INSULATION RESISTANCE TEST

The **Insulation Resistance Test** is the second test required by the electrical safety testing standards.

The **Insulation Resistance Test** consists in measuring the **insulation resistance** of a device under test, while phase and neutral are short circuited together. The measured resistance has to be higher than the indicated limit from the international standards.

A megohmmeter (also called **insulation resistance tester**, teraohmmeter) is then used to measure the ohmic value of an insulator under a direct voltage of great stability.

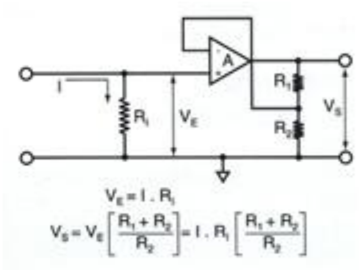
To measure a high value resistance, techniques for measuring a low value current are used. A constant voltage source is applied to the resistance to be measured and the resulting current is read on a highly sensitive ammeter circuit that can display the resistance value.

Two types of ammeter circuits are used on our range of insulation resistance testers, each circuit being chosen depending on the resistance values to be measured.

INSULATION TEST
Its objective is to measure the ohmmic value of the insulation under a direct voltage of great stability, generally 50, 100, 250, 500, or 1000 VDC. The ohmmic value of the insulation resistance is expressed in megohms (MΩ). To conform to specific standards, the insulation resistance test can be performed under voltages up to 1500VDC. Due to the stability of the voltage source, it is possible to adjust the test voltage by steps of 1 volt.

The stability of the voltage is critical; a non-regulated voltage will drop sharply in the presence of a bad insulation which will cause an erroneous measurement.

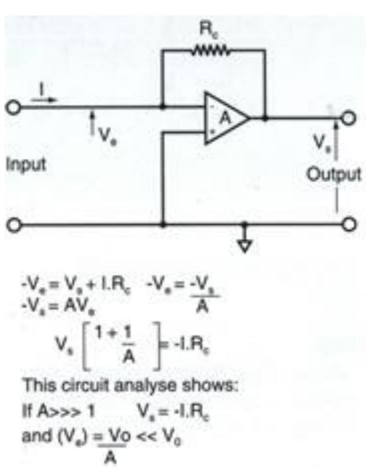
SHUNT AMMETER CIRCUIT



The voltmeter input, associated to a resistance, forms the shunt ammeter circuit. This setting allows measuring any value of I, many combinations of sensitivity and values of RI.

This circuit is used for current measurement of high values which correspond to resistance measurement of low values (I x 10^4 Ω to 2.10^6 Ω).

FEEDBACK AMMETER CIRCUIT

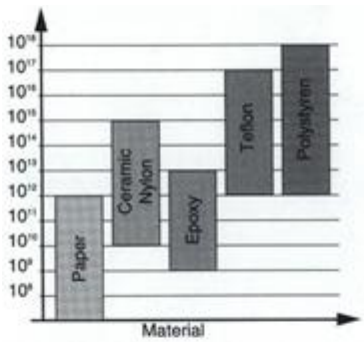


This circuit is the one most often used on our instruments. It covers the resistance measurement of high values higher than 2.10^6 Ω. The principle is indicated in the diagram.

The input current flows through the feedback Rc.
The low level of offset current of the amplifier negligeably affects the current I.

HIGH VALUE RESISTANCE MEASUREMENT

Using a constant voltage source offers the advantage of defining with accuracy the value of the voltage used for the measurement. The choice of this voltage is an important parameter.



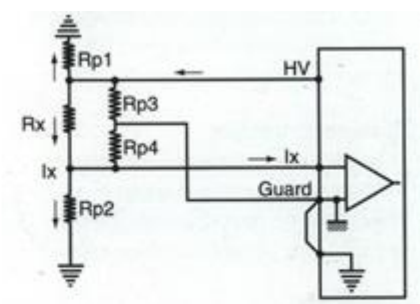
Indeed the value of a high resistance depends of the voltage applied to it.

Other factors intervene in the high value resistance measurement.

Temperature and relative humidity are two important parameters which influence the resistance value of an insulator. The latest Sefelec model (M1501P) provides for the measurement of these two physical parameters. In the table at left one can find the approximate resistance value of various insulating materials.

GUARD CIRCUIT

In order to minimize leakage currents, we offer a guard connection. The guard circuit allows the reduction of interferences on the test sample. A terminal accessible on the front panel of our instruments allows the measurement of one of the resistances of a Delta configuration (i.e. a cable with two conductors and its external shielding), so that the result is not affected by the presence of the other two shunt resistances.



- To this effect the guard terminal is close to the potential of the measuring input of the instrument.
- The value of Rx, will be defined with great accuracy if the current Ix, measured by the megohmmeter's input, is really the current flowing through Rx.
- Rp1: symbolizes the leakage between the high voltage (HV) connections and ground.
- Rp3 - Rp4: represent the parallel leakage of Rx. If the middle point Rp2-Rp4 is connected to the guard, these leakages will not influence the measurement of Rx.
- Rp2: has no influence if the guard is connected to earth.