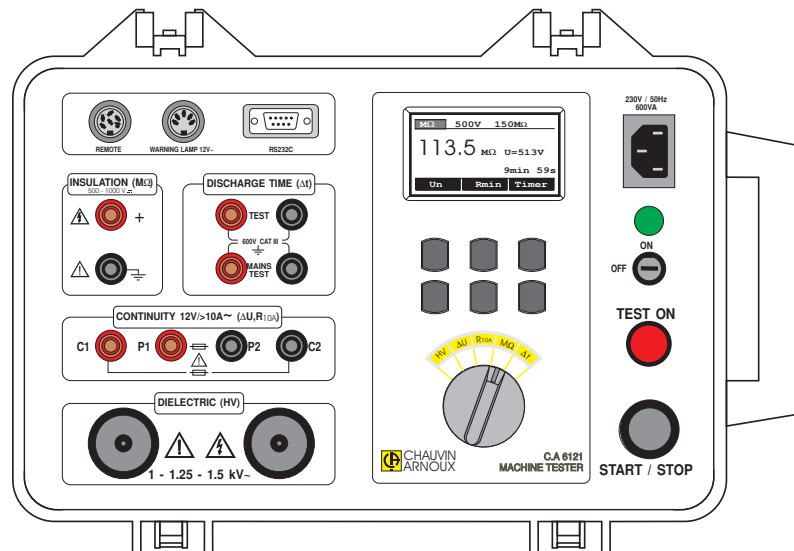


C.A 6121

- **CONTROLEUR "MACHINE"**
- **MACHINE TESTER**
- **MASCHINEN-TESTER**
- **MACHINE TESTER**
- **COMPROBADOR DE MAQUINARIA ELECTRICA**



User's Manual

The  means Warning

For your safety, you must read carefully and respect the instructions of the present user's manual.

You have just acquired a **C.A 6121 Machine Tester** and we thank you for your confidence.



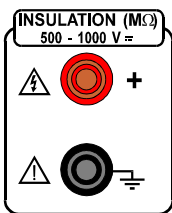
To get the best results with this instrument :

- **read** this user's manual carefully, **otherwise this instrument may be dangerous for the user, for the instrument itself or for the circuit under test !**
- **respect** the safety precautions detailed in the present manual

SAFETY PRECAUTIONS

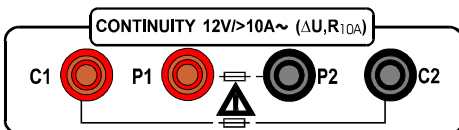
- This instrument must be powered from a mains supply which has a protective earth terminal
- The INSULATION, CONTINUITY or DIELECTRIC measurement terminals must only be connected to circuits that are not live.
- If a fuse has blown in the instrument, please follow the instructions in this manual to replace it!
- Any repair or metrological check procedure must be carried out by competent and approved personnel!
- The C.A 6121 MACHINE TESTER must only be handled by a competent operator, familiar with equipment using dangerous voltages !
- Use connection accessories whose overvoltage category and service voltage are greater than or equal to those of the circuits on which the measurements are made. Only use accessories that conform to safety standards (EN61010-031).

■ Insulation



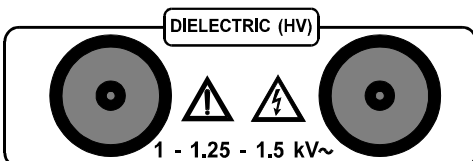
The terminal is grounded, connect it to the ground pole of the instrument to test !

■ Continuity



Please read the instructions on how to replace the fuses

■ Dielectric



Switch off the instrument immediately if the red safety light (pos.11, fig 1.) does not light after switching on the HT generator and have the instrument repaired.

■ Definitions



Warning : risk of electric shock



Earth terminal

The power supply input has an overvoltage category II. It must be connected to permanent domestic and analogous electrical installations (cf. IEC 664-1).

The measurement terminals for the DISCHARGE TIME have an overvoltage category II. They satisfy the severe requirements of reliability and availability which correspond to permanent use on fixed industrial installations (cf. IEC 664-1).

WARRANTY

Our guarantee is applicable for twelve months after the date on which the equipment is made available (extract from our General Conditions of Sale, available on request).

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1. GENERAL PRESENTATION

This machine has been designed for testing the electrical safety of machines, in conformity with standard EN60204-1, parts 19 -1 to 19-5.

Its worksite case is hardwearing, but also easy to carry to your measurement site. Its interface, simple to use, gives you very rapid access to all the main functions of the instrument. Its optional accessories allow it to be adapted to all specific environments.

List of measurements that the instrument can perform :

- Dielectric test with a test voltage of 1000 V AC
- Dielectric test with a test voltage of 1250 V AC
- Dielectric test with a test voltage of 1500 V AC
- Voltage drop scaled to 10 A AC with a test voltage of 12 V / > 10 A AC
- Low resistance with a test voltage of 12 V / >10 A AC
- Insulation resistance with a test voltage of 500 V DC
- Insulation resistance with a test voltage of 1000 V DC
- Two pole discharge time (residual voltage)
- Four pole discharge time (residual voltage)

2. DESCRIPTION OF THE INSTRUMENT

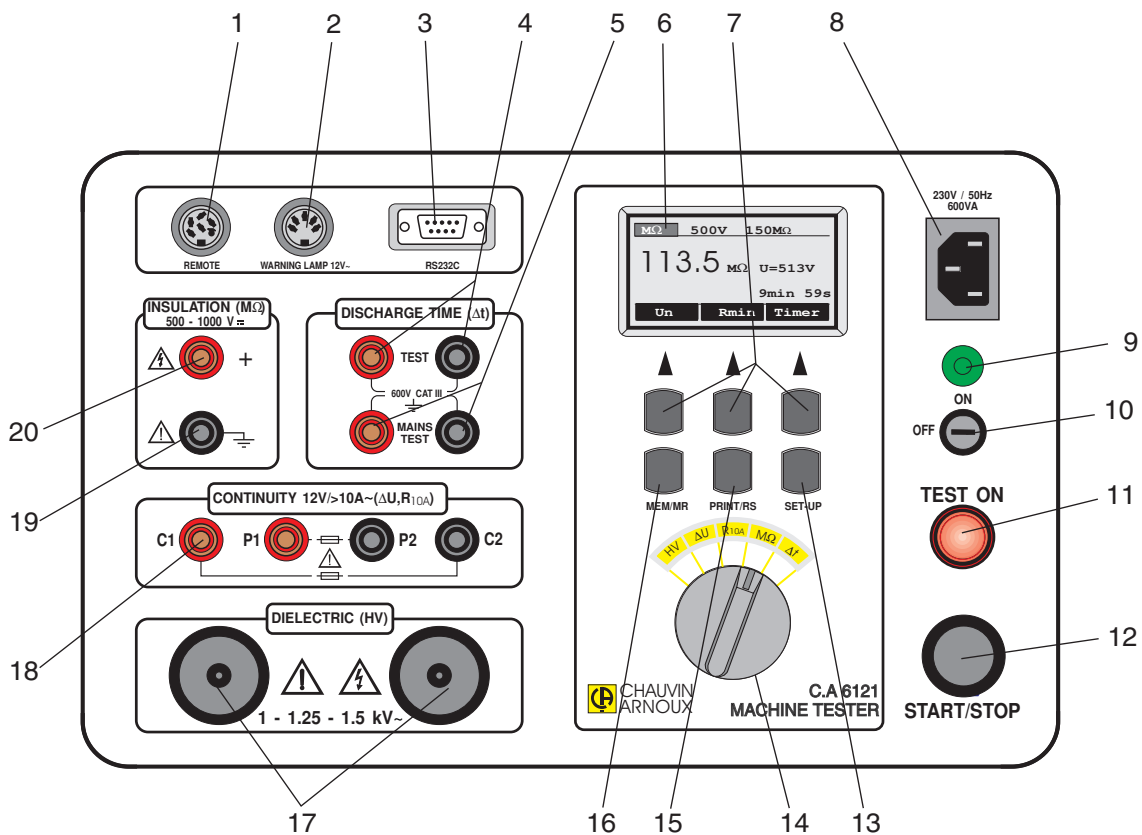


Fig.1. Presentation of the front panel

- 1 **REMOTE** connector to connect a REMOTE CONTROL PEDAL
- 2 **WARNING LAMP** connector to connect external WARNING LAMPS (standard VDE 104)
- 3 **RS 232** connector to connect external printer or PC
- 4 **DISCHARGE TIME - TEST** terminals to be used in four pole measurement
- 5 **DISCHARGE TIME - MAINS TEST** terminals to be used in 2 or 4 pole measurement
- 6 **LCD** dot matrix display with continuous back light
- 7 **GENERAL KEYS** (see the function of each key on the LCD)
- 8 **MAINS CONNECTOR** (mains power supply of the instrument)
- 9 **POWER ON** indicator light
- 10 **POWER ON / OFF** key
- 11 **TEST ON** warning light
- 12 **START/STOP** push button
- 13 **SET UP** key to set:
 - contrast of the display
 - real time clock and date
 - buzzer (on/off)
 - baud rate
- 14 **ROTARY SWITCH** to select the functions
- 15 **PRINT/RS** key to:
 - transmit memorised data to a PC
 - print memorized data to external printer
- 16 **MEM/MR** key to:
 - memorize results
 - recall memorized results
 - erase memorized results
- 17 **DIELECTRIC** test terminals
- 18 **CONTINUITY** test terminals (current terminals C1, C2 and potential test terminals P1, P2)
- 19 Grounded **INSULATION** test terminal
- 20 Positive **INSULATION** test terminal

3. TECHNICAL SPECIFICATIONS

3.1. DIELECTRIC TEST (POSITION HV)

- Nominal test voltage : adjustable 1000, 1250 or 1500 V / 50 Hz
- Test voltage : >1000 V, >1250 V or >1500 V / 50 Hz at $U_{mains} = 230$ V, and a power $P_{load} = 500$ VA
- Max open circuit test voltage : < 1200 V, < 1450 V, < 1650 V / 50 Hz for $U_{mains} = 230$ V
- Test voltage readout

Range (kV)	Resolution (V)	Accuracy
0 - 2.00	10	$\pm(2\%$ of the reading + 20 V)

- Tripping test current (nominal test voltage 1000V) :
adjustable to 1, 3, 5, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 150, 200, 250, 300, 350, 400, 450, 500 mA
- Tripping test current (nominal test voltage 1250V) :
adjustable to 1, 3, 5, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 150, 200, 250, 300, 350, 400 mA
- Tripping test current (nominal test voltage 1500V) :
adjustable to 1, 3, 5, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 150, 200, 250, 300, 333 mA
- Test current readout (sine) :

Range (mA)	Resolution (mA)	Accuracy
0 - 199.9	0.1	$\pm(2\%$ of the reading + 0.3 mA) Tripping current set to 1, 3, 5, 10 or 20 mA
200 - 500	1	$\pm(2\%$ of the reading + 0.5 mA) Tripping current set to 30, 40, 50, 60, 70, 80, 90 or 100 mA $\pm(2\%$ of the reading + 2 mA) Tripping current set to 150, 200, 250, 300, 330, 350, 400, 450 or 500 mA

- Character of the displayed test current: adjustable (\square), capacitive (\square) or absolute value ($I_A = \sqrt{I_R^2 + I_C^2}$)
- Trip out time : < 30 ms after crossing threshold
- Timer : adjustable from 1 s to 5 min (resolution 1s, then 10 s if duration > 1 min) or without timer

3.2. VOLTAGE DROP SCALED TO 10 A AC (POSITION ΔU)

■ Voltage drop readout :

Range ΔU (V)	Resolution (V)	Accuracy
0 - 10	0.01	±(2% of the reading + 0.02 V)

■ Test voltage readout :

Range (V)	Resolution (V)	Accuracy
0 - 12	0.01	±(2% of the reading + 0.02 V)

■ Test current readout :

Range (A)	Resolution (A)	Accuracy
0 - 9.99	0.01	±(5% of the reading + 2 pt.)
10.0 - 25.0	0.1	±3% of the reading

■ Max permitted voltage drop depending on the cross section of the cable :

Cross section of the cable (mm ²)	Max voltage drop (V)
0.5	5
0.75	5
1	3.3
1.5	2.6
2.5	1.9
4	1.4
≥ 6	1.0

- Max output voltage : 12 V AC
- Measurement current (0 - 0.5 Ω) : > 10 A AC
- Timer : adjustable from 1 to 15 s (resolution 1s) or without timer
- Connection system : 4 wire

3.3. LOW RESISTANCE (POSITION R_{10A})

■ Resistance readout :

Range R *	Resolution (mΩ)	Accuracy
0-999 mΩ	1	±(2% of the reading + 2 mΩ)
1.00 - 1.99 Ω	10	± 5% of the reading

* automatic ranges

- Max output voltage : 12 V AC
- Measurement current (0 - 0.5 Ω) : > 10 A AC
- Threshold value : adjustable from 10 mΩ to 1000 mΩ (resolution 10 mΩ) then from 1000 mΩ to 2000 mΩ (resolution of 100 mΩ) or without threshold (* mΩ)
- Timer : adjustable from 1 to 15 s (resolution 1 s) or without timer
- Connection system : 4 wire
- Test voltage readout :

Range (V)	Resolution (V)	Accuracy
0 - 12	0.01	±(2% of the reading + 0.02 V)

■ Test current readout :

Range (A)	Resolution (A)	Accuracy
0 - 9.99	0.01	±(5% of the reading + 2 pt.)
10.0 - 25.0	0.1	±(2% of the reading)

3.4. INSULATION RESISTANCE

3.4.1 Nominal voltage 500 V DC

■ Insulation resistance readout :

Range* (MΩ)	Resolution (kΩ)	Accuracy
0 - 1.999	1	±(2% rdg + 2 counts)
2.00 - 19.99	10	
20.0 - 199.9	100	
200 - 500	1000	±10% rdg

* gammes automatiques

- Range : 0 - 200 MΩ (stable result even on a capacitive load)
- Nominal voltage : 500 V DC (+10% / - 0%)
- Short circuit current : 1.4 mA max.
- Measurement current : 1 mA min. at 500 kΩ load
- Threshold value : adjustable from 0.2 MΩ to 1 MΩ (resolution 0.1 MΩ)
1 MΩ to 10 MΩ (resolution 1 MΩ)
10 MΩ to 500 MΩ (resolution 10 MΩ)
or without threshold (* MΩ)
- Timer : adjustable from 2 s to 10 min (resolution 1 s, then 10 s if duration > 1 min) or without timer

3.4.2 Nominal voltage 1000 V DC

■ Insulation resistance readout :

Range* (MΩ)	Resolution (kΩ)	Accuracy
0 - 1.999	1	±(2% rdg + 2 counts)
2.00 - 19.99	10	
20.0 - 199.9	100	
200 - 500	1000	±10% rdg

* automatic ranges

- Range : 0 - 200 MΩ (stable result even on a capacitive load)
- Nominal voltage : 1000 V DC (+10% / -0%)
- Short circuit current : 1.4 mA max.
- Measurement current : 1 mA min. at 1000 kΩ load
- Threshold value : adjustable from 0.2 MΩ to 1 MΩ (resolution 0.1 MΩ)
1 MΩ to 10 MΩ (resolution 1 MΩ)
10 MΩ to 500 MΩ (resolution 10 MΩ)
or without threshold (* MΩ)
- Timer : adjustable from 2 s to 10 min (resolution 1 s, then 10 s if duration > 1 min) or without timer
- Test voltage readout :

Range (V)	Resolution (V)	Accuracy
0 - 1200	1	±(2% rdg + 2 counts)

3.5. DISCHARGE TIME (POSITION ΔT)

3.5.1 Discharge time on mains supply socket (MAINS TEST inputs)

- Max service voltage : 600 V AC/DC
- Range : 0 - 10 s
- Threshold of discharge time : 1 s
- Resolution : 0.1 s
- Accuracy : ± (2% rdg + 0.2 s)
- Level of safety voltage : 60 V
- Internal resistance of the MAINS TEST input : 96 MΩ

3.5.2 Discharge time on internal electronic components (TEST inputs)

- Max service voltage : 600 V AC/DC
- Range : 0 - 10 s

- Threshold of discharge time : 5 s
- Resolution : 0.1 s
- Accuracy : \pm (2% of the reading +0.2 s)
- Level of safety voltage : 60 V
- Internal resistance of the TEST input : 96 M Ω

3.6. GENERAL SPECIFICATIONS

- Mains voltage : 230 V / 50 Hz
- Max power absorbed : 600 VA
- Screen : LCD dot matrix, 128 x 64 counts with continuous backlight
- Interface RS232 : 1 start bit, 8 data bits, 1 stop bit, X_{ON}/X_{OFF} protocol,
Baud rate adjustable to 300, 600, 1200, 2400, or 4800 Bauds
- Memories : 999 memory locations
- Remote control signals : START/STOP, SAVE
- Protection of the measurement circuits : F1 F 20 A/600 V 10.3 x 38 mm (Continuity/ ammeter)
F2 T 1 A/250 V 5 x 20 mm (warning lamp output)
F3 T 4 A/250 V 5 x 20 mm (general protection of the instrument)
F4 F 0.2 A/250 V 6.3 x 32 mm (Continuity/ voltmeter)
- Shockproof plastic case
- Dimensions : (W x H x L) 400 x 260 x 250 mm
- Weight : 11 kg
- Protection index : IP 40 (open) IP54 (closed)
- Working temperature range : 0...+50°C
- Reference temperature range : +5...+35°C
- Storage temperature range : -10...+60°C
- Max working humidity : 85% RH (0...+40°C)
- Max storage humidity : 90% RH (-10...+40°C)
80% RH (+40...+60°C)
- Use indoors
- Altitude < 2000 m
- Dielectric strength test
 - between mains and dielectric terminals: 4300 Vrms / 1 min
 - between mains and other terminals or accessible metallic parts: 3700 Vrms / 1 min
- List of standards respected by the tester :
 - Protection class 1 (with protection earth terminal)
 - IEC 61010-1 : Pollution degree 2
 - EN 60204-1 : Test of electric machines
 - VDE 104 : Installation and operation of electric test equipment
 - EN 61180-1.2 : High tension test techniques for low voltage equipment
 - EN 61326-1 : EMC - Emissions and immunity

4. MEASUREMENTS

4.1. DIELECTRIC TEST

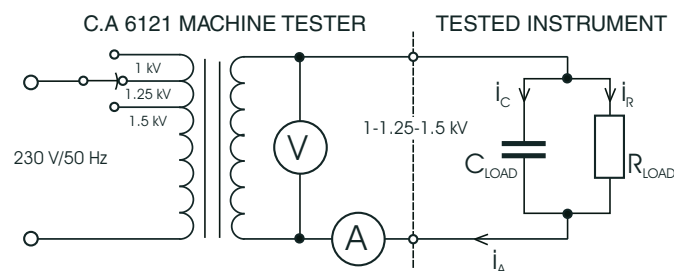


Fig. 2. Test current

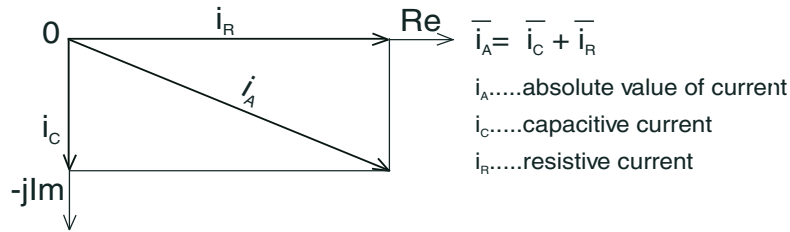


Fig. 3. Test current diagram

How to perform the measurement ?

1. Set the rotary switch to the HV (high voltage) position; the following screen is displayed :

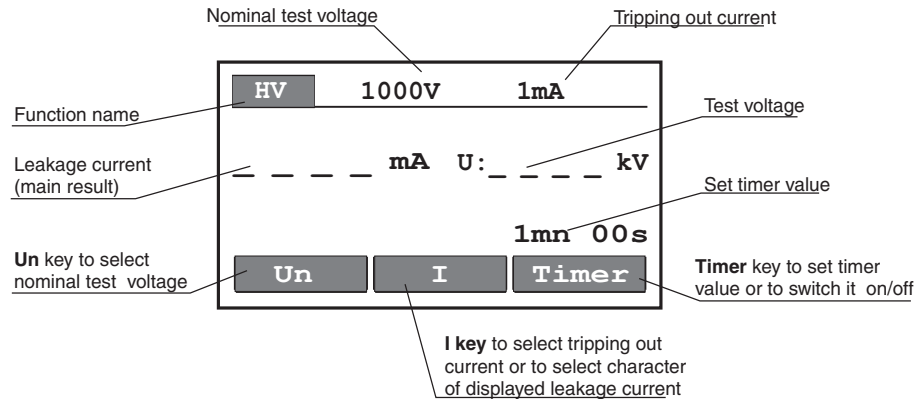


Fig.4. Basic screen in HV position

2. Select the test parameters as follows :

- Character of the displayed test current (fig. 5)
 - Press **I** key and keep it pressed (approx. 2 s) until the menu for selection of current character is displayed.
 - Press **↑** to select resistive part (the \square symbol is displayed above the mA unit), capacitive part (the \perp symbol is displayed above the mA unit), or absolute value (nothing is displayed above the mA unit).
 - Press **EXIT** key to exit this menu
- Tripping out current (fig. 6)
 - Press **I** key to open the tripping out current selection menu.
 - Press the **↑** or **↓** keys to choose the tripping current.
 - Press **EXIT** key to exit this menu
- Test voltage
 - Press the **U_n** key to choose the test voltage between 1 kV, 1.25 kV or 1.5 kV.
- Timer ON/ OFF
 - Press the **TIMER** key to validate the timer (the chosen test time is displayed) or not validate the timer (the test time is not displayed).
- Duration of the test (fig. 7)
 - Press the **TIMER** key and keep it pressed (approx. 2 s) until the menu for selection of the timer value is displayed.
 - Press the **↑** or **↓** keys to select the duration of the test.
 - Press **EXIT** key to exit this menu

NOTES : The value of the test current threshold that has been defined is always compared to the absolute value of the test current, whatever the chosen character displayed: resistive (real) or capacitive (imaginary).

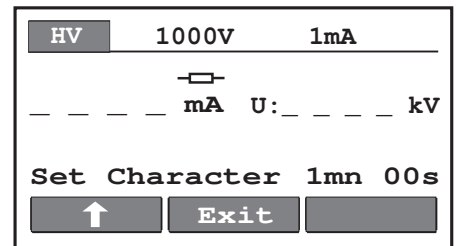


Fig.5. Menu for selection of test current character

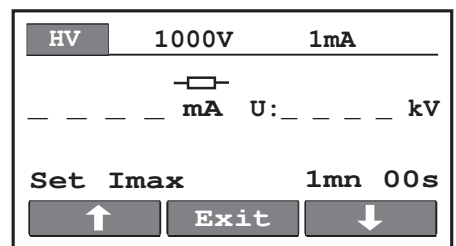


Fig.6. Menu for selection of tripping out current

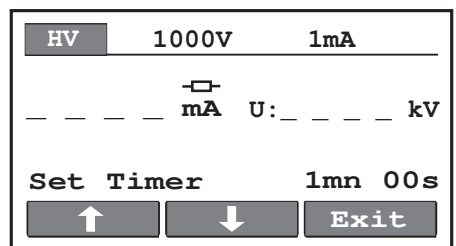


Fig.7. Timer value selection menu

3. Connect the test probes (guns) to the instrument as shown in the figure 8.

4. Press the **START/STOP** key to start the high voltage generator and perform the test using test probes.

5. Press the **START/STOP** key to stop the high voltage generator or wait for set time to elapse, if the timer has been used.

NOTES :

- Take care when handling HT probes - dangerous voltages!
- Use the Timer ON mode or optional REMOTE CONTROL pedal to stop the measurement when the test probes are still connected to the tested instrument. The results displayed that are obtained in this way can be saved in the memory for documentation purposes.
- It is advisable to connect the test probes before starting the test using the REMOTE CONTROL pedal, to avoid sparks and thus unwished tripping out of HV generator.
- For greater safety standard VDE 104 recommends the use of optional WARNING LAMPS, connected to the instrument, in particular when the measurements have to be made at a distance from the instrument using the optional test probes, equipped with longer cables (6 m).
- When the test current is greater than the pre-set limit, the HT generator trips automatically when this value is exceeded, and the pre-set limit value is displayed as the result.

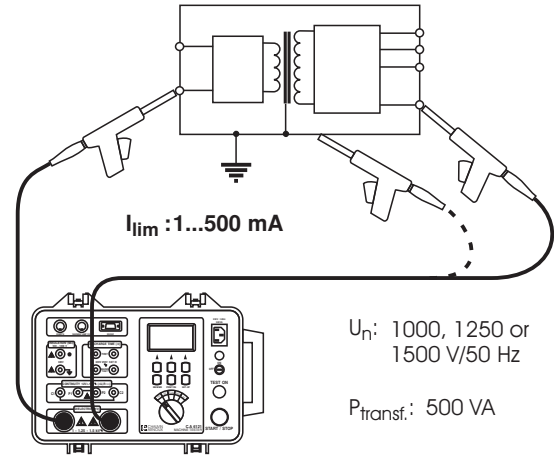


Fig.8. Connection of test probes

6. Save the displayed result for documentation purposes (refer to the instructions in chapter 5.2. to find out the procedure for saving the displayed result).

4.2. VOLTAGE DROP SCALED TO 10 A AC (POSITION ΔU)

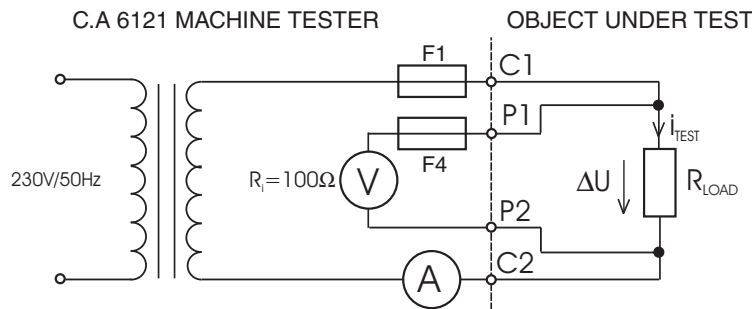


Fig.9. Test circuits

How to perform the measurement ?

1. Set the rotary switch to the **ΔU** position (voltage drop); the following screen is displayed :

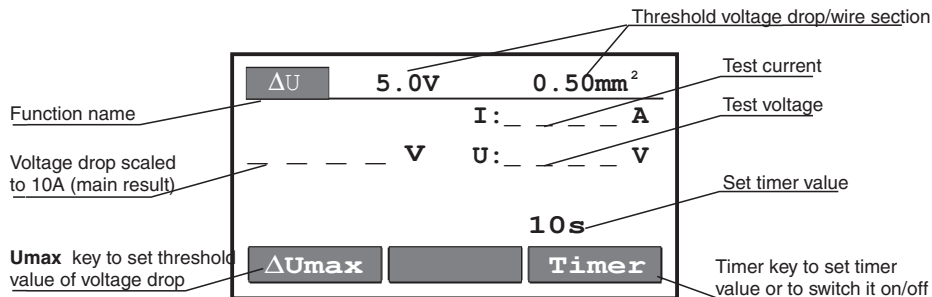


Fig.10. Basic screen in ΔU (voltage drop) position

2. Select the test parameters as follows :

- Voltage drop threshold
 - Press the ΔU_{max} key to select the threshold, refer to the table in chapter 3.2.
- Timer ON/ OFF
 - Refer to the instructions in chapter 4.1.
- Duration of the test
 - Refer to the instructions allowing definition of the duration in chapter 4.1.

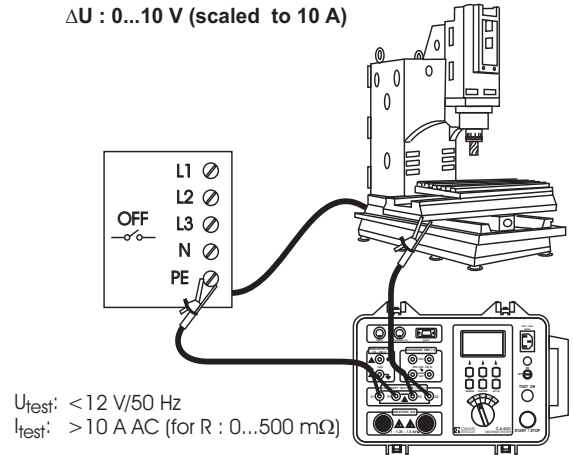
3. Connect the test leads to the instrument and to the tested instrument in accordance with the figure 11.

4. Press the START/STOP key to start the measurement.

5. Wait for the set time to elapse (if the timer has been switched on) or press the START/STOP key again to stop the measurement.

6. Save the displayed result for documentation purposes (refer to the instructions in chapter 5.2 to save the displayed result).

$\Delta U : 0...10 \text{ V (scaled to 10 A)}$



$U_{test} : < 12 \text{ V/50 Hz}$
 $I_{test} : > 10 \text{ A AC (for R : 0...500 m}\Omega)$

Fig.11. Connection of the test leads

4.3. LOW RESISTANCE (POSITION R10A)

Refer to the test circuits, fig.9.

How to perform the measurement ?

1. Set the rotary switch to the R 10A position (low resistance); the following screen is displayed.

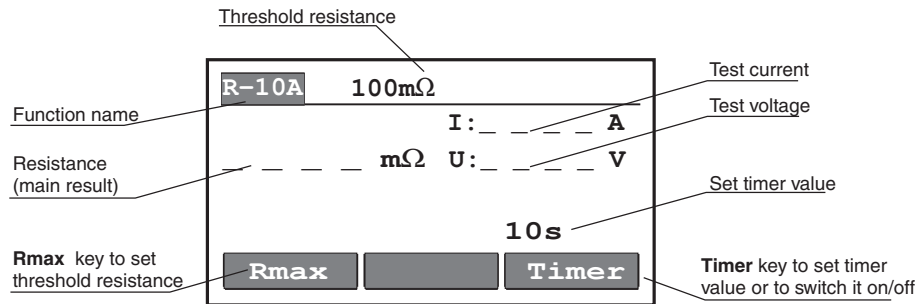


Fig.12. Basic screen in position R10A

2. Select the test parameters as follows :

- Resistance threshold
 - Press the R_{max} key to access the selection menu for the resistance threshold.

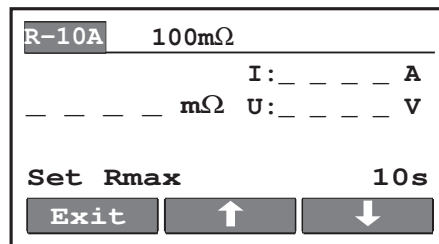


Fig.13. Low resistance threshold selection menu

- Press the \uparrow or \downarrow keys to select the threshold*.
 - * A buzzer will ring if this threshold is exceeded. If the value * mW is chosen as limit, the result will not be compared to any threshold and no buzzer will ring.
- Press **EXIT** key to exit this menu
- Timer ON/ OFF
 - Refer to the instructions in chapter 4.1.
- Duration of the test
 - Refer to the instructions allowing definition of the duration in chapter 4.1.

3. Connect the test leads to the instrument and to the tested instrument in accordance with figure 14.
4. Press the START/STOP key to start the measurement.
5. Wait for the set time to elapse (if the timer has been switched on) or press the START/STOP key again to stop the measurement.
6. Save the displayed result for documentation purposes (refer to the instructions in chapter 5.2 to save the displayed result).

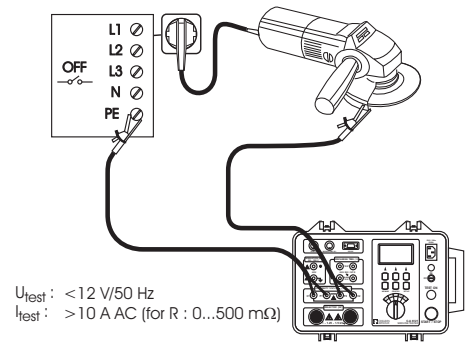


Fig.14. Connection of the test leads

4.4. INSULATION RESISTANCE

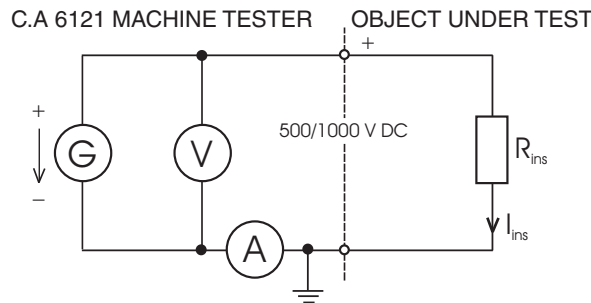


Fig.15. Test circuits

How to perform the measurement ?

1. Set the rotary switch to $M\Omega$ position(insulation resistance); the following screen is displayed.

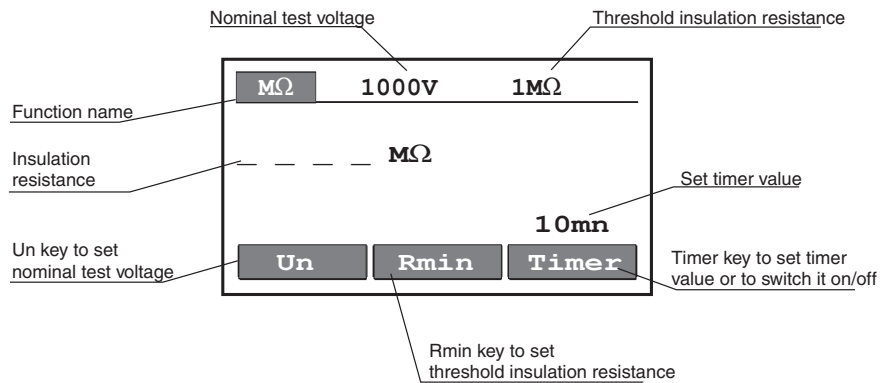


Fig.16. Basic screen in $M\Omega$ position

2. Select the test parameters as follows :

- Insulation resistance threshold
 - Press the R_{min} key to access the menu for insulation resistance threshold selection.
 - Press the \uparrow ou \downarrow keys to select the threshold*.
 - * A buzzer will ring if this threshold is exceeded. If the value * $m\Omega$ is chosen as limit, the result will not be compared to any threshold and no buzzer will ring.
 - Press **EXIT** key to exit this menu
- Test voltage
 - Press the U_n key to select the test voltage: 500 V DC or 1000 V DC
- Timer ON/ OFF
 - Refer to the instructions in chapter 4.1.
- Duration of the test
 - Refer to the instructions allowing definition of the duration in chapter 4.1.

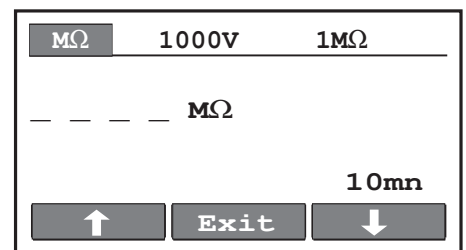


Fig.17. Insulation resistance threshold selection menu

3. Connect the test leads to the instrument and to the tested instrument in accordance with the figure 18.

4. Press the START/STOP key to start the measurement.

5. Wait for the set time to elapse (if the timer has been switched on) or press the START/STOP key again to stop the measurement.

6. Save the displayed result for documentation purposes (refer to the instructions in chapter 5.2 to save the displayed result).

NOTES :

- The actual test voltage is displayed during the measurement and also after finishing the measurement until the voltage drops to 60 V.
- Do not disconnect the leads until the voltage present drops down to 60 V and do not touch the test terminals during that time.

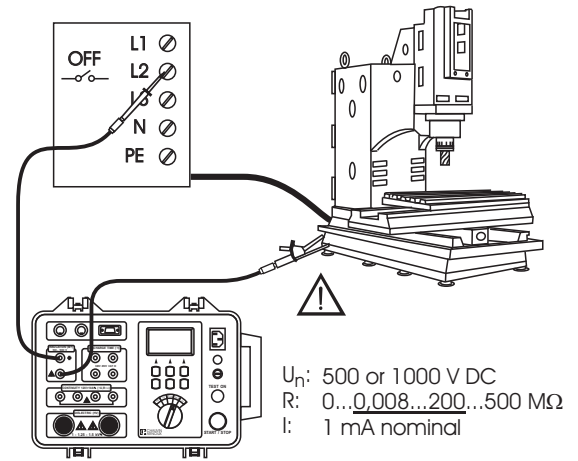


Fig.18. Connection of the test leads

4.5. DISCHARGE TIME - 2 POLE SYSTEM

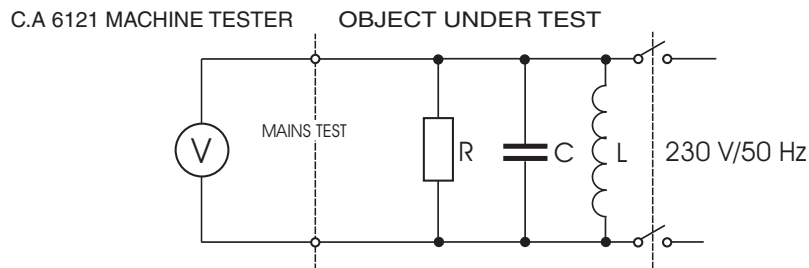


Fig.19. Test circuits

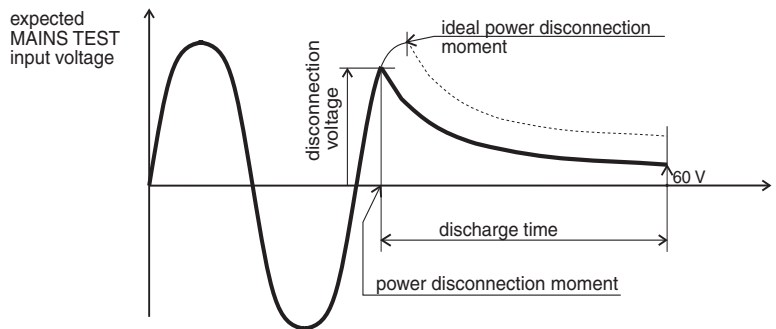


Fig.20. Voltage on MAINS TEST input

How to perform the measurement ?

1. Set the rotary switch to Δt (discharge time) position; the following screen is displayed.

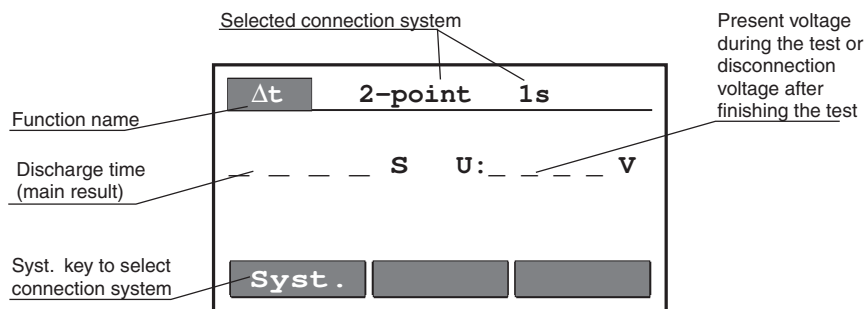
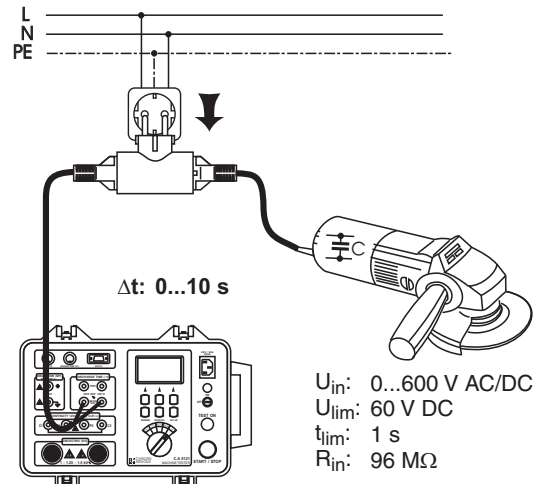
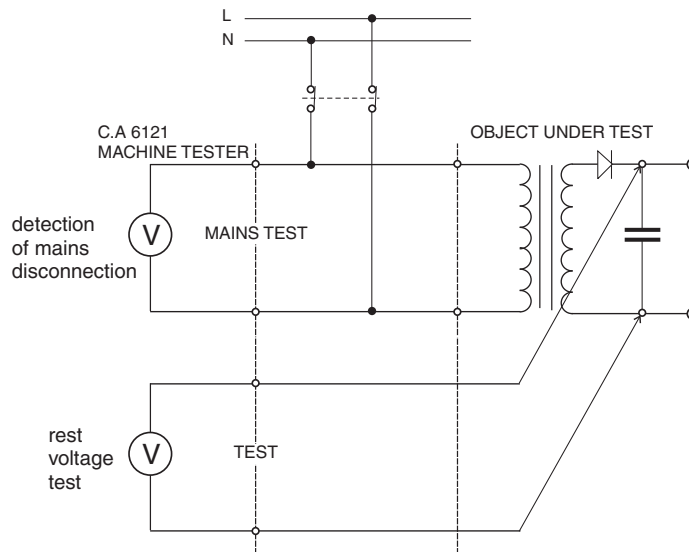
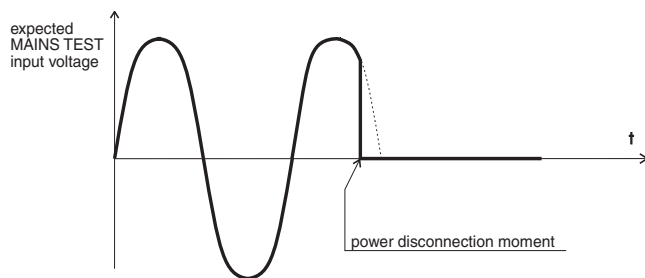
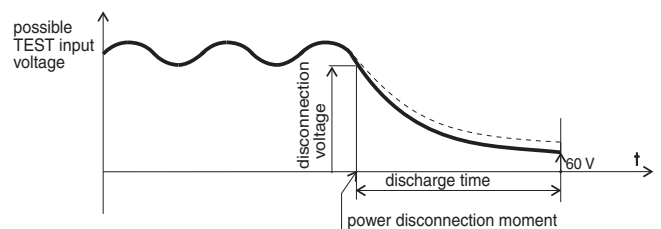


Fig.21. Basic screen in Δt position


2. Select 2-pole system by pressing the SYST. key (2-point 1s is displayed)
3. Connect the test cable to the instrument and to the tested unit in accordance with figure 22 ; le symbol is displayed above unit S, informing the user that the mains voltage is connected to the MAINS TEST input.
4. Press the START/STOP key to prepare the instrument for the mains voltage cut-out; Ready is displayed after 1s approx.
5. Pull out the double connection element and wait for the result to be displayed.
6. Save the displayed result for documentation purposes (refer to the instructions in chapter 5.2 to save the displayed result).


NOTES :

- The red TEST ON lamp is on during the measurement (until pulling out the double connection element and until the TEST voltage has dropped to 60 V).
- The actual voltage is displayed during the measurement, and the disconnection voltage (see fig.20) is displayed when the measurement is finished.
- $\Delta t < 0.1$ s is displayed under the main result and no voltage is displayed on the right of the display, if the discharge time is less than 0.1 s.


Fig.22. Connection of the test leads
4.6. DISCHARGE TIME - 4 POLE SYSTEM

Fig.23. Test circuits

Fig.24. Expected voltage on MAIN TEST input

Fig.25. Expected voltage on TEST input

How to perform the measurement ?

1. Set the rotary switch to Δt (discharge time) position; the screen in fig.21 is displayed.
2. Select 4-pole system by pressing the SYST. key (4-point 5s is displayed)
3. Connect the test cables to the instrument and to the tested unit in accordance with figure 26; le  symbol is displayed above unit S, informing the user that the mains voltage is connected to the MAINS TEST input.
4. Press the START/STOP key to prepare the instrument for the mains voltage cut-out; Ready is displayed after 1s approx.
5. Pull out the double connection element and wait for the result to be displayed.
6. Save the displayed result for documentation purposes (refer to the instructions in chapter 5.2 to save the displayed result).

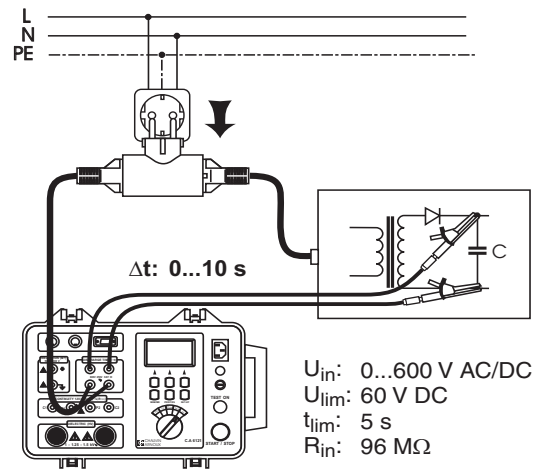


Fig.26. Connection of the test leads



NOTES :

- The red TEST ON lamp is on during the measurement (until pulling out the double connection element and until the TEST voltage has dropped to 60 V).
- The actual voltage is displayed during the measurement, and the disconnection voltage (see fig.20) is displayed when the measurement is finished.
- $\Delta t < 0.1$ s is displayed under the main result and no voltage is displayed on the right of the display, if the discharge time is less than 0.1 s.

5. OPERATION



5.1. WARNINGS

Different warnings in addition to information can be displayed during operation of the C.A 6121 MACHINE TESTER. See below a list of warnings and information for each function.

- **HV function :**
 Trip out : The HV generator tripped because the test current was higher than the set threshold value.
- **ΔU function :**
 $\Delta U > \Delta U_{max}$: The displayed result (ΔU) is higher than the set threshold value.
 $U > 12$ V : The AC voltage connected to the input P1-P2 is higher than 12 V.
- **R10A function :**
 $R > R_{max}$: The displayed result (R) is higher than the set threshold value.
 $U > 12$ V : The AC voltage connected to the input P1-P2 is higher than 12 V.
- **M Ω function :**
 $R < R_{min}$: The displayed result (R_{ins}) is lower than the set threshold value.
 $U > 30$ V : The AC or DC voltage connected to the MW terminals is higher than 30 V.
- **Δt function :**
 Voltage? : There is no voltage connected to MAINS TEST terminals.
 $\Delta t < 0.1$ s : The voltage at the terminals of the MAINS TEST inputs dropped below 60 V in less than 0.1s.
 $\Delta t > t_{max}$: The displayed result (Δt) is higher than the set threshold value (chosen at the same time as the connection system; 2 pole or 4 pole).
- **All functions :**
 HOT : The instrument is overheated (in functions ΔU , R10A or HV) \Rightarrow wait.
 Measurements in functions M Ω or Δt can still be carried out.
 NO RESULT : There is no result on the display or the displayed result has already been saved.
 NOTHING TO PRINT : There was no result saved/displayed before entering the PRINT menu.

5.2. MEMORISING THE RESULTS

Any displayed result can be saved in one of 999 memory locations. The associated results as well as the test parameters are saved at the same time as the main results and can be recalled or printed out later.

Each result is allocated a memory number (No.) and a machine number (MACH) e.g.: No:025 MACH:003

The machine number can be set between 001 and 255 and the memory numbers corresponding to each machine, between 001 and 999, until the total memory capacity is full.

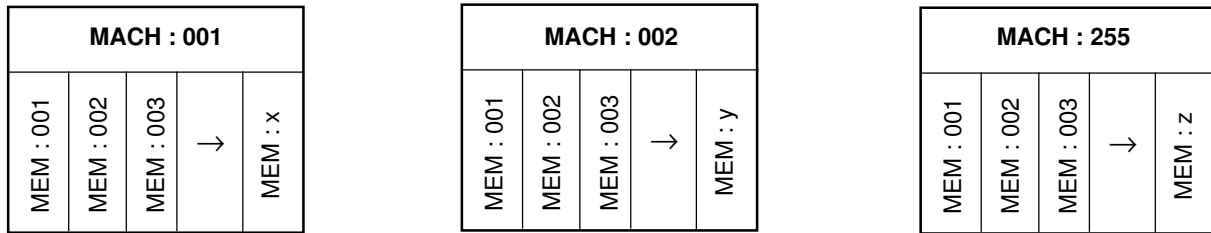


Fig.27. Presentation of memory organisation

How to save the displayed results ?

Key used :



Opens the menu of Memory options : **MEM** **MR** **CLR**



Opens the menu for selection of the memory number and the machine number : **MEM** **No ↑** **MACH ↑**.



Enter the memory and machine numbers and validate/save by pressing the **MEM ⇒**. The result is saved and the main menu is displayed again.



Press **MEM/MR** before validating/ saving (MEM) allows the user to exit without memorising the result.

NOTES :

- A displayed result can only be saved once (in order to avoid the risk of storing twice).
- Memory save locations already occupied can be erased by saving a new result at this location. The occupied locations are marked with the letters OC and the free locations with the letters FR, next to the memory number.
No:003 OC MACH:162
- Rapid scrolling of the memory and machine numbers is done by continuous press on the **No ↑** and **MACH ↑** keys.

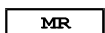
5.3. RECALLING STORED RESULTS

To check a result stored in the memory, the stored result recall function can be used as follows:

Key used :



Opens the menu of Memory options : **MEM** **MR** **CLR**



The highest save location corresponding to the last machine number used is displayed, as well as the following menu : **No ↓** **MR** **MACH ↓**.



Press the **No ↓** key to consult the results saved under the displayed machine number. Then press the **MACH ↓** key if you want to consult the results corresponding to other machines. A long press allows you to scroll through the memory and machine numbers.



MEM/MR or **EXIT**

The main menu is displayed again.

5.4. RS232 COMMUNICATION (FOR PRINTOUT AND CONNECTION TO A PC)

To print saved data or transfer them to a PC, you must use the RS232 communication function.

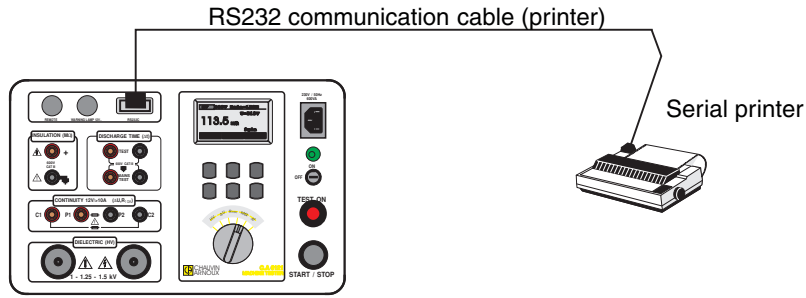


Fig.28. Connection of C.A 6121 MACHINE TESTER to a serial printer

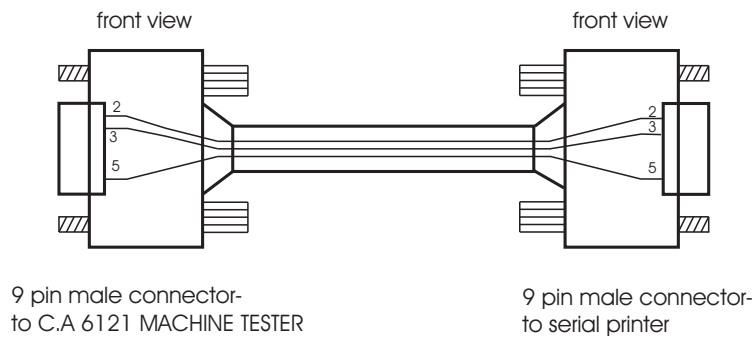


Fig.29. RS232 communication cable (printer)

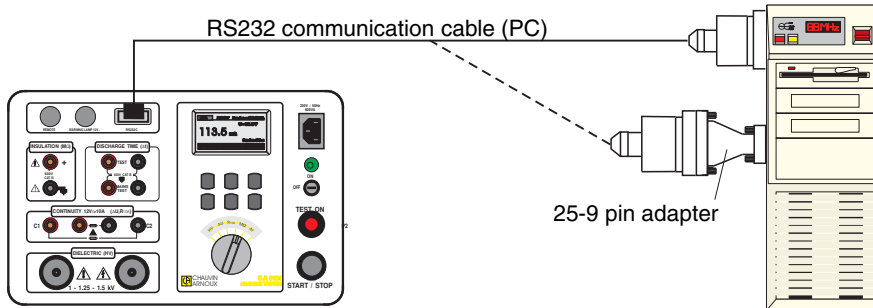


Fig.30. Connection of C.A 6121 MACHINE TESTER to PC (to 25 pin or 9 pin connector)

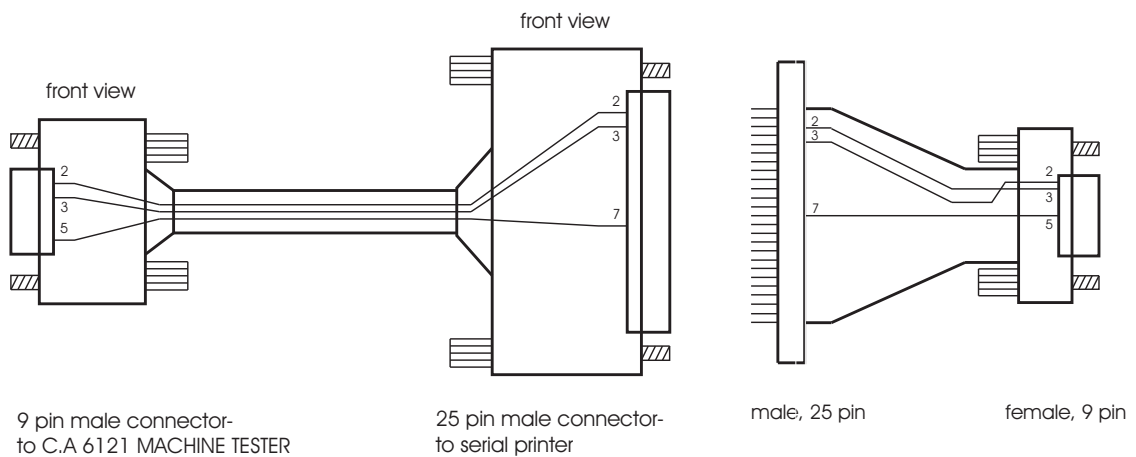
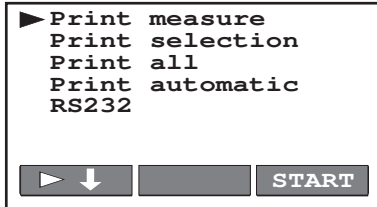


Fig.31. RS232 communication cable (PC) and 25-9 pin adapter

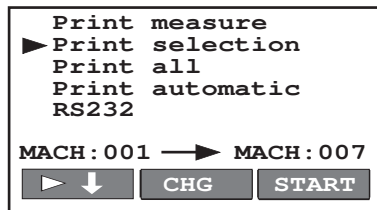
■ How to transfer stored data to serial printer or PC ?

1. Connect the C.A 6121 MACHINE TESTER to the serial printer or to the PC (see figures 28 to 30) using the appropriate RS232 communication cable and adapters.
2. Prepare the printer or the PC for communication.
3. Prepare the C.A 6121 MACHINE TESTER to communicate in the following way:
 - Check the baud rate :
Press the **SET UP** key and keep it pressed for 2 s approx., until the baud rate selection menu is displayed. Press the BAUD key, then the \uparrow or \downarrow keys to set the rate = 300, 600, 1200, 2400 or 4800 bauds (equal to that of the printer or the PC).
 - Press the **PRINT/RS** key to open the print menu and select one of the modes below (fig. 32).



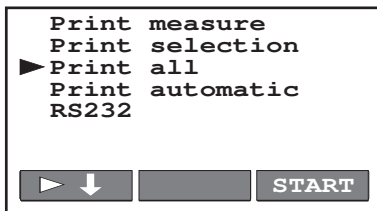
Print measure :

Only the last result displayed will be printed when you press the **START** key.



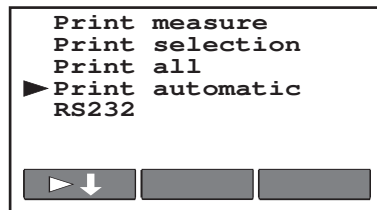
Print selection :

Only the results saved under the machine numbers 001→ 007 (in our example) will be printed when you press the **START** key. Press the **CHG** key then the \uparrow , \downarrow keys to modify the machine numbers.



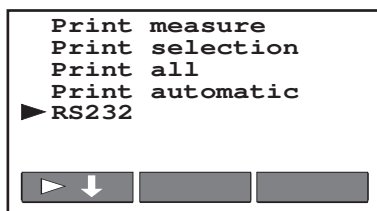
Print all :

All the results will be printed when you press the **START** key.



Print automatic :

When you select this mode, each result displayed is printed automatically at the end of a measurement.



RS 232 :

The instrument is in communication mode and is waiting for instructions from the PC.

Fig. 32. Printout modes


4. Select the print mode by pressing the $\blacktriangleright \downarrow$ key and follow the instructions below :

Print measure :


Press the **START** key, the last result displayed before opening the print menu is printed out, then the main menu is displayed.

Print selection :

Key used :


 Machine number on the left starts flashing.

 ,  Select start machine number.

 Machine number on the right starts flashing.

 ,  Select end machine number.

 Exit selection mode.

 Impression de tous les résultats enregistrés sous les numéros de machine compris entre celui de départ et celui de fin que vous avez sélectionnés. Un symbole * clignote à côté du curseur du côté gauche de l'écran pendant l'impression. Le menu principal s'affiche lorsque l'impression est terminée.

Print all :

Press the **START** key to print all the saved results. A symbol * flashes next to the cursor on the left of the screen during the printout. The main menu is displayed when the printout has finished.

Print automatic :

This function is used when you want to print each result as soon as the measurement has finished. Press the **PRINT/RS** key to open the main menu and continue to carry out measurements. From then on the results will be printed automatically.

RS 232 :

Use the communication software of the PC to communicate with the PC. Pressing the **PRINT/RS** exits the RS 232 mode and opens the main menu. Communication with the PC is then not possible.

NOTES : Check the RS 232 format in chapter 3.6.

5.5 ERASING THE RESULTS

To erase all or part of the saved results, the CLR function must be used. There are two erase modes:

- Erase all the save locations
- Erase the results saved under a particular machine number

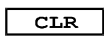
■ How to erase a part of the results saved ?




MEM/MR Enter memory operation mode.

 Two modes are offered : CLEAR ALL and CLEAR MACH.

 Select CLEAR ALL mode.

 Confirm erase by pressing the **CLR** key; the * symbol is displayed during erasure, then the main menu opens.

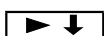
A press on  before confirming the erase operation (CLR) allows you to exit without erasing.



■ How to erase a part of the results saved ?

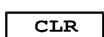



MEM/MR Enter memory operation mode.

 Two modes are offered : CLEAR ALL and CLEAR MACH.

 Select the CLEAR MACH mode, the machine number to erase is displayed.

 Press the **MACH**  key to select the number of your choice.

 Confirm erase by pressing the **CLR** key; the * symbol is displayed during erasure, then the main menu opens.

A press on  before confirming the erase operation (CLR) allows you to exit without erasing.

5.6. REINITIALISING THE INSTRUMENT

■ To reinitialise all the test parameters, please follow the procedure below:

1. Switch off the instrument by setting the ON/OFF key to the OFF position.
2. Press the SET UP key and keep it pressed while switching on the instrument.

Machine Tester followed by Hard Reset are displayed for a few moments, then the main menu opens.

NOTES : The reinitialised values of the adjustable parameters correspond to the requirements of standard EN 60204.

■ List of the test parameters per function, with their initial value.

Function	Parameter	Range of adjustment or possible values	Initial value
HV	U_N Test voltage	1, 1.25, 1.5 kV AC	1 kV
	I_{max} Tripping current	1, 3, 5, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 150, 200, 250, 300, 333, 350, 400, 450, 500 mA	500 mA
	t Timer	1s...1min...5 min (in steps of 1 s and 10 s)	1 s
ΔU	ΔU_{max} Max permitted voltage drop	5.0 V (0.50 mm ²), 5.0 V (0.75 mm ²), 3.3 V (1.0 mm ²), 2.6 V (1.5 mm ²), 1.9 V (2.5 mm ²), 1.4 V (4.0 mm ²), 1.0 V \geq 6.0 mm ²	3.3 V (1.0 mm ²)
	t Timer	1 s...15 s	10 s
R 10A AC	R_{max} Max permitted resistance	10 m Ω ...1000 m Ω (in steps of 10 m Ω) or *m Ω (no limit)	*m Ω
	t Timer	1s...15 s	10 s
M Ω	U_N Test voltage	500, 1000 V DC	500 V DC
	R_{min} min. allowed insulation resistance	0.2 M Ω ...1 M Ω (in steps of 0.1 M Ω) 1 M Ω ...10 M Ω (in steps of 1 M Ω) 10 M Ω ...500 M Ω (in steps of 10 M Ω) or * Ω (no limit)	1 M Ω
	t Timer	2 s...1min...10 min (in steps of 1 s and 10 s)	15 s
Δt	Syst Measuring system	2-point (1 s), 4-point (5 s)	2-point (1 s)
Toutes fonctions	t Timer ON/OFF (M/A)	ON ou OFF	ON
	Baud Baud rate	300, 600, 1200, 2400, 4800	4800
	Buzzer	ON/OFF	ON
	Contrast	0%...100% (in steps of 2%)	50%

■ To reinitialise all the test parameters and erase all stored data, please follow the procedure below :

1. Switch off the instrument by setting the ON/OFF key to the OFF position.
2. Press the SET UP and MEM/MR keys and keep them pressed while switching on the instrument.

Machine Tester then Hard Reset followed by Clear Memory are displayed for a few moments, then the main menu opens.

NOTES : The reinitialised values of the adjustable parameters correspond to the previous table, in accordance with standard EN 60204.

5.7. CONFIGURATION

5.7.1. Display contrast

If the display is not sufficiently readable (screen too dark or lettering intensity too low), the display contrast must be reinitialised.

How to set the contrast ?

1. Press the SET UP key to open the following menu :

NOTE : The clock displayed on the screen is working

2. Press the CONT. key to open the contrast set up menu.

3. Press the ↑ or ↓ keys to set the contrast (the best readability).

4. Press the EXIT key to exit the contrast set up menu.

NOTE : The set readability may change due to a change in the temperature of the screen (instrument heating or change in ambient temperature).

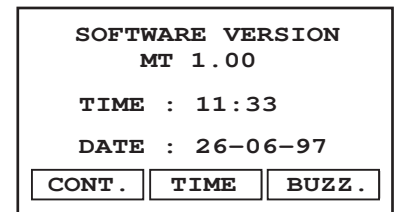


Fig.35. Set up menu

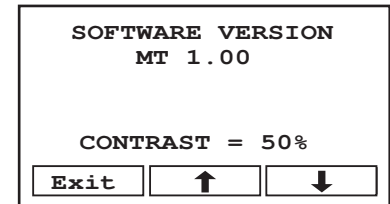


Fig.36. Contrast set up menu

5.7.2. Time and date

How to set the time and date ?

1. Press the SET UP key, see set up menu, fig.35.

2. Press the TIME menu to open the time set up menu:

3. Press the ↑, ↓ and ↵ keys to set hour, minutes, day, month and year.

4. Press the SET UP key to validate this set up; the clock works and the main menu is displayed.

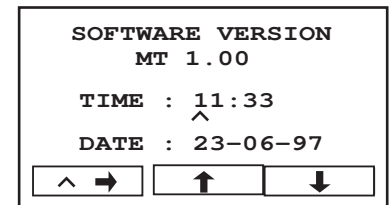


Fig.37. Time setup menu

NOTES :

- If you do not want to confirm the set time and date, simply turn the rotary switch.
- The clock displayed in the time set up menu is not running.

5.7.3. Warning buzzer

One of the functions of the warning buzzer is to provide audible information relating to the evaluation of the measurement result (set threshold value exceeded or not). This warning buzzer is on during and at the end of the measurement, only if the warning buzzer is set to the ON position. As the buzzer continues to beep when the result exceeds the set threshold value, it can disturb the user, which is why it is possible to cut off the warning buzzer. When the warning buzzer is cut off, it is only switched off for the result evaluation function, but remains on in all other cases (reaction to the operation of press keys, rotary switch etc...).

How to switch the buzzer on or off ?

1. Press the SET UP key, see configuration menu fig.35.

2. Press the BUZZ. key to open the buzzer setup menu.

3. Press the ↑ key to set the buzzer to on or off.

4. Press the EXIT key to exit the buzzer setup menu.

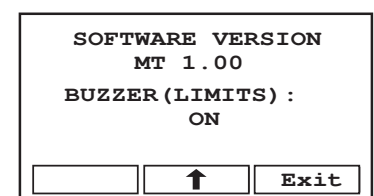


Fig.38. Buzzer setup menu

5.7.4. Baud rate

How to set the baud rate ?

1. Press the SET UP key and keep it pressed for approx. 2 s until the Baud menu is displayed (see fig.39) :
2. Press the BAUD key to open the baud rate setup menu (see fig. 40)
3. Press the ↑ and ↓ keys to set the rate to 300, 600, 1200, 2400, or 4800 bauds.
4. Press the EXIT key to return to the main menu.

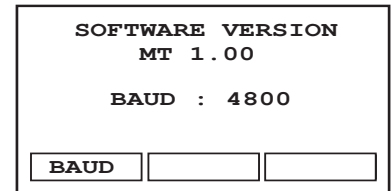


Fig.39. Baud rate menu

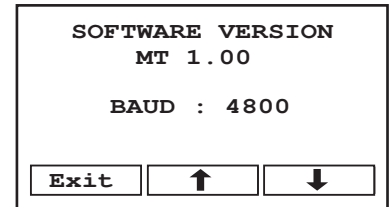


Fig.40. Baud rate setup menu

5.8. SOUND SIGNALS

There are 3 different types of sound signals :

- a) Continuous signal : The displayed result is outside the set limit
- b) Beep signal : Signals pressing of a key or turning of rotary switch
- c) Beep-beep signal : End of the timer or of a recording, erasing, printout or transmission to a PC.

5.9. USING THE REMOTE CONTROL PEDAL

The remote control pedal is used to trigger and to stop the measurement (in each function), as well as to save the displayed result with the foot. We recommend using the pedal when both hands are occupied with the test probes, or when tests are being made at a distance from the instrument, by means of longer cables.

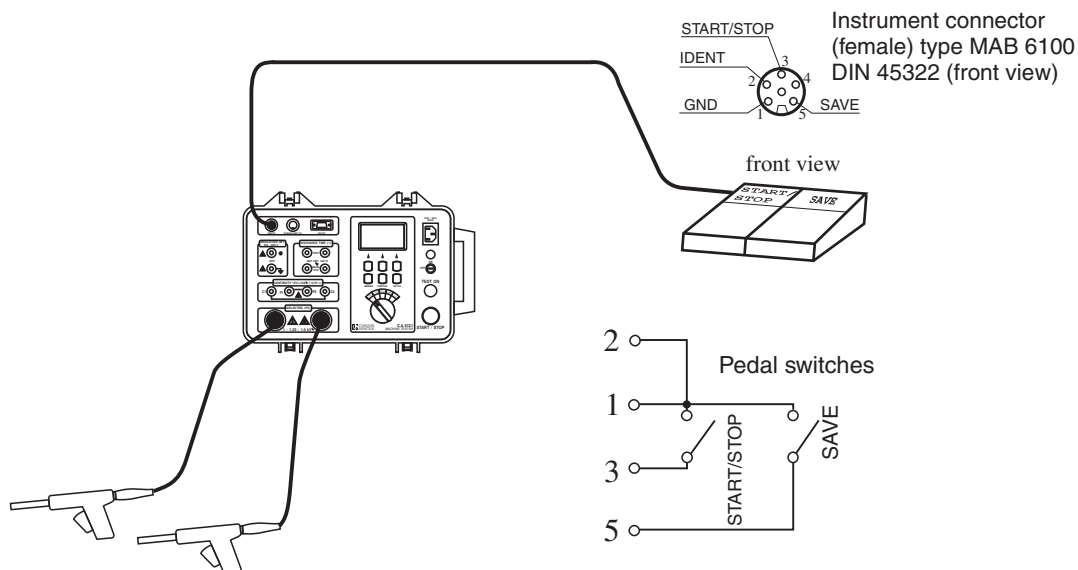


Fig.41. Connection of the remote control pedal to the C.A 6121 MACHINE TESTER

NOTE : When the remote control pedal is connected to the instrument, the START function on the front panel is not operational, whilst the STOP function is operational.

How does the remote control pedal work ?

- The START/STOP function of the pedal is absolutely identical to that of the front panel of the instrument when the pedal is not connected.
- The SAVE function of the pedal is automatic, which means that you simply press the SAVE pedal once to save the result displayed in the location following the machine number. The machine number must be defined beforehand.

The procedure to follow is as follows :

1. Connect the remote control pedal in accordance with fig 41.
2. Record a first measurement at the desired memory location (memory number and machine number) with the keys on the keyboard (see § 5.2).
3. Carry out the next test by pressing the START/STOP pedal.
4. Save the results by pressing the SAVE pedal.

The following window (fig. 42) is displayed for a moment (if for example an HT test has been carried out) :

Then the main menu is displayed again. Continue the measurements.

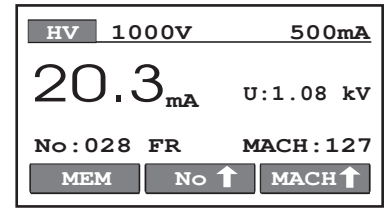


Fig.42. IMemory and machine number information

■ **Technical specifications of the pedal :**

- Cable length : 10 m
- Commands : START/STOP, SAVE
- Case : metallic
- Weight : 2 kg
- Dimensions (W x H x D) : 300 x 175 x 55 mm

5.10. USE OF WARNING LAMPS (STANDARD VDE 104)

The warning lamps are used to warn the user and other persons who may be present on the sites of the tests of the presence of dangerous voltages during dielectric tests.



■ **Meaning of the colours :**

- The red light (TEST) **lit** means the presence of a dangerous voltage at the terminals of the dielectric test. Please take care during handling of the test probes (guns) ! DANGER PRESENT !
- The green light (READY) **lit** means that the instrument is powered up and ready for a measurement; there is not a dangerous voltage at the terminals of the dielectric test. POTENTIAL DANGER !

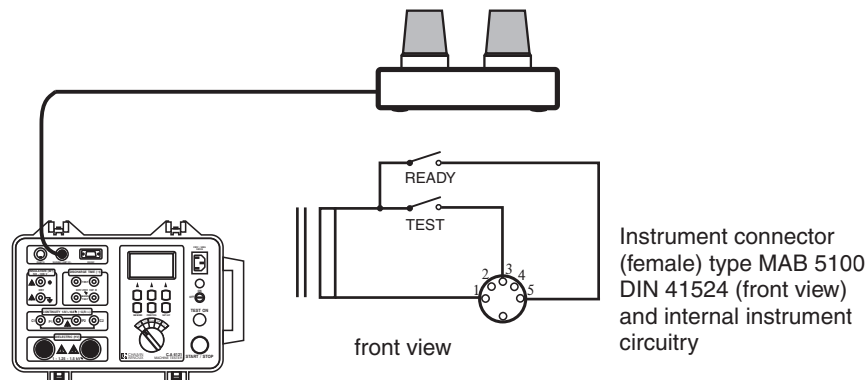


Fig.43. Connection of the warning lamps to the C.A 6121 MACHINE TESTER

■ **Technical specifications of the warning lamps:**

- Cable length : 2 m
- Bulbs : 12-15V / 4W
- Case : plastic
- Weight : 0.3 kg
- Dimensions (W x H x D) : 200 x 110 x 95 mm



NOTE : If no lamp lights up when the rotary switch is in the HV position, stop the measurements immediately and check the connection of the warning lamps as well as the bulbs.