S1 Series
5-kV and 10-kV Insulation Resistance Testers

- **Line supply or battery operated**
- **Noise rejection (2mA or 4mA rms@200v and above) for use in high voltage substations or switchyards**
- **5mA output current provides fast charging and testing of capacitive loads**
- **Measurement range to 15 TΩ (S1-552 and S1-554) and 35 TΩ (S1-1052 and S1-1054)**
- **Automatic insulation resistance tests (IR)**
- **Automatic dielectric absorption ratio (DAR), polarization index (PI), step voltage (SV), and dielectric discharge (DD) tests**
- **RS232 or USB download of results**
- **On board memory for results storage**

DESCRIPTION

The new Megger S1 Series of 5 kV and 10 kV insulation resistance testers are designed specifically to assist the user with the testing and maintenance of high voltage equipment. This series of testers includes the following models and distinct capabilities including voltage, test current and noise rejection:

Model #	Output Voltage	Test Current	Noise Rejection
S1-552	5 kV	5 mA	2 mA
S1-1052	10 kV	5 mA	2 mA
S1-554	5 kV	5 mA	4 mA
S1-1054	10 kV	5 mA	4 mA

All four models are heavy duty and reliable with features that meet the most demanding testing applications in existence today.

First the user has a choice of 5 or 10 kV voltage output capability. The 10 kV option is particularly suitable for testing to the IEEE standards required for testing motors rated greater than 12 kV.

Second, all four models provide 5 mA output current to provide fast charging and testing of high capacity loads such as long cables.

Third, all four models feature extra noise rejection capability, with Models S1-554 and 1054 providing an industry best (4 mA noise rejection). This virtually eliminates the possibility of poor, unreliable or unstable readings being made in noisy 400 kV and above substations or switchyards.

These instruments have been designed with expanded measurement ranges, up to 15TΩ for the 5kV models and up to 35TΩ for the 10kV models, in order to provide trending values for testing high quality insulating materials.

A large, easy-to-read backlit LCD is provided on all models making them suitable for use in both bright sunlight and poorly lit environments. Information displayed includes resistance, voltage, leakage current, capacitance, battery status and time constant. In addition, the elapsed time is continuously displayed, removing the need for separate timers. Adjustable timers and limit alarms are included.

A built-in, integral timer starts automatically at the beginning of a test, and displays minutes and seconds. At the end of any test, the load is automatically discharged and the decay voltage is displayed. The timer enables the performance of an automatic IR test, plus the capability of preprogrammed DAR, PI, SV and DD. They each include an alarm mode, which allows the operator to preset a specific resistance level. The unit will beep until the limit is exceeded.

In addition to the preprogrammed automated testing routines, the units are equally suited for simple insulation testing. The controls of the instruments are clear and unambiguous, and a “quick start” guide is included in the lid as a permanent refresher for the operator.

A guard terminal is provided with each model to allow greater accuracy when testing complex insulation systems with multiple terminals. A guard test lead is included as standard with each instrument.

The S1-552 Insulation Resistance Tester in use at an industrial complex substation

All models provide variable test voltages in 10V steps below 1kV and 25V steps above 1kV to enhance their flexibility, and to eliminate the need for multiple IR test sets to meet various applications.

Fast, repeatable measurements are possible on large motors, generators and cables due to the 5mA of charging current provided by the instrument, the highest available on the market.

Testing can be performed when the instrument is powered by AC mains or when powered by its internal rechargeable battery.

Built-in safety features enhance the operation of the units. If connected to a live test specimen, the external voltage will be displayed and testing will not be allowed if above 50V with the 5kV models or above 80V with the 10kV models. At the conclusion of every test, the instruments display the voltage remaining on the connected equipment and automatically discharge the residual energy.

APPLICATIONS

The S1 Series of insulation resistance testers are designed for testing the insulation of high-voltage electric equipment. Their wide voltage range also allows applications for low-voltage equipment. Generators, motors, transformers, cables and switchgear all require effective maintenance. The test techniques on the instruments provide valuable diagnostic information.

All models test the insulation resistance of:

- High-voltage power cables and high-voltage buses
- Large motor/generator windings
- Line and substation transformers

They perform spot tests, step-voltage tests, and dielectric absorption tests for the following applications:

- Acceptance testing at an installation to check conformance to specifications.
- Routine preventive/predictive maintenance testing after installation.
- Quality assurance testing as part of the manufacturing process.
- Diagnostic testing to isolate faulty components for repair.
- Contamination testing of service aged insulation.

With their higher voltage testing capability, the 10kV models are the perfect every day work tool for manufacturers and users and maintainers of rotating machinery. Designed in accordance with the requirements of IEEE43-2000 they are ideal for measuring the insulation resistance of armature and field windings in rotating machines rated 1hp (750 W) or greater. The standard applies to synchronous, induction and dc machines as well as synchronous condensers.

FEATURES AND BENEFITS

- Improved operating flexibility provides the user with the choice of using these instruments via line or battery operation. Line operation also affords enhanced charging capabilities for high-capacitance test samples.
- High measurement range enables installation testing and long-term trending of higher value apparatus.
- 5 mA short circuit current allows for faster charging and testing of large capacitive and inductive loads
- Results storage and downloading enables state-of-the-art record keeping free of transposition errors.
- Noise rejection provides accurate readings even in “noisy” environments such as high voltage utility substations and switchyards.
- Five industry-standard tests can be performed automatically, freeing operator from time-consuming manual operations.
- Backlit display enables ease of testing in poorly lit areas.
- Rugged, lightweight polypropylene case and IP65 rating make all of the instruments adaptable for all field conditions.
- A variety of measurements including applied test voltage, leakage current and capacitance, affords enhanced capabilities to diagnose insulation condition and problems.
- Redundant safety features includes automatic discharge of test item, test lockout in presence of external voltage, and design to EN61010.
- Models S1-1052 and S1-1054 incorporate the ability to apply test voltage up to 10 kV, making both fully conformable to the requirements of IEEE43-2000.
- A “quick start” guide is included in the lid, eliminating the need to carry bulky manuals to site locations.
- For greater ease of use and downloading, an RS232 or USB interface is available.
- Alarm limit mode allows for faster testing and less ambiguous result interpretation.

Circuit breaker being tested with the S1-552 Insulation Resistance Tester

These unique features improve insulation testing efficiency and effectiveness

Extra data storage and download capability
Run more tests and save more test data. Download results using either an RS232 or USB style connection.

Line or battery operation
The operating flexibility you need when site conditions are unknown or long term testing is required.

Multiple built-in safety features
Designed to meet the most stringent operator safety requirements, including EN61010. Includes live voltage warning, safety lockout over 50 V on 5-kV testers and 80 V on 10-kV testers, and automatic energy discharge.

Improved enclosure
It's virtually indestructible, yet ergonomic and lightweight. It features an oversized rubber handle and removable lid for effective use in tight places. A lid mounted lead storage bag is also included.

Easier operation
Use a "Quick Start" guide conveniently located in the lid, always there for easy reference.

SPECIFICATIONS

	Models S1-552 and S1-554	Models S1-1052 and S1-1054
Battery Life	6 hours continuous testing at 5kV	4 hours continuous testing at 10kV
Test Voltages	50V to 1 kV in 10V steps 1 kV to 5 kV in 25V steps	50V to 1 kV in 10V steps 1 kV to 10 kV in 25V steps
Accuracy	±5% to 1 TΩ ±20% to 10 TΩ	±5% to 2 TΩ ±20% to 20 TΩ
Display Range Digital Display (3 digit) Analog Display	10 kΩ to 15 TΩ 100 kΩ to 1 TΩ	10 kΩ to 35 TΩ 100 kΩ to 1 TΩ
Capacitor Charge Time	<1.5 seconds per µF at 5mA to 5kV	<3 seconds per µF at 5mA to 10kV
Capacitor Discharge Time	<120ms per µF to discharge from 5000V to 50V	<250ms per µF to discharge from 10000V to 50V

Voltage input range:
95-240 V ±-10% rms 50/60Hz

Guard: 2% error guarding 500 kΩ leakage with 100 MΩ load

Short circuit/charge current: 5 mA

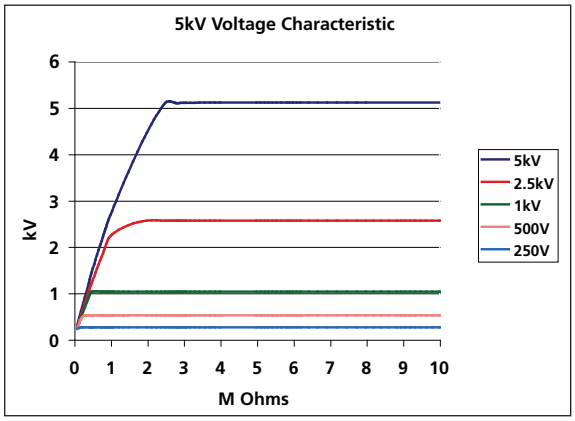
Capacitance measurement:
10 nF to 50 µF (dependant on measurement voltage)

Capacitance measurement accuracy (23° C):
±5% ±5 nF

Voltage output accuracy (0° C to 30° C):
+4% ±10 V of nominal test voltage at 1 GΩ load ±25 V for test voltages less than 500 V

Current measurement range:
0.01 nA to 5 mA

Current measurement accuracy (23° C):
±5% ±0.2 nA at all voltages



Test Voltage Output Characteristics Over Insulation Resistance Range

Display:
Analogue/digital 3 digits

Interference rejection:
2 mA rms @ 200 V and above (models S1-552 and S1-1052)
4 mARMS @ 200 V and above (models S1-554 and S1-1054)

Filter (models S1-554 and S1-1054 only
10, 30 and 100 second time constants (selectable)

Timer range:
Up to 99 minutes and 59 seconds from start of test

Memory capacity:
32kB

Pre Programmed Test Routines:
- Auto Insulation Resistance (IR)
- Polarization Index (PI)
- Dielectric Absorption Ratio (DAR)
- Step Voltage (SV)
- Dielectric Discharge (DD)

Interface:
RS232 and USB

Data storage:
Voltage, test time, leakage current, resistance, PI, DAR, DD, capacitance and time constant

Real time output:
Serial, once per second of test voltage, current and resistance

Environmental Operating temperature:
-10° C to 50° C

Storage temperature:
-25° C to 65° C

Ingress protection (lid closed):
IP65

Humidity:
90% RH non-condensing at 40° C

Safety:
Meets the requirements of EN61010-1:2001 CATIII 300 V

EMC
Meets the requirements of EN61326-1:1998 for use in heavy industrial areas.

Dimensions:
305 x 194 x 360 mm (12.7 x 6 x 14.2 inches)

Weight:
7.1 kg (16lb) approx.

Product Comparison Guide A look at each instrument's features		S1-552	S1-1052	S1-554	S1-1054
Display	Analog/Digital	■	■	■	■
Power Supply	Mains power	■	■	■	■
	Rechargeable	■	■	■	■
Test Voltage	10.0 kV		■	■	■
	5.0 kV	■	■	■	■
	2.5 kV	■	■	■	■
	1.0 kV	■	■	■	■
	500 V	■	■	■	■
	250 V	■	■	■	■
	10 V steps 50 V to 1 kV, 25 V steps 1 kV to max test voltage	■	■	■	■
Measurements	Max readingΩ	15 TΩ	35 TΩ	15 TΩ	35 TΩ
	Min reading	10 kΩ	10 kΩ	10 kΩ	10 kΩ
	Voltage	■	■	■	■
	Capacitance and time constant	■	■	■	■
	Test current	■	■	■	■
Test Types	Auto IR	■	■	■	■
	Polarization index	■	■	■	■
	Step voltage	■	■	■	■
	Dielectric discharge	■	■	■	■
	Dielectric absorption ratio	■	■	■	■
Other Features	Noise rejection	■	■	■	■
	Timer control	■	■	■	■
	Timer display	■	■	■	■
	5mA test currents	■	■	■	■
	USB output	■	■	■	■
	RS232 output	■	■	■	■
	Free calibration certificate	■	■	■	■
	IP65 rating	■	■	■	■

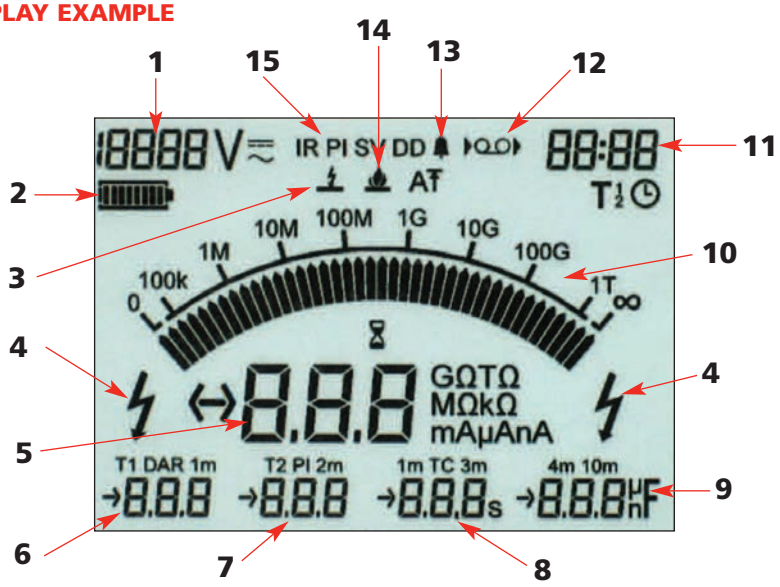
What is the IEEE Standard 43-2000?

In March 2000, the IEEE-SA Standards Board approved a revision of IEEE Std 43-1974 by the Electric Machinery Committee of the IEEE Power Engineering Society. This revision is IEEE Std 43-2000, the "IEEE Recommended Practice for Testing Insulation Resistance of Rotating Machinery."

Following is a brief summary of the highlights of IEEE Standard 43-2000:

- Test voltages up to 10 kV are recommended for windings rated greater than 12 kV.
- Both the insulation resistance and the polarization index test are recommended.
- Test results should be compared to historical values to identify changes.
- In lieu of historical records, minimum acceptable values (based on the type of equipment) for both tests are indicated.
- Depending on the machine rating, the readings for one or both tests should exceed the minimum acceptable values.
- If the readings are below the minimum acceptable values, the winding is not recommended for an over-voltage test or for operation.

S1-552/S1-1052 DISPLAY EXAMPLE



1. **Voltage at terminals** — Displays amount of voltage present at the terminal.
2. **Battery level** — Indicates the level of battery operation available.
3. **Breakdown indicator** — Indicates that breakdown mode is in operation
4. **High-voltage indicator** — Indicates the presence of high voltage during operation.
5. **Digital display** — Displays the reading during a test.
6. **Dielectric absorption ratio (DAR)**
7. **Polarization index (PI)**
8. **Time constant**
   6 through 8 — Displays the ratio value or the resistance measured at the indicated time.
9. **Capacitance display** — Indicates the capacitance of the test sample.
10. **Analog display** — Unique, patented analog display shows test voltage with real-time pointer movement.
11. **Timer** — Displays the elapsed time of test. Displayed constantly, eliminating the need for a separate timer.
12. **Data recording** — Indicates if data is being recorded during the test.
13. **Alarm** — Indicates that alarm has been set.
14. **Burn indicator** — Indicates that burn mode is in operation.
15. **Test modes** — Shows which pre-programmed test is being run.

ORDERING INFORMATION

Item	Cat. No.
5 kV Insulation Resistance Tester	S1-552
5 kV Insulation Resistance Tester	S1-554
10 kV Insulation Resistance Tester	S1-1052
10 kV Insulation Resistance Tester	S1-1054
Included Accessories	
3m lead set	8101-181
RS232 cable	25955-025
USB cable	25970-041
User guide on CD-ROM	6172-988
Optional Accessories	
3m lead set with straight jaw clamps	6220-797

Item	Cat. No.
15m lead set	8101-183
3 m lead set 6 kV insulated clips	6220-820
3 m lead set 10 kV insulated clips	6220-811
3 m shielded lead set (5 kV)	6220-835
3 m shielded lead set (10 kV)	6220-834
15 m shielded lead set (5 kV)	6311-080
15 m shielded lead set (10 kV)	6220-833
3 m lead set 1 kV insulated clips	6220-822

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ISO STATEMENT
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