



MICRO-OHMMETER
OM 10



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NT 46039-100A - Ed. 23 JAN 01

Specifications indicated in the present instruction manual may be changed without prior notice.

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Notes

Thank you for choosing this AOIP precision instrument which benefits from our century of experience designing and manufacturing accurate measurement tools.

We intend to continue with this policy of constant innovation which has served our customers so well during our first hundred years. AOIP encourages user comment and welcomes any suggestions you may have for future product enhancements.



Notes

1.1 Introduction

The micro-ohmmeter OM 10 is intended for accurate measurement of low resistances from 10 $\mu\Omega$ (resolution) to 50 k Ω . It also measures DC and AC voltages.

Made in a compact, rugged and heavy duty housing, it is well suited for on site measurements. Powered by mains, it can also be used in workshop or laboratory.

1.2 Applications

Its main applications are listed below:

- Cable resistance and resistivity measurements.
- Inductive resistance measurements (transformers, motors, etc..).
- Contact resistance measurements (connectors, switches, relays).
- Test and measurements of electrical components : resistors, fuses, etc.
- Surface state, resistance of mechanical bonds and material test.

1.3 Presentation

- Programming and processing the unit using a 15-key keypad.
- Portable unit with built-in Ni/Cd battery pack, 1.7 Ah. Life : 13 h approx. over the 500 m Ω range, direct current mode and > 24 h over the other ranges.
Battery pack recharge: using the mains adapter delivered with the unit or a DC voltage supply from 10 V to 20 V, 0.5 A.
Adapter specifications: 230 V \pm 10 %, 50/60 Hz mains.
Recharge time: 14 h.
- LCD display.
- Direct display of measurement together with its unit, range, type of current and if required, temperature compensation.
- Selection of range, type of current (direct or pulse) temperature compensation and measurement trigger using keys.
- 4-wire measurement with automatic compensation of stray voltages.
- Automatic compensation of ambient temperature by measuring it thanks to the built-in sensor or manual edition and programming of the metal type or its temperature coefficient.
- Rugged ABS case provided with a stand.
- Dimensions: 120 mm x 245 mm, thickness: 65 mm.
- Weight: 1.1 kg with battery pack.

1.4 Safety provisions

1.4.1 In accordance with safety standards

The OM 10 is constructed and tested according to European Norm EN 61010-1.

This instruction manual contains information and advice that users must follow to be protected against electrical shocks and to ensure the reliability of the unit in order to maintain it in a satisfactory state with regard to safety.

The unit may occasionally be exposed to temperatures between - 10°C and + 55°C without its safety features being compromised.

1.4.2 Following instructions supplied with the attached documents

The unit is constructed to operate under safety conditions if the instructions supplied in the attached documents are followed. Any usage, except those described, may reduce the safety of the operator and then, becomes dangerous and prohibited.

1.4.3 Taking measurements

The test leads and measuring wires must be in good condition and should be changed if there is any evidence of deterioration (insulation split burnt, etc...).

When the unit is connected to a circuit under test, some of its terminals may be hazardous, therefore the hands should be kept away from any used or unused terminals. Any intervention on these circuits should be performed with the unit disconnected from any other external circuit.

Never exceed the safety values indicated in the specifications, chapter 6.

Before changing function, disconnect the measuring wires from the external circuit. When measuring voltages, remember that circuits may show dangerous voltage regarding the earth.

Never perform resistance measurements on a live circuit.

1.4.4 Faults and abnormal constraints

Should there be any indication that the protection of the unit has been compromised, it should be switched off and steps taken to prevent it being used inadvertently.

The protections may have been compromised in the following cases, for example:

- The unit is obviously damaged.
- The unit is no longer capable of taking accurate measurements.
- The unit has been stored under unfavorable conditions.
- The unit has been subject to severe stresses during transport.

1.4.5 Definitions

1.4.5.1 Definition of the installation category

This is also called overvoltage category.

It's the installation classification according to standardized limits for transient overvoltages (IEC Publication 664). Level of these limits depends on the nominal line voltage, regarding the earth, which is present in the unit environment.

The Publication has 4 levels of increasing overvoltage, from CAT I to CAT IV.

1.4.5.2 Table of the symbols used

Symbol	Description	Symbol	Description
~	Alternating current.	I	Power ON.
⋮	Direct current.	O	Power OFF.
⎓	Direct and alternating current.	□	Double insulation.
⏏	Measurement earth terminal.	⚡	Risk of electric shock.
Ⓧ	Protective conductor terminal.	⚠	Warning: see the attached documents.

1.4.6 Maintenance

The unit should be remantled as explained in the instruction manual. Any incomplete or bad remantle may be dangerous for the safety of the operator.

The responsible authority must check at regular time interval that all the components ensuring safety are not subject to wear and undertake all the necessary steps for preventive operations.

Refer to chapter 5.

Before the casing is opened, make sure that the measuring leads have been disconnected from the unit.

The unit should not be opened up for adjustment, maintenance or repair when live unless this is absolutely essential, in which case this work should be carried out **only by qualified personnel advised of the risk entailed.**



Notes

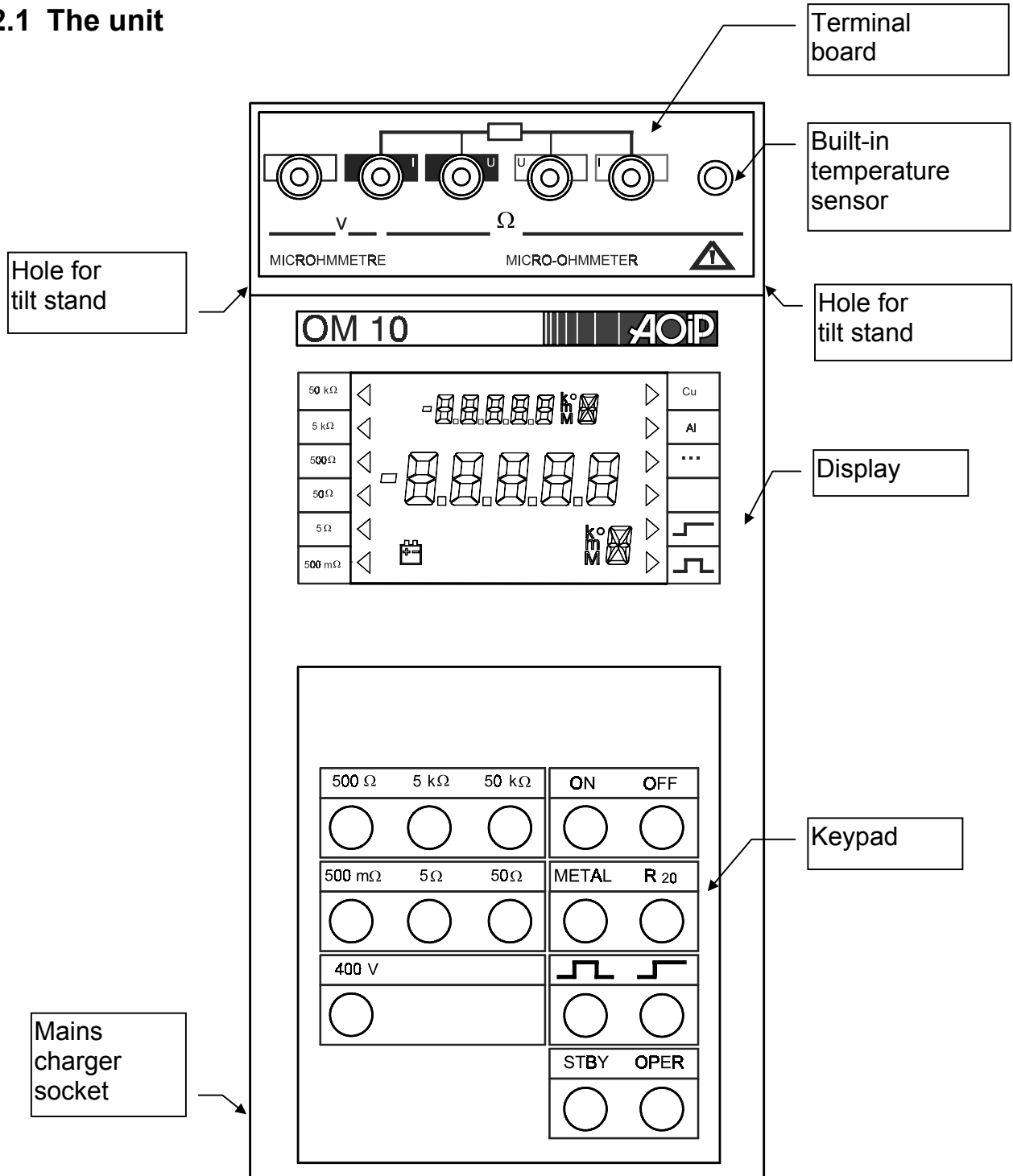
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Notes

2.1 The unit



2.2 Terminal board

Five safety sockets for 4 mm- plugs:

- Two sockets I supplying a variable current from 100 mA to 10 μA.
- Two sockets U for measuring the voltage drop at terminals of the resistor.
- One socket V together with socket I- (black) for measuring rms voltages (AC + DC).

At the extreme right, the sensor measuring the ambient temperature.

2.3 Display

LCD display.











Two series of 5 digits together with their units. First series displays, if required, the ambient temperature when using the "temperature compensation" mode; the second series displays the resistance and rms voltage values.

At right and left, index indicating the range and operating modes (temperature compensation, current waveform).

Errors are indicated using appropriate messages.

2.4 Keypad

Composed of 15 keys:

Key	Meaning
ON 	Switches the unit ON.
OFF 	Switches the unit OFF.
500 $\mu\Omega$ 50 Ω 	Six keys for selecting the range when measuring resistance.
400 V 	Key for measurement DC and AC voltages.
	Measuring resistance in direct current mode. Range and compensation parameters previously programmed are not changed. This key is deactivated in Volt function.
	Measuring resistance in pulse current mode. Range and compensation parameters previously programmed are not changed. This key is deactivated in Volt function.
R20 	Setting the temperature compensation in use or not. Range, current waveform as well as compensation parameters previously programmed are not changed. This key is deactivated in Volt function.
METAL 	Selecting the metal type. Pressing this key enables the user to select three different types of metal Cu, Al, ... (other). This key is activated only in temperature compensation mode.
STBY 	The unit is set to standby position. Range, current waveform and compensation parameters previously programmed are not changed. The measuring current is switched off. This key is deactivated in Volt function.
OPER 	Triggers the measurement.

2.5 Accessories

2.5.1 Delivered with the unit

- A mains adapter for recharging the battery pack and the unit supply.
- A tilt stand for bench-type usage. This tilt stand comes in the holes located on each side of the casing.
- A carrying case.
- An instruction manual.
- A short operating mode (to be pasted at back of the unit).

2.5.2 Delivered in extra

- A soft casing, part number: ACL 310.
- A replacement battery pack, part number: PEM40286-000. Refer to chapter 5 to replace it.
- A pair of leads, 1.2 m long, equipped with insulated crocodile clips (Kelvin clips) small size, part number: AN 5806.
Set of 10 rubber devices for AN 5806, part number: AN 5806BC.
- One lead, 3 m long, equipped with a double-pole prods (Kelvin), part number: AMT 003.
AMT 003 Spare parts:
 - Middle prod, part number: ER 40891-000.
 - Concentric prod, part number: ER 40892-000.
- A maintenance document, part number NT 46039-190A.



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Notes

3.1 Instructions before use

3.1.1 Unpacking

The OM 10 is mechanically and electrically checked before dispatch. Every precaution has been taken to ensure that it reaches the user undamaged.

Nevertheless, it is advisable to carry out a quick check for any damage that may have occurred in transit. If any such damage is found, it should be reported to the shipper.

3.1.2 Return

If the unit is to be returned, the original packaging should be used and a note explaining as clearly as possible the reasons for returning it should be included.

3.2 Instructions before switching on

Before using the unit with all the necessary safety, the user must read **carefully** chapter 1 which deals with safety provisions.

3.3 Switching on


The unit may operate either from its built-in battery pack or from the mains using the adapter supplied.

3.3.1 Battery operation

The unit is equipped with a Ni/Cd battery pack for an autonomous operation.

A special device indicates state of the batteries.

This device works in two ways:

1. Symbol  coming on the display indicates that it remains few minutes of autonomy.
2. The unit automatically stops operating. It is then necessary to recharge the battery before to switch the unit on again.

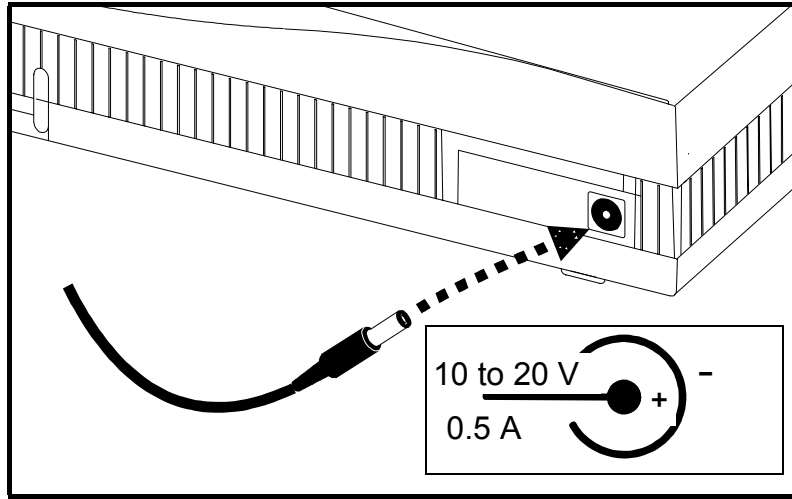
3.3.2 Mains operation

WARNING: Before any connection, make sure that the mains adapter meets the mains voltage.

Connect the mains adapter DC output to the unit DC plug.

Connect the adapter to the mains.

The unit may be used permanently on mains, via the adapter, without any battery discharge, but the autonomy is reduced (see para. 5.2.1).

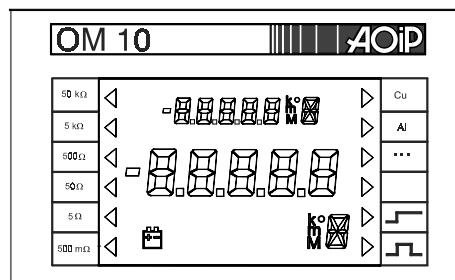


3.3.3 Starting operation

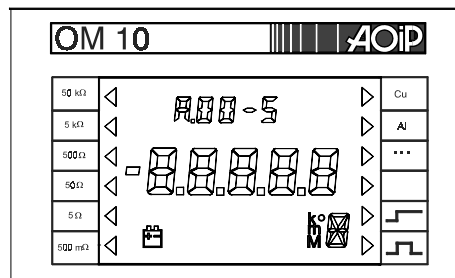
Make sure that the unit is disconnected from any external circuit.

Press the  key.

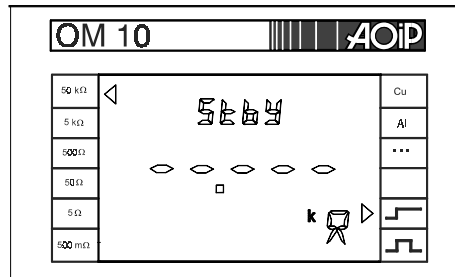
After an initialization procedure, the screen is as follows:



then, after a few seconds, the unit reads the software version as shown below:



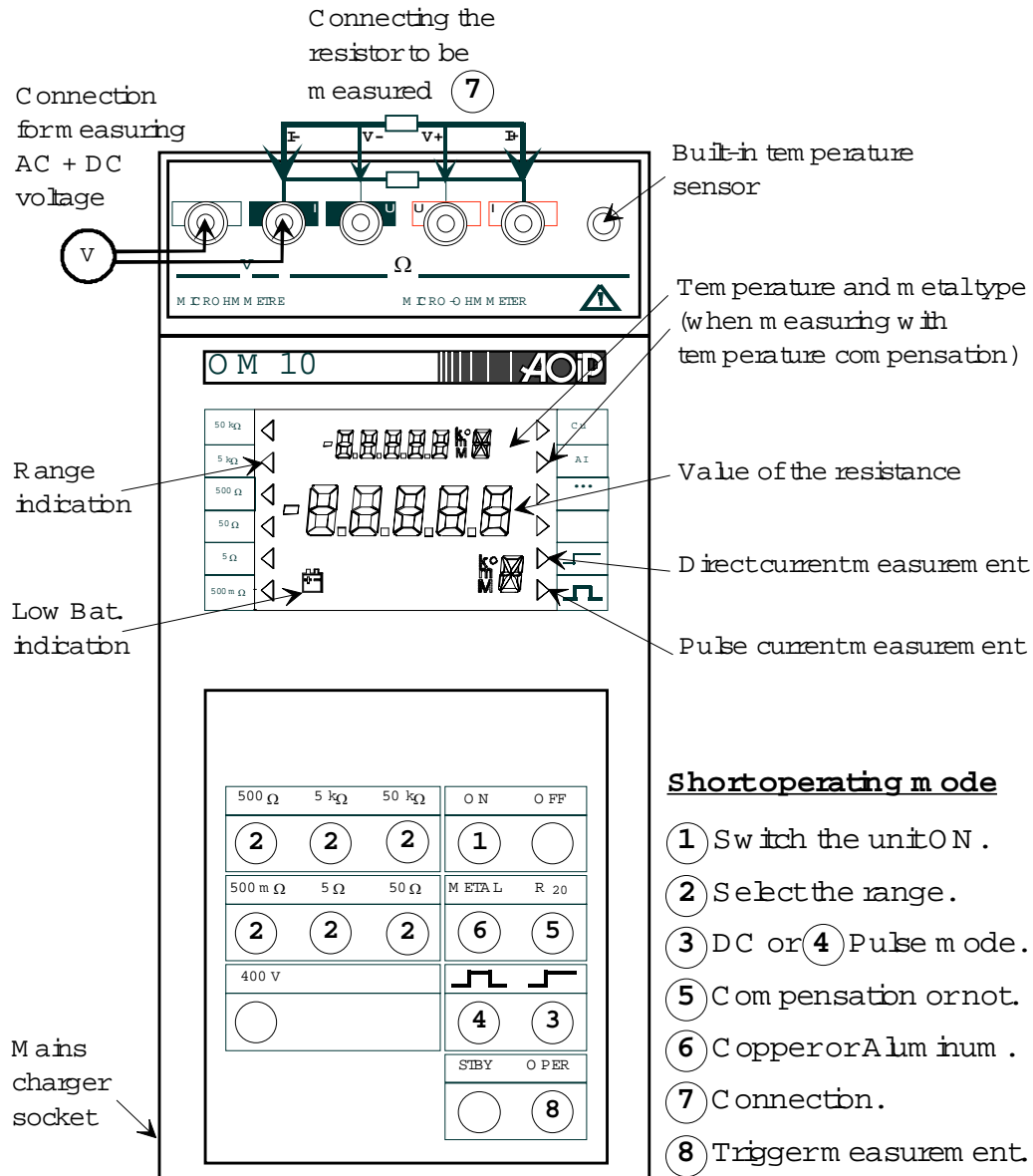
Then, the unit switches to the configuration programmed (see para. 4.5.2) and reads, for example, the screen below and goes to STandBY position. It is ready to operate.



To switch the unit OFF, press the ^{OFF}  key.

3.4 Short operating mode

Below is the short operating mode delivered with the unit.



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Notes

4.1 Measuring resistance

4.1.1 4-wire principle

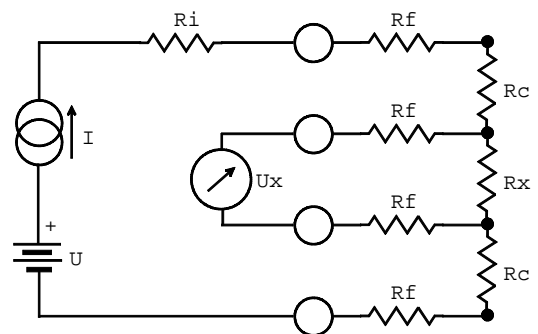
Principle of this connection is shown in the diagram.

From a voltage source U , a generator supplies a current of value I and determined waveform (pulse or direct).

A voltmeter measures the voltage drop U_x at the terminals of the resistor to be measured R_x and displays $R_x = U_x / I$.


The result is not affected by other resistors encountered in the current loop (R_i , R_f , R_c), as long as the total voltage drop induced across R_x remains below the voltage supplied by the source U ($U \geq 5 \text{ V}$).

4-wire connection




4.1.2 STANDBY position

The unit is set to standby:

- at switching on,
- by pressing the  key,
- after changing the current waveform.

This position:

- switches the internal current source off,
- waits for starting a measurement cycle by pressing the  key.

4.1.3 Selecting the range

- Press on the desired range key according to the table below:

Range	Measurement current	Voltage drop
500 m Ω	100 mA	50 mV
5 Ω	10 mA	50 mV
50 Ω	10 mA	500 mV
500 Ω	1 mA	500 mV
5 k Ω	0.1 mA	500 mV
50 k Ω	0.01 mA	500 mV

4.1.4 Selecting the current waveform

There are two different current waveforms available by pressing the keys following:





Direct current. The corresponding index comes on the display.

Pulse current. The corresponding index comes on the display.

4.1.4.1 Direct current

This mode is designed to measure resistances featuring a high inductive component: transformers, motors, etc.

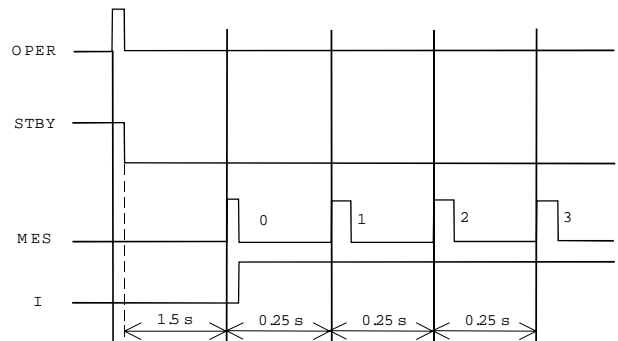
From standby position, a measurement cycle triggered by pressing the  starts as follows:

- Switch current off, measure residual voltage (U_0) across resistor terminals. **This value is displayed for a moment in mV.** If more than 1/10 of the measurement rated voltage, there is display of O.L and the unit switches to Standby position.
- **Switch current on (I) and maintain as long as the unit does not return to Standby**, either by pressing the , key or by selecting another current mode.
- Measure voltage across resistor terminals (U_1) and display measurement $R = (U_1 - U_0) / I$.
- Any following measurements display U_1 , U_0 being stored in memory.
- **For safety reasons, returning to Standby position implies waiting for complete discharge. During this period, the OM 10 reads "- - -" over the upper display and hands should be kept away from connecting wires.**

Measurement duration: 0.25 s.

NOTE: Over the 50 k Ω range and in case the measured resistor is to be changed for more than 10 %, it is advisable to return first to  position and then to press the  key.

Operating diagram



0 = Measuring offset voltage (stored).
1, 2, 3 = First measurements.

4.1.4.2 Pulse current

This is the current generally used to measure low inductive resistances accurately (time constant below 1 ms).

It is used to:

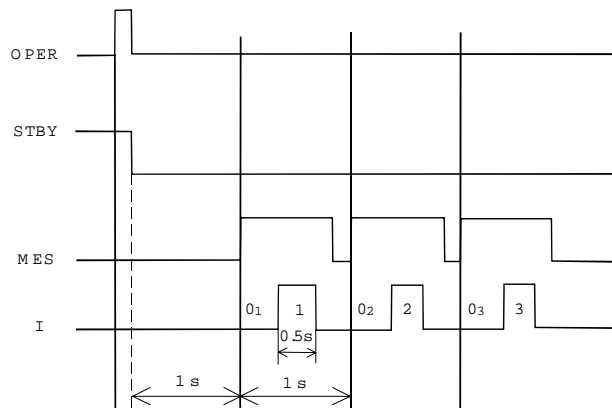
- reduce consumption as the current is switched off between the measurements and the battery autonomy is then increased,
- to heat less the measured resistor,
- to improve compensation of stray emfs as they are measured and compensated before each resistance measurement.

Each measurement is performed as follows:

- Switch current off, measure residual voltage (U_0) at resistor terminals. If more than 1/10 of the measurement rated voltage, there is display of O.L. and the unit switches to Standby position.
- Switch current on (I).
- Measure voltage at resistor terminals (U_1) and break current.
- Display measurement $R = (U_1 - U_0) / I$ or error O.L in case of overrange.


Measurement duration: 1 s.

Operating diagram

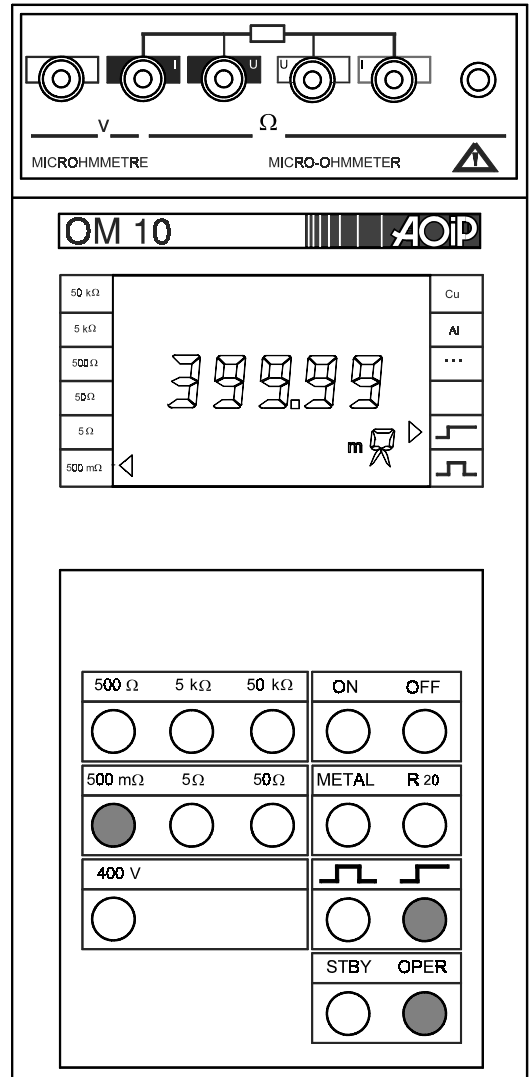


0_x = Measuring offset voltage.
1, 2, 3 = First measurements.

4.1.5 Triggering the measurement

- Connect as shown on the label.
- Press the desired range key.
- Press the desired current key (direct or pulse current).
- Trigger measurement by pressing the  key.

Example: connection selecting keys and display



4.1.6 Ambient temperature compensation

NOTE: When the unit has been subject to important thermal shock, allow one hour for temperature settling before performing any ambient temperature compensation.

Metals used in the windings of certain components (for example the copper wire in transformers or motors) have high temperature coefficients of the order of 0.4 %/°C (copper or aluminum).

This means that the resistance measured is directly related to the temperature of the component.

Providing that the resistor is close to the ambient temperature measured by the OM 10 and one knows the metal involved or its temperature coefficient, the "temperature

compensation" function, available by pressing the R_{20} key, displays the "R20" value of the resistor reduced to a constant temperature of 20°C.


- Taking the example in para. 4.1.5, press the R_{20} key to set the function in use.

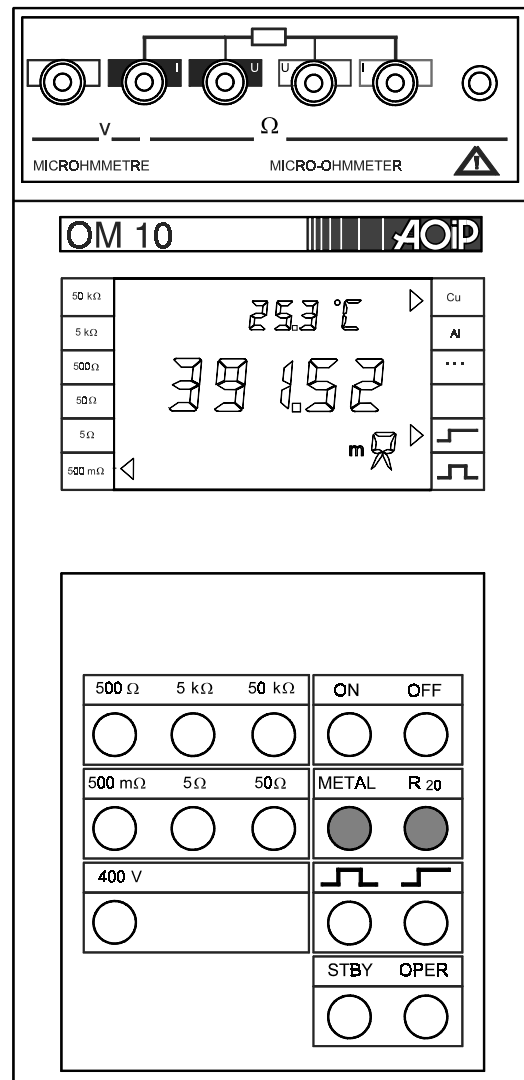
The ambient temperature, measured every 10 seconds by the sensor located at right of the socket I+ (red), is indicated by the upper display together with its unit (°C).

- The upper right index indicates the metal selected.

To change it, press the METAL key.
To enter a temperature coefficient other than copper or aluminum (Other metal ...), refer to para. 4.3.2.

- To deactivate the function, press the R_{20} key again.

- To measure with a temperature compensation to be entered manually, edit the value as indicated in para. 3.4. This function is indicated on the display by the symbol  at left of the temperature indication.



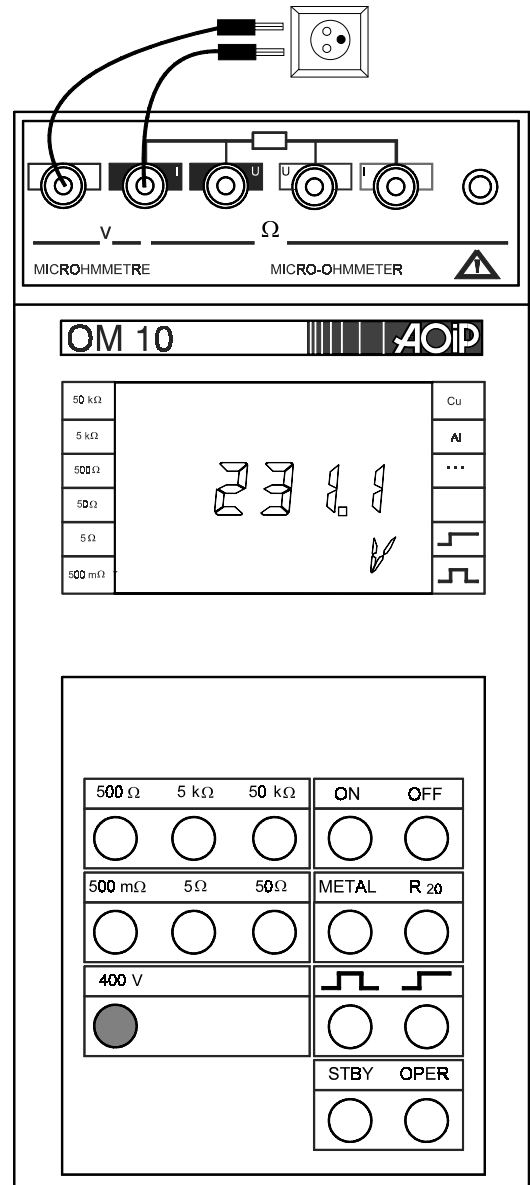
4.2 Measuring DC and AC voltages

- Disconnect the wires from the external circuit.
- Press the 400 V range key.
- Connect as indicated on diagram.

Read the measurement. The value indicated is the rms value of the measured voltage (DC + AC).

NOTE: When measuring voltages, remember that circuits may show dangerous voltage regarding the earth.

Example: connection selecting keys and display



4.3 Programming menu

4.3.1 Presentation

The programming menu is accessible after pressing the ^{ON} key followed by the ^{OPER} key.

- The ^{OPER} key is equivalent to the direction arrow key → which gives access to the programming menu and validates prompts appearing on the display.
- The ^{STBY} key is equivalent to the direction arrow key ↓ which enables the user to scroll through the various prompts and to increment figures.

By several pressing on the ^{STBY} key the programming menu is as follows:

TEMP	Choice between a fixed temperature to be changed using the keypad (MAn) and the temperature measured (MEAS) by the built-in sensor.
METAL	Enables the user to enter a third temperature coefficient other than copper and aluminum.
CONF	Enables the user to select the desired range and operating mode at the unit power on.
FREQ	Enables the user to select the mains frequency (50 or 60 Hz).
RESERVED	Program reserved to the adjustment of the unit.
END	Exit from the programming menu and return to the measurement.

4.3.2 Accessing the different prompts

TEMP	OPER	MAN	OPER	-	00.00	Enter the desired temperature. See para. 4.3.3.
STBY						
		MEAS	OPER		END	Press OPER key. Return to measurement.

STBY

TEMP	OPER	-0.0000	Enter the desired temperature coefficient in %.
------	------	---------	---


STBY

CONF	OPER, the display blinks.	Select the desired range and current waveform.	OPER again.	END	Press OPER key. Return to measurement. The configuration is stored.
------	---------------------------	--	-------------	-----	---


STBY

FREQ	OPER	50Hz	OPER	END	Press OPER key. Return to measurement. The frequency is stored.
STBY					
		50Hz	OPER	END	Press OPER key. Return to measurement. The frequency is stored.

STBY

	OPER	The unit waits for the password. Program reserved to maintenance purposes only (see para. 5.5).	Press OFF key to exit from the program.
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STBY




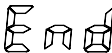

	OPER	Return to measurement.
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4.3.3 Editing a number

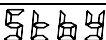


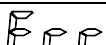

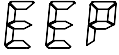

Edition is performed as follows:

Sign minus (-) blinks:

- To validate it, press the  key.
- If not, press the , then the  keys.

In both cases, the first figure blinks, increment it by using the  key, then press the  key to access the second figure and so on up to validation of the number with the  key and display of  to be validated with the  key to exit from edition function and return to measurement.

4.4 Messages

	The unit is set to standby position. To trigger the measurement, press the  key.
	Overrange and/or offset voltage overload > 10 % of the rated voltage drop.
	When triggering measurement if one of the wires I is broken.
Blinking measurement	If one the wires I is broken during the measurement.
 	Unit internal failure. The measurements may be wrong. To clear the message, press the  key. To suppress the message at switching on, adjust the unit.

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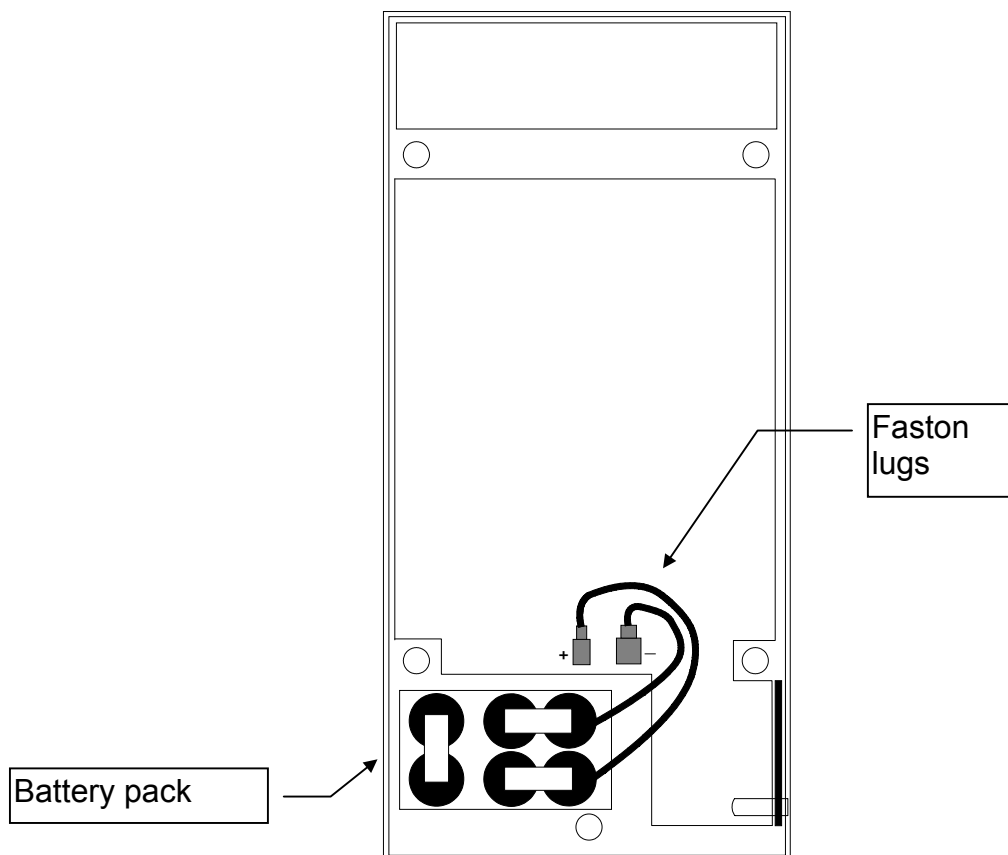
Notes

In view of the necessary precautions and the risks involved, any maintenance operations, apart from those relating to battery changing, should be left to **qualified personnel**. **This warning applies particularly to recalibration of the unit which should be done under precise conditions.**

5.1 Opening/closing the unit

WARNING: When a maintenance procedure need opening of the unit cover, remove all the connections from the external circuits as well as the mains charger if the unit is charging. **Make sure that the unit is switched off.**

- Turn the unit, rear panel in front of the operator.
- Unscrew the five fixing screws from the rear cover.
- Lift the cover and pull it towards the left.
- The unit right part is as follows:




- To remantle the unit, perform operations above in reverse way.

NOTE: For safety reasons, make sure that all the screws are well tightened.

5.2 Battery pack

5.2.1 Charging the battery

Symbol  coming on the display indicates that it remains a few minutes of autonomy and it is advisable to recharge the battery as soon as possible.

Plug the charger jack in the socket located on the unit side. The battery may be charged using a supply between 10 V and 20 V, 0.5 A and provided with an adequate plug.

Connect the supply to the mains, making sure that the mains voltage is correct.

Recharging the battery takes 14 h, unit switched on or off, except over the 500 mΩ range (direct current mode).

Battery life: 1 000 charge/discharge cycles approximately.

NOTE: If the operator experiences reduced autonomy with the unit, power it up, disconnect the charger and leave it until it automatically powers down. This action, which can be repeated after every 50 charge cycles, maintains the battery's full capacity.

5.2.2 Replacing the battery

- Dismantle the unit as indicated in para. 5.1.
- Remove the battery lugs (see figure in para. 5.1) and the battery pack.
- Replace the battery with same type.
- Reconnect the battery lugs.
- Remantle the unit as indicated in para. 5.1.
- Charge the battery fully.

5.3 Fuse

The unit supply is protected by a fuse. This fuse is not accessible by the operator. If the fuse blows, the battery cannot be recharged (the red LED below the charger plug remains off) and the unit should be returned to AOIP for checking.

5.4 Checking of performances

The operator may require cyclic checking of the performances in order to keep track of the quality.

This operation implies as follows:

- Room temperature: $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$.
- Relative humidity: 45 % to 75 %.

Known accuracy for the instruments used for checking below or equal to:

- ± 0.1 % for the voltage standard,
- ± 0.01 % for the resistance standards by taking the environmental factors into account.

The unit should only be adjusted if one or more characteristics are really outside the tolerances specified in chapter 5. The operator may:

- Adjust the unit according to the procedure described in para. 5.5. This implies an equipment with performances equal to the one used for verification above.
- Return the unit to the address indicated in para. 5.6 for checking and adjustment in our works.

5.5 Adjustment

RECOMMENDATIONS

The unit has been adjusted in our works. Any inadvertent operation modifies the adjustments of the unit in a non-reversible way.

Authority responsible of the usage of this unit must be sure that the person in charge of the adjustment is well-advised of precautions to take before performing this operation.

AOIP suggest to return the unit in their works to perform the adjustment under perfect conditions.

The warranty is lost in case these recommendations are not respected.

5.5.1 Material required

Range	Standard	Accuracy
500 mΩ	From 400 mΩ to 510 mΩ.	≤ 0.01 %.
5 Ω	From 4 Ω to 5.10 Ω.	
50 Ω	From 40 Ω to 51 Ω.	
500 Ω	From 400 Ω to 510 Ω.	
5 kΩ	From 4 kΩ to 5.1 kΩ.	
50 kΩ	From 40 kΩ to 51 kΩ.	
400 V	Voltage source from 200 V to 400 V rms, 50 Hz to 1 kHz.	Below $1 \cdot 10^{-3}$.
Temperature	Ambient	Known, with the best possible accuracy (< 0.5°C).

5.5.2 Environment

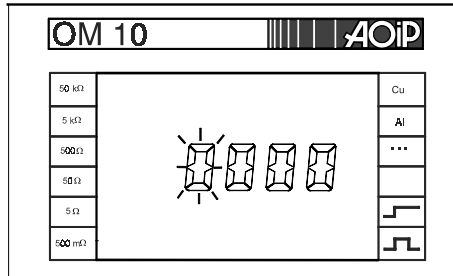
Temperature: 23°C ± 5°C.

Humidity: 45 % to 75 %.

Warming-up: 1 hour.

5.5.3 Procedure

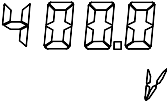

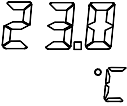



Press the ^{ON} key, then the ^{OPER} key. Press the ^{STBY} key four times and validate \overline{CAL} prompt by pressing the ^{OPER} key, the unit reads as follows:





The first figure blinks and the unit waits for the password. Enter number **9456** according to procedure explained in para. 4.3.3, then validate it with the ^{OPER} key. The unit reads the various adjustment phases in the order they are indicated in the table below.

If the password is wrong, the unit reads \overline{End} prompt. To return to the programming menu, press the ^{STBY} key five times to reach \overline{CAL} prompt and enter the password again.

Range adjustment	Display	What to do
500 mΩ	500.00 m	Connect the standard resistor in 4-wire mode.
5 Ω	5.0000 	
50 Ω	50.000 	Enter its value.
500 Ω	500.00 	Trigger the adjustment by pressing the ^{OPER} key.
5 kΩ	5.0000 k	Wait for the end of the cycle. The unit reads the next range.
50 kΩ	50.000 k	

Range adjustment	Display	What to do
400 V		Connect the voltage source. Enter its value. Trigger the adjustment by pressing the  key. Wait for the end of the cycle. The unit reads the next prompt.
Ambient temperature		Enter its value. Trigger the adjustment by pressing the  key Wait for the end of the cycle. The unit reads  prompt to be validated with the  key in order to exit from the adjustment menu and return to measurement.

It is possible, at any time, to exit from the adjustment program by validating  prompt with the  key. The unit returns to measurement.

5.6 Warranty

The unit is fully warranted for one year in respect of defects which under proper use may appear in any parts and which are due to faulty manufacturing materials or workmanship, provided that no unauthorized modifications have been made on the unit.

If the unit is not operating correctly, it must be returned to the address below or to your local approved agency by using the original packaging and explaining as possible the reasons for returning it.

AOIP
Service Après-Vente
Zone Industrielle de Saint-Guénault
Rue Maryse Bastié
BP 182 - 91006 EVRY CEDEX - FRANCE
Tel: +33 1 69 36 50 50
Fax: +33 1 60 79 08 37



Notes

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Notes

6.1 Applicable standards

6.1.1 Safety class

In accordance with European Norm EN 61010-1.

Category III, pollution 2.

Isolating voltage: 400 V.

The unit should not be used at altitude above 2 500 m.

Note 1: *Safety provisions for the unit are given in chapter 1.*

Note 2: *In order to maintain performances of the announced safety provisions, the measuring accessories must meet the European Norm EN 61010-2-031 and have adapted safety characteristics.*

6.1.2 EMC conformity

The unit performances meet the standard following:

Conducted and radiated disturbances: EN 55022/1994, class B.

Immunity: EN 50082-1/1992.

Radiated: IEC 801-3/1984. Conducted: IEC 801-4/1988.

Electrostatic discharges: IEC 801-2/1991.

6.1.3 Ambient conditions

In accordance with IEC Publication 359 (national standards NF C 42-600, DIN 43745): operating category I.

Reference range: 23°C ± 5°C, relative humidity: 45 % to 75 %.

Normal operating range: 0°C to + 50°C, relative humidity: 20 % to 75 % non-condensing.

Operating range limits: - 10°C to + 55°C, relative humidity: 10 % to 80 % non-condensing.

Storage and transport range: - 30°C to + 60°C (- 15°C to + 50°C with battery charged).

6.1.4 Mechanical conditions

Protection according to IEC Publication 529 (national standard NF C 20-010) : IP 52.

Vibrations and shock according to European Norm EN 61010-1.

6.1.5 Measurements at reference conditions

According to IEC Publication 485 (national standards NF C 42-630 and DIN 43751).

6.1.6 Resistance measurements

Electrical continuity and contact resistance: tests in accordance with IEC Publication 512-2, DIN 41640 Ch 4.

6.2 Characteristics

6.2.1 General

Stated accuracies are expressed in $\pm (n \% \text{ rdg} + C)$, with rdg = reading and C = Constant expressed as a practical unit. They applied to a unit situated in the reference conditions defined elsewhere in the manual after warming-up for 1/2 hour.

6.2.2 Measuring resistances

- 4-wire measurement with compensation of stray voltages.

Range	Resolution	Accuracy, 1 year $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$	Measurement current	Voltage drop
500 m Ω	10 $\mu\Omega$	0.05 % + 50 $\mu\Omega$	100 mA	50 mV
5 Ω	0.1 m Ω	0.05 % + 0.5 m Ω	10 mA	50 mV
50 Ω	1 m Ω	0.05 % + 5 m Ω	10 mA	500 mV
500 Ω	10 m Ω	0.05 % + 50 m Ω	1 mA	500 mV
5 k Ω	0.1 Ω	0.05 % + 0.5 Ω	0.1 mA	500 mV
50 k Ω	1 Ω	0.05 % + 5 Ω	0.01 mA	500 mV

Temperature coefficient, 0°C - 18°C and 28°C - 50°C : $\leq 1/10$ of accuracy/ $^{\circ}\text{C}$.

Open circuit voltage: < 8 V.

Resistance of the connection cables: < 20 Ω .

- Measuring the ambient temperature for compensation:
 - Resolution: 0.1 $^{\circ}\text{C}$.
 - Accuracy: $\pm 1.5^{\circ}\text{C}$.

6.2.3 Measuring DC and AC voltages

Frequency	Resolution	Accuracy, 1 year $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$
from 30 Hz to 50 Hz	1 V	1.5 % + 1 V
from 50 Hz to 1 kHz	1 V	1 % + 1 V

Accuracy with DC component (AC + DC mode) : add to the AC accuracy term 1 % of the DC component.

6.2.4 Protections

- 400 V peak when measuring resistances.
- 600 V peak when measuring voltages.
- The unit is protected against breaking current during inductance measurement.