

- Mégohmmètres
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# C.A 6541

# C.A 6543



Notice de fonctionnement  
User's manual  
Bedienungsanleitung  
Libretto d'Istruzioni  
Manual de Instrucciones

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#### Significations du symbole

**ATTENTION !** Consulter la notice de fonctionnement avant d'utiliser l'appareil.

Dans la présente notice de fonctionnement, les instructions précédées de ce symbole, si elles ne sont pas bien respectées ou réalisées, peuvent occasionner un accident corporel ou endommager l'appareil et les installations.

#### Significations du symbole

Cet appareil est protégé par une isolation double ou une isolation renforcée. Il ne nécessite pas de raccordement à la borne de terre de protection pour assurer la sécurité électrique.

#### Significations du symbole

**ATTENTION !** Risque de choc électrique.

La tension, des parties repérées par ce symbole, est susceptible d'être  $\geq 120$  V DC. Pour des raisons de sécurité, ce symbole s'allume sur l'écran LCD dès qu'une tension est générée.

Vous venez d'acquérir un **mégohmmètre C.A 6541** ou **C.A 6543** et nous vous remercions de votre confiance.

Pour obtenir le meilleur service de votre appareil :

- **lisez** attentivement cette notice de fonctionnement,
- **respectez** les précautions d'emploi.



## PRECAUTIONS D'EMPLOI



- Respectez les conditions d'utilisation : température, humidité, altitude, degré de pollution et lieu d'utilisation
- Cet instrument peut-être utilisé sur des installations de catégorie III, pour des tensions n'excédant pas 600 V par rapport à la terre. La catégorie III répond aux exigences de fiabilité et de disponibilité sévères correspondant aux usages permanents sur des installations fixes industrielles (cf EN 61010)
- Utilisez des accessoires de branchement dont la catégorie de surtension et la tension de service sont supérieures ou égales à celles de l'appareil de mesure (600 V Cat III). N'utilisez que des accessoires conformes aux normes de sécurité (EN 61010-2-032).
- Respectez la valeur et le type des fusibles (voir § 8.1.3) sous risque de détérioration de l'appareil et d'annulation de la garantie.
- Positionner le commutateur en position OFF lorsque l'appareil n'est pas utilisé.
- Vérifier qu'aucune des bornes n'est connectée et que le commutateur est bien sur OFF avant d'ouvrir l'appareil.
- Toute opération de dépannage ou de vérification métrologique doit-être effectuée par du personnel compétant et agréé.
- Le CA 6543 ne permet pas d'effectuer des mesures simultanément à la recharge des batteries.
- Un chargement de la batterie est indispensable avant essais métrologiques.

## English

### Meaning of the symbol

**Warning !** Please refer to the User's Manual before using the instrument.

In this User's Manual, the instructions preceded by the above symbol, should they not be carried out as shown, can result in a physical accident or damage the instrument and the installations.

### Meaning of the symbol

This device is protected by a double insulation or by a reinforced insulation. No linking is required from the protection earth terminal to ensure the electrical security.

### Meaning of the symbol

**WARNING!** Risk of electric shock.

The voltage of parts indicated with this symbol can be  $\geq 120$  V DC. For safety reasons, this symbol lights up on the LCD screen as soon as a voltage is generated.

Thank you for purchasing a **C.A 6541 or C.A 6543 megohmmeter**.






To get the best service from this instrument :

- **read** this user's manual carefully
- **respect** the safety precautions detailed

## SAFETY PRECAUTIONS

- Observe the conditions for use : temperature, humidity, altitude, pollution level and place of use.
- This instrument can be used on category III installations with voltages not exceeding 600 V in relation to the earth. Category III meets with the severe reliability and environmental requisites corresponding to permanent use on fixed industrial installations (see EN 61010)
- Use connection accessories with overvoltage category and service voltage that are above or equal to that of the test instrument (600 V Cat III). Only use accessories that comply with the safety standards (EN 61010-2-032).
- Observe the correct value and type of fuse (see § 8.1.3) at risk of damaging the device and rendering your guarantee void.
- Select the OFF position on the selector switch when the device is not in use.
- Check that none of the terminals are connected and that the selector switch is set to OFF before opening up the instrument.
- All repairs and metrological verification procedures must be carried out by qualified personnel.
- The CA 6543 does not allow measurements to be carried out during battery charging.
- A battery charging up is indispensable before metrological tests.

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# 1. PRESENTATION

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## 1.1 Megohmmeters

**Megohmmeters C.A 6541 and C.A 6543** are portable instruments, each housed in robust casing with lid and operating on batteries (C.A 6541), or on a rechargeable battery and the mains (C.A 6543).

They can be used to measure :

- voltage
- insulation
- continuity
- resistance
- capacitance

These megohmmeters contribute to the safety of electrical installations and equipment.

Their functioning is micro-processor controlled, for data acquisition, processing, displaying measurements, memory storage and the printing of results (C.A 6543).

They offer a number of advantages such as:

- digital filtering of insulation measurements,
- running measurements with the help of a remote control probe,
- automatic voltage measurement in all functions,
- automatic detection of external AC or DC voltages on the terminals, before or during measurements, which prohibits or stops measurement, no matter what function you're in,
- threshold programming in each function, triggering audible alarms,
- timed control of measurement duration,
- fuse protection of the device, with defective fuse detection,
- operator safety thanks to the automatic discharge of the residual high voltage on the tested device,
- automatic device switch-off to save the batteries (C.A 6541) or the rechargeable battery (C.A 6543)
- the battery wear indicator (C.A 6541) or the battery charge status indicator (C.A 6543),
- a large back-lit LCD with comprehensive range of symbols, easily read by the user.

The C.A 6543 has the following additional features:

- Integral rechargeable battery (recharged from the mains)
- Operation directly powered from the mains
- 128 kB memory, real time clock and serial interface
- Piloting of the instrument from a PC (with the optional MEGOHM VIEW software)
- Printing in RS 232 or Centronics mode

## 1.2 Accessories

- **Remote control probe** (*optional, see § 11.3*)

This probe plugs in via a specific connector.

It can be used to carry out all measurements, the yellow button operates in just the same way as the device's START/STOP button.

A push button, on the back of the probe, enables you to light up the measurement point (approx. 500 lux illumination) : a useful feature since insulation measurements are made on dead installations, hence in darkness.

■ **“Megohm View” PC software (option for the C.A 6543)**

The PC software makes it possible to:

- retrieve data from memory, to plot graphs of the changes in insulation as a function of the time over which the test voltage is applied,  $R(t)$ ,
- to print out protocols of personalised tests depending on the user's needs,
- to create text files for use on spreadsheets (Excel™, ...),
- to set up and control the instrument entirely via the RS 232.

The minimum configuration recommended for the PC is a 486DX100 processor.

■ **Serial printer (option for the C.A 6543)**

This compact printer enables you to print out test results directly on-site, whether you've saved them or not.

■ **Serial-to-parallel adapter**


The RS232/Centronics adapter available as an option makes it possible to convert the serial interface (RS232) into a parallel printer interface (Centronics), which enables direct printing of all measurements on A4 format office printers without having to resort to using a personal computer.

## 2. DESCRIPTION

### 2.1 Unit overview

Refer to the pictures of the device in Appendix § 11, found at the end of this user's manual.

#### 2.1.1 C.A 6541 and C.A 6543

- ① 3 x 4 mm Ø safety terminals labelled: “ + ”, “ G ” and “ - ”  
 Next to the “ - ” terminal, there are 2 additional terminal contacts for the connection of the remote control probe (3 contact connector)
- ② Rotary selector switch with 9 positions:
  - Off : instrument is off
  - MΩ - 50 V : insulation measurement up to 200 GΩ
  - MΩ - 100 V : insulation measurement up to 400 GΩ
  - MΩ - 250 V : insulation measurement up to 1 TΩ
  - MΩ - 500 V : insulation measurement up to 2 TΩ
  - MΩ - 1000 V : insulation measurement up to 4 TΩ
  - 400 KΩ : resistance measurement
  - 40 Ω  : continuity measurement
  - SET-UP : set-up of the device configuration
- ③ 1 yellow START / STOP button: start/stop of the measurement
- ④ 6 buttons (C.A 6541) or 8 buttons (C.A 6543) in elastomer, each with a first and a second function:




Selection of the second function (in yellow italics below each button)

**R-DAR-PI**



**First function:** before insulation measurement use to choose the type of measurement desired from amongst normal measurement, the dielectric absorption ratio (DAR) and the polarisation index (PI). After measurement it displays R, DAR, PI and capacitance (μF).

**Second function:** Show / hide the interval values of insulation resistance, test voltage and time-stamping, following a time-controlled test (buttons V-TIME and  can also be used).

**V-TIME**



**First function:** When measuring insulation, it displays the time elapsed since the beginning of the measurement, then the exact voltage generated. When carrying out Resistance or Capacitance measurement, this button has no effect. In MR (memory recall), it displays the date and the time at which the measurement was memorised, the exact test voltage and the OBJ : TEST number.

**Second function:** activation/deactivation of “time-controlled” test mode



**ALARM**

**First function:** to turn display back-lighting on and off

**Second function:** to activate/deactivate the alarms programmed in SET-UP



**First function:** to select a parameter to be modified

**SMOOTH**

**Second function:** to stop/start smoothing of displayed values during insulation testing

- ▲ **First function:** to increase the flashing parameter being displayed. To move about the list of interval insulation measurements, in the R(t) function.
- ▼ **Second function:** to decrease the flashing parameter being displayed. To move about the list of interval insulation measurements, in the R(t) function.
- If the ▲ and ▼ buttons are held down, the movement between parameters is fast.

#### ■ C.A 6543 Only

- MEM** **First function :** to save measured values
- MR** **Second function:** to recall saved data (this function is independent of the rotating switch position)
- PRINT** **First function:** for the immediate printing of measurement results
- PRINT MEM** **Second function:** for printing of memory contents

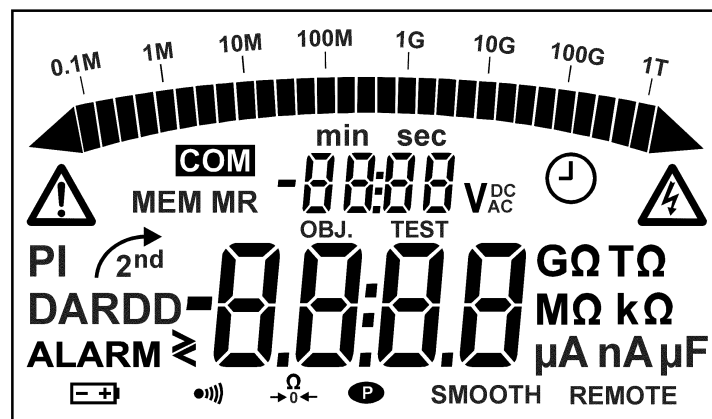
⑤ Back-lit liquid crystal display

#### 2.1.2 C.A 6543 only

- ⑥ Mains plug (direct operation on AC network/ battery recharge)
- ⑦ RS 232 serial INTERFACE male plug (9 pin) for connection to a PC or printer

**Note :** The battery compartment (C.A 6541) or the rechargeable battery compartment (C.A 6543) is situated inside the unit casing.

## 2.2 Display





### 2.2.1 Digital display

The main display indicates values when carrying out insulation measurement (resistance, DAR and PI, capacitance), and continuity and resistance measurement.

The small digital display indicates the voltage measured or applied by the instrument.

During insulation measurement, the elapsed time or the output voltage is displayed.

After recording a set of data (C.A 6543), the small display also indicates the time and date in MR (memory recall) mode. It also indicates the memory address with the OBJ. TEST number (see § 2.2.3. Symbols).

### 2.2.2 Bar graph

The bar graph is active for insulation measurement (0.1 MΩ to 1 TΩ). It also serves to indicate the battery charge, as well as the free memory space - one segment representing approximately 100 groups of saved values.

### 2.2.3 Symbols

**MEM/MR** Memory address (C.A 6543): the number is displayed above, on the small digital display.

**OBJ : TEST** Memory address (C.A 6543), the number is displayed above on the small digital display.

**COM** Flashes on the screen when data is transmitted to the serial interface (C.A 6543) or remains permanently displayed if there is a problem during transfer.

**DAR/PI** Indicates the mode chosen before insulation measurement or the results of these measurements.



Dangerous voltage generated,  $V > 120\text{ V}$ .



External voltage present, symbol is activated after pressing START, if  $V > 25\text{ V}_{AC} \pm 3\text{ V}$  or  $> 35\text{ V}_{DC}$



Activation of "time-controlled test" mode or clock adjustment when in SET-UP (C.A 6543)



Indicates that the second function of a button is to be used



Flashes if the battery voltage (C.A 6541) or the rechargeable battery (C.A 6543) is low. The batteries should be replaced or the rechargeable battery should be recharged (See § 8 Maintenance).

The voltage is displayed on the small digital display for 2 seconds whilst the instrument switches on. The main display indicates "bat ". This test is carried out internally on a load corresponding to that during functioning.



Signal that lead compensation is in effect



Warning buzzer is activated



Indicates that the automatic switch-off function has been deactivated

**SMOOTH** Smoothes the insulation measurements displayed

**REMOTE** Remote control via an interface (C.A 6543). In this mode, all the buttons and the rotary switch on the instrument are non-functional, except for in the case of switching off the instrument.

**FUSE HI** Flashes if the " + " input fuse is defective.

**FUSE -G-** Flashes if the " G " input fuse is defective.

## 3. MEASUREMENT FUNCTIONS

### 3.1 AC / DC Voltage


Select any insulation, resistance or continuity measurement position with the rotary selector switch and the device is automatically in AC / DC voltage measurement mode. The voltage is permanently measured and is shown on the small display.

Proceeding with a measurement is prohibited if an external voltage is present at the terminals before pressing START / STOP. Similarly, if an interference voltage is detected during measurement, the measurement is stopped and the voltage indicated.

### 3.2 Insulation measurement




As soon as one of the MΩ positions has been selected, the main display shows “- - - MΩ”, and the small display indicates the voltage present at the device's + and - terminals.

 **If the external voltage present at the device's terminals exceeds the thresholds shown on the table below**, then pressing the yellow START / STOP button does not bring about insulation measurement but instead triggers a discontinuous audible signal (beep, beep, beep, ...) and the  symbol flashes for 2 seconds, then the device goes back to automatic voltage measurement.

 **If the external voltage present at the device terminals is below the thresholds shown below**, then insulation measurement can go ahead:

Test voltage	Max voltage allowed for measurement
50 V	8 V
100 V	16 V
250 V	50 V
500 V	50 V
1000 V	50 V

Pressing START immediately begins the measurement. The measurement value is displayed on the main digital display and on the bar graph. An audible beep is given out every 10 seconds to indicate that measurement is in progress.

 **If the generated voltage is liable to be dangerous (> 120 V), the  symbol is displayed.**  
**If, during insulation measurement, an external voltage > 25 V<sub>AC</sub> ±3 V or 35V<sub>DC</sub> is detected, the measurement is stopped as long as the voltage is applied to the instrument. The  symbol flashes and the voltage value is indicated on the small digital display.**

If the measurements fluctuate greatly, it is possible to use the *SMOOTH* function (see § 4.5).

By pressing the V-TIME button during measurement you can alternate between displaying, on the small display, the duration of the voltage measurement and the exact voltage generated (see § 4.2).

Pressing the STOP button stops the measurement.

After the measurement has been stopped the main result remains displayed.

It is possible to scroll down all the other results available on the main display using the R-DAR-PI button. This button can also be used before measurement is begun (see § 4.3).

If the “Time-controlled test” mode has been selected, the *R(t)* button makes it possible to access all the saved interval measurements automatically. (see § 4.2 and 4.3).

If the ALARM function is activated, a buzzer is triggered as soon as the measurement crosses the threshold programmed in the SET-UP configuration menu (see § 4.4).

### ■ Display of values after measurement

The following information may be displayed:

R-DAR-PI button		V-TIME button
Main Display	Small display	Small display if the <i>MR</i> button is pressed (C.A 6543)
<b>Resistance</b> DAR PI	duration (min. sec) duration (min. sec) duration (min. sec)	date, time, test voltage, OBJ : TEST date, time, test voltage, OBJ : TEST date, time, test voltage, OBJ : TEST
<b>Capacitance</b> * <i>R(t)</i>	duration (min. sec)	last voltage

\* Capacitance ( $\mu\text{F}$ ) measurement is only displayed after the measurement is finished and the circuit has been discharged.

### 3.3 Continuity ( $40\ \Omega$ ) / resistance ( $400\ \text{k}\Omega$ )

Continuity measurement is carried out on the  $40\ \Omega$  current position (with a test current  $> 200\ \text{mA}$  up to  $20\ \Omega$ ), resistance measurement on the  $400\ \text{k}\Omega$  position (with a test current  $< 6\ \text{mA}$ ).

■ **Once the selector switch has been turned** to one of these 2 positions, the main display indicates - - - -  $\Omega$  (for continuity) or - - - -  $\text{k}\Omega$  (for resistance ) and the small display indicates the voltage present on the + and - terminals.

⚠ **If the voltage is  $> 3\ \text{V}_{\text{AC/DC}}$  and the START / STOP button is pressed**, the  $\phi$  symbol flashes and the audible alarm gives out beeps (for 2 seconds) telling you that the measurement was denied, then the device goes back to its normal voltage measurement.

⚠ **If the voltage is  $< 3\ \text{V}_{\text{AC}}$  and the START / STOP button is pressed**, the measurement goes ahead.

■ The main display indicates the continuity or resistance value in progress and the small display indicates the voltage present on the + and - terminals.

⚠ **Buttons R-DAR-PI, V-TIME and SMOOTH are not active for these functions.**


**There is no automatic polarity change for continuity measurement.**



⚠ **If, during continuity or resistance measurement, an external voltage  $> 25\ \text{V}_{\text{AC}} \pm 3\ \text{V}$  or  $35\ \text{V}_{\text{DC}}$  is detected, the measurement is stopped whilst the voltage is applied to the instrument. The ⚠ symbol flashes and the voltage value is indicated on the small digital display.**

If the ALARM function is activated, a buzzer is triggered as soon as the measurement crosses the threshold programmed in the SET-UP configuration menu.

## 4. SPECIAL FUNCTIONS

### 4.1 Button

Use this button to select the second function activated by the buttons, it is always associated with the  symbol.

This symbol disappears upon pressing the function button chosen, except if the ▼ button is activated. In this case, it only disappears when the  button is pressed again or if other function buttons are pressed. This allows you to rapidly decrease parameters with the ▼ button, without having to press the  button every time.

### 4.2 V-TIME / Button

#### ■ First function V-TIME

With this button, all the secondary information available can be displayed on the small display.


##### For insulation measurement:

- The time elapsed since the start of the measurement
- The voltage between the instrument's + and - terminals
- Date, time, test voltage and OBJ :TEST number in memory recall mode (MR)

##### For resistance or continuity measurement:

- Voltage between the instrument's + and - terminals
- Date, time, test voltage and OBJ :TEST number in memory recall mode (MR)

#### ■ Second function (time-controlled test)

- The small display indicates the measurement duration programmed in SET-UP, the  symbol lights up. Pressing the START button commences measurement.
  - The measurement duration is set to 15 minutes by default (programmed in during manufacturing).
  - As soon as the measurement is commenced, the small display counts down the remaining duration of the measurement.
- Once this duration reaches zero, measurement stops.

As the time-controlled test is carried out, interval samples (resistance/voltage values as a function of time) are automatically saved.

The time between each sample is set to 30 s by default, but this value can be changed in the SET-UP menu.

The samples are displayed with the  $R(t)$  function (see § 4.3) as long as a new measurement has not been commenced. With each new measurement, the previous sample value is erased from the memory. These sample values are saved with the last value of the resistance if used with the MEM (memory storage) function.



**If the selector switch's position is altered, or if the STOP button is pressed during measurement, then measurement is interrupted.**

**This function is only active for insulation measurement.**

### 4.3 R-DAR-PI / $R(t)$ Button

#### ■ First function R-DAR-PI

The R-DAR-PI button allows automatic measurement of the Polarisation Index (PI) and the Dielectric Absorption Ratio (DAR).

These two parameters are particularly useful when monitoring the ageing of insulation on electrical machines or on long cables for example.

On these kinds of parts, measurement is disturbed at the beginning due to interference currents (from capacitive charges, dielectric absorption) which eventually cancel each other out. Therefore, in order to get an accurate measurement of the leakage current that is representative of the insulation, it is necessary to carry out the measurement over a long period of time so as to reduce the influence of any interference currents when measurement is commenced.

Next we calculate the ratios such as the PI or the DAR :

$$PI = R_{10 \text{ min}} / R_{1 \text{ min}} \text{ (2 values to take down during a 10 min. measurement)}$$

$$DAR = R_{1 \text{ min}} / R_{30 \text{ s}} \text{ (2 values to take down during a 1 min. measurement)}$$

The quality of insulation depends on the results found.

DAR	PI	State of the insulation
< 1.25	< 1	Inadequate, even dangerous
	< 2	
< 1.6	< 4	Good
> 1.6	> 4	Excellent

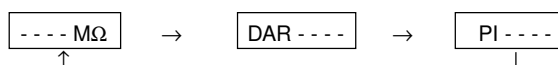
#### ■ Using the R-DAR-PI function

During or after measurement, the R-DAR-PI button allows you to scroll through the following values:

- DAR (for measurements lasting > 1 min)
- PI (for measurements lasting > 10 min)
- Capacitance in  $\mu F$  (only after the measurement has stopped and the circuit has been discharged)
- Insulation resistance in  $M\Omega$ ,  $G\Omega$  or  $T\Omega$

#### Automatic measurement of DAR or PI:

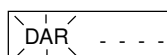
If the R-DAR-PI button is pressed when in voltage measurement mode before proceeding with a measurement, then the following is displayed:



Depending on the choices (DAR or PI), the measurement goes as follows:

- a) DAR :** press START → the DAR symbol flashes and the display indicates “- - - -” as long as the calculation of the coefficient is not possible ( $t < 1 \text{ mn}$ ).

e.g. :

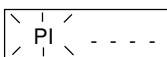


After 1 min, measurement stops and the main display automatically shows the DAR value.

During or after measurement, the R-DAR-PI button can be used to see the insulation measurement carried out, but it does not give the PI value since the measurement has not lasted long enough.

- b) PI :** press START → the PI symbol flashes and the display shows “- - - -” as long as the calculation of the coefficient is not possible ( $t < 10 \text{ mn}$ ).

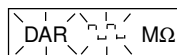
e.g. :



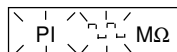
After 10 min, measurement stops and the main display automatically shows the PI value .

During and after measurement, the R-DAR-PI button makes it possible to display the DAR (after 1 min), the PI (after 10 mn) and the insulation measurement.

**Note :** If during DAR or PI measurement (automatic or not), a high external interference voltage becomes present, or the insulation resistance goes off the device's measurement range, then the DAR or PI measurements are interrupted and the screen indicates:



or



**Note :** The 10 min/ 1 min measurement durations for PI calculation can be modified in the SET-UP menu (see § 4.7), allowing adaptation to possible changes in standards or to suit a particular application.

#### ■ Second function $R(t)$

The  $R(t)$  button is used to access the interval insulation resistance values as a function of time, after a measurement in "Time-controlled test" mode  $\odot$  (see § 4.2).

The time between each saved sample is programmed in the SET-UP menu.

This function is also available on model C.A 6541 which has neither a read-write memory for saving measured data, nor an interface for data retrieval from the instrument by a PC.

**On the C.A 6541**, up to 20 samples can be recorded by the instrument during  $\odot$  measurement when sampling at the rate chosen in SET-UP (the default value is 30 seconds).

It is possible to save more than 20 samples, available processing memory space permitting.

**On the C.A 6543**, the number of samples that can be saved is only limited by the read-write memory space available.

After pressing the  $R(t)$  button, the instrument is in display mode:

- the small display indicates the time 00:30 (if the sampling frequency is 30 s)
- the main display shows the corresponding R value.

Using the V-TIME button it is possible to alternate between the time and voltage (on the small display), associated with the R value on the main display.

The  $\blacktriangle$  button is used to scroll down through the all the samples saved during measurement. This makes it possible to read off the information in order to draw out  $R(t)$  and an  $V(t)$  graphs.

This makes it possible to carry out  $R(t)$  analysis on-site, without a printer or a PC.

Pressing the  $R(t)$  or the R-DAR-PI again exits from this function

## 4.4 \* / ALARM Button

### ■ First function \*

This function allows the display back-light to be turned on or off.

### ■ Second function ALARM

Activates/deactivates the ALARM function. The corresponding symbol is displayed when activated.


If this function is activated and the high or low threshold value programmed in the SET-UP menu is crossed, the **ALARM** symbol flashes and the buzzer (if activated) sounds continually.

It is possible to program a different limit in each function and these limits will be stored in memory after the device is switched off.

## 4.5 ► / *SMOOTH* Button

### ■ First function ►

Used to select the desired parameter to be modified – the selected parameter flashes.

It is modified using the  button (see § 4.6).

### ■ Second function *SMOOTH*



Used to activate a digital filter for insulation measurement. It only has an effect on the displayed values (which are smoothed) and not the actual measurements.


This function is useful for instances when the displayed insulation values are highly unstable, brought about due to a capacitive component in the tested element for example.

## 4.6 Button


This function is used to change the flashing parameters being displayed, or to consult R (t) values (see § 4.3).

As a general rule, two figures (day, month, hour, min., sec., OBJ, TEST) flash.






The  and  functions have a “follow-on” mode, i.e.: as soon as the high or low modification limit is reached, the parameter to be modified switches automatically to the following low or high limit.

■ **First function  :** By pressing the button briefly, the displayed number can be increased unit by unit.

When pressed for a longer time, the number is increased at a faster rate.

■ **Second function  :** By pressing the button briefly, the displayed number can be decreased unit by unit.

When pressed for a longer time, the number is decreased at a faster rate.

Unlike all the other second functions of other buttons, it is not necessary to press the  button each time to get to the  function. The  symbol remains displayed and thus valid for the  function (only), as long as the user does not deactivate it by pressing  or another button.



## 4.7 SET- UP function

This function, found on the rotary selector switch, is used to alter the device configuration by directly accessing the parameters to be modified.



















After having selected SET-UP with the rotary selector switch:

- all the display segments are lit up for 1 second,
- the software version number is displayed
- the instrument serial number is displayed
- **PUSH** comes up on the small display and **btn** on the main display, inviting the operator to press a button.

**The SET-UP function is used to directly access the parameters to be modified, by pressing the corresponding button:**

- After having pressed a button, the figures or the symbols corresponding to the selected function appear on the screen.
- The figures or the symbols that can be modified flash on the screen. The usual modification procedure using the  and  buttons should be followed.
- All the parameters are immediately and permanently saved.

The table on the following page defines the buttons that are functional when in SET-UP, and the corresponding display with the possible range of adjustment.

Parameters to modify	Command button	Display			
		main	small	symbols	values
Duration of "time-controlled test"			15 : 00	min. sec,	1 - 59 min
1 <sup>st</sup> and 2 <sup>nd</sup> times for PI calculation	R-DAR-PI	second time (10 min)	first time (1 min)	min : sec	00 : 59
Time between interval samples in  "time-controlled test "	$R(t)$		00 : 30	min : sec	5 s - 10 min
Limit for M $\Omega$ -50 V	ALARM	50 k $\Omega$	50 V	ALARM <	2 k-200 G and </>
Limit for M $\Omega$ -100 V	ALARM (2 <sup>nd</sup> press)	100 k $\Omega$	100 V	ALARM <	4 k-400 G and </>
Limit for M $\Omega$ -250 V	ALARM (3 <sup>rd</sup> press)	250 k $\Omega$	250 V	ALARM <	10 k-1 T and </>
Limit for M $\Omega$ -500 V	ALARM (4 <sup>th</sup> press)	500 k $\Omega$	500 V	ALARM <	20 k-2 T and </>
Limit for M $\Omega$ -1000 V	ALARM (5 <sup>th</sup> press)	1000 k $\Omega$	1000 V	ALARM <	40 k-4 T and </>
Limit for 400 k $\Omega$ (resistance measurement)	ALARM (6 <sup>th</sup> press)	100 k $\Omega$	rES	ALARM <	0.01-400 k $\Omega$ and </>
Limit for 40 $\Omega$ (continuity measurement)	ALARM (7 <sup>th</sup> press)	2 $\Omega$	Cont	ALARM <	0.01-40 $\Omega$ and </>
Time	V-TIME		12 :55		hh(0-23) mn (0-59)
Date (European version)	V-TIME (2 <sup>nd</sup> press)	17.03	1999		jj.mm .aaaa
Version : USA, European	V-TIME (3 <sup>rd</sup> press)	USA/Euro			USA/Euro
Memory wipe	MEM then MEM (2 s)	cLr	ALL	MEM	
Selective wiping of memory	MEM then  and  and MEM (2 s)	cLr	OBJ : TEST number	MEM + OBJ : TEST	00...99
Baud	PRINT	9600	bAUd		300...9600 or "parallel"
Buzzer		On			On / OFF
Auto switch-off	 (2 <sup>nd</sup> press)	On			On / OFF
Compensation	 (3 <sup>rd</sup> press) then  and START	---- (value if START)	On		On / OFF and 0.01-5 $\Omega$
Default configuration	 (4 <sup>th</sup> press) then START	DFLt	SEt		
Barring of insulation test	 (5 <sup>th</sup> press)	On	50 V		On / OFF
Barring of insulation test	 (6 <sup>th</sup> press)	On	100 V		On / OFF
Barring of insulation test	 (7 <sup>th</sup> press)	On	250 V		On / OFF
Barring of insulation test	 (8 <sup>th</sup> press)	On	500 V		On / OFF
Barring of insulation test	 (9 <sup>th</sup> press)	On	1000 V		On / OFF

The values shown on this table, in the "Display / main" and "Display / small" columns, are the default values programmed in during manufacturing. In case they are accidentally changed, it is possible to get them back: see § 4.7.4.



#### 4.7.1 Wiping the memory

In **SET-UP**, press the MEM button:

- The **MEM** symbol flashes
- The small display indicates **ALL**
- The main display indicates **cLR**

To wipe the entire memory, press the MEM button again for 2 seconds:

- The **MEM** symbol is displayed without flashing
- The main display indicates **FrEE**

To wipe the contents of a specific OBJ : TEST number:

- Select the number using the ► and ◆ buttons
- **cLr** remains displayed on the main display

Press the MEM button again for 2 seconds to wipe the contents:

- The **OBJ : TEST** number is indicated on the small display
- The main display indicates **FrEE**

#### 4.7.2 Signaling speed in Bauds (RS 232)

In **SET-UP**, press the PRINT button.

The main display indicates the signalling speed in bauds, either 300, 600, 1200, 2400, 4800, 9600 or Parallel.

On the small display, **baud** appears. The value can be changed using the ▲ and ▼ buttons.

The display of "Parallel" means that parallel mode has been selected, for printing on a parallel printer via the serial-to-parallel adapter (RS 232-Centronics).

#### 4.7.3 Lead resistance compensation

In **SET-UP**, press the \* button three times:

The  $\rightarrow \Omega \leftarrow$  symbol appears and the small display indicates **On**. It is possible to select **OFF** with the ◆ button. In this instance, the lead resistance will not be subtracted when carrying out continuity measurement.

To memorise the lead resistance:

- Connect them together and press START (in SET-UP position  $\rightarrow \Omega \leftarrow$ )
- The resistance of the leads will be memorised and indicated on the main display

**Note :**

- This value is stored in memory, even when the instrument is switched off.
- The lead compensation only comes into effect when carrying out continuity measurement.
- To activate/deactivate this function, simply select **On** or **OFF** on the small display with the ◆ button.
- The memorised value will be stored and displayed on the main display, but can be activated or deactivated, depending on what the small display indicates.
- Values between 0 and 5  $\Omega$  can be saved for leads compensation. Beyond this value, nothing is saved.

#### 4.7.4 Default device configuration

In **SET-UP**, press the \* button four times:

- The small display indicates **SEt** (flashing).
- The main display indicates **DFLt**

Press START to select the default configuration settings (see the previous table).

#### 4.7.5 Barring of insulation measurement


This function prohibits insulation measurement from being carried out at certain test voltages. This makes it possible to entrust the instrument to less experienced operators, for specific applications for example (telephone ...).

**In SET-UP**, press ✱ 5 times or more (depending on voltage to be barred):

- The test voltages appear in succession on the small display with the ✱ button and **On/OFF** on the main display.
- Choose **On** or **OFF** using the ⬆ button for each test voltage, to bar (OFF) or to reinstate (On) the access to the insulation tests at these voltages.

## 5. USE

### 5.1 Measurement procedure

- Start up the device by selecting the corresponding position ( $M\Omega$ ,  $40\ \Omega$  ) or  $400\ k\Omega$ ) with the selector switch. All the segments on the LCD screen are displayed, then the battery (or rechargeable battery) voltage.
- Connect the leads to the + and – terminals and the points of measurement.
- The input voltage is constantly measured and displayed on the small display.  
If an external voltage is present that is greater than the thresholds described in § 5.2, 5.3 and 5.4, then measurement is prohibited.
- Pressing START/STOP starts measurement.
- Pressing START/STOP once again stops measurement. The last result remains displayed until the next measurement or turn of the selector switch.

If a voltage  $> 25\ V_{AC}$  or  $35\ V_{DC}$  is detected during all measurements, the instrument indicates this voltage on the small display, the warning symbol flashes and the measurement in progress is stopped.

**Note :** There are several special functions that can be used. (see § 4).

### 5.2 Insulation measurement (see § 3.2)

When using this function, the instrument can measure insulation from  $1\ k\Omega$  to  $40\ G\Omega$  at a test voltage of  $50\ V$ ,  $100\ V$ ,  $250\ V$  and up to  $1\ T\Omega$  at  $500\ V$  and  $1000\ V$ .

- Select, with the rotating switch,  $M\Omega-50\ V$ , or  $M\Omega-100\ V$ , or  $M\Omega-500\ V$ , or  $M\Omega-1000\ V$
- Connect the instrument to the insulator to be tested. **If the voltage present exceeds  $8\ V$  for  $M\Omega-50\ V$ , or  $16\ V$  for  $M\Omega-100\ V$ , or  $25\ V$  at all the other test voltages, then measurement is prohibited.**
- Start the measurement and read-off the results.

It is possible to scroll through the results on the main display with the R-DAR-PI button, or on the small display with the V-TIME button (see § 3.2).

Using R (t) when carrying out a 'time-controlled test', it is possible to scroll through the interval measurement values saved at the sampling rate specified in SET-UP. These samples are available until another measurement is got underway or the selector switch is turned. (see § 4.3)

**When measuring high levels of insulation ( $> 1\ G\Omega$ ),** it is advised that the guard terminal should be used to eliminate the influence of surface leakage currents. The guard is connected, between the two measurement contact points, to the surface susceptible to surface currents, i.e. dusty or damp cable or transformer insulation. In this case, croc-clips are preferable to test-probes held in the hand. (see § 11). As soon as insulation measurement is stopped, the test circuit is automatically discharged over the instrument's internal resistance.

### 5.3 Continuity measurement (see § 3.3)

In this function, the measurement current is > 200 mA from 0 to 20  $\Omega$  and > 140 mA from 20 to 40  $\Omega$ .

This measurement serves to test the low resistance of PE ground cables for example.

The measurement ranges increase automatically up to 40  $\Omega$  with a maximum resolution of 0.01  $\Omega$ .

- Select 40  $\Omega$  position with rotary switch
- Connect the instrument to the test object
- If the voltage present is > 3 V, then measurement is prohibited
- Start the measurement and read-off the results.

**NOTE :** It is possible to compensate for the lead resistance (see § 4.10.3)



**The R-DAR-PI and V-TIME buttons are not active for this function.**  
**There is no automatic polarity change in continuity measurement.**

### 5.4 Resistance measurement (see § 3.3)

In this function, the measurement current is limited to 6 mA. The measurement ranges increase automatically in increments up to 400 k $\Omega$  with maximum resolution of 0.01  $\Omega$ .

- Select 400 k $\Omega$  position with the rotary switch
- Connect the instrument to the test object
- If the voltage present is > 3 V, then measurement is prohibited
- Start the measurement and read-off the results

During measurement, the potential difference at the input is indicated on the small display (useful for measurement of multi-junction components: thyristors, high voltage diodes...).

The open circuit voltage is equal to the voltage of the battery (C.A 6541) or rechargeable battery voltage (C.A 6543).



**NOTE : the R-DAR-PI and V-TIME buttons are not active in this function.**

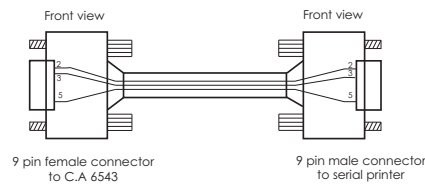
### 5.5 Capacitance measurement

Capacitance measurement is automatically carried out during insulation measurement, and is displayed after the measurement is stopped and the circuit is discharged, using the R-DAR-PI button.

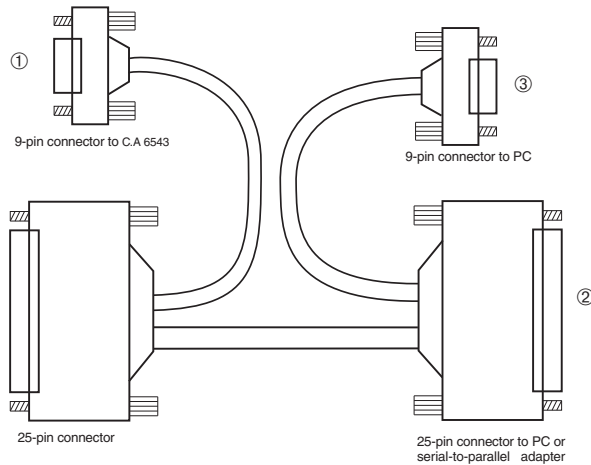
## 6. MEMORY / RS 232 (C.A 6543)

### 6.1 RS 232 Specifications

- The signalling speed in Bauds can be set to 300, 600, 1200, 2400, 4800, 9600, or "Parallel" for the printing of results on parallel printers via the optional serial-to-parallel adapter. This setting is carried out in the SET-UP menu (see § 4.7)
- Data format: 8 data bits , 1 stop bit, without parity, Xon / Xoff protocol
- Serial printer connection



- Connection to a PC or to a parallel printer.



#### Necessary links DB9 → B25 (① → ②) (null cable - standard modem) :

1 → 8    6 → 20  
 2 → 2    7 → 5  
 3 → 3    8 → 4  
 4 → 6    9 → 22  
 5 → 7

#### ■ DB25 → DB9 conversion (② → ③):

2 → 3  
 3 → 2  
 7 → 5

### 6.2 Saving / recalling values ( MEM/MR button)

#### 6.2.1 First function MEM (save)

With this function results may be recorded on the device's read-write memory. These results are stored under addresses defined by an object number(OBJ) and a test number (TEST).

An object represents a 'box' into which we can place 99 tests. Thus, an object can represent a machine or an installation upon which a certain number of various measurements (insulation, resistance, continuity) are carried out.

1. When the button is pressed, the MEM symbol flashes and the small display indicates the first free OBJ : TEST number, e.g. **02 : 01**. The main display indicates **FrEE**.

The OBJ number is the same as that of the last saved measurement, but the TEST number goes up in 1's.

It is always possible to modify OBJ : TEST with ► and ▲.

If the user happens to select a memory address that is already occupied, then **OCC** appears on the main screen.

If a new OBJ is selected, TEST goes back to 01.

2. By pressing MEM once again, the present measurement results will be recorded in the selected memory address (occupied or otherwise). The MEM symbol stops flashing and remains displayed. The time and the date of this recording are memorised with the available data (R, V, t).

**If a button other than MEM or the selector switch is activated before pressing MEM a second time, the instrument exits from MEM mode without having saved the results.**

3. If a time-controlled test has been carried out, interval values (samples) are available (see § 4.3). They are automatically saved under the same OBJ : TEST number as the final measurement.

#### ■ Estimation of the memory capacity:

Total memory space : 128 kb

Data management : 8 kb

Free memory space : 120 kb

An insulation measurement result takes up approximately 80 bytes.

For a "time-controlled test", a sample takes up 10 more bytes.

A resistance or continuity measurement takes up 26 bytes.

It is therefore possible to record about 1500 insulation measurements or about 4000 resistance or continuity tests.

#### ■ Free memory space

This function is automatically activated when a result is saved.

Press MEM once in order to get the following free OBJ. TEST number; the bar graph indication is in proportion to the available free memory space.

- If the entire memory is free, all of the bar graph segments show up.
- If the entire memory is full, the left arrow to the left of the bar graph flashes.
- As soon as the saving is over with, the bar graph disappears.

Each segment of the bar graph equates to approximately 50 recordings.

### 6.2.2 Second function *MR*



With the *MR* function it is possible to recall any saved data from the memory, no matter the position of the rotary selector switch.

- When the button is pressed, the MR symbol is displayed (without flashing).



The small display indicates the last OBJ : TEST number to be assigned, e.g. 02 :11.

02 "11" flashes opposite the TEST symbol, the usual modification procedure using the ► and ▲ buttons should be used to select the desired OBJ : TEST number.


If a new OBJ is selected, TEST is automatically set to the maximum memorised number.

At this stage it is possible to consult the entire memory with the  and  buttons, since the measurement values corresponding to the selected OBJ : TEST number are displayed on the main display. It is possible to scroll down through them with the R-DAR-PI button.

- The V-TIME button is active and gives access to the date / time / V / OBJ-TEST number for each result.

If the recording selected by the OBJ : TEST number corresponds to a time-controlled test, the R (t) values can be accessed by pressing the *R (t)* button. The small display changes and indicates **min : sec** (time of 1<sup>st</sup> sample) and the symbol  flashes on the screen. You can scroll through the other samples with the  button.

**To exit from R (t) mode and return to the normal memory recall mode (OBJ : TEST), press *R (t)* or R-DAR-PI again.**

 **To exit the MR function**, press the MR button once again or turn the selector switch.

### 6.3 Printing out measured values (PRINT/PRINT MEM button) (C.A 6543)

If you use a serial printer, choose the appropriate communication speed in the SET-UP menu, between 300...9600 bauds, then program the printer to the format run by the instrument (see § 6.1).

If you are using a parallel printer, you should set the signalling speed to "Parallel" when in SET-UP and use the serial-to-parallel adapter that comes as an optional item (to plug in series the supplied cable + adapter + Centronics printer cable).

There are two different printing modes possible :

- Instantaneous printing of measurement (PRINT)
- Printing of recorded data (*PRINT memory*)



**If the data transmission to the printer is successful**, the COM symbol flashes on the screen.

**If a problem is experienced**, the COM symbol remains permanently on the LCD screen without flashing.

#### 6.3.1 Instantaneous printing of measurements (PRINT button)

Following a measurement or after accessing values in MR mode, use the PRINT function to print-off the measurement results.

Pressing the button brings about the printing of:

- 1 set of measurements (U/R/DAR/PI/date/time) for normal tests,
- the R(t) values if the 'time-controlled test' has been used.

**To stop printing**, alter the position of the selector switch.

According to the function used, the following models are obtained:

#### ■ Insulation measurement

CHAUVIN ARNOUX C.A 6543

Instrument number: 000 001

INSULATION RESISTANCE TEST

OBJECT : 01                      TEST : 01                      (*only printed in MR mode*)

Description : .....

.....

Date : ..... 31.03.1998

Start time: ..... 14 :55

Test duration: ..... 15 min. 30 sec

Temperature : ..... °C ..... °F

Relative humidity : ..... %

Test voltage : ..... 1000 V

Insulation resistance (R) : ..... 385 GOhm

DAR (R 1"/R 30") : ..... 1.234

PI (R 10"/R 1") : ..... 2.345

Comments: .....

.....

Date of next test : ..... /.../.....

*After a 'time-controlled test' other results are printed (interval samples) :*

Time	Resistance	Voltage
00 : 30	35.94 GOhm	1005 V
01 : 00	42.00 GOhm	1005 V
01 : 30	43.50 GOhm	1005 V

etc...

*A space for the operator to fill in their signature comes at the end of the printout.*

### ■ Continuity or resistance measurement

CHAUVIN ARNOUX C.A 6543

Instrument number : 000 001

CONTINUITY TEST or RESISTANCE TEST

OBJECT : 01                      TEST : 01                      *(only printed in MR)*

Description: .....

.....

Date : ..... 31.03.1998

Start time : ..... 14 : 55

Test current : ..... > 200 mA

Lead compensation : ..... 0.12  $\Omega$

Potential difference: ..... 0.9 V

Continuity or Resistance : ..... 0.45  $\Omega$

Comments : .....

.....

.....

Date of next test : ..... /.../.....

*A space for the operator to fill in their signature comes at the end of the printout.*

### 6.3.2 Printing of memorised data (PRINT MEM button)

Use this function to print out the contents of the device's read-write memory.

The small display indicates **01 : 01** for the OBJ : TEST number (starting address of printing).

The main display indicates the last recording in memory (the end address of printing).

e.g. **12 : 06**;

01 flashes opposite the OBJ position, the usual modification procedure should be used (► and ◄ buttons) in order to define the start/end addresses of the print-out.

**To quit without printing**, alter the position of the selector switch.

**To go ahead with printing**, press the PRINT button once more.

**To stop printing**, alter the position of the selector switch.

Only the main results are printed out.

#### **Example :**

CHAUVIN ARNOUX C.A 6543

Instrument number : 000 001

CONTINUITY TEST

OBJECT : 01                      TEST : 01

Date : ..... 31.03.1998

Start time : ..... 14:55

Continuity : ..... 0.45  $\Omega$

CONTINUITY TEST

OBJECT : 01                      TEST : 02

Date : ..... 31.03.1998

Start time: ..... 14:55

Continuity : ..... 0.91  $\Omega$

INSUALTION RESISTANCE TEST

OBJECT : 01                      TEST : 03

Date : ..... 31.03.1998



Start time: ..... 14:55  
 Test duration: ..... 15 min 30 sec  
 Temperature : ..... °C ..... °F  
 Relative humidity: ..... %

Test voltage: ..... 1000 V  
 Insulation resistance (IR) : ..... 385 GΩ  
 DAR (RI 1'/30") : ..... 1.234  
 PI (RI 10'/RI1') : ..... 2.345

Comments : .....  
 .....  
 .....

*A space for the operator to fill in their signature comes at the end of the printout.*

## 6.4 Printing with the serial-to-parallel adapter

1. Connect the null - modem RS232 cable to the C.A 6543
2. Connect the cable to the adapter, then the adapter to the printer cable
3. Switch on the printer
4. Switch on the C.A 6543
5. To start printing out values that haven't been saved (immediate printing), press PRINT after a measurement.
6. To start printing out saved measurements, press the "PRINT MEM" button

**⚠ WARNING: This adapter is designed exclusively for use with the C.A 6543 and is not suitable for any other application.**

# 7. SPECIFICATIONS

## 7.1 Reference conditions

Influence quantity	Reference values
Temperature	23°C +/- 3°K
Relative humidity	45 to 55 %
Supply voltage	9 to 12 V
Frequency range	DC and 15.3...65 Hz
Parallel resistance on the resistor	0 μF
Electric field	nil
Magnetic field	< 40 A/m

## 7.2 Specifications per function

### 7.2.1 Voltage

Measurement range	Resolution	Frequency range
1... ... 1000 V	1 V	DC / 16 ... 420 Hz

- Accuracy :  $\pm 1\%$  R  $\pm 3$  cts, AC sinusoidal or DC voltage
  - Input resistance : approx. 750 k $\Omega$
- ⚠ **WARNING:** This instrument is Cat III 600 V, according to EN 61010-1. It shall not be connected to voltages > 600 V in relation to the earth.

### 7.2.2 Insulation resistance

- Method: Voltage-current method according to EN 61557-2
- Nominal output voltage: 50, 100, 250, 500, 1000 V<sub>DC</sub>
- Open-circuit voltage :  $\leq 1.1 \times V_n \pm 5$  V (50, 100, 250, 500, 1000 V)
- Nominal current: > 1 mA<sub>DC</sub> at the nominal voltage
- Short-circuit current: < 6 mA<sub>DC</sub>
- **Max. overvoltage:** U<sub>rms</sub> max. = 1200 V AC and DC for 10 seconds between the "+" and "-" terminals  
660 V AC and DC between the "G" and "-" or "G" and "+" terminals
- Measurement ranges :
  - 50 V : 2 k $\Omega$ ... 200 G $\Omega$
  - 100 V : 4 k $\Omega$ ... 400 G $\Omega$
  - 250 V : 10 k $\Omega$ ... 1 T $\Omega$
  - 500 V : 20 k $\Omega$ ... 2 T $\Omega$
  - 1000 V : 40 k $\Omega$ ... 4 T $\Omega$

Range	2 ... 999 k $\Omega$ 1.000...3.999 M $\Omega$	4.00...39.99 M $\Omega$	40.0...399.9 M $\Omega$	400...999 M $\Omega$ 1.000...3.999 G $\Omega$	4.00...39.99 G $\Omega$	40.0...399.9 G $\Omega$	400...999 G $\Omega$ 1.000...3.999 T $\Omega$
Resolution	1 k $\Omega$	10 k $\Omega$	100 k $\Omega$	1 M $\Omega$	10 M $\Omega$	100 M $\Omega$	1 G $\Omega$
Voltage	50, 100, 250 500, 1000 V	50, 100, 250 500, 1000 V	50, 100, 250, 500, 1000 V	50, 100, 250, 500, 1000 V	50, 100, 250, 500, 1000 V	50, 100, 250, 500, 1000 V	250 V, 500, 1000 V
Accuracy	$\pm(5\% L + 3 \text{ ct})$					$\pm(15\% L + 10 \text{ ct})$	

### DC voltage measurement after insulation test

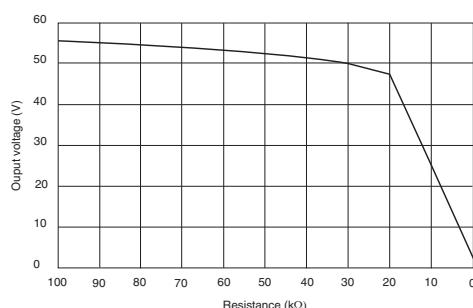
- DC Voltage range: 25...1000 V
- Resolution : 0.5% V<sub>DC</sub>
- Accuracy:  $\pm 1\%$  R  $\pm 3$  cts
- Voltage Vs load curve

### Capacitance measurement (following the discharging of test object)

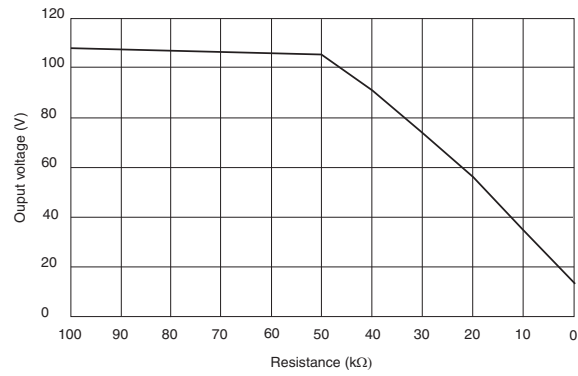
- Range : 0.005...4.999  $\mu$ F
- Resolution: 1 nF
- Accuracy :  $\pm (10\% + 1 \text{ ct})$

Graphs showing the typical changes in test voltage as a function of the load

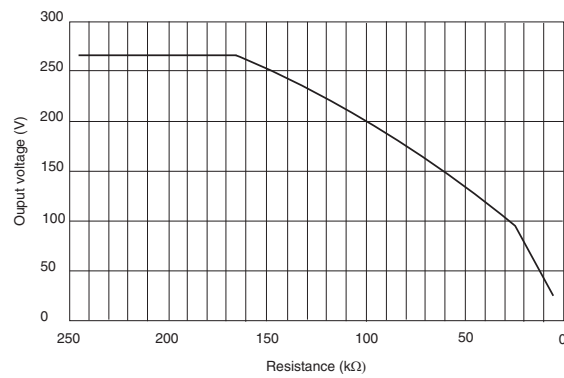
50 V test voltage



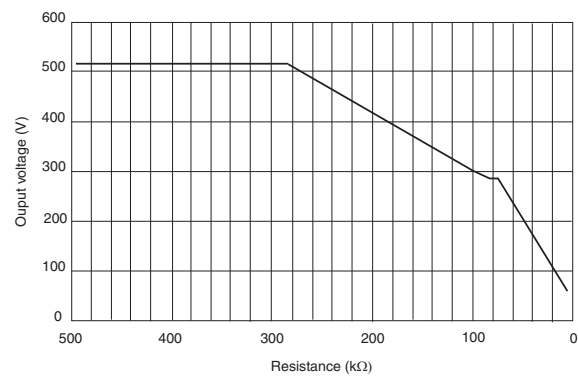
**100 V test voltage**

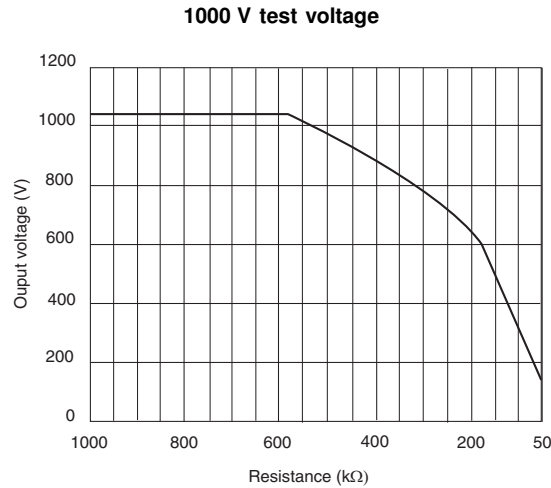


**250 V test voltage**



**500 V test voltage**





■ **Typical settling time of the measurement as a function of the elements tested**

These values include the influences on the auto-range and supply voltage regulation system due to the charge of the capacitive component.

	Non-capacitive load	Load with 1 $\mu$ F capacitor
1 M $\Omega$ insulation	7 s	7s
500 G $\Omega$ insulation	17 s	20 s

■ **Discharge time of the tested element (across a 750 k $\Omega$  internal resistance) up to 25 V**

Initial voltage	Discharge time
1000 V	2.8 s
500 V	2.2 s
250 V	1.7 s
100 V	1 s
50 V	0.5 s

- **Range of DAR and PI ratios** : 0.000 to 9.999  
 Accuracy:  $\pm 5\%$

**7.2.3 Continuity**

- Method: Voltage-current method according to EN 61557-4
- Open-circuit voltage: Max. 12.4 V<sub>DC</sub> (< 15 V with external supply)
- Short-circuit current: > 200 mA<sub>DC</sub>
- Max. voltage surge: 1200 V AC and DC for 10 seconds between the "+" and "-" terminals  
 660 V AC and DC between the "G" and "-" or "G" and "+" terminals
- Test lead compensation:  
 R<sub>Δ</sub> is measured for the test leads in short-circuit when in the SET-UP menu (see § 4.7), this value is memorised and subtracted from all continuity measurements. The compensation is limited to 5  $\Omega$ .  

$$R_{\text{displayed}} = R_{\text{measured}} - R_{\Delta}$$
- Continuity measurement range: 0.01 to 39.99  $\Omega$
- Resolution : 0.01  $\Omega$

- Operating current: > 200 mA from 0.01 to 20.00  $\Omega$  and > 140 mA from 20.01 to 39.99  $\Omega$
- Accuracy :  $\pm 3\%$  R  $\pm 4$  cts
- Max inductive load : 5 hrs without damage to the instrument
- Max serial mode voltage: 3 V<sub>AC/DC</sub>; measurement is prohibited above this value

#### 7.2.4 Resistance

- Method : Voltage-current measurement
- Open-circuit voltage: max. 12.4 V<sub>DC</sub> (< 15 V with external supply)
- Short-circuit current : < 6 mA DC
- Max. voltage surge: 1200 V AC and DC for 10 seconds between the “+” and “-” terminals  
660 V AC and DC between the “G” and “-” or “G” and “+” terminals

- Max serial mode voltage: 3 V<sub>AC</sub> or 3 V<sub>DC</sub>; measurement is prohibited above this value

Range	0.01..39.99 $\Omega$	40.0..399.9 $\Omega$	0.400..3.999 k $\Omega$	4.00..39.99 k $\Omega$	40.0..399.9 k $\Omega$
Resolution	0.01 $\Omega$	0.1 $\Omega$	1 $\Omega$	10 $\Omega$	100 $\Omega$
Accuracy	$\pm 3\%$ R $\pm 3$ cts				

### 7.3 Power supply

- The device supply is via:
  - 8 x 1.5 V batteries, LR 14 (C.A 6541)
  - Rechargeables battery NiMH (C.A 6543)

Recharge: 85 to 256 V / 50-60 Hz (electrical safety: 256 V Cat. III)

Instrument	C.A 6541	C.A 6543
Measurement	Average operating radius	Average operating radius
Insulation measurement:	21, 000 x 5 s measurements with 20 s pause, for normal load* (1)	5, 000 x 5 s measurements with 29 s pause, for normal load * (2)
Continuity measurement:	16 000 measurements lasting 5 s with pause of 20 s at nominal load * (1)	4 000 measurements lasting 5 s with pause of 20 s at nominal load * (2)

\* Normal load.: 1000 V/1 mA

(1) If we assume that a 10 minute long PI measurement is made 5 times a day, the operating radius will be 67 days (or 10 weeks or 2.5 months)

(2) If we assume that a 10 minute long PI measurement is made 5 times a day, the operating radius will be 16 days (or 2.5 weeks or 0.5 months)

#### ■ Recharging time (C.A 6543)

- 4.5 hours to reach 100% of its capacity (Max. recharge time: 6 hours)
- 0.5 hours to reach 10% of its capacity (gives operating radius: 1 day approx.)

### 7.4 Environmental conditions


- Operating range
  - 10 to 40°C, during recharging of batteries
  - 10 to 55°C, during measurement
  - 20 to 80 % RH
- Nominal temp. range
  - 0 to 35°C
- Storage :
  - 40 to 70°C
  - 10 to 90 % RH

- Temperature influence on measurement accuracy (for all functions)  
 $\pm 0.15\%$  per °C
- Altitude: < 2000 m

### 7.5 Mechanical specifications

- Outside dimensions of casing (L x W x H): 240 x 185 x 110 mm
- Weight : approx. 3.4 kg

### 7.6 Conformity to international standards

- Electrical safety according to: EN 61010-1, EN 61557
- Double insulation: 
- Pollution level: 2
- Installation category: III
- Max. voltage in relation to earth: 600 V

#### 7.6.1. Electromagnetic Compatibility


- Emissions and immunity in an industrial setting compliant with EN 61326-1.

#### 7.6.2. Mechanical protection

IP 54 according to NF EN 60529  
 IK 04 according to NF EN 50102

## 8. MAINTENANCE


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 **For maintenance, use only specified spare parts. The manufacturer will not be held responsible for any accident occurring following a repair done other than by its After Sales Service or approved repairers.**


### 8.1. Upkeep

#### 8.1.1. Replacing the batteries (C.A 6541)

The battery voltage comes up on the small digital display for 2 seconds when switching on the instrument. The main display indicates “bAt”. This test is made internally on a load corresponding to that during functioning.

Before making the measurement, make sure that the  symbol is not flashing on the screen. (after the switching on stage the battery voltage appears for 2 seconds on the small display).



If this is not the case, it is essential that you should change all the batteries, taking all the necessary precautions whilst opening the instrument.

 **Check that none of the terminals is connected and that the selector switch is definitely on OFF before accessing the battery compartment found inside the instrument.**

Exact type of batteries specified: LR14 (alkaline)

To open up the instrument, unscrew the 4 captive screws situated on the underside of the case. As soon as they turn freely, place the instrument on a table and press on the screws to extract the front panel. Turn over the instrument to entirely remove the front panel unit from the casing. The batteries are then accessible at the back of the panel unit after having unscrewed the battery compartment's two screws. Take care not to damage the seal during removal and replacement of the front panel unit.

#### 8.1.2 Recharging the battery (C.A 6543)

- ⚠ **If the  symbol appears flashing**, then it is necessary to recharge the battery. Connect the instrument to the mains AC network via the  connector, charging starts automatically:
- **bAt** on the small display and **CHrG** on the main display, signifies fast charging in progress
  - **bAt** on the small display and **CHrG** flashing on the main display, signifies slow charging (starts off with fast charge, temperature conditions permitting)
  - **bAt** on the small display and **FULL** on the main display, signifies that charging is over.

If the instrument is started up and the battery voltage is > 8 V, then the normal use of the device is permitted.

- ⚠ **The battery should be changed by Manumasure or a repairer recognised by CHAUVIN ARNOUX**  
**Changing the battery causes data to be lost from the memory.** Press the MEM / MR button and 'OFF' is displayed. Proceed with a total memory wipe in SET-UP (see § 4.7.1) so the MEM/MR functions can be used again.

#### 8.1.3 Replacing the fuses

If **FUS HI** or **FUSE -G-** flashes on the LCD when switching on or during continuity measurement, then it is imperative that the corresponding fuses should be changed, taking all the necessary precautions when opening up the instrument (see § 8.1.1 for opening procedure).

- ⚠ **Check that none of the terminals are connected and that the selector switch is set to OFF before opening up the device casing.**

Exact types of fuses (on sticker in battery compartment) :

- + terminal fuse F1 (FUS HI) : F 2.5 A time delayed fuse – 1.2 kV - 8 x 50 mm - 15 kA
- G terminal fuse F2 (FUS G) : F 0.1 A fast fuse - 660 V – 6.3 x 32 mm - 20 kA

#### 8.1.4 Cleaning

- ⚠ **The instrument must be disconnected from any source of electricity.**

Use a soft cloth lightly dampened with soapy water. Rinse with a wet cloth and then dry with a dry cloth or a flow of air. Do not use alcohol, solvents or hydrocarbons.

#### 8.1.5 Storage

If the instrument is not used for an extended time period (longer than two months), remove the battery and store separately. (C.A 6541).

#### 8.1.6 Calibration

- ⚠ **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 available on request), at our Chauvin Arnoux subsidiary or the branch in your country.

#### 8.1.7 Maintenance

For all repairs before or after expiry of warranty, please return the device to your distributor.