

SMRT1 and 1D Single Phase Relay Test System



- **Small, rugged, lightweight, and powerful**
- **Operate with or without a computer**
- **Intuitive manual operation with Smart Touch View Interface (STVI) or on board display**
- **High current, high power (75 A/400 VA RMS)**
- **Fully automated testing using RTMS software**
- **IEC 61850 GOOSE testing capability**
- **IEC 61850 9-2 LE Sampled Values compliant**

DESCRIPTION

As a standalone unit the SMRT1 and 1D 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 SMRT1 test system can be manually controlled with Megger’s Smart Touch View Interface™ (STVI) and the SMRT1D with the Integrated on-board display. The STVI, with its large, full color, high resolution, TFT LCD touch screen and the SMRT1D, with its integrated 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 standalone STVI and the on-board display on the SMRT1D 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 STVI’s, or 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 Testing 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). Megger also supports customers using the legacy Advanced Visual Test Software (AVTS).

APPLICATIONS

The current channel is rated for 32 A at 200 VA continuous and up to 60 A at 300 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 SMRT1/1D 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, SMRT1/1D 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.



SMRT1 and 1D Single Phase Relay Test System



APPLICATIONS SELECTION GUIDE

Protective Relays by IEEE Device #		SMRT1/1D
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 to 32 A at 200 VA per phase continuous for timing tests and can provide up to 60 A at 300 VA for testing instantaneous overcurrent relays.

PowerV™ voltage amplifier high power output – The SMRT2 and 1D 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 SMRT1/1D 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 EMT/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 SMRT1/1D 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 \geq 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).

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.

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.

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.

SPECIFICATIONS¹

Input power

100 to 240 V (\pm 10 %) AC, 1 \emptyset , 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

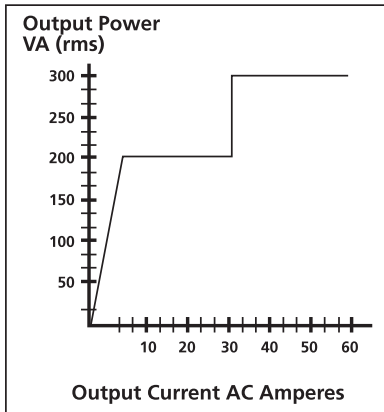
Output power ratings are specified in AC RMS values and peak power ratings.

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 90 Cycles

DC 200 Watts

Duty cycle: 32 A Continuous, 60 A for \pm 1.5 seconds

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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 VRMS	10 mA
0 – 10 VRMS	100 mA
0 – 40 VRMS	25 mA

Duty cycle: Continuous

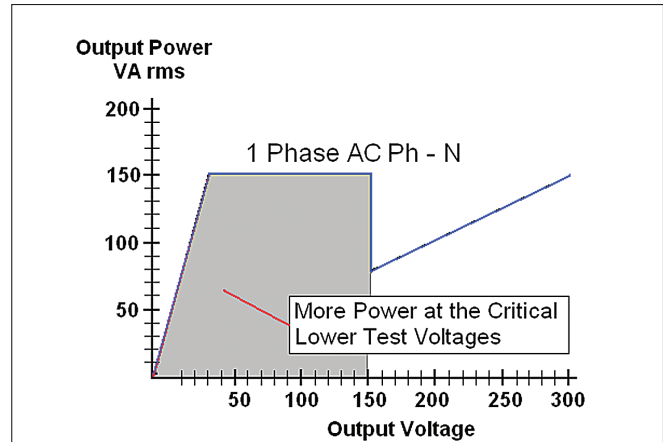
AC voltage output

Outputs are rated with the following ranges:

Output voltage	Power	Max I
2 V ²³	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 1.5 seconds

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

SMRT1 and 1D

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Megger[®]

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

SMRT1/1D 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., I _{max} : 8 A, 2000 VA max. breaking capacity
DC rating:	300 V max., I _{max} : 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

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 current²

Range:	50 mA
Accuracy:	± 0.5 mA typical and 1 mA guaranteed
Resolution:	0.0001
Measurements:	AC RMS

DC voltage amplitude

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

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

SMRT1 and 1D

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On-board display (SMRT1D)

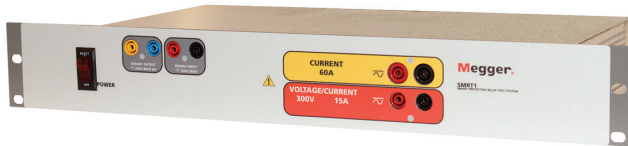
The display is a 10.1" touch tablet with high resolution and features 'Wide Viewing Angle' technology and a large screen with high luminance.

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.

Unit enclosure

The SMRT1 unit comes housed in a rugged, metal, lightweight enclosure. IEC Enclosure Rating IP20. Optional enclosure for a 19 inch rack mount is available. The SMRT1D enclosure is a flame retardant ABS POLYLAC plastic, which is light and rugged.



Rack mount enclosure includes two BNC connectors on the back panel. These connectors are used to amplify an external analogue signal using the SMRT amplifiers. Application of ± 10 Volts peak will provide full scale output from the selected output.

Dimensions

Standard enclosure (SMRT1)

13.5W x 2.4H x 6.75D in. (34.3W x 6.1H x 17.2D cm)

Standard enclosure (SMRT1D)

13W x 5.5H x 8.75D in. (33.02W x 13.97H x 22.23D cm)

Rack mount enclosure (SMRT1)

19W x 3.5H x 8.75D in. (48.3W x 8.9H x 22.2D cm)

Weight

Standard enclosure (SMRT1): 8.9 lb. (4 kg)

Standard enclosure (SMRT1D): 12.5 lb. (5.7 kg)

Rack mount enclosure (SMRT1): 10.85 lb. (4.9 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)

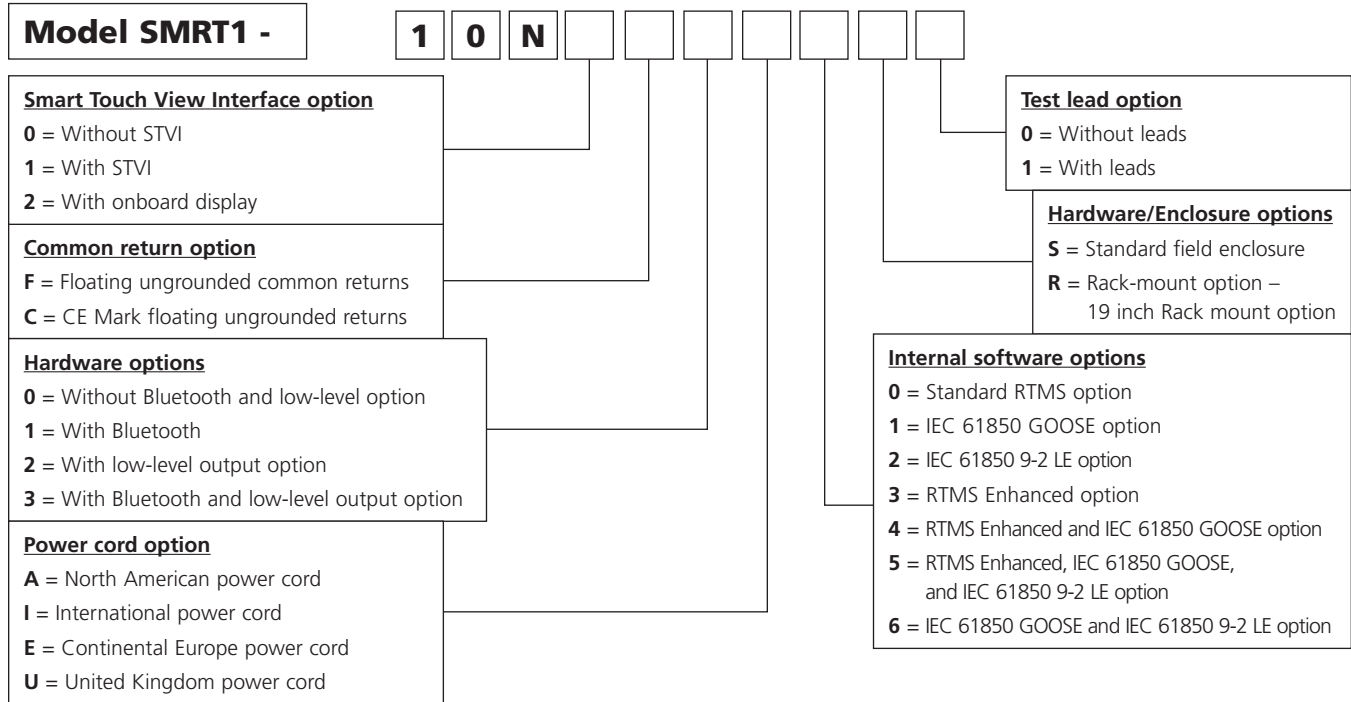
Bluetooth (optional)

SMRT1 and 1D Single Phase Relay Test System



ORDERING INFORMATION

STYLE NUMBER IDENTIFICATION



DESCRIPTIONS OF HARDWARE OPTIONS

Smart Touch View Interface option: Enter the number **0** for the unit to be supplied without a STVI, the number **1** for the unit to be supplied with a STVI hand-held controller 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 Bluetooth and low-level option.
- 1** = Enter the number **1** for the unit to be supplied with the Bluetooth option.
- 2** = Enter the number **2** for the unit to be supplied with the low-level option.
- 3** = Enter the number **3** for the unit to be supplied with the Bluetooth and 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. The Megger GOOSE Configurator/Sampled Values Analyser (MGC/SVA)* software is required to test and commission IEC 61850 GOOSE compliant devices.
- 2** = Enter the number **2** for the unit to be supplied with the IEC 61850 9-2 LE hardware license enabled on the unit. The Megger GOOSE Configurator/Sampled Values Analyser (MGC/SVA)* software is required to test and commission IEC 61850 9-2 LE compliant devices.
- 3** = Enter the number **3** for the unit to be supplied with the RTMS Enhanced option.
- 4** = Enter the number **4** for the unit to be supplied with both RTMS Enhanced and IEC 61850 GOOSE hardware licenses enabled. The Megger GOOSE Configurator (MGC)* software is required to test and commission IEC 61850 GOOSE compliant devices. *MGC/SVA standalone software part number: 1007-246.
- 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. The Megger GOOSE Configurator/ Sampled Values Analyser (MGC)* software is required to test and commission IEC 61850 GOOSE and IEC 61850 9-2 LE compliant devices. *MGC/SVA standalone software part number: 1007-246
- 6** = Enter the number **6** for the unit to be supplied with IEC 61850 GOOSE and IEC 61850 9-2 LE hardware licenses enabled. The Megger GOOSE Configurator/ Sampled Values Analyser (MGC)* software is required to test and commission IEC 61850 GOOSE and IEC 61850 9-2 LE compliant devices. *MGC/SVA standalone software part number: 1007-246

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Hardware/enclosure options: **S** = Standard unit. **T** = With transducer test capability enabled (requires 3 channel configuration). When equipped with the transducer test feature the total number of binary inputs and outputs are reduced by 1.

Test leads option: Enter the number **1** for the unit to be supplied with test leads. Enter **0** for the unit without test leads.

DESCRIPTION OF SOFTWARE OPTIONS

Included software	Part Number
RTMS Standard application software	84978
Optional software	
Megger GOOSE Configurator and Sampled Values Analyser stand-alone software	1007-246
RTMS Enhanced software upgrade kit	84973
IEC 61850 GOOSE hardware upgrade kit	83646
IEC 61850-9-2LE Sampled Values hardware upgrade kit	1013-856
SMRT IEC 61850 GOOSE and IEC 61850-9-2LE Sampled Values hardware upgrade kit	1013-938
Low-level hardware upgrade kit (includes Rogowski, low-current and variable voltage on B/I 1 feature) ^{2/3}	87416

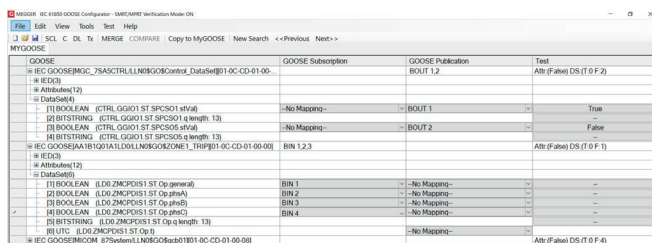
DESCRIPTIONS OF SOFTWARE

Included software

Every unit is supplied with Relay Testing and 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 software 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.

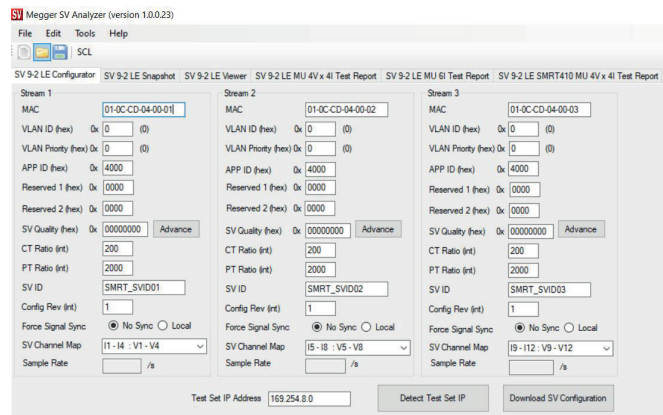
Additional optional software

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 Enhanced, 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

SMRT1 and 1D Single Phase Relay Test System



RTMS Enhanced software 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 the RTMS software, 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 Software upgrade kit, part number 84973. The kit will include a RTMS Enhanced software 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 GOOSE hardware upgrade kit – The IEC 61850 GOOSE test feature is a hardware enabled option. RTMS software 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 the RTMS software 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 1001-044. 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 1013-856. 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 1013-938. 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








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	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 SMRT1/1D 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





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Descriptions of optional test leads and accessories		Quantity	Part number
	Individual (non-sleeved) extra-long test 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 version2 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. Unit comes 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

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	Descriptions of optional test leads and accessories	Quantity	Part number
	<p>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.</p>	1	TPA10
	<p>Single-slot soft-sided carry case: Designed to carry 1 each SMRT1 unit. The fabric-covered hard sides protect the unit from light rain and dust, while the custom-designed foam padded inside provides protection while in transit. Zipper pouch on the front side is provided to carry power cord, test leads, and Ethernet cable. The SMRT1 and SVTI is small and light enough to hand-carry on virtually all major commercial airlines.</p>	1	2002-567
	<p>Two-pocket soft-sided carry case: The fabric-covered hard sides protect the unit from light rain and dust, while the custom-designed foam padded inside provides protection while in transit for the SMRT1, STVI-2, and test leads. Tested and certified to MIL-SPEC standards for impact. The case is small and only weighs 5.8 lb. The SMRT1 and STVI is small and light enough to hand-carry on virtually all major commercial airlines.</p>	1	2002-468
	<p>Soft sided carry case: The soft-sided carry case protects the SMRT1D unit from light rain and dust. The padded sides provide moderate protection while in transit. The pouch provides storage for the power cord, test leads, and accessories.</p>	1	2014-768

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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