ALAT UJI
Products, Solution, Services

MICROHMMETER

C.A 6250

User's manual

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Thank you for purchasing a **C.A 6250 microhmmeter**.

To obtain the best service from your instrument:
- **read** this user manual carefully,
- **comply with** the precautions for use.

⚠	WARNING, risk of DANGER! The operator must refer to this user's manual whenever this danger symbol appears.
⧈	Equipment protected by double insulation.
⏚	Earth.
CE	The CE marking indicates conformity with European directives, in particular LVD and EMC.
	The rubbish bin with a line through it indicates that, in the European Union, the product must undergo selective disposal in compliance with Directive WEEE 2002/96/EC. This equipment must not be treated as household waste.

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 to.

PRECAUTIONS FOR USE

This device is compliant with safety standard IEC 61010-2-030 and the leads are compliant with IEC 61010-031, for voltages up to 50 V with respect to earth in category III.
Failure to observe the safety instructions may result in electric shock, fire, explosion, and destruction of the instrument and of the installations.
- The operator and/or the responsible authority must carefully read and clearly understand the various precautions to be taken in use. Sound knowledge and a keen awareness of electrical hazards are essential when using this instrument.
- If you use this instrument other than as specified, the protection it provides may be compromised, thereby endangering you.
- Before making any measurement, check that the resistance to be checked is not live: never connect the instrument to a live circuit.
- Do not use the instrument if it seems to be damaged, incomplete, or poorly closed.
- Use only the accessories supplied with the instrument, compliant with safety standards.
- 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;
- When resistances having a large inductive component (motors, transformers, etc.) are measured, the instrument automatically discharges the inductance after the measurement. During this discharging, the ⚠ symbol is displayed.
- Do not disconnect the measuring cords until the symbol ⚠ disappears.
- Comply with the charging characteristics of the battery and use a fuse of the appropriate type and rating; failure to do so may damage the instrument and void the warranty.
- Set the switch to OFF when the instrument is not in use.
- Check that none of the terminals is connected and that the switch is set to OFF before opening the instrument.
- All troubleshooting and metrological checks must be performed by competent and accredited personnel.

CONTENTS

1. PRESENTATION

The C.A 6250 microhmmeter is a top-quality portable digital measuring instrument with backlit LCD display. It is designed to measure very small resistances.
Housed in a rugged construction-site type case with cover, the C.A 6250 is a self-contained instrument powered by a rechargeable battery with built-in charger.

It provides 7 measurement ranges, from 5 mW to 2,500 W, that can be accessed and selected directly on the front-panel rotary switch.
It uses the 4-wire measurement method (see 3.1.1), with automatic compensation of spurious voltages.

It has many advantages:

- automatic detection of the presence of an external AC or DC voltage on the terminals, before or during the measurement, which disables or stops the measurements when measurement accuracy is no longer guaranteed,
- 3 different measurement modes depending on the nature of the resistance to be measured,
- protection of the operator when a resistance having a large inductive component (motor, transformer, etc.) is measured. After the measurement, the instrument automatically discharges the inductance if the measuring cords are left connected to the inductive resistance measured.
- programming of alarm thresholds (alarms in the form of audible beeps),
- possibility of measuring the measurement temperature using a Pt100 jack on the front panel,
- function for automatic calculation of the resistance at a reference temperature using the possibility of selecting the type of metal the resistance is made of and its temperature coefficient,
- extended memory making it possible to store approximately 1,500 measurements,
- indication of the level of memory use,
- indication of battery charge condition,
- automatic switching of the backlighting to standby to save battery power,
- RS 232 interface to print the results on a serial printer or export them to a PC.

Its main applications are:

- bonding measurements,
- earth continuity measurements,
- motor and transformer resistance measurements,
- contact resistance measurements,
- component measurements,
- electric cable resistance measurements,
- tests of mechanical links.

2. DESCRIPTION

2.1. FRONT PANEL OF THE C.A 6250

- 4 4mm-dia. safety terminals identified as C1, P1, P2 and C2
- 9-way rotary switch:
  - Off : instrument power off / setting for charging
  - 2500 Ω : 2500,0 Ω range – measuring current 1 mA
  - 250 Ω : 250,00 Ω range – measuring current 10 mA
  - 25 Ω : 25,000 Ω range – measuring current 100 mA
  - 2500 mΩ : 2500,0 mΩ range – measuring current 1 A
  - 250 mΩ : 250,00 mΩ range – measuring current 10 A
  - 25 mΩ : 25,000 mΩ range – measuring current 10 A
  - 5 mΩ : 5,0000 mΩ range – measuring current 10 A
  - SET-UP : instrument configuration
- 1 yellow START/STOP key: start/stop measurement
- 8 elastomer keys each having a primary function and a secondary function.
- 1 backlit LCD screen
- 1 receptacle for connection to line power to charge the battery
- 1 jack for connection of a Pt100 temperature probe,
- 1 RS 232 serial INTERFACE plug (9 pin contacts) for connection to a PC or to a printer.

2.2. KEYS

8 keys each having a primary function and a secondary function:

2nd	Activate the secondary function written in yellow italics bellow each key. The *2nd* symbol appears on the screen.
⎍ / ⎓ *METAL*	**Primary function:** before starting the measurement, select the desired measurement mode : inductive, non-inductive or non-inductive with automatic triggering. **Secondary function:** select the metal for the temperature compensation calculation: Cu, Al, or Other metal.
R (θ) ALARM	**Primary function:** activate/deactivate the temperature compensation function: calculation of the resistance at a temperature other than the measurement temperature. **Secondary function:** activate/deactivate alarms. The direction and the triggering value (high or low) are adjusted in the SET-UP menu.
MEM MR	**Primary function:** store the measurement at an address identified by an object number (OBJ) and a test number (TEST). **Secondary function:** retrieve stored data (this function is independent of the setting of the switch) except in the OFF and SET-UP settings.
% &	**Primary function:** in SET-UP mode, select a function or increment a flashing parameter. **Secondary function:** in SET-UP mode, select a function or decrement a flashing parameter.
▶ ■	**Primary function:** select the parameter to be modified (in wraparound mode, from left to right). In SET-UP mode, access the adjustments of a function. **Secondary function:** in SET-UP mode, shift the decimal point and select the unit.
PRINT PRINT MEM	**Primary function:** print the measurement directly to a serial printer. **Secondary function:** print stored data to a serial printer.
✻ 🔊	**Primary function:** activate/deactivate the backlighting of the display unit. **Secondary function:** activate and adjust the sound level/deactivate the audible signal.

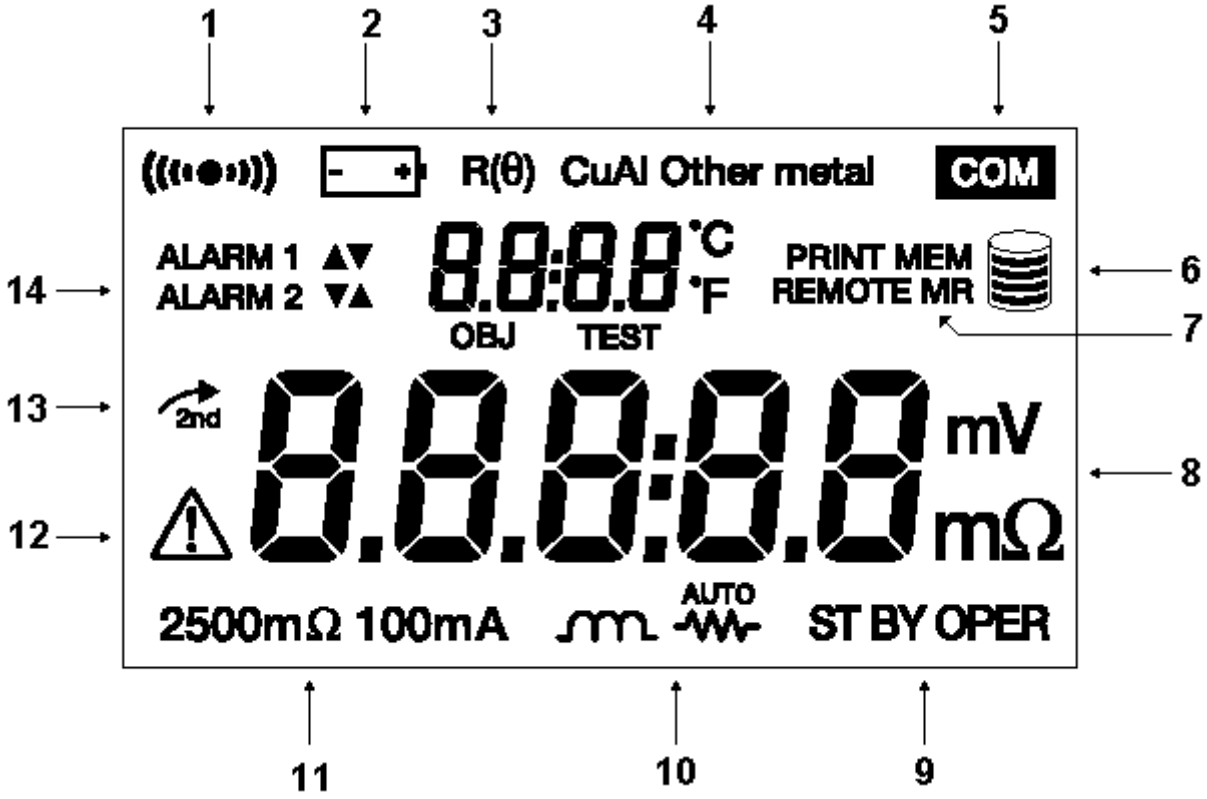
2.3. DISPLAY UNIT

- Dual liquid crystal display.

Secondary display unit: measurement parameters / memory address

Main display unit: measured values

- Other indications and symbols:



1. indicates that the buzzer/audible signal is activated
2. indicates the battery charge condition
3. indicates that temperature compensation is activated
4. indicates the metal selected for the temperature compensation function
5. indicates that data are being transmitted to the serial interface
6. Indicates the memory use level
7. PRINT: printing of current measurement
   PRINT MEM: printing of stored data
   MEM: storage of measurement
   MR: retrieval and reading of a stored measurement
   REMOTE: instrument remotely controlled via the RS 232 interface
8. measurement units of the result displayed
9. indicates the status of the instrument:
   OPER: measurement in progress
   ST BY: Standby -no measurement in progress - waiting for an action
10. indicates the measurement mode selected
11. indicates the range and measuring current selected
12. Warning! Do not disconnect the measuring wires/presence of external voltage
13. indicates that the secondary function of a key will be used
14. indicates which alarm(s) are activated and their direction

2.4. RS 232 INTERFACE: CHARACTERISTICS

- The RS 232 jack can be used with 4 different peripherals (choice of 4 different links in SET-UP) :
  - PC : activate RS232 link between the instrument and a computer
  - PRNT : activate RS232 link between the instrument and a printer
  - TRIG : activate the remote measurement triggering function
  - VT100 : activate RS232 link between the instrument and a disply console

Note that the RS232 can be switched OFF to deactivate the input and output functions of the connector (saves battery power).

Selecting an RS232 link opens a submenu in which to choose the data rate between the instrument and the peripheral. This adjustment is made in SET-UP (see § 3.6)
The baud rate can be set to 4,800, 9,600, 19,200, or 31,250.

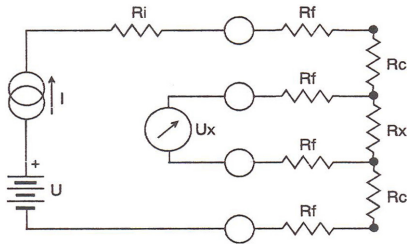
- Data format: 8 data bits, no parity, 1 stop bit, hardware control (CTS).

3. USE / PROCEDURE

3.1. MAKING A MEASUREMENT

3.1.1. CONNECTIONS

Connections are made in accordance with the 4-wire measurement principale; the set-up used is shown in the figure bellow:



Where :

Ri = Internal resistance of the instrument.
Rf = Resistance of the measuring wires.
Rc = Contact resistance.
Rx = Resistance to be measured.

From a DC voltage U, a generator delivers a current I.
A voltmeter measures the voltage drop Ux on the terminals of the resistance Rx to be measured and displays Rx = Ux/I.
The result is independent of the other resistances in the current loop (Ri, Rf, Rc) provided that the total voltage drop they cause, in combination with Rx, is less than the voltage the source can deliver U (U ≤ 6V).

3.1.2. SEQUENCE OF USE

1. Turn the rotary switch from OFF to the desired range. The range and the associated measuring current are then indicated at bottom left in the display unit.
2. Press the ⎓ / Ω key until the desired measurement mode is obtained.
   For a detailed description of the different measurement modes, see § 3.2.
3. If desired, press the **R(θ)** key to activate the temperature compensation function. For a detailed description of this function, see § 3.3.
4. If desired, press the ***ALARM*** (2nd + **R(θ)**) key to activate the alarm(s).
5. Connect the measuring cords to the instrument, then to the resistance to be measured.
6. The instrument indicates ST BY (standby). Press START to start the measurement and, if applicable, STOP to stop it (this depends on the measurement mode selected).
   Remark: Changing ranges during a measurement stops the measurement cycle; the instrument returns to standby (ST BY).
7. The instrument displays the measurement result.
8. Then press MEM to store the result and validate by pressing again.
   For a detailed description of result storage, see § 3.5.

3.2. SELECTION OF THE MEASUREMENT MODE : ⏦ / ⏦ KEY

There are three measurement modes:

- Inductive resistance measurement: ⏦
- Non-inductive resistance measurement: ⏦
- Non-inductive resistance measurement with automatic triggering: ***AUTO*** ⏦

The measurement mode is selected by successive presses on the ⏦ / ⏦ key; the mode selected is displayed bellow, in the centre of the display unit.

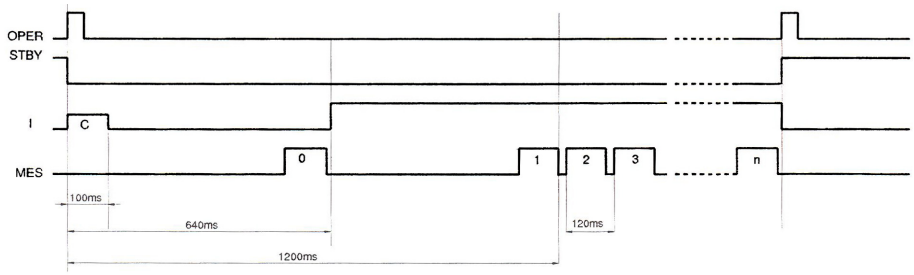
3.2.1. MEASUREMENT IN INDUCTIVE RESISTANCE MODE

This mode is used for measurements on transformers, motors and other inductive devices.
The measurement is started by pressing START and stopped by pressing STOP.

■ **Description:**

- press the START key.
- automatic check of connection of the “current” and “voltage” wires: if the connection is incorrect, an error message is displayed (Err 11 if the “current” wires are incorrectly connected, Err 12 if the “voltage” wires are incorrectly connected); the instrument switches to standby; the cycle is resumed when the connection is correct.
- current not established, measurement of residual voltage **Uo** on the terminals of the resistance. If this voltage is too high, the instrument displays Err 13.
- establishment of current **I**, maintained for as long as the instrument does not return to “standby”.
- measurement of voltage **U1** on the terminals of the resistance and display of the measurement **R = (U1 - Uo) / I**.
- any subsequent measurement involves the measurement of **Un** only, since **Uo** is kept in memory the cycle is ended by pressing the STOP key.

■ **Operating diagram:**



C = check of connections
0 = measurement of residual voltage (stored).
1, 2, 3 ... n = successive measurements of the voltage on the terminals of the resistance (interval between two measurements: 120 ms).
The delay stated for the first measurement (1,200 ms) is an indication only; it can vary according to the load measured.

Remarks :

- If the range is exceeded, the instrument displays Err 07.
- The source of current is protected against overheating. If a measurement at 10 A lasts too long (> several tens of seconds) and causes a temperature rise, the current is cut off and the instrument displays Err 05. The instrument must be allowed to cool down before another measurement can be made.
- After a measurement cycle, the instrument automatically discharges the inductance completely.

During this discharging, the instrument displays the following icon: ⚠

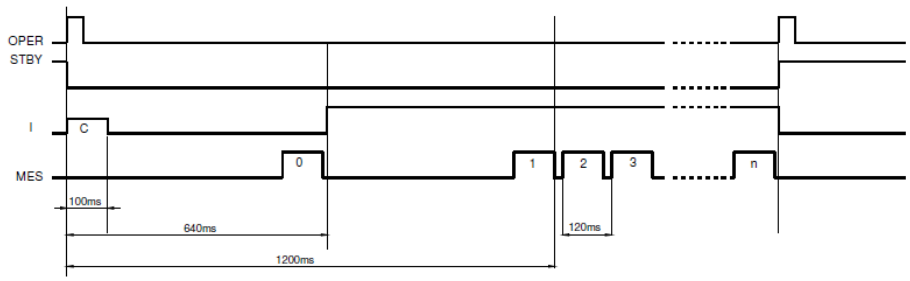
Never touch or disconnect the leads before the icon disappears.

3.2.2. MEASUREMENT IN NON-INDUCTIVE RESISTANCE MODE

This mode is used to measure contact resistances, bondings, and, generally, any resistance having a time constant shorter than a few milliseconds.
The measurement is started by pressing START and stops automatically as soon as the measurement result is available. START must be pressed again to make another measurement.

- **Description :**
  - press the START key.
  - automatic check of connection of the “current” and “voltage” wires: if the connection is incorrect, an error message is displayed (Err 11 if the “current” wires are incorrectly connected, Err 12 if the “voltage” wires are incorrectly connected); the instrument switches to standby; the cycle is resumed when the connection is correct.
  - current not established, measurement of residual voltage **Uo** on the terminals of the resistance. If this voltage is too high, the instrument displays Err 13.
  - establishment of current **I**.
  - measurement of the voltage on the terminals of the resistance **U1** then cutoff of the current.
  - display of the measurement **R = (U1 - Uo) / I**
  - automatic stop at the end of the measurement. The instrument, in standby, is ready for another measurement.

- **Operating diagram (Example : two measurements cycles):**



C = check of connections
0 = measurement of the residual voltage.
M = measurement of the voltage on the terminals of the resistance.

Remarks :
- If the range is exceeded, the instrument displays Err 07.
- This mode has many advantages:
  - it reduces the consumption, because the current is cut off between measurements, and so increases the battery life,
  - it avoids a temperature rise in the resistance measured,
  - It improves the compensation of spurious electromotive forces (because they are measured and compensated before each resistance measurement).

3.2.3. MEASUREMENT IN NON-INDUCTIVE RESISTANCE MODE WITH AUTOMATIC TRIGGERING

This mode is intended only for measuring resistances without time constants.
In this measurement mode, there is no need to press START (other than to start the whole measurement process) or STOP to start or stop the measurement.
The measurement is triggered automatically as soon as the current and voltage circuits are established (as soon as contact is established) and stops automatically as soon as the measurement result is available.
Another measurement is started automatically as soon as the current and voltage circuits are established again (as soon as contact is established again), etc.

- **Description :**
  - press the START key to activate the cycle.
  - connect the wires to the resistance. The instrument remains on standby until the links are established.
  - measurement of residual voltage **Uo** on the terminals of the resistance.
  - establishment of measuring current **I**, measurement of the voltage **U1** on the terminals of the resistance, and display of the measurement **R = (U1-U0)/I**
  - to make another measurement, it is necessary to release at least one link, then reestablish it.
  - cycle ended by pressing the STOP key

Remarks :
- If the range is exceeded, the instrument displays Err 07.

3.3. TEMPERATURE COMPENSATION: (θ)

3.3.1. PRINCIPLE

The metals used for the windings of certain components (e.g. the copper in transformers and motors) have large temperature coefficients (of the order of 0.4 %/°C for copper and aluminium).
This makes resistance measurements strongly dependent on the temperature of the component.

The “temperature compensation” function is used to adjust the resistance measured, which depends on the ambient temperature (measured or programmed), to the value it would have at a programmed reference temperature.

The “temperature-compensated” resistance is calculated as follows:

$$R(t°ref) = \frac{R(t°amb) * (1 + (alpha * t°ref))}{1 + (alpha * t°amb)}$$

where
R(t°amb) : resistance measured at ambient temperature by the instrument
t°amb : temperature measured by a PT100 or programmed by the user
Alpha : temperature coefficient of the selected metal (Aluminium, Copper or»Other metal»)
t°ref : programmed reference temperature to which the measurement is referred

t°amb , alpha and t°ref are parameters that can be programmed in SET-UP (see § 3.6.).

Various values of temperature coefficient:

Metal	per °C	Metal	per °C
Aluminium	0,00403	Lead	0,0043
Copper	0,00393	Mercury	0,00090
Carbon (0-1850°C)	0,00025	Platinium	0,0038
Iron	0,0050	Zinc	0,0037

3.3.2. PROCEDURE

- first check the programming of the t°amb, alpha, and t°ref parameters (see § 3.6.) and the connections.
- press the R(θ) key
  - the R(θ) symbol and the metal selected are displayed steadily on the display unit.
  - the small display unit indicates the temperature t°ref then the temperature t°amb.
- once the measurement has been made, the instrument displays:
  - on the small display unit, depending on the programming:
    the programming ambiente temperature
    or the temperature measured by the temperature sensor
    or «-.-.-.-» if the temperature sensor is validated but not connected or incorrectly connected,
    or if the temperature measured is out of bounds (-10°C to 55°C).
  - on the large display unit:
    the compensated resistance value

Remark :
- Err 10 is displayed if a temperature is out of bounds or if the leads of the sensor become disconnected.

3.4. ACTIVATING THE ALARMS

The alarms are activated by successive presses on the **MR** key (2nd + R(θ)).
The instrument displays:
- alarm 1 and its direction of activation.
- then alarm 2 and its direction of activation.
- then alarm 1 and alarm 2 and their directions of activation.

The values of the alarms and their direction of activation are programmed in advance by the user in SET-UP (see § 3.6)

3.5. STORING AND RETRIEVING MEASUREMENTS (MEM / MR)

3.5.1. STORING RESULTS (MEM)

Measurement results can be stored at memory addresses identified by an object number (OBJ) and a test number (TEST).
An object is a “box” in which 99 tests can be stored. An object can thus represent a device on which a number of measurements/ tests are to be performed.

Procedure :

1. When the measurement is over (result held on the display unit), press the MEM key.
   The MEM symbol flashes and the small display unit indicates the first free OBJ : TEST number (e.g. 02 : 01). The main display unit then indicates FrEE.
   The OBJ no. is that of the last measurement stored, but the TEST no. is incremented by 1.
   OBJ : TEST can changed at any time using the ▸ and ▲▼ keys.
   If the user selects a memory address that is already occupied, OCC appears on the main display unit.
   If a new OBJ is selected, TEST is set to 01.

2. Pressing the MEM key again saves the measurement results at the selected memory address (whether occupied or not).
   The MEM symbol stops flashing and remains displayed. Pressing a key other than MEM or turning the switch before the second press on MEM causes an exit from the save mode without storage of the results.

3. To exit from the memory mode and return to measurement mode, turn the rotary switch.

Remark :
Memory available.
This function is activated automatically when a result is saved.
Press MEM once to obtain the next free OBJ:TEST number.
The memory use symbol is displayed (symbol identified as no. 6 on the display unit):
- if all segments are lit, the entire memory is free.
- if all segments are off, the entire memory is full.

One segment represents approximately 300 records.

3.5.2. RETRIEVING STORED RESULTS (MR)

The MR function can be used to retrieve any stored data, whatever range is selected on the rotary switch.

Procedure :

1. Press the **MR** key (2nd + MEM). The MR symbol is then displayed steadily on the display unit.
   The small display unit indicates the last occupied OBJ : TEST number, e.g. 02 :11.
   OBJ : TEST can be changed at any time using the ▸ and ▲▼ keys.

2. To exit from the memory mode after the consultation, press MR again or turn the rotary switch.

The content of a memory location is as follows:
- the 0BJ:TEST no. of the measurement,
- the range and measuring current settings,
- the measured value with any compensation,
- the R(θ) symbol and symbol of the metal if the measurement was compensated,
- the active alarms at the time of the measurement.

Other items of information are also accessible by pressing a key:
- ⎓/⏦ : displays the coeff. of correction of the metal selected for compensated measurements.
- R(θ) : displays the ambient temperature at the time of the measurement for compensated measurements.
- R(θ) (2fois) : displays the reference temperature of the measurement for compensated measurements.
- ALARM : displays the alarm threshold, for measurements with an alarm active.

3.6. INSTRUMENT CONFIGURATION : SET-UP

This function is used to configure the instrument and change its configuration as needed.

After the rotary switch is turned to SET-UP :
- all segments of the display unit light for 1 second,
- SEt then appears on the small display unit to prompt for a key press,
- the ▲ ▼ key is then used to navigate in the parameter programming menu,
- the parameter to be modified is selected by pressing the ▶ key.

After a parameter to be modified has been selected:
- the figures or symbols corresponding to the parameter appear on the screen,
- the figures or symbols that can be modified flash: changes are made using the ▲ ▼ key (to change the value of a figure, digit, or symbol) and the ▶ key (to change figures, digits, or symbols).

Remarks :
- all changes to parameters are saved immediately and permanently.
- to exit from the configuration mode, turn the rotary switch to a position other than SET-UP.

3.6.1. PROGRAMMING MENU

The table bellow specifies which keys are active in the SET-UP function and the corresponding display, with the possible adjustment ranges:

	Parameter to modified	key	Display		
			main	secondary	symbol
▲ (1st press)	**RS** communication	▶	Prnt	rS	-
▲ (2nd press)	**BUZZ** buzzer sound level		-	BUZZ	
▲ (3rd press)	**EdSn** display of serial no.	▶	Number	EdSn	-
▲ (4th press)	**EdPP** display of prgram no.	▶	Number	EdPP	-
▲ (5th press)	**Lan9** printing language	▶	L9F	Lan9	-
▲ (6th press)	**trEF** reference temp.	▶	Value	trEF	°C
▲ (7th press)	**tAnb** ambient temp.	▶	nPrb	tAnb	°C
▲ (8th press)	**nEtA** metal selection	▶	Value	nEtA	Cu or Al or Other metal
▲ (9th press)	**ALPH** Other metal coeff.	▶	Coeff. value	ALPH	Other metal
▲ (10th press)	**dE9** temperature unit	▶	dE9c	dE9	-
▲ (11th press)	**ALAr** alarms (values and directions)	▶	Value	ALAr	ALARM + 
▲ (12th press)	**Ll9H** duration of backlighting	▶	t = 1	Ll9ht	-
▲ (13th press)	**nEn** erasure of memory	▶	dEL	nEn	-

Remark:
The SEt function can also be adjusted. This possibility is however provided for maintenance of the instrument only and is password-protected (see § Maintenance).

Value	Changing of values
Prnt / OFF / tri9 / PC / ut100 + rate:	- type of communication: successive presses on ▲ - speed regulation: ▶ then ▲
Low / hight or OFF	- successive presses on ▲
-	-
-	-
Fr / 9b	- press on ▲
-10 … 55°C	- press on ▶ to change the digit - press on ▲ to change the value of the digit
Prb or nPrb if nPrb : -10 … 55°C	- presence or absence of sensor: press on ▲ - if nPrb : ▶ then - press on ▶ to change the digit - press on ▲ to change the value of the digit
Cu or Al or Other metal	- successive presses on ▶
0 … 100,00 (10-3 /°C)	- press on ▶ to change the digit - press on ▲ to change the value of the digit
dE9c (°C) or dE9F (°F)	- press on ▲
ALARM 1 or 2 / ▲ or ▼ / 5mΩ to 2500Ω	- choice of parameter to change: successive presses on ▶ - modification of the parameter: ▲
1 mn / 5 mn / 10 mn or OFF	- press on ▲
dEL or dEL O (all memory or object)	- press on ▲ then ▶

3.6.2. ERASING THE MEMORY

Two possibilities:
- erase all stored data.
- erase the content of an OBJET number.

Erasing all stored data:

- in the SET-UP menu, select the **nEn** parameter.
- press the ▶ key and, on the main display unit, select **CLr** using the ▲ key.
- confirm by pressing ▶ key.
- the instrument asks you to confirm by **CLr Y** to execute this function:
  - if yes, press the ▲ key.
  - if no, select **CLr n** by pressing the ▲ key and confirm by pressing the ▶ key.

Erasing the content of an OBJET number:

- in the SET-UP menu, select the **nEn** parameter.
- press the ▶ key and, on the main display unit, select **CLr 0** using the ▲ key.
- confim by pressing the ▶ key.
- the last OBJ number flashes; it can be changed using the ▲ ▼ keys.
- confirm by pressing the ▶ key.
- the instrument asks you to confirm by **CLr Y** to execute this function:
  - if yes, press the ▶ key.
  - if no, select **CLr n** by pressing the ▲ key and confirm by pressing the ▶ key.

3.7. PRINTING RESULTS (PRINT/PRINT MEM)

Two printing modes are available:
- immediate printing of a measurement (PRINT)
- printing of stored data (PRINT MEM).

If transmission of the data to the printer goes well, the COM symbol flashes on the display unit.
If a problem occurs, the symbol COM remains on steadily on the LCD screen.

3.7.1. IMMEDIATE PRINTING OF A MEASUREMENT (PRINT)

Following a measurement or after the MR (memory retrieval) mode is accessed, the PRINT function can be used to print the measurement results.

When the key is activated, the measurement is printed, along with the measurement conditions and R(θ) if the function was activated).
To stop printing, change the setting of the rotary switch.

Below is a printing ticket form:

CHAUVIN-ARNOUX - C.A 6250

INSTRUMENT NUMBER :
LOW RESISTANCE MEASUREMENT :
OBJECT : TEST :
DESCRIPTION :
.....
.....

DATE :	-- / -- / ----
MEASUREMENT :	NON-INDUCTIVE
METAL :	Cu
METAL COEFF. :	3.93
MEASUREMENT TEMPERATURE :	23.2Cel
REFERENCE TEMPERATURE :	20.0Cel
RESISTANCE MEASUREMENT :	1294.6Ohm
MEASUREMENT REFERED TO TREF :	1287.2Ohm

REMARK : .....
.....
DATE OF NEXT TEST : -- / -- / ----

3.7.2. PRINTING STORED RESULTS (PRINT MEM)

This function is used to print the content of the instrument's memory.

Press the PRINT MEM key (2nd + PRINT).
The secondary display unit indicates the OBJ:TEST number 01 : 01 as start address for printing.
The main display unit indicates the last recording in memory, e.g. 12 : 06, as end address for printing.
To change the printing beginning/end addresses, use the normal modification procedure (▶ and ▲ ▼ keys).

To **exit without printing**, change the setting of the rotary switch.
To **start printing**, press the PRINT key again.
To **stop printing**, change the setting of the rotary switch.

3.8. LIST OF CODED ERRORS

Err 1	Battery charge too low
Err 2	Internal problem
Err 3	Impossible to measure battery charge
Err 4	Impossible to measure temperature
Err 5	Internal temperature too high - Let the instrument cool down
Err 6	Measuring current not established
Err 7	Measurement out of range
Err 8	Internal problem
Err 9	Measurement cycle stopped
Err 10	Temperature sensor incorrectly connected or missing
Err 11	Current-circuit wires incorrectly connected
Err 12	Voltage-circuit wires incorrectly connected or measured resistance too high
Err 13	Residual voltage too high
Err 21	Adjustment out of bounds
Err 22	Measured value out of bounds
Err 23	Edition out of bounds
Err 24	Cannot write to back-up memory
Err 25	Cannot read in back-up memory
Err 26	Memory full
Err 27	Memory empty: no data available
Err 28	Memory check problem
Err 29	Object or test number incorrect

Warning:
If error message 2, 3, 4, or 8 appears, the instrument must be switched off and sent to qualified organization for repair.

4. CHARACTERISTICS

4.1 CHARACTERISTICS

Remark:
accuracies are stated in the form ± (n% read + C) where read = reading and C = a Constant, in practical units.
They apply to the instrument placed in the reference conditions (see § 4.3), after 1 hour of warming up.

- 4-wire measurement with compensation of spurious voltages.
  (measurements made under reference conditions as per publication CEI 485 (national standards NF C 42-630 and DIN 43751)).

Range	Resolution	Accuracy over 1 year	Measuring current	Voltage drop
5.000 mΩ	0.1 µΩ	0.05% + 1.0 µΩ	10 A	50 mV
25.000 mΩ	1 µΩ	0.05% + 3 µΩ	10 A	250 mV
250.00 mΩ	10 µΩ	0.05% + 30 µΩ	10 A	2500 mV
2500.0 mΩ	0.1 mΩ	0.05% + 0.3 mΩ	1 A	2500 mV
25.000 Ω	1 mΩ	0.05% + 3 mΩ	100 mA	2500 mV
250.00 Ω	10 mΩ	0.05% + 30 mΩ	10 mA	2500 mV
2500.0 Ω	100 mΩ	0.05% + 300 mΩ	1 mA	2500 mV

- Possible overshoot of nominal range:
  5mΩ range: +20%
  25mΩ range: +20% (the values depend on the battery charge condition)

- Maximum open-circuit voltage on terminals: 7V

- Temperature coefficient from 0 °C to 18 °C and from 28 °C to 50 °C : ≤ 1/10 of the accuracy per / °C.

- Measurement of ambient temperature for compensation:
  Resolution: 0.1 °C
  Accuracy: ± 0.5 °C.

4.2. POWER SUPPLY

- The instrument is supplied by:
  - a rechargeable battery pack comprising 5 1.2 V, 8.5 Ah (size D) NiMH cells
  - that can be charged, using a built-in charger, by connecting the instrument to line power: 90 to 264 V, 45 to 420 Hz.

Note: The battery compartment is inside the housing.

- Charging the batteries:

Warning: measurements are disabled while the batteries are charging.

- if the instrument displays:
  - o during the measurement: « Err01 »
  - o in stand-by :  , this means that the charge of the battery is low. It must then be charges
- The instrument can be charged only when OFF, and a full charge takes approximately 5h.
- Indication of charge level: when the rotary switch is set to a position other than OFF, the display:
  - o CHr9 L : the instrument starts pre-charging
  - o bAt CHr9 and  flashes : l'appareil est en charge
  - o bAt FuLL and  is displayed without flashing : la charge est finie.

4.3. ENVIRONMENTAL CONDITIONS

- Reference domain:
  23°C ±5°C
  45°C to 75 % HR.

- Nominal operating domain:
  0°C to +50°C
  20% to 80% HR without condensation.

- Extreme domain:
  -10°C to +55°C
  10°C to +80°C, without condesation.

- Extreme storage and transport domain:
  -40°C to +60°C
  -15°C to +50°C, with battery charged.

4.4. PHYSICAL CHARACTERISTICS

Overall dimensions of the housing (L x W x H) : 270 x 250 x 180mm
Mass: approximately 4kg

4.5. COMPLIANCE WITH INTERNATIONAL STANDARDS

- Electric safety as per standard EN 61010-1
- Level of pollution: 2
- Measurement category III
- Max. voltage relative to earth: 50 V.
- CEM conformity as per standard EN 61326-1, standard environment, discontinuous operation.
- Mechanical protections:
  Tightness as per standard EN 60529
  IP53 = housing open.
  IP64 = housing closed.
- Protections:
  Electronic protection up to 250 V on the “voltage” wires
  Protection by fuse on the “current” wires
  Protection against opening of the “current” circuit during inductive resistance measurements.

5. MAINTENANCE

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

5.1. SERVICING

5.1.1. CHANGING THE BATTERY PACK

The battery should preferably be changed by Manumesure or by a repairer approved by Chauvin-Arnoux.

However, the replacement procedure is as follows:

- disassemble the instrument:
  - unscrew the 4 screws on the bottom
  - withdraw the instrument from the box
  - turn the instrument over so that the battery pack is up.
- unscrew the nuts at the four corners of the mettallic plate,
- remove the 6- and5-contact connectors of the power supply board, and the wires of the pack The yellow wires have no polarity.
- change the battery pack,
- to reassemble the instrument, perform the above operations in reverse order.

Important remarks:

- Changing the battery causes stored data to be lost.
- Avoid storing the instrument with the battery charge too low.
  If the instrument is left unused for a long time (more than 2 months), the charging time will be longer.
  Before using the instrument again, it is therefore best to carry out 3 complete charging/discharging cycles.

5.1.2. REPLACING FUSES

The instrument is protected by two fuses:

- quick-blow fuse F1, 6.3 x 32 mm, 16 A/250 V, with a low internal resistance, protects the current source against the application of an external voltage.
- quick-blow fuse F2, 5.0 x 20 mm, 2 A/250 V, protects the power supply board of the charger.

The replacement procedure is as follows:

- disassemble the instrument as indicated in § 5.1.1,
- remove the defective fuse,
- replace it with an **identical fuse**.

In all cases, if the problem persists, you must send the instrument back to Manumesure for checking.

5.1.3. CLEANING

The instrument must be disconnected from any source of electricity.
Use a soft cloth slightly moistened with soapy water. Rinse with a damp cloth and dry rapidly with a dry cloth or forced air. Do not use alcohol, solvents, or hydrocarbons.

5.2. MAINTENANCE

The primary function of the programming menu is reserved for maintenance use and is protected by a 5-digit password:

- set the rotary switch to SET-UP, SEt is then displayed.
- enter the programming mode by pressing the ▸ key.
- enter the password; the factiry value is 09456.

When the password has been validated, a submenu proposes the various maintenance functions:

- the ▲ ▼ key is then used to navigate in the functions menu,
- the desired function / command is selected by pressing the ▸ key.

✸ (1st press)	CPt A	Display the values of adjustments counters for the various ranges Pt100, 2500Ω, 250Ω, 25Ω, 2500mΩ, 250mΩ, 25mΩ, 5mΩ
✸ (2nd press)	AdJ	Adjust the instrument, refer to § 5.2.1
✸ (3rd press)	nCOEF	Delate the adjustment coefficients and use the default coefficients. Restarting the instrument cancels the previous action.
✸ (4th press)	UP9	Update the program of the instrument, refer to § 5.2.2
✸ (5th press)	FrEq	Select the line power frequency, 50 or 60 Hertz

5.2.1. METROLOGICAL CHECK

Like all measuring or testing devices, the instrument must be checked regularly.
This instrument should be checked at least once a year. For checking and calibration, contact one of our accredited metrology laboratories (information and contact details avilable on request), at our Chauvin-Arnoux subsidiary or the branch in your country.

As part of the tracking of metrological quality, the user may be led to perform periodic performance checks him/herself. The checks must include the usual metrological precautions. Comply with the following instructions.

The operations are performed in the reference conditions, i.e.:
Temperature of the room: 23 °C ± 5 °C.
Relative humidity: 45 % to 75 %.

The standards that make up the checking chain must be such that the errors at the testing points are known and are ≤ ± 0,01 % for the resistance standards, with allowance for the factors of influence encountered.

If this check shows that one or more characteristics of the instrument are outside the specified tolerances, you must:

- either return the instrument for verification and adjustment:
  - in mainland France: to our COFRAC-accredited metrology laboratories or to a Manumesure agency - Information and coordinates on request:
    tél. : 02 31 64 51 43
  - outside mainland France: to a Chauvin Arnoux subsidiary or to the dealer who sold you this equipment.
- or make the adjustment using the procedure below, which requires equipment at least as effective as that used for the check performed previously.

Adjustment procedure:

RECOMMENDATIONS

The instrument was adjusted in the factory. Any untimely work irreversibly alters the adjustments of the instrument.
The person responsible for the use of this instrument must make sure that the person in charge of the work has been informed of the precautions to be taken in performing this operation.
For the adjustment to be performed under ideal conditions, Chauvin Arnoux recommends returning the instrument to its workshops.
Failure to comply with these recommendations may void the warranty.

This operation must be performed under the following stable climatic conditions:

- Temperature: 23 °C ± 5 °C.
- Humidity: 45 % to 75 %.
- Warm-up time: 1 hour.

The temperature of the instrument must be stabilized, as well as the temperatures of the standards. If these conditions cannot be met, returning the instrument to the factory is preferable.

To adjust the instrument, it is necessary to have resistances calibrated with an uncertainty less than or equal to $1x10^{-4}$. The standards must be able to withstand the currents of the corresponding ranges.
The following ranges must be adjusted: Pt100, 5 mΩ, 25 mΩ, 250 mΩ, 2500 mΩ, 25 Ω, 250 Ω, 2500 Ω.
The measurement ranges are adjusted at one point.
We recommend standards having values greater than 80 % of full scale of the ranges.

The Pt100 range is not a measurement range; it is used for temperature compensation measurements; it must therefore also be adjusted, at two points, a low point and a high point.
We recommend using standards close to 100 Ω for the low point and 115 Ω for the high point, the lower and upper limits being 98 Ω and 120 Ω.

For the adjustments of the ranges, connect the standards using the measurement connectors.
For the adjustment of the Pt100 range, connect the standards to the connector of the probe.
Reminder: The maintenance menu is password-protected.

- Adjusting the 5 mΩ, 25 mΩ, 250 mΩ, 2500 mΩ, 25 Ω, 250 Ω and 2500 Ω ranges:
  - in the SEt maintenance menu, select the AdJ command,
  - select the range to be adjusted and check that the standard is in fact connected,
  - select AdJH and enter the value of the standard,
  - select MEASH: the adjustment is then performed,
  - the -AdJ- message indicates that the adjustment is over and was successful.

- Adjustment of the Pt100 measurement:
  - in the Set maintenance menu, choose the AdJ command,
  - in the submenu, choose the Pt100 range and check that the standard is in fact connected,
  - select AdJ L and enter the value of the standard,
  - select MEAS L: the low point is then adjusted,
  - select AdJ H and enter the value of the standard,
  - select MEAS H: the high point is then adjusted,
  - the -AdJ- message indicates that the adjusment is over and was successful.

Note : the error messages Err10, Err21 or Err22 may be displayed.