



Protective relay testing equipment

Megger[®]
Power on

Simpler.

Our aim is to make simpler the complex task of protective relay testing.

Our robust, reliable solutions and our advanced integrated software have been designed to make the art of testing relay protection schemes simpler and more intuitive.

By simplifying testing we speed up the process, reducing costs by freeing up skilled man hours that become available for other tasks.

Megger Relay Testing equipment gives you the tools you need to POWER ON.

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SMRT Series Relay Test Products

Megger's SMRT Series of relay test sets has been engineered to offer a full range of testing solutions built around flexibility and customization. These test sets are ideally suited for testing today's complex micro-processor relays as well as legacy electro-mechanical relays. The versatility of the SMRT Series is ideal for performing commissioning and periodic maintenance testing to help keep the power on.

Designed for accuracy, reliability and power, the SMRT Series delivers a level of assurance unmatched in the relay testing industry.



SMRT Series

Automated single phase, multi-phase and relay commissioning test sets

Whether you are testing single-phase or more complex 3-phase relays, the SMRT Series provides comprehensive testing solutions to meet your needs. Our SMRT Series has the smart combination of high compliance voltage and high current to test all electromechanical, solid-state and microprocessor-based overcurrent relays, including voltage controlled, voltage restraint and directional overcurrent. These features, combined with the ability to daisy-chain multiple SMRT units, provide game-changing flexibility and testing options to ensure your testing needs are met and exceeded.

Features

- High output current
- High resolution and accuracy through metered outputs
- Convertible voltage channels for enhanced testing options
- Steady-state, dynamic and transient testing capabilities, programmable waveforms with harmonics and DFR playback
- Digital binary input and output for testing reclosing relays
- Boolean logic programmable for complex power system simulations
- Audible and visual error indications
- Dynamic, transient and GPS satellite synchronized end-to-end testing capability with built-in IRIG-B
- IEC 61850 testing capability
- Small, rugged, and portable



SMRT46

SMRT46D

Select from units with integrated RTMS (Relay Test and Management System) for stand-alone operation using a high resolution touch screen, or units without an integrated touchscreen that can be controlled via an external PC.



Daisy chain multiple SMRT1 units to test more complex relay schemes and expand your testing capabilities.

SMRT Selection Guide



		SMRT1	SMRT33N	SMRT43/43D	SMRT46/46D	SMRT410/410D
Outputs	Instantaneous Current per channel	60 A @ 300 VA _{RMS}	45 A @ 300 VA _{RMS}	45 A @ 300 VA _{RMS}	60 A @ 300 VA _{RMS}	60 A @ 300 VA _{RMS}
	Continuous Current per channel	30 A @ 200 VA _{RMS}	30 A @ 200 VA _{RMS}	30 A @ 200 VA _{RMS}	30 A @ 200 VA _{RMS}	30 A @ 200 VA _{RMS}
	Max Voltage per channel	300 V @ 150 VA _{RMS}	300 V @ 150 VA _{RMS}	3 X 300 V @ 150 VA _{RMS} 1 X 150 V @ 100 VA _{RMS}	3 X 300 V @ 150 VA _{RMS} 1 X 150 V @ 100 VA _{RMS}	4 X 300 V @ 150 VA _{RMS}
	Number of Current channels	1/2*	3	3	3/6*	6/10*
	Number of Voltage channels	1	3	4	4	4
Control	Onboard Touch Screen display			D model only	D model only	D model only
	STVI option	■	■	■	■	■
	PC Software	RTMS/ PowerDB	RTMS/ PowerDB	RTMS/ PowerDB	RTMS/ PowerDB	RTMS/ PowerDB
Communications	Bluetooth (Optional)	■	■	■	■	■
	USB		■	■	■	■
	Ethernet	■	■	■	■	■
	Transducer (optional)		■	■	■	■
	Battery Simulator (optional)			■	■	■
	Weight	8.9 lbs (4 kg)	25.4 lbs (11.4 kg)	27.9 lbs (12.55 kg) D Model 29.35 lbs (13.2 kg)	27.9 lbs (12.55 kg) D Model 29.35 lbs (13.2 kg)	39.5 lbs (17.76 kg) D Model 42.65 lbs (19.2 kg)
	Rack mountable	■				
IEC61850 (Optional)	■	■	■	■	■	

* /X Represents the number of channels when convertible voltage channels are in current mode.

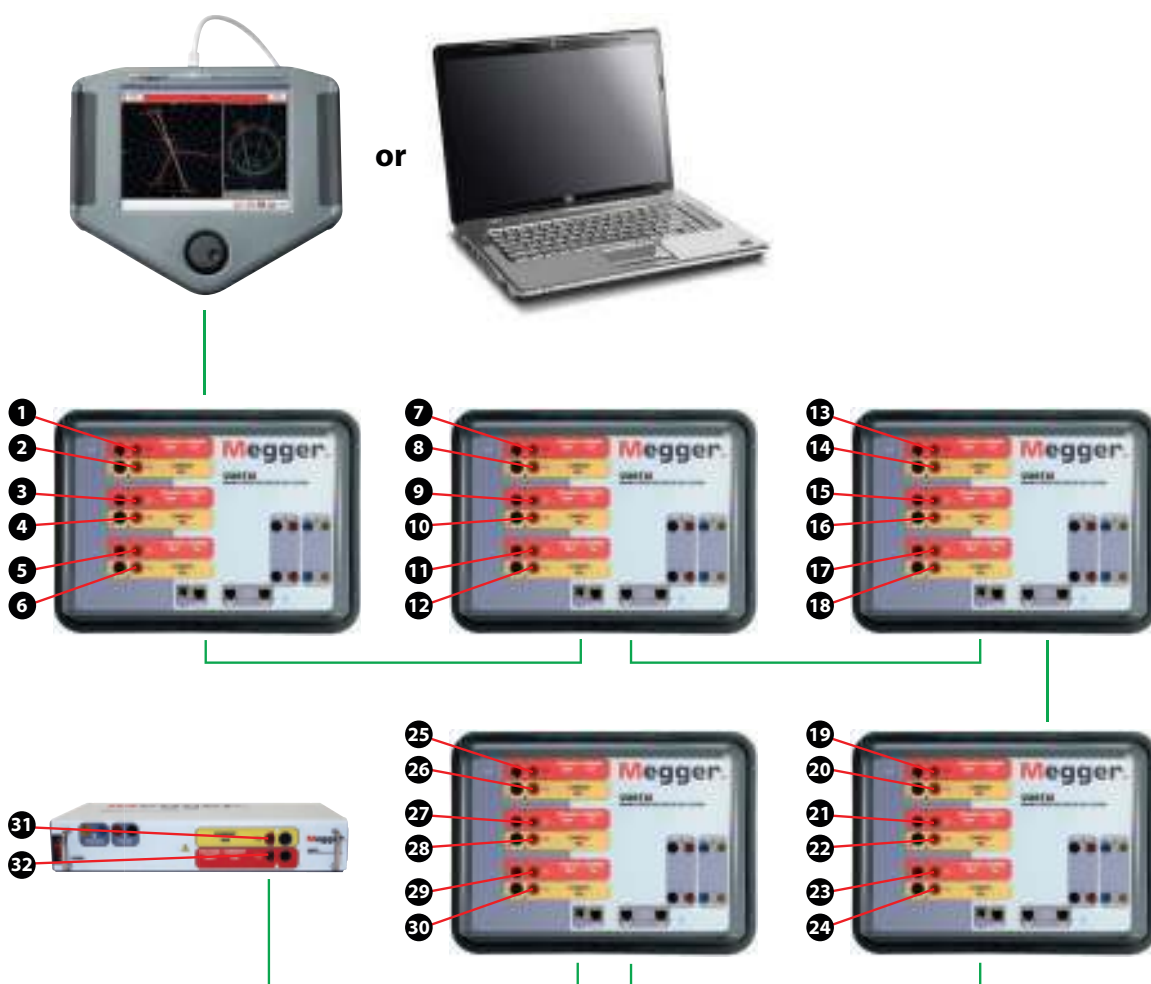
** SMRT410 battery simulator is optional, SMRT410D battery simulator is a standard feature, all other units share the battery simulator and V4.

Expand Your Testing

Daisy-chaining SMRT units

The SMRT Family of relay testing products is the only solution on the market that allows multiple test sets to be interconnected, controlled and viewed as a single entity to increase testing capabilities when you need it.

The SMRT test sets can be connected to one another using standard off-the-shelf Ethernet cables. The connected units are then synchronized and controlled as a single test system using RTMS, Megger's Relay Test and Management Software. This allows you to test even the most complicated protection schemes that require more than 6 current channels, avoiding the need to sectionalize testing into different zones. This reduces your testing time from days to hours.



The SMRT test sets shown are connected via standard RJ45 Ethernet cables and controlled from a single STVI interface or PC. This example presents a 32 channel testing environment.

Popular SMRT Accessories



The STVI controller is both the most comprehensive relay test set controller on the market and the easiest to use.

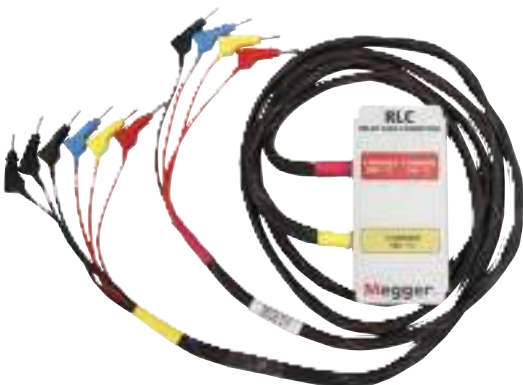
The Smart Touch View Interface (STVI) is a substation hardened controller for the SMRT series relay test sets, custom built to be adapted for field use. As a dedicated unit, it offers true plug and play capability with test sets, eliminating the need to deal with constant Windows® updates, viruses, communication issues due to firewalls or anti-virus software, and other annoyances of using a laptop or PC. Its anti-glare LCD screen is easily readable in direct sunlight and the resistive touchscreen allows operation even when wearing protective gloves.



Soft Carrying Case For SMRT1 and STVI
Smart Touch View Interface



Megger Transit Case



Relay Lead Connector



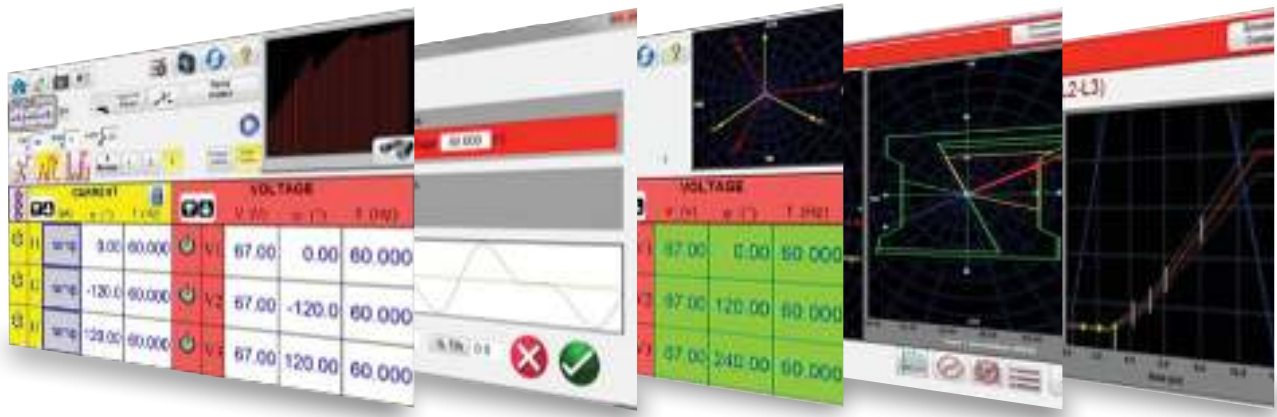
RTMS

Relay test and management software

Megger's **Relay Test and Management Software (RTMS)** combines our easy to use Smart Touch View Interface to give you increased testing abilities that are easier than ever to perform. RTMS is the go-to software platform for all relay testing requirements and is compatible across the entire Megger SMRT Family. This powerful software runs on SMRT units with built in displays, the STVI hand-held controller, or on your PC.

RTMS Distinctive Features

- User-friendly start-up manual test screen
- Generate harmonic waveforms in real time
- Automatic configuration for multi-phase tests
- Automatic ramping modes
- Automatic timing tests on overcurrent, voltage and frequency relays
- Sequencer (dynamic) testing capability
- Click-on-fault impedance relay test screen
- Transformer differential testing capability
- Synchronizer relay characteristic test
- Frequency relay test, including ROCOF df/dt relays
- Real-time split-screen display
- Execute AVTS files, fault calculator and COMTRADE playback
- Manual Power Swing test capability



RTMS Standard and Enhanced

RTMS comes in two versions – Standard and Enhanced. The Standard version is included with every SMRT unit at no cost. It includes all the test features and capabilities found previously in our STVI software, plus an overcurrent relay test feature that supports directional overcurrent relay testing.

The Enhanced version of the software includes many of the test modules found previously in our AVTS Relay Library, and features a synchronizer test and frequency test (includes ROCOF). The Enhanced version is a hardware enabled option for SMRT units, similar to the IEC 61850 feature.

FEATURE	STANDARD	ENHANCED
Manual Test Screen - Perform dynamic timing tests on virtually any relay Includes a fault calculator to generate complex waveforms, spot test impedance relays, calculate positive, negative, and zero sequence values. Manually control up to 30 currents.	■	■
Ramp Control - Perform automatic continuous ramp, pulse ramp, or pulse ramp binary search	■	■
Sequencer Test Screen - Run real time sequence of vectors test screen Up to 15 vector states may be created to perform reclosing tests. The sequence can be synchronized to a satellite using IRIG-B input for dynamic end-to-end tests.	■	■
Timing Test - Automatic timing of: Overcurrent, Voltage and Frequency Relays using manufacturer's time curves Includes time curves and time curve algorithms for hundreds of relays. Overcurrent Test includes Pickup and Timing of Phase, Ground, and Neutral elements, Phase, Ground and Neutral Instantaneous elements, and Directional test associated with Phase, Ground and Neutral elements. Includes test for DC Target and Seal-in elements.	■	■
Differential Screen - Automated differential testing for Transformers, Generators and Motors Test three phase Transformer Differential relays. All bias equations are supported. Four slope characteristics are provided; Line Segments (e.g. G.E. SR 745), Slope Through X Axis (e.g. Siemens 7UT613), Slope Through Origin (e.g. SEL 387 and 587) and Slope From Base Point (e.g. ABB RET670 and Areva/Schneider P63x). Harmonic block and harmonic shot tests are also available.	■	■
Click-on-Fault™ Screen - Perform automated testing on distance relays Automatic Testing of Distance Elements. Includes generic MHO, Half MHO, Quad. Software draws operating characteristic(s) of the relay defined by user settings. Relay Test Library includes numerous impedance relay test templates. Perform tests using Constant Current, Constant Voltage, or Constant Source Impedance. Import RIO Files or import settings from XRIO files, SEL settings files and GE settings files.	■	■
Fault Calculator Includes easy to use test features such as overcurrent and voltage tests which provide harmonic output currents and voltages. Includes impedance mode button for fast testing of impedance relays, and symmetrical mode for testing positive, negative, and zero sequence. Recently added power swing mode to perform power swing simulations on impedance relays.	■	■
Synchronizer Screen - Perform automated dV/df testing on synchronizer relays Provides automatic tests of synchronizing and sync-check type relays. User can simultaneously observe the synchro scope as test voltage rotates and the dynamic test point closing in on the relay close characteristic.		■
Frequency Screen - Perform automated test of frequency relays Provides automatic pickup and timing tests of Under/Over Frequency, and df/dt ROCOF type relays.		■
AVTS Screen - Run the entire library of AVTS modules Megger has developed hundreds of relay specific test modules. One-Touch Tests™ will open the communication link between RTMS and the relay under test, automatically download relay settings, and perform a sequence of tests. Test modules, which are One-Touch capable, save time, money, and remove the possibility of human error when reading and entering hundreds of relay settings. Tests are conducted to downloaded settings.		■

SVERKER Series

Relay and Substation Toolboxes

Megger's SVERKER Series offer single and three-phase test solutions combined with traditional substation testing applications. This combination makes them an engineer's toolbox built for testing efficiency. Tests include plotting excitation curves, current and voltage transformer ratio tests, burden measurement for protective relay test equipment, impedance measurement, efficiency tests, and polarity (direction) tests. Their designs incorporate benefits gleaned from years of experience in relay testing in the field, and have a well-earned reputation for reliability and convenience. SVERKER Series units have sold more than 22,000 units globally, making it the most sold relay tester in the world.

Built to simplify your relay and substation testing, the SVERKER series simplify your testing so you can power on.



SVERKER 900

Manual relay and substation test system



The **SVERKER 900** is our top level manual relay test set. It supports three-phase testing, and is designed for users that do not require the full features of our more advanced, automatic three-phase systems. Its 3 current and 4 voltage sources can be connected in parallel or series to achieve up to 105 A AC or 900 V AC. This is sufficient for many primary injection applications in distribution, generation and industrial environments. This multipurpose unit is perfect for municipal utilities or electrical testing service providers with field crews who perform both relay and substation testing. The rugged hardware is designed for field use over a wide temperature range, with intelligent, integrated software to perform rapid testing.

- **Versatile toolbox for substation 3-phase testing**
- **Three currents and four voltages**
- **Stand-alone functionality**
- **Rugged and reliable for field use**
- **Generation of 900 V and 105 A in single phase mode**
- **Secondary and primary testing**

KEY FEATURES	SVERKER 900
Current Generators	3 X 35 A @ 250 VA (DC or AC) Compliance voltage 50 V
Single phase mode (Current generators in parallel)	0 - 105 A @ 300 VA
Single phase mode (Current generators in series)	18 A, 625 VA (Compliance voltage 140 V)
Voltage Generators	4 X 300 V @ 125 VA (DC or AC)
Single phase mode/Voltage generators in parallel	300 V, 375 VA
Single phase mode/Voltage generators in series	900 V, 450 VA
Frequency Range	10 - 600 Hz
Timing Range	1 ms - 35 min.
Time measurement binary inputs	4 + 2
Battery simulator, DC or AC supply output voltage	300 V, 125 W or 125 VA
Analog inputs - current (ameter)	0 A - 10 A
Analog inputs - voltage (voltmeter)	0 V - 900 V
Mains	100 - 240 VAC
Local software, stand alone	■
Knob, dial	■
Power measurement	■
Weight	14.9 kg / 32.8 lbs.
Dimensions	350 mm X 270 mm X 220 mm / 13.8 in. X 10.6 in. X 8.7 in.

SVERKER 900

Model Functionality

The SVERKER900 comes in three model variations: Basic, Standard and Expert. Each model offers various test instruments to be used depending on the test being performed.

INSTRUMENTS	BASIC	STANDARD	EXPERT
Main instrument <ul style="list-style-type: none"> • General: set - inject - measure • Timing test • Finding the pick up and drop off values 	■	■	■
CT magnetization instrument Test to determine the knee point voltage of the current transformer		■	■
Prefault - fault instrument Timing test - to be used mainly to test relays that require a simulation of a prefault state before the fault simulation	■	■	■
Ramping instrument <ul style="list-style-type: none"> • Automatically determine the pick up threshold • Time testing, e.g. when testing df/dt relays 		■	■
Sequence instrument Simulation of sequences, e.g. auto recloser, motor starts, re-striking earth fault		■	■
Impedance instrument <ul style="list-style-type: none"> • The impedance screen allows you to test relays directly from the impedance plane, where the conversion from the impedance into voltages and currents is automatically done by the SVERKER 900. Used mainly for testing distance protection. • Prefault and fault test • Impedance ramping 			■

SVERKER 780 and SVERKER750

Premier manual single-phase relay and substation toolbox



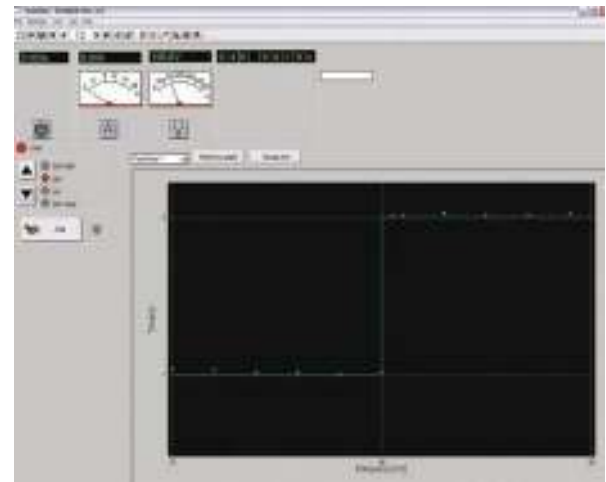
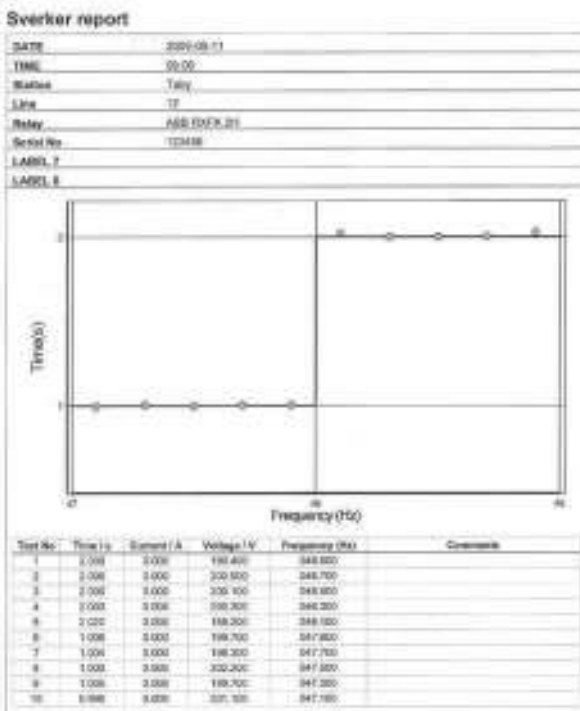
The **SVERKER 750** and **SVERKER 780** are manual, single-phase relay test sets designed to be used in high voltage substation and industrial environments. Testing can be performed using the onboard controls, or be managed using a PC running the optional SVERKER Win. Both models facilitate convenient relay testing with an easy to read display that shows time, voltage, current, Z, R, X, S, P, Q, phase angle and cos phi. Directional relays and autoreclosers are easily tested.

KEY FEATURES	SVERKER 780	SVERKER 750
Current Outputs AC	30 A cont., 250 A for 1 sec.	30 A cont., 250 A for 1 sec.
Main Voltage Outputs AC/DC	0 - 250 V AC, 0 - 300 V DC	0 - 250 V AC, 0 - 300 V DC
AUX Voltage Output	Range: 5 - 220 V AC Frequency Generator Frequency Range: 15 - 550 Hz Phase Angle: 0 - 360 deg.	0 - 120 V AC
Timing Range	Seconds or cycles 0.000 - 999.9s	Seconds or cycles 0.000 - 999.9s
Binary Inputs	2 (start and stop)	2 (start and stop)
Binary Outputs	1 output Max. current - 1 A Max. voltage - 250 V AC / 120 V DC	1 output Max. current - 1 A Max. voltage - 250 V AC / 120 V DC
DC Supply Output Voltage.	20 - 220 V DC	20 - 220 V DC
Internal Ammeter (high current)	0 - 250 A AC	0 - 250 A AC
External Ammeter	0 - 6 A AC / DC	0 - 6A AC / DC
External V-Meter	0 - 600 V AC / DC	0 - 600 V AC / DC
Measurements	Z (Ω and $^\circ$), Z (Ω), R and X (Ω and Ω), P (W), S (VA), Q (VAR)	Z (Ω and $^\circ$), Z (Ω), R and X (Ω and Ω), P (W), S (VA), Q (VAR)
Reclosing test	■	■
Local software	■	■
Optional PC software	■	■
USB Comm. port	■	■
Resistor Set	■	■
Mains Voltage	115 / 230 V AC, 50 / 60 Hz	115 / 230 V AC, 50 / 60 Hz
Weight	39.9 lbs. / 18.1 kg. (without accessories)	17.3 kg / 38.1 lbs. (without accessories)
Dimensions	350 mm X 270 mm X 220 mm / 13.8 in. X 10.6 in. X 8.7 in.	350 mm X 270 mm X 220 mm / 13.8 in. X 10.6 in. X 8.7 in.

SVERKER SOFTWARE

SVERKER Win for SVERKER 780 and SVERKER 750

SVERKER Win makes fieldwork easier while providing neat and easily readable reports for your record keeping. The SVERKER Win software enables you to control the SVERKER from a PC, and gives you access to customized reports, reference graphs, and current curve templates for many different relay types.



- Streamline test reporting and documentation by generating customizable, print-ready test reports
- Test reports are easy to read and share with full tables and graphs
- Test results are in an open format that can be easily exported to third-party software like Microsoft® Word or Excel
- Log lists are generated during testing and stored as a data file, with the ability to add comments to each test point
- Access to connection instructions and test instructions for streamlined testing
- Customized settings are saved and stored, and can be retrieved when testing similar devices

SVERKER 650

Basic manual single-phase relay and substation toolbox



KEY FEATURES	SVERKER 650
Current Outputs AC	0 - 100 A
Main Voltage Outputs AC/DC	0 - 250 V AC, 0 - 350 V DC
AUX Voltage Output	DC Range: 20 - 220 V DC AC Fixed: 110 V AC
Timing Range	Seconds or cycles 0.000 - 999.9 s
Binary Inputs	2 (start and stop)
Internal I Meter	Analog 0 - 100 A
Mains voltage	115 V or 230 V
Output for External A Meter	■
Resistor Set	■
Weight	16 kg / 35.3 lbs.
Dimensions	280 mm X 178 mm X 220 mm / 11 in. X 7 in. X 8.7 in.

The **SVERKER 650** is a simple single-phase relay test set, designed to be used in high voltage substation and industrial environments. The SVERKER 650 offers manual secondary testing of almost all types of single-phase protective relays. It can be used with the optional ACA120, a variable AC voltage source, to test directional overcurrent relays with higher settings.

- **Rugged design for field use**
- **0 to 100 Amp output current**
- **Suitable for testing many different types of relays such as power, voltage and current**
- **Easy to operate**

MRCT

Megger relay and current transformer tester

The Megger MRCT is a light weight, robust, portable unit used to perform demagnetization, ratio, saturation, winding resistance, polarity, phase deviation, and insulation tests on current transformers. The MRCT automatically calculates ratio errors, saturation curves, and knee points. The MRCT provides a microprocessor-controlled variable voltage and current output and precision instrumentation for automatically testing single and multi ratio CTs, reducing testing time and increasing productivity.

The MRCT will directly connect to multi ratio CT's and perform all tests – saturation, ratio and polarity, winding resistance and insulation – on all taps with the push of a button and without changing leads.

- Industry leading test duration using patented simultaneous multi-tap measurements reduces testing time by 20% on multi-tap CT's
- Increased measurement accuracy to support metering class CT testing
- Smallest and lightest 2 kV secondary voltage injection unit on the market
- Integrated single phase relay test system
- General purpose substation secondary circuit testing with 300 V and 60 A generators
- Grouped testing: demagnetization, knee points, ratios, saturation curves, and more
- Measure all ratios and saturation curves on multi-tap CTs with one lead connection
- Built-in insulation resistance testing
- Relay option adds all features of the SMRT Series to the MRCT

New Optional Features

- VT testing
- CVT testing up to 256 kV
- New DC algorithm for testing CT kneepoints up to 30 kV



SUPPORTING PRODUCTS

PMM-1

The PMM-1 is a multifunction instrument for measuring and logging power quantities commonly found in three-phase electrical systems. It has a built-in timer for measuring induction unit pickup and other relay timing tests. It can be used to conduct load and voltage surveys by automatically measuring and storing up to 286 three-phase datasets at user-defined time intervals.



MGTR-II

The MGTR-II is a timing reference for the SMRT and FREJA series relay test sets for synchronized end-to-end testing of line protection schemes. It has a 12-channel Global Positioning System (GPS) receiver to simultaneously track all available GPS satellites and derive highly accurate timing information from the satellites' cesium atomic clocks. The MGTR-II can generate a precise Programmed Output Pulse (POP) with 100 ns resolution, allowing it to synchronize multiple test systems, miles apart, to within 1 μ s of Universal Time Coordinated (UTC). The Intelligent Holdover™ feature provides near rubidium standard accuracy in the absence or loss of GPS signals so you can test even in urban canyon environments or government and military facilities where GPS signals may be temporarily blocked.



PAM410

The PAM410 is a digital phase angle meter designed to perform phase angle measurements in high voltage substations and industrial environments (CAT III 500 V safety rating). Its inputs can be switched between current and voltage, allowing it to measure the phase angle relationship between any combinations of two signals.



PAM420

The PAM420 is a digital multifunction meter designed for use in high voltage substations and industrial environments (CAT III 500 V safety rating). It can measure phase angle, voltage, current, frequency and timing. Its inputs can be switched between current and voltage, allowing it to measure the phase angle relationship between any combinations of two signals.



TM200

The TM200 is a digital timer designed for use in medium voltage substation and industrial environments. Its 1 ms resolution makes it suitable for a broad range of timing and triggering applications from circuit breaker testing to relay testing.



SST-9203

The SST-9203 is a digital timer designed for use in high noise utility environments such as extra high voltage substations and switchyards. Its shielding and noise-suppression circuitry ensures reliable readings when measuring the operating time of switching devices such as relays, circuit breakers or contactors. Using a crystal-controlled oscillator, it can achieve 100 μ s accuracy, independent of power line frequency.



NTS-300A

The NTS-300A is self-contained test set specifically designed for field testing of secondary network protectors. Network protectors are typically installed in underground vaults contained within a submersible enclosure and the NTS-300A's two-piece design makes it easy to maneuver and operate in tight spaces. The NTS-300A is able to perform all tests as specified in the IEEE C57.12.44-2014 standard.



ERTS

The Electronic Recloser Test Simulator adds the ability to easily test electronically controlled reclosers to Megger's relay test sets. It can simulate three-pole or single-pole trip and reclose, and can test both the electronic controller and the recloser on the pole simultaneously. The included 14, 19 and 32 pin cable adapters allow it to directly interface with the most widely used reclosers on the market.



AFS (Arc Flash Simulator)

The Arc Flash Simulator interfaces with Megger's relay test sets to test arc flash protection systems. It provides a high intensity white light to simulate an arc flash without the need for a direct connection to the arc flash sensor. The flexible arm and magnetic base allows for easy mounting and positioning on switchgear and other metal surfaces.



Quality You Can Depend On.

To keep the power on, you need electrical testing equipment that you can trust will function properly and deliver the proper results. Each Megger testing unit is put through a rigorous development and testing process to ensure that when you need it most, it will deliver the functionality you need.

Megger uses internationally recognized quality design practices for every single component that goes into our relay testing units. All units are manufactured in-house to our exacting quality standards. Megger is ISO9001 certified, with strict supply chain standards that include annual on-site inspections and audits of our key suppliers.

Our units are designed to keep up with you in the field and can withstand mechanical stress in accordance with international standards for vibration, transit drop, free fall and topple shocks.

Each completed unit undergoes a full systems test, with every input and output tested to their full operating range and limits. The unit is then stress tested in a thermal chamber where the temperature is cycled to thermal extremes. Internal sensors allow autonomous temperature monitoring and control, ensuring worry-free operation in all climates and conditions.

These production standards are the reason Megger is the world leader in electrical testing equipment. When you need the very best at your side, Megger is the name you can depend on to help you power on.







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