AEMC® INSTRUMENTS
CHAUVIN ARNOUX GROUP
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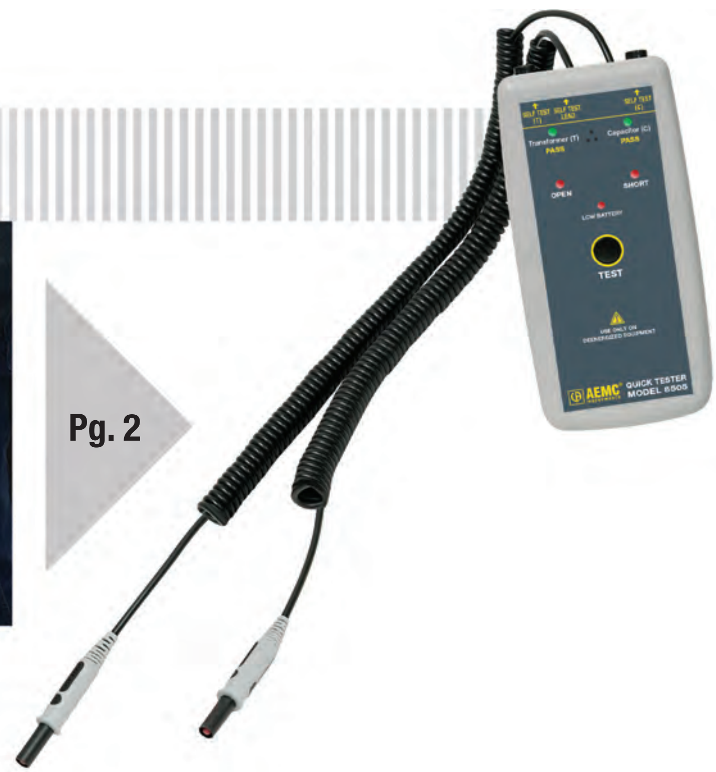
Issue 06 | "WATTS CURRENT" BULLETIN | Summer 2015

TECHNICAL BULLETIN

Featured Product:
Quick Tester Model 8505

Pg. 2



Inside this Issue:

Featured Product:

AEMC® Quick Tester Model 8505 Transformer and Capacitor Tester

The AEMC® Quick Tester Model 8505 is a hand-held instrument for performing basic integrity tests on transformers and capacitors used by manufacturers and electrical utilities. This instrument is a fast and inexpensive inspection tool for detecting opens or shorts caused by shipping damage or workmanship issues.

The Quick Tester verifies transformers with functional coils without requiring a full transformer ratio test. A single user can check a shipment of incoming transformers; defective units can be quickly identified and turned around for repair. Typical users include maintenance and management personnel at electrical utility suppliers, and transformer manufacturers and repair facilities.

With the Quick Tester, you can test:

- Transformers that have newly arrived at your facility. During transport, vibration and shock can cause the transformer coils to short, open, or disconnect from the terminals. Although it's possible for a transformer turn ratiometer to test for integrity; this type of instrument requires more time and labor to connect to the transformer and perform the test. The Quick Tester can perform a very fast and simple integrity test, enabling you to test multiple transformers in a short amount of time.
- Transformers transported back to the repair facility. The instrument ensures that the basic continuity of each coil is intact before performing more detailed tests.
- Capacitor terminals or plates that may be damaged. The instrument can quickly determine whether or not a capacitor is still functioning to determine whether more detailed tests and repairs are necessary.

The Quick Tester features internal multi-frequency ACV source and loads to accommodate the testing of a wide range of transformers and capacitors. Its microprocessor-based design provides a high level of control, stability, and repeatability. The instrument features simple operation; the user only needs to make the proper connections and push a button. Test results are clearly indicated by bright LEDs and (when applicable) a buzzer. It also automatically detects whether or not the unit under test is a transformer or a capacitor. Other features include built-in self-test components and an indicator providing ample warning for low battery.

The instrument includes captive cables with a test probe and two alligator clips, and operates on four AA batteries. A carrying pouch is included. Note that the probe and alligator clips are threaded and must be screwed onto the cable.

The Quick Tester is a companion product to AEMC's ***DTR Model 8510*** digital transformer ratiometer. The Model 8510 provides more detailed information about the unit under test, but requires more time to set up and obtain results. For example, the Quick Tester can determine whether or not to accept or reject the incoming transformer; the Model 8510 is then used to measure the actual turns ratio of the transformer.

Note that if a transformer coil is partially damaged – for instance, some internal turns have shorted but there is continuity as a coil -- or if a capacitor is partially damaged but is still functioning as a capacitor, the Quick Tester will not detect an error.

Self-Test Features

The Quick Tester provides self-test features that ensure the instrument is functioning properly.

1. Locate the SELF TEST LEAD, labeled at the top of the instrument's front panel.
2. Attach the probe to the SELF TEST LEAD by inserting the lead into the probe and then screwing it in.
3. Attach one of the alligator clips to the other (unlabeled) lead.
4. With the probe and clip separated, press the TEST button. The red OPEN light should blink while the button is depressed. Release the button.
5. Connect the alligator clip to the probe tip, and press the TEST button again. The red SHORT light should blink while you hold down the button.

6. Separate the probe from the clip. Insert the tip of the probe into the terminal labeled SELF TEST (T), and then press the TEST button. The green Transformer PASS light should blink, and the buzzer should emit a steady sound.
7. Insert the probe into the terminal labeled SELF TEST (C), and press TEST. The green Capacitor PASS light should blink, and the buzzer should sound.

If any of the preceding tests fail to produce the expected response, return the instrument to AEMC® for repair.

Safety

Before performing a test on a capacitor or transformer, ensure it is fully de-energized. Testing an energized transformer or capacitor is a potential shock hazard to the user and may damage the instrument.

When checking the secondary side of transformers, note that high voltage may be present on the primary side. Be sure to avoid any contact with primary-side connections that have not been fully de-energized.

In most single-phase power transformers, the primary coils are accessible over the insulator bushings; the secondary coils are more easily accessible over the tank. Note that you should disconnect the fuse on the primary side while checking the integrity of the secondary coils.

Also be sure that the terminals are clean and free from oxidation. Use a wire brush or similar implement to ensure good electrical contact between the terminals and the Quick Tester's clip and probe.

Transformer Testing

Transformer terminals can be tested in any order. In this example, we will first test the secondary coil. Ensure that the secondary circuit breaker is in the ON position. Connect the alligator clip to one terminal of the secondary and touch another terminal with the probe. The secondary coil terminals are labeled X1, X2, and (for transformers with center-tapped terminals) X3.

If the secondary is not center-tapped, test across X1 and X2. If it is center-tapped, also test across X1 and X3, and X2 and X3.

In all combinations, pressing the TEST button should result in the Transformer PASS light blinking and the buzzer sounding.

Turn the secondary circuit breaker to the off position, and repeat these tests. In each test, the red OPEN light should blink.

Now test the primary coil. Testing across the terminals should result in a Transformer PASS indication, while testing each primary to a secondary terminal – or to the transformer's casing -- should produce an OPEN indication.

Finally, after each test session it is good practice to once again run through the Quick Tester's cycle of self-tests, to ensure the instrument remains in working order.

Testing a Capacitor

To test a capacitor, you must first remove the shorting bar if installed. If one is not installed, connect a shorting bar and follow the procedure for fully discharging the capacitor before testing. And as with transformers, be sure the capacitor terminals are free of oxidation that may prevent good electrical contact. Clean them with a wire brush if necessary. Then connect the alligator clip to one terminal and touch the probe to the other.

If the capacitor is functional, the green Capacitor PASS light blinks and the buzzer sounds. If the capacitor is shorted, the red SHORT light blinks and no buzzer sounds.

This concludes our introduction to the Quick Tester Model 8505. For more detailed information about using the Quick Tester, including how to perform tests on various configurations of three-phase transformers, consult the documentation that comes with the instrument. You can also visit the ***Model 8505 Product Page*** for additional specifications.

Customer Support Tip:

Clamp-On Current Probe Selection Guide

By Guy Belliveau

Clamp-on current probes extend the current measuring capabilities of DMMs, power instruments, oscilloscopes, hand-held scopes, recorders/loggers, and other instruments. The probe is “clamped” around the current-carrying conductor to perform non-contact current measurements without interrupting the circuit under test. The probe generates a current or voltage signal directly proportional to the measured current; thereby providing current measurement and display capabilities to instruments with low-current or voltage inputs.

It is important to note when using a current probe that produces a current output, you must first connect it to the instrument before clamping around a live conductor. This will avoid the high voltage condition that can be present on the output of the probe and chattering that will occur on if unterminated.

When a clamp-on probe makes a measurement, the current-carrying conductor remains unbroken and electrically isolated from the meter input terminals. As a result, the meter’s low input terminal may be either floated or grounded. It is not necessary to interrupt the power supply when using a clamp-on current probe for taking measurements; so costly downtime can be eliminated.

True RMS measurements within the probe frequency response are possible by using most AEMC® current probes with a True RMS multimeter. In most cases, RMS measurements are not limited by the probes, but by the instrument to which they are connected. Best results are provided by probes offering inherently high accuracy, good frequency response, and minimal phase shift.

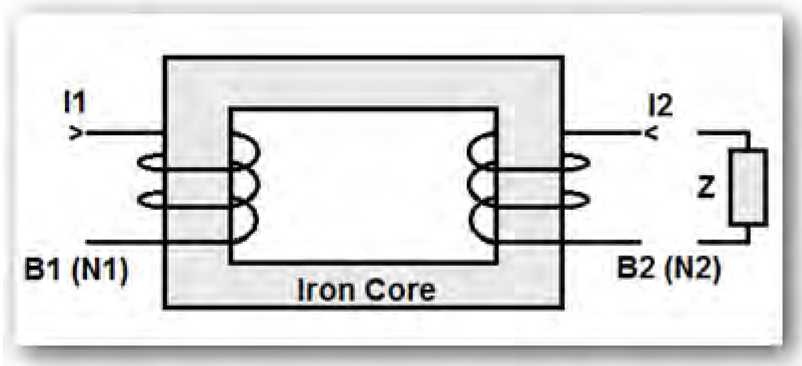
AEMC® offers the widest selection of current probes available to measure AC or DC current. Several AEMC® probes are patented for their unique circuitry and design; and the majority are UL approved.

When selecting a probe, consider the following questions:

- Are you measuring AC or DC?
  DC current probes are categorized as AC/DC because they measure both.
- What are the maximum and minimum currents you will measure? Ensure the probe provides the required accuracy when measuring its low range, or select a probe specifically designed for low current. Most probes provide greater accuracy at the upper ends of their ranges.
- What size conductor will you clamp onto? This parameter determines the probe jaw size needed.
- What type of probe output will work (mA, mV, AC, DC, etc.)? Check the maximum receiver impedance to ensure that the probe will perform to specifications.
- What is the working voltage of the conductor to be measured? AEMC® probes must not be used above 600V (per specifications).
- What type of output termination do you need: lead with BNC, lead with 4mm safety banana plugs, or jacks to accept 4mm leads?
- Will the probe be used for harmonics or power measurements? Look at the frequency and phase shift specifications.

AC Clamp-On Current Probes

An AC clamp-on current probe is a simple current transformer. A transformer is essentially two coils wound on a common iron core:



A current I1 is applied through the coil B1, inducing through the common iron core a current I2 in the coil B2.

The number of turns of each coil and the current are related by:

N1 x I1 = N2 x I2

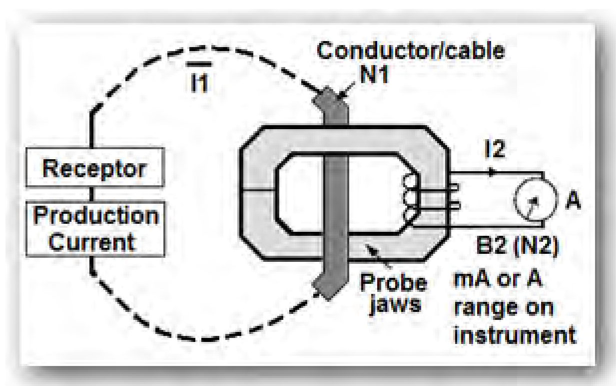
where N1 and N2 are the number of turns in each coil. From this relationship:

I2 = N1/N2 x I1 or I1 = N2/N1 x I1

This same principle is applied to a clamp-on current probe. The articulated magnetic core holds the coil B2 and clamps onto a conductor where the current I1 is flowing. B1 is simply the conductor where the user is measuring the current, with the number of turns N1 equal to one. The current probe clamped around the conductor provides an output proportional to the number of turns in its coil B2, such that:

I2 (probe output) = N1/N2 x I1

where N1 = 1 or probe output = I1/N2 (number of turns in the probe coil).



It is often difficult to measure I1 directly because of currents which are too high to be fed directly into a meter or simply because breaking into the circuit is not possible. To provide a manageable output level, multiple turns are set into the probe coil bobbin.

The number of turns in the clamp-on coil is generally simple multiples (for instance 100, 500 or 1000). If N2 equals 1000, then the clamp has a ratio of N1/N2 or 1/1000, which is expressed as 1000:1. Another way to express this ratio is to say that the probe output is 1mA/A - the probe output is 1mA (I2) for 1A (or 1A @ 1000A) flowing in the jaw window.

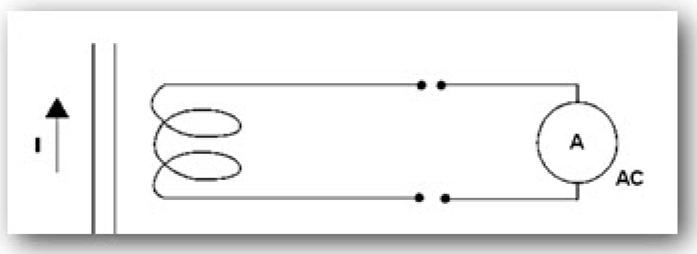
There are numerous other ratios possible (500:5, 2000:2, 3000:1, 3000:5, and so on) for different applications.

The most common application is the use of a current probe with a digital multimeter. Take as an example a current probe with a ratio of 1000:1 (Model SR604) with an output of 1mA/A. This ratio means that any current flowing through the probe jaws will result in a current flowing at the output that is 1000 times smaller:

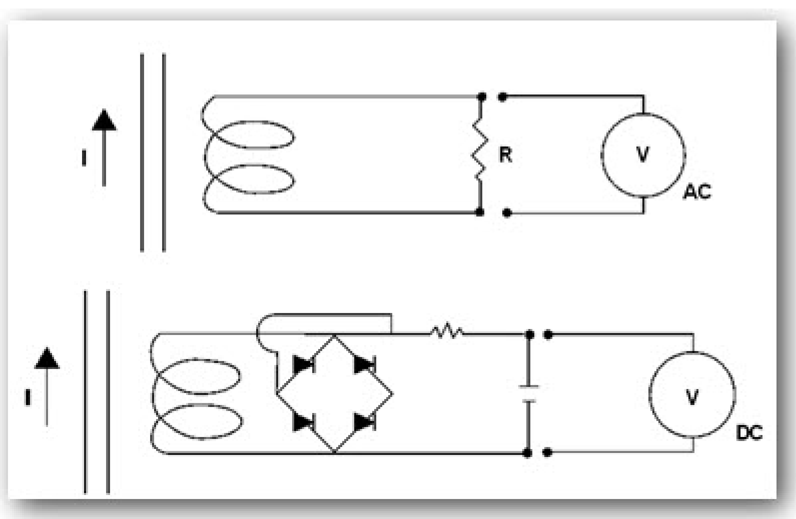
Conductor	Probe Output (1000 times less or 1mA/A)
1000A	1000mA (1A)
750A	750mA
250A	250mA
10A	10mA

The probe output is connected to a DMM set on the AC current range to handle the probe output. Then, to determine the current in the conductor, multiply the reading of the DMM by the ratio (e.g. 150mA read on the 200mA DMM range represents 150mA x 1000 = 150A in the conductor measured).

Current probes can be used with other instruments with current ranges, provided that these instruments have the required input impedance:



Current probes may also have AC or DC voltage outputs to accommodate current measurements with instruments (loggers, scopes, etc.) with voltage ranges only:

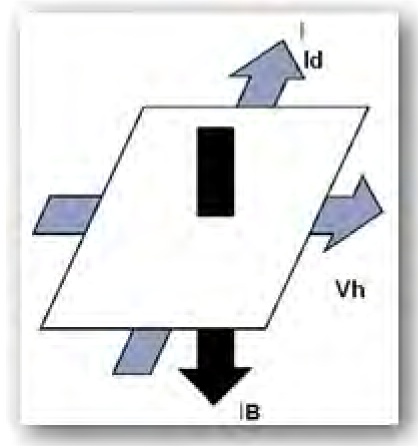


This is simply done by conditioning the current probe output inside the probe to provide voltage (e.g., Model MN251). In these cases, the probe mV output is proportional to the measured current (e.g., 1mVAC/AAC).

AC/DC Clamp-On Current Probes

Differing from traditional AC transformers, AC/DC current sensing is often achieved by measuring the strength of a magnetic field created by a current-carrying conductor in a semiconductor chip using the Hall effect principle.

When a thin semiconductor is placed at right angles to a magnetic field (B), and a current (Id) is applied to it, a voltage (Vh) is developed across the semiconductor. This voltage is known as the Hall voltage, named after the US scientist Edwin Hall who first reported the phenomenon.

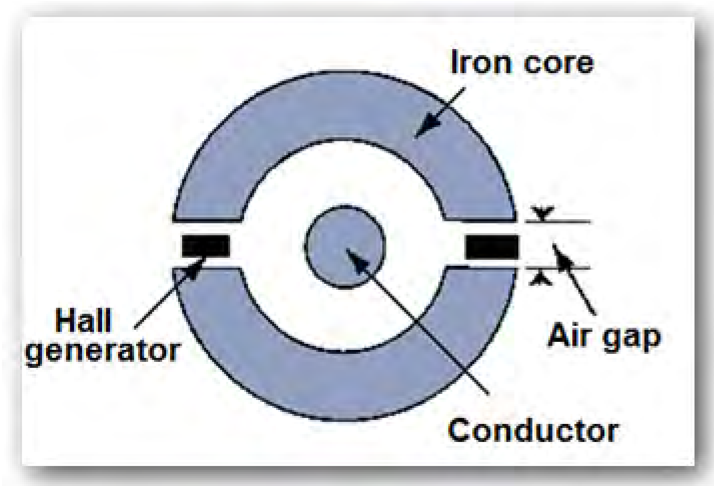


When the Hall device drive current (Id) is held constant, the magnetic field (B) is directly proportional to the current in a conductor. Thus, the Hall output voltage (Vh) is representative of that current. Such an arrangement has two important benefits for universal current measurement.

First, since the Hall voltage is not dependent on a reversing magnetic field, but only on its strength, the device can be used for DC measurement.

Second, when the magnetic field strength varies due to varying current flow in the conductor, response to change is instantaneous. Thus, complex AC waveforms may be detected and measured with high accuracy and low phase shift.

The basic construction of a probe jaw assembly is shown below (note that one or two Hall generators are used depending on the type of current probe).



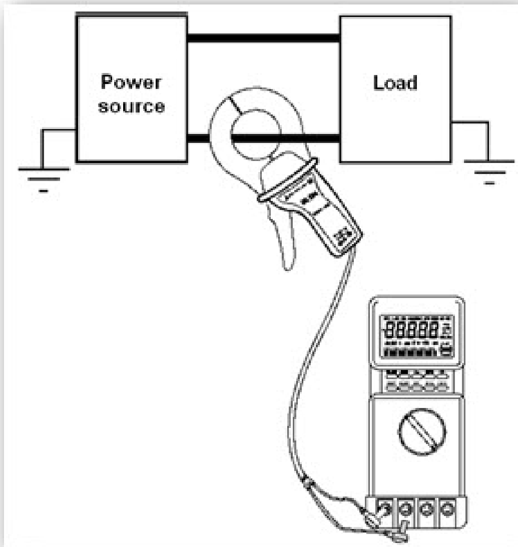
Many AEMC® AC/DC current probes have been developed based on the above principle, together with patented electronic circuitry incorporating signal conditioning for linear output and a temperature compensation network. These have a wide dynamic range and frequency response with highly accurate linear output, for application in all areas of current measurement up to 1500A. Direct currents can be measured without the need of expensive, power-consuming shunts; and alternating currents up to several kHz can be measured with fidelity to respond to the requirements of complex signals and RMS measurements.

The probe outputs are in mV (mVDC when measuring DC, and mVAC when measuring AC) and can be connected to most instruments with a voltage input, such as DMMs, loggers, oscilloscopes, hand-held scopes, recorders, and others. AEMC® also offers different technologies for DC measurements such as in the Models K100 and K110 designed to measure very low DC currents, using saturated magnetic technology. AC/DC probes also offer the opportunity to display or measure True RMS in AC or AC + DC.

AC or DC Current Measurement

The basic steps for measuring AC or DC current are as follows:

1. Connect the probe to the instrument.
2. Select the function and range.
3. Clamp the probe around a single conductor.
4. Read the conductor's current value (see below).

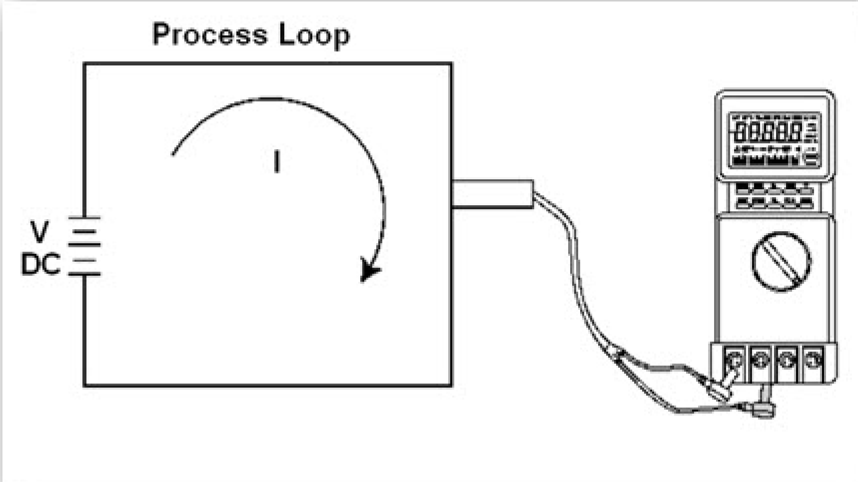


The following AC and DC probes can be used in this setup:

- **AC Current Probe Model SR604**
  Ratio: 1000:1
  Output: 1mAAC/AAC
  DMM: Set to mAAC range
  DMM Reading: 125mAAC
  Current in Conductor: 125mA x 1000 = 125AAC
- **DC Current Probe Model MR521**
  Output: 1mVDC/ADC (Hall sensor)
  DMM: Set to mVDC range
  DMM Reading: 160mVDC
  Current in Conductor: 160ADC
- **AC Current Probe Model MR411**
  Output: 1mVAC/AAC (Hall sensor)
  DMM: Set to mVAC range
  DMM Reading: 120mVAC
  Current in Conductor: 120AAC
- **DC Micro Probe Model K100**
  Output: 1mVmA
  DMM: Set to mVDC range
  DMM Reading: 7.4mVDC
  Current in Conductor: 7.4mA

Low Current, Process Loops, Leakage and Differential Measurements

Numerous probes are offered for low current measurements. For example, the Models K100 and K110 provide 50µADC sensitivity and the Model K110 can be used on 4 to 20mA process loops.



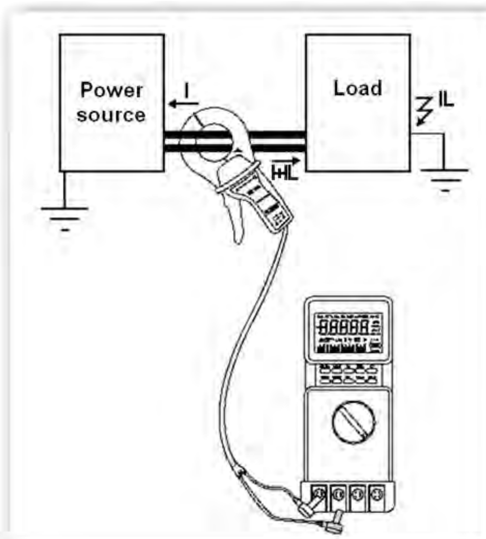
For example, the following probe can be used in process loops:

- **4 to 20mA Loop Probe Model K110**
  Output: 10mV/mA
  DMM: Set to mVDC range
  DMM Reading: 135mVDC
  Loop Current: 13.5mADC (135/10)

When the current to be measured is too low for the probe or better accuracy is required, it is possible to insert the conductor multiple times through the probe jaws. The value of the current is the ratio of the reading to the number of turns.

The Model SR604 is an example of a probe that can be used for this type of measurement:

- **AC Current Probe Model SR604**
  Ratio: 1000:1
  DMM: Set to mAAC range
  Turns in Probe Jaw: 10
  DMM Reading: 60mAAC
  Current in Conductor: 60mA x 1000/10 = 6000mA = 6A



When the probe is clamped around two conductors with different polarities, the resulting reading will be the difference between the two currents. If the currents are the same, the reading will be zero.

When a reading other than zero is obtained, the reading is the amount of leakage current on the load. To measure low currents or leakage, you need a clamp-on probe which will measure low values, such as the Model 2620. Leakage current on grounds also may be measured directly with the Model MN307 or SR759.

Flexible Sensors

Another way to measure AC current is to use the AmpFlex® and MiniFlex® sensors. These are based on the principle of the Rogowski coil. The primary circuit is constituted by the conductor carrying the alternating current to be measured, while the secondary is formed by a special coil wound on a flexible support. At its terminals, this coil develops a voltage proportional to the derivative of the primary current to be measured:

$$u = \mu 0.n \times S.\ di\ 2\pi.r\ dt$$

where:

$\mu 0$ = vacuum permeability

S = surface area of a turn

n = number of turns

r = core radius

The AC voltage u is then passed via a shielded cable to the casing containing processing electronics and a battery power supply.

Because there are no magnetic circuits on these sensors, they are very lightweight and flexible. Without magnetic circuits, there is no saturation effect or overheating. This feature ensures excellent linearity and low phase shift.

Choosing the correct current sensor doesn't have to be difficult. With the wide variety of sensors available in our **AEMC® catalog**, we likely have one that fits your needs.

If you have any questions about your application, please contact one of our Application Engineers at 1-800-343-1391 (x351) and we will be more than happy to help you make the correct choice.

About the Author:

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An Introduction to Insulation Resistance Testing

In a perfect world, electrical insulation would allow no current to flow through it. Unfortunately, a number of factors can over time result in the deterioration and ultimate failure of electrical insulation. Excessive heat or cold, moisture, dirt, corrosive vapors, oil, vibration, aging, and damaged wiring can all compromise an insulation system. Faulty insulation can result in equipment underperformance and downtime, and pose a serious danger to personnel.

To assess and monitor insulation integrity, several tests have been developed. These typically involve injecting a test voltage and then measuring resistance. This "stress tests" the insulation, similar to applying high water pressure to plumbing to test for leaks.

A regular program of resistance testing can detect insulation deterioration so it can be addressed before it becomes a major problem. Insulation resistance testing helps ensure personnel safety and optimal operation of equipment. It also helps evaluate the quality of repairs that may be required before equipment is put back into operation.

In this article, we discuss three commonly used methods for testing insulation resistance: the ***Spot Reading*** test, the ***Time Resistance*** test, and the ***Step Voltage*** test. These three tests are used primarily to test motor, generator, cable, and transformer insulation.

To perform these tests, you will need a megohmmeter with a timed test function. AEMC® Instruments offers a complete line of megohmmeters designed for insulation testing, ranging from 100V handheld instruments to heavy-duty models providing test voltages up to 15,000V.

And with some models, you can download and analyze the results on a computer running AEMC’s DataView® software.

You will also need a thermometer or similar temperature measurement device. And if the equipment temperature is below the dew point, a humidity measuring instrument will be necessary, especially when performing a spot test.

Safety

Before performing any insulation resistance test, be sure to observe the following safety measures, as well as any additional guidelines specified in the documentation that comes with your test instrument. Insulation resistance testing involves the application of high DC voltages. Properly 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.

Take the equipment under test out of service. Shut down the apparatus, open all switches, and de-energize the unit. Disconnect from all other equipment and circuits, including neutral and protective ground connections. Be sure to follow proper lock-out/tag-out procedures during this step.

Perform a thorough inspection of the system. In general, the more equipment included in a test, the lower the resistance reading. Therefore it is critical to inspect the system and understand exactly what you’re including in the test. Make note of any equipment that might be damaged by high test voltages, and either adjust the test voltage accordingly or exclude these components from the test.

Discharge capacitance before and after conducting an insulation resistance test. Note that AEMC® megohmmeters automatically discharge capacitance when not running a test.

Check current leakage at switches and other connections.

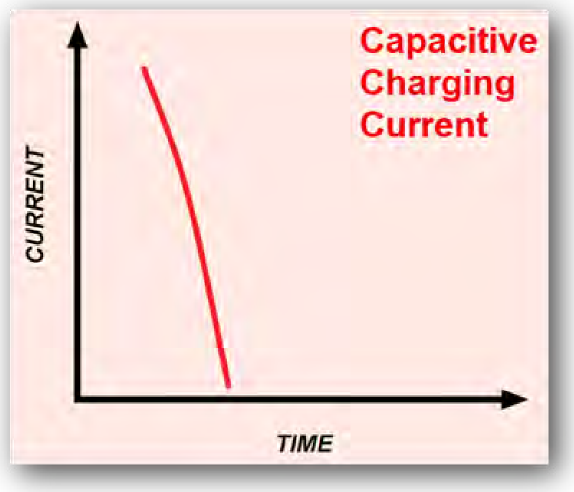
When performing the test, restrict personnel access to the test site. Also, be sure to use personal protective gear such as gloves where appropriate.

And after the test is complete, make sure the system under test is fully discharged. A minimum discharge time of four to five times the duration of the applied test voltage is recommended. Some insulation resistance test instruments feature a built-in circuit to ensure a safe discharge after the test. Instruments with this capability ensure devices are safely discharged after every test.

The Three Components of Insulation Current

To properly interpret test results, it’s important to understand that the total current flowing through the insulation consists of three components: capacitance charging current, absorption current, and conduction or leakage current.

Charging Current:



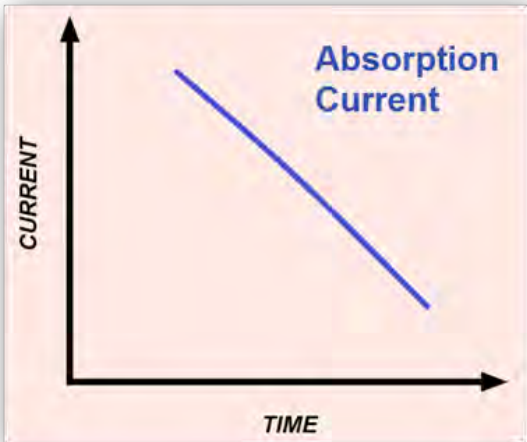
When two conductors are in close proximity separated by an insulator – for example, a length of common two-wire electrical cord -- they can act as a capacitor.

When test voltage is first applied, this capacitive charging effect results in current flowing through the conductors until the voltage across the insulation reaches the test voltage. Consequently, the initial resistance measurement will be relatively low and then quickly rise as the capacitance becomes fully charged.

This effect is usually brief; often lasting less than a second (although on very long cables or large motors this can last much longer, up to 30 minutes or more). Capacitive charging current is not an indicator of insulation quality; but it needs to be accounted for to ensure your measurements are meaningful and relevant.

Absorption Current:

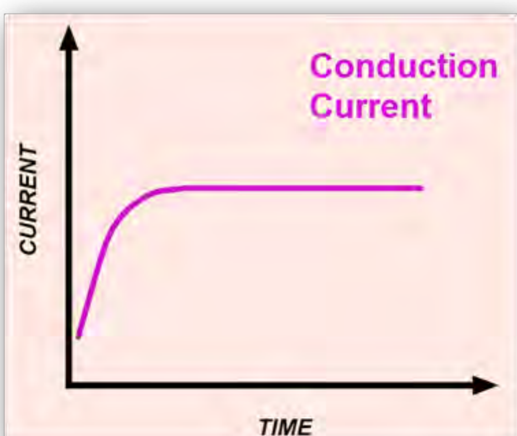
Absorption current, also called polarization absorption current, is caused by the insulating material becoming polarized by the electricity flowing through the conductor. As the polarization level increases, the absorption current decreases.



This gradual change reflects the storage of potential energy in and along the insulation. As a result, resistance is initially lower and then rises. This produces a measurement profile similar to capacitive charging current, but at a much slower rate; the effect can last from several seconds up to a minute or more.

The length of time it takes for absorption current to fall can be affected by moisture or other contaminants in the insulation material. Therefore absorption current is an important indicator of insulation integrity.

Conduction Current:

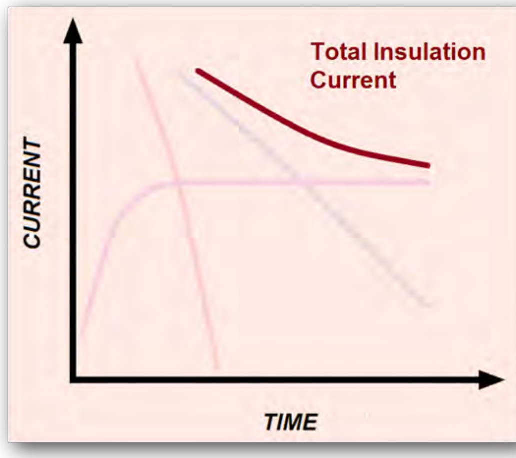


Conduction current, often called leakage current, is the steady current present both through and over the insulation.

This is a critical measurement, since an increase in conduction current over time is likely an indication of deteriorating or damaged insulation.

To summarize: for a typical test, the initial measurement primarily reflects capacitance charging current. After a period of time, absorption current is dominant. And beyond one to ten minutes, the measurement is mainly determined by conduction current, the primary value used to calculate the quality of insulation resistance.

Combining these three components produces a total insulation current profile similar to the illustration shown below:



Understanding how these individual currents contribute to the total insulator current can help you correctly interpret the results you receive when performing a test.

Environmental Factors

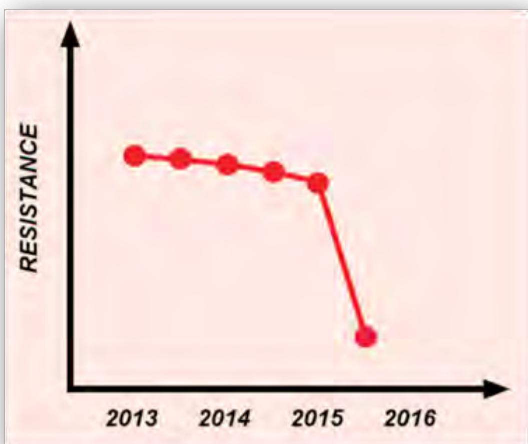
It's also important to be mindful of how environmental factors can affect resistance. For example, oil or soot on the equipment's surface can lower insulation resistance. And if the equipment's surface temperature is at or below the dew point of the ambient air, a film of moisture forms. This can significantly lower the equipment's resistance value.

Temperature is also a critical consideration. Insulation resistance can vary with temperature, with different materials exhibiting different rates of change. Ideally, all resistance testing should be done at the same temperature. If this is not possible, temperature should be carefully recorded so correction factors can be applied to the resistance measurements.

Spot Reading Test

The first type of insulation resistance test we'll examine is the Spot Reading test. 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 one to ten minutes), then take a resistance reading. Spot testing is suitable for a system with small or negligible capacitance effect, for example a short wiring run.

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 corrective action.



For example, suppose you perform a spot test every six months. By plotting the results on a graph, you observe a slow and gradual downward trend, as would be expected by the normal aging of the insulation. However, your latest measurement reveals a sudden drop in resistance. This is likely indication that the insulation has begun to deteriorate at an accelerated rate. To address this, you can schedule downtime for the system and take appropriate measures such as cleaning, upgrading, or replacing the insulation.

To ensure your results are valid, spot testing should ideally only be performed on systems with temperatures exceeding the dew point. If tests are performed at different temperatures, carefully record the temperature of each test and apply the appropriate correction to determine what the resistance would be if the test were performed at 68° F (20° C).

Time Resistance Test

Another insulation resistance measurement method is the Time Resistance test, also referred to as the dielectric absorption test. It involves conducting a 10 minute test. For the first minute, during which absorption current will have the highest effect on resistance, measurements are taken every 10 seconds. After the first minute, measurements are taken once per minute.

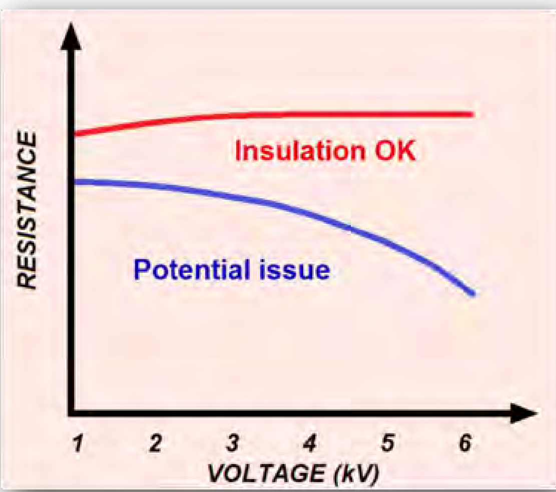
When you plot the results, you should see a curve that rises relatively rapidly at first, and then continues to gradually rise throughout the testing period. If instead the curve is relatively flat or begins to turn down as the test progresses, moisture, dirt, or other factors may be compromising your insulation.

Time Resistance tests on large rotating electrical machinery, especially systems with high operating voltage, require high insulation resistance ranges and a very constant test voltage. 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.

The Time Resistance test is sometimes associated with two values, the ***Polarization Index***, or PI, and the ***Dielectric Absorption Ratio***, or DAR. The Polarization Index is derived by dividing the 10 minute resistance measurement by the 1 minute measurement. The Dielectric Absorption Ratio is calculated by dividing the 1 minute measurement by the 30 second measurement. Although DAR is no longer commonly used with newer insulation systems; it still may have applicability when testing older insulation materials.

Step Voltage Test

A third method is the Step Voltage test. This involves testing at least two or more test voltages and comparing the results. The test begins at an initial test voltage. At a specified interval, typically one minute, a measurement is recorded, after which the test voltage is increased. This increase is usually to five times the initial voltage. This process may be repeated through several steps, with measurements taken after one minute and the test voltage increased at a five to one ratio over the previous voltage. A common practice is to test at five voltage steps.



The Step Voltage test is designed to create electrical stresses on internal insulation cracks, identifying potential problems that may not be revealed by testing at lower voltages. Insulation that is thoroughly dry, clean, and in good physical condition should provide roughly the same resistance measurements across the voltage range. If instead you observe a significant decrease in resistance at higher voltage, your insulation may be contaminated or deteriorating.

Step Voltage testing is also often used as a way to dry wet cables or equipment. Gradual voltage steps, applied for increasingly longer durations, can facilitate drying through heating.

This concludes our quick introduction to insulation resistance testing. As noted earlier, AEMC® offers a complete line of megohmmeters designed for quick and accurate testing of electrical insulation in a variety of devices, environments, and applications. Consult the AEMC® web site for to learn more about these instruments. And be sure to check our **YouTube channel** for further information about insulation testing and other topics in electronics.

AEMC® Interview:

Laura Cursack, Import/Export Manager

Laura Cursack oversees AEMC's international distribution network, covering a global territory that includes Central and South America, Australia and New Zealand, and all subsidiaries. Her primary responsibilities include assisting distributors with sales and technical questions. In this interview, Laura talks about her experiences serving this diverse and cross-cultural community.

Q. Briefly, what are some of your chief responsibilities at AEMC® Instruments?

A. I oversee all aspects of our day-to-day international sales (excluding Canada) and shipments (including Canada and all store orders). I handle our subsidiaries' orders and referrals, a handful of OEM accounts domestic and international (some of these are key accounts), and several house accounts, direct customers, and all export houses.

I take Compliance very seriously and make sure AEMC® is always up-to-date verifying that all import/export procedures are being followed and in compliance with U.S. Government regulations as well as AEMC's standards. I work very closely with our freight forwarders and broker mostly in product classification for import purposes.

I am proud to have written and continue to maintain our first Export Management System that delineates how we do business when it comes to exports.

Q. Do import and export regulations in the U.S. and other countries change frequently? How does AEMC® ensure it remains in compliance with these regulations?

A. Import/Export regulations change constantly, and at AEMC® we must make sure we comply at all times even before the government deadlines. We periodically attend seminars and participate in webinars, read publications when they become available, and contact our broker and Customs attorney for assistance and input when needed. We receive daily notifications and announcements from U.S. Census Bureau and the U.S. Department of the Treasury responsible of releasing all of the Office of Foreign Assets Control (OFAC) actions. We periodically check our distributors as well as all new customers and store order customers against the Specially Designated Nationals, Blocked Persons, Entity List, Denied Persons List of the Bureau of Industry and Security. We also abide by the Banned Countries List and the intended End Use of our product as specified by the Export Administration Regulations published and updated by the U.S. Department of Treasury.

Q. Has AEMC® formed partnerships with companies in other countries?

A. We don't have partnerships or joint-ventures with companies in other countries per se, but we manufacture international OEM products and have strong alliances with specific customers that use and promote our products overseas, who also publish articles about the qualities of our instruments.

Q. As a global company, what are some of the primary challenges AEMC® faces in doing business in different countries and regions?

A. We always keep in mind that local customs affect the way countries do business; and we do our best to understand why a customer might be requesting or doing something in a particular way. We must also remain alert for sudden political and economic changes in the countries we deal with to avoid mistakes that can cost us our export privilege. We also respect our subsidiaries' sales territories.

Q. Is doing business globally becoming more or less complicated compared to the past?

A. In some aspects it is much easier, especially with the broad use of the Internet and credit cards, and how banks have improved their wire transfers process. There are, however, more and more regulations specific to each country that must be observed; for example free trade agreements, CE/UL/Origin marking, need of import licenses, Customs requirements, etc. Everything must fall in place in order to have a smooth transaction and avoid penalties and delays. Attention to detail is paramount.

Q. How does AEMC® support a customer base from so many different countries (and speaking different languages)?

A. We offer PRs, brochures, and catalogs in Spanish to our Spanish speaking customers/distributors; while everyone else receives this material in English. Through Chauvin Arnoux we can offer some user manuals in five languages that prove to be very convenient to our Brazilian customers who speak Portuguese.

I personally love the thrill of picking up the phone and not knowing the language I will be spoken to! Answering a customer that is struggling to find or pronounce English words in his/her own language (most of the time) has generated many smiles but mostly sighs of relief! People really appreciate when we communicate with them in their language and are usually really candid about it.

Q. Does AEMC® adapt its products and services for certain regional markets? For example, are some products marketed more aggressively or positioned differently in some regions compared to others?

A. Absolutely! Trends as well as specific needs for particular countries are evaluated. When pertinent, we run promos, make special offers or grant special discounts according to the variables that we consider of importance at the moment. Since each country has its set of distinct regulations, we cannot treat them all the same. It takes constant review of the specific factors that are affecting a particular area. We have to combine this to what we need at that moment, whether it is launching a new product, or promoting an instrument, or moving inventory.

Q. What are some of the steps involved in launching a new product simultaneously in different countries?

A. Distributors and end users receive an email from Marketing as part of the email blast campaign. I also send our distributors the English and/or the Spanish Press Release and brochure, if available, and inform them the instrument's price and their discount as well as estimated lead time.

Q. How does AEMC® handle translations and other localization issues?

A. We sub-contract a company to translate our catalog. I assist with some translations for the catalog, as well as PRs, brochures, marketing ads, and web content. I edit all translations, including the entire catalog. I receive daily an incredible amount of technical questions that I translate back and forth between the customers/distributors and the engineers, until the situation has been solved/answered.

Q. How does AEMC® coordinate its international activities with the rest of Chauvin Arnoux?

A. Chauvin Arnoux is divided in sales territories. We adhere to this and refer all requests from outside our territory to whoever handles that particular country. In turn we receive referrals from our subsidiaries; while we will handle some of them direct at AEMC®, many must be referred to the particular distributor in a specific country. Purchase orders from any of the subsidiaries are handled like standard exports.

Q. Anything else?

A. My personal goal is that our customers will be satisfied with our instruments and that they will feel that they have been treated fairly and respectfully while remaining compliant with the U.S. export regulations. I want our customers to continue purchasing our instruments. I love happy customers!