

# SMRT36

## Megger Relay Test System



SMRT36 with P Option shown

- **Small, rugged, lightweight and powerful**
- **Operate with or without a computer**
- **Intuitive manual operation with Smart Touch View Interface**
- **High current, high power (60 Amps/300 VA rms) per phase**
- **Network interface provides IEC 61850 test capabilities**
- **Fully automated testing using AVTS Software**

### DESCRIPTION

For size, weight, and features the SMRT36 is conceivably the smallest, lightest, highest output powered, complete three phase relay test system in the world today. The test system may be customized by adding the number of Voltage-Current, "VIGEN", modules needed for specific test applications. For electric utility use, the SMRT36 with three VIGEN Modules provides complete three-phase testing of three-phase impedance, directional power, negative sequence overcurrent and other devices that require a three-phase four-wire wye connected source. With three modules, output current and VA is tripled for high instantaneous or high burden overcurrent relays. With the voltage channels converted to currents, the same unit can provide 6-phase current. The SMRT36 VIGEN modules also provide high power in BOTH the voltage and current channels to test virtually all relays.

### SMRT36 Relay Test System

#### Touch View Interface

The SMRT36 test system has the ability to be manually controlled with Megger's new optional Smart Touch View Interface™ (STVI). The STVI, with its large, full color, high resolution, TFT LCD touch screen 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 preset test routines for most popular relays.

For full automatic testing the SMRT36 may be controlled by Megger Advanced Visual Test Software (AVTS). AVTS is a Microsoft® Windows® XP®/Vista™/7 compatible software program designed to manage all aspects of protective relay testing using the new Megger SMRT. More flexibility has

been added as well as some new and powerful features. AVTS comes in three different levels:

- SE Test
- Advanced Test
- Professional Test

Every unit comes with AVTS SE (Swift & Easy). The SE version includes Online Vector control (for single and multi-state timing tests including reclosing) Online Ramp control (for automatic ramping of voltage, current, phase angles or frequency to find minimum operating / pickup and dropout tests) and Online Click-On-Fault (for dynamic tests of impedance relays) with the ability to import specific relay impedance characteristics. The user may also save, execute and print relay specific test modules and results. Test results may also be exported directly to Microsoft Word. The SE version also includes new enhanced Relay Test Wizards for overcurrent, voltage, differential, impedance and frequency relays, making relay testing swift and easy.

The Advanced Test version includes the powerful Test Editor, Dynamic Control (includes dynamic end-to-end testing capability), Modbus communication test capability, ASPEN OneLiner™ or Electrocon CAPE™ SS1 File Converter for dynamic testing, and easy to use programming Tools for creating and editing test modules.

The Professional Test version includes all of the features of the SE and Advanced versions plus some other powerful test tools and features. It includes the DFR Waveform Viewer, One-Touch™ Test for fully automatic tests, and Waveform Digitizer to digitize scanned waveforms of electromechanical over current time curves.

**SMRT SYSTEM COMPONENTS**

**The ‘POWER BOX’**

The ‘Power Box’ is ultra rugged, lightweight and feature packed. Some of the unique features include:

**Constant Power Output (CPO) Capability** – The current amplifier delivers maximum compliance voltage to the load constantly through the entire “power curve” of a test. With a CPO rating of up to 400 VA per current channel it has the power and flexibility to test virtually any relay. Constant power output eliminates the need for complicated, time consuming, series and parallel combination connections of current channels together to test high burden relays. Constant power output in the new “PowerV” voltage channel provides a flat power curve at 150 VA from 30 to 150 Volts, which provides testing of electromechanical high impedance relays, and other high burden applications such as panel testing.

**Unique VIGEN Internal Design** – The Voltage and Current Generator (VIGEN) components have been combined into one small amplifier package. This reduces size, weight and with reduced parts count increases reliability. The SMRT36 has the flexibility to deliver up to three voltages, three currents, or using the convertible voltage channels the unit can provide combinations of voltages and currents up to six currents from the 3 channel system.

**Multiple High Speed Communication Ports:** The SMRT36 is provided with three Ethernet ports (two are shared for synchronizing two or more SMRT units together) a high speed USB port and a Bluetooth® option. The Bluetooth option provides the additional capability to communicate with the SMRT36 wirelessly from your PC.

**THE SMRT TOUCH VIEW INTERFACE (STVI)**



Finally...an easier way to perform manual, semiautomatic and automatic relay testing without the need of a computer and expensive software. It's all done via a unique hand held controller called the Smart Touch View Interface (STVI). The most significant feature of the STVI is its ability to provide the user with a very simple way to manually

test even the most complex relays manufactured today. Manual operation is simplified through the use of a built-in computer operating system and the Smart Touch View Interface, with a large color high resolution TFT LCD touch-screen. The STVI eliminates the need for a computer when testing virtually all types of relays. Menu screens and touch screen function buttons are provided to quickly and easily select the desired test function.

**Here's how easy it is**

Pressing the Time test on the top menu bar, the user simply selects the type of relay to be tested. Built-in timing test files are provided for a wide variety of protective relays, including Overcurrent, Voltage, Frequency and Recloser relays. In Figure 1 the pull down relay selection menu for Overcurrent relays is displayed. To make it even easier and faster, the STVI has IEEE and IEC standard time

curve algorithms built-in. The STVI also includes over 180 relay specific time curves, both digitized time curves for electromechanical and time curve algorithms for solid state or microprocessor based relays. Time curves are selectable by manufacturer, model number, and/or curve shape (inverse, very inverse, definite time etc.). In Figure 1, the General Electric IAC 51 relay with a 2 Amp tap and number 5 Time Dial was selected and tested. Three test points were selected.

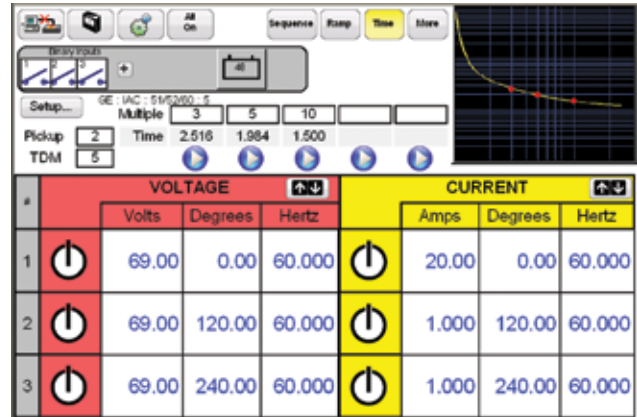


Figure 1. Timing Test Screen for Overcurrent Relays

Test results will automatically be plotted and compared to the theoretical values from the manufacturer's time curve. Up to 5 user defined test points maybe performed. Test results may be saved to the internal PowerDB database for immediate review, or later downloaded for data keeping or printing. See the following figure for an example report. Note that the test report has a defined area in the upper right hand corner for a company logo to customize for a more professional looking report.

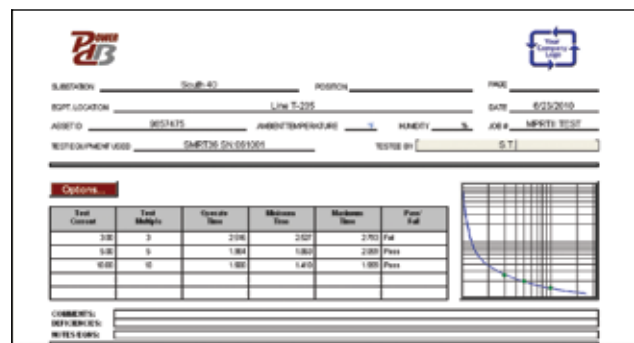


Figure 1B. Example of final Test Report results

The STVI also has the ability to easily do more complex tests and calculations. For example, with the SMRT test system and the STVI it can easily test impedance relays using the Click-On-Fault test screen. To test impedance relays, the user would select the Impedance relay from the top menu bar, see Figure 2 for the Generic Characteristics.

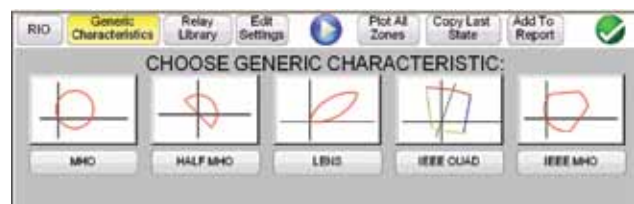


Figure 2. Pull Down Selection Screen for Generic Impedance Characteristics

The user simply selects the relay operating characteristic from the menu bar, like MHO, LENS, QUAD, or imports a specific relay operating characteristic from the Relay Library or imports a characteristic like a RIO file. Selecting the Generic Mho Characteristic the following setting screen will appear. From here the user can define test points in the Impedance Test Screen.



Figure 3. Generic MHO Setting Screen

The user selects the appropriate Zone identifier 1, 2, 3, 4 or 5. The user then selects either phase to ground or phase to phase, and if the characteristic is in the Forward or Reverse direction. Clicking on the green check button will take the user to the test screen, see Figure 4.

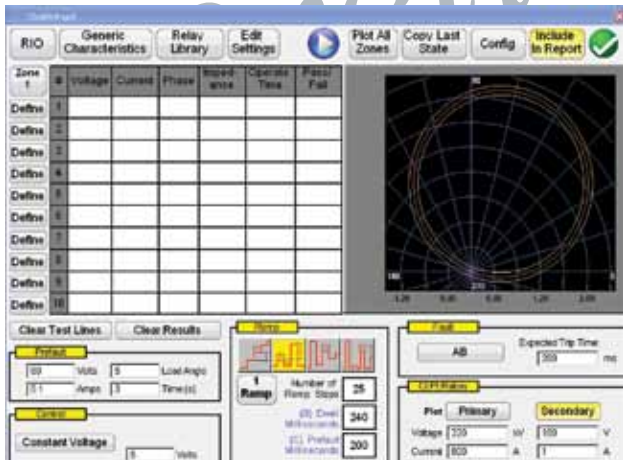


Figure 4. Impedance Relay Click On Fault Test Screen

The user selects Zone, Constant Voltage, Constant Current, Constant Source, or Constant Source (RX). The user inputs the appropriate test quantity (fault voltage or current), and selects the type of fault to simulate, and the type of ramp desired to test the zone. Four types of ramps are available, linear ramp, pulse ramp, binary search, and pulse ramp binary search. Then the user simply clicks and drags across the touch screen where they wish to test. The built-in fault calculator will automatically calculate the test values depending on the Control setting and display the test quantities on the left side. Up to 10 points per test per zone may be defined. The user simply presses the blue execute button and the SMRT will automatically perform all the tests and record the results. A typical test may look like, see Figure 5.

On the right side the user can visually see the test pointer moving in the impedance plane indicating exactly where the test impedance is in real time. When the relay operates a red colored test point is displayed indicating where the relay operated. On the left side the user can see the test vectors changing in real time. When the test is completed, the test results are displayed for each defined test point with PASS/FAIL indication, see the following figure for a sample result.

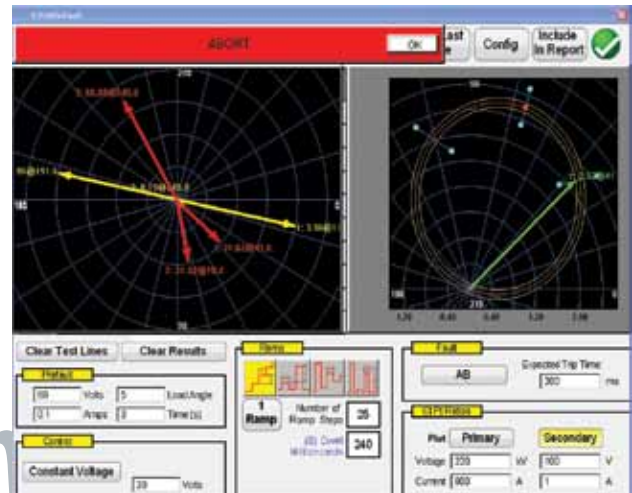


Figure 5. COF Real Time Test Screen



Figure 6. Generic MHO COF Test Results

Clicking on the More button in this Test Monitor Screen the user can click on the View Report button to review the test results in the PowerDB format. See Figure 7.

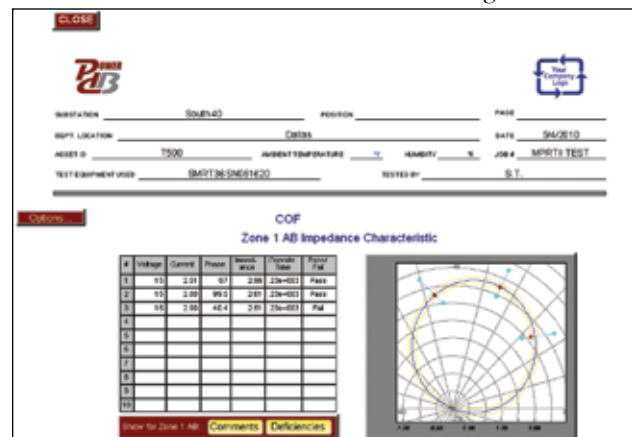


Figure 7. Test Report viewed in PowerDB format



Selecting from the Relay Library the user may select from a list of predefined operating characteristics, see Figure 8 for an example relay.

**Relay Library**

If one of the Generic Impedance Relay Characteristics does not meet your needs, press the Relay Library tab. The user can pick from a list of predefined operating characteristics for many of the more popular manufacturers relays like ABB, AREVA, General Electric, SEL or Siemens, see Figure 8 for an example relay.

The user enters the relay setting values and then simply selects the type of fault desired (Line to Earth, Line to Line, Three Phase). Multiple test points maybe selected and the STVI will automatically calculate the appropriate test currents and phase angles based upon the Settings and the Fault Type selected. In the Settings screen the user can define Constant Voltage, Constant Current or Constant

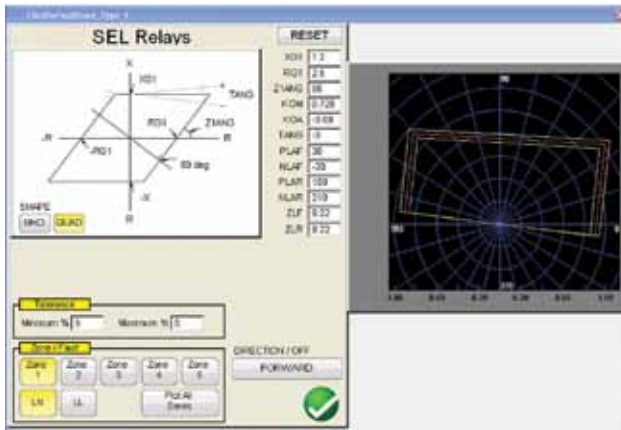


Figure 8. SEL 311 Quadrilateral Characteristic Input Screen

Source Z (defined by Source Z, Source Angle and K factor). If using the Search the test will progress down a line, using click and drag, either as a **ramp**, a **pulse ramp**, a **binary search**, or the new **pulse ramp binary search** looking for the relay to operate. Test results are automatically displayed for each test point similar to Figure 6.

**Manual Monitor Test Screen** – In the following Manual Test Screen the pre-selected outputs are set using the touch screen, or preset default values maybe automatically set. The user can select from a variety of test options including manual control using the control dial, a dynamic sequence of tests to include trip and reclose operations, an automatic ramp, pulse ramp, binary search or pulse ramp binary search to determine pickup or drop out of relay contacts, or perform a timing test. When the test is started by pressing the On button, the selected output indicators will change colors indicating which outputs are energized. A vector graph indicates the relative phase angles of all of the outputs. All of the output amplitudes are metered and displayed to provide real time verification of all of the selected outputs.

**Use the File Manager to organize all test results** – The STVI has sufficient internal memory to save hundreds of test and result files. To manage the tests and results, the STVI has a File Manager screen.

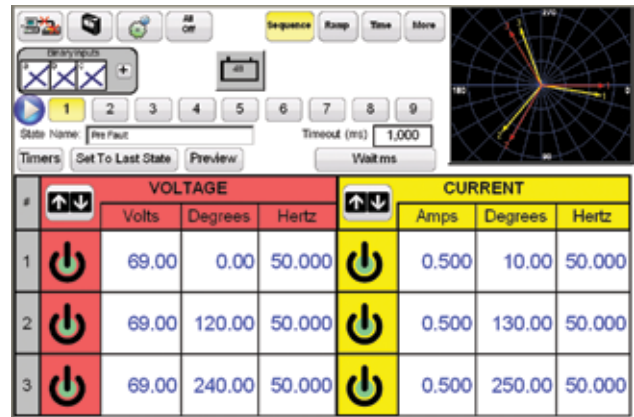


Figure 9. Manual Test Screen Showing Different Ramp Selection

From any test screen, the user has access to the Test File Manager Screen. The user can give the test file/result file any name up to a maximum of 99 characters. Notes may be added to the test report. Once saved, the user can recall the test and execute with the appropriate settings already set, or recall saved test results to download into the PowerDB database for storage or for report generation.



Figure 10. Virtual Keypad and Test Report Notes Section

**All output magnitudes are metered and displayed** –

When under automatic computer control (with the AVTS software), the STVI becomes a meter display for all of the SMRT outputs. The metered values are displayed to provide continuous real-time verification of the outputs, even when under automatic control. Output values are displayed with a vector display, which shows the vector relationship between the output voltage and currents.

**User customized configuration** –

The user may customize how the unit displays phase angles (0-360° Lead/Lag or ± 180°), and set default values of voltages, currents and frequency. The user may also select a language for prompting the operator. Four language choices are currently available, English, French, German, and Spanish.



Figure 11. SMRT Configuration Screen

## FEATURES AND BENEFITS

**Large Color TFT LCD touch-screen display** – The STVI features an easy to use and read display providing manual control of the test set, and displays measured values of voltage and current. This reduces human error and time in testing relays.

**Constant Power Output** – The new SMRT36 employs high powered Voltage-Current amplifiers. The current amplifier delivers maximum compliance voltage to the load constantly during the test. Constant power output in most cases eliminates the need for complicated, time consuming, series and parallel combination connections of current channels together to test high burden relays. Constant power output in the new “PowerV” voltage channel between 30 to 150 Volts provides testing of electromechanical high impedance relays, and other high burden applications such as panel testing.

**Modular design** – Output modules plug-in for system re-configuration and ease of maintenance. Purchase less than a 3 phase system now and upgrade later allows customers to better utilize their limited budgets.

**High resolution and accuracy** – The STVI has Metered outputs and a timer to provide extremely high accuracy.

**Internal memory** – The STVI provides storage of test set-up screens, test results, which reduces testing time and paper work. Saved test results can be downloaded into the Power DB database.

**Steady-State and Dynamic test capability** – The SMRT36 provides, either through manual control or computer control, both steady-state and dynamic testing of protective relays. This includes programmable waveforms with dc offsets and harmonics, which provide realistic transient output waveforms.

**Display screen prompts operator** – The STVI features a display screen that prompts the user with easy to use function buttons. Single button operation saves time in testing relays and minimizes human error.

**Display screen provides four languages** – The STVI display screen currently prompts the user in English, French, German, and Spanish.

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

**Memory metering** – Allows the user to set test currents and voltages faster, which reduces heating of the device under test.



SMRT36 with N Option

**Digital inputs and outputs** – SMRT36 with the “N” option and at least two VIGENS has 2 programmable inputs, and 2 programmable outputs. For more binary inputs and outputs, the “P” (Plus) option adds 8 binary inputs, and 4 binary outputs (2 high speed), and the Battery Simulator. Binary

Inputs can be programmed, using Boolean logic, for more complex power system simulations.

**Circuit breaker simulator** – The SMRT36 binary outputs provide programmable normally closed and 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 EMTF/ATP simulations in the IEEE- C37.111, COMTRADE Standard format.

**Perform End-to-End tests** – Using AVTS software and a GPS satellite signal, the SMRT36 units can perform satellite-synchronized end-to-end dynamic or transient tests. Provides precisely synchronized testing of remotely located complex protection schemes.

**Wide-ranging output frequency** – The output frequency of the current and voltage channels can be set for any frequency from dc to 1 kHz.

**Ethernet ports** – Two Ethernet ports provide high speed computer interface. This can be used to quickly download transient waveform data, or update test set firmware. One Ethernet port is used to connect the STVI to the SMRT36. Another port is used for automated control using a PC and AVTS software. The third port may be used to either connect to a substation bus for IEC 61850 testing, or “piggy-back” multiple SMRT units together for synchronized multi-phase test systems.

**Bluetooth Communication** – Bluetooth wireless communications provides a reliable communications medium at the same time providing isolation from the PC.

**Universal input voltage** – Operating from 90 to 264 VAC, 50/60 Hz, the SMRT36 can use virtually any standard source in the world.

**Battery simulator** – The SMRT36 with the P option provides a variable dc output voltage from 5 to 250 Volts, at 100 Watts (4 Amps Max), which eliminates needing a separate dc source for providing logic voltage for solid-state relays. The SMRT36 with the N option does not include a battery simulator.

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

**SPECIFICATIONS**

**Input Power:**

100 to 240 Volts (± 10%), AC, 1Ø, 50/60 Hz, 1800 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. All amplifier outputs are independently isolated or floating. The SMRT units can be ordered with the amplifier common return terminals tied to chassis ground as an option.

**Output Current Sources**

The SMRT36 with three VIGEN modules can provide up to six current sources; three high current / high power, and three convertible channels providing lower current / high power. Output power ratings are based upon an input voltage of 120 volts; higher output ratings are possible with 230 volt input. Output power ratings are specified in rms values and peak power ratings.

Output Current	Power	Max V	Duty Cycle
4 Amperes	200 VA (282 peak)	50.0 Vrms	Continuous
15 Amperes	200 VA (282 peak)	13.4 Vrms	Continuous
30 Amperes	200 VA (282 peak)	6.67 Vrms	Continuous
60 Amperes	300 VA (282 peak)	5.00 Vrms	90 Cycles
DC	200 Watts		

**With two currents in parallel:**

Output Current	Power	Max V	Duty Cycle
8 Amperes	400 VA (565 peak)	50.0 Vrms	Continuous
30 Amperes	400 VA (565 peak)	13.4 Vrms	Continuous
60 Amperes	400 VA (565 peak)	6.67 Vrms	Continuous
120 Amperes	600 VA (848 peak)	5.00 Vrms	90 Cycles

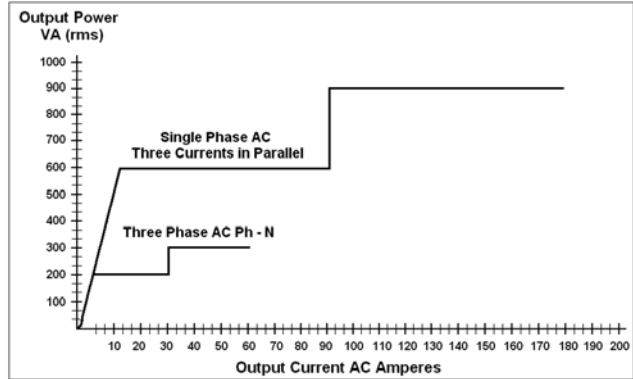
**With three currents in parallel:**

Output Current	Power	Max V	Duty Cycle
12 Amperes	600 VA (848 peak)	50.0 Vrms	Continuous
45 Amperes	600 VA (848 peak)	13.4 Vrms	Continuous
90 Amperes	600 VA (848 peak)	6.67 Vrms	Continuous
180 Amperes	900 VA (1272 peak)	5.00 Vrms	90 Cycles

With two currents in series, the compliance voltage doubles to provide 4.0 Amperes at 100 Volts rms.

**Current Amplifier – Extended Power Range**

The SMRT current amplifier provides a unique flat power curve from 4 to 30 Amperes to permit testing of electromechanical high impedance relays, and other high burden applications, with an extended operating range up to 60 Amperes at 300 VA rms per phase.



Current Amplifier Output Power Curve

**AC Voltage Output**

Outputs are rated with the following Ranges:

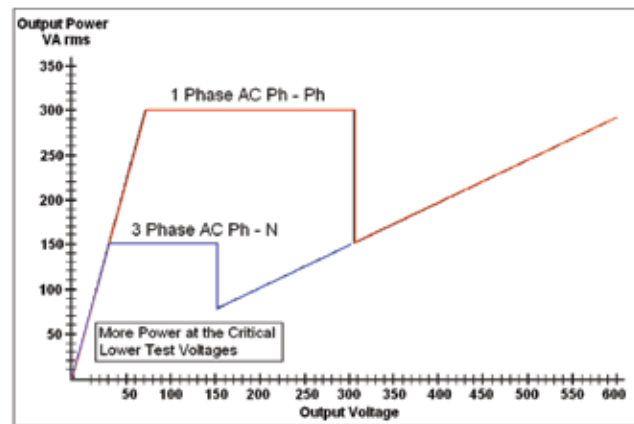
**Model MPRT**

Per phase: Output Volts	Power	Max I
30 Volts	150 VA	5 Amps
150 Volts	150 VA <sup>1</sup>	
300 Volts	150 VA	0.5 Amps
DC	150 Watts	

**Duty Cycle:** Continuous

**“PowerV” Voltage Amplifier - Extended Power Range**

The SMRT voltage amplifier provides a flat power curve in the 150V range to permit testing of electromechanical high impedance relays, and other high burden applications.



“PowerV” Voltage Amplifier Output Power Curves

<sup>1</sup> SMRT – Similar to the current channel, the voltage channel provides a constant output power of 150 VA. Provides test capability of high impedance electromechanical the relays that require more than 1 amp at test voltages from 30 Volts to 150 Volts.

**With two voltages in series:**

Output Volts	Power	Max I
60 Volts	300 VA	5 Amps
300 Volts	300 VA <sup>1</sup>	
600 Volts	300 VA	0.5 Amps

**Voltage Amplifier in Current Mode:**

**Per Phase:**

Output Current	Power	Max V	Duty Cycle
5 Amperes	150 VA (212 peak)	30.0 Vrms	Continuous
15 Amperes	150 VA	10.0 Vrms	90 Cycles

**With two convertible amplifiers in Parallel:**

Output Current	Power	Max V	Duty Cycle
10 Amperes	300 VA (424 peak)	30.0 Vrms	Continuous
30 Amperes	300VA1	10.0 Vrms	90 Cycles

**With three convertible amplifiers in parallel:**

Output Current	Power	Max V	Duty Cycle
15 Amperes	450 VA (636 peak)	30.0 Vrms	Continuous
45Amperes	450 VA1	10.0 Vrms	90 Cycles

**Battery Simulator**

The SMRT36 with the P (Plus) option includes a battery simulator providing a variable DC output voltage ranging from 5 to 250 Volts at 100 Watts, 4 Amps max, providing capability to power up relays with redundant power supplies. Voltage output is controlled via the Smart Touch-View Interface, or through AVTS software. The SMRT36 with the N option does not include a battery simulator.

**Metering**

Measured output quantities such as AC Amperes, AC Volts, DC Volts or DC Amperes, and Time may be simultaneously displayed on the large, variable contrast, color TFT LCD touch screen. The AC and DC outputs display the approximate voltage/current output prior to initiation of the outputs. The memory feature of the metering provides fast and accurate preset of test values. All Accuracies stated are from 10 to 100% of the range at 50/60 Hz.

**Binary Inputs – Start/Stop/Monitor Gates**

SMRT36 with a minimum of two VIGENS and the P option have 10 (with the N option have 2) identical, independent, galvanically isolated, Start/Stop or Monitor circuits provided. To monitor operation of relay contacts or trip SCR, a continuity light is provided for each 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). Binary Inputs can also be programmed using Boolean logic for more complex power system simulations.

**Input Rating:** up to 300 V AC/DC

**Binary Output Relays**

SMRT36 with a minimum of two VIGENS and the P option have 6 (with the N option have 2) independent, galvanically isolated, output relay contacts to accurately simulate relay or power system inputs to completely test relays removed from the power system. Binary outputs simulate normally open / normally closed contacts for testing breaker failure schemes. Outputs can be configured to change state based on binary input logic.

**High Current Output Relays:** The first two VIGEN Modules have 1 each, and the P option adds 2 more.

**AC Rating:** 400 V max., I<sub>max</sub>: 8 amps, 2000 VA max. breaking capacity

**DC Rating:** 300 V max., I<sub>max</sub>: 8 amps, 80 W

**Response Time:** <10ms

**High Speed Output Relays:** SMRT36 P Option adds 2

**AC/DC Rating:** 400 V peak, I<sub>max</sub>: 1 amp

**Response Time:** <1ms typical



### Waveform Generation

Each output channel can generate a variety of output waveforms such as: DC; sinewave; sinewave 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 COMTRADE standard format.

### Waveform Storage

Each output channel can store waveforms for playback on command. End-To-End playback of stored waveforms is possible, when triggered externally by a GPS receiver.

### 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 (3, 2 are shared)  
USB  
Bluetooth (optional)

### IEC 61850 GOOSE Option

The SMRT in conjunction with the Megger GOOSE Configurator (MGC) software can be used in the testing or commissioning of IEC 61850 compliant devices. The MGC graphical user interface provides a quick and easy tool used to configure the test set. The traditional methods of substation interlocking and tripping a breaker via a contact have been replaced by high speed peer to peer GOOSE (Generic Object Oriented Substation Events) messages. This message will be used extensively when performing tests using the SMRT and the Megger GOOSE Configurator software.

### IEC 61850 Test Applications

In order to test the IEC 61850 Intelligent Electronic Devices (IED) it is necessary to capture all the GOOSE messages from the IED. The SMRT is able to subscribe as well as publish GOOSE messages to the individual IED or to the entire network. A GOOSE message can be imported directly from an SCL (Substation Configuration Language) type file or directly captured by “sniffing” the network. Once a GOOSE message is imported or captured, the user will be able to either subscribe or publish GOOSE messages. The SMRT will provide the test signals to the relay under test. The IED being tested will publish a trip GOOSE to tell the breaker to trip. The SMRT reads the trip GOOSE, changes the analogue outputs from the SMRT, and “publishes” a GOOSE message telling the relay that the breaker tripped. In a trip and reclose scheme, the relay may “publish” another GOOSE telling the breaker to Close. The SMRT will read the close GOOSE, change the outputs from the SMRT, and publish a GOOSE back to the relay saying that the circuit breaker has closed. In addition to testing IED’s, the SMRT with the MGC software may also be used to test the substation interlocking system, as well as monitor dataset status changes in specific GOOSE messages using a change in color of the effected GOOSE message(s). Using the Merge feature, the MGC may also be used to troubleshoot the substation SCL file by comparing the captured GOOSE messages with those in the SCL file.

### IEC 61850 Manual or Automated Testing

The MGC assigns GOOSE messages to individual Binary Inputs and Outputs of the SMRT, thus instead of monitoring a set of relay contacts, the SMRT will monitor the GOOSE messages indicating pickup or trip operations. Once the SMRT has been configured using the MGC, the SMRT can be operated manually via the Smart Touch-View Interface controller, or automatically with the AVTS software. The SMRT with the IEC 61850 option provides selectable priority, VLAN-ID, and meets the IEC 61850-5 standard Type 1A, Class P 2/3, for high speed trip and reclose simulations.

### 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

### Unit Enclosure



The SMRT unit comes housed in a rugged, virtually indestructible, lightweight and ergonomic enclosure. It features a large oversized rubber cushioned handle, and removable lid for use in tight spaces.

### Dimensions

**With the lid on:** 14.2 W x 7.6 H x 12.0 D in.  
(360 W x 194 H x 305 D mm)

**With the lid off:** 14.2 W x 7.2 H x 12.0 D in.  
(360 W x 180 H x 305 D mm)

**IEC Enclosure Rating:** IP30

### Weight

**With the lid on:** 27.9 lb. (12.55 kg)

**With the lid off:** 25.8 lb. (11.6 kg)

### Safety, EMC, RFI and ESD Conformance Standards

**Safety:** EN 61010-1, UL 61010-1, CSA-C22.2 #61010-1

**Emissions:** EN 61326, EN 61000-6-4, EN 61000-3-2/3,

FCC Subpart B, Part 15 Class A Instrument

**Immunity:** EN61326, EN 61000-6-2, EN 61000-4-2/3/4/5/6/8/11

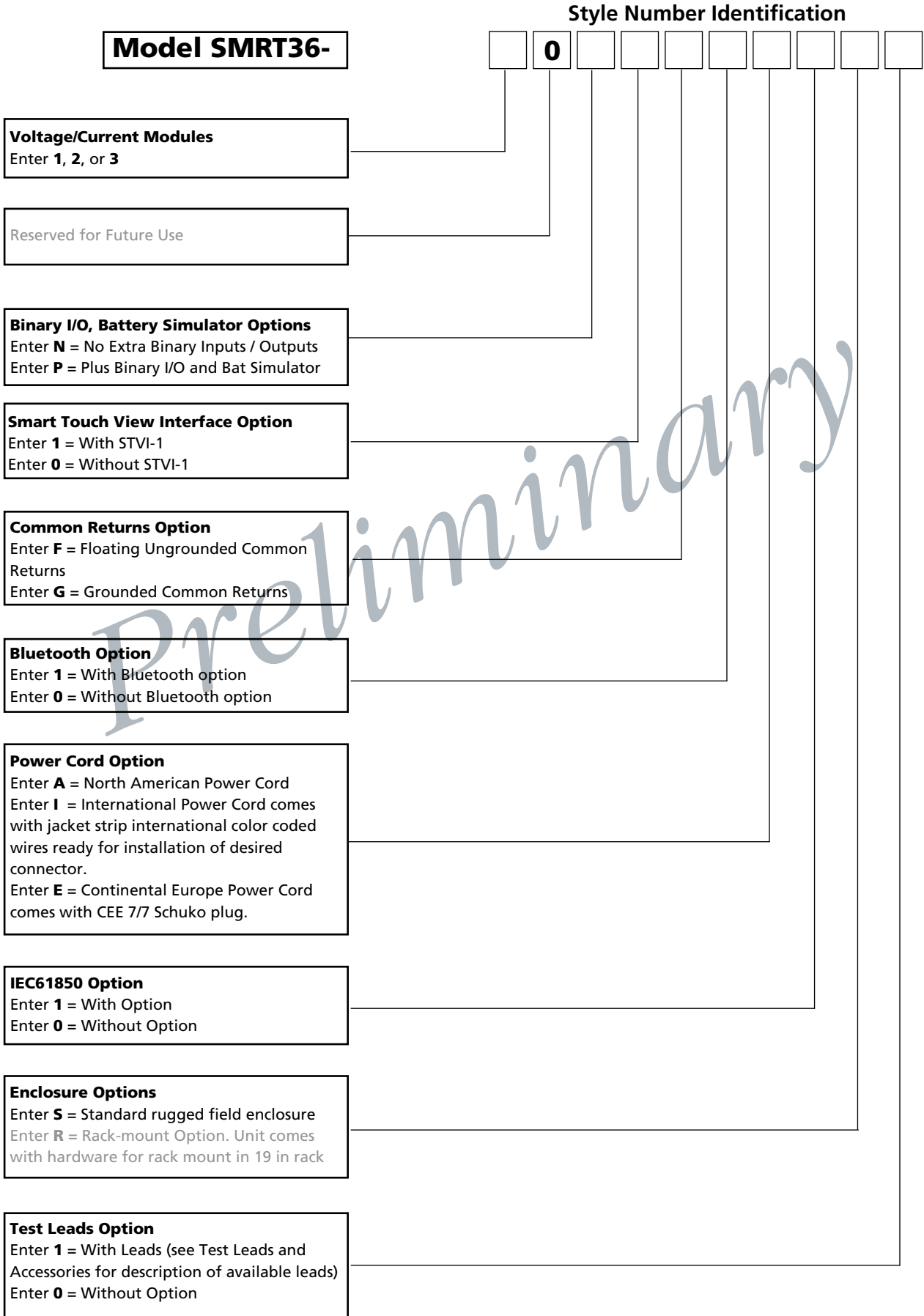
### Shock and Vibration

**Shock:** IEC 60068-2-27 (15g/11 ms, half-sine)

**Vibration:** IEC 60028-2-6 (20 m/s<sup>2</sup>, 10 – 150 Hz)



**ORDERING INFORMATION**



**SELECTION OF CONFIGURATION AND OPTIONS**

**Voltage/Current Module:** The SMRT36 unit can have up to a total of 3 voltage/current modules. Enter the number of desired Voltage/Current modules 1, 2 or 3.

**Future:** 0, Reserved for future use.

**Binary I/O, Battery Simulator Option**

The binary input is used to monitor relay trip contacts and the binary output is used to simulate circuit breaker contacts. There are presently two options available. The first option is no extra binary inputs and outputs, or a battery simulator. With the SMRT36 the first two channels provide 1 binary input and 1 binary output each. A two channel unit provides a total of 2 binary inputs and 2 binary outputs, which is usually sufficient for most relay tests. Enter the alpha character N for No extra binary I/O or battery simulator. For the user who requires the extra binary inputs, outputs and/or the battery simulator enter P for Plus option.

**Smart Touch View Interface Option**

Enter the number 1 for the unit to come with the STVI-1, or enter the number 0 for without. Note that users can still set IP addresses, as well as all of the other system default settings normally set using the STVI-1 by using the AVTS SE software (which comes with each unit).

**Item (Qty)**

**Cat No.**

**Smart Touch View Interface Option**

Includes the following:

Smart Touch View Interface (1 ea.)	STVI-1
STVI Ethernet Cable Assy., 210cm (7 ft.) long (1 ea.)	620094

**Common Returns Option**

The SMRT unit has two options for the return terminals associated with each output channel. They are **F** for floating returns and **G** for grounded common returns. The floating returns option provides independent, isolated return terminals for each output channel. This option requires the user to connect, or common, all of the returns together externally using jumper leads (jumpers supplied with the optional Standard Test Leads, see **Test Leads and Accessories** for more information). Floating outputs is widely accepted in many countries, even though it requires the users to make extra test connections to common the returns together. One significant advantage is when running output currents in parallel and at high current amplitudes. By providing additional parallel leads to the common returns, instead of potentially burning up the internal grounded commons, all of the current is forced through the externally connected common return jumper test leads. It also allows more than two current channels to be series together in a push-push configuration. Normally this is done to increase the compliance voltage. Since the SMRT already provides 50 Volts per phase (100 Volts with two in series) this is not normally something that the SMRT user will need to do, but it is available with the floating output option. The second option is **G** for grounded common returns. All of the return terminals are interconnected internally and connected to chassis ground. This is popular in many parts of the world, since previous standard models (from Megger and other relay test set manufacturers) use grounded common returns.

**Bluetooth Option**

For customers who wish to have a wireless control of the SMRT unit, enter the number **1** for the unit to come with the Bluetooth option installed. Enter **0** for the standard unit.

**Power Cord Option**

There are three optional power cords to choose from. Depending on the destination country, customers can choose which type of power cord they want the unit to come with. Enter **A** for the North American Power Cord. The North American Power cord is used in 36 different countries and territories around the world. Enter **I** for the International Power Cord, which comes with international color coded wires (light blue, brown and green with yellow stripe) with the insulation jacket stripped ready for installation of the appropriate male connector. The international power cord is fairly universal since it does not come with the male connector. It allows the user to install their locally available connector. Enter **E** for the Continental Europe Power Cord, which comes with CEE 7/7 Schuko plug. This plug is commonly used in 42 different countries around the world, which includes most of Europe.

**IEC 61850 Option**

Enter the number **1** for the unit to come with the IEC 61850 option enabled. Enter **0** for the unit without IEC 61850 enabled.

**Enclosure Options**

Enter **S**, for Standard, rugged fiberglass reinforced ABS plastic field type enclosure. The options are **S** for Standard, and **R** for rack mount. The rack mount is not available at this time. The rack unit will come in a metal enclosure with 19 inch rack mount hardware installed.

**Test Leads Option**

Enter the number **1** for the unit to come with Test Leads. Enter **0** for the unit without Test Leads. Due to the optional number of Voltage/ Current generators, and the optional Binary Input / Output with Battery Simulator, the type and number of test leads the unit comes with will vary. See the following for detailed descriptions.

**Test Leads and Accessories**

All units come with a power cord (see Power Cord option), and Ethernet communication cable, and instruction manual CD. All other accessories varies depending on the options selected, see Table of Accessories.

**Included Accessories**

Included Standard Accessories

**Item (Qty)**

**Cat No.**

Power Cord - Depending on the style number, the unit will come with one of the following,	
Line cord, North American	14350
Line cord, Continental Europe with CEE 7/7 Schuko Plug	15021
Line cord, International color coded wire	14525

**Ethernet Crossover Cable**









Ethernet crossover cable for interconnection to PC

210cm (7 ft.) long (Qty. 1 ea)	620094
Instruction manual CD	80989

**Table of Accessories**

The following accessories are supplied with the selection of the Test Leads Option, or the Binary Input/Output/Battery Simulator Option, and/or the STVI Option. With the Test Leads Option the number and type of leads varies depending on the number of channels ordered. If desired, Test Leads and Accessories can be ordered individually, see description and part numbers below.

	<b>Optional Accessories Descriptions</b>	<b>STVI, or Binary I/O Bat SIM, or Test Leads Options</b>	<b>One (1) Voltage Current Module</b>	<b>Two (2) Voltage Current Modules</b>	<b>Three (3) Voltage Current Modules</b>	<b>Binary I/O, Battery Simulator Option</b>
	<b>Accessory Carry Case:</b> Use to carry power cord, Ethernet cable, Optional STVI and test leads. Carry case may be clipped to the SMRT enclosure, or use carry strap to carry over shoulder.	Qty. 1 ea. Part No. <b>2001-487</b>				
	<b>Sleeved Pair of Test Leads:</b> Keeps the test leads in pairs and from getting entangled. Sleeved Test Leads, one red, one black, 200 cm (78.7") long, 600 V, 32 Amperes CAT II.		Qty. 3 pr. Part No. <b>2001-394</b>	Qty. 6 pr. Part No. <b>2001-394</b>	Qty. 2 pr. Part No. <b>2001-394</b>	Qty. 3 pr. Part No. <b>2001-394</b>
	<b>Cable/Spade Lug Adapter (Small):</b> Small lug fit most new relay small terminal blocks.					
	Lug adapter, <b>red</b> , 4.1 mm, use with test leads up to 1000 V/20 Amps CAT II.		Qty. 3 ea. Part No. <b>684004</b>	Qty. 6 ea. Part No. <b>684004</b>	Qty. 12 ea. Part No. <b>684004</b>	Qty. 3 ea. Part No. <b>684004</b>
	Lug adapter, <b>black</b> , 4.1 mm, use with test leads up to 1000 V/20 Amps CAT II.		Qty. 3 ea. Part No. <b>684005</b>	Qty. 6 ea. Part No. <b>684005</b>	Qty. 12 ea. Part No. <b>684005</b>	Qty. 3 ea. Part No. <b>684005</b>
	<b>Jumper Lead:</b> Used to common returns together on units with floating ground returns, or parallel of current channels. Jumper lead, black, 12.5 cm (5") long, use with voltage/current outputs, 600 V, 32 Amps CAT II.			Qty. 2 ea. Part No. <b>2001-573</b>	Qty. 4 ea. Part No. <b>2001-573</b>	
	<b>Sleeved Combination Voltage Test Leads:</b> Keeps the test leads from getting entangled. Three common leads connect to the test set, which are interconnected down to one black common to connect to the relay under test. Sleeved Three Phase Test Leads, three red and black, 200 cm (78.7") long, 600 V, 32 Amperes CAT II.				Qty. 1 ea. Part No. <b>2001-395</b>	
	<b>Sleeved Combination Current Test Leads:</b> Keeps the test leads from getting entangled. Three pairs of leads connect to the test set, with three pairs to connect to the relay under test. Sleeved Three Phase Test Leads, three red and black, 200 cm (78.7") long, 600 V, 32 Amperes CAT II.				Qty. 1 ea. Part No. <b>2001-396</b>	

**Item (Qty)** **Cat No.**

**Deluxe Test Leads and Accessories Kit:**

The Test Leads and Test Lead Accessories are an option. Test leads and accessories can be ordered with the unit, or later as a kit. The Deluxe Test Leads and Accessories kit includes sleeved pairs of leads for use with the extra binary inputs/outputs/battery simulator option, as well as the three phase sleeved combination leads for voltage and current channels. The following test leads and test lead accessories are included in the Deluxe Test Leads and Accessories kit in quantities shown. 2001-619

**Sleeved Combination Voltage Test Leads:**

Keeps the test leads from getting entangled. Sleeved Three Phase Test Leads, three red and black, 200 cm (78.7") long, 600 V, 32 Amperes CAT II (Qty. 1 ea) 2001-395

**Sleeved Combination Current Test Leads:**

Keeps the test leads from getting entangled. Sleeved Three Phase Test Leads, three red and black, 200 cm (78.7") long, 600 V, 32 Amperes CAT II (Qty. 1 ea) 2001-396

**Sleeved Pair Test Leads**, one red, one black, 200 cm (78.7") long, 600 V, 32 Amperes CAT II, (Qty. 5 pair) 2001-394

**Jumper lead**, black, 12.5 cm (5") long, use with voltage/current outputs, 600 V, 32 Amps CAT II (Qty. 4 ea.) 2001-573

**Cable/Spade Lug Adapter (Small):** Small lug fits most new relay small terminal blocks. Lug adapter, red, 4.1 mm, use with test leads up to 1000 V/ 20 Amps CAT II (Qty. 15 ea.) 684004

**Lug adapter**, black, 4.1 mm, use with test leads up to 1000 V/ 20 Amps CAT II (Qty. 15 ea.) 684005

**Accessory Case** 2001-487

**Item (Qty)** **Cat No.**

**Additional Accessories (Not Included in the Test Leads Option or Deluxe Lead Kit) -**

Additional 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.



**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") 600 V/ 32 Amps CAT II 620143

Test Lead, black, use with voltage/current output, or binary I/O, 200 cm long (78.7") 600 V/ 32 Amps CAT II 620144



**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 Amps CAT II 684002

Lug adapter, black, 6.2 mm, use with test leads up to 1000 V/ 20 Amps CAT II 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 Amps CAT III 684006

Alligator clip, black, use with test leads up to 1000 V/ 32 Amps CAT III 684007



**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 Amps CAT III 90001-845



**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") long, use with test leads up to 600 V, 32 Amperes CAT II 90001-843

Retractable Sleeve Test Lead, black, 50 cm (20") long, use with test leads up to 600 V, 32 Amperes CAT II 90001-844



**Item (Qty)** **Cat No.**



**In-Line Fused Test Lead:** Use with high speed binary outputs 5 or 6 to protect for switching of currents higher than 1 Amp.

Test lead, blue, in-line 500 mA fuse protection, 200 cm long (78.7") (Qty. 1 ea) 568026



**In-Line Fused Test Lead:** Use with Battery Simulator output to protect for accidental connection to substation battery.

Test lead, black, in-line 3.15 A fuse protection, 200 cm long (Qty. 1 ea) 568025



**In-Line Resistor Test Lead:** Use with old solid state relays with "leaky" SCR trip gates

Test lead, red, in-line 100 k Ohm resistor, use with test leads up to 1000 V/32 Amps CAT III 500395



**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 Amperes CATII FTP10



**STATES® 10 Pole Test Paddle Attachment:** Use with STATES FTP10 Test Paddle

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 Amperes CAT II TPA10



**Transit Case**  
**Hard-Sided Transit Case:** Includes custom designed foam inserts for the SMRT unit and accessory case. Transit case includes retractable handle, polyurethane wheels with stainless steel bearings, double-throw latches, fold-down handles, stainless steel hardware and padlock protection, with O-ring seal making the case water-tight,

with an IP 67 rating. Tested and certified to US Department of Defense Standards for impact, vibration, and low/high storage temperatures. The case is small (meets airline total dimensions restrictions of 62 in/157 cm as checked luggage), and weighs only 23 pounds (10.35 kg). With a three channel SMRT36 it is light enough to check as luggage on commercial airliners (slightly more than 50 lbs/23 kg).

Rugged, hard-sided transit case (1ea) 90002-168

**Example Configurations**



For customers in **North America, Central America, Japan, Philippines, South Korea, Taiwan, Thailand, Venezuela, Virgin Islands,** and other countries that use standard NEMA type power outlets of 100, 110, 115 or 120 volts at 50/60 Hz. could order a unit with the standard North American power cord. In this example the unit is a SMRT36 three phase unit, with the extra binary I/O and Battery Simulator, with the STVI-1, with grounded common returns, no Bluetooth, no IEC61850, in the standard enclosure. The style number would be, **SMRT36 - 30P1G0A0S**



For customers in **Austria, Belgium, Finland, France, Germany, the Netherlands, Norway, Portugal, Spain, Sweden, Turkey,** and other countries where the CEE 7 standard connector is used could order a unit with the Continental European Power Cord with CEE 7/7 Schuko plug. In this example the unit is a 3 phase unit, with the extra binary I/O and Battery Simulator, without the STVI-1, with floating outputs, no Bluetooth, with IEC61850 enabled, in the standard enclosure. The style number would be, **SMRT36 - 30P0F0E1S**

The final example is for countries that have more unique power connectors, which will require international color coded wires ready for appropriate male connectors to be installed like; **Australia/New Zealand, Argentina, China, Demark, India/South Africa, Ireland, Israel, Russia, Switzerland, or the United Kingdom.** These countries are more likely to order the unit with the international color coded power cord ready for mounting the appropriate male connector. In this example the unit is a 3 phase unit, with the extra binary I/O and Battery Simulator, with the STVI-1, with the floating outputs, with Bluetooth, with IEC61850 enabled, in the standard enclosure. The style number would be, **SMRT36 - 30P1F1I1S**

Preliminary

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**UK**

Archcliffe Road Dover  
CT17 9EN England  
T +44 (0) 1304 502101  
F +44 (0) 1304 207342

**UNITED STATES**

4271 Bronze Way  
Dallas TX 75237-1088 USA  
T 800 723 2861 (USA only)  
T +1 214 333 3201  
F +1 214 331 7399

**OTHER TECHNICAL SALES OFFICES**

Norristown USA, Sydney AUSTRALIA,  
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Kingdom of BAHRAIN, Mumbai INDIA,  
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**ISO STATEMENT**

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