating modes can be accessed by the key: **Range** :

- the AUTO mode → [F1]
- the AUTO Pk mode → [F2]
- the MANUEL mode → [F3]

- When a measurement is being acquired, the AUTO mode is active as default and range selection is managed automatically by the multimeter.

☞ To limit the risk of measurement instability, the 100mV range is not managed in the **AUTO** mode, but only in the **MANUAL** mode.

- In the AUTO PEAK mode, changes of range occur only when the acquisition of a higher peak makes a higher range necessary.

☞ The AUTO PEAK mode is available only on AC and AC+DC measurements in V and A. It avoids the untimely overshoot of the peak factor specified for the instrument.

- When the MANUAL mode is selected and it is valid for the function concerned,



the keys of the navigator allow a change of the measurement range.

Measurements concerned: voltage, current (in series or clamp), resistance, capacitance

### 4.3. Communication interfaces

The multimeter can communicate with a PC, making it possible:

- to update the embedded software → Connect the multimeter to the computer via the USB link and run the application downloaded from the CHAUVIN ARNOUX web site.
- to calibrate the multimeter using the optional SX-MTX 329X calibration software (HX0059B).
- to program using Labview and Labwindows
- to recover the data or program the device using the SX-DMM software (USB, Bluetooth)

The multimeter (Bluetooth version) communicates with smartphones and tablets, making it possible:

- to track and display the history of measurements via the ASYC IV DMM application, which can be downloaded free from Google Play Store.

Your multimeter includes:

- an isolated optical USB link (type HX0056Z)
- SX-DMM processing software
- Labview and Labwindows drivers to program the devices.

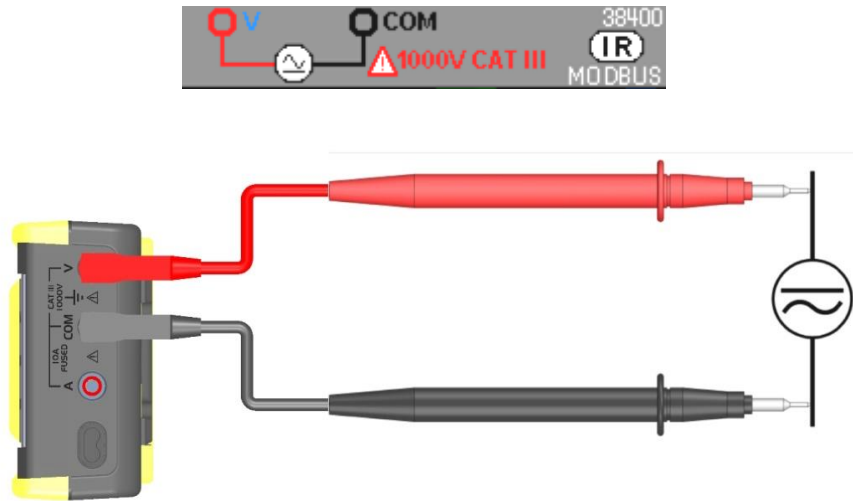


It is also possible to program the instrument using the SCPI or MODBUS protocol.

# 5. MEASUREMENTS

## 5.1. Voltage measurement

### 5.1.1. Connecting the multimeter



### 5.1.2. Main measurement



In this setting, the user can measure the true RMS value of an alternating voltage with its bias component (no capacitive coupling): "TRMS" measurement. (default coupling is AC+DC)



In the "DC" mode, you measure a direct voltage or the DC component of an AC voltage.

Selection of the coupling from among:

- alternating voltage measurement AC [F1]
- direct voltage measurement DC [F2]
- alternating voltage superposed on a direct voltage AC+DC [F3] at high impedance
- low-impedance alternating voltage **LowZ** [F4] to make measurements on electrical installations, in order to avoid the measurement of a "phantom" voltage due to coupling between lines.

### 5.1.3. Secondary measurements

Pressing Meas... gives access to the secondary measurements **MEAS+** of the main function.

1. in VAC+DC and VAC

- the frequency, the period, and the mathematical function:
- the frequency, the measurement in dB, and the mathematical function:
- the power measurement in dBm, its reference, and the mathematical function:
- the measurement of Peaks+ then – and the peak factor:
- the resistive power, its reference, and the mathematical function:
- the power VxA, the current A, and the mathematical function:

FREQ\_PER\_MATH  
 FREQ\_DB\_MATH  
 DBM\_REF\_MATH  
 PK+\_PK-\_CF  
 W\_REF\_MATH  
 VxA\_A\_MATH

2. in VDC :

- the mathematical function:
- the resistive power, its reference, and the mathematical function:
- the power VxA, the current A, and the mathematical function:

MATH  
 W\_REF\_MATH  
 VxA\_A\_MATH

3. in VLowZ

- the mathematical function:
- the frequency, the period:

MATH  
FREQ\_PER

Range

The 100mV range is present only in MANUAL mode, by Range. In all cases, "OL" is displayed above 1050V and a beep sounds when the measurement exceeds 600V. The hazardous voltage symbol is displayed if "V" exceeds 60 VDC or 25 VAC



#### 5.1.4. Waveform & trend



During an AC voltage measurement, the waveform of a signal at a frequency between 10 Hz and 600 Hz can be viewed using the WFORM function.

As default, the GRAPH mode displays the trend curve of the quantity measured (default time base 1min28s) vs time.

#### 5.1.5. Procedure



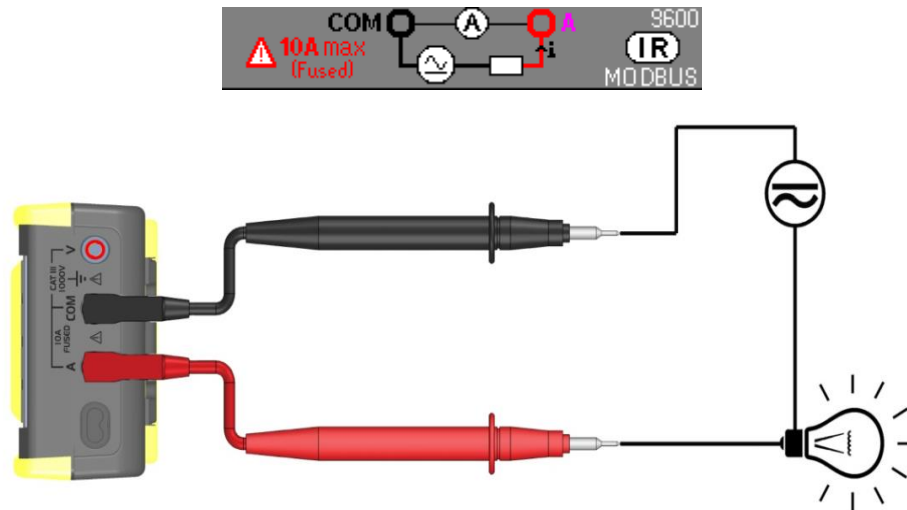
1. Press on the V function, then select the coupling according to your measurements: AC, DC, AC+DC, LowZ (AC is default).
2. Connect the black lead to the COM terminal and the red lead to V.
3. Read the measurement indicated on the display unit; the graph of trend values >1min28s is displayed on the screen or selection of secondary measurement **Meas.../MEAS+** (4 display units max).
4. It is possible to activate an MLI filter (**SETUP/Measurement/filter/yes**) for measurements on a variator: the cutoff frequency of the filter <300Hz.
5. It is possible to display the **specifications** of the range for metrology or a RELative measurement.
6. Surveillance of voltage by activation by **Meas.../SURV**
7. Recording of data internal to the multimeter:
8. Display the waveform of a signal in the 10Hz – 600 Hz band

- Mem → to start the campaign
- Mem → to stop the campaign then look-up of the data by long press on Mem ...
- Processing of the measurements: plot of the main measurement and display of the secondary measurements.



## 5.2. Direct measurement of current

### 5.2.1. Connecting the multimeter



### 5.2.2. Main measurement A in series in a circuit



The current is the flow of electrons through a conductor. To measure the current, you must open the circuit to be checked and connect the inputs of the multimeter in series in the circuit.

Selection of the coupling from among:

- alternating current measurement AC [F1]
- direct current measurement DC [F2]
- alternating current measurement superposed on a direct voltage AC+DC [F3], at high impedance



When the device is in use in the 10A range, it can withstand an overload of 20% for one hour. A overload of 20A is acceptable for 30 seconds max., with a pause of at least 5 minutes between measurements.

Reminder : Breaking capacity of the fuse = circuit 11A/1000V/>18kA

### 5.2.3. Secondary measurements

1. in IAC and IAC+DC :

- the MATH function associated:
- the frequency, period and MATH function :
- the Pk+ then Pk- measurement and crest factor :
- the resistive power, its reference and MATH function :

MATH  
FREQ\_PER\_MATH  
PK+\_PK-\_CF  
W\_REF\_MATH

2. in IDC :

- the MATH function associated:
- the resistive power, its reference and MATH function :

MATH  
W\_REF\_MATH

### 5.2.1. Waveform & trend



During an AC current measurement, the waveform of a signal at a frequency between 10 Hz and 600 Hz can be viewed using the **WFORM** function

As default, the GRAPH mode displays the trend curve of the quantity measured (default time base 1min28s) vs time.

## 5.2.2. Procedure

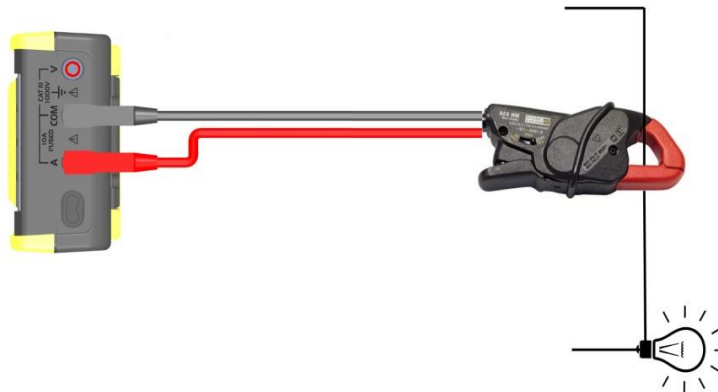


1. Press function A, then select the coupling according to your measurements: AC, DC, AC+DC (AC+DC is default)
2. Connect the black lead to the COM terminal, the red lead to A, and the probe tips in series between the source and the load as shown below:
3. Read the measurement indicated on the main display unit. Look up the graph of the trend values >1min28s if it is activated. Look up the secondary measurements if they are activated (activated by Meas... → MEAS+).
4. It is possible to display the specifications of the range for metrology or a RELative measurement.
5. Surveillance of voltage **SURV** or Recording **MEM** of data internal to the multimeter  
"OL" is displayed if the current available  $I > 20A$ .
6. View the waveform of a current in the 10 Hz – 600 Hz band

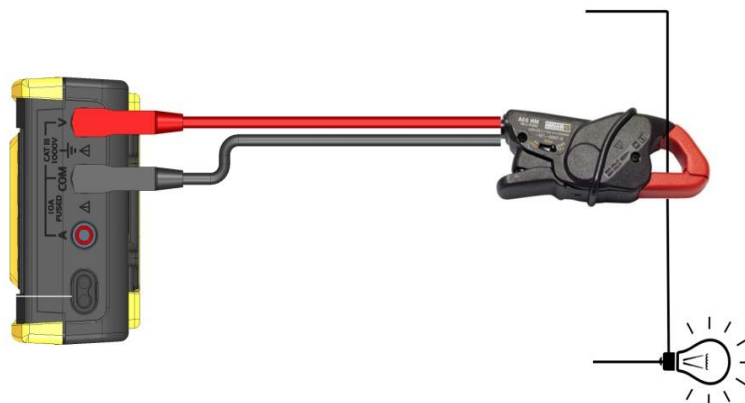
## 5.3. Current measurement with clamp

### 5.3.1. Connecting the multimeter

#### Current clamp with current output connected to the multimeter



#### Current clamp with voltage output connected to the multimeter



### 5.3.2. Main measurement



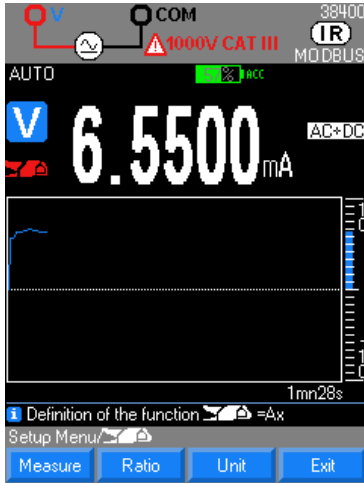
To avoid opening a circuit, we recommend measuring the current with a current clamp, output A or V (Ax function).



The clamp function includes a precise ratio  $xxx.XA/xxx.XV$  or  $XA$ , making it possible to connect a broad range of current clamps that you will find in the CHAUVIN ARNOUX catalogue; it is however necessary to verify that the input/output range of the clamp matches the ranges available on the multimeter.

The accuracy of this "clamp" function depends on the accuracy of the clamp and of the range used on the multimeter.

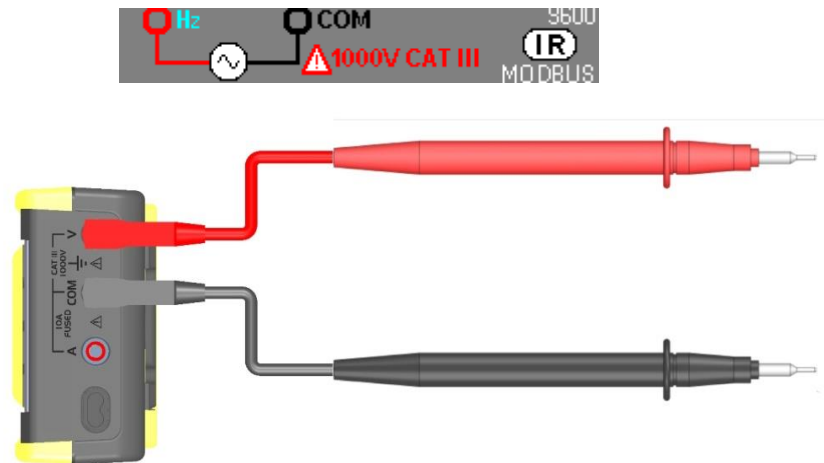
### 5.3.3. Procedure



1. Activate the clamp function and, depending on the type of clamp connected, double-press "Clamp" or use the setup/clamp menu specify the coupling.
2. Select the type of Measurement clamp output (V, A)
3. Define ratio A displayed on the clamp Val1/Val2 or xxxx.Xa/xxxx.Xv (by default 1A/1V) to be incorporated (Ok to Validate, or Cancel).
4. Define the physical unit to be displayed (default: A): 3 programmable fields

## 5.4. Frequency measurement

### 5.4.1. Connecting the multimeter



### 5.4.2. Main measurement



Select the Hz function to measure the frequency of the voltage  
 Measurement of the period is accessible as a secondary measurement  
 If the MLI filter is activated, the frequency that can be measured remains within the pass band limit of the 300Hz filter.  
 Below 10Hz, or if the signal is too weak, the value is forced to "--"  
 Possibility of selection of the range by "Range+ or --" or of the manual freq. F <200kHz (default) or F >200kHz

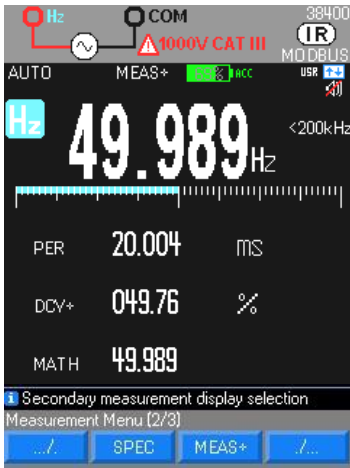
### 5.4.3. Secondary measurements

Pressing **MEAS+** gives access to the measurements of the main function:

1. DUTY CYCLE :duty cycle DCY+ or DCY-
2. CNT+ et CNT- :counting of pulses
3. PW+ et PW- :pulse width

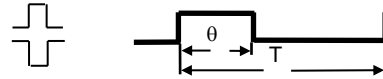
- the mathematical function associated: **MATH**
- the period, the positive duty cycle and the mathematical function: **PER\_DCY+\_MATH**
- the period, the negative duty cycle and the mathematical function: **PER\_DCY-\_MATH**
- the positive pulse width, the counting of positive pulses, its reference and the mathematical function: **PW+\_CNT+\_MATH**
- the negative pulse width, the counting of negative pulses, its reference and the mathematical function: **PW-\_CNT-\_MATH**

### Duty cycle



Display of the measurement in % of a logical signal (TTL, CMOS, etc.)

DCY+ duty cycle =  $\theta$   
 DCY- duty cycle =  $T - \theta$



The DCY duty cycle mode is optimized to measure the active or inactive intervals of switching signals or logical signals. Electronic fuel injection systems and switching power supplies, in particular, are controlled by pulses of variable width that can be verified by a duty cycle measurement.

### Pulse counting



Depending on the triggering conditions of the frequency counter, calculation of the positive or negative pulses

Minimum pulse duration 5µs

Counting up to 99999

Triggering threshold 10% of range except for range 1000 VAC

This threshold is positive in  $\square$ , negative in  $\sqcup$

👉 Reset of CNT by long press on MEAS... For negative events, cross the leads.

The pulse width function  $\theta$  measures the duration during which the signal is low or high. The waveform measured must be periodic; its curve must repeat at intervals of equal duration.

### Pulse width



Depending on the triggering conditions of the frequency counter, measurement of the pulse width in ms.

Resolution 10µs

Minimum pulse width 100µs

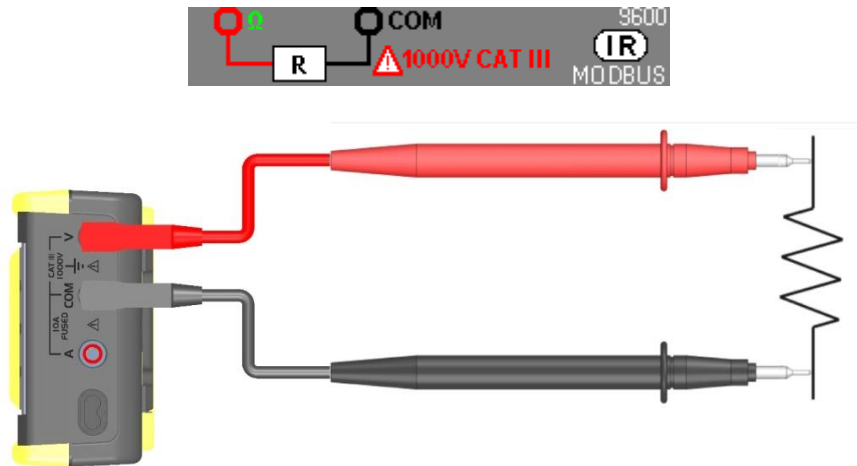
Accuracy 0.05% ±10µs Maximum duration of a period 12.5s

Triggering threshold 20% of the range except for the 1000 VAC range

For negative events, cross the leads.

## 5.5. Resistance measurement

### 5.5.1. Connecting the multimeter



### 5.5.2. Main measurement



The multimeter measures resistance (opposition to the flow of current) in ohms ( $\Omega$ ). For this purpose, it sends a weak current through the measurement leads to the circuit being tested. The input (+, COM) must not have been overloaded by the accidental application of a voltage on the input terminals with the switch set to  $\Omega$  or T°.

- Selection of range: automatic or manual
- "Active" protection: by PTC thermistor
- Measurement voltage: approx. 1.2V
- Max. open-circuit voltage: 4 V typ.

Because the measurement current of the multimeter takes all possible paths between the probe tips, the resistance measured in a circuit is often different from the nominal resistance.

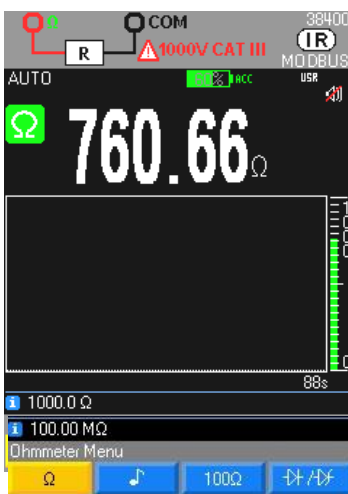
The measurement leads can add from 0.1 $\Omega$  to 0.2 $\Omega$  of error to resistance measurements. To test the leads, touch the probe tips together and note the resistance of the leads.

To eliminate the resistance of the leads from the measurement, keep the probe tips together, press the Meas... function key, then REL, and integrate this measurement as REF.

A MATH secondary measurement is active in resistance measurement.

All measurements made then indicate the resistance between the probe tips.

### Ohm

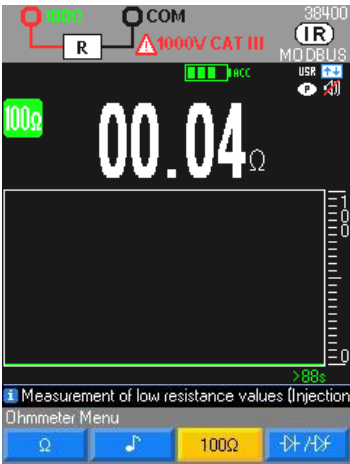


In the 50 M $\Omega$  range, in order to avoid the influence of the mains and guarantee the stated specifications, it is best to disconnect the multimeter from the Wall Plug to avoid perturbations.

For measurements greater than 10 M $\Omega$ , a shielded lead is recommended.

For a 2-wire link, use very short wires (<25cm) and twist them together.

**100 Ohm measurements**



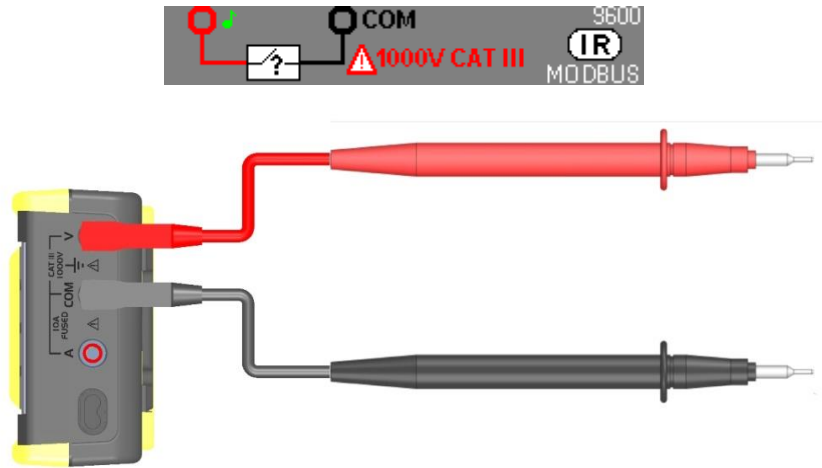
Press the F3 key to access this function.

So as not to damage the circuit tested, note that the multimeter provides a current of approximately 10mA max. at an open-circuit voltage of 28 volts max.

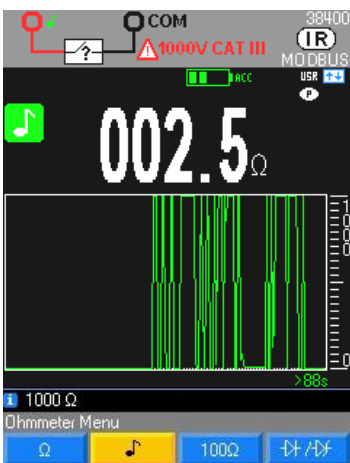
For low resistance measurements, <100 Ohm, this single range provides good resolution.

**5.6. Audible continuity measurement**

**5.6.1. Connecting the multimeter**



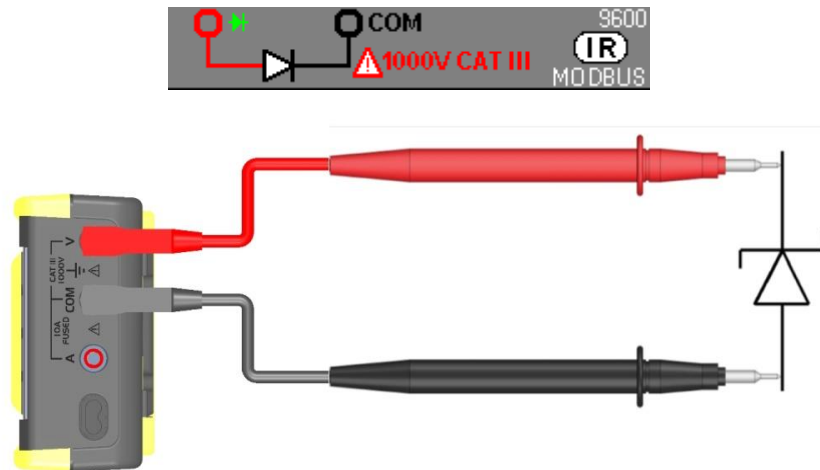
**5.6.2. Main measurement**



Measurement of a resistance up to 1000Ω , with continuous 4kHz audible indication.  
 Power the circuit down before making any measurement.  
 The continuity test monitors the circulation of the current in a complete resistive circuit. The continuity function detects open-circuits and intermittent short-circuits lasting as little as one millisecond.  
 If a short-circuit is detected, an audible beep sounds. If the circuit is open, **OL** is displayed.  
 Detection threshold in continuity mode: ≈ 20Ω (response time <10ms)  
 "Active" protection by PTC thermistor  
 Max. open-circuit voltage: 3.5V.

## 5.7. Diode test

### 5.7.1. Connecting the multimeter



This function performs a diode forward voltage check to verify:



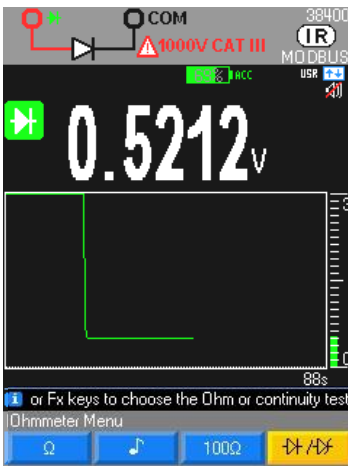
- diodes,
- transistors,
- silicon-controlled rectifiers (thyristors)
- and other semiconductor components.

This function tests a semiconductor junction by passing a current through it and measuring the voltage drop across the junction.

Indication of the junction voltage in the forward direction from 0 to 2.1V in a single range (10V range): forward polarization.

### 5.7.2. Main measurement

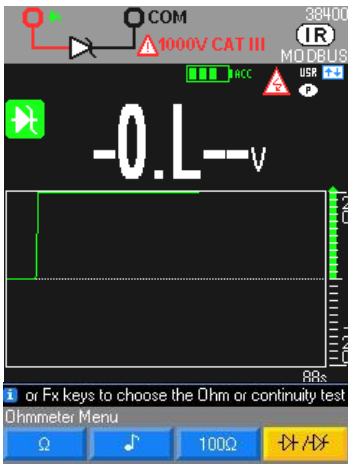
**4V**



Reading of the threshold voltage; if the circuit is open or the threshold of the diode >4V, the indication is OL.

forward polarization of diode

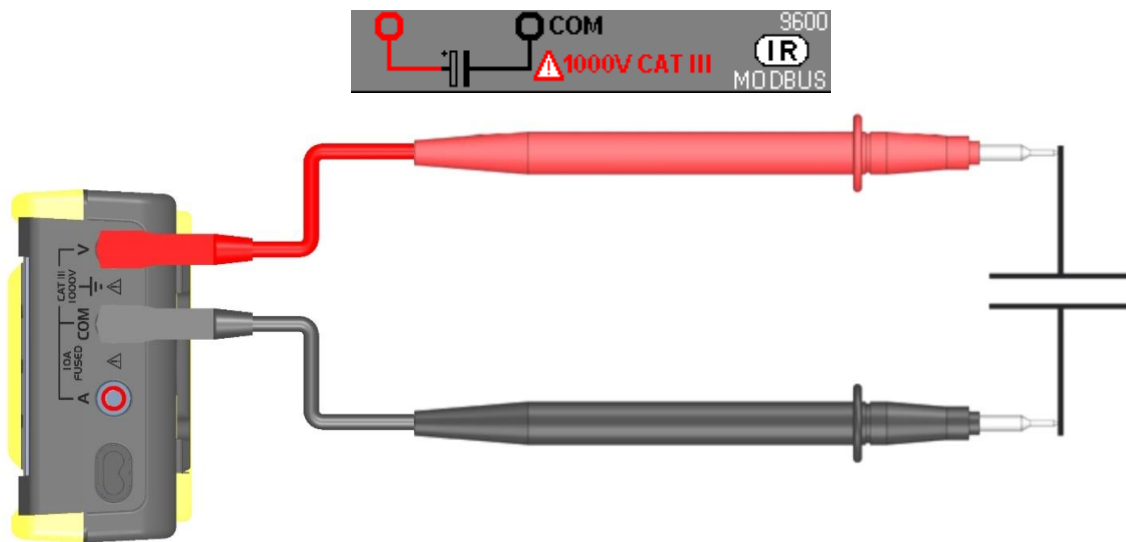
## 26V



Zener diode or LED: selecting this diode applies the same function as for the diode above but with a maximum voltage of 26V and a maximum current of 10mA.

## 5.8. Capacitance measurement

### 5.8.1. Connecting the multimeter



### 5.8.2. Main measurement



Capacitance characterizes the ability of a component to store an electric charge. The unit of capacitance is the farad (F). Most condensers/capacitors lie within the range from nanofarads (nF) to microfarads ( $\mu\text{F}$ ). The multimeter measures capacitance by charging a capacitor with a known current for a known time and measuring the resulting voltage. The result is the capacitance.



Measurement of the capacitance of a capacitor with a resolution of 1000pts "Run" appears when the measurement is in progress.

With large capacitances, the display of "RUN" lasts longer.

"OL" is displayed if the value to be measured exceeds the range limits or if the capacitor is short-circuited.





AUTO range selection, automatic (default) or manual: Range + or Range -  
 “Active” protection by PTC thermistor  
 Maximum open-circuit Voltage: 1V typ., 4V max.  
 Use the REL function for values <10% of the range in order to restore the residual zero (compensation for the capacitance of the leads)  
 🖐 For measurements <10nF, a shielded lead is recommended. For a 2-wire link, use very short wires (<25cm) and twist them together. Use the REL function to compensate for the error introduced by the measurements leads. In REL mode, changes of range are not available.

## 5.9. Temperature

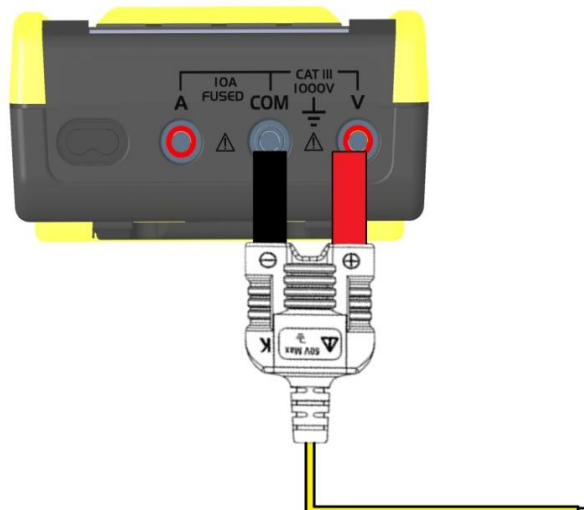
### 5.9.1. Connecting the multimeter



#### Connecting Pt100/Pt1000



#### Connecting a K or J thermocouple with the temperature compensated plug (optional)



## 5.9.2. Main measurement

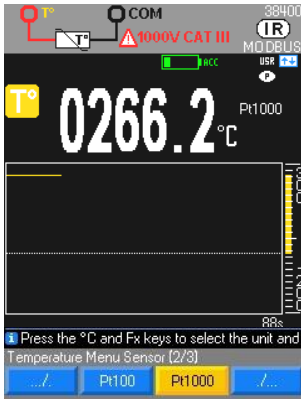
To measure a temperature:



1. Connect the sensor to the V and COM terminals, making sure to get the polarity right.
2. Choose the unit: °C (Celsius), K (Kelvin) or °F (Fahrenheit).
3. Select ".../...".
4. Choose the type of sensor Pt100, Pt1000, TCJ, or TCK.

If "OL" is displayed, the sensor is open-circuit or the measured value exceeds the range limit.

### 2 presses T°




Measurement of the temperature with a sensor: Pt100/Pt1000.  
 "Active" protection by PTC thermistor To connect a 2-wire PT probe to the multimeter, we recommend the use of the PT100 probe module → HX0091.

### 3 presses T°



Measurement of the temperature in °Celsius using a thermocouple between the V and COM terminals

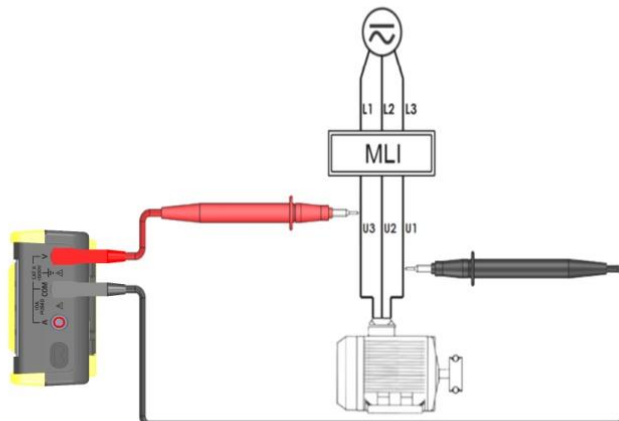
K thermocouple from -40°C to +1200°C or TCJ (J thermocouple) from -40°C to +750°C  
 Without a TK thermocouple, you can determine the ambient temperature inside the multimeter with a bridge between the V and COM terminals.

The  keys of the navigator are used to change the scale of the graphic window. The scale selected is transcribed in the help line.

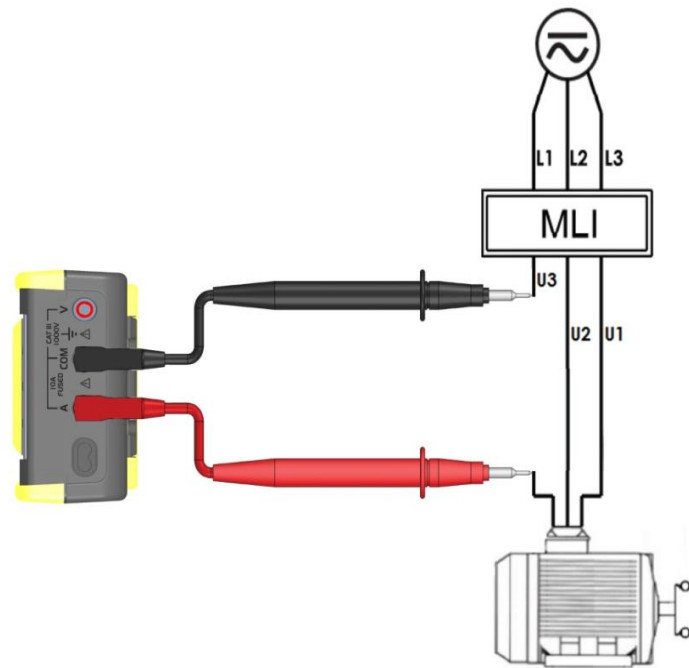
## 5.10. Measurement on an MLI type speed variator

### 5.10.1. Connecting the multimeter

#### Connecting the multimeter to filter a voltage >300 Hz



**Connecting the multimeter to filter a current >300Hz**



**5.10.2. Main measurement**



The multimeter has a low-pass AC filter that blocks voltages or currents at undesirable frequencies. The MLI filter is activated as follows: Setup → Measurement → Filter YES: a symbol then appears on the screen.

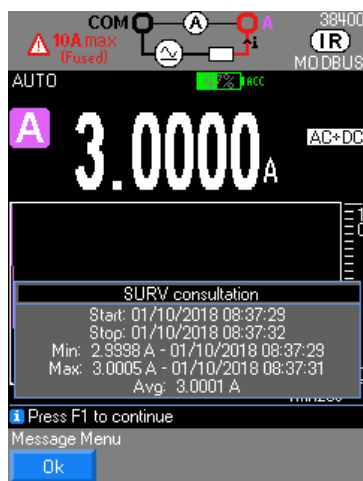
The multimeter continues the measurements in the chosen mode, AC, AC+DC, or VlowZ, but the signal goes through a filter that blocks undesirable voltages >300Hz. The low-pass filter improves measurement performance on the composite sinusoidal signals often generated by inverters and variable-speed motors.

**5.11. Surveillance mode**

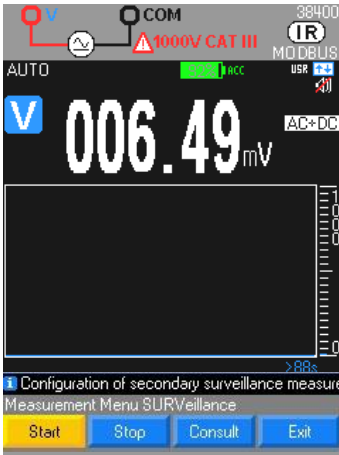


The SURV mode (available under MEAS...) monitors the variations of a signal, recording the extremes (MIN and MAX) of the main measurement and calculating its mean (AVG).

For each quantity stored, the multimeter records the corresponding date and time. This mode is active for the following functions: V, Hz, Ohm, clamp, capacitance, temperature, and current.



The SURV look-up screen is not saved. You must take a screenshot (Print Scrn) to record it.



Integration time at least **200ms**, programmable according to your configuration: **Start** → **Stop**, then look-up of the quantities on the screen, in a specific window.

It is possible to recover a screen grab of this window under our SX-DMM software, but this mode cannot be stored in the instrument.

☞ Reset of the MIN/MAX values by a long press on MEAS...

### Peak



The rapid peak measurements are available in the **MEAS**, **MEAS+**, **PK+** and **PK-** secondary measurements for the following measurement functions: V and A (AC, AC+DC); integration time less than **250µs**.

☞ Reset of the values by a long press on MEAS...

## 5.12. Graphic mode

It is accessible by default in **Meas...** → **Graph** and is used to display a change in the quantity measured with respect to a fixed time scale adjustable from 1mn28s to 1h13mn20s by pressing the left and right arrows; the vertical scale is automatic or manual (range selection).

This mode is available in all main measurement functions.

## 5.13. Relative mode



This mode indicates that the value displayed is relative to a reference value. It is available for the following measurement functions: V, Hz, Ohm, clamp, capacitance, temperature, and current.

Reset the Ref to the current value by a long press on **MEAS...**

## 5.14. SPEC mode



Using the internal technical specifications of the multimeter, the **SPEC** mode directly displays the tolerance on the measurement in progress, with no need to look for it and calculate it.

This mode is very useful for the metrology of the instrument.

## 5.15. MEAS mode

It gives access to the secondary measurements of the main measurement: a maximum of 3 secondary measurements can be displayed.

This mode is available in **MEAS...** → **MEAS+** for the following measurement functions: V, Hz, Ohm, and current.

## 5.16. MATH mode

The MATH function  $y = Ax + B$  (A and B configurable in **Setup** → **Math** → **Coeff A** and **B**) enables the user, measuring an arbitrary physical quantity in:

- Volts (⚡ e.g.: process 0-10V or high-voltage probe)
- Amperes (⚡: 4-20mA current loop or current clamp)
- Frequency (⚡: measurement of flow rates, speeds of rotation)
- Ohms (⚡: resistive position sensor)

to convert it and assign the appropriate unit so as to obtain a direct reading of the original quantity on the instrument.

It is available via **Meas...** → **MEAS+** → **MATH** under the following measurement functions: V, Hz, Ohm, and current.

# 6. BLUETOOTH

The multimeters with the BT option are equipped with a Bluetooth module with classic 2.1 BR/EDR connectivity and a max. transmission power of 1.55dBm. The frequency band used is [2400; 2483.5]MHz. They include the Serial Port Profile service, making it possible to communicate with a computer having any type of Bluetooth adapter, a smartphone, or a tablet.

If your computer does not have a Bluetooth module, the USB/Bluetooth adapter for PC (ref. P0 1102112) will be necessary. For the installation of these drivers, refer to the data sheet that comes with them.

Virtual RS232 serial communication between the multimeter (Server) and the PC (Client) requires the creation of a connection at the PC end.

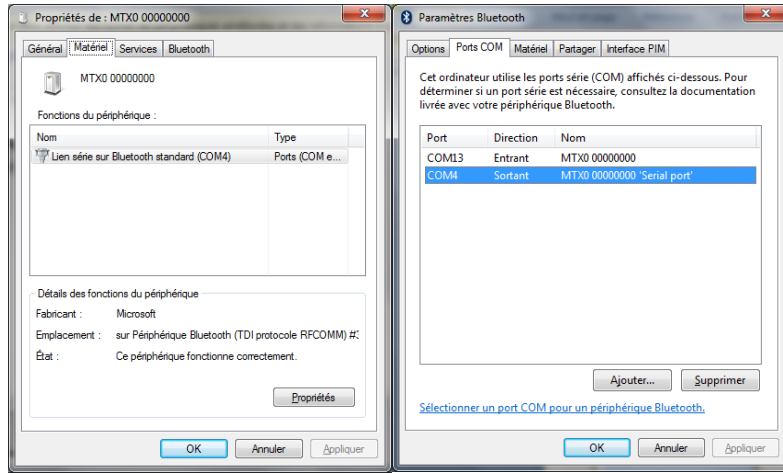
No configuration is necessary at the multimeter end, other than activation of Bluetooth communication (**BT**) using the **Comm.** function in the "Util" menu.

You only need to activate BT to communicate with an Android peripheral.

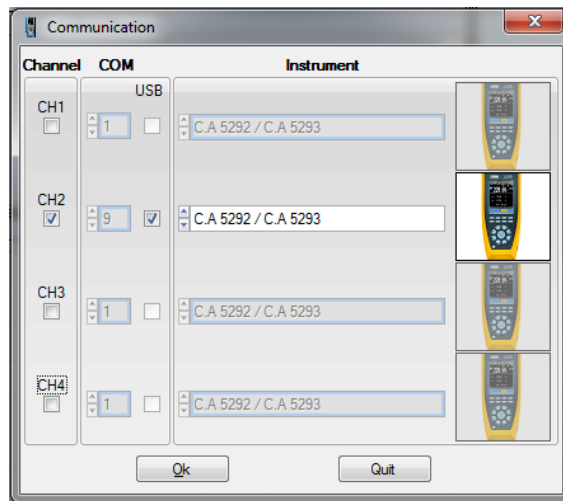
## 6.1. Upon first connection only

1. Switch the multimeter on.
2. Configure it for Bluetooth (BT) in the setup menu.
3. Create a new connection with the software driving your Bluetooth module at the PC end by:
  - clicking the Bluetooth Manager icon of the menu bar at the bottom of the screen
  - selecting the "Add a peripheral" function
  - selecting the Bluetooth peripheral of the multimeter, then clicking Next
  - clicking Next after configuring a COM port number x

You can verify that the connection has in fact been created by viewing the icon associated with the multimeter in the window. For more information, refer to the Help menu that comes with the Bluetooth utility.

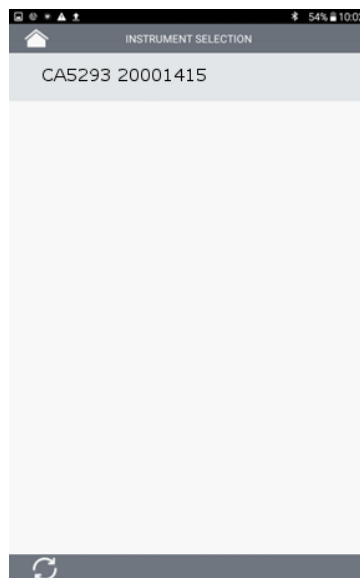


## 6.2. Configuration of the link under SX DMM



With some Bluetooth adapters, a reboot of the PC is recommended to validate the connection. The connection parameters are specific to each multimeter. They must be assigned manually, the first time only.

## 6.3. Configuration of the link with the ANDROID ASYC IV DMM application



Activate the Bluetooth function and the MODBUS protocol on the multimeter. The connection is initiated by pressing the name of the instrument when it is displayed.

## 6.4. Reactivation of the connection after an interruption or to look up the COM port number

- Click the Bluetooth Manager icon of the menu bar at the bottom of the screen.
- Click the icon associated with the multimeter in the peripheral management window and note the COM port number created


## 6.5. Communication with several multimeters

The USB/Bluetooth adapter for PC makes it possible to communicate with several CA multimeters at once. The connection procedure above must be repeated for each multimeter and a different COM port assigned to each of them.

# 7. SX-DMM Software

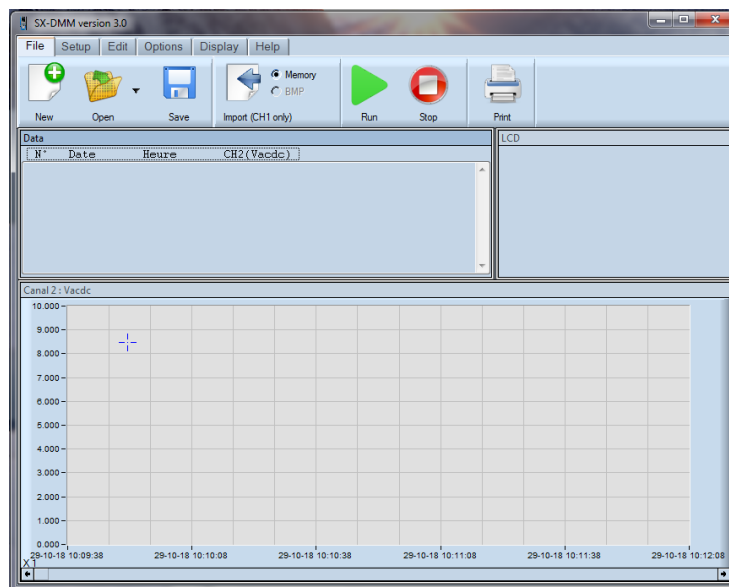
These multimeters can interface directly with a computer or with a Windows tablet running the SX-DMM acquisition software: In the "**General adjustments**" menu of the multimeter:

1. Select infrared communication (IR is default) by the Comm. function or BT if BT version multimeter
2. Select the Modbus communication protocol
3. Parameterize the infrared transmission rate by the IR baud function: 9600/19200/38400 Baud.

 The default transmission rate is 38400 Baud.

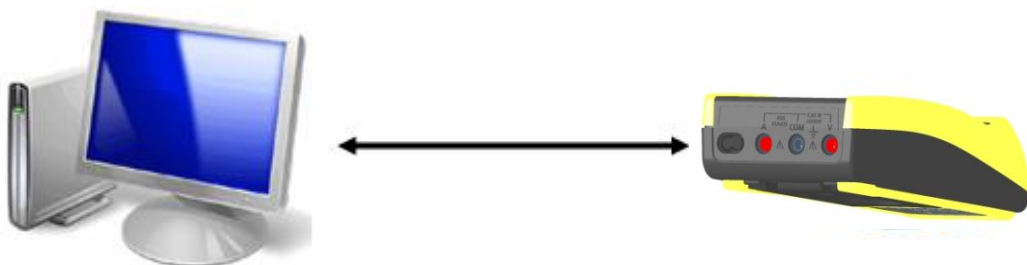
The other transmission parameters are fixed (8 data bits, 1 stop bit, no parity).

Remark: In Bluetooth communication, the instrument is displayed in the Peripherals and Printers window.




## 7.1. Connection of the isolated USB optical lead supplied

1. Connect the isolated optical lead to the isolated optical input of the multimeter (on the side of the multimeter). Mechanical polarization prevents connection in reverse.
2. Connect the USB lead to one of the USB ports of the PC.
3. Install the USB driver on your PC (see the data sheet on the CD provided).



## 7.2. Installing the software

1. Install the "SX-DMM" software on the PC using the CD.
  2. Start the software for data acquisition and study the various display possibilities (curves, tables, etc.).
- The  symbol appears on the display unit when the instrument is controlled from the PC (REMOTE mode).

For more information, refer to the "Help" menu of the software.

## 7.1. Remote programming

Refer to the remote programming manual.

# 8. TECHNICAL CHARACTERISTICS

## 8.1. DC voltage

In the "DC" mode, you measure a direct voltage or the DC component of an AC voltage.  
The 100mV range is available only in manual mode, by **Range**

### 8.1.1. CA5292

Range	Input impedance	Resolution	Protection	Accuracy
100 mV (*)	10 MΩ / 1 GΩ	1 μV	1414 Vpk	0,1 % R + 30 D
1000 mV	11 MΩ / 1 GΩ	10 μV		0,05 % R + 8 D
10 V	10,5 MΩ	0,1 mV		0,03 % R + 8 D
100 V	10 MΩ	1,0 mV		
1000 V	10 MΩ	10 mV		0,035 % R + 8 D

(\*) REL mode activated (Δ measurement)

- Recovery after triggering of the protection (>10V) approx. 10 s.
- Protection 1 minute max.
- Specifications valid from 0% to 100% of the range
- Rejection : 100mV range common mode: > 40dB at 50Hz and 60Hz
- 1V range common mode: > 70dB at 50Hz and 60Hz
- 10V range common mode: >100dB at 50Hz and 60Hz
- serial mode: > 60dB at 50Hz and 60Hz
- Automatic or manual selection of the ranges
- Protection by varistors

### 8.1.2. CA5293

Range	Input impedance	Resolution	Protection	Accuracy
100 mV (*)	10 MΩ / 1 GΩ	1 μV	1414 Vpk	0,1 % R + 30 D
1000 mV	10 MΩ / 1 GΩ	10 μV		0,05 % R + 8 D
10 V	10,5 MΩ	0,1 mV		0,02 % R + 8 D
100 V	10 MΩ	1,0 mV		
1000 V	10 MΩ	10 mV		0,03 % R + 8 D

(\*) REL mode activated (Δ measurement)

- Recovery after triggering of the protection (>10V) approx. 10 s.
- Protection 1 minute max.
- Specifications valid from 0% to 100% of the range
- Rejection: 100mV range common mode: > 40dB at 50Hz and 60Hz
- 1V range common mode: > 70dB at 50Hz and 60Hz
- 10V range common mode: >100dB at 50Hz and 60Hz



- serial mode:> 60dB at 50Hz and 60Hz
- Automatic or manual selection of the ranges
- Protection by varistors

## 8.2. AC and AC+DC voltage

With this function, the user can measure the true RMS (TRMS) value of an AC voltage with its DC component (no capacitive coupling) or without its DC component.

The 100mV range is available only in Manual mode, by **Range**

In the VAC & VAC+DC modes and for signals >1kHz, the range of uncertainty displayed is given for information only: we recommend using the formulas below.

VLowZ: The error should be slightly greater than the error in VAC.

### 8.2.1. CA5292

Range	Input impedance	Resolution	Accuracy	
			45 Hz to 1 kHz	1 to 100 kHz
100 mV (*)	10 MΩ	1 μV	1 % R ± 50 D	1%R + 0,1% x [F(kHz) - 1]R ±50D
1000 mV	11 MΩ	10 μV	0,5 % R ± 50 D	0,5%R+ 0,25% x [F(kHz) - 1]R ±50D <10 kHz 2,75%R+ 0,04% x [F(kHz) - 10]R ±50D >10 kHz
10 V	10,5 MΩ	0,1 mV	0,3 % R ± 50 D	0,3%R + 0,04% x [F(kHz) - 1]R ±50D
100 V	10 MΩ	1 mV	0,3 % R ± 50 D	0,3%R+ 0,03% x [F(kHz) - 1]R ±50D
1000 V (**)	10 MΩ	10 mV	0,3 % R ± 50 D	0,3%R + 0,02% x [F(kHz) - 1]R ±50D

(\*\*) ⚠ limitation at high frequency

(\*) not contractual indicative values (see curves below)

(\*\*) BP: Freq [kHz] limited to: 15,000/U input [V]

U input [V] limited to: 15,000/Freq [kHz]

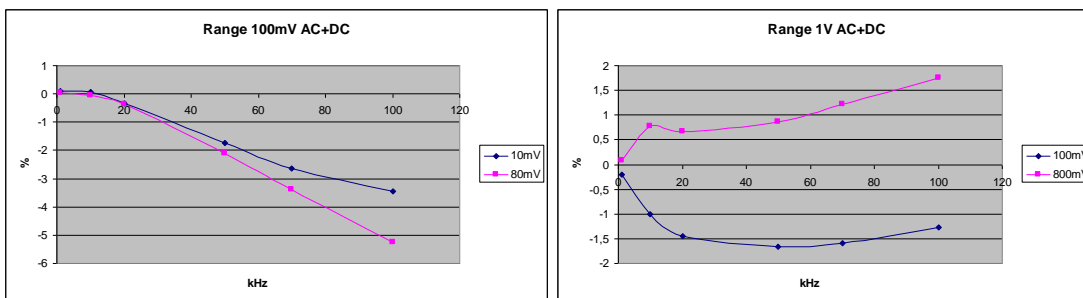
🔪 Example: U input = 1,000 VAC → Max. frequency: 15,000/1,000 = 15kHz

In the presence of a DC component: additional error: (UDC/U measured)x(0.7% + 70 D)

🔪 Example: UDC = 2V, U measured = 5 Vrms → Additional error: 0.28% + 28 D

- Rejection: common mode >80dB at 50Hz or 60Hz depending on selection
- Automatic or manual selection of the ranges
- Protection by varistors
- Maximum acceptable permanent voltage: 1,414 Vpk
- Specifications valid from: 10 to 100% of the range in the band from 20kHz to 100kHz
- Influence of the peak factor on the accuracy in VAC, VAC+DC at 50% of the range: 1% for a peak factor < 3.

👉 As soon as the PEAK symbol appears, use the AUTO PEAK mode.



### 8.2.2. CA5293

Range	Input impedance	Resolution	Accuracy		
			45 Hz to 1 kHz	1 to 100 kHz	100 to 200 kHz
100 mV (*)	10 MΩ	1 μV	1 % R ± 50D	1 % R + 0,05 % x [F(kHz) - 1] R ± 50D (*)	-
1000 mV	11 MΩ	10 μV	0,5 % R ± 40D	0,5%R + 0,2% x [F(kHz) - 1]R ± 40D <10kHz 2,3%R + 0,02% x [F(kHz) - 10]R ± 40D >10kHz	12 % R ± 50 D (*)
10 V	10,5 MΩ	0,1 mV	0,3 % R ± 30D	0,3 % R + 0,03 % x [F(kHz) - 1] R ± 30D	10 % R ± 30D
100 V	10 MΩ	1 mV	0,3 % R ± 30D	0,3 % R + 0,015 % x [F(kHz) - 1] R ± 30D	8 % R ± 30D
1000 V (**)	10 MΩ	10 mV	0,3 % R ± 30D	0,3 % R + 0,01 % x [F(kHz) - 1] R ± 30D	-

(\*\*) ⚠ limitation at high frequency

(\*) not contractual indicative values (see curves below)

(\*\*)BP: Freq [kHz] limited to: 15,000/U input [V]  
U input [V] limited to: 15,000/Freq [kHz]

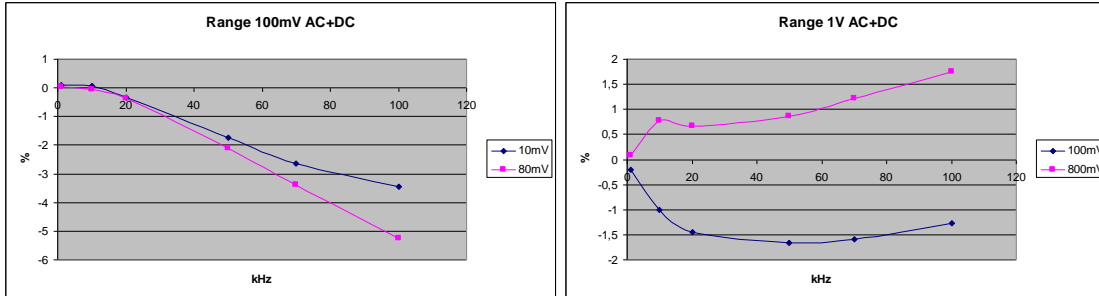
🔗 Example: U input = 1,000 VAC → Max. frequency: 15,000/1,000 = 15kHz

In the presence of a DC component: Additional error: (UDC/U measured) x (0.7% L + 70 D)

🔗 Example: UDC = 2V, U measured = 5 Vrms → Additional error: 0.28% L + 28 D

- Rejection: common mode >80dB at 50Hz or 60Hz depending on selection
- Automatic or manual selection of the ranges
- Protection by varistors
- Maximum acceptable permanent voltage: 1,414 Vpk
- Specifications valid from: 10 to 100% of the range in the band from 20kHz to 200kHz
- Influence of the peak factor on the accuracy in VAC, V at 50% of the range:
- 1% for a peak factor < 3.

👉 As soon as the PEAK symbol appears, use the AUTO PEAK mode.



### 8.3. DC current

Three possible modes: DC, AC, AC+DC

In DC mode, you can measure a direct current or the DC component of an alternating current.

In the AC and AC+DC modes, you can measure the true RMS (TRMS) value of an alternating current with/without its direct component (no capacitive coupling in "DC" mode).

Fuse: ex.: SIBA/5019906/11A (10x38-11000-DMI-30kA-CR 1000V, very rapid action).

Range	Input impedance	Resolution	Protection	Accuracy
1000 μA	≈ 170 Ω	10 nA	11 A 20 A < 30 s	0,1 % R + 15 D
10 mA	≈ 17 Ω	0,1 μA		0,08 % R + 8 D
100 mA	≈ 1,7 Ω	1 μA		0,15 % R + 8 D
1000 mA	≈ 0,17 Ω	10 μA		0,5 % R + 15 D
10 A	≈ 0,03 Ω (*)	100 μA		
100 A (**)		1000 μA		

(\*) with the fuse supplied with the device  
 (\*\*)100A range limited to 20A  
 Specifications valid from 0% to 100% of the range

**Limiting condition on the current**

An overload of 20A is acceptable for 30 seconds max. with a pause of at least 5 minutes between measurements.

**8.4. AC and AC+DC TRMS current**

Range	Input impedance	Resolution	Protection	Accuracy		
				45 Hz to 1 kHz	1 to 20 kHz	20 to 50 kHz
1000 µA	≈ 170 Ω	10 nA	11 A 20 A < 30 s	0,5 % R ± 40 D	0,5 % R + 0,25 % x [F(kHz) - 1] R ± 30 D	-
10 mA	≈ 17 Ω	0,1 µA		0,3 % R ± 30 D	0,3 % R + 0,1 % x [F(kHz) - 1] R ± 30 D	-
100 mA	≈ 1,7 Ω	1 µA		0,3 % R ± 30 D	0,3 % R + 0,1 % x [F(kHz) - 1] R ± 30 D	-
1000 mA	≈ 0,17 Ω	10 µA		0,3 % R ± 30 D	0,3 % R + 0,1 % x [F(kHz) - 1] R ± 30 D	-
10 A	≈ 0,03 Ω (*)	100 µA		0,4 % R ± 400 D	0,4 % R + 0,15 % x [F(kHz) - 1] R ± 40 D	-
100 A (**)		1000 µA		2,5 % R ± 40 D	2,5 % R + 0,15 % x [F(kHz) - 1] R ± 40 D	-

(\*) with the fuse supplied with the device

(\*\*) 100A range limited to 20A

In the presence of a DC component:

Additional error: (IDC/I measured)x(0.7% L + 70 D)

A max. overload of 20A is acceptable for 30 s max. with a pause of at least 5 min between measurements.

From 7A, the measurement is limited to an ambient temperature of 40°C and a period of 1h30m, with a pause of at least 15 minutes between measurements.

AUTO PEAK mode always activated.

Detection of peaks of which the duration exceeds 250µs

mA and µA range :

Additional error 2% for a peak factor between 2.5 and 3

Additional error 15% for a peak factor between 3 and 4

10 A range : Zero up to the peak factor of 2.5 at 100%

Specifications valid from 10% to 100% of the range for a sinusoidal current.

Protection 1000 VRMS by HBC ceramic fuse

Fuse 1,000V, 11A >18kA Cos φ >0.9 (10x38mm)

**Voltage drop :**

in 1 mA Voltage drop approx. 160mVRMS

in 10 mA Voltage drop approx. 180mVRMS

in 100 mA Voltage drop approx. 180mVRMS

in 1000 mA Voltage drop approx. 210mVRMS

in 10 A Voltage drop approx. 300mVRMS

**8.5. Frequency**

**8.5.1. Main frequency measurement**

The user can measure a voltage or a current and its frequency simultaneously.

Range	Resolution	Protection	Accuracy
10 à 100 Hz	0,001 Hz	1414 Vpk	0,02 % ± 10 D
100 à 1000 Hz	0,01 Hz		
1000 Hz à 10 kHz	0,1 Hz		
10 à 100 kHz	1 Hz		
100 à 1000 kHz	10 Hz		
1 MHz à 5 MHz	100 Hz		

Range	Sensitivity (applicable only to rectangular signals)				
	100 mV	1 V	10 V	100 V	1000 V
0 Hz à 10 Hz	-	-	-	-	-
10 Hz à 200 kHz	10 %	20 à 5%	5 %	5 %	5 % (*)
200 à 500 kHz	20 %	5 %	5 à 2 %	5 à 10 % (*)	5 % (*)
500 à 1000 kHz	-	5%	2 %	10 %	5 % (*)
1 MHz à 5 MHz			2 à 50 %		20 % (*)

(\*) Freq [kHz] limited to:  $15,000/U$  input [V]  
U input [V] limited to:  $15,000/\text{Freq}$  [kHz]

(\*\*) limited to 200kHz

The measurement is made by capacitive coupling.

Manual selection of freq. range,  $F < 200\text{kHz}$  (default) or  $F > 200\text{kHz}$  by a short press.

Input resistance:  $\approx 10\text{M}\Omega$  (Freq  $< 100\text{Hz}$ )

Max. acceptable permanent voltage: 1,414 Vpk, see (\*)

Protection by varistors on the voltage input.

### 8.5.2. Secondary frequency measurement

Range	Resolution	Accuracy	Acceptable overload
10 à 100 Hz	0,001 Hz	0,02 % + 8 D	1450 Vcc (1 min max.) in range 100 mV
100 à 1000 Hz	0,01 Hz		
1000 à 10 kHz	0,1 Hz		
10 à 100 kHz	1 Hz		
100 à 200 kHz	10 Hz		

Range	Sensitivity (applicable only to rectangular signals) Vrms			
	100 mV	1 V	10 V à 1000 V (*)	1000 $\mu\text{A}$ à 20 A (**)
10 Hz à 200 kHz	15% of the calibration	10% of the calibration	10% of the calibration	5 à 10 %
10 Hz à 10 kHz				
10 kHz à 30 kHz				

(\*) Freq limited to [kHz]:  $15,000/U$  input [V]  
U input [V] limited to [V]:  $15,000/\text{Freq}$  [kHz]

(\*\*) at 50kHz for the «Ampere» range

The measurement is made by capacitive coupling.

Input resistance:  $\approx 10\text{M}\Omega$  ( $F < 100\text{Hz}$ )

Protection by varistors on the voltage input.

## 8.6. Resistance

### 8.6.1. Ohmmeter

In this setting, the user can measure a resistance.

Particular reference conditions:

The (+COM) input must not have been overloaded following the accidental application of a voltage to the input terminals with the switch set to Ω or T°. If this happens, the return to normal may take about ten minutes.

Protection : 1414 Vpk

Range	Accuracy	Resolution	Protection
1000 Ω	0,1 % R + 8 D	10 mΩ	1414 Vpk
10 kΩ	0,07 % R + 8 D	100 mΩ	
100 kΩ		1 Ω	
1000 kΩ		10 Ω	
10 MΩ	1 % R + 80 D	100 Ω	
100 MΩ	3 % R + 80 D R ≤ 50 MΩ	1 kΩ	

Automatic or manual range selection

“Active” protection by PTC thermistor

Measurement voltage: approx. 1.2V

Maximum open-circuit voltage: 3.5V typ.

In the 100MΩ range, in order to avoid the influence of the mains and guarantee the stated specifications, it is best to disconnect the multimeter from the Wall Plug.

**8.6.2. 100Ω measure**

Range	Accuracy	Resolution	Protection
100 Ω	0,2 % R + 10 D	0,01 Ω	1414 Vpk

**8.7. Capacity**

**8.7.1. Capacitance meter**

In this setting, the user can measure the capacitance of a capacitor.

Range	Operating range	Specified measurement range	Resolution	Intrinsic error	Measurement current	Measurement time
1 nF	0 à 1,000 nF	0,100 à 1,000 nF	1 pF	2,5 % R ± 15 D	< 10 µA	≈ 400 ms
10 nF	0 à 10 nF	0,1 à 10,00 nF	10 pF	1 % R ± 8 D	< 10 µA	≈ 400 ms
100 nF	0 à 100,0 nF	1 à 100,0 nF	0,1 nF	1 % R ± 8 D	< 50 µA	≈ 400 ms
1000nF	0 à 1000nF	10 à 1000nF	1 nF	1 % R ± 10 D	< 200 µA	≈ 0,125 s/µF
10 µF	0 à 10,00 µF	1 à 10,00 µF	0,01 µF	1 % R ± 10 D	< 200 µA	≈ 0,125 s/µF
100 µF	0 à 100,0 µF	1 à 100,0 µF	0,1 µF	1 % R ± 10 D	< 500 µA	≈ 0,125 s/µF
1 mF	0 à 1,000 mF	0,1 à 1,000 mF	1 µF	1 % R ± 15 D	< 500 µA	≈ 17 s/mF
10 mF	0 à 10,00 mF	0,5 à 10,00 mF	10 µF	1,5 % R ± 15 D	< 500 µA	≈ 17 s/mF

(\*) Use the REL function for values <10% of the range in order to restore the residual zero (compensation for the capacitance of the leads)

Resolution 1,000 points

Automatic or manual range selection

“Active” protection by PTC thermistor

Maximum open-circuit voltage: 1V typ./4V max.

**8.8. Diode test**

Indication of the junction voltage in the forward direction, from 0 to 2.1V in a single range (10V range)

	Normal	Z Diode
Accuracy	2 % R ± 30 D	id.
Resolution	0,1 mV	10 mV
Measurement current	< 0,5 mA	< 11 mA

Max. open-circuit voltage	3,5 V max.	28 V
Indication of overshoot	in the reverse direction	in the reverse direction
“Active” protection by PTC thermistor	1414 Vpk	1414 Vpk

## 8.9. Audible continuity

In this setting, you measure a resistance up to 1000Ω, with continuous 4kHz audible indication

Range	Accuracy	Resolution	Protection
1000 Ω	0,1 % R + 8 D	100 mΩ	1414 Vpk

Detection threshold in continuity mode  $\approx 20\Omega$  (response time <10ms)

“Active” protection by PTC thermistor

Maximum open-circuit voltage: 3.5V 2V typ

## 8.10. Temperature

### 8.10.1. Pt100/Pt1000

The user can measure the temperature by means of a Pt100/Pt1000 sensor.

Range	Measurement current	Resolution	Accuracy	Protection
- 125°C à + 75°C	< 1 mA (Pt100) < 0,1 mA (Pt1000)	0,1°C ---	± 0,5 °C	1414 Vpk
- 200°C à + 800°C	< 1 mA (Pt100) < 0,1 mA (Pt1000)	0,1°C ---	0,1 % R ± 1 °C 0,07 % R ± 1 °C	

“Active” protection by PTC thermistor

Display in °C/°F possible

### 8.10.2. Thermocouples

Function	Internal temperature	External temperature	
Type of sensor	Integrated circuit	K thermocouple	
Display range	1000 °C 1000 °F	1000 °C 1000 °F	10 000 °C 10 000 °F
Specified measurement domain	- 10,0 °C à + 60,0 °C + 14,0 °F à + 140,0 °F	- 40,0 °C à + 999,9°C - 40,0°F à + 1831,8°F	+ 1000 °C à + 1200 °C + 1832 °F à + 2192 °F
Uncertainty (note 1)	± 3 °C ± 5,4 °F	1 % R ± 3 °C 1 % R ± 5,4 °F	1 % R ± 3 °C 1 % R ± 5,4 °F
Resolution	0,1 °C 0,1 °F	0,1 °C 0,1 °F	1 °C 1 °F
Thermal time constant (note 2)	0,7 min./ °C	Depending on model of sensor	
Detection of sensor open-circuit	No	Yes: indication of the internal temperature although the external sensor is connected	

Note 1: The stated accuracy in external temperature measurement does not take into account the accuracy of the K thermocouple.

Note 2: Operation of the thermal time constant (0.7 min/°C):

If there is a sudden variation of the temperature of the multimeter, by 10°C for example, the multimeter will reach 99% of the final temperature at the end of 5 time constants, or 0.7min/°C x 10°C x 5 cts = 35 min (to which must be added the constant of the external sensor)

Protection: 1,414 Vpk

### 8.11. Rapid peak

Secondary quantities	Ranges	Additional error	Protection
Peak V t > 500 μs	100 mV à 1000 V	3 % R ± 50 D	1414 V <sub>pk</sub>
Peak A t > 500 μs	1000 μA à 20 A	4 % R ± 50 D	

Specifications valid from 20% of the range in A, 10% of the range in V  
 The peak factor is calculated:  $CF = (Pk+ - Pk-)/2 \times V_{rms}$   
 Additional error for  $250\mu s < t < 500\mu s$ : 3%

### 8.12. SURV (Min, Max, Avg)

Remark: measurements time-stamped  
 Accuracy and rate: same as Volt and Ampere measurement specifications

### 8.13. dBm mode

Display of the measurement in dBm with respect to a resistance reference chosen by the user between 1Ω and 10kΩ (default value 600Ω).

Resolution	0.01dBm
Absolute error in dBm	0.09 x relative err. VAC expressed in %
Additional calculation error	0.01dBm
Measurement span	10mV to 1,000V
Protection	1,414 V <sub>pk</sub>

### 8.14. dB mode

Display of the measurement in dB with the value measured when the mode was activated as voltage reference (V ref.).

Resolution	0.01dB
Absolute error in dB	0.09 x relative err. VAC expressed in %
Additional calculation error	0.01dB
Measurement span	10mV to 1,000V
Protection	1,414 V <sub>pk</sub>

### 8.15. W ref resistive power

Display of the measurement in relative power with respect to a resistance reference chosen by the user between 1Ω and 10kΩ (default value 50Ω).

The function determined is:	$(\text{measured voltage})^2 / W \text{ Ref (W unit)}$ $(\text{measured current})^2 * W \text{ Ref (W unit)}$
Range	DC, AC and AC+DC
Resolution	100 μW
Accuracy	2 x accuracy in VDC/VAC expressed in %
Max. measurement voltage	1,000 VAC + DC
Protection	1,414 V <sub>pk</sub>
Unit of display	W

### 8.16. V x A power

In AC and AC+DC voltage measurement: this calculation is limited to 400Hz.  
 The current measurement is always made in AC+DC.  
 Accuracy (typical)/Accuracy of V measurement + Accuracy of peak A measurement

☞ The link to the COM input must be short and of large diameter, in order to limit the voltage drop that influences the Volt measurement.  
 Protection : 1414 V<sub>pk</sub>

### 8.17. Duty cycle

Display of the measurement in % of a logical signal (TTL, CMOS, etc.)

DC+ duty cycle	= θ	
DC- Duty cycle	= T-θ	
Resolution	0.01%	

Minimum duration for  $\theta$  10 $\mu$ s  
 Maximum duration for T 0.8s  
 Minimum duration for T 200 $\mu$ s (5 kHz)  
 Nominal range 5 to 90% typical  
 Sensitivity (10V range) > 10% of the range, Freq <1kHz  
 > 20% of the range, Freq >1kHz  
 Absolute error on the duty cycle, expressed in % absolute  $\pm [0,1\% + 0,045\% \cdot (RC-50)]$  Freq < 1 kHz  $\pm [0,5\% + 0,06\% \cdot (RC-50)]$  Freq > 1 kHz  
 Additional absolute error 0.1xC/P  
 (slope at zero crossing) C = range in V or in A  
 (for the 1,000V range, C = 5,000)  
 P = slope in V/s A/s  
 Protection 1,414 Vpk

### 8.18. Event counting CNT

Depending on frequency counter triggering conditions.  
 Minimum pulse width 5  $\mu$ s  
 Counting up to 99999  
 Triggering threshold 10% of the range except 1,000 VAC range  
 This threshold is: positive in  $\square$ , negative in  $\sqcup$   
 For negative events, cross the leads.  
 Protection 1,414 Vpk

### 8.19. Pulse width PW

Depending on frequency counter triggering conditions.  
 Resolution 10  $\mu$ s  
 Minimum pulse width 100  $\mu$ s  
 Accuracy 0.1% L  $\pm$  10 $\mu$ s  
 Maximum duration of a period 1.25 s (0.8Hz)  
 Triggering threshold 20% of the range except 1,000 VAC range

This threshold is positive in  $\square$ , negative in  $\sqcup$ .

Additional error on the measurement due to the slope at the zero crossing:  
 For negative events, cross the leads.  
 Protection 1,414 Vpk

### 8.20. Time stamp chronometer

Accuracy approx. 30s/month (drift of real-time clock)  
 Resolution 1s  
 Display hour/minute/second  
 Day/month/year

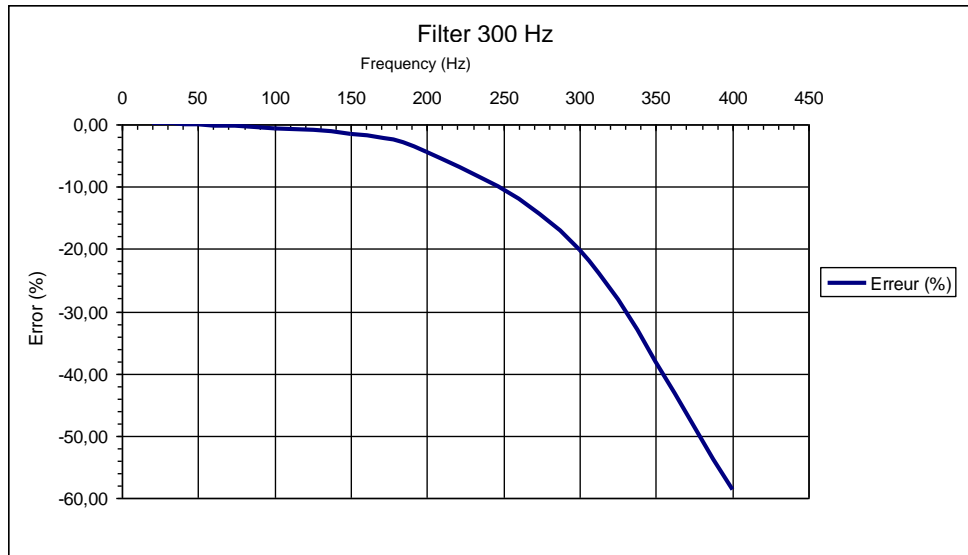
### 8.21. Variation in the nominal range of use

Quantity of influence Functions	Temperature (max influence.)	range 10 V/m 500 MHz	Humidity	voltage Primary battery 4.1 < U < 6.4 V Storage battery 4.1 < U < 5.5 V
V <sub>DC</sub>	0,003 % / °C	nil		
V <sub>AC+DC</sub>	0,05 % / °C	nil	influence	no influence
V <sub>AC L Z</sub>	0,05 % / °C	nil	influence	no influence
Hz	0,003 % / °C	nil	nil	no influence
$\rightarrow$	0,015 % / °C	nil	(objective)	(objective)
$\Omega$ 10M/50M Cap	0,007 % / °C 0,14 % / °C 0,15 % / °C	nil		
mA <sub>DC</sub>	0,020 % / °C	nil		



<b>mA<sub>AC+DC</sub></b>	0,05 % / °C	nil		
<b>10 A<sub>DC</sub></b>	0,05 % / °C	nil		
<b>10 A<sub>AC+DC</sub></b>	0,055 % / °C	nil		
<b>Peak fast</b>	0,025 % / °C	nil		
<b>Loader</b>	1,5 D / °C (gamme mV)			

## 8.2.2. Response of the filter



## 9. GENERAL SPECIFICATIONS

### 9.1. Environmental conditions

Altitude	< 2000 m
Reference range	23°C ± 5°C
Specified range of use	0°C to 40°C
Influence of temperature	see §. Variation.
Relative humidity	0 % to 80 % from 0°C to 35°C 0 % to 70 % from 35°C to 40°C Limited to 70 % for the 5 and 50 Ω ranges
Storage range	- 20°C to 70°C

### 9.2. Power supply

- Mains power via USB charger (100-240VAC/50-60 Hz/0.5A)
- Primary batteries: 4x1.5V nominal, LR6 Alkaline (or more if possible)
- Life: ≈100 h in VDC (ultra power)
- Storage batteries: 4x1.2V A-A storage batteries, NI-MH LSD 2500 Life: ≈80h (2500mAh). In order to optimize the life of the storage batteries, the charging of the multimeter with the charger is operational up to <35°C.
- Average charging time: 6 hours.  
Measurements can be made while the multimeter is charging.

### 9.3. Display

- 1 colour graphic LCD display unit, 320x240 pts, allowing the display of one main quantity and 3 secondary quantities or a graphic screen  
Dimensions of the display: 70x52mm useful
- The refresh rate of the display unit is 200ms.

## 9.4. Conformity

### 9.4.1. Safety

According to NF EN 61010-1:

- Insulation class 2
- Degree of pollution 2
- Use indoor
- Altitude < 2000 m
- Measurement category of the "measurement" inputs CAT III, 1000V with respect to earth
- Measurement category of the "measurement" inputs CAT IV, 600V with respect to earth

### 9.4.2. EMC

This instrument is designed in conformity with the EMC standards in force and its compatibility has been tested in accordance with the following standards:

Emissions (cl. A) and Immunity NF EN 61326-1

### 9.4.3. Radio Equipment Directive (RED) – for the BT versions of the multimeters

This instrument is designed in compliance with directive 2014/53/EU and has been tested in accordance with the following standards:

ETSI EN 301 489-1  
ETSI EN 301 489-17  
ETSI EN 300 328  
EN 62311

## 10. MECHANICAL SPECIFICATIONS

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### 10.1. Housing

- Dimensions 196 x 90 x 47.1mm
- Mass 570g
- Materials ABS V0
- Dust- and water-tightness IP67, according to NF EN 60529 (Not in operation; if the instrument is immersed, it must be dried, in particular the terminal block, before it can be used again)

## 11. MAINTENANCE

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Except for the fuse and the batteries, the instrument contains no parts that can be replaced by personnel who have not been specially trained and accredited. Any unauthorized repair or replacement of a part by an "equivalent" may gravely impair safety.

### 11.1. Cleaning

Disconnect the instrument completely and switch it OFF.

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

Make sure that no foreign body interferes with the operation of the snap device of the sensor.

### 11.2. Replacement of the fuse

For safety reasons the fuse must always be replaced by an identical model:

11A: 10x38 -1,000V -F

### 11.3. Updating of the internal software

With a view to providing, at all times, the best possible service in terms of performance and technical upgrades, Chauvin Arnoux invites you to update the embedded software of the device by downloading the new version, available free of charge on our web site.

Our site:

<http://www.chauvin-arnoux.com> Embedded software

Under **Support**, click on **ASYC IV embedded software /Loader Async IV v.xx.exe**

4 language pairs are available: English/French, English/Spanish, English/German, and English/Italian.

Connect the device to your PC using the USB cord provided.

The update of the embedded software depends on its compatibility with the hardware version of the instrument. This version is indicated in SET-UP (see §5).

Attention: updating the embedded software resets the configuration and causes the loss of the stored data. As a precaution, save the stored data to a PC before updating the embedded software.

## 12. WARRANTY

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Except as otherwise stated, our warranty is valid for **36 months** starting from the date on which the equipment was sold. Extract from our General Conditions of Sale provided on request.

The warranty does not apply in the following cases:

- Inappropriate use of the equipment or use with incompatible equipment;
- Modifications made to the equipment without the explicit permission of the manufacturer's technical staff;
- Work done on the device by a person not approved by the manufacturer;
- Adaptation to a particular application not anticipated in the definition of the equipment or not indicated in the user's manual;

Damage caused by shocks, falls, or floods.

## 13. APPENDIX

### 13.1. Default configuration

In **User** mode, the device restarts in the user's personal configuration (General and Measurement menus) and the function selected when switched off, but coupling in Volt function (AC+DC).

In **Basic** mode, the default, the multimeter starts up in its elementary configuration (default values) and in the Volt function (AC+DC).

General	Language: EN/language		
	Beep: yes		
	Sleep: yes		
	Lighting: ECO	Communication: IR	
	IR baud: 38400	Configuration: basic	
	Energy: Ni-MH		
	Storage battery capacity: 2,500mAh		
	Communication protocol: MODBUS		
Measurement	Filter: NO	Impedance: 10/20M	
	dBm REF: 600Ω	W REF: 50Ω	
Func. CLAMP,	Function: V	Unit: A	
	Ratio: 1A/AV		
Func. MATH	Function: V	Unit: none	
	Coef. A: 1	Coef. B: 0	
Func. MEM	Recording interval: 1s		
	Nb. of records 5292: 10000	Nb. Of records. 5293: 30000	
Main functions	V, A: AUTO, AC+DC	Hz: 10V range	
	Ω, Capacity: AUTO	° C: ° C, Pt 100	

\* FR, DE, IT, ES depending on the embedded software loaded and the user's selection.

Restart configuration assumes no leads connected. If they are connected, they will be taken into account in the selection of the function

### 13.2. Instructions before recharging the storage batteries

Before recharging, check that the device is equipped with all 4 storage batteries.

It is not necessary to withdraw them to recharge them. If "Ni-MH" is selected in the Type of Energy menu (see paragraph), then charging is enabled.

An attempt to charge with primary batteries in the device may damage the device.

For safety reasons, the charging of the storage batteries is enabled only between: 0°C and 35°C.

Note: an elevation of the internal temperature by a current measurement may possibly trip the thermal safety.

In order to keep the storage batteries in good condition, use the multimeter until the min. level is reached before recharging.

Then connect the plug of the power supply unit (USB) to the specific jack.

Connect the power supply unit (USB) to mains.

The symbol opposite on the display unit is used to monitor the course of the charging with a % of charge:

- battery charged → green symbol and 100%
- battery discharged → orange symbol, indicating charging recommended
- battery level at limit → red symbol and xx%
- battery level too low → blinking red symbol and % together with audible beep

The storage batteries are fully charged when the symbol is stabilized with 4 segments (each fixed plateau is acquired), after approximately 6 h.

The multimeters are delivered with 2500mAh Ni-MH storage batteries.

These used storage batteries must be turned over to a recycling company or a company processing hazardous materials.

Never throw these storage batteries away with other solid waste.





For more information, contact your Manumasure agency.

Once the storage batteries are fully charged, the device stops automatically.

When the multimeter is delivered, it may happen that the storage batteries are discharged and require full recharging.

### 13.3. Table of secondary measurements

Display unit 1: mean measurement						Secondary display unit 1		Secondary display unit 2		Secondary display unit 3	
V AC V AC+DC	V DC	A AC A AC+DC	A DC	Hz	Ω	function	unit	function	unit	function	unit
X		X				FREQ	Hz	PER	S	MATH funct.	
X						FREQ	Hz	dB	dB	MATH funct.	
X						dBm	dBm	REF(dBm)	Ω	MATH funct.	
X		X				Pk+	V-A	Pk-	V -A	CF	
X	X	X	X			W	W	REF(Ω)	Ω	MATH funct.	
				X		PER	S	DC+	%	MATH funct.	
				X		PER	S	DC-	%	MATH funct.	
				X		PW+	S	CNT+		MATH funct.	
				X		PW-	S	CNT-		MATH funct.	
X	X	X	X	X	X	MATH funct.					
X	X					VxA	VA	A	A	MATH funct.	

- MATH =  $y = Ax + B$
- FREQ = frequency measurement
- PER = measurement of the period
- dB = measurement of decibel of voltage in dB
- dBm = measurement of decibel of power in dBm with REF = dBm REF
- Pk+ = measurement of positive peaks
- Pk- = measurement of negative peaks
- CF = measurement of the peak factor
- w = calculation of the resistive power with REF = W REF
- VxA = calculation of the power limited to 400Hz
- DCY+ = measurement of positive duty cycle 
- DCY- = measurement of negative duty cycle 
- W+ = measurements of positive pulse widths or durations
- PW- = measurements of negative pulse widths or durations
- CNT+ = counting of positive pulses 
- CNT- = counting of negative pulses 

X04855A02-Ed.01-02/2019

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