

## Earth Resistance & Resistivity Tester KEW 4106

**Earth Resistance Measurements with 4, 3 and 2 Wires**  
**Earth Resistivity ( $\rho$ ) Measurement using WENNER method**



- High test current up to 80mA yielding resolution of 0.001Ω on 2Ω range
- Advanced Filtering method (based on FFT Fast Fourier Transform) reduces noise interference for obtaining stable measurements.
- Automatic and Manual selection of the Test Current Frequency in four bands (94/105/111/128Hz). In Automatic mode, KEW4106 will select the most suitable Frequency.
- Several sub-results can be shown on the display: Resistance of the Auxiliary Earth Spikes, Frequency of Test Current, Voltage and Frequency of Interference (noise), Residual Resistance  $R_k$ , etc.
- Warning for excessive noise and high Auxiliary Earth Spikes resistance.
- Large Graphic Display with backlight for readings in poorly illuminated areas.
- Up to 800 measurement results can be saved in the memory and recalled on the display.
- The stored results can be transferred to a PC using the "KEW Report" software and a USB adaptor (Model 8212-USB) which are included.
- Robust design with IP54 protection.



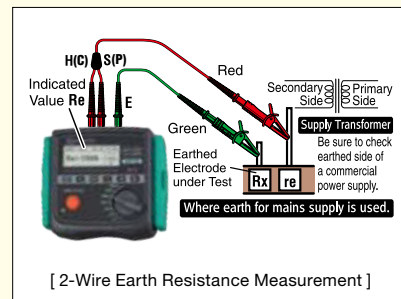
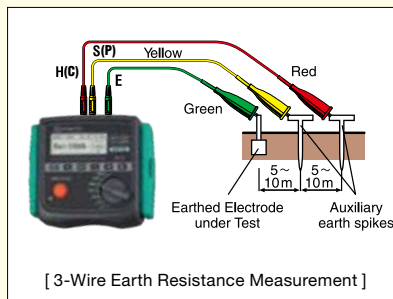
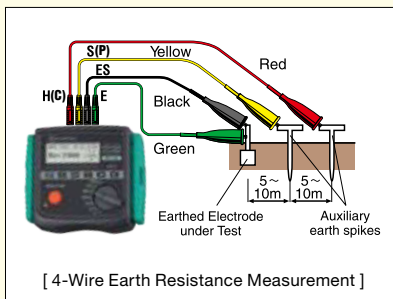
# Earth Resistance Measurement

- Earth resistance measurement with 4, 3 and 2 wires and six ranges covering measurements from  $0.03\Omega$  to  $200k\Omega$ .
- Also ideal for large earthing systems by the considerable test current of  $80mA(max)$  yielding a high resolution of  $0.001\Omega$  on  $2\Omega$  range.

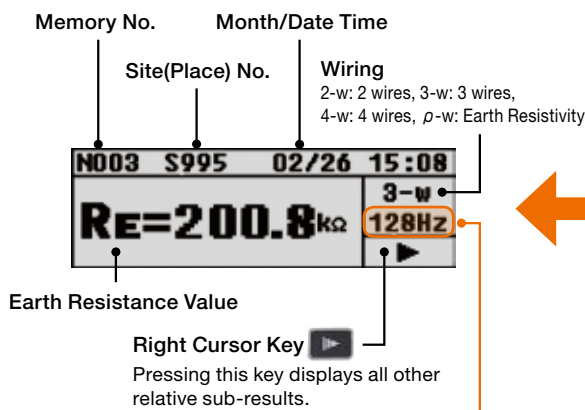


- Advanced Filtering method (based on "FFT" Fast Fourier Transform) reduces noise interference for obtaining stable measurements.
- Warnings for excessive noise and high Auxiliary Earth Spikes resistance.

## Earth Resistance Measurements with 4, 3 and 2 Wires



### Earth Resistance Measurement Display

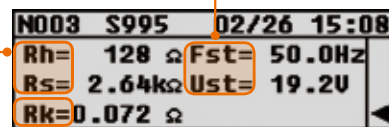


#### Automatic and Manual selection of the Test Current Frequency:

AUTO/94/105/111/128Hz  
This is to minimize the noise influence of the earth voltage.

#### Series Interference Voltage (Earth Voltage) Measurement

Fst: Frequencies of the Earth Voltage between E-S terminals  
Ust: Voltages of the Earth Voltage between E-S terminals



#### Null Facility

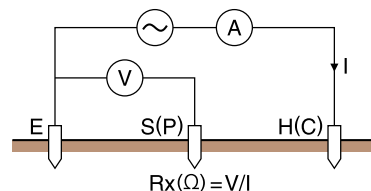
The residual test lead resistance (Rk) is stored and is deducted from the measured result. This is to ensure more accurate low Earth Resistance measurements.

#### Auxiliary Earth Spikes Measurement

Rh: Resistance of Auxiliary Earth Spike H(C)  
Rs: Resistance of Auxiliary Earth Spike S(P)

### Principle of Earth Resistance Measurements

This instrument makes earth resistance measurements with fall-of-potential method, which is a method to obtain earth resistance value "Rx" by applying AC constant current "I" between the measurement object "E" (earth electrode) and "H(C)" (current electrode), and finding out the potential difference "V" between "E" (earth electrode) and "S(P)" (potential electrode).



## Earth Resistivity Measurement

- The earth resistivity measurement is useful for soil surveys to establish the optimum earth electrode system design and site, to avoid extra cost of re-working electrode installations. It can be also suitable for geological investigations.
- Earth resistivity measurement is automatically calculated after having set the distance between Auxiliary Earth Spikes (Wenner method).

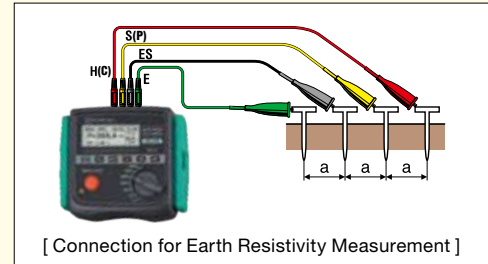


### Measurement Method for Earth Resistivity ( $\rho$ )

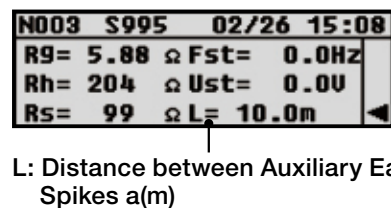
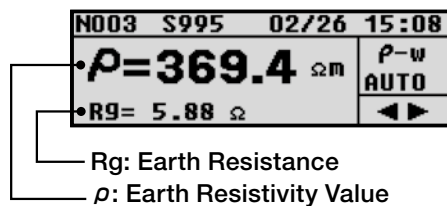
#### [Connection of Auxiliary Earth Spikes and Test Leads]

Stick the four Auxiliary Earth Spikes into the ground deeply. They should be aligned at an interval of 1-30m(a). The depth should be 5% or less of the interval between the spikes.

Note) The supplied Test Leads can be used for the distance between the spikes up to 20m.



### Earth Resistivity ( $\rho$ ) Measurement Display

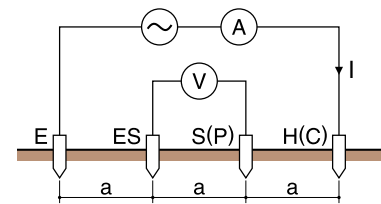


### Principle of Earth Resistivity ( $\rho$ ) Measurements

According to the Wenner 4-pole method, apply AC current "I" between the "E" (earth electrode) and "H(C)" (current electrode) to find out the potential difference "V" between the two potential electrodes "S(P)" and "ES".

To obtain the earth resistance "Rg ( $\Omega$ )", divide the potential difference "V" by AC current "I"; where the distance between electrodes is "a" (m).

Then use the formula:  $\rho = 2 \cdot \pi \cdot a \cdot Rg (\Omega \cdot \text{m})$ .



## Software included (KEW Report)

The stored results can be transferred to a PC via USB adaptor (Model 8212-USB).

- Up to 800 measurement results can be saved in memory.
- Data can be converted to CSV files.



[ List of data ]

## ● KEW 4106 Specification

Function	Range	Resolution	Measuring range	Accuracy
Earth resistance Re (Rg at ρ measurement)	2Ω	0.001Ω	0.03~2.099Ω	±2%rdg±0.03Ω
	20Ω	0.01Ω	0.03~20.99Ω	±2%rdg±5dgt <sup>*1</sup>
	200Ω	0.1Ω	0.3~209.9Ω	
	2000Ω	1Ω	3~2099Ω	
	20kΩ	10Ω	0.03~20.99kΩ	
	200kΩ	100Ω	3~209.9kΩ	
Auxiliary earth resistance Rh, Rs				8% of Re+Rh+Rs
Earth resistivity ρ	2Ω	0.1Ω·m~1Ω·m Autoranging	0.2~395.6Ω·m	ρ=2×π×a×Rg <sup>*2</sup>
	20Ω		0.2~3956Ω·m	
	200Ω		20~39.56kΩ·m	
	2000Ω		0.2~395.6kΩ·m	
	20kΩ		2.0~1999kΩ·m	
	200kΩ			
Series interference voltage Ust (A.C only) <sup>*3</sup>	50V	0.1V	0~50.9Vrms	±2%rdg±2dgt (50/60Hz) ±3%rdg±2dgt (40~500Hz)
Frequency Fst	Autoranging	0.1Hz 1Hz	40Hz~500Hz	±1%rdg±2dgt
Measuring method	Earth resistance: Fall-of-potential method (currents and voltages measured via the Probes) Measurement method of Earth Resistivity (ρ): Wenner 4-pole method Series interference voltage (earth voltage): RMS Rectifier (between the E-S Terminals)			
Memory capacity	800 data			
Communication interface	Model 8212USB Optical Adaptor			
LCD	Dot-matrix 192×64, monochrome			
Over-range Indication	"OL"			
Overload Protection	between E-S(P) and between E-H(C) terminals AC280V / 10 sec.			
Withstand voltage	between the electrical circuit and enclosure AC3540V(50/60Hz) / 5 sec.			
Applicable standards	IEC 61010-1 CAT. III 300V, CAT. IV 150V Pollution degree 2 IEC 61010-031, IEC 61557-1,5, IEC 61326-1(EMC), IEC 60529(IP54)			
Power source	DC12V : sizeAA manganese dry battery (R6P) x 8 (Auto power off: approx. 5 minutes)			
Dimensions	167(L) × 185(W) × 89(D)mm			
Weight	approx. 900g (including batteries)			
Accessories	7229(Precision measurement test leads), 7238(Simplified measurement test leads), 8032(Auxiliary earth spikes [2 spikes/set])×2 sets (4 spikes in total), 8200-04(Cord reel [4 reels])×1 set, 8212-USB(USB adaptor with "KEW Report(Software)"), 9121(Shoulder strap), 9125(Carrying case), R6P×8, Instruction manual, Calibration certificate			
Optional	8212-RS232C(RS232C adaptor with "KEW Report(Software)")			

\*1: Auxiliary earth resistance is 100Ω with Rk correction

\*2: Depending on the measured Rg, Interval [a] between auxiliary earth spikes is 1.0~30.0m

\*3: This instrument is NOT designed to measure line voltages on commercial powers.

## EVERYTHING YOU NEED.....

KEW4106 comes with everything you need for testing the Earth Resistance and Soil Resistivity.

A full set of accessories is included: four auxiliary spikes, four cable reels and four test leads(Red:40m, Yellow/Black/Green:20m) for Earth and Resistivity measurements. It is also supplied with particular test leads with relative probes and crocodile clips dedicated for simplified measurements. PC software for downloading and interpreting of data and an interface cable are included.

The instrument also comes in a soft carry case, a quick reference guide is attached to the case lid, and it is supplied with a calibration certificate.



**! Safety Warnings :** Please read the "Safety Warnings" in the instruction manual supplied with the instrument thoroughly and completely for correct use. Failure to follow the safety rules can cause fire, trouble, electrical shock, etc. Therefore, make sure to operate the instrument on a correct power supply and voltage rating marked on each instrument.



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