AQUAMETER
CRM

Microprocessor Based Resistivity Meter

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आण्विक ANVIC SYSTEMS

Manufacturers of Geo-Physical Instruments

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USE OF RESISTIVITY IN GEOLOGICAL APPLICATIONS

In geophysical prospecting, the geo electrical (resistivity) method is often preferred for speed, economy and high resolution. It is used effectively for ground water prospecting, bedrock studies, certain civil engineering applications, water quality studies and mineral prospecting.

The pattern of electric flow in the ground is dependent on the sub-surface variations in conductivity. The electric potential distribution on the surface is therefore related to the sub-surface geology. The electrical resistivity of different material being significantly different from each other, it is possible to distinguish them by their resistivity values. By resistivity survey it is possible to determine the thicknesses and depths of the different strata underneath. Presence of water changes the resistivity considerably and hence can be easily located by the resistivity method. Therefore resistivity surveys are widely carried out to locate underground water resources.

In resistivity surveys electrical current is fed into the ground through two current electrodes. The resulting potential drop between two potential electrodes (generally placed between the current electrodes) is measured.

Aquameter CRM generates a well regulated current (I) and measures the resulting signal voltage ΔV between the two potential electrodes. It then calculates the apparent resistance $R = \Delta V/I$ for the given spacing configuration. The effect of other ground currents resulting in spurious voltage is eliminated by sophisticated noise eliminating circuitry and modern electronic techniques. The resistivity so obtained is the weighted average of the resistivity of all the formations through which the current is passing. Apparent resistivity is expressed in Ohm-meter (Ω-m). The analysis of apparent resistivity variations as a function of spacing of current electrodes makes it possible to draw conclusions about the sub-surface geological conditions.

SELF POTENTIAL (SP) :

Natural earth potentials are setup in the ground due to electro chemical activity. These are referred to as self or spontaneous potentials. SP anomalies yield useful information about clays, marls, pyrite ores and graphite. Together with resistivity SP anomalies are also an indication of water quality viz salinity and hardness. SP surveys are carried out by using a pair of non-polarizing electrodes with **Aquameter CRM.**

SPECIAL FEATURES :

a) Increased Portability :

It is often found in conventional resistivity meters that the Transmitter and Amplifier are housed in separate casings to avoid signal interference due to electromagnetic coupling. The CRM is a complete instrument housed in a single casing. This is possible only because of incorporation of modern electronic design principles. Heavy duty rechargeable battery pack is also housed in the same casing. The instrument is fitted with a strong adjustable nylon belt for ease of carrying.

b) Dual Mode Capability :

CRM combines advantages of both AC and DC methods in geological surveying. In the resistivity mode SP measurement and cancellation is done automatically by the instrument itself. There is no necessity of non-polarizing electrodes. On the other hand, when SP values are required they can be measured in the voltage mode by use of non-polarizing electrodes.

c) Better Depth Penetration and Accuracy :

Use of finely regulated constant current results in deeper penetration. CRM can give penetration more than

600 meters and up to 800 meters in favorable geological conditions. Polarity reversal overcomes polarization effects. Accuracy is improved using integration techniques.

d) Audio Visual Information :

CRM displays readings on its liquid crystal display. The display is clear and easily readable even in bright sunlight. The microprocessor checks all circuits, switch positions, suitability of selected parameters, battery condition and noise levels. All this takes only one second. The electronic design comprises of an in built error diagnostics system. If any parameter is wrong or an error condition is detected, the operator is informed about it by means of an audio visual signal. When all checks are complete the instrument proceeds to measure and display the resistance.

e) Averaging Mode :

The resistance readings can be averaged to get the best possible reading in the given geological conditions. This gives additional noise elimination and gives accurate readings. User can select number of cycles from any of the predetermined four values 1, 4, 16, 64. If cycle number is say 4, the instrument repeats the measurement 4 times, displays the successive average each time and the final reading is the average of all the 4 readings.

f) Controls : CRM has 5 controls.

1) On / Off Switch : Switches power pack current on/off.
2) Measure Push button: Initiates automatic check and proceeds for measurement.
3) 7 Position generator current selection switch. 7 values of current can be selected in increasing order from minimum to maximum current.
4) 6 Position range selector switch : Battery check position indicates battery voltage, In addition to the resistance ranges, voltage position is provided to measure external voltage across V1, V2.
5) 4 Position cycle switch: Selects single reading mode or 4, 16 and 64 readings in average reading mode.

ACCESSORIES :

For field survey proper accessories are also important. We provide following accessories.

1) Stainless Steel Electrodes :

Non corrosive stainless steel electrode 50 cm long & 2.5 cm diameter with tapering end on one side.

2) Continuous Contact Winch :

A light weight sturdy winch with hollow pipe stand and aluminum wheel is designed with spring loaded plunger arrangement for continuous contact. The winch can house 400 meters of wire. Continuous contact ensures ease of operation in field.

3) Survey Cable :

14 X 0.3 Copper wire with thick PVC insulation to withstand the pull in field operations. Specially manufactured as a continuous wire of 400 meter length. There are no joints as joints become weak part and wire may break at the joint.

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Technical Specifications

AQUAMETER CRM-20
Depth of Investigation - 120 meters

a.	**Transmitter**	
	Selectable Constant Current	0.2, 0.5, 1, 2, 5, 10, 20mA
	Voltage (Max)	150 V (300 Vpp)
	Power	4W
b.	**Amplifier**	
	Voltage Measurement	
	Input Impedance	10 M Ohm
	Input Range	0 - 100V
	Precision	+/- 0.001 V
	Noise Rejection	95 dB at 50-60 Hz
c.	**Resistance Measurement**	
	Apparent R Range	1Ohm, 100 Ohm, 10K Ohm, 1M Ohm
	Apparent R Precision	+/- 0.001Ohm (1 Ohm Range, 20mA)
d.	**System Data**	
	Cycle time	4 seconds
	Accuracy	2% + precision
	Diagnostic display	9 codes
	Temp. Range	0 – 50 degree c
e.	**Power Source**	12 Volt, 7 Ah Rechargeable Battery
	Measuring capacity	4000 single cycle readings at 20 mA
f.	**Weight**	10.5 Kg
g.	**Dimensions**	L 350mm X W 150mm X H 370mm

AQUAMETER CRM-500 / AUTO-C
Depth of Investigation - 600 meters

a.	**Transmitter**	
	Constant Current	5mA - 500mA
	Voltage (Max)	400 V (800 Vpp)
	Power	40W
b.	**Amplifier**	
	Voltage Measurement	
	Input Impedance	10 M Ohm
	Input Range	0-200V
	Precision	+ 0.05 mV
	Noise Rejection	95 dB at 50-60 Hz
c.	**Resistance Measurement**	
	Apparent R Range	m Ohm, Ohm, K Ohm
	Apparent R Precision	0.02 m Ohm at 500 mA
d.	**System Data**	
	Cycle time	12 seconds
	Accuracy	2%
	Diagnostic display	9 codes
	Temp. Range	0 – 50 degree c
e.	**Power Source**	12 Volt, 12 Ah Rechargeable Battery
	Measuring capacity	200 readings at 500 mA
f.	**Weight**	12.5 Kg
g.	**Dimensions**	L 400mm X W 225mm X H 330mm

Model **CRM-500** & **CRM AUTO-C** are similar in all respects except that **CRM AUTO-C** selects current automatically from 1mA to 500 mA as per ground conditions & displays the value of current on LCD.