

S1 Series

5-kV and 10-kV Insulation Resistance Testers



- CAT IV 600 V safety rating
- Line supply or battery operated
- Noise rejection (3mA 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 T Ω (5-kV models) and 35 T Ω (10-kV models)
- Automatic insulation resistance (IR), 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 |
|-----------|----------------|--------------|-----------------|
| S1-552/2 | 5 kV | 5 mA | 3 mA |
| S1-1052/2 | 10 kV | 5 mA | 3 mA |
| S1-554/2 | 5 kV | 5 mA | 4 mA |
| S1-1054/2 | 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. The Models S1-554/2 and S1-1054/2 incorporate a hardware filter designed to tolerate a industry best 4 mA rms of noise current at 50Hz and above. This filter is enabled by default, but may be switched off in order to speed up the settling time when there is little noise current. The Insulation Resistance mode offers additional firmware filtering to average out slow variations during testing. This virtually eliminates the possibility of poor, unreliable or

unstable readings being made in noisy 345-kV and above substations or switchyards.

These instruments have been designed with expanded measurement ranges, up to 15T Ω for the 5kV models and up to 35T Ω 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 S1-552/2 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 10-kV models are the perfect tool for manufacturers and users 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

- CAT IV 600 V safety rating allows for safe use in the widest range of applications.
- 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.
- The S1-554/2 and S1-1054/2 provide the ultimate in noise rejection that will even cope in extreme conditions such as 345-kV to 500-kV 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 S1-1052/2 and S1-1054/2 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 S1-552/2

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.



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.



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

Product Features and Benefits Guide

| FEATURES | S1-552/2 | S1-554/2 | S1-1052/2 | S1-1054/2 | BENEFITS |
|---|----------|----------|-----------|-----------|--|
| 5-kV max test voltage | ■ | ■ | | | Industry standard |
| 10-kV max test voltage | | | ■ | ■ | Full conformity to IEEE43-2000 Future proofs against new insulation technology |
| 5 mA SC output current | ■ | ■ | ■ | ■ | Ultimate fast charge of capacitance Maintain test voltage at lower MΩ |
| CAT IV 600 V safety | ■ | ■ | ■ | ■ | Ultimate in safety |
| Full diagnostic test capability (PI, DAR, SV, DD) | ■ | ■ | ■ | ■ | Provides full information on insulation quality |
| Test result memory | ■ | ■ | ■ | ■ | Essential for trending results |
| 3 mA noise immunity | ■ | | ■ | | High noise immunity |
| 4 mA noise immunity | | ■ | | ■ | Ultimate noise immunity for locations such as 345-kV to 500-kV substations and switchyards |
| Shielded leads supplied std. | | ■ | | ■ | Additional noise protection |



S1-552/2 shown with included accessories



S1-1052/2 shown with included accessories



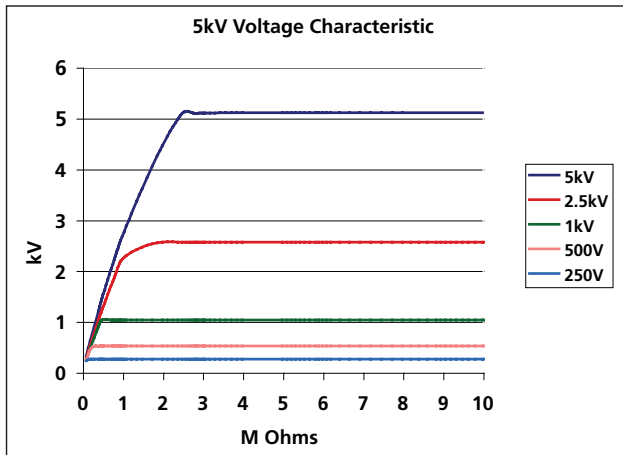
S1-554/2 shown with included accessories



S1-1054/2 shown with included accessories

SPECIFICATIONS

| | Models S1-552/2 and S1-554/2 | Models S1-1052/2 and S1-1054/2 |
|---|--|---|
| 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 |



Test Voltage Output Characteristics Over Insulation Resistance Range

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

Display:

Analog/digital 3 digits

Default voltmeter range: 50-600V a.c. or d.c.

Accuracy: (23° C) ±2% ±1V

Instrument: All MIT/S1 5/10kV

Interference rejection:

3 mA rms @ 200 V and above (S1-552/2 and S1-1052/2)

4 mARMS @ 200 V and above (S1-554/2 and S1-1054/2)

Filter (models S1-554/2 and S1-1054/2 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

Temperature Range

Operating: -4°F to 122°F (-20°C to +50°C)

Storage: -13°F to +149°F (-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 CATIV 600 V EMC

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

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

Weight: 16 lb (7.1 kg) approx.

S1-552/2 & S1-1052/2
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. | Item | Cat. No. |
|---|-----------|--|----------|
| S1-552/2 5 kV Insulation Resistance Tester | 1000-384 | Optional Accessories | |
| S1-554/2 5 kV Insulation Resistance Tester | 1000-390 | HV Lead Sets: | |
| S1-1052/2 10 kV Insulation Resistance Tester | 1000-387 | 3 x 3m uninsulated compact clips | 8101-181 |
| S1-1054/2 10 kV Insulation Resistance Tester | 1000-393 | 3 x 8m uninsulated compact clips | 8101-182 |
| Included Accessories for all instruments | | 3 x 15m uninsulated compact clips | 8101-183 |
| 3m lead set medium insulated clips | 6220-820 | 3 x 10m medium insulated clips | 1000-441 |
| RS232 cable | 25955-025 | 3 x 15m medium insulated clips | 1000-442 |
| USB cable | 25970-041 | 3 x 3m large insulated clips | 6220-811 |
| User guide on CD-ROM | 6172-988 | 3 x 10m large insulated clips | 1000-443 |
| Lid mounted pouch | 6320-244 | 3 x 15m large insulated clips | 1000-432 |
| PowerDB LITE CD-ROM | DB0001 | Control Circuit Test Lead Sets: | |
| S1-554/2 and S1-1054/2 also includes | | 2 x 3m small insulated clips | 6220-822 |
| 10 m shielded lead set, compact clips | 6220-861 | Shielded HV Test Lead Sets: | |
| Accessory carry bag | 6420-143 | 1 x 3m 5-kV, uninsulated compact clip | 6220-835 |
| S1-1052/2 and S1-1054/2 also includes | | 1 x 15m, 5-kV, uninsulated compact clip | 6311-080 |
| 3 x 3 m, lead set large insulated clips | 6220-811 | 1 x 3m, 10-kV, uninsulated compact clip | 6220-834 |
| | | 1 x 10m, 10-kV, uninsulated compact clip | 6220-861 |
| | | 1 x 15m, 10-kV, uninsulated compact clip | 6220-833 |

UK
Archcliffe Road, Dover
CT17 9EN England
T +44 (0) 1 304 502101
F +44 (0) 1 304 207342
UKsales@megger.com

UNITED STATES
4271 Bronze Way
Dallas, TX 75237-1019 USA
T 1 800 723 2861 (USA only)
T +1 214 333 3201
F +1 214 331 7399
USsales@megger.com

OTHER TECHNICAL SALES OFFICES
Täby SWEDEN, Norristown USA,
Sydney AUSTRALIA, Toronto CANADA,
Trappes FRANCE, Kingdom of SAUDI ARABIA,
Mumbai INDIA, Johannesburg SOUTH
AFRICA, and Chonburi THAILAND

ISO STATEMENT
Registered to ISO 9001:2000 Reg no. Q 09250
Registered to ISO 14001 Reg no. EMS 61597
S1 SERIES/2_DS_USen_V04
www.megger.com
Megger is a registered trademark