EN - User's manual

MTX 3297Ex

Intrinsically Safe Digital Multimeter

Portable multimeter with digital display

Measure up

Thank you for purchasing this **Portable multimeter MTX 3297Ex with digital display**.
For best results from your instrument:

- **read** these operating instructions carefully,
- **comply** with the precautions for use.

Failure to observe these warnings and/or directions may damage the instrument and/or its components and may endanger the user.

	WARNING, risk of DANGER! The operator must refer to these instructions whenever this danger symbol appears.
	CAUTION! Risk of electric shock. The voltage applied to parts marked with this symbol may be hazardous.
	Useful information or tip.
	Equipment protected by double insulation.
	The product is declared recyclable following an analysis of the life cycle in accordance with standard ISO 14040.
	The CE marking indicates conformity with European LVD and EMC directives.
	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 2012/19/EU.

Definition of measurement categories

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

PRECAUTIONS FOR USE

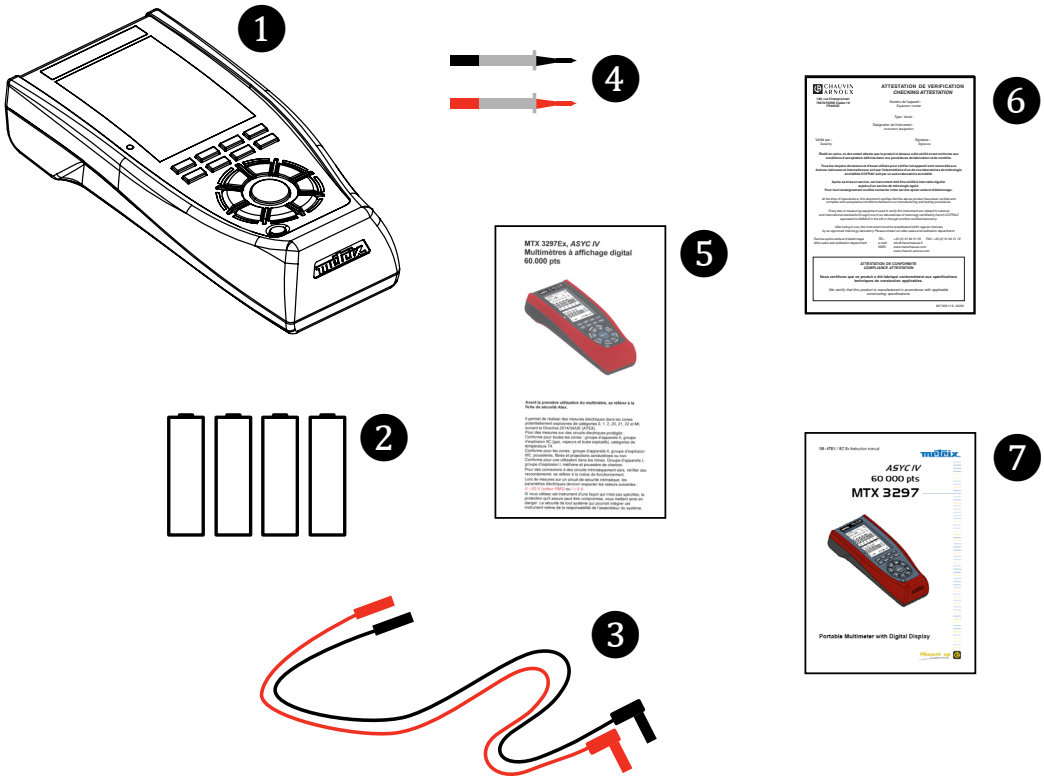
This instrument is compliant with safety standard IEC 61010-2-033, the leads are compliant with IEC 61010-031, and the current sensors are compliant with IEC 61010-2-032, for voltages up to 1 000 V in category III.
Do not use the instrument for measurements on circuits that are not in measurement categories II, III, or IV or that might be connected inadvertently to circuits that are not in measurement categories II, III, or IV.

- The operator and/or the responsible authority must carefully read and clearly understand the various precautions to be taken in use. Sound knowledge and a keen awareness of electrical hazards are essential when using this instrument.
- If you use this instrument other than as specified, the protection it provides may be compromised, thereby endangering you.
- Do not use the instrument on networks of which the voltage or category exceeds those mentioned.
- Do not use the instrument if it seems to be damaged, incomplete, or poorly closed.
- Before each use, check the condition of the insulation on the leads, housing, and accessories. Any item of which the insulation is deteriorated (even partially) must be set aside for repair or scrapping.
- Before using your instrument, check that it is perfectly dry. If it is wet, it must be thoroughly dried before it can be connected or used.
- Use only the leads and accessories supplied. The use of leads (or accessories) of a lower voltage or category limits the voltage or category of the combined instrument and leads (or accessories) to that of the leads (or accessories).
- Use personal protection equipment systematically.
- When handling the leads, test probes, and crocodile clips, keep your fingers behind the physical guard.
- All troubleshooting and metrological checks must be performed by competent and accredited personnel.

CONTENTS

1. DELIVERY CONDITION

1.1. UNPACKING



1 One multimeter

2 4 Lithium batteries (refer to "ATEX/IECEx Instructions Manual")

3 2 elbow-straight safety cables (red, black)

4 2 probe tips (red, black)

5 One multilingual quick start guide

6 One test report with measurement record

7 One ATEX/IECEx Instructions Manual

For the options, get in touch with the sales department:
- Optical USB cable
- Carrying bag

2. GENERAL INSTRUCTIONS

2.1. INTRODUCTION

	MTX 3297Ex ATEX
Display	Digital monochrome backlit (70 x 52)
Power supply	4 qualified batteries 1.5 V
Points	60 000
Communication	IR / USB

This multimeter is compliant with safety standard IEC 61010-2-033, concerning multimeters.

2.2. PRECAUTIONS AND SAFETY MEASURES

This manual concerns only the use of the MTX 3297Ex in a safe, non-explosive zone.

- This instrument is disigned for used:
  - indoor
  - in an environment of pollution degree 2
  - at an altitude of less than 2 000 m
  - at a temperature between -10°C and 55°C
  - at a relative humidity below 80 % up to 31°C.

- The safety of any system incorporating the instrument is the responsibility of the system integrator.

- It can be used for measurements on circuits:
  - **MTX 3297Ex safe zone:** 1 000 V CAT III and 600 V CAT IV
  - **MTX 3297Ex explosive zone:** refer to the following documents: ATEX/IECEx Instructions Manual

Some accessories may lead to the use of this instrument on circuits at lower voltages and in a lower category.

2.2.1. BEFORE USE

- Comply with the environmental and storage conditions.
- Check the integrity of the guards and insulation of the accessories. Any item of which the insulation is deteriorated (even partially) must be removed from service and scrapped. A change of colour of the insulation is a sign of deterioration.
- The instrument must be clean and dry.

2.2.2. DURING USE

- Read closely all notes preceded by the ⚠ symbol.
- As a safety measure, use only the appropriate leads and accessories supplied with the instrument or approved by the manufacturer.

2.2.3. SAFETY FEATURE

- It is impossible to open the battery or fuse compartment without first disconnecting the measurement leads.
- During a measurement exceeding 60 VDC or 25 VAC the ⚠ symbol blinks on the display unit
- Automatic detection of a connection to the "Ampere" terminal (for both voltage and current measurements).
- When the maximum permanent voltage or current that can be measured is exceeded, an intermittent audible signal warns of the risk of an electric shock.

2.2.4. FEATURES PROTECTING THE MEASUREMENT INPUTS

- This multimeter has several features to protect them:
  - varistor protection that clips transient voltage surges on the measurement terminals.
  - PTC (Positive Temperature Coefficient) protection against permanent overvoltages less than or equal to 1 000 V during resistance, capacitance, and diode test measurements.
    This protection is reset automatically after the overload.
  - a fuse that provides protection during current measurements.
    Refer to ATEX.IECEx Instructions Manual

2.3. SPECIAL FUNCTIONS

2.3.1. AUTOMATIC 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 by the command keypad is incompatible with the connection of the lead, it triggers an audible or visual (LEADS) alert.

The current measurement is made with automatic peak range full-scale.
During a current measurement, an audible alert is triggered in the event of a prolonged absence of current.

2.3.2. AUTOMATIC SWITCHING OFF

If the function is validated (**P**), the device is automatically switched off after 30 mn of operation if there has been no action on the front panel during this time.

Automatic switching off is disabled:
- in the MAX, MIN, AVG, PEAK Surveillance mode
- in the Communication mode

2.3.3. WARNING SIGNALS

An intermittent audible signal is emitted in all "Voltage" and "Current" settings if the max. permanent value the device can measure is exceeded. It is accompanied by display of the "O. L" acronym and of the symbol on the display unit.

This symbol is activated when the voltage on the "V" input exceeds 60 VDC or 25 VAC in the "Voltage" setting or when the current injected between the A and COM terminals exceeds 10 A.

2.4. UNPACKING, REPACKING

All of the equipment has undergone mechanical and electrical checks before being dispatched. When you receive it, carry out a quick check to detect any deterioration that may have occurred during transport. Should the need arise, immediately contact our sales department and notify the carrier of the customary reservations.
Use the original packaging to reship the equipment, if possible. Indicate as clearly as possible, by a note attached to the equipment, the reasons for the transfer.

2.5. MAINTENANCE

- Disconnect everything connected to the instrument and press the ON/OFF key .
- Use a soft cloth, moistened with soapy water.
- Rinse with a damp cloth and dry rapidly with a dry cloth or forced air.
- Make sure that no foreign objects interfere with the operation of the device by which the leads are snapped into place.

2.6. REPLACING THE FUSE

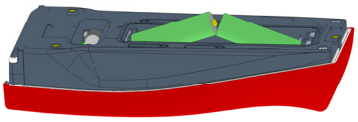
Unscrew the 3 cross-headed screws, then remove the battery membrane.

Before replacing the fuse (reached by opening the bottom compartment), disconnect the instrument from any source of current. During the replacement, make sure that only a fuse of the appropriate rating and specified type is used. Using another type of fuse and shorting the fuse holder are strictly forbidden.

Checking the current fuse:

MTX 3297Ex: Refer to ATEX/IECEx Instructions Manual

2.7. BATTERIES



- Remove the safety tabs from the batteries to make the instrument operational (first use),
- Unscrew the 3 screws,
- Remove the membrane covering the batteries,
- Remove the batteries safety tab,
- Replace the membrane covering the batteries,
- Tighten the 3 screws and press on ON key.

After replacing the batteries, wait 10 s before switching the instrument back on.

MTX 3297Ex: Refer to ATEX/IECEx Instructions Manual or § 9.2

2.8. ACTIVE COMMUNICATION INTERFACE

The multimeter can communicate with a PC via the USB link.
The MTX 3297Ex includes a USB link using an isolated optical USB cord (in option) and SX-DMM software, plus Labview and Labwindows drivers to program the devices.

MTX 3297Ex: It can also be programmed via the SCPI protocol:

- to program via Labview/LW
- to recover data or program the instrument using the software SX-DMM
- to calibrate the MTX 3297Ex

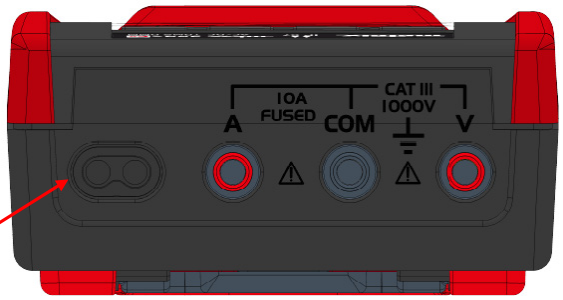
3. DESCRIPTION OF THE INSTRUMENT

3.1. MTX 3297Ex

3.1.1. FRONT AND BACK PANEL

3.1.2. PROP

3.1.3. TERMINAL BLOCK



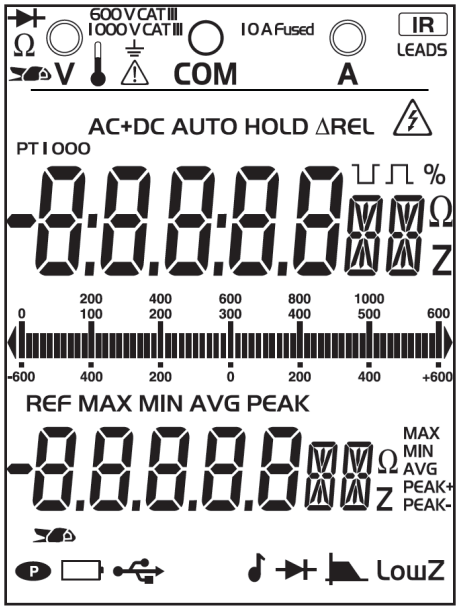
Optical connector: active only outside EX environment

3.2. DISPLAY UNIT

The display is in two parts:

- A digital display for convenient reading of the digits:
  - main display unit: 12.7 mm
  - secondary display unit: 9.7 mm

- The "bargraph" display (61 segments) with scale (indication of the measurement range) for an analogue reading.



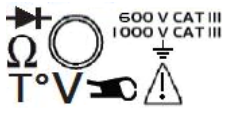
3.2.1. QUANTITIES MEASURED

- 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
- Hz Frequency measurement
- Ω Resistance measurement
- µF Capacitance measurement
- T° Temperature measurement
- ms Measurement of the period
- % Measurement of relative value

3.2.2. UNITS

- V Volt
- A Ampere
- Hz Hertz
- Ω Ohm
- F Farad
- °F Degree Fahrenheit
- °C Degree Celsius
- ms millisecond
- k kilo (kΩ - kHz)
- M Mega (MΩ - MHz)
- n nano (nF)
- µ micro (µV - µA - µF-µS)
- m milli (mV - mA – mF-ms)
- % Percentage

3.2.3. TABLE OF SYMBOLS DISPLAYED ON THE SCREEN

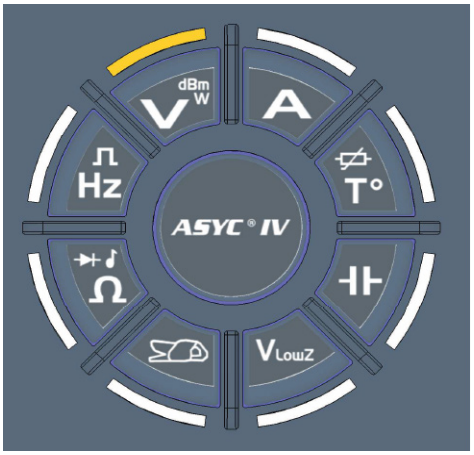
Symbols	Designation
AC	Measurement of the AC signal
DC	Measurement of the DC signal
AC+DC	Measurement of the AC and DC signal
AUTO	Automatic range switching
Δ REL	Values relative to a reference
REF	Reference value
HOLD	Storage and display of stored values
MAX MIN AVG	Value (surveillance)
MAX	Maximum value
MIN	Minimum value
AVG	Mean value
PEAK	Peak value
PEAK+	Maximum peak value
PEAK-	Minimum peak value
.run r.un ru.n	Capacitance meter, acquisition in progress
-----	Frequency measurement impossible
O.L	Overshoot of the measurement capacities
USER	USER mode (on main display unit)
BASIC	BASIC mode (on main display unit)
Hz	Hertz symbol (main display unit)
Hz	Hertz symbol (secondary display unit)
Ω	Ohm (main display unit)
Ω	Ohm (secondary display unit)
%	Percentage
	Positive pulse
	Negative pulse
PT100	Symbol for temperature measurement using a Pt100 probe
PT1000	Symbol for temperature measurement using a Pt1000 probe
	Symbol for measurement using a current clamp
LEADS	Function selected incompatible with the connection of the lead
LowZ	Low-impedance voltage measurement
♪	Symbol of the audible continuity measurement
	Symbol of the measurement and testing of a semiconductor junction
	Warning, possibility of electric shock (*)
	USB communication
	300Hz filter
	Auto power OFF deactivated (permanent mode)
	The symbol indicates the battery charge level.
	Volt, Ohm, temperature, etc. measurement input

COM	COM measurement input
10 A Fused A	Ampere measurement input
1 000 V CAT III	Input indication
IR	Isolated optical link (USB) input
	Display of unit on the main display unit (2x14 segments)
	Display of unit on the secondary display unit (2x14 segments)
	Identifies the reminder of the display zone connection

(*) When voltages exceeding 60 V_{DC} or 25 V_{AC} are measured, the ⚠ symbol flashes on the display unit.

3.3. SWITCH

Orange LEDs around the highly reliable virtual switch indicate the measurement function chosen. The keys of the switch have priority over the action of the keys of the keypad. The change from one function to another resets the configuration of the measurement mode.



3.3.1. KEYS OF THE SWITCH

	Short press	Successive short press
	Current measurement	
	Temperature measurement	Sélection du type de sonde : Pt 100, Pt 1000
	Capacitance measurement	
	Low-impedance AC voltage measurement (VLowZ)	
	Current and frequency measurement with a clamp-on ammeter	Selection of the transformation ratios 1, 10, 100, 1,000 mV/A
	Resistance measurement, audible continuity measurement, diode test	Selection of the continuity, diode functions
	Measurement of frequency and duty cycle or pulse width	Selection of the functions: - Positive duty cycle DC + - Negative duty cycle DC - - Positive pulse width PW + - Negative pulse width PW -
	Voltage and frequency measurement	Selection of the functions: dBm, W

3.4. 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.
Two types of action are possible:

- Short press → press lasting <2 seconds, validated by a beep as soon as the key press is detected.
- Long press → press lasting >2 seconds, validated by a beep as soon as the key press is detected.

3.4.1. FUNCTION KEYS

	Successive short presses	Long press
Hold	Activation/deactivation of storage of the measurements and of the quantities at a given time: - Hold of the display without stopping the acquisitions. The bargraph continues to operate normally. - Exit from the HOLD mode In the MAX/MIN/AVG PEAK mode, when the HOLD is active, the blinking of the "MAX MIN AVG PEAK" symbol indicates that acquisition continues as a background task.	- Hold of the display after stabilization of the measurement (Auto HOLD) - Exit from the Auto HOLD mode
MODE AC/DC	Choice of coupling **AC, DC, AC+DC** : - Access to various parameters → In dBm: change of impedance 50 Ω, 75 Ω, 90 Ω, 600 Ω → In temperature: the main display unit indicates the temperature in °C the other in °F → In the ΔREL mode, the keys is used to change from (present value - reference value) to $\frac{\text{presente value - reference value}}{\text{reference value}} \times 100$ The value is diplayed in %.	Activation / deactivation of auto power off (APO)
	Activation/deactivation of the low-pass filter ≈ 300Hz: The low-pass filter (4th order) makes it possible to measure the RMS voltage delivered by an MLI type speed controller (for asynchronous motor). *See curve, § 7.21..*	Activation / deactivation of the key-press beep
Range	Manual selection of measurement range: The range defines the maximum measurement range the instrument can cover. **The Auto Range mode is default.**	Used to return to Auto Range mode.
Peak ±	Activation of the **Peak+ Peak-** measurements: - **Peak+:** displays the maximum instantaneous peak value of the measurement. - **Peak-:** displays the minimum instantaneous peak value of the measurement. 1st press: recording of PEAK+, PEAK- (on the 2nd display unit). The PEAK+ value is displayed as default. - Subsequent presses: look-up of stored values (volatile).	Exit from the **Peak** mode
MAX/MIN AVG	Activation of the **MAX, MIN, AVG**: - **MAX** and **MIN** display the highest and lowest RMS values measured, respectively. - **AVG**: displays the mean value of the signal since the key press. Time-stamped value for the min and the max [temporary display (4s) on the main display unit, followed by return to present value] If the time (h:min:sec) exceeds (9:59:59), ---- is displayed - 1st press: recording of the MAX, MIN, AVG (on the 2nd display unit). The max. value is displayed by default. - Subsequent presses: look-up of the stored values (volatile).	Exit from the **MAX, MIN, AVG** mode

ΔRel	Activation of the relative display mode: - Display and storage of the reference and differential values in the unit of the quantity measured. - 1st press: activates the relative mode ΔREL (present value - reference value) and stores the measured value that will be used as reference. - "REF" indicates the storage of the reference. - Subsequent presses: toggles the display between the measured value and the relative measurement ΔREL.	Exit from the Δ**REL** mode
☼	Activation of the Backlight: - successive presses to increase the brightness - circular operation: brightness 1 → brightness 2 → brightness 3 → brightness 1	Deactivation of the Backlight

Remark 1: The 0 centre bargraph is managed automatically in I_{DC} and V_{DC}.

When the multimeter is switched on:

- 1st press on Hold (sustained press)+press on ON/OFF → display of all segments of the display unit.
- 2nd press → display of model and version (US/Europe)
- 3rd press → software version (display unit 1) and keyboard and display unit board versions (display unit 2)
- 4th press → normal operation. An audible beep acknowledges key presses.

Remark 2: USER/BASIC mode: During power up, the device is in **BASIC** mode (default configuration volt AC+DC).

- If, when you power up your multimeter, you want to activate the **USER** mode to recover the configuration when the multimeter was switched off, press the Range, key, hold it down, then press **ON/OFF**.
- After an automatic power down, the device restarts in **USER** mode.

The main display unit indicates, for 3 s, the change to **USER** or **BASIC** mode.

In the volt and Ampere functions, the multimeter starts up in AC+DC, as in the USER mode.

3.5. CONNECTION

3.5.1. IN VOLT AND OTHER FUNCTIONS

3.5.2. IN AMPERE

4. GETTING STARTED

4.1. PREPARATION FOR USE

4.1.1. INSTRUCTIONS BEFORE STARTING UP

When you use this multimeter, you must observe the usual safety rules, which:

- protect you from electrical hazards,
- protect the multimeter from operator errors.

For your safety, use only the leads and accessories (clamp meter, etc.) supplied with the instrument. Before each use, make sure that they are in perfect condition.

4.1.2. POWER SUPPLY

The MTX 3297Ex is powered only by 4 qualified batteries 1.5 V
(Refer to ATEX/IECEx Instructions Manual)

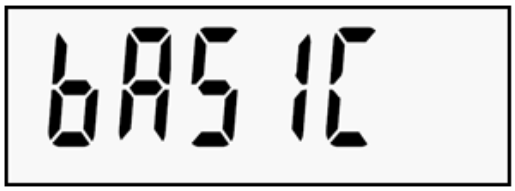
Remove the pull tabs from the batteries before the first use: unscrew the 3 cross-headed screws, then remove the battery membrane.

4.1.3. POWER-UP, DOWN

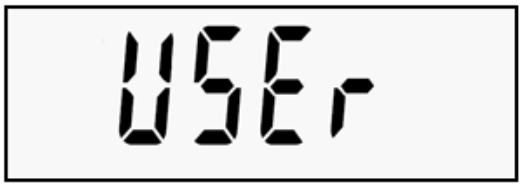
Press **ON/OFF** to power up the device.

Reminder: If the multimeter malfunctions, a long press (>2 s) on this key can be applied to power down the instrument and then restore normal operation.

4.1.4. POWER-UP CONFIGURATION



In the **BASIC** mode, as default, the device starts up in its elementary configuration (default values) and in the VAc+DC function.



In the **USER** mode, the device restarts in the configuration and function selected when it was powered down.

4.1.5. AUTOMATIC SWITCHING OFF

The multimeter automatically switches itself off after 30 minutes if there has been no action on the front panel of the multimeter. Auto power off is disabled:

- in the MAX, MIN, AVG, PEAK mode and in communication
- when the measured quantity (voltage, current) on the input exceeds the danger thresholds, for the user's safety.

5. FUNCTIONAL DESCRIPTION

5.1. MAX MIN AVG MODE

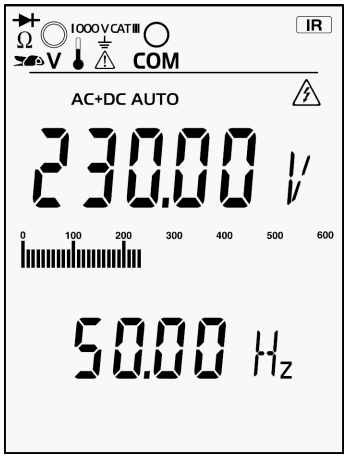
A beep indicates an overshoot or a change of quantity.

5.1.1. DISPLAYS IN THE V_{AC+DC} FUNCTION

Measured signal: 230 V, 50 Hz:

Main dislay unit → ← Present value of the signal

Secondary display unit → ← Frequency of the signal

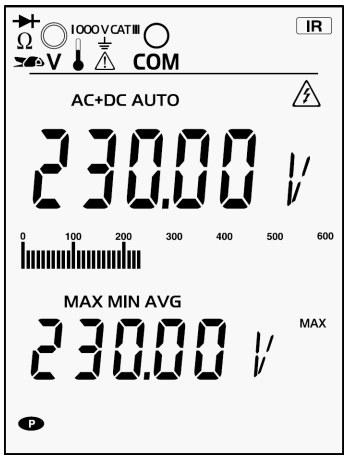


5.1.2. FOR THE MAX VALUE

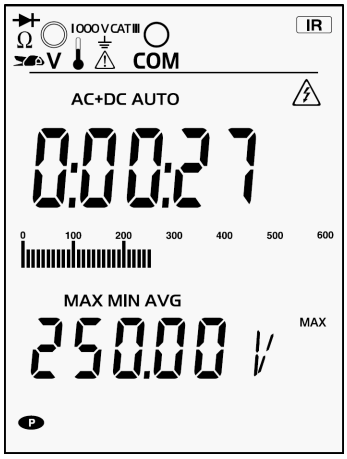
1st press on MAX/MIN AVG:

← Present value of the signal

← MAX value



The measured signal changes to 250 V, 50 Hz:

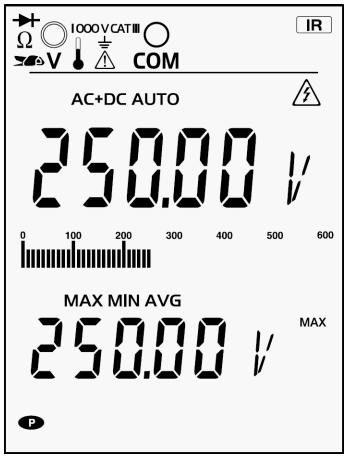


← h:min:sec Ex.: 27 s

← MAX value

Momentary screen (4s) indicating the time-stamped max. value, if the value changes or if the value is looked up.

The display then becomes:



← Present value of the signal

← MAX value

5.1.3. FOR THE MIN VALUE

EX. 3 s

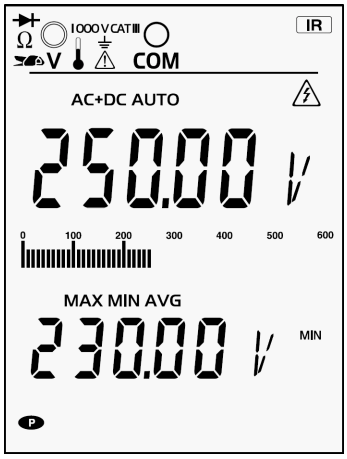
2nd press MAX/MIN AVG :

← h:min:sec

← MIN value

Momentary screen (4 s) indicating the time-stamped max. value, if the value changes or if the value is looked up.

The display then becomes:

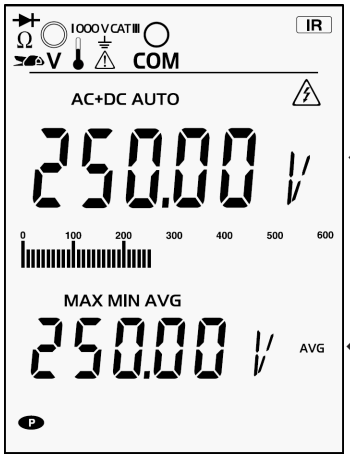


← Present value of the signal

← MIN value

5.1.4. FOR THE AVG VALUE

3rd press MAX/MIN AVG :



← Present value of the signal

← AVG value

5.1.5. DE-ACTIVATION

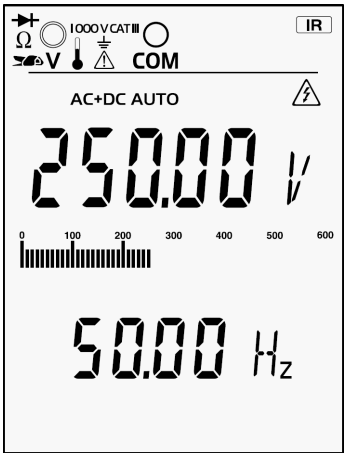
By a long press on the key.

5.2. PEAK MODE

A beep indicates an overshoot or a change of quantity.

5.2.1. DISPLAYS V_{AC+DC} FUNCTION

Measured signal: 250 V, 50 Hz :

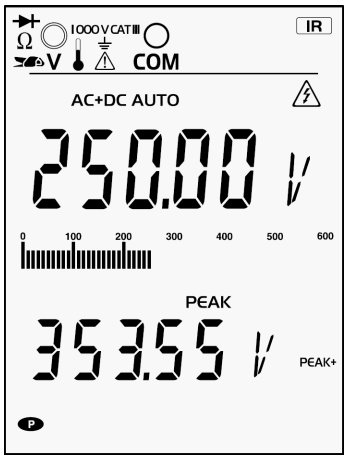


← Present value of the signal

← Secondary measurement value

5.2.2. FOR THE PEAK+ VALUE

1st press on Peak ± :

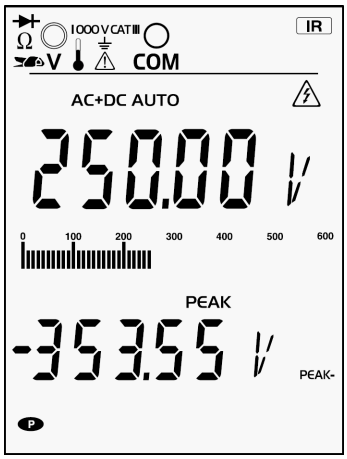


← Present value of the signal

← Peak+ value

5.2.3. FOR THE PEAK- VALUE

2nd press on Peak ± :



← Present value of the signal

← Peak- value

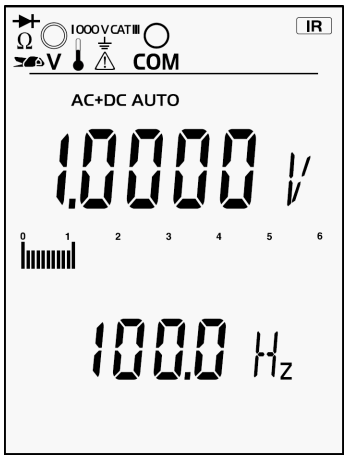
5.2.4. DE-ACTIVATION

By a long press on the key.

5.3. ΔRELATIVE MODE (PRINCIPAL READING ONLY)

5.3.1. DISPLAYS IN THE V_{AC+DC} FUNCTION

Measured signal: 1 V, 100 Hz:

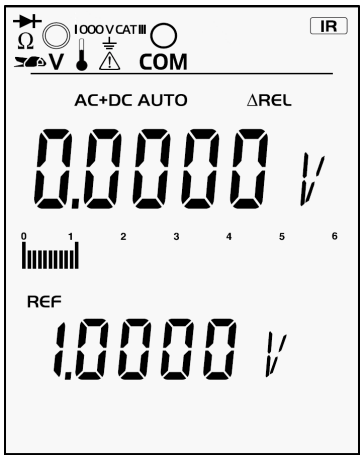


← Present value of the signal

← Secondary measurement value

5.3.2. ACTIVATION OF THE ΔREL MODE

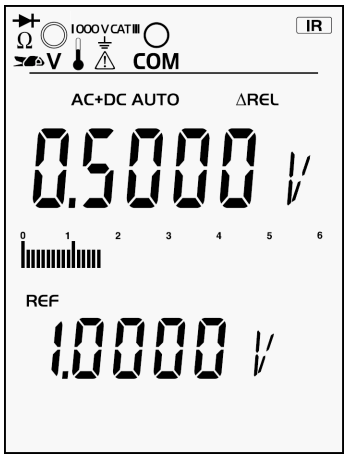
A short press on ΔRel :



← ΔREL = (present value - reference value)

← Reference value

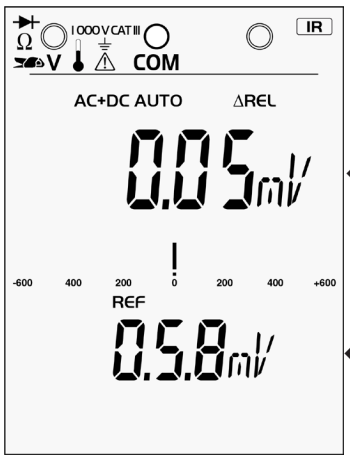
The measured signal changes to 1.5 V: (ΔREL = 1.5 V - 1 V = 0.5 V)



← ΔREL = (present value - reference value

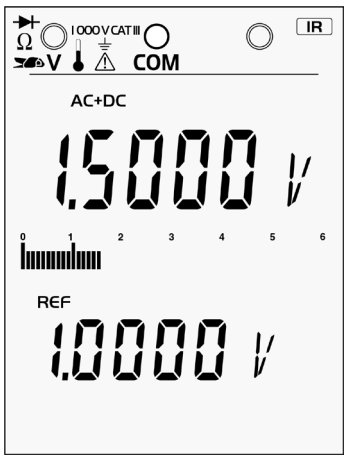
← Reference value

Short press, in the ΔREL mode, on MODE AC/DC :



← ΔREL (%) = (present value - reference value) / reference value x 100

← Reference value



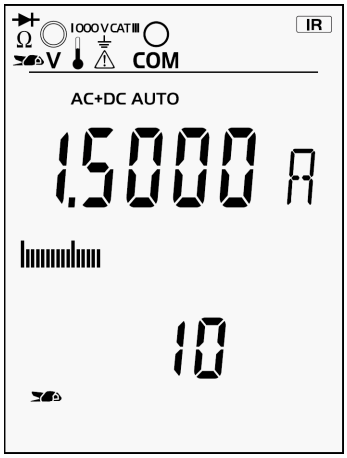
A long press on the ΔREL key erases the reference value.

5.3.3. DE-ACTIVATION

By a long press on the key.

5.4. CLAMP FUNCTION

Ex.: 10 mV/A



← Present value of the signal

← Transformation ratio, selected by successive presses on :

- press 1 : 1 mV/A
- press 2 : 10 mV/A
- press 3 : 100 mV/A
- press 4 : 1 000 mV/A

5.5. SERIAL OPERATION OF THE KEYS OF THE SWITCH

	Press 1	Press 2	Press 3	Press 4	Press 5	Press 6	Short press
	V	dBm	W	V	dBm	W	... ↻
	I	I	I	I	I	I	... ↻
	Pt100	Pt1000	Pt100	Pt1000	Pt100	Pt1000	... ↻
	Capa	Capa	Capa	Capa	Capa	Capa	... ↻
	VLowZ	VLowZ	VLowZ	VLowZ	VLowZ	VLowZ	... ↻
	R = 1	R = 10	R = 100	R = 1000	R = 1	R = 10	... ↻
	Ω	Continuity	Diode	Ω	Continuity	Diode	... ↻
	Frequency	Pos. duty cycle	Neg. duty cycle	Width of neg. pulse	Width of neg. pulse	Frequency	... ↻

5.6. FUNCTIONS OF THE SWITCH AND KEYS

To access the 

, **dBm, W, continuity, diode, duty cycle, and pulse duration functions**, press the button of the switch corresponding to the chosen function.

Here are the possible combinations according to the type of measurement:

Type of measurement	MAX/MIN/ AVG	PEAK ±	ΔREL	RANGE		HOLD	
				Auto.	Manu.		
VLowZ voltage VAC voltage VAC+DC voltage AAC, AAC+DC current	✓	✓	✓	✓	✓	✓	✓
VDC voltage ADC current	✓	-	✓	✓	✓	✓	-
60mVDC voltage	✓	-	✓	-	✓	✓	-
60mVAC voltage 60mVAC+DC voltage	✓	✓	✓	-	✓	✓	✓
Temperature	✓	-	✓	✓	-	✓	-
Ohmmeter	✓	-	✓	✓	✓	✓	-
Capacity	✓	-	✓	✓	✓	✓	-
Frequency	✓	-	✓	✓	-	✓	✓
Period (1/F)	✓	-	✓	✓	-	✓	✓
Continuity	-	-	-	✓	-	-	-
Diode	-	-	-	✓	-	✓	-
dBm	-	-	-	✓	-	✓	-
W	-	-	-	✓	-	✓	-
Duty cycle (Dc+, DC-)	-	-	-	✓	-	✓	-
Pulse duration (Pw+, Pw-)	-	-	-	✓	-	✓	-

The 0 center bargraph is managed automatically in IDC and VDC.

6. HOW ARE THE VARIOUS QUANTITIES MEASURED ?

6.1. VOLTAGE MEASUREMENT

: AC voltage measurement, or measurement of an AC voltage superposed on a DC voltage, or DC voltage measurement at high impedance.

: This position is provided to allow measurements in electrical installations. The input impedance <1 MΩ serves to avoid measuring "phantom" voltages due to couplings between the lines. In VlowZ the coupling must be AC.

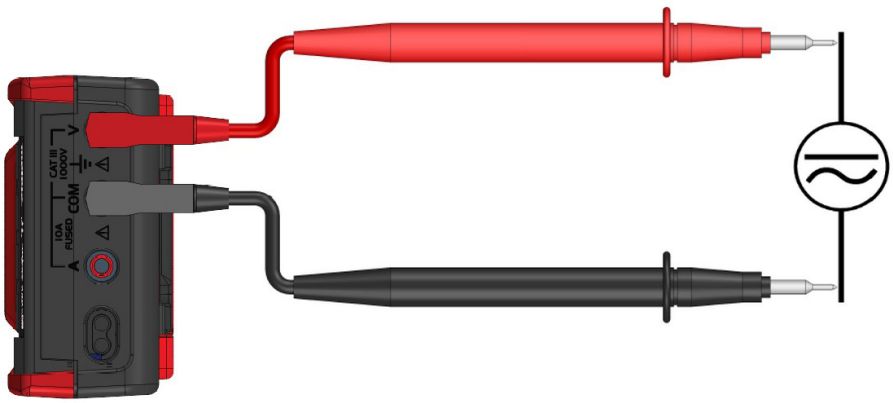
In all cases, "**O.L**" is displayed above 1 050 V and a beep sounds when the measurement exceeds 1 000 V.

1. Press: or .

2. Select the signal coupling, AC+DC, AC, or DC (the central zero bar chart is activated automatically) by pressing MODE AC/DC (the default coupling is AC+DC).
Depending on what you select, the screen displays DC, AC or AC+DC.

3. Connect the black lead to the "**COM**" terminal and the red lead to "**V**".
If the connection is not correct, an audible beep and a visible signal (LEADS) are activated.

4. Place the test probes on the terminals of the circuit to be measured:



5. Read the measurement value indicated on the display unit.

6. As default, the 2nd display unit indicates the frequency, except in DC.

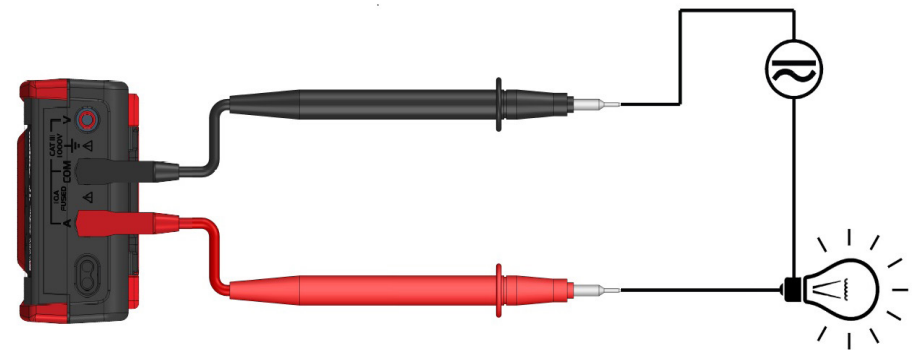
It is possible to activate the filter in V_{LowZ}, V_{AC+DC}, V_{AC}. The cutoff frequency of the filter is ≤ 300 Hz. When a voltage having a frequency above 150Hz is measured, it is heavily attenuated, and so a large error may be observed. It is necessary in this case to deactivate the filter to have the full passband.

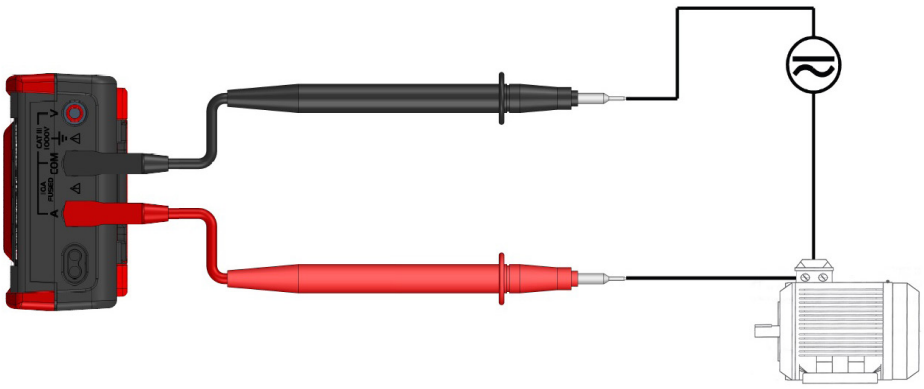
6.2. CURRENT MEASUREMENT

6.2.1. AS AN AMMETER

1. Press:  .

2. Select the type of signal, AC+DC, AC, or DC, by pressing  .
Depending on what you select, the screen displays AC, DC, or AC+DC.
3. Connect the black lead to the "**COM**" terminal and the red lead to "**A**".
If the connection is not correct, an audible beep and a visible signal (LEADS) are activated.
4. Place the test probes in series between the source and the load:





5. Read the measurement value indicated on the display unit. "**O.L**" is displayed, if **I > 20 A**.
6. Par défaut, le 2ème afficheur indique la fréquence, sauf en DC.

It is possible to activate the  **filter in A_{AC+DC}, A_{AC}. The cutoff frequency of the filter is ≤ 300 Hz.**
When a voltage having a frequency above 150Hz is measured, it is heavily attenuated, and so a large error may be observed. It is necessary in this case to deactivate the filter to have the full passband.

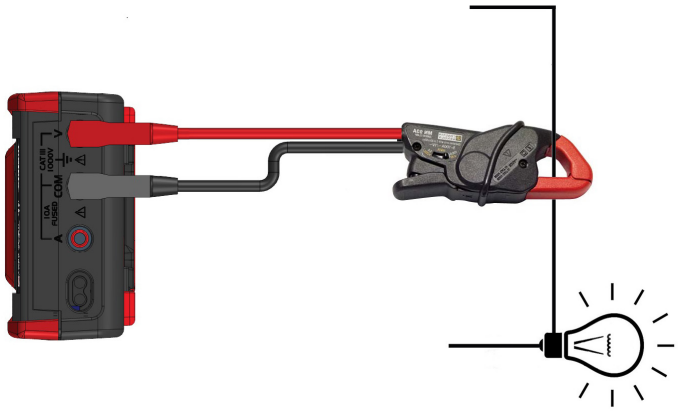
6.2.2. WITH A CURRENT CLAMP

1. Press:  .

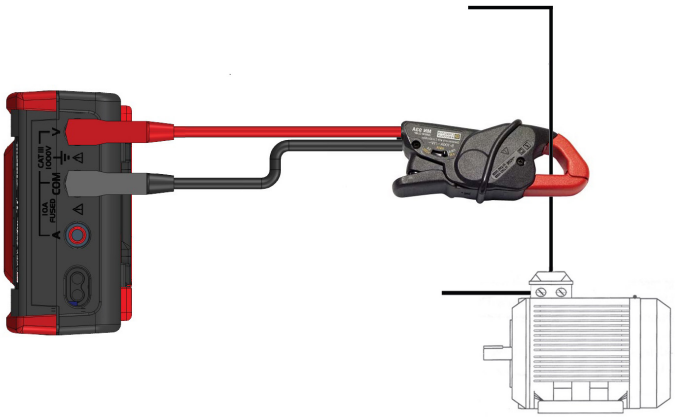
2. Select the type of signal, AC+DC, AC, or DC, by pressing  .
Depending on what you select, the screen displays AC, DC, or AC+DC.
3. Connect the black lead of the clamp to the "**COM**" terminal and the red lead of the clamp to "**V**".
4. Select the transformation ratio (the same as that of the clamp) 1 mV/A, 10 mV/A, 100 mV/A, 1 000 mV/A by pressing on "clamp"

 to have a direct reading of the current.

5. Place the clamp arround the conductor:



Clamp, V output



7. Read the measurement value indicated on the display unit. The measurement accuracy is indicated in "Technical characteristics", §Clamp".
8. As default, the 2nd display unit indicates the transformation ratio in mV/A.

It is possible to activate the filter in A_{AC+DC}, A_{AC}. The cutoff frequency of the filter is ≤ 300 Hz.
When a voltage having a frequency above 150 Hz is measured, it is heavily attenuated, and so a large error may be observed. It is necessary in this case to deactivate the filter to have the full passband.

No approved clamp-on accessory in ATEX/IECEx Explosive zone.

6.3. FREQUENCY MEASUREMENT

1. Press: Hz .
2. Connect the black lead to the "**COM**" terminal and the red lead to "**V**".
3. Place the test probes on the terminals of the circuit to be measured.

Connect the instrument as for a voltage measurement.

4. Read the measurement value indicated on the display unit. The second display unit indicates the period of the signal, 1/F.

5. Press Hz several times to obtain :

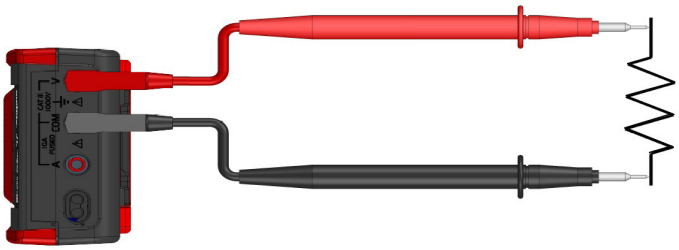
- Positive duty cycle (DC+)
- Negative duty cycle (DC-)
- Positive pulse duration (Pw+)
- Negative pulse duration (Pw-)

It is possible to activate the filter in A_{AC+DC}, A_{AC}. The cutoff frequency of the filter is ≤ 300 Hz.

6.4. RESISTANCE MEASUREMENT

1. Press the button of the switch:  .
2. Connect the black lead to the “**COM**” terminal and the red lead to “**V**”.
3. Place the test probes on the terminals of the component.

Resistance measurements must be made with power off. However, while the presence of a voltage will prevent or throw off the measurement, it will not damage the instrument.



4. Read the measurement value indicated on the display unit.
5. "**O.L**" is displayed, if the circuit is open.

6.5. AUDIBLE CONTINUITY MEASUREMENT

1. Press:  .

2. Press  again; the " ♪ " symbol is displayed.
3. Connect the black lead to the “**COM**” terminal and the red lead to “**V**”.
4. Place the test probes on the terminals of the circuit to be measured.

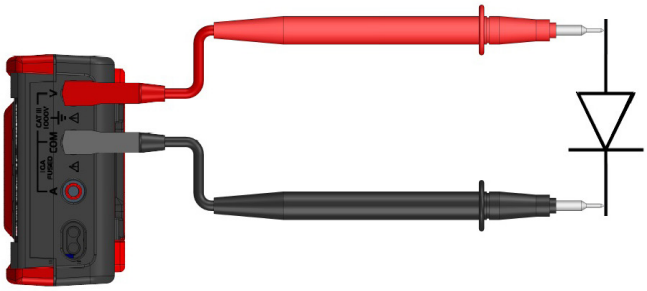
Connect the instrument as for a resistance measurement.

5.Read the measurement value indicated on the display unit.
6. The continuity beep sounds when R < 30 Ω ± 5 Ω.
7. "**O.L**" is displayed, if the circuit is open.

6.6. DIODE TEST

1. Press:  .

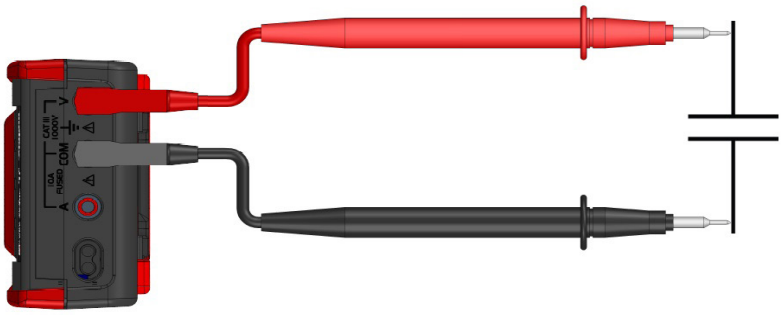
2. Press two times  again; the "  " symbol is displayed.
3. Connect the black lead to the “**COM**” terminal and the red lead to “**V**”.
4. Place the test probes on the terminals of the component.



5. Read the measured threshold voltage of the junction indicated on the display unit.
6. "**O.L**" is displayed, if the circuit is open or the threshold of the diode > 3 V.

6.7. CAPACITANCE MEASUREMENT (discharged)

1. Press: .
2. Connect the black lead to the "**COM**" terminal and the red lead to "**V**".
3. Place the test probes on the terminals of the component.



4. Read the measurement value indicated on the display unit.
"**O.L**" is displayed, if the value to be measured exceeds the capacitance of the range.
"**O.L**" is displayed, if the capacitor is short-circuited.

- For high values, the measurement cycle includes the display of "run" with a "chaser" decimal point This means that acquisition is in progress; wait for the display of the digital result.

"Run" is displayed immediately, if the previous measurement was in a small range.

- The prior discharge of very high capacitances helps shorten the measurement time.

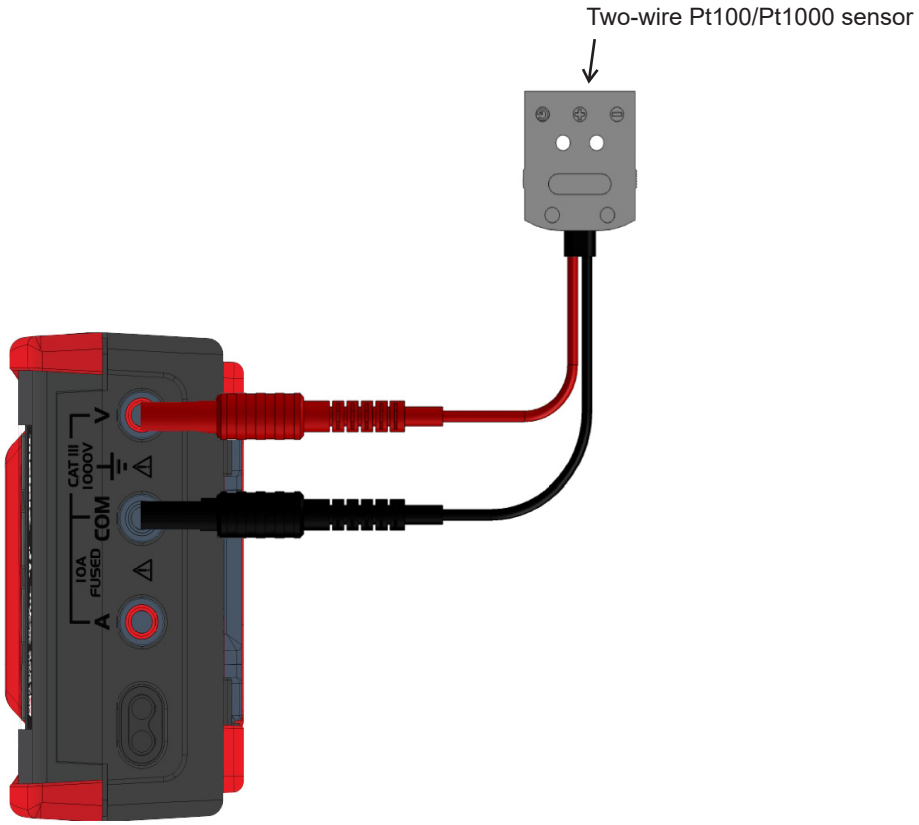
capacitance measurements are forbidden in an explosive zone.

6.8. TEMPERATURE MEASUREMENT (with platinium resistance probe)

1. Press: .
2. Press to select the type of probe: Pt100 or Pt1000.
3. Press MODE AC/DC to switch the temperature unit (°C or °F) between the two display units.

The unit displayed as default on the main display unit is °C.

4. Connect the adapter of the Pt100 or Pt1000 temperature probe (*) to the "**COM**" and "**V**" terminals, making sure that the polarity is correct.



5. Read the measurement value indicated on the display unit.

If "O.L" is displayed, the probe is open-circuit or short-circuited or the value to be measured exceeds the range.

For greater accuracy, avoid exposing the instrument to sudden changes of temperature.

(*) You will find a list of accessories in the CHAUVIN ARNOUX catalogue.

Non-certified probes may not be used in an explosive zone. Use only probes (manufacturer's safety certificate) holding a certificate of compliance allowing use in conjunction with this multimeter.

6.9. MEASUREMENT ON AN MLI TYPE SPEED VARIATOR

6.9.1. VOLTAGE MEASUREMENT

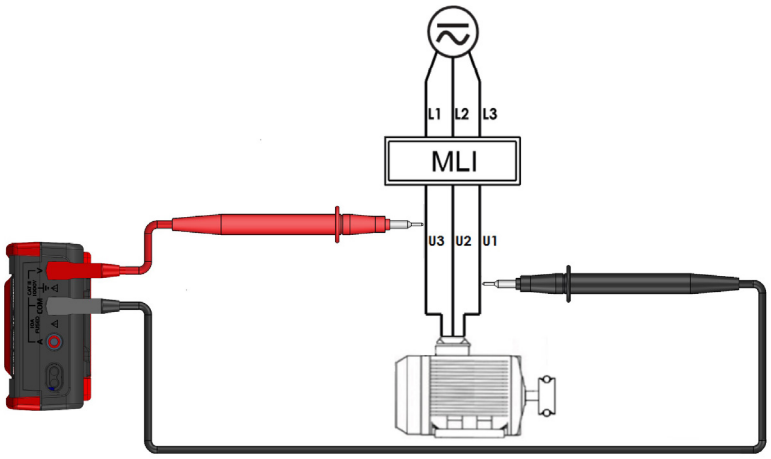
1. Press: VLowZ or dBm W.

2. Type of signal, AC, MODE AC/DC.

3. Select the filter by pressing .

4. Connect the black lead to the "**COM**" terminal and the red lead to "**V**".

5. Place the test probes between two phases of the circuit to be measured:



6. Read the measurement values indicated on the display unit (voltage and frequency).

In all cases, "O.L" is displayed above 1 050 V and a beep sounds when the emasurement exceeds 1 000 V.

The presence of the  symbol indicates that the 300 Hz filter is active.

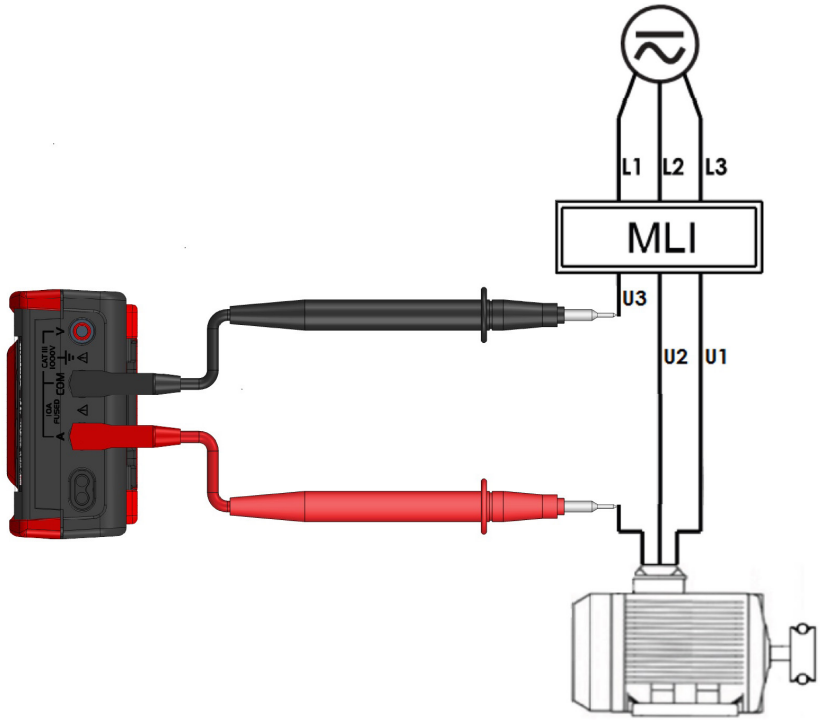
It is very important to leave the filter activated to measure the voltage and frequency of the signal without being perturbed by the MLI.

6.9.2. CURRENT MEASUREMENT

1. Press:  .

2. Select the type of signal, AC+DC, AC, or DC, by pressing  .
Depending on what you select, the screen displays AC, DC, or AC+DC.

3. Select the filter by pressing  .
4. Connect the black lead to the "**COM**" terminal and the red lead to "**A**".
5. Place the test probes in series between the source and the load:



6. Read the measurement value indicated on the display unit.
"O.L" is displayed, if I > 20 A.

The presence of the  symbol indicates that the filter is active.

It is very important to leave the filter activated to measure the voltage and frequency of the signal without being perturbed by the MLI.

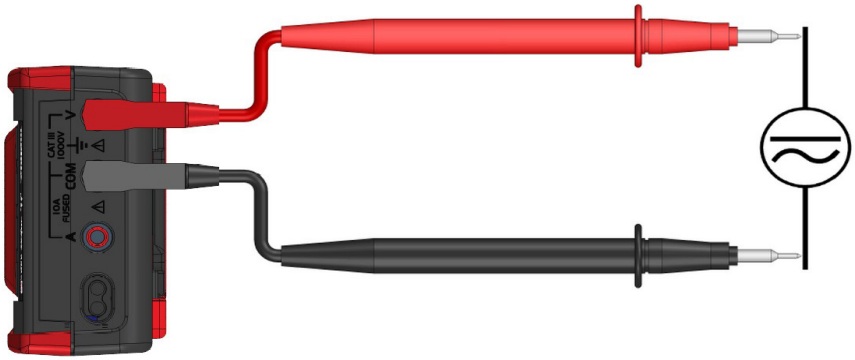
7. As default, the 2nd display unit indicates the frequency, except in DC.

It is possible to make the current measurement using a current clamp in conjunction with the multimeter (see § 6.2.2.).

6.10. RESISTIVE POWER

1. Press  three times.

2. Select AC+DC, AC or DC coupling of the signal by pressing  (the default coupling is AC+DC)
Depending on what you select, the screen displays DC, AC or AC+DC.
3. Connect the black lead to the **"COM"** terminal and the red lead to **"V".**
4. Place the probe tips on the resistive load terminals:



5. As default, the main display unit indicates the value in W ($U^2/600$) into a 600 Ω load.

6.10.1. FOR USE WITH SOME OTHER LOAD ≠ 600 Ω

1. Start by powering down the load.

2. Press  . The display unit indicates the resistance.

3. Press  to store the resistance, which will be used to calculate the power.

4. Press  three times.

5. Select AC+DC, AC or DC coupling of the signal by pressing  (the default coupling is AC+DC).
Depending on what you select, the screen displays DC, AC or AC+DC.
6. Power up the load.
7. Read the measurement value indicated on the display unit:

- the main display unit indicates the power in W (U^2/R)
- the secondary display unit indicates the resistance measured on the installation (600 Ohm by default).

6.11. DBM POWER RATIO IN DECIBELS

1. Press dBm W.

2. Press dBm W again.

3. Press MODE AC/DC to select the reference resistance, 50, 75, 90, or 600 Ohm.

4. Connect the black lead to the "**COM**" terminal and the red lead to "**A**".

5. Place the test probes on the terminals of the circuit to be measured:

Connect the instrument as for a voltage measurement.

6. Read the measurement value indicated on the display unit.

- the main display unit indicates the value in dBm.
- the secondary display unit indicates the resistance measured on the installation (50 Ω, by default)

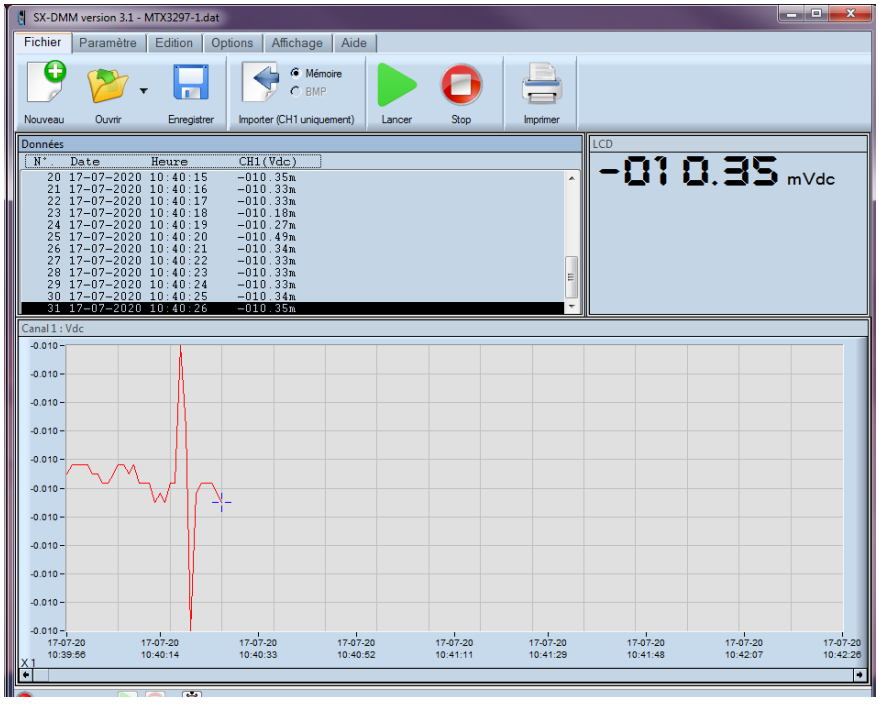
Reminder:

R	0 dBm (VRef)
50 Ω	223.6 mV
75 Ω	273.86 mV
90 Ω	300 mV
600 Ω	774.6 mV

$$X\ dBm = 20\ Log \frac{Vmeasured}{VRef}$$

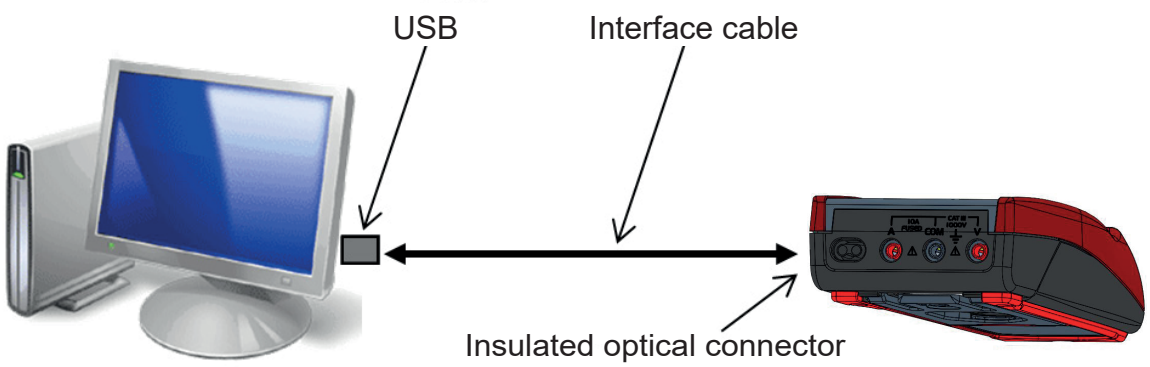
6.12. SX-DMM : PROCESSING SOFTWARE (available from support website www.chauvin-arnoux.com)

The multimeter can be interfaced directly with a PC or other computer via an IR/USB optical link using SX-DMM acquisition software:
The transmission rate is 9 600 Bauds.
The transmission parameters are fixed (8 data bits, 1 stop bit, no parity).



6.12.1. CONNECTION OF THE ISOLATED USB OPTICAL CABLE (OPTION)

1. Connect the isolated optical lead to the isolated optical input of the multimeter (located on the top of the multimeter). Mechanical polarization prevents connection in reverse.
Connect the USB lead to one of the USB ports of the PC.
2. Install the USB driver on your PC (included in the SX-DMM software).



Communication between MTX 3297Ex and PC in safe zone only.

6.12.2. INSTALLING THE "SX-DMM" SOFTWARE

1. Install the "SX-DMM" software on the PC.
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.

6.13. CALIBRATION KIT (optional)

Uses the USB link for calibration with housing closed.

6.14. REMOTE PROGRAMMING MANUAL

This manual (available on our website) describes the SCPI commands needed for the programming of the multimeter.

7. TECHNICAL CHARACTERISTICS (safe zone)

Accuracy: “a% R +b D” means “a% of the reading +b Digit”.

Only values with tolerances or limits are guaranteed values.
Values without tolerances are given for guidance (standard NFC42670).
The technical specifications are guaranteed only after 30 minutes of warming up. Except as otherwise indicated, they are valid from 10 % to 100 % of the measurement range.

7.1. DC VOLTAGE

In the “DC” mode, you measure a direct voltage or the DC component of an AC voltage (filter activated).

60mV range: Measuring a strong current for a long time can cause a temperature rise in some components.
Protection: 1 414 Vpk

Range	Specified measurement range	Resolution	Intrinsic error	Input impedance
60 mV [1)]	0 to 60.000 mV	0.001 mV	0.5 % L + 35 D	10.612 MΩ
600 mV	0 to 600.00 mV	0.01 mV	0.5 % L + 25 D	10.9 MΩ
6 V	0 to 6.0000 V	0.0001 V	0.05 % L + 25 D	10.9 MΩ
60 V	0 to 60.000 V	0.001 V		10.082 MΩ
600 V	0 to 600.00 V	0.01 V		10.008 MΩ
1 000 V [2)]	0 to 1 000.0 V	0.1 V	0.07 % L + 25 D	10.008 MΩ

1) This range is accessible only with the Range key.
   Input impedance: approx. 10.6 MΩ // 50 pF
2) The display indicates “+OL” above +1.050 V and “-OL” above - 1.050 V.
   Secondary measurements and displays: MAX, MIN, AVG.

7.2. AC RMS 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 pass band (between 3dB down points) is reduced to 300 Hz, if the filter is activated.

60mV range: Measuring a strong current for a long time can cause a temperature rise in some components.
Protection: 1 414 Vpk

Range	Operating range	Specified measurement range [4)]	Resolution	Additional uncertainty DC (±)	Uncertainty (±) AC	Additional uncertainty F(Hz) [1)]	Pass band	Input impedance //< 50 pF	Peak factor
60 mV [2)]	0 to 60.000 mV	6.,000 to 60.000 mV	0.001 mV	± 15 D	1.5 % L ± 35 D	45<F<65 Hz 0.3 % L typ. to 100 Hz 0.7 % L typ. to 150 Hz 1.8 % L typ. to 300 Hz 30 % L typ.	≈ 400 Hz	10.612 MΩ	3 @ 50 mV
600 mV	0 to 600.00mV	60.00 to 600.00 mV	0.01 mV		1 % L + 0.6 % x [F(kHz)-1] L ± 30 D		10 Hz to 50 kHz	10.9 MΩ	3 @ 500 mV
6 V	0 to 6.0000 V	0.6 to 6.0000 V	0.0001 V		0.7 % L + 0.6 % x [F(kHz)-1] L ± 25 D		10 Hz to 100 kHz	10.9 MΩ	3 @ 5 V
60 V	0 to 60.000 V	6.000 to 60.000 V	0.001 V		0.5 % L + 0.3 % x [F(kHz)-1] L ± 25 D			10.082 MΩ	3 @ 50 V
600 V	0 to 600.00 V	60.00 to 600.00 V	0.01 V					10.008 MΩ	3 @ 500 V
1 000 V [3)]	0 to 1 000.0 V	60 to 1000.0 V	0.1 V					10.008 MΩ	1,42 @ 1 000 V

1) See the typical curve of the 300 Hz filter.
2) This range is accessible only with the Range key.
Input impedance: approx. 10.6 MΩ//50 pF
3) The LCD indicates “+OL” above +1,050 V, “-OL” above -1,050 V or 1,050 VRMS
4) From 1kHz measurement must exceed 15 % of the range.
Secondary measurements and displays: FREQ (AC coupling), MAX, MIN, AVG, PEAK

7.3. VLOWZ AC RMS

In VLowZ, there is no 60 mV range
Protection : 1 414 Vpk

Range	Operating range	Specified measure-ment range [3]	Resolution	Uncertainty (±)	Additional uncertainty F (Hz) [1]	Input impedance //<50 pF	Peak factor
600 mV	0 to 600.00 mV	60.00 to 600.00 mV	0.01 mV	1 % L + 0.6 % x [F(kHz)-1] L ± 30 D	45<F<65 Hz 0.3 % L typ. to 100 Hz 0.7 % L typ. to 150 Hz 1.8 % L typ. to 300 Hz 30 % L typ.	≅ 300 kΩ	3 @ 500.0 mV
6 V	0 to 6.0000 V	0.6 to 6.0000 V	0.0001 V	0.7 % L + 0.6 % x [F(kHz) -1] L ± 25 D			3 @ 5.0 V
60 V	0 to 60.000 V	6.000 to 60.000 V	0.001 V	0.5 % L + 0.3 % x [F(kHz) -1] L ± 25 D			3 @ 50.0 V
600 V	0 to 600.00 V	60.00 to 600.00 V	0.01 V				3 @ 500.0 V
1 000 V [2]	0 to 1 000.0 V	60 to 1 000.0 V	0.1 V				1.42 @ 1 000.0 V

1) See the typical curve of the 300 Hz filter.
2) The LCD indicates “+OL” above +1.050 V, “-OL” above -1.050 V or 1.050 VRMS
3) From 1 kHz, the measurement must exceed 15 % of the range.
Secondary measurements and displays: FREQ (AC coupling), MAX, MIN, AVG, PEAK

7.4. VAC+DC TRMS

60 mV range: Measuring a strong current for a long time can cause a temperature rise in some components.
Protection : 1414 Vpk

Range	Operating range	Specified measurement range	Resolution	Additional uncertainty DC (±)	Uncertainty (±) AC	Additional uncertainty F (Hz) [1]	Pass band	Input impedance //< 50 pF	Peak factor
60 mV [2]	0 to 60.000 mV	6.000 to 60.000 mV	0.001 mV	± 15 D	1.5 % L ± 35 D	45<F<65 Hz 0.3 % L typ. to 100 Hz 0.7 % L typ. to 150 Hz 1.8 % L typ. to 300 Hz 30 % L typ.	≈ 400 Hz	10.612 MΩ	3 @ 50 mV
600 mV	0 to 600.00 mV	60.00 to 600.00 mV	0.01 mV		0.8 % L + 0.6 % x [F(kHz)-1] L ± 30 D		10 Hz to 50 kHz	10.9 MΩ	3 @ 500 mV
6 V	0 to 6.0000 V	0.6 to 6.0000 V	0.0001 V		0.7 % L + 0.6 % x [F(kHz)-1] L ± 25 D		10 Hz to 100 kHz	10.9 MΩ	3 @ 5 V
60 V	0 to 60.000 V	6.000 to 60.000 V	0.001 V		0.5 % L + 0.3 % x [F(kHz)-1] L ± 25 D			10.082 MΩ	3 @ 50 V
600 V	0 to 600.00 V	60.00 to 600.00 V	0.01 V					10.008 MΩ	3 @ 500 V
1 000 V [3]	0 to 1 000.0 V	60 to 1 000.0 V	0.1 V					10.008 MΩ	1.42 @ 1 000 V

1) See the typical curve of the 300 Hz filter.
2) This range is accessible only with the Range key.
Input impedance: approx. 10.6 MΩ//50 pF
3) The LCD indicates “+OL” above +1,050 V, “-OL” above -1,050 V or 1,050 VRMS.
4) From 1 kHz, the measurement must exceed 15 % of the range
Secondary measurements and displays: FREQ (AC coupling), MAX, MIN, AVG, PEAK

7.5. CURRENTS

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).

7.5.1. DC CURRENT

Particular reference conditions:
600 µA and 6 mA ranges: Measuring a strong current for a long time may cause a temperature rise of some components. In this case, it is necessary to wait some time for the metrological characteristics specified in these ranges.

Range	Operating range	Specified measurement range	Resolution	Uncertainty (±)	Voltage drop	Protection
600 µA	0 to 600.00 µA	0.02 to 600.00 µA	0.01 µA	1 % L ± 25 D	0.12 mV / µA	Fuse 10 A / 1 000 V > 30 kA
6 mA	0 to 6000.0 µA	0.002 to 6.0000 µA	0.1 µA	0.8 % L ± 25 D	25 mV / mA	
60 mA	0 to 60.000 mA	0.020 to 60.000 mA	0.001 mA	0.8 % L ± 20 D	3 mV / mA	
600 mA	0 to 600.00 mA	0.20 to 600.00 mA	0.01 mA	0.8 % L ± 20 D	0.58 mV / mA	
6 A	0 to 6.0000 A	0.2000 to 6.0000 A	0.0001 A	0.8 % L ± 20 D	0.05 V / A	
10 A / 20 A (*)	0 to 20.000 A	0.200 to 20.000 A	0.001 A	0.8 % L ± 20 D	0.05 V / A	

The display indicates “OL” above 19.99 A. The symbol blinks and a beep sounds above 10 A.
(*) Acceptable overload: 10 A to 20 A for 30 s max. with a pause of 5 min between 2 measurements. Ambient temp. 35°C max.
Secondary measurements and displays: MAX, MIN, AVG

7.5.2. AAC RMS CURRENT

Range	Operating range	Specified measurement range	Resolution	Uncertainty 40 Hz to 20 kHz (±) (**)	Peak factor	Voltage drop	Protection
600 µA	0 to 600.00 µA	60 to 600.00 µA	0.01 µA	1% L + [0.15% x (FkHz-1)] L ± 30 D	2.6 @ 500 µA	10 mV / µA	Fuse 10 A/1000 V > 30 kA
6.000 mA	0 to 6.0000 mA	0.6000 to 6.0000 mA	0.1 µA	1.2% L + [0.08% x (FkHz-1)] L ± 25 D	2.6 @ 5 mA	25 mV / mA	
60 mA	0 to 60.000 mA	6.000 to 60.000 mA	0.001 mA	1% L + [0.08% x (FkHz-1)] L ± 25 D	2.6 @ 50 mA	3 mV / mA	
600 mA	0 to 600.00 mA	60.00 to 600.00 mA	0.01 mA		2.6 @ 500 mA	0.58 mV / mA	
6 A	0 to 6.0000 A	0.6000 to 6.000 A	0.0001 A	1% L + [0.1% x (FkHz-1)] L ± 25 D	2.8 @ 5 A	0.05 V / mA	
10 A / 20 A (*)	0 to 20.000 A	1.000 to 20.000 A	0.001 A	1.2% L + [0.1% x (FkHz-1)] L ± 25 D	3.7 @ 8 A	0.05 V / mA	

The display indicates “OL” above 19.99 A. The symbol ⚠ blinks and a beep sounds above 10 A.
Secondary measurements and displays: FREQ (AC coupling), MAX, MIN, AVG, PEAK
(*) Acceptable overload: 10 A to 20 A for 30 s max. with a pause of 5 min between 2 measurements. Ambient temp. 35 °C max.
(**) Additional uncertainty with the 300 Hz filter.

7.5.3. AAC+DC TRMS CURRENT

Warning : the sum AC+DC must never exceed the range, 600 mA, or 60 mA, or 6 mA, or 600 µA or 6 A, or 10 A, as the case may be.
The AC component must represent at least 5 % of the amplitude of the AC+DC total for it to be possible to measure it.

Range	Operating range	Specified measurement range	Resolution	Uncertainty AC 40 Hz - 20 kHz (±)(**)	Additional uncertainty DC (±)	Peak factor	Voltage drop	Protection
600 µA	0 to 600.00 µA	60 to 600.00 µA	0.01 µA	1% L + [0.15% x (FkHz-1)] L ± 20 D	± 20 D	2.6 @ 500 µA	10 mV / µA	Fuse 10 A/1000 V > 30 kA
6 mA	0 to 6.0000 µA	0.6000 to 6.0000 µA	0.1 µA	1% L + [0.08% x (FkHz - 1)]L ± 25 D	± 15 D	2.6 @ 5 mA	25 mV /mA	
60 mA	0 to 60.000 mA	6.000 to 60.000 mA	0.001 mA	1% L + [0.08% x (FkHz - 1)]L ± 25 D		2.6 @ 50 mA	3 mV / mA	
600 mA	0 to 600.00 mA	60.00 to 600.00 mA	0.01 mA			2.6 @ 500 mA	0.58 mV / mA	
6 A	0 to 6.0000 A	0.6000 to 6.000 A	0.0001 A	1% L + [0.1% x (FkHz-1)]L ± 25 D		2.8 @ 5 A	0.05 V /mA	
10 A / 20 A (*)	0 to 20.000 A	0.600 to 20.000 A	0.001 A	1.2% L+ [0.1% x (FkHz-1)]L ± 25 D		3.7 @ 8 A	0.05 V /mA	

The display indicates “OL” above 19.99 A. The symbol blinks and a beep sounds above 10 A.
(*) Acceptable overload: 10 A to 20 A for 30 s max. with a pause of 5 min between 2 measurements. Ambient temp. 35 °C max.
Secondary measurements and displays: FREQ (AC coupling), MAX, MIN, AVG, PEAK
(**) Additional uncertainty with the 300 Hz filter.

7.6. FREQUENCY

7.6.1. MAIN FREQUENCY MEASUREMENT

In this setting, you can measure the frequency of a voltage.

Particular reference conditions: 150 mV < U < 600 V
When the switch is set to Hz, the 300 Hz filter is not in service.
Protection: 1 414 Vpk

Range	Operating range	Specified measurement range	Resolution	Intrinsic error
60 Hz	10.00 à 60.00 Hz	10.00 à 60.00 Hz	0.01 Hz	0.1 % L ± 1 D
600 Hz	10.0 à 600.0 Hz	10.0 à 600.0 Hz	0.1 Hz	
6 kHz	0 à 6.000 kHz	0.010 à 6.000 kHz	0.001 kHz	
60 kHz	0 à 60.00 kHz	0.01 à 60.00 kHz	0.01 kHz	
600 kHz	0 à 200.0 kHz	0.1 à 200.0 kHz	0.1 kHz	

Below 10 Hz, or if the signal detection level is insufficient, the value is forced to 0.

The measured period in ms is available on the second display unit.

7.6.2. SECONDARY FREQUENCY MEASUREMENT

You can measure the frequency and magnitude of a voltage or of a current simultaneously.

Same accuracy as in the “Hz” setting.
Particular reference conditions: 150 mV < U < 600 V
0.15 A < I < 10 A
Max. frequency measurable in volts: 100 kHz
(except 60 mV range → 400 Hz and
600 mV range → 50 kHz)
Max. frequency measurable in amperes: 20 kHz
When the switch is set to VLowZ, Volts or Ampere, if the 300 Hz filter is activated, the measurable frequency remains within the limits of the PB of the filter.
Below 10 Hz, or if the signal detection level is inadequate, the reading is forced to « -----«.

7.7. RESISTANCE

7.7.1. 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: 1 414 Vpk

Range	Specified measurement range	Resolution	Uncertainty	Measurement current	Open-circuit voltage
600 Ω	0 to 600.00 Ω (*)	0.01 Ω	0.2 % L ± 20 D	≈ 1 mA	< 5 V
6 kΩ	0 to 6.0000 kΩ	0.0001 kΩ	0.2 % L ± 20 D	≈ 126.6 µA	
60 kΩ	0 to 60.000 kΩ	0.001 kΩ		≈ 12.6 µA	
600 kΩ	0 to 600.00 kΩ	0.01 kΩ		≈ 1.26 µA	
6 MΩ	0 to 6.0000 MΩ	0.0001 MΩ	1.5 % L ± 30 D	≈ 240 nA	
60 MΩ	0 to 60.000 MΩ	0.001 MΩ	3 % L ± 30 D	≈ 29 nA	

(*) REL measurement

7.8. CAPACITY

7.8.1. CAPACITANCE METER

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

Range	Operating range	Specified measurement range	Resolution	Intrinsic error	Measurement current	Measurement time
6 nF	0.100 to 6.000 nF	0.100 to 6.000 nF	0.001 nF	2 % L ± 30 D	≈ 1.26 µA	≈ 400 ms
60 nF	0 to 60.00 nF	0 to 60.00 nF	0.01 nF	1 % L ± 10 D	≈ 1.26 µA	≈ 400 ms
600 nF	0 to 600.0 nF	0 to 600.0 nF	0.1 nF	1 % L ± 10 D	≈ 1.26 µA	≈ 400 ms
6 µF	0 to 6.000 µF	0 to 6.000 µF	0.001 µF	1 % L ± 10 D	≈ 12.6 µA	≈ 0.125 s/µF
60 µF	0 to 60.00 µF	0 to 60.00 µF	0.01 µF	1 % L ± 10 D	≈ 126.6 µA	≈ 0.125 s/µF
600 µF	0 to 600.0 µF	0 to 600.0 µF	0.1 µF	3 % L ± 5 D	≈ 1 mA	≈ 0.125 s/µF
6 mF	0 to 6.000 mF	0 to 6.000 mF	1 µF	4 % L ± 5 D	≈ 1 mA	≈ 17 s/mF
60 mF	0 to 60.00 mF	0 to 60.00 mF	10 µF	6 % L ± 5 D	≈ 1 mA	≈ 17 s/mF

The use of wires that are very short and shielded is strongly recommended.
Protection: 1 414 Vpk

7.9. TEST DIODE

Range	Resolution	Accuracy	Open-circuit voltage	Measurement current
3 V	0.1 mV	1 % L ± 30 D	< 5 V	< 1.1 mA

Audible signal triggered if < 40 mV ± 10 mV
Protection: 1 414 Vpk

7.10. AUDIBLE CONTINUITY

Range	Resolution	Accuracy	Open-circuit voltage	Measurement current	Protection
600 Ω	0.1 Ω	0.2 % L ± 20 D	< 5 V	< 1.1 mA	1 414 Vpk

Response time: < 100 ms
Triggering threshold: < 30 Ω ± 5 Ω
Protection: 1 414 Vpk

7.11. CLAMP

You can measure a current using various current clamps and obtain a direct reading of the current by selecting the correct transformation ratio, which must be the same as that of the clamp.

If the signal detection level is insufficient, the value is forced to “-----“

The input impedance is approximately 10 MΩ.

Add the error of the clamp to the intrinsic error of the multimeter, specified in the tables below.

7.11.1. DC CURRENT

Ratio / Range		600 mA	6 A	60 A	600 A	6 000 A
1 mV/A	Resolution			0.01 A	0.1 A	1 A
	Accuracy			0.5 % L ± 2 D	0.5 % L ± 2 D	0.05 % L ± 2 D
10 mV/A	Resolution		0.001 A	0.01 A	0.1 A	
	Accuracy		0.5 % L ± 2 D	0.5 % L ± 2 D	0.05 % L ± 2 D	
100 mV/A	Resolution	0.1 mA	0,001 A	0.01 A		
	Accuracy	0.5 % L ± 2 D	0.5 % L ± 2 D	0.05 % L ± 2 D		
1 000 mV/A	Resolution	0.1 mA	0.001 A			
	Accuracy	0.5 % L ± 2 D	0.05 % L ± 2 D			

Secondary measurements and displays: MAX, MIN, AVG and transformation ratio of the sensor.

7.11.2. AAC RMS CURRENT

Ratio / Range		600 mA	6 A	60 A	600 A	6 000 A
1 mV/A	Resolution			0.01 A	0.1 A	1 A
	Accuracy			1.5 % L ± 5 D (BW ≈ 400 Hz)	1 % L + 0.25 % x [F(kHz)-1] L ± 5 D (BW : 10 Hz to 50 kHz)	0.5 % L + 0.18 % x [F(kHz)-1] L ± 3 D (BW : 10 Hz to 100 kHz)
10 mV/A	Resolution		0.001 A	0.01 A	0.1 A	
	Accuracy		1.5 % L ± 5 D (BW ≈ 400 Hz)	1 % L + 0.25 % x [F(kHz)-1] L ± 5 D (BW : 10 Hz to 50 kHz)	0.5 % L + 0.18 % x [F(kHz)-1] L ± 3 D (BW : 10 Hz to 100 kHz)	
100 mV/A	Resolution	0.1 mA	0.001 A	0,01 A		
	Accuracy	1.5 % L ± 5 D (BW ≈ 400 Hz)	1 % L + 0.25 % x [F(kHz)-1] L ± 5 D (BW : 10 Hz to 50 kHz)	0.5 % L+ 0.18 % x [F(kHz)-1] L ± 3 D (BW : 10 Hz to 100 kHz)		
1 000 mV/A	Resolution	0.1 mA	0.001 A			
	Accuracy	1 % L + 0.25 % x [F(kHz)-1] L ± 5 D (BW : 10 Hz à 50 kHz)	0.5 % L+ 0.18 % x [F(kHz)-1] L ± 3 D (BW : 10 Hz to 100 kHz)			
Peak factor, 3		@ 500 mA	@ 5 A	@ 50 A	@ 500 A	@ 5 000 A

From 1 kHz, the measurement must exceed 15 % of the range

Secondary measurements and displays: MAX, MIN, AVG and transformation ratio of the sensor.

300 Hz filter: if the filter is active, see “300 Hz filter” curve for the additional uncertainty.

7.11.3. AAC+DC TRMS CURRENT

Ratio / Range		600 mA	6 A	60 A	600 A	6 000 A
1 mV/A	Resolution			0.01 A	0.1 A	1 A
	Accuracy			1.5 % L ± 15 D (BW ≈ 400 Hz)	0.8 % L + 0.18 % x [F(kHz) -1] L ± 15 D (BW : 10 Hz to 50 kHz)	0.5 % L + 0.18 % x [F(kHz) -1] L ± 13 D (BW : 10 Hz to 100 kHz)
10 mV/A	Resolution		0.001 A	0.01 A	0.1 A	
	Accuracy		1.5 % L ± 5 D (BW ≈ 400 Hz)	0.8 % L + 0.18 % x [F(kHz) -1] L ± 15 D (BW : 10 Hz to 50 kHz)	0.5 % L + 0.18 % x [F(kHz) -1] L ± 13 D (BW : 10 Hz to 100 kHz	
100 mV/A	Resolution	0.1 mA	0.001 A	0,01 A		
	Accuracy	1.5 % L ± 5 D (BW ≈ 400 Hz)	0.8 % L + 0.18 % x [F(kHz) -1] L ± 15 D (BW : 10 Hz to 50 kHz)	0.5 % L + 0.18 % x [F(kHz) -1] L ± 13 D (BW : 10 Hz to 100 kHz		
1 000 mV/A	Resolution	0.1 mA	0,001 A			
	Accuracy	0.8 % L + 0.18 % x [F(kHz) -1] L ± 15 D (BW : 10 Hz to 50 kHz)	0.5 % L + 0.18 % x [F(kHz) -1] L ± 13 D (BW : 10 Hz to 100 kHz			
Peak factor, 3		@ 500 mA	@ 5 A	@ 50 A	@ 500 A	@ 5 000 A

From 1 kHz, the measurement must exceed 15 % of the range
Secondary measurements and displays: MAX, MIN, AVG and transformation ratio of the sensor.
300 Hz filter: if the filter is active, see “300 Hz filter” curve for the additional uncertainty.

7.12. TEMPERATURE

7.12.1. PT100 / PT1000

The user can measure the temperature by means of a Pt100/Pt1000 sensor. This specification is guaranteed for Ta (ambient temperature) -10 °C < Ta < 45°C.

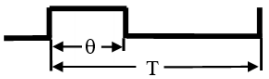
Range	Measurement current	Resolution	Accuracy	Protection
- 200°C to + 800°C	< 1 mA (Pt 100) < 0.15 mA (Pt 1000)	0.1°C	0.1 % L ± 1.5°C	1 414 Vpk

"Active" protection by PTC thermistor
Display in °C / °F possible
(in Pt100 the coefficient: 0.385 Ω/°C)

7.13. PEAK

Add 1 % L ± 30 D to obtain the accuracy corresponding to the function and the range.

Fmax 1 kHz (1 ms)
Protection 1 414 Vpk



θ = 1 ms mini

7.14. SURV

7.14.1. MIN, MAX, AVG

Add 0.2 % L + 2 D to obtain the accuracy corresponding to the function and the range.
Acquisition time of the extrema approximately 100 ms
Protection 1 414 Vpk

7.15. W RESISTIVE POWER

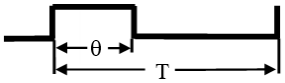
Display of the resistive power with respect to a reference resistance measured on the installation and saved in memory using the HOLD key (600 Ω is the default)

The function determined is:	(measured AC+DC voltage) 2/VRef
Range	AC and AC+DC
Resolution	1 mW
Accuracy:	2 x accuracy VAC (en %)
Max. measurement voltage	1 000 VAC + DC
Protection	1 414 Vpk
Unit of display	W

7.16. DC DUTY CYCLE

Display of the measurement in % of a logical signal (TTL, CMOS, etc.) in "AC+DC" mode

DC+ duty cycle	= θ
DC- duty cycle	= T - θ
Resolution	0.01 %
Minimum duration for θ	10 µs
Maximum duration for T	0.8 s
Minimum duration for T	200 µs [5 kHz]
Nominal range	5 à 95 % typical
Sensitivity (10 V range)	> 10 % of the range Freq < 1 kHz
	> 20 % of the range Freq > 1 kHz
Absolute error on the duty	± [0.1 % + 0.045 % *(RC-50)] Freq < 1 kHz
cycle, expressed in % absolute	± [0.5 % + 0.06 % *(RC-50)] Freq > 1 kHz
Protection	1 414 Vpk



7.17. PULSE WIDTH (PW+⎍) (PW-⎎)

Depending of tfrequency counter triggering conditions.

Resolution	10 µs
Minimum pulse width	100 µs
Accuracy	0.1 % * 10 µs
Maximum duration of a period	1.25 s (0.8 Hz)
Triggering threshold	20 % of the range except 1 000 VAC
This threshold is:	positive in ⎍, negative in ⎎.

Additional error on the measurement due to the slope at the zero crossing: see §. Measurement of duty cycle.

Protection	1 414 Vpk

7.18. dBm: power ratio in dB

Display of the measurement in dBm with respect to a resistance reference chosen by the user from among 50 Ω, 75 Ω, 90 Ω and 600 Ω,

	(default value 600 Ω)
Resolution	0.1 dBm
Absolute error in dBm	0.09 x relative err. VAC expressed in %
Additional calculation error	0.1 dBm
Measurement range	10 mV to 1 000 V
Protection	1 414 Vpk

7.19. OPERATION OF THE AUDIBLE BEEP

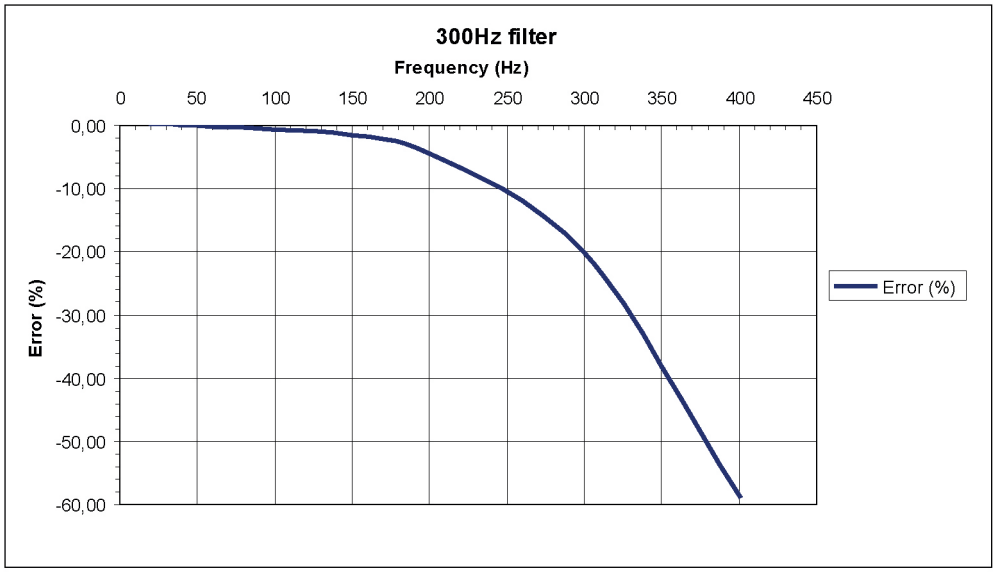
Beep reporting a valid key	High-pitched sound
Beep reporting an invalid key	Low-pitched sound
Successive beeps reporting an overshoot of the danger threshold (alarm)	High-pitched sound
Successive beeps reporting recording of the MAX, MIN, PEAK	High-pitched sound
Successive beeps (alarm) → current > 10 A	High-pitched sound
Continuity measurement	Medium-pitched sound

7.20. VARIATION IN THE NOMINAL RANGE OF USE

Quantity of influence	Range of influence	Quantity influenced	Influence	
			Typical	MAX
Battery voltage	4.2 V to 6 V	all	< 3 D	0.2 % L + 1 D
Temperature	-10°C… 18 28 ... 55°C	VDC mV	0.02 % L ± 0.2 D / 1°C	0.04 % L ± 0.25 D / 1°C
		VAC mV, VLowZ mV	0.08 % L ± 0.2 D / 1°C	0.25 % L ± 0.1 D / 1°C
		VDC	0.01 % L ± 0.1 D / 1°C	0.05 % L ± 0.1 D / 1°C
		VAC, VAC+DC,VLowZ		0.25 % L ± 0.1 D / 1°C
		ADC	0.05 % L ± 0.1 D / 1°C	0.1 % L ± 0.1 D / 1°C
		AAC and AAC+DC	0.08 % L ± 0.1 D / 1°C	0.12 % L ± 0.1 D / 1°C
		⊣▶⊢	0.01 % L ± 0.1 D / 1°C	0.1 % L / 1°C
		Ω (*)	0.05 % L / 1°C	0.1 % L / 1°C
		60 MΩ		0.3 % L / 1°C
		µF		0.2 % L ± 0.1 D / 1°C
		mF		0.6 % L ± 0.1 D / 1°C
		Hz		0.01 % L / 1°C
		Temp.	From -10°C to 45°C	± 2°C + 0.05 % L / 1°C
			From 46°C to 55°C	Typical values
		Stabilization time	≈ 2 h	2.5 h
Humidity (without condensation)	10 %... 80 % HR	V A ⊣▶⊢ Ω (*) Hz	0	0
Common mode	600 V 50 Hz	VAC, VAC+DC,VLowZ	Range: 60 mV, 600 mV — typical: > 35 dB	
			Range: 6 V — typical: > 60 dB	
			Range: 60 V, 600 V, 1 000 V — typical: > 95 dB	

(*)Excluding the 60 MΩ range

7.21. RESPONSE OF THE FILTER



Influence of a sudden change of range (all versions)
At 1 kHz and above, during a change of range (except for the 60 V and 600 V ranges), the reaction time of the instrument can be as long as 4 mn for a residual difference of 0.8 %. Without a change of range, the phenomenon occurs only in the 6 V range.

7.21.1. INFLUENCE OF THE PEAK FACTOR ON VAC AND VAC+DC

Peak factor from 3 to 83 % of range,
Peak factor from 1.42 to 1 000 V

7.21.2. INFLUENCE OF THE PEAK FACTOR ON ADC AND AAC+DC

Peak factor from 2.6 to 83 % of range (6 mA, 60 mA, 600 mA range)
Peak factor from 2.8 to 83 % of range (6 A range)
Peak factor from 3.7 to 83 % of range (10 A range)

7.21.3. INFLUENCE OF A SUDDEN CHANGE OF RANGE

At 1 kHz and above, during a change of range (except for the 60 V and 600 V ranges), the reaction time of the instrument can be as long as 4 mn for a residual difference of 0.8 %. Without a change of range, the phenomenon occurs only in the 6 V range.

8. CHARACTERISTICS OF THE MTX 3297Ex (explosive zone)

A description of the characteristics of the multimeter in an explosive zone is given in the ATEX Specifications document concerning ATEX directive 2014/34/EU.

An explosive atmosphere (ATEX) is a mixture with air, under atmospheric conditions, of flammable substances in gaseous, vapour, or dust form in which, after ignition, combustion spreads to the whole of the unburnt mixture.

Directive 2014/34/EU, which is a revision of directive 94/9/EC, was published in the official gazette of the European Union for 29 March 2014. It has been mandatory since 20 April 2016. The transpositions into French law were published as follows:
- Decree no. 2015-799 of 1 July 2015 concerning hazardous substances and equipment.
- Ministerial order of 1 July 2015 concerning organizations authorized to perform the required assessments of compliance and in-service follow-up operations of hazardous substances and equipment.

Directive 2014/34/EU applies to electrical equipment as well as to mechanical equipment. It explicitly mentions instruments and protection systems used in an ATEX; along with the safety, control, and adjustment devices, even if they are not in contact with an ATEX, whenever they are necessary for or contribute to the operation of the instruments and protection systems.
The MTX 3297Ex multimeter is used in an ATEX zone

MTX 3297Ex: Refer to ATEX/IECEx Instructions Manual

9. GENERAL CHARACTERISTICS

9.1. ENVIRONMENTAL CONDITIONS

Altitude < 2 000 m	
Reference range	23°C ± 5°C
Specified range of use	-10°C to 55°C
Influence of temperature	see §. Influences
Relative humidity	0 % to 80 % from 0 °C to 31°C 0 % to 70 % from 40 °C to 55°C Limited to 70 % for the 6 and 60 MΩ ranges
■ Dust- and water-tightness	IP67 while non-operating no IP in operation
■ Storage range	- 20 °C to 70 °C

9.2. POWER SUPPLY

The multimeter is powered by batteries:
- Batteries, 4x1.5V nominal – ANSMANN 1502-0005
  (Refer to ATEX/IECEx Instructions Manual)
  VDC (without backlight) : ≈ 350 h with qualified batteries

9.3. DISPLAY

The refresh rate of:	the display unit is 200 ms the bargraph is 100 ms.

9.4. CE

9.4.1. SECURITY

According to IEC 61010-2-033:

- Insulation class 2
- Degree of pollution 2
- Use indoor
- Altitude < 2 000 m
- Measurement category of the "measurements"
  1 000 V CAT III and 600 V CAT IV with respect to earth

9.4.2. CEM

This instrument is designed in accordance with the EMC standards in force and their compatibilities have been tested in accordance with the following standards:

- Emissions and Immunity, EN 61326-1 class B, compliant for use in an industrial environment

NOTE: for radiated fields between 3 V/m and 10 V/m
A loss of performance of less than 25 % of full scale in Ω and 5 % of full scale in
ADC in the 10 A range and in VDC in the 50 V range may occur at frequencies between 250 MHz and 500 MHz.

10. WARRANTY

This equipment is warranted for 3 years against any defect of materials or workmanship, in accordance with the general terms of sale. During the warranty period, the instrument may be repaired only by the manufacturer, who reserves the right to repair the instrument or to replace it or part of it. If the equipment is returned to the manufacturer, the cost of transport to the manufacturer is borne by the customer.

The warranty does not apply in the following cases:

- improper use of the equipment or use in association with incompatible equipment
- modification of the equipment without the explicit permission of the manufacturer's technical staff
- maintenance done by a person not approved by the manufacturer
- adaptation to a particular application not anticipated in the definition of the equipment or by the user manual
- a shock, a fall, or flooding.

The design of the MTX 3297Ex ATEX does not allow any work inside the product.

11. MECHANICAL CHARACTERISTICS

11.1. HOUSING

- Dimensions 196 x 90 x 47.1 mm
- Weight 715 g)
- Materials ABS + SEBS
- Dust- and water-tightness Product made water- and dust-tight by potting **no IP**
- Colours black with red encapsulation

12. SUPPLY

12.1. SUPPLIED AS ACCESSORIES (outside of explosive zones)

- Current clamps (see table below)
- Two-wire Pt100 temperature probe
- Two-wire Pt1000 temperature probe
- Metrology software for Windows
- HV probe
- CMS clamp
- Multifix adapter for DMM
- USB optical cable
- Carrying case

12.1.1. SPARE

MTX 3297Ex: Refer to ATEX/IECEx Instructions Manual

List of clamps set to  mV/A	Ratio
Miniflex from 0.5 to 3 000 AAC 10 Hz to 20 kHz	1 or 10 or 100
Ampflex from 0.5 to 3 000 AAC 10 Hz to 20 kHz	1 or 10 or 100
MNXX or MN 73 clamps from 0.1 to 240 AAC 40 Hz to 10 kHz	10
EXX clamps from 0.05 to 80 AAC/DC DC to 8 kHz	1 or 10 or 100
PACXX clamps from 0.2 to 1 400 AAC/DC DC to 10 kHz	1 or 10

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