

APPLICATION NOTE

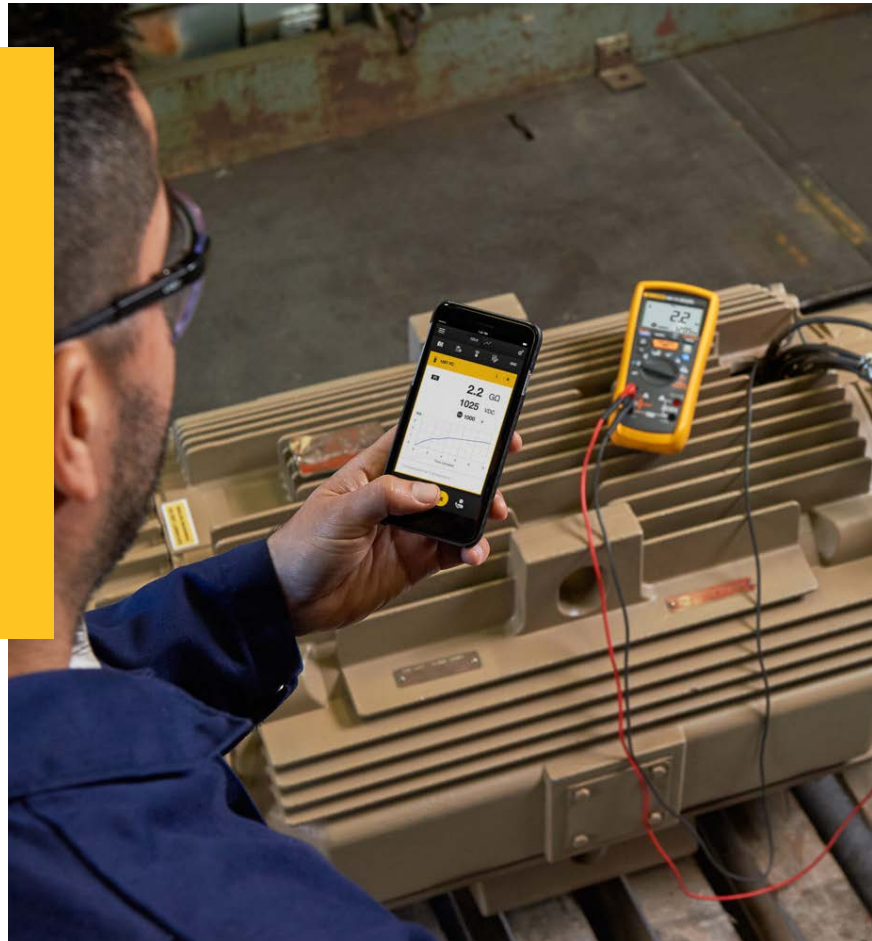
How to perform preventive maintenance with insulation resistance testing

Insulation testing is important to protect and prolong the life of electrical systems and motors. Periodic maintenance tests can provide valuable information about the state of motor insulation, determine what deterioration may have taken place and help in predicting possible failure of the system. Identifying and correcting problems before they result in total failure will result not only in a trouble-free system, but will also extend the operating life for a variety of equipment.

What information do I need to capture from insulation resistance testing to make sure the preventive maintenance program is sustainable and successful?

Comprehensive, quality data is the foundation of every successful preventive maintenance program. A good record keeping practice should cover a list of items (as shown in Figure 1) and make it easier and less time consuming to do so. Three things differentiate the Fluke 1587 FC and Fluke Connect® software from alternative solutions on the market:

1. With Fluke Connect tools and software, you can automatically transfer measurement data from the test tool to software. This includes not only the insulation resistance value and time stamp of the test, but also contextual information such as output test voltage, test duration and temperature compensation (see page 2 for further explanation).
2. You can organize measurements by equipment and by work order, with just one click.
3. You can enter text and voice notes to communicate findings and share knowledge.



How can I tell if an insulation resistance value is good or bad?

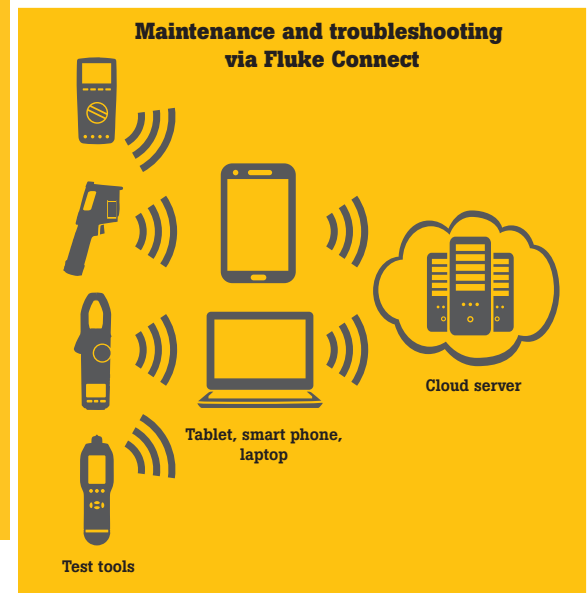
An insulation spot test should be performed at regular intervals (e.g. every six months) to track the changes in insulation integrity over the life of a motor or a critical piece of equipment.

When you have several months of test results, Fluke Connect Assets software (sold separately) automatically generates a trending graph based on the historical spot test results from all your inspections (see Figure 2). This graph makes it easier for you to identify degradation issues and make real-time decisions right in the field.

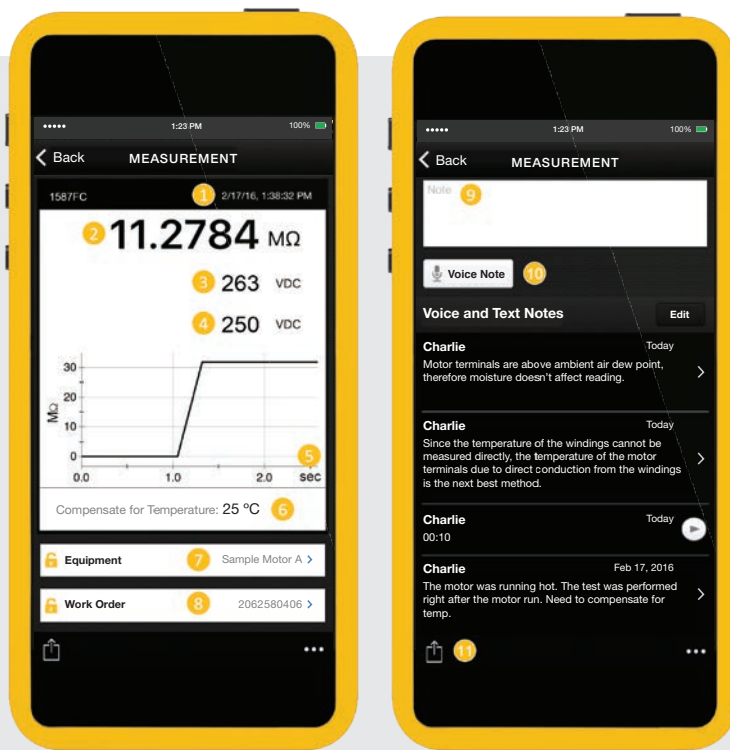
What is Fluke Connect®?

Fluke Connect is a preventive maintenance software platform that wirelessly links Fluke test tools to smartphones and to the cloud where measurements can be viewed, graphed, shared and stored for trending and further analysis. The full system includes Fluke Connect compatible tools as well as either an iOS or Android app and web-based software for use on computers.

A worker takes measurements with a test instrument—electrical, temperature (infrared or thermocouple) or vibration—and the phone app automatically saves the data and uploads it to the cloud. The software helps organize the data and also provides managers analytical tools to make better maintenance decisions.



- 1 Date and time stamp of the test
- 2 Insulation resistance value
- 3 Output test voltage
- 4 Test voltage range
- 5 Test time
- 6 Temperature compensation of equipment
- 7 Equipment under test
- 8 Work order number
- 9 Text notes
- 10 Voice notes
- 11 Export test result



Another approach to testing insulation integrity is to perform polarization index (PI) and dielectric absorption ratio (DAR) tests. PI is defined as the ratio of the 10 minute resistance value to the 1 minute resistance value. Dielectric absorption ratio is expressed as the ratio of the 60 second resistance value to the 30 second resistance value. With 1587FC and Fluke Connect software, you can see a real-time trending graph of those two tests (see Figure 3) and identify moisture and contaminated insulation problems quickly.

Figure 1. A complete maintenance record contains not only the measurement made at that point-in-time, but details about the equipment being tested, the parameters of the test notes related to the work order.

Why does temperature compensation matter during the insulation resistance testing? How do I do it?

The basic theory is that when temperature increases, resistance in the insulation decreases.

According to IEEE 43, all resistance measurements should be corrected to use a constant, compensated temperature of 40 °C (104 °F). For every 10 °C (18 °F) deviation above the baseline temperature, the resistance value halves. For every 10 °C (18 °F) below baseline value, the resistance value doubles.

- 1 Motor placed in service
- 2 Effects of contamination, aging, etc.
- 3 Motor insulation failure
- 4 Condition after being rewound
- 5 Change status of the equipment to flag an issue

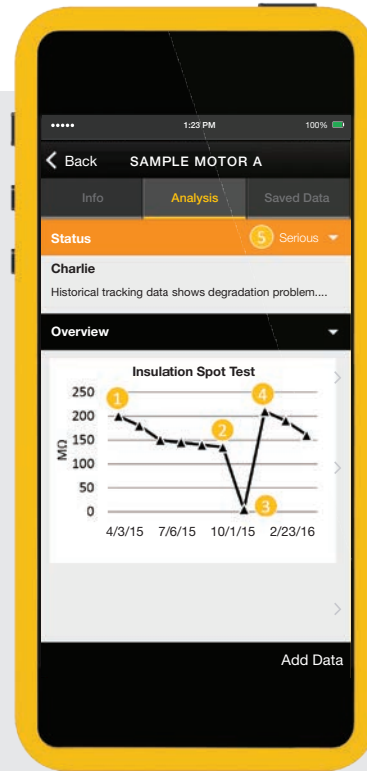
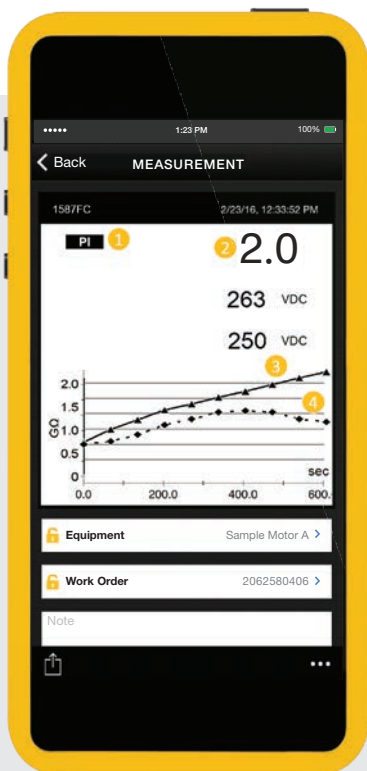


Figure 2. Insulation spot test trending graph



- 1 Two timed-resistance tests: PI/DAR
- 2 10/1 min ratio: if it's less than 2.0 insulation condition may be compromised
- 3 The slope of the curve indicates the condition of the insulation. Good insulation (curve 3) indicates a continual increase in resistance.
- 4 Moist or cracked insulation (curve 4) shows a relatively constant resistance.

To deal with this, Fluke Connect® software performs the math involved with temperature compensation for you. All you need to do is to take the temperature reading of the equipment under test. The Fluke 1587 FC Insulation Multi-meter is capable of taking contact temperature measurements and transferring that data directly to the Fluke Connect app on your phone (see Figure 1). Manual calculations are a thing of the past, and you can make regularly scheduled, accurate resistance measurements as part of your preventive maintenance program.

Figure 3. PI/DAR test graph

How can I share test results with my boss and coworkers?

Once you capture the test result, it's automatically uploaded to FlukeCloud™ storage. You can share this data with coworkers on your team. Everyone on the team will have the same access to the measurement data as your team builds and grows over time. All the data is kept in one place, with no more data silos.

In addition, you can quickly generate a report (see Figure 4) with Fluke Connect® app right in the field and send it through email. This way, you can quickly get questions answered or next steps authorized.

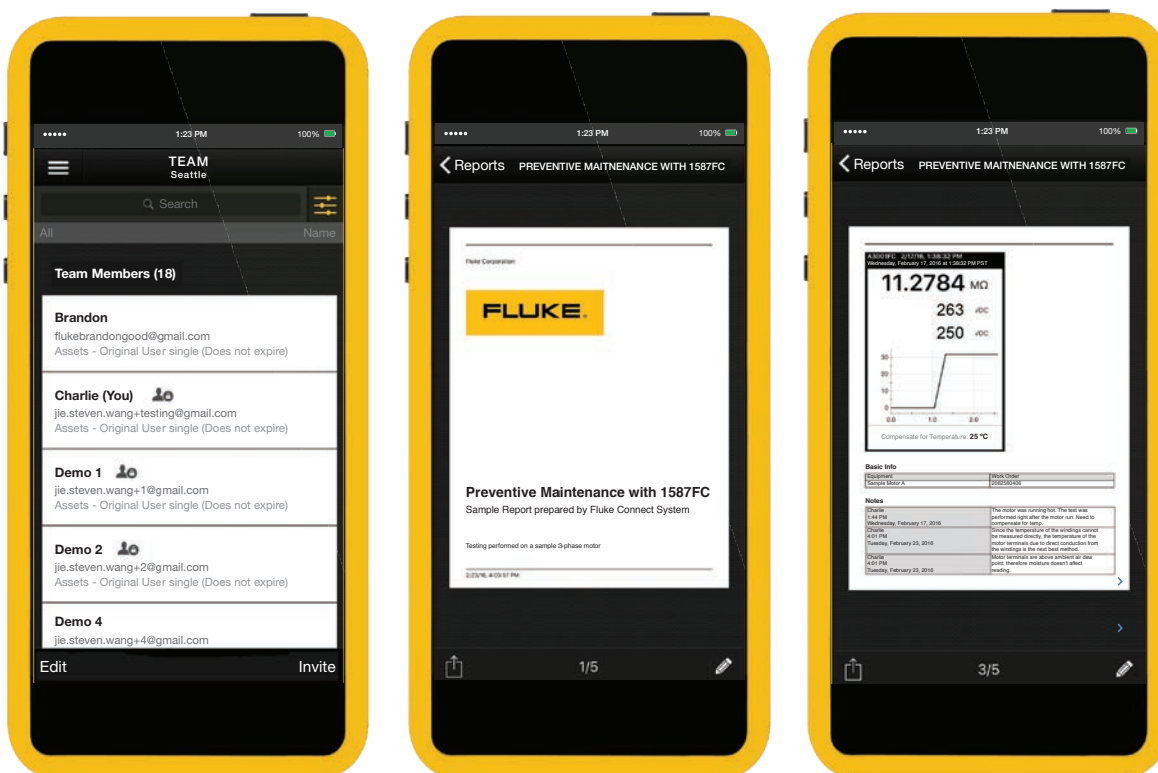


Figure 4. Store test results using FlukeCloud storage, create reports on-site, and share with coworkers.

The Fluke 1587 FC Insulation Multimeter

The Fluke 1587 FC combines a digital insulation tester with a full-featured, true-rms digital multimeter in a single compact, handheld unit, which provides maximum versatility for both troubleshooting and preventative maintenance. It offers four powerful diagnostic functions through the Fluke Connect® platform:

- PI/DAR timed ratio tests with TrendIt™ graphs identifies moisture and contaminated insulation problems faster.
- Memory storage through Fluke Connect eliminates writing down results, reduces errors and saves data for historical tracking over time.
- Temperature Compensation through app for establishing accurate baselines and relevant historical comparisons.
- Historical tracking and trending of assets identifies degradation over time, allows real-time decisions to be made in the field with Fluke Connect Assets (sold separately).



Preventive maintenance simplified. Rework eliminated.

Save time and improve the reliability of your maintenance data by wirelessly syncing measurements using the Fluke Connect® system.

Find out more at flukeconnect.com



Fluke. *Keeping your world up and running.®*

Fluke Corporation
PO Box 9090, Everett, WA 98206 U.S.A.

Fluke Europe B.V.
PO Box 1186, 5602 BD
Eindhoven, The Netherlands

For more information call:
In the U.S.A. (800) 443-5853 or
Fax (425) 446-5116
In Europe/M-East/Africa +31 (0) 40 2675 200 or
Fax +31 (0) 40 2675 222
In Canada (800)-36-FLUKE or
Fax (905) 890-6866
From other countries +1 (425) 446-5500 or
Fax +1 (425) 446-5116
Web access: <http://www.fluke.com>

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