

MX 650

**Pince multimètre AC
AC Clamp-on meter
AC-Vielfachmesszange
Pinza multimetro AC
Pinza multímetrica CA**

MX 655


**Pince multimètre ACrms/DC
ACrms/DC Clamp-on meter
ACrms/DC- Vielfachmesszange
Pinza multimetro ACrms/DC
Pinza multímetrica CArms/CC**

Notice de fonctionnement
User's manual
Bedienungsanleitung
Libretto d'istruzioni
Manual de instrucciones

metrix

User's manual
Chapter II - page 16

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1. GENERAL INSTRUCTIONS

1.1. Precautions and safety measures

1.1.1. Before using

You have just acquired a 4,000-count multimeter clamp. We thank you for your confidence.

This multimeter clamp complies with the IEC 61010 norms concerning electronic measuring instruments. For your own safety and to prevent damage to the instrument, you must follow the instructions given in this manual.

- * This instrument can be used for measuring category III installation circuits, in an environment with a pollution degree of 2 and with a voltage no higher than 600 V in relation to the earth.
- * Definition of the installation categories (see IEC 61010-1 publication):

CAT I : CAT I circuits are circuits protected by low level transient -voltage surge limiters

Example: protected electronic circuits

CAT II : CAT II circuits are household or similar appliance power circuits, which may carry medium-level transient voltage surge.

Example: household appliance and portable tool power supplies

CAT III : CAT III circuits are high-power appliance power circuits, which may carry high-level transient voltage surges.

Example: industrial machinery or instrument power supplies

CAT IV : CAT IV circuits are circuits which can carry very substantial transient -voltage surges.

Example: power feeders

For safety reasons, you should only use leads that comply with the IEC 61010 standard.

Before using, always check that they are in perfect working order.

1.1.2. When using the instrument

- Never exceed the protection limit values indicated in the specifications for each type of measurement.
- When the multimeter clamp is linked to the measurement circuits, do not touch any unused terminals.
- Before changing the function, disconnect the measurement leads from the circuit measured.
- Never measure resistances on a live circuit.

1.1.3. Symbols



Refer to the user's manual



Risk of electric shock



Double insulation

1.1.4. Instructions

- **Before opening the instrument**, disconnect it from the measuring circuits and make sure that you are not charged with static electricity, which could irreparably damage the instrument's internal elements.
- A "**qualified person**" is someone who is familiar with the installation, the construction, the application and the dangers at hand. This person is authorised to power up and power down the installation and equipment, in compliance with safety regulations.

1.1.5. Cleaning

Turn off the power supply. Clean with a damp cloth and soap. Never use abrasive products or solvents.

1.2. Warranty

This equipment is guaranteed against any material or manufacturing defects, in accordance with the general conditions of sale.

During the warranty period (1 year), the instrument can only be repaired by the manufacturer, who reserves the right to repair the instrument or to exchange all or part of it. If the equipment is returned to the manufacturer, the outgoing transport costs are borne by the customer.

The warranty is not applicable in the following cases:

1. improper use of the equipment or use of it in conjunction with incompatible equipment;
2. modifications to the equipment without the explicit authorisation of the manufacturer's technical department;
3. work carried out on the instrument by a person not approved by the manufacturer;
4. adaptation for a specific application, not included in the definition of the equipment or the user's manual
5. knocks, falls or flooding.

The contents of this manual must not be reproduced in any form without our consent.

1.3. Maintenance

Return your instrument to your distributor for any work to be done within or outside the guarantee.

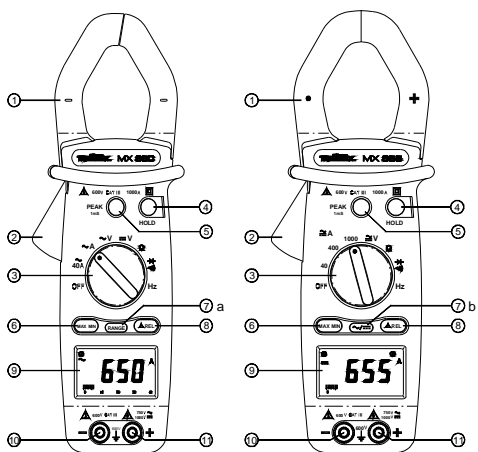
1.4. Unpacking - Repacking

All the equipment was checked mechanically and electronically before shipment. Every precaution was taken to ensure that you receive the instrument undamaged. It is a good idea to check quickly to detect any damage that may have occurred during transport. If there is any damage, immediately notify the transporter of the customary reservations.

Caution! *If you ship this instrument on elsewhere, use preferably the original packaging and indicate the reasons for reshipment as clearly as possible in a note enclosed with the equipment.*

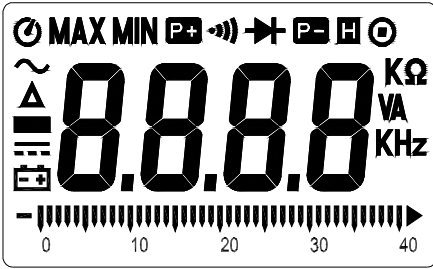
2. DESCRIPTION OF THE INSTRUMENT

2.1. Description of front and rear



1	Jaws
2	Trigger
3	Selector switch
4	HOLD button
5	PEAK button
6	MIN / MAX button
7a	RANGE button
7b	AC/DC button
8	Δ REL button
9	Display
10	COM input terminal
11	+ input terminal
12	Battery housing


2.2. Description of the display



MX 650	MX 655		
•	•		Auto cut-off
•	•	MAX	Max. value
•	•	MIN	Min. value
•	•		Positive peak
•	•		Continuity test
•	•		Diode test
•	•		Negative peak
•	•		Hold
•	•		Manual range
•	•	Ω	Resistance measurement
•	•	V	Voltage measurement
•	•	A	Current measurement
•	•	Hz	Frequency measurement
•	•	K	Kilo
•	•		Bargraph
•	•		Batteries down
	•		Direct current
•	•		Negative value
•	•	Δ	Zero function and relative measurement
•	•	\sim	Alternating current

3. GENERAL DESCRIPTION

3.1. Battery installation and replacement

1.  displayed when the voltage supplied by the batteries is lower than the operating voltage.
2. Before changing the batteries, position the switch to "OFF", unplug the measurement leads and disconnect the clamp from the circuit being measured .
3. Using a Phillips screwdriver, loosen the 2 screws holding the back of the case in place.
4. Replace the old battery with a new 9V battery, ensuring that the polarity is respected.
5. Put the battery flap back in place and tighten the fixing screws.

3.2. Zero function and relative measurement

This function is used to perform RCD measurements (in A, V or Ω) by recording a "calibration value" which is subtracted from the measurements.

To activate this function, press on the **ΔREL** button (the " Δ " symbol is displayed).

The last value measured becomes the reference value which will be subtracted from any subsequent measurements.

To display the reference value, press again on the **ΔREL** button (the value is displayed and the " Δ " symbol flashes).


To quit this function, press the zero button for 2 seconds.

3.3. Memory

It is possible to freeze the value displayed by pressing on the "**HOLD**" button. To deactivate this function, press the "**HOLD**" button a second time.

3.4. Automatic range


MX 650 and MX 655 multimeter clamps have automatic range selection (Autorange).

On the MX 650 model, the range change can be "forced" manually by holding the **RANGE** button down (the  manual range symbol appears).


The user can then choose the position of the decimal point with short presses on the **RANGE** button.

To quit manual range, you must hold the **RANGE** button down for at least 2 seconds; the clamp then returns to automatic range selection mode.

3.5. Auto cut-off

The clamp shuts down automatically after 30 minutes if no operations are performed ( symbol is displayed).

To deactivate this function, press and hold down the **ΔREL** button. Then, switch the clamp on using the selector switch.

Release the button when a buzzing signal confirms the manoeuvre (the  symbol is no longer displayed).

3.6. PEAK function (1 ms)

This function enables 1 ms voltage or current PEAK signals to be captured.

Before a signal is captured, the clamp must first be calibrated by holding the **PEAK** button down for more than 2 seconds, until "CAL" is displayed, indicating that the offset has been correctly taken into account.

Choose the positive or negative sign of the peak (P+ or P-) with short presses on the **PEAK** button.

To quit the manual range, you must hold the **RANGE** (MX 650) or the \sim/\equiv (MX 655) button down for at least 2 seconds; the clamp then returns to normal mode.

3.7. MAX MIN function (500 ms)

To activate the MAX MIN function, press on the **MAX MIN** button. The MAX value is then displayed.

If you press on the button again, the MIN value will be displayed.

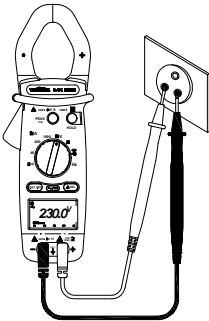
If you press on the button a third time, the instantaneous measurement is displayed (however, the "MAX MIN" symbol flashes, indicating that the function is still active).

To quit the manual range, you must hold the **MAX MIN** button down for at least 2 seconds; the clamp then returns to normal mode.

4. FUNCTIONAL DESCRIPTION

4.1. Measuring AC voltage

- (MX 650) Position the switch to $\sim V$.
- (MX 655) Position the switch to $\sim V$. The symbol \sim (alternating signal) should be displayed. If not, press on the \sim/\equiv button, to make it appear.

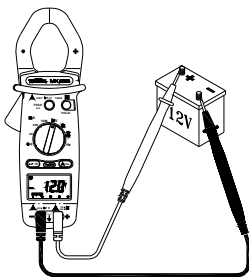


Connect the red test lead to the "+" input terminal and the black test lead to the "COM" input terminal.

Then place the touch prods in contact with the points where the AC voltage is to be measured.

Then read the result on the display.

4.2. DC voltage measurement



- (MX 650) Set the switch to $\text{---}V$.
- (MX 655) Set the switch to $\sim V$.

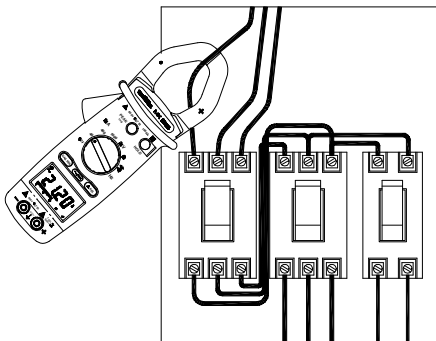
Press on the $\sim/\text{---}$ button to display the --- symbol (direct signal).

Connect the red test lead to the "+" input terminal and the black test lead to the "COM" input terminal.

Then place the touch prods in contact with the points where the DC voltage is to be measured.

Then read the result on the display.

4.3. Measuring AC current



- (MX 650) Set the switch to $\sim A$ (corresponding to the 1000 A \sim and 400 A \sim automatic calibres).
- (MX 655) Set the switch to 1000 A \sim . The \sim symbol (alternating signal) should be displayed. If not, press on the $\sim/\text{---}$ button, to make it appear.

Open the clamp jaws by pressing the trigger. Position the clamp around the conductor to be measured.

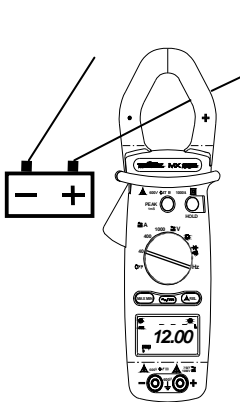
Release the trigger. Check the clamp is properly closed. Read the result of the measurement on the display.

If reading is difficult, press the **HOLD** button and read the result afterwards.

If necessary, for better resolution you can move to a lower range by means of the selector switch.

Note: For safety reasons, disconnect the measuring leads before measuring current. The clamp should encircle only one conductor, otherwise the measurement result may be incorrect. The best measurement is obtained with the conductor centred in the middle of the jaws.

4.4. Measurement of direct current (MX 655 only)



Set the switch to 1000 A \sim .

Press on the $\sim/==$ button to display the $==$ symbol (direct signal).

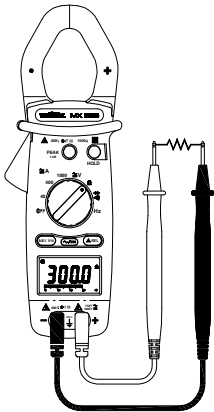
Once the display is stabilised, press on the Δ REL button to automatically reset the DC zero.

Then follow the same procedure as for measuring alternating current.

See previous §.

Note: The correct connection direction to obtain a positive value is indicated on the right-hand jaw.

4.5. Measuring resistance



Set the switch to Ω .

Connect the red test lead to the "+" input terminal and the black test lead to the "COM" input terminal.

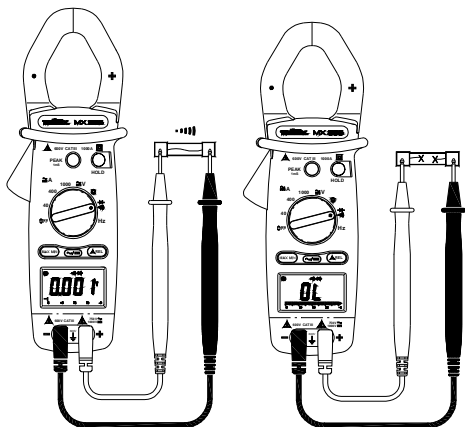
Place the touch prods in contact with the points to be measured and read the result on the display.

Note: Always ensure that the circuit is disconnected from the power supply before measuring resistance!

To measure low resistances, it is preferable to offset the resistance of the measurement leads.

To do this, short-circuit the lead touch prods then press the Δ REL button before taking the measurements.

4.6. Continuity test with buzzer



Set the switch to .

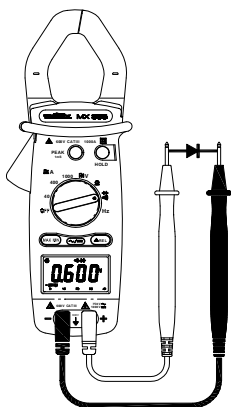
Connect the red test lead to the "+" terminal and the black to the "COM" terminal.

Put the touch prods into contact with the circuit to be tested.

If the resistance is less than $R < 75 \Omega \pm 25 \Omega$, the buzzer will make a continuous sound.

Note : Always ensure that the circuit is disconnected from the power supply before measuring continuity! To offset lead resistance, short circuit the lead touch prods, then press on the **ΔREL** button.

4.7. Diode test



Set the switch to .

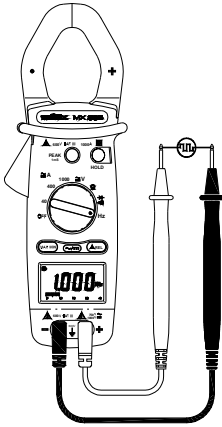
Connect the red test lead to the "+" terminal and the black test lead to the "COM" terminal.

Put the red touch prod into contact with the diode anode and the black prod into contact with the cathode.

Read the value of its threshold voltage off the display.

Note: Always ensure that the circuit is disconnected from the power supply before testing diodes! If the connection is made back to front, the display indicates "OL" (Overload); this enables the user to distinguish the anode from the cathode.

4.8. Measurement of the voltage frequency



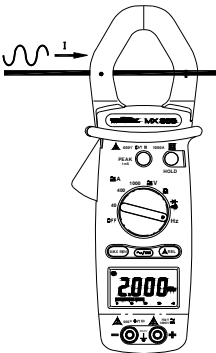
Set the switch to "Hz".

Connect the red test lead to the "+" terminal and the black test lead to the "COM" terminal.

Place the touch prods in contact with the points whose frequency is to be measured.

Read the result on the display.

4.9. Measurement of the current frequency



Set the switch to "Hz".

Open the clamp by pressing the trigger.

Encircle the conductor and close the jaws correctly by releasing the trigger.

Read the result on the display.


Note: For safety reasons, disconnect the clamp measuring leads before measuring current frequency. The clamp should encircle only one conductor, otherwise the measurement result may be incorrect.

Note: To measure frequency, either the input terminals (voltage) or the clamp jaws (current) can be used, but the two sources should never be used at the same time.

5. TECHNICAL SPECIFICATIONS

5.1. General

Only the values assigned tolerances or the limits declared constitute guaranteed values. The values without any tolerance are given as indications.

The symbol  is displayed when input signal exceeds measuring limit in 40 A_~ (MX 650), 40 and 400 A_~ (MX 655), resistance and continuity range.

In voltage, current and frequency range, this symbol will not be shown even the read reach the measuring limit of :

750 VAC, 1000 VDC, 1000 AAC/DC, 10 Hz.

5.2. Characteristics

Accuracy is to within \pm [% of the reading (L) + number of counts (ct)] in the reference conditions indicated in the appendix.

(MX 655) When measuring U_{rms} and I_{rms}, add \pm 1% L additional error margin, from 5% to 50% of the range for a maximum peak factor of 6, and from 5% to 100% of the range for a peak factor of between 1.4 and 3.

Over and above these limits, accuracy is not specified.

5.2.1. Direct voltage (automatic ranges)

(MX 650)

Range	Meas. range	Resolution	Accuracy
400 V	0.2 to 399.9 V	0.1 V	0.75% L + 2 ct
1000 V	400 to 1000 V	1 V	0.75% L + 2 ct

Protection against overloads: 1000 Vrms

(MX 655)

Range	Meas. range	Resolution	Accuracy
400 V	0.2 to 399.9 V	0.1 V	1% L + 2 ct
1000 V	400 to 1000 V	1 V	1% L + 2 ct

Protection against overloads: 1000 Vrms

5.2.2. Alternating voltage (automatic ranges)

(MX 650)

Range	Meas. range	Frequency	Resol.	Accuracy
400 V	0.5 to 399.9 V	50...500 Hz	0.1 V	1.2% L + 5 ct
		500...1000 Hz		1.5% L + 5 ct
750 V	400 to 750 V	50...500 Hz	1 V	1.2% L + 5 ct
		500...1000 Hz		1.5% L + 5 ct

Input impedance: 10 M Ω

Protection against overloads: 1000 Vrms

(MX 655)

Range	Meas. range	Frequency	Resol.	Accuracy
400 V	0.5 to 399.9 V	50...500 Hz	0.1 V	1.5% L + 5 ct
		500...1000 Hz		1.8% L + 5 ct
750 V	400 to 750 V	50...500 Hz	1 V	1.5% L + 5 ct
		500...1000 Hz		1.8% L + 5 ct

Input impedance: 10 M Ω

Protection against overloads: 1000 Vrms

5.2.3. Direct current (MX 655 only)

Range	Meas. range	Resolution	Accuracy
40 A	0.10 to 39.99 A	0.01 A	2.5% L + 10 ct
400 A	40.0 to 400.0 A	0.1 A	2.5% L + 10 ct
1000 A	400 to 1000 A	1 A	2.5% L + 10 ct

Protection against overloads: 1200 ARMS

5.2.4. Alternating current

(MX 650 automatic ranges)

Range	Meas. range	Frequency	Resol.	Accuracy
40 A	0.05 to 39.99 A	50...500 Hz 500...1000 Hz	0.01 A	1.9% L + 5 ct 3% L + 5 ct
400 A	40.0 to 400.0 A	50...500 Hz 500...1000 Hz	0.1 A	1.9% L + 5 ct 3% L + 5 ct
1000 A	400 to 1000 A	50...500 Hz 500...1000 Hz	1 A	1.9% L + 5 ct 3% L + 5 ct

Protection against overloads: 1000 ARMS
(in 40 A range) and 1500 Arms (in 400 A and 1000 A ranges)

(MX 655)

Range	Meas. range	Frequency	Resol.	Accuracy
40 A	0.05 to 39.99 A	50...60 Hz 60...500 Hz 500...1000 Hz	0.01 A	1.9% L + 5 ct 2.5% L + 5 ct 3.5% L + 5 ct
400 A*	40.0 to 400.0 A	50...60 Hz 60...500 Hz 500...1000 Hz	0.1 A	1.9% L + 5 ct 2.5% L + 5 ct 3.5% L + 5 ct
1000 A*	400 to 1000 A	50...60 Hz 60...500 Hz 500...1000 Hz	1 A	1.9% L + 5 ct 2.5% L + 5 ct 3.5% L + 5 ct

Protection against overloads: 1200 ARMS
*Position \sim A on the switch corresponds to the two automatic
calibres, 400 A~ and 1000 A~.

5.2.5. Resistance (Ω) (automatic ranges)

Range	Meas. range	Resolution	Accuracy
400 Ω	0.2 to 399.9 Ω	0,1 Ω	1%L + 3 ct
4000 Ω	400 to 4000 Ω	1 Ω	1%L + 2 ct

Protection against overloads: 600 Vrms
Continuity detection threshold: $R < 75 \Omega \pm 25 \Omega$.

5.2.6. Diode 

	Test current	Open circuit voltage
MX 650	0.6 mA	max .3 V
MX 655	max 1.7 mA	max 6 V

Protection against overloads: 600 Vrms

5.2.7. Frequency Hz (automatic ranges)

- For current

Range	Meas. range	Resol.	Accuracy	Sensitivity
4000 Hz	20 to 3999 Hz	1 Hz	0.1% L + 1 ct	2 ARMS
10 kHz	4 to 10 kHz	10 Hz	0.1% L + 1 ct	5 ARMS

- For voltage

Range	Meas. range	Resol.	Accuracy	Sensitivity
4000 Hz	10 to 3999 Hz	1 Hz	0.1% L + 1 ct	5 Vrms
10 kHz	4.00 to 10.00 kHz	10 Hz	0.1% L + 1 ct	10 Vrms

5.3. Safety

IEC 61010-1 Ed.95 and IEC 61010-2-032 Ed.93:

- Insulation: class II
- Pollution level: 2
- Altitude: < 2000 m
- Installation category: CAT III 600 V

5.4. General information

Digital display

3 ¾ digit LCD with max. reading of 3,999 counts


Analogue display

42-segment bargraph

Polarity

When a negative signal is applied, the  signal appears.

Low battery indicator

 is displayed when the voltage supplied by the batteries is lower than the operating voltage. Measurements are no longer guaranteed.

Power supply

Battery: 9 V, NEDA 1604, 6F22, 006P or alkaline

Typical autonomy: 180 hours (MX 650)

36 hours (MX 655)

with alkaline battery and without buzzer function.

Protection level of the housing

IP30 according to NF EN 60529 Ed. 92

Maximum jaw opening

MX 650: ∅ 36 mm

MX 655: ∅ 40 mm

Dimensions

246 x 93 x 43 mm

Weight

400 g (with battery)

5.5. Environmental conditions

5.5.1. Temperature

Operation: 0°C to 40°C, < 70 % RH

Storage: -10°C to 60°C, < 80 % RH

5.5.2. E.M.C.

Immunity: acc. to EN 61326 + A1 (1998)

Emission: acc. to EN 61326 + A1 (1998)

5.6. Delivery configuration

Instrument delivered with:

1 set of measuring leads (one black, one red)

1 x 9 V alkaline battery

1 carrying case

1 user's manual

1 verification certificate

APPENDIX: Reference conditions

Sine signal:

- Frequency from 48 to 65 Hz

- No continuous components

Temperature 23°C ± 5°C

External magnetic field < 40 A/m

No alternating magnetic field

Measured conductor centred (in A)

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