SMRT1B
Single Phase Relay Test System

Megger

- **Small, rugged, lightweight, and powerful**
- **Operate with or without battery**
- **Intuitive manual operation with onboard display**
- **High current, high power (75 A/400 VA RMS)**
- **Fully automated testing using RTMS**
- **IEC 61850 GOOSE testing capability**
- **IEC 61850 9-2 LE Sampled Values compliant**

DESCRIPTION

As a standalone unit the SMRT1B has the "smart" combination of high compliance voltage and high current to test electromechanical, solid-state, and microprocessor-based overcurrent relays. This includes voltage controlled, voltage restraint and directional overcurrent, under/over voltage, single-phase impedance, single-phase power, directional, synchronising, auto-synchronising, negative sequence under/over voltage, current balance, frequency, volts/hertz, reclosing, thermal, and various other relays (see the Application Guide for more). The SMRT1B can be controlled with the Integrated on-board display. The on-board display with its large, full color, high resolution and Wide Viewing Angle Technology bright LCD touch screen display allows the user to perform manual, steady-state, and dynamic testing quickly and easily using the manual test screen, as well as using built-in pre-set test routines for most popular relays.

The onboard display eliminates the need for a computer when testing almost any type of relay. Menu screens and touch screen function buttons are provided to select the desired test function quickly and easily. Tests results can be saved to the on-board display's, internal memory for later download to a USB Thumb drive to transfer or print test reports. For fully automatic testing every SMRT unit is supplied with Relay Test Management Software (RTMS) for installing on a PC. It does not require a security dongle or license to operate and can be loaded on as many customer-owned computers as required. There are two different levels of RTMS: Standard and Enhanced (see ordering information for details).

The SMRT1B can be powered from a standard AC voltage source, or from the optional DC battery source. The input voltage rating is from 90 - 264 VAC, 50/60 Hertz. The maximum input power is 700VA. The input is protected by a resettable circuit breaker. The battery source is protected using fuses.

BATTERY

The SMRT1B can be powered using two DeWALT **Flexvolt® 20/60V Lithium 9.0Ah**, or equivalent, batteries, Dewalt part number DCB609. Batteries, and battery charger, are not included with the SMRT1B and must be purchased separately.

APPLICATIONS

The current channel is rated for 32 A at 200 VA continuous and up to 60 A at 319 VA for short durations. It has a unique flat power curve from 4 to 32 A that always ensure maximum compliance voltage to the load. With a high compliance voltage of 50 V, the SMRT1B has the capability to test high impedance overcurrent relays.

The voltage channel can provide a variable output of 0 - 30/150/300 V at 150 VA of output power and has a unique flat power curve from 30 to 150 V, always ensuring maximum output power to the load. With the voltage channel converted to current, it can perform minimum operating point, slope, and timing on current differential relays, including harmonic restraint transformer differential relays (which can be tested one phase at a time).

It is also designed to operate in conjunction with other SMRT family units. Using the Ethernet ports, SMRT1B is literally a "plug-and-play" unit, where voltage and current outputs can be seamlessly synchronized with other SMRT unit's voltage and current outputs for testing more complex relays such as three-phase directional power, distance, and loss of excitation, with up to 30 phase currents for testing bus differential schemes.

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APPLICATIONS SELECTION GUIDE

Protective Relays by IEEE Device #		SMRT1B
2	Time delay	■
21	Distance single-phase	■
21	Distance three-phase open delta	+
21	Distance three-phase wye	+ +
24	Volts/Hz	■
25	Synchronising	+
27/59	Under/over voltage	■
32	Directional power single-phase	■
32	Directional power three-phase (open delta)	+
37/76	DC under/over voltage/current	■
40	Loss of field	■
46	Phase balance current	■
46N	Negative sequence overcurrent	■
47	Phase sequence voltage (open delta)	+
50	Instantaneous overcurrent	Up to 75 A*
51	Time delay overcurrent	Up to 75 A*
55	Power factor	■
60	Voltage/current balance (open delta)	+
67	Directional overcurrent	■
67N	Ground directional overcurrent	■
78	Out of step	■
79	Reclosing	■
81	Frequency	■
85	Carrier or pilot wire	■
87	Differential	■
91	Voltage directional (open delta)	+
92	Voltage and power directional (open delta)	+
94	Tripping	■

+ Requires additional SMRT1 for each +

* For operating times less than 1.5 seconds. For longer trip times output is rated for 37 A continuous with convertible channel in parallel.

FEATURES AND BENEFITS

Constant power output – The current amplifier delivers maximum compliance voltage to the load constantly during the test, and range changing is done automatically under load. This ensures better test results and saves time by not having to turn the outputs off to change ranges. Constant power output in many cases, eliminates the need to parallel or series current channels together to test high burden relays.

High output current – Provides up 32 A at 200 VA per phase continuous for timing tests and can provide up to 60 A at 319 VA for testing instantaneous overcurrent relays.

PowerV™ voltage amplifier high power output – The SMRT1B provides a high VA power output on the voltage channel at the lower critical test voltages (from 30 to 150 V). Users who want to test a panel of relays at the same time, or certain older electromechanical impedance relays, find it impossible using lower VA rated voltage amplifiers. The high burden voltage option in the SMRT, when enabled allows the unit to output up to 1 A at 300 V.

Convertible voltage channel – Provides a second current source for testing single phase current differential relays, including harmonic restraint transformer differential relays. Paralleled with the main current channel to increase output current to 37 A continuous, and up to 75 A for a short time.

High resolution and accuracy – Metered outputs provides extremely high accuracy needed for testing a wide variety of devices. Eliminates uncertainty with setting values, with metered values what you see is what you get.

Steady-state and dynamic testing capability – The SMRT1B provides, either through manual control or computer control, both steady-state and dynamic testing of protective relays. This includes programmable waveforms with harmonics.

Output current and voltage sine waves are generated digitally – Outputs do not vary with sudden changes in input voltage or frequency, which increases test accuracy and reduces testing time.

Digital binary input and output – The programmable binary input, and programmable output provide timing and logic operations in real-time with the output voltage and currents. The binary input can be programmed, using Boolean logic, for more complex power system simulations.

Circuit breaker simulator – Binary output provide programmable normally closed or normally open contacts to simulate circuit breaker operation for testing reclosing relays. Sequence of operation, timing, and lockout are easily tested.

Performs transient tests – Perform acceptance or troubleshooting tests by replaying digitally recorded faults or EMTP/ATP simulations in the IEEE C37.111/IEC 60255-24, COMTRADE Standard format.

Perform end-to-end tests – Using the RTMS Sequencer test; with a Megger MGTR GPS satellite receiver (or suitable IRIG-B time code source input into Binary Input #1), the SMRT1B performs satellite-synchronised end-to-end tests.

Wide-ranging output frequency – The output frequency of the current and voltage outputs can be set for any frequency from DC to 1 kHz. Popular test frequencies such as 16.66, 25, 33, 50, 60, 100,120, 125, 150, 180, 250, 300, and 400 Hz are easily set and controlled. Multi-purpose test system saves time and money.

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Two Ethernet ports – PC/IN Ethernet port is the primary PC connection port. It is also used when chaining multiple SMRT units together. The 61850/OUT Ethernet port is primarily used to interconnect multiple SMRT units together for synchronous multi-unit operation, or it may be used to connect to the IEC 61850 substation bus.

IEC 61850 and Megger GOOSE Configurator – With the IEC 61850 GOOSE option enabled in the SMRT hardware the Megger GOOSE Configurator (MGC) provides mapping of the binary inputs and outputs of the SMRT test set to the desired GOOSE messages. The GOOSE messages are read from available SCL (Substation Configuration Language) files or may be automatically detected by scanning the substation network in search of available published GOOSE messages. This scanning process is known as GOOSE "sniffing". The MGC also provides advanced network troubleshooting tasks such as comparing the GOOSE messages available on the network with the GOOSE messages described in the SCL files with GOOSE MERGE/COMPARE functionality; this is also a powerful tool for validating the horizontal communication description (GOOSE) in the supplied SCD file at Factory Acceptance Tests (FAT) in IEC 61850 substations. This type of verification is also known as GOOSE Consistency Check.

IEC 61850 9-2 LE and Megger Sampled Values Analyser (SVA) – With IEC 61850 9-2 LE Sampled Values option enabled in the SMRT hardware Sampled Values Analyser (SVA) is used as a testing tool that provides the ability to configure a maximum of three Sampled Value (SV) streams compliant with first edition of IEC 61850 9-2 LE to be used in process bus applications for digital substations. As per IEC 61850 9-2 LE guidelines, SMRT can provide three SV data streams with 4 voltages and 4 currents on each stream. Sampled Values (SV) are used for transmitting digitized values of currents and voltages on ethernet frames using a publisher/subscriber mechanism. In a digital substation environment, merging units are typically used to convert analogue signals from current and voltage transformers into digital streams of data packets at 80 samples per cycle – both for 50 Hz and 60 Hz systems as per IEC 61850 9-2 LE. The merging unit in this scenario acts as an SV publisher. Relays compliant to the protocol can act as an SV subscriber to receive the data packets. Digital signal processors in relays can then process the data measurement and take appropriate actions as per the algorithm. Functional testing of Sampled Values SV-based protective relays with the help of SMRT can be seen as a first step to validate such systems. With the SV-enabled option, SMRT can be used to inject SV streams directly into the relay thereby mimicking merging units. Additionally, SMRT can also be connected to the network and be used as an SV stream monitoring tool.

Either of the OUT (PC) or IN ports on SMRT provide the ability to subscribe/publish a maximum of three Sampled Values streams.

Minimum hardware requirement to use the IEC 61850 9-2 LE Sampled Values Option – SMRT VIGEN bootloader version >/= 1.052 and firmware 6.259 or higher.

Low-level Rogowski mode – In the Low-level Rogowski mode, the current channels will convert from a current source to a millivolt source. This will allow the current channel to simulate a low-level voltage source from a Rogowski coil. The MLLA will provide filtering of the low-level outputs from the latest version of voltage/current generators in the Megger SMRT series test sets. The MLLA provides the interface from the low-level outputs to the device under test using appropriate interface cables (see MLLA data sheet for ordering and unit compatibility information).

Low-level output capability – The current generators can provide very low current outputs ranging from 0 to 50 mA full scale or be enabled to provide a voltage output simulating a Rogowski output. In Rogowski mode the current channel will change from a current source to a voltage source, this will allow the current channel to simulate a low-level voltage source from a Rogowski coil. There are three ranges for the Rogowski outputs: 2, 10, and 40 Volts. In the 50 mA mode the feedback loop will stay on down to test currents as low as 5 mA. This provides test capability for generator anti-motoring and network relays, which can be set as low as 10 to 7.5 mA.

Universal input voltage – Operation from 90 to 264 VAC, 50/60 Hz, the SMRT can use virtually any standard power source in the world.

Immediate error indication – Audible and visual alarms indicate when amplitude or waveforms of the outputs are in error.

Bluetooth – Optional Bluetooth provides more flexibility. A wireless interface between the PC and SMRT, in conjunction with the SMRT IEC 61850 Ethernet port, provides the isolation required for a secure substation access interface between the SMRT and the IEC 61850 substation network.

Variable voltage threshold – The variable voltage threshold will either start or stop the timer. The continuity indicator will glow (application) or not glow (removal) upon the application or removal of either an AC or DC voltage. The programmable voltage threshold is available on binary input 1, with a programmable range from 5 to 150 volts AC/DC.

Open communication architecture – The SMRT units can be used with third party software for more flexible automated control.

SPECIFICATIONS[1]

Input power
100 to 240 V (± 10 %) AC, 1 Ø, 50/60 Hz, 700 VA

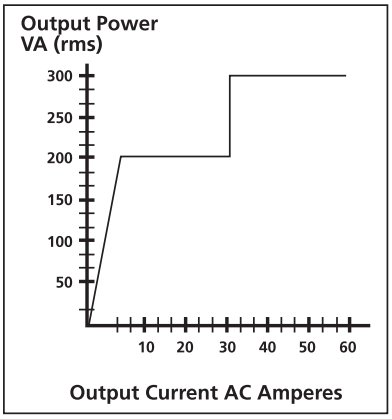
Outputs
All outputs are independent from sudden changes in line voltage and frequency. This provides stable outputs not affected by sudden changes in the mains source. All outputs are regulated so changes in load impedance do not affect the output.

Output current
Output power ratings are specified in AC RMS values and peak power ratings.

Output current	Power	Max V
50 mA[2]	5 VA	10.0 V RMS
1 A	15 VA	15.0 V RMS
4 A	200 VA (282 peak)	50.0 V RMS
15 A	200 VA (282 peak)	13.4 V RMS
32 A	200 VA (282 peak)	6.67 V RMS
60 A	319 VA (450 peak)	5.00 V RMS

DC 200 Watts

Duty cycle: 32 A Continuous, 60 A for ± 1.5 seconds or 90 cycles



Current amplifier output power curve

Current amplifier – extended power range

The SMRT current amplifier provides a unique flat power curve from 4 to 32 A to permit testing of electromechanical high impedance relays, and other high burden applications, with an extended operating range up to 60 A at 319 VA RMS.

AC Low-level Rogowski output (converted current channels) [2/3]

Each current channel can provide the following voltage outputs with the following Ranges:

Output volts	Max I
0 – 2 V RMS	10 mA
0 – 10 V RMS	100 mA
0 – 40 V RMS	25 mA

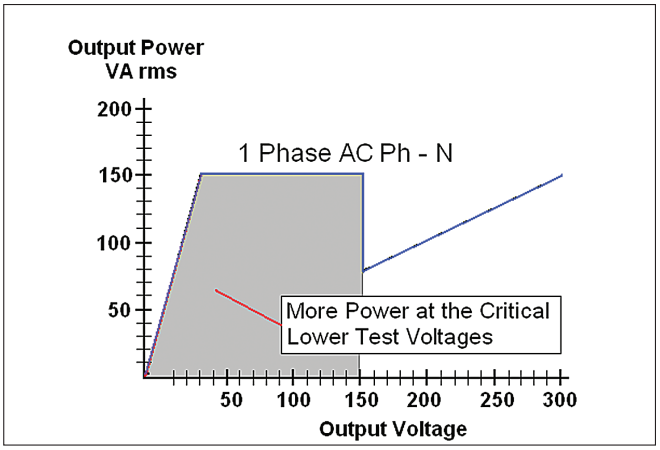
Duty cycle: Continuous

AC voltage output

Outputs are rated with the following ranges:

Output voltage	Power	Max I
2 V[2/3]	0.02 VA	10 mA
30 V	150 VA	5 A
150 V	150 VA	Variable[4]
300 V	150 VA	0.5 A
DC 150 Watts		

Duty cycle: Continuous



"PowerV™" voltage amplifier - extended power range

The SMRT voltage amplifier provides a flat power curve from 30 to 150 V in the 150 V range to permit testing of high current applications such as panel testing.

Voltage amplifier in current mode

The voltage amplifier is convertible to a second current source with the following output capability. Output power ratings are specified in RMS values and peak power ratings.

Output current	Power	Max V
5 A	150 VA (212 peak)	30.0 V RMS
15 A	120 VA	8.0 V RMS

Duty cycle: 5 A Continuous, 15 A for ± 1.5 seconds or 90 cycles

Phase angle

Ranges :

0.00 to 359.99 degrees, counterclockwise, or clockwise rotation, or 0.00 to ± 180.00 degrees

Accuracy: ± 0.02° typical, ± 0.25° max at 50/60 Hz

Frequency

The output modules provide a variable frequency output with the following ranges and accuracy:

Ranges

DC: 0.001 to 1000.000 Hz

Output amplifiers can provide transient signals with a range of DC to 10 kHz for transient playback using IEEE-C37.111 Standard COMTRADE files.

Resolution: 0.001 Hz

Frequency accuracy: 2.5 ppm typical
25 ppm, 0° to 50° C, at 50/60 Hz maximum
AC/DC AUX: 250 ppm, 50/60 Hz maximum

Total harmonic distortion

Less than 0.1 % typical, 2 % maximum at 50/60 Hz

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Timer
The timer-monitor input is designed to monitor and time-tag inputs, as a 'sequence of events' recorder. In addition, the binary input controls enable the user to perform logic AND/OR functions, and conditionally control the binary output relay to simulate circuit breaker, trip, reclose and carrier control operation in real-time. The timer function displays in seconds or cycles, with the following range and resolution:

Seconds: 0.0001 to 99999.9 **(auto ranging)**
Cycles: 0.01 to 99999.9 **(auto ranging)**
Accuracy ± 0.001 % of reading, typical
± 2 least significant digit
± 0.005 % of reading from 0 to 50 °C maximum

Binary input – start/stop/monitor gate
To monitor operation of relay contacts or trip SCR, a continuity light is provided for the input gate. Upon sensing continuity, the lamp will glow. In addition to serving as wet/dry contacts the binary inputs may be programmed to trigger binary output sequence(s).
Input rating: Up to 300 V AC/DC

Binary output relays
SMRT1B has an independent, galvanically isolated, output relay contact to accurately simulate relay or power system inputs to completely test relays removed from the power system. The binary output simulates normally open/normally closed contacts for testing breaker failure schemes. The binary output can be configured to change state based on binary input logic.

AC rating: 400 V max., Imax: 8 A,
2000 VA max. breaking capacity
DC rating: 300 V max., Imax: 8 A, 80 W
Response time: < 10 ms

Waveform generation
Each output channel can generate a variety of output waveforms such as: DC; sine wave; sine wave with percent harmonics at various phase angles; half waves; square waves with variable duty cycles; exponential decays; periodic transient waveforms from digital fault recorders, relays with waveform recording capability, or EMTP/ATP programs, which conform to the IEEE C37.111/IEC 60255-24 COMTRADE standard format.

Metering
Measured output quantities such as AC Amperes, AC Volts, DC Volts or DC Amperes, and time may be simultaneously displayed on the large, colour TFT LCD touch screen of the STVI. The AC and DC outputs display the approximate voltage/current output prior to initiation of the outputs. Accuracies are specified from 10 to 100 % of range, 25 °C ± 5 °C, 50-60 Hz.

AC voltage amplitude
Accuracy: ± 0.05 % reading + 0.02 % range typical
± 0.15 % reading + 0.05 % range maximum
Resolution: 0.01
Measurements: AC RMS
Ranges: 30, 150, 300 V

DC voltage amplitude
Accuracy: 0.1 % range typical, 0.25 % range maximum
Resolution: 0.01
Measurements: RMS
Ranges: 30, 150, 300 V

AC low-level voltage output[2/3]
Range: 2 V
Accuracy: 0 – 1 V: 0.5 mV typical and 1 mV guaranteed
1 – 2 V: 0.5 mV typical and 2 mV guaranteed
Resolution: 0.001
Measurements: AC RMS

AC low-level Rogowski output (converted current channels)[2/3]
Range: 2 V
Accuracy: 0 – 1 V: 0.5 mV typical and 1 mV guaranteed
1 – 2 V: 0.5 mV typical and 2 mV guaranteed
Resolution: 0.001
Measurements: AC RMS
Ranges: 10, 40 V
Accuracy: ± 0.05 % of reading + 0.02 % of range typical
± 0.15 % of reading + 0.05 % of range guaranteed
Resolution: 0.001
Measurements: AC RMS

AC current amplitude
Accuracy: ± 0.05 % reading + 0.02 % range typical
± 0.15 % reading + 0.05 % range maximum
Resolution: 0.001/0.01
Measurements: AC RMS
Ranges: 32, 60 A

AC low current[2]
Range: 50 mA
Accuracy: ± 0.5 mA typical and 1 mA guaranteed
Resolution: 0.0001
Measurements: AC RMS

DC current amplitude
Accuracy: ± 0.05 % reading + 0.02 % range typical
± 0.15 % reading + 0.05 % range maximum
Resolution: 0.001/0.01
Measurements: RMS
Range: 30 A

Convertible source in AC current mode
Accuracy: ± 0.05 % reading + 0.02 % range typical
± 0.15 % reading + 0.05 % range or ± 12.5 mA whichever is greater
Resolution: 0.001
Measurements: AC RMS
Ranges: 5, 15 A

Temperature range
Operating: 32 to 122 °F (0 to 50 °C)
Storage: -13 to 158 °F (- 25 to 70 °C)
Relative Humidity: 5 – 90 % RH, Non-condensing

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On-board display
The display is a 10.1" touch tablet with high resolution and features 'Wide Viewing Angle' technology and a large screen with high luminance.

Dimensions: 8.5 H X 5.3 W inches (215.9 H X 134.6 W mm), 10.1 inches Diagonal (256.5 mm).

Display: Computer touch tablet 10.1", 700 NITS panel brightness, 1920 x 1200 resolution, with 2GB of RAM and 64GB memory.

Dimensions
18W x 9.5H x 13.5D in. (457.2W x 241.3H x 342.9D mm)

Weight
21.0 lb. (9.52 kg)

Conformance standards
Safety: EN 61010-1
Shock: EN/IEC 60068-2-27
Vibration: EN/IEC 60068-2-6
Transit drop: ISTA 1A
Free fall: EN/IEC 60068-2-32
Drop/topple: EN/IEC 60068-2-31

Electromagnetic compatibility
Emissions: EN 61326-2-1, EN 61000-3-2/3, FCC Subpart B of Part 15 Class A
Immunity: EN 61000-4-2/3/4/5/6/8/11

Protection
Voltage outputs are protected from short circuits and thermally protected against prolonged overloads. Current outputs are protected against open circuits and thermally protected against prolonged overloads.

Communication interfaces
Ethernet (2)
Bluetooth (optional)

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ORDERING INFORMATION

STYLE NUMBER IDENTIFICATION

Model SMRT1 - 1 0 N ☐ ☐ ☐ ☐ ☐ B 1

Smart Touch View Interface option
0 = Without STVI
2 = With onboard display

Common return option
F = Floating ungrounded common returns
C = CE Mark floating ungrounded returns

Hardware options
0 = Without low-level option
2 = With low-level output option

Power cord option
A = North American power cord
I = International power cord
E = Continental Europe power cord
U = United Kingdom power cord

Test lead option
1 = With leads

Hardware/Enclosure options
B = Rugged enclosure with battery ability

Internal software options
0 = RTMS Standard option
1 = IEC 61850 GOOSE hardware license option
2 = IEC 61850 9-2 LE hardware license option
3 = RTMS Enhanced option
4 = RTMS Enhanced and IEC 61850 GOOSE hardware license option
5 = RTMS Enhanced, IEC 61850 GOOSE, and IEC 61850 9-2 LE hardware license option
6 = IEC 61850 GOOSE and IEC 61850 9-2 LE option

DESCRIPTIONS OF HARDWARE OPTIONS

Smart Touch View Interface option: Enter the number **0** for the unit to be supplied without a display or the number **2** for the unit to be supplied with an onboard display.

Common returns option: F is for floating returns terminals associated with each output channel and **C** is for CE-marked units with floating returns.

Hardware option:
0 = Enter the number **0** for the unit to be supplied without the low-level option.
2 = Enter the number **2** for the unit to be supplied with the low-level option.

Power cord option: Customers can choose which type of power cord they want the unit to come with.
- **A** option – NEMA 5-15 to IEC60310 C13 connectors, UL and CSA approved for countries with NEMA outlets.
- **I** option – International colour-coded wires (light blue, brown and green with yellow stripe) insulation jacket stripped ready for male connector with IEC 60320 C13 connector, CE marked.
- **E** option – CEE 7/7 "Schuko" plug to IEC 60320 C13 connector is CE marked.
- **U** option – United Kingdom power cord with IEC 60320 C13 connector, and 13 A fuse. BS 1363 / CE marked.

Internal software options:
0 = Enter the number **0** for the unit to be supplied with the RTMS Standard option.
1 = Enter the number **1** for the unit to be supplied with the IEC 61850 GOOSE hardware license enabled on the unit.
2 = Enter the number **2** for the unit to be supplied with the IEC 61850 9-2 LE hardware license enabled on the unit.
3 = Enter the number **3** for the unit to supplied with the RTMS Enhanced option.
4 = Enter the number **4** for the unit to be supplied with RTMS Enhanced and IEC 61850 GOOSE hardware licenses enabled.
5 = Enter the number **5** for the unit to be supplied with RTMS Enhanced, IEC 61850 GOOSE and IEC 61850 9-2 LE hardware licenses enabled.
6 = Enter the number **6** for the unit to be supplied with IEC 61850 GOOSE and IEC 61850 9-2 LE hardware licenses enabled.

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DESCRIPTION OF SOFTWARE OPTIONS

Included software	Part Number
RTMS Standard application	84978
Optional software	
Megger GOOSE Configurator and Sampled Values Analyser stand-alone software	1007-246
RTMS Enhanced upgrade kit	84973
IEC 61850 GOOSE hardware upgrade kit	83646
IEC 61850-9-2LE Sampled Values hardware upgrade kit	88695
SMRT IEC 61850 GOOSE and IEC 61850-9-2LE Sampled Values hardware upgrade kit	88696
Low-level hardware upgrade kit (includes Rogowski, low-current and variable voltage on B/I 1 feature)[2/3]	87416

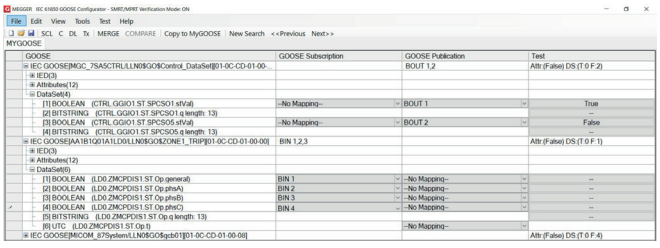
DESCRIPTIONS OF SOFTWARE

Included software

Every unit is supplied with Relay Test Management Software (RTMS) for installing on a PC. The software does not require a security dongle or license to operate and can be loaded on as many customer-owned computers as required. The powerful RTMS can be run directly from a PC providing both manual and automatic test capabilities. See the RTMS datasheet for more detailed descriptions of test features and capabilities. Megger supports customers using the legacy Advanced Visual Test Software (AVTS) and AVTS Basic is supplied with the unit.

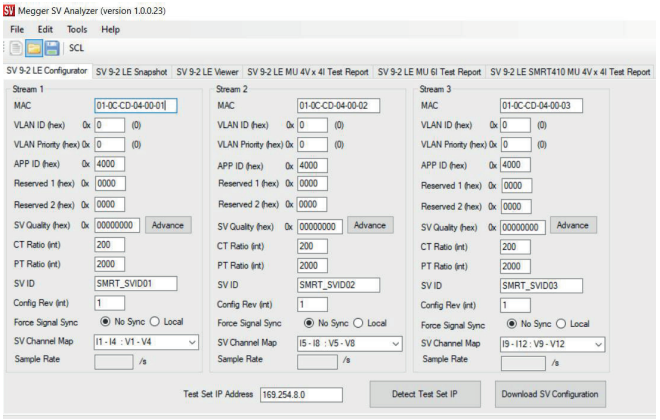
RTMS Template Manager – RTMS Template Manager is included with RTMS, allowing users to download new versions of relay templates as they are released from the Megger Cloud and will update the user's local PC data base (Internet connection is required). RTMS Template Manager also provides documents and how-to videos to support relay testing.

Megger GOOSE Configurator Software (MGC) – The SMRT unit is certified by KEMA as being compliant with IEC61850 protocol. With the IEC 61850 GOOSE option enabled in the hardware, in conjunction with the Megger GOOSE Configurator (MGC) software in RTMS Standard, the SMRT unit can be used in the testing or commissioning of IEC 61850 compliant devices. See the RTMS datasheet for details.



Megger GOOSE Configurator software

Megger Sampled Value Analyser (SVA) software – The SMRT unit is certified by KEMA as being compliant with IEC61850-9-2LE guidelines. With the IEC 61850 Sampled Values hardware enabled, in conjunction with the Megger Sampled Values Analyser software, the SMRT unit is user configurable to provide Sampled Values for testing or commissioning devices which require Sampled Values. When configured, the SMRT unit can provide three data streams of four voltages and four currents each.



Megger Sampled Values Configurator

Additional optional software

RTMS Enhanced upgrade kit – RTMS comes with two different levels, Standard and Enhanced. See the RTMS datasheet for details regarding features and capabilities of each level. The Enhanced level is hardware enabled. When using RTMS, if the Enhanced feature is enabled in the SMRT unit, then the software will automatically recognise it and allow access to the Enhanced test features. The Enhanced feature can be enabled by the customer in the field by purchasing the RTMS Enhanced upgrade kit, part number 84973. The kit will include a RTMS Enhanced license certificate, with a unique 32-digit code number assigned specifically to the unit (requires the customer to provide the unit serial number when ordering the kit). The kit also includes step-by-step instructions on how to enable the feature with the 32-digit code.

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SMRT IEC61850 GOOSE hardware upgrade kit – The IEC 61850 GOOSE test feature is a hardware enabled option. RTMS will automatically recognise if the GOOSE feature is enabled in the SMRT. There are two ways to determine if the unit has the IEC 61850 test capability enabled: First there is nameplate or a sticker on the back of the unit that will state "IEC 61850 ENABLED". The second way to determine if the unit has been enabled is to power up the unit and go to the configuration screen in RTMS and it will either state IEC 61850 ENABLED or DISABLED. The IEC 61850 GOOSE test feature can be enabled by the customer in the field by purchasing the IEC 61850 GOOSE license upgrade kit, part number 83646. The kit will include an IEC 61850 GOOSE license certificate, with a unique 32-digit code number assigned specifically to the unit (requires the customer to provide the unit serial number when ordering the kit). The kit also includes step-by-step instructions on how to enable the feature with the 32-digit code.

SMRT IEC61850 9-2 LE Sampled Values hardware upgrade kit – The IEC 61850-9-2LE Sampled Values test feature is a hardware enabled option. The IEC 61850-9-2LE Sampled Values test feature can be enabled by the customer in the field by purchasing the SMRT IEC 61850-9-2LE Sampled Values license upgrade kit, part number 88695. The kit will include an IEC 61850-9-2LE Sampled Values license certificate, with a unique 32-digit code number assigned specifically to the unit (requires the customer to provide the unit serial number when ordering the kit). The kit also includes step-by-step instructions on how to enable the feature with the 32-digit code.

SMRT IEC 61850 GOOSE and IEC 61850-9-2LE Sampled Values hardware upgrade kit – The IEC 61850 GOOSE the IEC 61850-9-2LE Sampled Values test feature is a hardware enabled option. The IEC 61850 GOOSE and IEC 61850-9-2LE Sampled Values test feature can be enabled by the customer in the field by purchasing the IEC 61850 GOOSE and SMRT IEC 61850-9-2LE Sampled Values hardware upgrade kit, part number 88696. The kit will include IEC 61850 GOOSE and IEC 61850-9-2LE Sampled Values license certificates, with unique 32-digit code numbers assigned specifically to the unit (requires the customer to provide the unit serial number when ordering the kit). The kit also includes step-by-step instructions on how to enable these features with the 32-digit code.

TEST LEADS AND ACCESSORIES

Included standard accessories	Part number
Power Cord - Depending on the style number, the unit will be supplied with one of the following:	
Line cord, North American	620000
Line cord, Continental Europe with CEE 7/7 Schuko Plug	50425
Line cord, International colour-coded wire	15065
Line cord, United Kingdom	90002-989
Ethernet cable for interconnection to PC, 210cm (7 ft.) long (Qty. 1 ea.)	90003-684
Instruction manual USB	84977

TABLE OF ACCESSORIES

Test leads and accessories are supplied with the selection of the test leads option. With the test leads option, the number and type of leads varies depending on the unit that is ordered. Test leads and accessories can be ordered individually, see part numbers below.

	Descriptions of test leads and accessories	Quantity	Part number
	**Accessory carry case:** Used to carry power cord, ethernet cable, optional STVI, test leads and accessories.	1	2001-487
	**Sleeved pair of test leads:** Sleeved test leads, one **red**, one **black**, 200 cm (78.7") long, 600 V, 32 A CAT II.	2	2008-539-2

	Descriptions of test leads and accessories	Quantity	Part number
	**Cable/spade lug adapter (small):** Small lug fit most new relay small terminal blocks. Lug adapter, **red**, 4.1 mm, rated up to 1000 V/20 A CAT II.	4	684004
	**Cable/spade lug adapter (small):** Small lug fit most new relay small terminal blocks. Lug adapter, **black**, 4.1 mm, rated up to 1000 V/20 A CAT II.	4	684005
	**Jumper lead:** Jumper lead, **black**, 12.5 cm (5 in) long, use with voltage/current outputs, 600 V, 32 A CAT II.	2	2001-573

OPTIONAL TEST LEADS ACCESSORIES (NOT INCLUDED IN THE SMRT1B TEST LEAD OPTION)

Optional test leads and accessories can be ordered individually, see description and part numbers below. **The following accessories and part numbers are in quantities of 1 each. Order the appropriate number required.**

	Descriptions of optional test leads and accessories	Quantity	Part number
	**Sleeved pair of test leads:** Sleeved test leads, one **red**, one **black**, 300 cm (118.11") long, 600 V, 32 A CAT II.	1	2008-539-3
	**Sleeved combination voltage test leads:** Three common leads connect to the test set, which are interconnected to one black common to connect to the relay. Sleeved, three **red** and **black**, 300 cm (118.11") long, 600 V, 32 A CAT II.	1	2008-540-3
	**Sleeved combination current test leads:** Three pairs of leads connect to the test set, and to the relay under test. Sleeved, three **red** and **black**, 300 cm (118.11") long, 600 V, 32 A CAT II.	1	2008-541-3
	**Sleeved pair of test leads:** Sleeved test leads, one **red**, one **black**, 600 cm (236.22") long, 600 V, 32 A CAT II.	1	2008-539-6
	**Sleeved combination voltage test leads:** Three common leads connect to the test set, which are interconnected to one black common to connect to the relay. Sleeved, three **red** and **black**, 600 cm (236.22") long, 600 V, 32 A CAT II.	1	2008-540-6
	**Sleeved combination current test leads:** Three pairs of leads connect to the test set, and to the relay under test. Sleeved, three **red** and **black**, 600 cm (236.22") long, 600 V, 32 A CAT II.	1	2008-541-6
	**Individual (non-sleeved) test leads:** Excellent for widely separated individual terminal test connections. Test lead, **red**, use with voltage/current output, or binary I/O, 200 cm long (78.7 in) 600 V/32 A CAT II.	1	620143
	Individual (non-sleeved) test leads: Excellent for widely separated individual terminal test connections. Test lead, **black**, use with voltage/current output, or binary I/O, 200 cm long (78.7 in) 600 V/32 A CAT II.	1	620144

	Descriptions of optional test leads and accessories	Quantity	Part number
	**Individual (non-sleeved) extra-long lest leads:** Excellent for widely separated individual terminal test connections. Extra-long test lead, **black**, use with voltage/current output, or binary I/O, 360 cm long (12 ft) 600 V/ 32 A CAT II.	1	2003-172
	Individual (non-sleeved) extra-long test leads: Excellent for widely separated individual terminal test connections. Extra-long test lead, **red**, use with voltage/current output, or binary I/O, 360 cm long (12 ft) 600 V/ 32 A CAT II.	1	2003-173
	**Cable/spade lug adapter (large):** Large spade lug fits older relay terminal blocks, or STATES® Company FTP10 or FTP14 test paddles, ABB, or General Electric test plugs with screw down terminals. Lug adapter, **red**, 6.2 mm, use with test leads up to 1000 V/20 A CAT II.	1	684002
	Cable/spade lug adapter (large): Large spade lug fits older relay terminal blocks, or STATES® Company FTP10 or FTP14 Test paddles, ABB, or General Electric test plugs with screw down terminals. Lug adapter, **black**, 6.2 mm, use with test leads up to 1000 V/20 A CAT II.	1	684003
	**Alligator/crocodile clip:** Excellent for test connections to terminal screws and pins where spade lugs cannot be used. Alligator clip, **red**, use with test leads up to 1000 V/32 A CAT III.	1	684006
	Alligator/crocodile clip: Excellent for test connections to terminal screws and pins where spade lugs cannot be used. Alligator clip, **black**, use with test leads up to 1000 V/32 A CAT III.	1	684007
	**Flexible test lead adapter with retractable insulated sleeve:** Use for connection to old style non-safety sockets with retractable protective sleeve on one end. Retractable sleeve test lead, **red**, 50 cm (20 in) long, use with test leads up to 600 V/32 A CAT II.	1	90024-780
	Flexible test lead adapter with retractable insulated sleeve: Use for connection to old style non-safety sockets with retractable protective sleeve on one end. Retractable sleeve test lead, **black**, 50 cm (20 in) long, use with test leads up to 600 V/32 A CAT II.	1	90024-781
	Flexible test lead adapter: Use with rail-mounted terminals or screw clamp connections where spade lugs and crocodile/alligator clips cannot be used. Flexible test lead adapter, **black**, 1.8 mm male pin, use with test leads up to 1000 V/32 A CAT III.	1	90001-845
	**Parallel test lead adapter:** Used when paralleling up to three current test leads together to a common test point. Usually used when connecting to a test paddle (like the pictured States Company test paddle.)	1	1002-286
	**Arc Flash Simulator:** The Megger arc flash simulator provides a focused high-intensity bright white light to simulate an arc flash for testing arc flash protection relays and systems.	1	AFS
	**Megger Low Level Adapter (Set of three filters):** The MLLA provides filtering of the low-level outputs from the latest version[2] of voltage/current generators in the Megger SMRT series test sets. It also provides the interface from the low-level outputs to the device under test using appropriate interface cables. **For individual filters and interface cables, see the MLLA datasheet**.	Set of three filters	MLLA
	**Megger GPS timing reference:** The MGTR is a small, lightweight, field portable, GPS satellite receiver system specifically designed to perform end-to-end tests of line protection schemes. The unit comes with a GPS Antenna, power supply, and a stainless-steel antenna mount. Cable length depends on the ordering part number.		
	GPS unit with all-weather antenna, power supply, and 15 m cable	1	MGTR-II-50
	GPS unit with all-weather antenna, power supply, and 30 m cable	1	MGTR-II-100
	**STATES® 10-pole test paddle:** Use with STATES FMS test switch or ABB FT-1 10-pole test switch. Test paddle features knobs which also serve as insulated Ø 4 mm rigid socket accepting spring loaded Ø 4 mm plugs with rigged insulating sleeve, or retractable sleeve. Use with test leads up to 600 V, 32 A CATII.	1	V1TP10

SMRT1B
Single Phase Relay Test System

	Descriptions of optional test leads and accessories	Quantity	Part number
	**STATES® 10-pole test paddle attachment:** Use with STATES V1TP10 test paddle. The test paddle attachment provides an additional 10 insulated connection points for front connection, as well as the standard top connections for test leads. Adapter can provide convenient parallel test connections of test currents to two terminals at one time. Use with test leads up to 600 V, 32 A CAT II.	1	TPA10

[1] Megger reserves the right to change product specifications at any time.
[2] Requires VIGENS with hardware version 3.5.1 or higher.
[3] For directly testing relays with low level inputs by simulating signals from nonconventional CTs and VTs with low level interfaces, i.e., Rogowski coils. Requires Megger MLLA Low Level Filter.
[4] PowerVTM voltage amplifier output current varies depending on the voltage setting on the 150 Volt range, see curve.

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