

The AutoISO-5000 Adapter – Automating Insulation Resistance Testing.



AutoISO-5000

The safety of electrical equipment, cabling, infrastructures, and installations depends upon good insulation. Plus, proper insulation is essential for reliable operation. Over time insulation will deteriorate due to heat, vibration, mechanical stress, climatic conditions, accidental or deliberate damage, exposure to chemicals, and simply – old age.

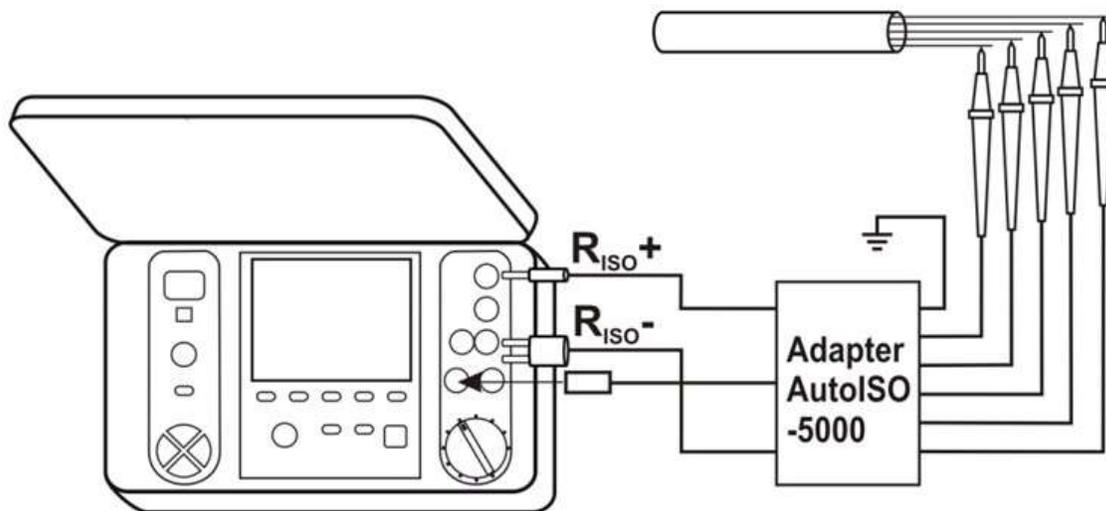
A regular testing program is necessary to examine the present condition of insulation, and detect deterioration. Insulation resistance will inevitably trend downwards over time. Periodic testing will indicate whether the deterioration is gradual, or more rapid, and therefore helps to predict whether to take preventive action immediately, or at some future date. Safety of personnel is of paramount consideration and is the main justification for performing insulation testing. Insulation testing is also an important maintenance activity to ensure reliable and continued operation of industrial equipment where downtime can be very costly. Insulation test results for cables and equipment should be recorded, and the most recent results compared to their history. Also, keep in mind that the first tests should be done even before equipment is placed into service, such as for new motors, or new cables. The initial reading establishes a base-line to compare to, and may indicate faulty equipment or sub-par conductors that ought not to be installed at all.

The common method of testing the insulation resistance of a cable is to apply a test voltage with a meter, between the metallic conductor and the outer jacket, or from the conductor to ground if the cable has an armored shield, and measure the resulting current. The circuit is formed by the insulation material. No insulator is perfect and a current will flow in the insulation. If the insulation is good, i.e. a very high resistance, then the current will be very small. The insulation (or dielectric) resistance is calculated from Ohm's law from the applied voltage and the current.

Testing many cables in a day, whether already installed in a facility, or in a storage area prior to installation, can be a time-consuming exercise. Multi-conductor cables require a specific method of measurement to go through all the combinations to measure the resistance of each conductor relative to each other. For a cable with 4 conductors (A, B, C, G) the operator must manually change test clip connections six times when equipped with only a pair of test leads and clips. (To test the combinations A to B, A to C, C to A, A to G, B to G, C to G). For cables with 5 conductors takes ten connect/ re-connect operations.

If insulation measurement is done on one cable then changing individual test clips 5 times is not especially burdensome, but for performing tests many times a day, such as on several new cable drums prior to installation, connecting and reconnecting test leads does become burdensome and time consuming. The sheer number of connecting and re-connecting test leads can introduce connection errors unless there is a rigorous procedure to keep track of all testing combinations, and to make sure all combinations are measured. With previous test meters, operators often encountered frequent problems related to re-connection errors, often forcing the operator to repeat the entire set of measurements. Fortunately, Sonel has developed a solution to eliminate numerous reconnections errors, test all conductor pair combinations without fail, and improve productivity and work efficiency; the AutoISO-5000 adapter.

The AutoISO 5000 in conjunction with a Sonel insulation test meter is designed to automate the insulation testing of multi-conductor cables, as follows:



Measuring multi-conductor power cables with grounding using AutoISO-5000 adapter.

- 1) 5 test clips are provided to test up to 5 conductors so that the operator makes the connections once, and does not have to un-clip and re-clip for each set of conductor pair insulation tests.
- 2) It is controlled by a Sonel insulation test meter (MIC-10s1, or MIC-5s1). When connected, the AutoISO adapter is automatically detected by the insulation meter which switches to the automatic measurement mode.

- 3) It is programmed to automatically sequence through all combinations of conductor to conductor, and each conductor to ground. This eliminates missed tests.
- 4) The insulation tester saves all testing results in memory that can be downloaded to a PC for report.
- 5) The AutoISO adapter allows for complete measurements of multi-conductor cables with test voltages up to 5 kV.

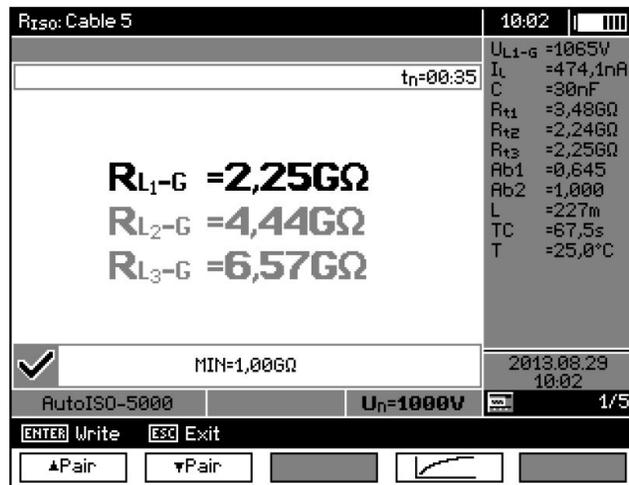
Operation is simple. The AutoISO is connected to the insulation meter. Temperature must be taken into account; Sonel provides a temperature probe that is connected to the test meter. The meter operator just chooses the test voltage and the method of measurement, connects the test clips to the cable conductors, and then presses the START button. All pairs of conductors will be measured automatically. For operator safety, the cable is always automatically discharged after the measurements are complete. The results for each set of tests are stored in meter's memory by pressing the ENTER button.

The AutoISO adapter saves time, and money, by reducing the number of manual connect and re-connect operations of test leads. Once the test leads are connected, the possibility of errors, such as missing a conductor pair, or testing a pair that had already been previously tested, is eliminated. The AutoISO takes over testing all pair combinations, so the possibility of failing to test any individual pair of conductors is also eliminated. On average, the time to test a 4-conductor cable by the manual method, if just performing a short insulation test for each pair, takes approximately 5-6 minutes. The automatic method reduces this time to less than 2 minutes. This time savings accrues significantly when testing multiple cables in a day.

Total test time also depends on how many tests are chosen. If the operator includes all tests such as leakage current, dielectric absorption ratios, polarization index, capacitance, length, temperature, performing all tests could take up to 10 minutes per conductor pair (polarization index measurement needs several minutes); a 4-conductor cable would require almost one hour for all tests. When testing multiple cables in a day, and performing all tests, time savings are less significant since the time it takes to connect and re-connect test leads is small compared to the time it takes for the test meter to run through all its measurements. However, the benefits of eliminating connection errors, and ensuring that all conductor pairs are tested, are still enjoyed.



AutoIso5000 adapter connected to Sonel insulation meter and cable under test



Measurement results with AutoISO-5000

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September 2016