Generator Testing Programs

**Industrial applications**
Siemens offers a variety of testing programs for your generators. These programs are designed to provide vital information that will help predict the future performance and reliability of your equipment. This knowledge allows for proactive maintenance and outage planning and will help to avoid major shutdowns.

Each of the following tests are directed toward detecting particular types of issues or follow long-term trends. Not all tests are required at every inspection period.

**Insulation resistance test**
The insulation resistance test measures the resistance of the electrical insulation to ground to determine the current condition of the insulation. This test is typically performed with a MEGGER® or other brand of megohmmeters. Test voltages are commonly 500, 1,000, 2,500 or 5,000 volts. The insulation resistance is typically in the thousand or tens of thousands of megohms. This test can be used on both generator rotors and stators, as well as motor armatures and stators.

**Polarization index (DC MEGGER)**
Dielectric absorption (polarization index) tests provide information concerning the relative condition of the insulation with respect to moisture and other contaminants. The polarization index takes the ratio of the values of an insulation resistance test at one minute and at 10 minutes.

**Winding resistance**
Winding resistance tests on direct current detect loose connections and open-circuited windings. The winding resistance of generator or motor windings, on both rotors and stators, can be measured with the use of a digital low-resistance ohmmeter (DLRO) or a Kelvin Bridge.

It provides insight into how the insulation is absorbing charge or polarizing, and is used as a rough indication of the condition of the insulation. As with the insulation resistance test, this can be used on generator rotors and stators and on motor armatures and stators.
Typically these instruments are intended to measure very low resistance ranges and are capable of measuring from 0.000001 Ohms (1 microOhm) to 59.99 Ohms. It is important to compare the existing resistance to historical measurements taken during previous outages. If the resistance has increased compared to previous tests, it could indicate that a joint or connection has broken or begun to separate. If the resistance has decreased, then there could be a short between layers of the winding.

### AC impedance test

The AC impedance test is performed on generator rotors to determine the winding impedance at various voltages between zero and 120 volts AC, or the changes in winding impedance at a set voltage at various speeds from zero up to the unit’s rated speed. It is possible to detect shorted turns or changes in the number of shorted turns by tracking changes in impedance over time. This test is useful as a comparative test where AC impedance data has been taken and recorded in the past.

### Pole balance

The pole balance test is used to determine if there are shorted turns in the generator rotor winding. A voltage of 120 volts AC or less is applied to the field winding, and voltage measurements are taken at the pole-to-pole connections between poles. This test relies on the fact that rotor windings need to be symmetrical, both electrically and physically, in order to operate smoothly. The voltage reading at those points should be very similar, with no more than two percent difference. If there is more than a two percent difference, then there could be shorted turns in the generator rotor winding. This is the most accurate shorted turn test that can be performed on a generator rotor at standstill.

### Dielectric absorption test

Dielectric over-voltage tests establish that the winding is capable of withstanding the applied voltage. Such tests may be destructive to a greater or lesser extent. Both AC and DC tests have been widely used for maintenance over-voltage testing.

### Mechanical considerations

The operation and maintenance of turbine-driven generators require a thorough knowledge of their construction, as well as the ability to recognize the symptoms of impending failure. Mechanical issues may be detected or avoided with a comprehensive generator testing strategy. The electrical tests described in this brochure are typical of those required during a maintenance outage. However, Siemens can complete a variety of additional electrical tests, depending upon the initial test results or customer requirements. The above chart briefly explains further test options for the various generator components. Most of these procedures can be performed either on site or at one of our service centers across North America.