

Megohmmeter Model 1060: Taking and Storing a Measurement

This Application Note explains some of the basic functions of the AEMC Megohmmeter Model 1060. We begin by describing how to set up the instrument for testing. We then demonstrate two commonly used methods for testing insulation resistance: the manual “spot reading” test, and the timed resistance test. Along the way, we describe how to store results in the instrument. We also show how to display Polarization Index and Dielectric Absorption Ratio values, both of which are automatically calculated by the instrument.

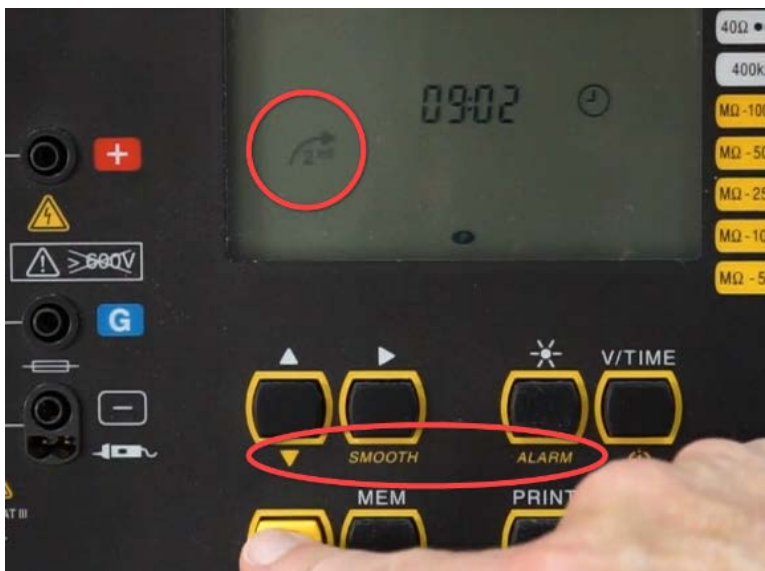
Safety

Before performing any insulation resistance test, be sure to observe all safety instructions specified in the documentation that comes with your test instrument. Insulation resistance testing involves the application of high DC voltages. Therefore carefully preparing the system under test, and the instrument used to conduct the test, is crucial to your safety and helps prevent damage to your wiring and machinery, and personal injury to you and others.

1. Setting the Date and Time

The first task is to ensure the instrument’s time and date information is correctly configured. An accurate clock is essential for analyzing test results to identify trends over time.

1. Turn the instrument’s Rotary selector switch to SET-UP. After a few moments the message **PUSH btn** appears on the LCD, indicating the instrument is in configuration mode.
2. Press the V/TIME button to display the current time. The hours setting blinks, indicating it is in edit mode. Use the Up and Down buttons to change the time if necessary. To activate the Down button, press the yellow 2nd key to display the 2nd symbol on the LCD. While this symbol is displayed, buttons perform the functions shown in yellow. For example, in 2nd mode the Up button becomes the Down button; pressing it decreases the displayed value. To leave 2nd mode, press the yellow 2nd button.



3. When finished setting the hours, press the Right button to edit the minutes setting.
4. Press V/TIME to display the current date, and use the Up, Down, and Right buttons to select settings and make changes.
5. When finished setting the date, press V/TIME to select the format in which the time and date are displayed. Options are USA and European formats. Use the Up button to make the selection, and press V/TIME to return to the PUSH btn screen.

Manual “Spot Reading” Measurement

The first type of test we'll examine is often called the Spot Reading measurement. This is relatively straightforward: simply connect the megohmmeter leads across the insulation to be tested, apply test voltage for a fixed period of time (typically a few seconds or so), then take a resistance reading. Spot testing is suitable for a system with small or negligible capacitance effect, for example a short wiring run.

1. With the instrument OFF, connect the leads to the terminals and the insulation to be tested. Then turn the instrument rotary selector switch to a test voltage setting. In general, the higher the resistance to be measured, the higher the test voltage. In cases where the resistance is unknown, it's good practice to start with the lowest voltage, and gradually increase until the measurement results are consistent. As another rule of thumb, we recommend testing at twice the system voltage, as long as the system voltage does not exceed 1000 volts. In our example, we will start with the 250 volt setting.
2. After a few moments a voltage reading appears on the screen. This is the external voltage present in the test specimen. As a safety feature, if during testing external voltage exceeds 25 volts, a warning symbol appears and the instrument immediately stops the test.
3. To measure resistance, press the START/STOP button. The voltage reading changes to the test voltage. At the top of the screen an analog meter displays the measurement visually. After a few seconds, the resistance reading appears in the main display. Also note the flashing symbol, alerting you that the test voltage is higher than 120 volts.



4. The reading will continue until you press START/STOP a second time. The analog meter disappears, and the final resistance measurement and test voltage are displayed.
5. You can now save the test results in the instrument's memory. With the test displayed, press the MEM button. At the top of the display is a meter indicating how much instrument memory is free for storing tests. In the example shown below, all memory is free.
6. In the middle of the display is the Object and Test numbers, with the Test number blinking. An object can be thought of as a "box" of test results. Up to 99 objects can be stored in memory, and each object can store up to 99 tests. The displayed numbers are derived by incrementing the Object and Test combination of the most recent test stored in memory. In the following example no tests are in memory, so by default the test will be stored as Test 1 in Object 1.



To change this setting, use the Up, Down, and Right buttons to select and change the Object and Test fields. Then press MEM to store the measurement.

Note that a single Spot Reading test is of limited value. But the results become meaningful when a series of tests, all featuring the same test voltage and duration, are performed over time and the results compared. This comparison can help predict a potential insulation failure in time to take preventive action.

Timed Resistance Test

Now we'll demonstrate a more complex insulation resistance measurement method known as the timed resistance test. This involves configuring the test to run for a defined period of time. Timed resistance tests on large rotating electrical machinery, especially systems with high operating voltage, require high insulation resistance ranges and a very constant test voltage. This test is also useful for measuring resistance in transformer windings and cable insulation. Since this test provides meaningful results within a single 10-minute duration, it is relatively independent of temperature. It is also independent of the size of the system under test.

By recording measurements at certain intervals during the timed test, the Model 1060 can automatically calculate and display values such as the Polarization Index and the Dielectric Absorption Ratio.

To configure and run a timed test:

1. Turn the rotary selector switch to SET-UP.
2. Press the yellow 2nd button, then press the Clock button. This displays how long the test will run, in minutes and seconds.

3. Use the Up, Down, and Right buttons to change these settings. In our example, we will set the test duration to 10 minutes.
4. Configure additional parameters such as data storage rate, alarms, and variables that determine how Dielectric Absorption Ratio is calculated. These are described in the Model 1060 user manual.
5. Connect the instrument to the test specimen, as instructed by the Model 1060 user manual.
6. Turn the rotary selector switch to the desired voltage setting.
7. Press the yellow 2nd button, then press the clock button. The clock symbol now appears on the LCD.
8. Press the START/STOP button. After a few seconds the resistance reading appears on the screen.
9. The test will run for the duration of the time configured through SET-UP. As the test runs, the LCD displays how much time remains before test completion.



When the test is finished, the last instantaneous resistance measurement appears on the screen. You can cycle through all measurements taken during this test by pressing the yellow 2nd button and then pressing the R(t) button. This displays the first measurement recorded during the test, along with the time it was taken. Use the Up and Down buttons to scroll through test results. The interval between each saved sample is programmed in the SET-UP menu.

10. Note the blinking clock symbol, indicating you are viewing incremental test results. To leave this mode, press the 2nd button and then press R(t).

Polarization Index (PI) and Dielectric Absorption Ratio (DAR)

We can now view the Polarization Index and Dielectric Absorption Ratio values. These are commonly called PI and DAR respectively.

The R-DAR-PI button lets you cycle through the resistance, PI, DAR, and capacitance values. For instance, to display the Dielectric Absorption Ratio, press R-DAR-PI after the test measurement is complete. The instrument automatically calculates DAR by dividing the 1 minute measurement by the 30 second measurement. Although DAR is no longer commonly used with newer insulation systems that require longer than one minute of stress before breakdown, it still may have applicability when testing older insulation materials.

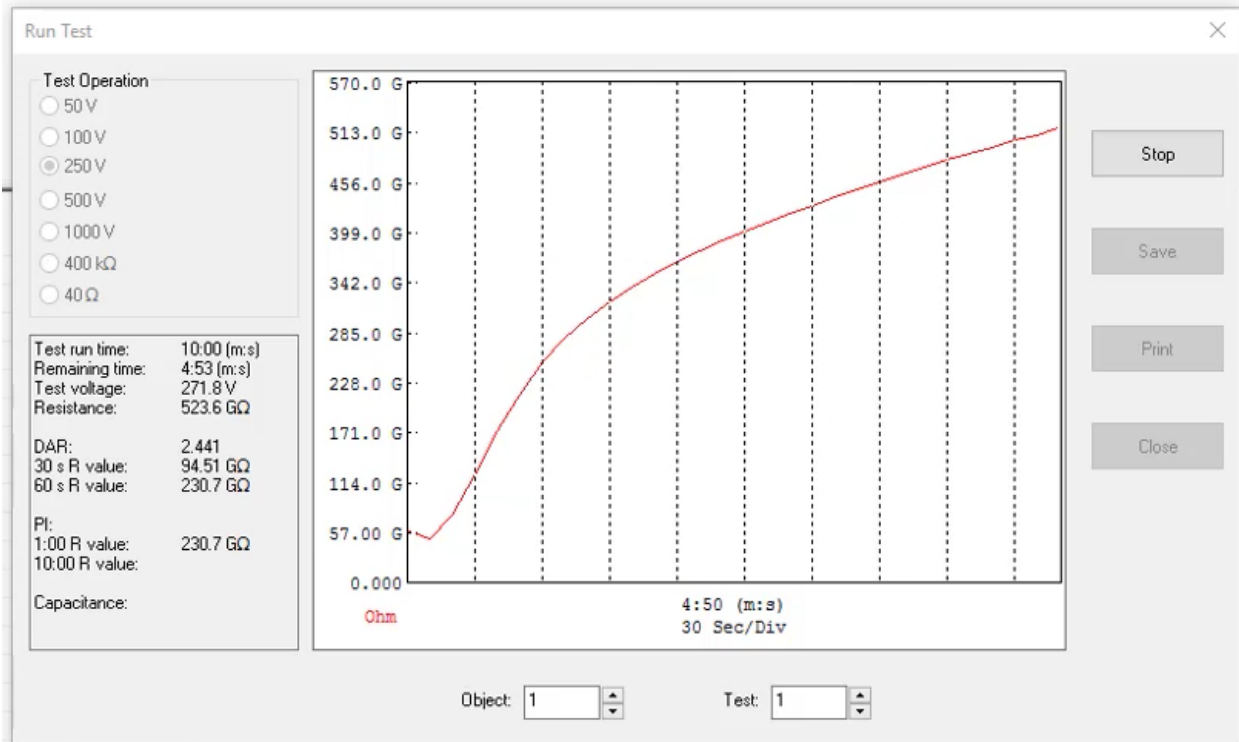


With the Dielectric Absorption Ratio displayed, press R-DAR-PI to display the Polarization Index. This value is derived by dividing the 10 minute resistance measurement by the 1 minute measurement.

Polarization Index and Dielectric Absorption Ratio are useful on long cables, or when monitoring the aging of insulation on electrical machines. Measurements of this type can be initially affected by interfering currents from capacitive charges and dielectric absorption. After test voltages have been applied for several minutes, these influences eventually cancel out each other. So to ensure accuracy, measurements should be performed over an extended period, typically 10 minutes or more.

DataView

An important feature of the Model 1060 is its ability to be configured and operated from a computer running DataView software. Once connected, you can set up and start a test, and view measurement results graphically in real time.



This provides an easy-to-understand view of your test results, to help determine whether or not they indicate a possible problem. DataView also enables you to download tests stored in the instrument, generate reports from this data, and perform numerous other tasks including instrument configuration. This is the topic of a separate Application Note.