

# Reliable, accurate and quick for comprehensive earth testing

## MULTI-FUNCTION

- All types of earth resistance measurements and earth measurement on pylons (C.A. 6474 option)
- Resistivity (Wenner and Schlumberger methods)
- Earth coupling
- Ground potential measurement
- Continuity / resistance

## HIGH PERFORMANCE

- Possibility of analysing the frequency behaviour of earthing systems (41 Hz to 5 kHz)
- Wide measurement range for optimum resolution
- Rejection of interference voltages up to 60 V<sub>peak</sub>
- Automatic calculation of the earth coupling coefficient and ground resistivity
- Measurement and analysis of pylon earthing
- Recording of results

**Earth and resistivity tester**

**Adapter for pylon earth measurements**



## A versatile instrument

The C.A 6472 earth and resistivity tester can be used for quick, comprehensive testing of all earthing systems by gathering all the earth measurement functions in a single instrument. When used with the C.A 6474, it also offers pylon earth measurements, making it an essential tool for diagnosing and maintaining the earthing systems of all types of pylons.

## 2 operating modes for easy learning

### Automatic mode:

A single key for simple handling:



- function selection by rotary switch
- press on START / STOP button
- reading of the result

In this mode, the instrument carries out a default measurement at 128 Hz and chooses the most appropriate frequency in the event of interference voltages.

## New measurement concept

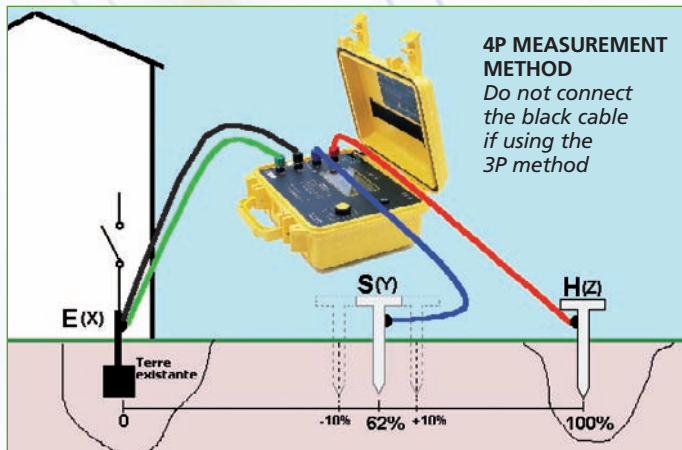
Unlike traditional earth testers, the C.A 6472 offers the possibility of analysing the frequency behaviour of earthing systems thanks to its particularly extensive measurement frequency range (from 41 to 5,078 Hz). The use of a high-frequency measurement signal makes it possible to assess the behaviour of an earthing system in the event of lightning.

### Expert mode:

Users can choose the required measurement parameters (specific measurement frequency, frequency scan, measurement voltage between H and S, etc.) and can access additional measurement results for more accurate interpretation.

### Automatic recognition of input connections:

the connections are displayed and flash if incorrect or absent.



## 3P EARTH MEASUREMENT METHOD

The 3P method is the traditional method using rods to measure the resistance of an existing earth connection. The C.A 6472 can also be used to measure the resistances of the auxiliary rods RS and RH, as well as any interference voltages, thus allowing more accurate interpretation of the measurement.

**Suitable for all types of measurement environments**, even the most difficult, it guarantees measurement of auxiliary rod resistances up to 100 k $\Omega$  and interference voltages up to 60 V<sub>peak</sub>.

## 4P AND 4P SELECTIVE MEASUREMENT

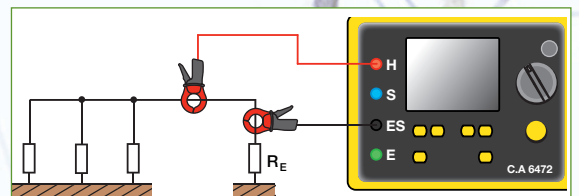
The 4P measurement method is particularly well-suited to measuring very low earth resistance values.

In the event of several resistances set up in parallel, it is possible to combine this method with a clamp-on ammeter in order to carry out selective measurements. This "4P selective" method saves considerable time as it is no longer necessary to disconnect the earth resistance to be measured. Indeed, the clamp enables measurement of the current through the earth connection to be tested, thus avoiding the influence of the parallel earth connections.

## EARTH LOOP MEASUREMENT WITH 2 CLAMPS

In the event of a system with parallel earth connections, the C.A 6472 is capable of accurately measuring an earth resistance using clamps only. The principle of this method involves placing 2 clamps around the earth conductor to be tested and connecting them each to the instrument. One clamp injects a known signal (32 V / 1367 Hz) while the other clamp measures the current circulating in the loop.

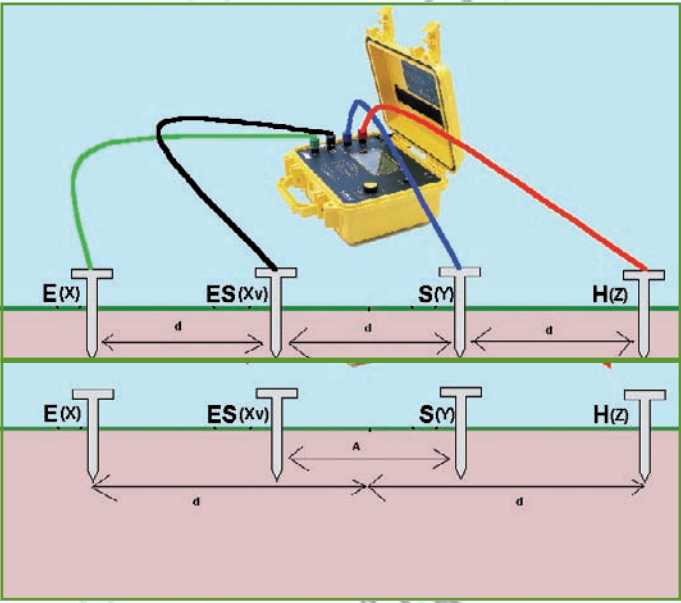
This method saves considerable time when earth testing because it is no longer necessary to set up auxiliary rods or to disconnect the earth connections.



## EARTH COUPLING MEASUREMENT

The operator performs 3 successive measurements (2 traditional earth measurements using the 3P method – R<sub>1</sub> & R<sub>2</sub> – and 1 earth measurement using the 2P method – R<sub>1,2</sub>). The C.A 6472 then automatically calculates the coupling resistance:  $R_c = (R_1 + R_2 - R_{1,2}) / 2$ .

# GROUND RESISTIVITY MEASUREMENT



**Wenner method:**  
 the distances between the 4 rods are identical:  
 $d \rho W = 2 \cdot \pi \cdot d \cdot R_{S-E}$

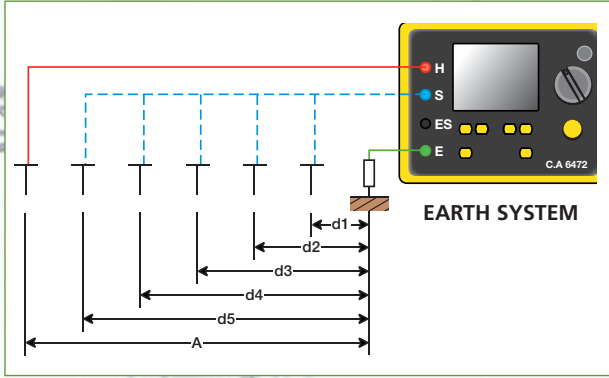
**Schlumberger method:**  
 the distance between the 2 central rods S & ES is A  
 the distance between the 2 outside rods E & H is 2d  
 $\rho S = (\pi \cdot (d^2 - A^2) / A) \cdot R_{S-SE} / 4$

When it is possible to choose the position of the earth connection, resistivity measurement helps to assess the ground and thus determine the place where the earth resistance will be lowest (optimization of construction costs).

The C.A 6472 automatically calculates the resistivity of the ground ( $\rho$ ) using the Wenner or Schlumberger method, as soon as the distances used between the rods have been entered. The resistances of the rods  $R_E$ ,  $R_{ES}$ ,  $R_S$  and  $R_H$  can also be measured.

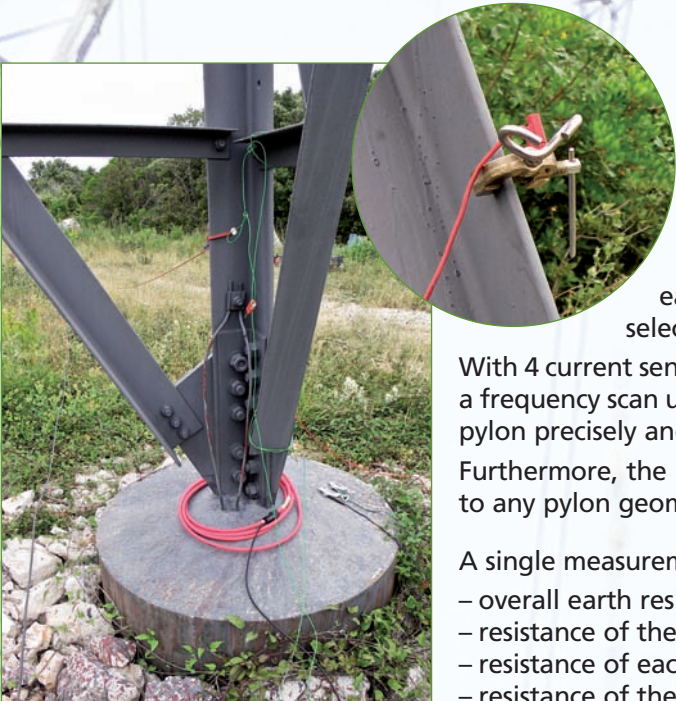
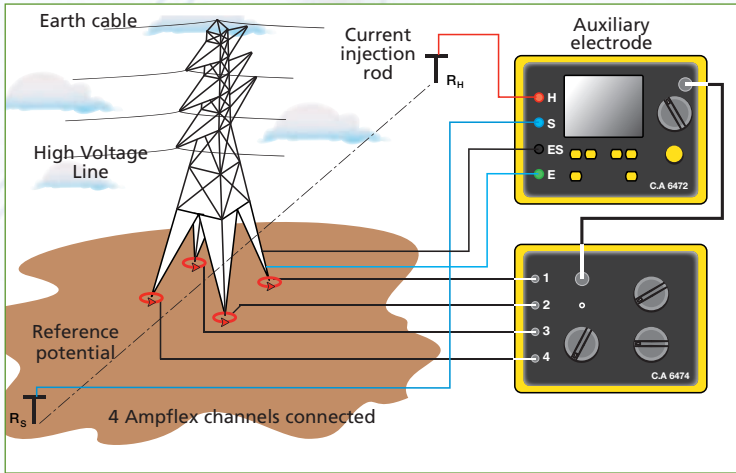
# GROUND POTENTIAL MEASUREMENT

This measurement can be used to determine the value of the potential as a function of distance. By performing several measurements with different distances (d), it is thus possible to track the change in potential around an earthing system.



# EARTH MEASUREMENT ON PYLONS WITH EARTH CABLE

High-voltage lines are usually equipped with an earth cable to allow lightning to discharge to earth via the pylons. As all the pylons are connected to this conductor, all the pylons' earth resistances are in parallel. This means that it is impossible to measure pylon resistance using traditional 3P methods unless the earth cable is disconnected, which is a dangerous and time-consuming operation.



Used in conjunction with the C.A 6474 vectorial processing unit, the C.A 6472 offers the possibility of measuring a pylon's earth resistance even if it is part of a parallel earth network, by selective measurement of the pylon in question.

With 4 current sensors (Ampflex) positioned around the footings of the pylon and a frequency scan up to 5 kHz, it is possible to measure the earth impedance of the pylon precisely and selectively.

Furthermore, the use of flexible sensors means that this concept can be adapted to any pylon geometry.

A single measurement is sufficient to acquire all the essential quantities:

- overall earth resistance of the line
- resistance of the pylon under consideration
- resistance of each pylon footing
- resistance of the earth cable between pylons

## ELECTRICAL SPECIFICATIONS

	3P method	4P / 4P selective method	Earth measurement with 2 clamps	Resistivity	Earth potential measurement	DC resistance measurement	Measurements with C.A 6474
<b>Range</b>	0.01 Ω to 99.9 kΩ	0.001 Ω to 99.99 Ω	0.01 Ω to 500 Ω	0.01 kΩ to 99.9 kΩ	0.01 mV to 65.00 V	0.001 Ω to 99.9 kΩ	0.001 Ω to 99.99 kΩ
<b>Resolution</b>	0.01 to 100 Ω	0.001 to 10 Ω	0.01 to 1 Ω	0.01 to 100 Ω	0.01 mV to 10 mV	2 wires: 0.01 Ω to 100 Ω / 4 wires: 0.001 Ω to 10 Ω	0.001 to 10 Ω
<b>Accuracy</b>	± (2% + 1 count)	± (2% + 1 count)	± (10% + 1 count)	± (2% + 1 count)	± (5% + 1 count)	± (2% + 2 counts)	± (5% + 1 count)
<b>No-load voltage</b>	16 or 32Vrms	16 or 32 Vrms	16 or 32 Vrms	16 or 32Vrms	16 or 32 Vrms	±16 VDC	16 or 32 Vrms
<b>Measurement frequency</b>	41 to 5,078 Hz	41 to 5,078 Hz	Auto: 1,367 Hz Manual: 1,367 Hz, 1,611 Hz, 1,758 Hz	41 to 128 Hz	41 to 128 Hz	DC	41 to 5078 Hz
<b>Coupling measurement</b>	yes	–	–	–	–	–	–
<b>Auxiliary rod resistance measurement</b>	0.1 Ω to 100 kΩ	0.01 Ω to 100 kΩ	–	–	–	–	0.01 Ω to 100 kΩ
<b>U<sub>interference</sub></b>	maximum 60 Vpeak					–	maximum 60 Vpeak
<b>Test method</b>	–	–	–	Wenner and Schlumberger with automatic calculation	–	–	–
<b>Type of measurement</b>	3 wires	4 wires	–	4 wires	3 wires	2 wires or 4 wires	–
<b>Measurement current</b>	–	–	–	–	–	> 200 mA DC	–

## MECHANICAL SPECIFICATIONS

<b>Memory/Communication</b>	512-record memory / optical link/USB
<b>Dimensions / weight</b>	272x250x128 mm / C.A 6472: 3.2 kg / C.A 6474: 2.3 kg
<b>Protection rating</b>	IP 53
<b>Electrical safety</b>	CAT IV 50 V, complies with IEC 61326-1 / IEC 61010 / IEC 61557-1-4-5

## STATE OF DELIVERY

- **C.A 6472 earth and resistivity tester** ..... **P01.1265.04**

Delivered with: mains adapter + 2-pole mains cable for recharging the battery from the mains supply, one operating manual in 5 languages on CD-ROM, 5 simplified operating manuals and 5 specific labels, each in a different language.  
Data export software + USB/optical communication cable and two C182 clamps



- **C.A 6474 adapter for pylon earth measurement (PYLON BOX)** ..... **P01.1265.10**

Delivered with a carrying bag for accessories containing: One C.A 6472 – C.A 6474 connection lead, 6 BNC / BNC cables 15 m long, 4 AmpFLEX flexible current sensors 5 m long, 1 set of 12 AmpFLEX identification rings, 2 cables (5 m green, 5 m black) with safety connectors on winder, 5 spade lug/banana plug converters Ø 4 mm, 3 clamps, 1 calibration loop, 5 operating manuals and 5 specific labels, each in a different language.



## ACCESSORIES

- **100 m earth and resistivity kit** ..... **P01.1020.24**
- **150 m earth and resistivity kit** ..... **P01.1020.25**
- **C.A 647X continuity kit (mΩ position)** ..... **P01.1020.37**
- **MN82 CLAMP (Ø 20 mm) for C.A 6474** ..... **P01.1204.52**
- **Adapter for battery charging on cigarette lighter** ..... **P01.1020.36**
- **DataView® PC software**..... **P01.1020.06**
- **Optical / RS232 communication cable**..... **P01.2952.52**

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