

SVERKER 900

Relay and multifunctional substation test system





WITH OVER 25,000 UNITS SOLD TO DATE, SVERKER is synonymous with the very best in relay and substation testing. New SVERKER 900 now lifts this success to a higher level.

Megger's skilled designers and testers have taken the best of previous generation equipment and added modern, state-of-the-art functions (plus a simple stroke of genius) to meet today's increasing need for accurate three-phase protection testing in electrical distribution substations, renewable power generation stations and industrial applications. Intuitive to use and packed in an easy-to-transport box, SVERKER 900 is ready for your next test assignment.

SVERKER 900 – a true hybrid

Now with full three-phase testing capability

The strict demarcation between single and three-phase testing no longer exists. Modern microprocessor-based relay protection platforms demand to be tested with three-phase voltage and current sources. Yet the need to quickly switch back to single-phase testing of older electromechanical and solid-state relays still remains. SVERKER 900 Relay and Substation Test System handles both with finesse. It's a true hybrid.

Cleverly-designed jumpers ensure safe and simple switching between test modes

Three current and four voltage generators make SVERKER 900 a complete three-phase test system. Furthermore, since all voltage and current sources have floating ungrounded neutral, primary switchgear testing is also possible. All sources can be used; separate, in parallel or in series. Quick and reliable transfer between test modes is taken care of by a series of jumpers. Their patented design, in combination with the new panel layout, ensures that you do not accidentally short circuit generator and also they drastically reduce cabling.



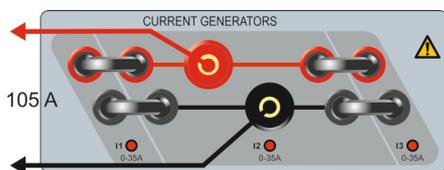
SVERKER 900 jumpers – the safe and simple way reset phase status.

Intuitive user-interface adds clarity and flexibility

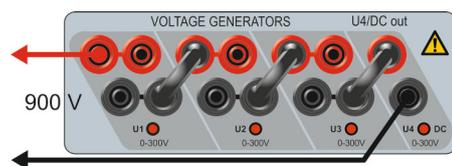
For times when most of your tests are single-phase, SVERKER 900's user-interface also simplifies resetting by minimizing the number of button-pushing adjustments needed for each new test. Clear coupling graphics shown on the 5.7" LCD touch-screen also help you make the right connections.

In addition, operating SVERKER 900 via the touch screen eliminates the need for a PC in the field.

Test files and results are simply transferred between the instrument and a PC via a USB port on the front panel. Performed relay tests can be saved and used as 'test plans' for repeated test or as a template. This greatly speeds up testing in the field.



All three current generators in parallel.



Easy-to-follow coupling instructions are shown on the graphic display.



Stand-alone functionality in the field. With its built-in LCD touch-screen and USB port, SVERKER 900 needs no PC.

Leave the test site knowing you've done a good job

"I need easy-to-use equipment to test my ROCOF relays in distributed generation plants. I also need to test simple directional over-current relays without getting a headache about calculating the polarization voltage or current, 3U0, Open delta, residual current or voltage. Any suggestions?"

"I rarely use the full capability of our expensive test set. What I really want is lower-cost simple test sets plus selected advanced set tools for more complex tasks."

"I wish I had a good programmable powerful test set to test my advanced motor protections without paying a fortune. Do you have a solution?"

Our answer to these and related needs is simple. SVERKER 900. With a flexibility that simplifies and speeds up field-testing, it instills confidence in every user.

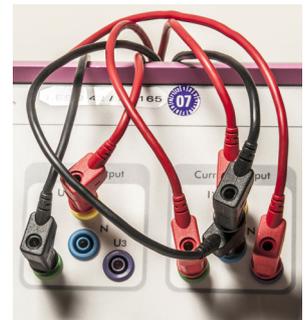
Power plus versatility

Well capable of generating up to 900 V, SVERKER 900 simplifies performing magnetization curves for current transformers. In keeping with tradition, its four voltage generators each offer a generous 125 VA power output. All are galvanically separated for maximum flexibility. With 300 V per channel, it's a natural choice in industrial plants dependent on motor and generator protection testing, as well as relay protection in MV substations. The three current generators each deliver up to 35 A and their combined effect can be fully deployed in single-phase to reach 105 A in total. At last, you have a modern relay tester that easily handles instantaneous- trip testing of over current relay protection (including 5 A secondary input) without compromise. And without a mass of confusing cables.

Self-Powered Relays

Self-powered relays which grows rapidly with the increase of distributed generation, is a challenge to modern test equipment due to the unbalanced and non-linear load. The powerful current generators of SVERKER 900 perform accurate tests without a problem.

What's more, a transformer differential relay poses no problems either. Simply add the desired level of harmonics to test the correct operation of the harmonics restraint function.



Many other testing instruments confront users with an untidy tangle of confusing cables.



With SVERKER 900, single-phase high-current and high-voltage connection of a multi-phase test set has never been so simple.

Leave the test site knowing you've done a good job

Time measurement made easy

SVERKER 900 has a total of five timer or binary inputs. Four start internally while the fifth acts completely independent of generator activation. This allows it to function as an independent timer for a variety of tasks.

The four internal inputs can be used singly or conditioned to work together. Just switch on or off inputs as needed. A few taps on the touch-screen buttons are all that's needed. And it's just as easy to set an individual function for each input. Experienced SVERKER users will feel right at home when setting timer conditions, which promotes quick, smooth and confident working.

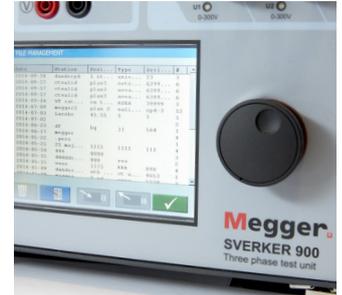
Test File Manager saves and reuses tests

A special SVERKER 900 Test File Manager application accelerates and simplifies relay testing in the field. Test File Manager both saves performed test results and allows them to be reused as 'test plans' when repeating the test or as a template for similar tests.

Test files are transferred via USB to a PC, where they through the SVERKER Viewer software can be analyzed further, saved as a PDF file and printed as a report.



Familiar, easy-to-follow touch-panel makes setting timer conditions quick and confident.



Test File Manager speeds testing in the field and greatly simplifies the further handling and processing of results.



For substation engineers everywhere, this is your ultimate toolbox

The need to test modern relays using three-phase voltage and current sources is clear to all involved with today's MV substations. From commissioning engineers needing to ensure compliance to dedicated relay engineers requiring greater power and amplitude to handle a wide spectrum of test situations, SVERKER 900 is the ultimate universal toolbox – complete, reliable, accurate and very easy-to-use.

Electrical contractors and service companies, especially those working in deregulated markets, will also find SVERKER 900 perfect for the many different assets they need to test. Similarly, sectors like heavy industry, marine and oil and gas will also enjoy the ergonomic connector panel and intuitive user-interface, not only in the substation environment but also in motor and generator protection testing.

BINARY INPUTS

Independently programmable and galvanically separated. Measure both energized and floating contacts.

BINARY OUTPUTS

One change-over contact. Simplifies testing relay re-close function or simulating breaker status contact.

EXTERNAL TIMER

Universal timer. Can be used independently of voltage or current outputs, or be used with internal start and stop conditions.

USB OUTPUT

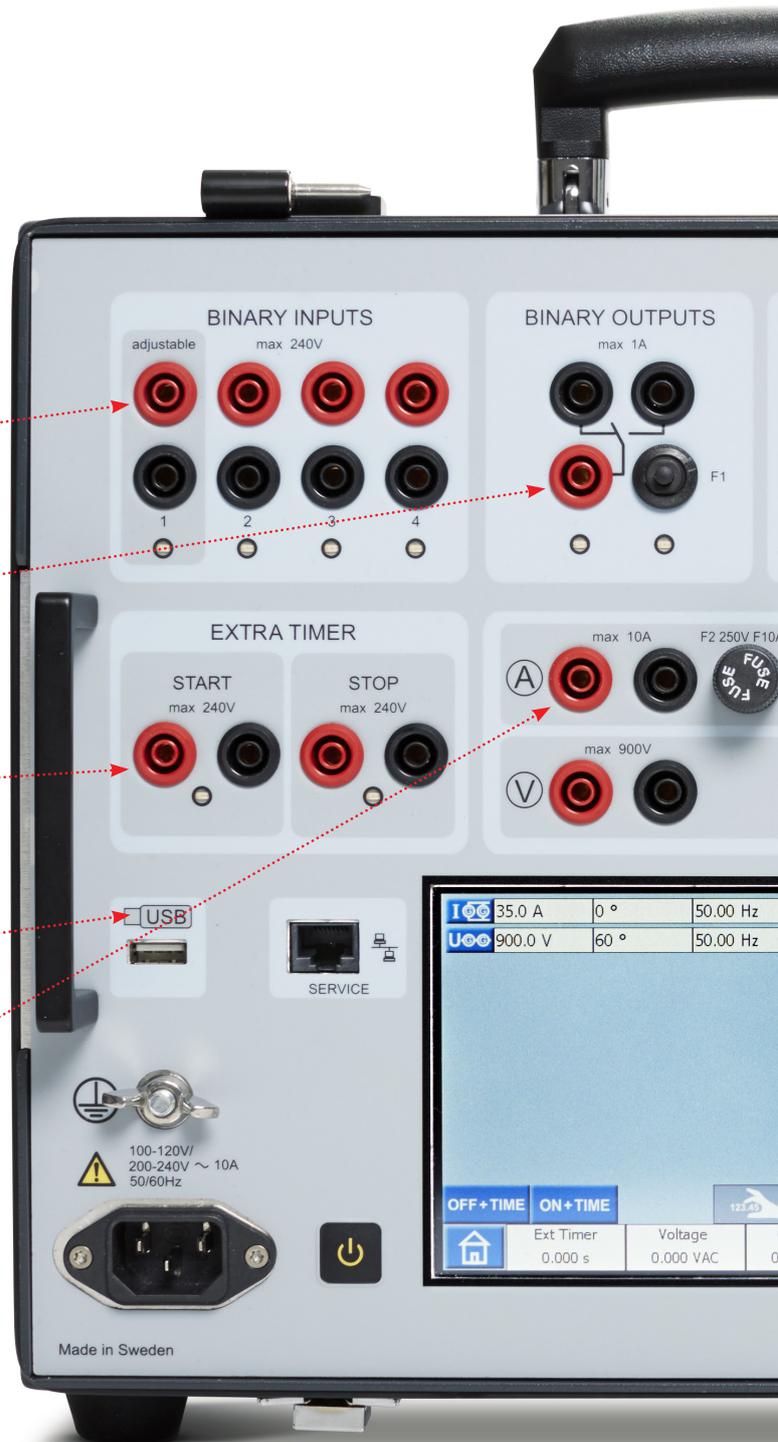
Primarily for report data upload/download, or if you would like to control the screen from keyboard and mouse.

ANALOG MEASURING INPUTS

Ampmeter: 0–10 A

Voltmeter: 0–900 V

Measurements available: (P, Q, S, power factor), impedance (resistance, reactance), frequency and phase angle.



For substation engineers everywhere, this is your ultimate toolbox

Scan the QR code
for more information
and for application
notes.



All current and voltage generators are galvanically separated. Can be controlled independently with respect to:

- AC or DC
- Frequency
- Amplitude
- Phase Angle



CURRENT GENERATORS

High-current terminals secure high-power connections during single-phase testing of over-current relays and low-voltage breakers.

3 power generators, fully isolated.
Connect in series or parallel. Jumpers help avoid wrong connections.

VOLTAGE GENERATORS

4 voltage generators. Fully-isolated.
Connect in series or parallel. Also protected against incorrect wiring. 900 V is sufficient to record CT saturation curves in most MV substations.

LCD TOUCH SCREEN

LCD touch-screen with full control of instruments and test types.

Fields for test condition inputs and measurements.

DIAL

Dial sets generator output. Also for ramping or searching for function values during testing.

Wide range of test functions plus simple, efficient working

Using SVERKER 900 is simplicity itself. It takes the obvious, logical ergonomics of previous generations and adds new, highly-intuitive panel and screen layouts. Setting the correct voltage and current generator output couldn't be easier. Plus you have all the instruments you need to generate accurate test measurements without fuss or bother. The result is simpler and more efficient working. Here are some examples.

Flexible and powerful

Test engineers performing servicing jobs in power stations or substations can take great comfort in the knowledge that SVERKER 900 handles both simple over-current protection and maintenance tests on generator protection. The power it generates is sufficient for heavy-powered older generations of back-up relay protections as well as checking the knee-point voltage of connected transformers.

Pre-fault – fault instrument

A timing test used mainly to test relays that require simulation of a pre-fault state before the fault simulation. Both pre-fault and fault states can be configured individually (including time duration). SVERKER 900 will then measure the test object's trip time from when the fault state was initiated. Multiple Timing Test (MTT) feature with reference curve Inverse Definite Minimum Time (IDMT) according to IEC60255-151:2009, simplifies test and verification of the tripping times for the different current amplitudes.

Ramp instrument

The ramp test is very similar to pre-fault – fault. Set a ramp rate between the states (individually for each generator if you wish) as well as the threshold and time measurement. SVERKER 900 automatically determines the pick-up or drop-off values.

This instrument is particularly well suited for generator protection applications, such as ROCOF, frequency, under/over voltage functionality, etc., where the need for flexible control of rate-of-change for any set parameter is paramount.

Sequence instrument

You can define up to 16 different sequence states, freely setting values for generator voltage, current, phase angle and frequency in each one. Similarly, the binary inputs can be used to set stop conditions dependent on or independent of each other. This operating mode is most often used to simulate and test auto reclosers, motor starts and re-striking earth faults.

CT magnetization Instrument

In relay testing, this function is mostly used to determine the different knee-point voltages of respective current transformers characterized by having at least two separate cores with different saturation curves. Commissioning engineers thus need to ensure that these are correctly connected. If not, correct relay functionality at high fault currents may be compromised.

Advanced mode – enables harmonics generation

In this mode, each individual generator can be set to generate a harmonic waveform. A second and third layer of harmonics can be super-imposed over the fundamental frequency with a user-selectable portion of the fundamental frequency and selectable harmonics frequency.

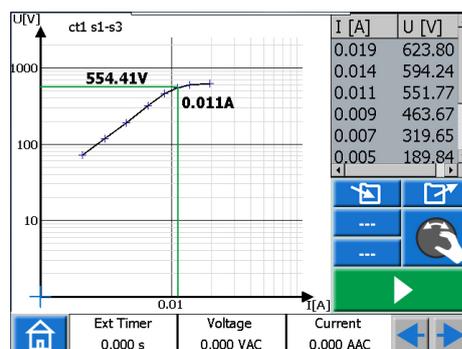
In addition, the fundamental frequency can be set to any value between 10 Hz and 600 Hz, allowing for DC to cater for high-current DC applications.

Impedance instrument

To test distance protection effectively this instrument allows to test relays directly from the so called impedance plane, where the conversion from the impedance into voltages and currents is automatically done by SVERKER 900. Pre-fault fault, ramp, click-on-fault tests etc. can be performed.

Continuous software development

Continuous development of SVERKER 900 software will make additional measurement instruments available on a regular basis. This ensures that users always have the most up-to-date means of performing relay and substation testing at their disposal.



The accurate CT testing information provided by SVERKER 900 helps manage power grid protection systems.

Wide range of test functions plus simple, efficient working



By helping detect and counteract islanding in distributed power generators, SVERKER 900's ramp instrument is useful to test frequency protection.



SVERKER 900 eliminates concerns about test equipment power capacity and facilitates setting up the test sequence.

Testing distributed generation plants

In the strive to become climate neutral, electricity and renewable energy sources, such as wind and solar, plays a key role. The significant increase of distributed power generation puts new demands on grid safety and regulation. With this in mind IEC in 2019 released a new standard, IEC 60255-181:2019, specifying relay performances and test methodologies of frequency relays including ROCOF protection.

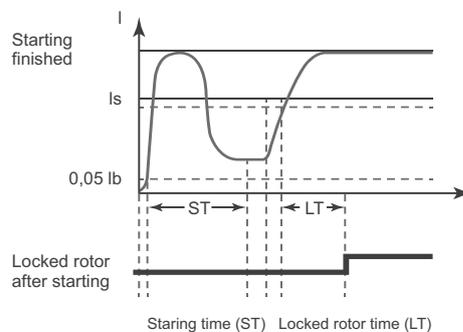
ROCOF's role is to detect power supply failures and isolate the generator in the event of loss of supply. If the power flow from the utility supply prior to an islanding generator is not zero, the frequency changes to the islanded system's natural resonance frequency. Islanding can be dangerous to utility workers, who may not realize that a circuit is still powered, and it may prevent automatic re-connection of devices.

It is therefore essential that distributed generators both detect islanding and immediately stop producing power. The ramp instrument is compliant with the IEC 60255-181:2019 standard and SVERKER 900 offers quick, safe and convenient testing of the vital ROCOF function.

Motor protection testing

Motor protection is a very common feature in most industrial facilities, including power generation. It also requires a great deal of power; extended loading time at high power is needed for the actual relay testing, for example. Furthermore, the set-up curve is quite complex.

It's a big advantage for users if they can test this protection to the full without worrying about test equipment capacity. A simple and intuitive user interface for setting up the test sequence demanded by the relay also makes their work much easier. SVERKER 900 delivers on both counts.



Case of locked rotor after starting.

CT-testing

All decision-making depends on accurate information and managing a power grid protection system is no different. That both current and voltage transformers are properly connected to their protection and give correct values is fundamental to this task. Since the very beginning, the SVERKER family of relay and substation testing equipment has always helped simplify CT testing and verification. SVERKER 900 is no exception. This new full three-phase testing model has now been developed to encompass:

- Excitation curves
- Polarity
- Ratio
- Burden

Specifications

CE - MARKING	
EMC	IEC61326-1
LVD	IEC61010-1:2010
GENERAL	
Mains input	100–240 V AC, 50 / 60 Hz
Current consumption	10 A (max)
Power consumption	1800 VA (max)
Dimensions, Instrument	350 x 270 x 220 mm (13.8" x 10.6" x 8.7")
Weight, Instrument	14.9 kg (32.8 lbs)
MEASUREMENT SECTION	
TIMER INPUTS 1, 2, 3, 4 and EXTRA TIMER Start/Stop	
Number	5 galvanically separated
Type	Dry or wet contacts max, 240VAC or 340VDC
Timer	
Resolution	1 ms
Binary Outputs	
Insulation	250 V AC
Current	1 A (max)
Voltage	250 V AC or 120 V DC
Voltmeter	
Measurement method	AC true RMS, DC mean value
	AC/DC 0-900 V in 4 fields
Resolution	1 mV
Ammeter	
Measurement method	AC true RMS, DC mean value
	AC/DC 0-900 V in 4 fields
Resolution	1 mA

Extra measurements

Power factor and phase angle measurements

	Ranges	Resolution	Inaccuracy
Power factor $\cos\phi$	-0.01 (cap) to 1 to +0.01 (ind)	< 0.01	< 0.04
Phase angle ($^{\circ}$) ¹⁾	10 A (max)	< 0.1 $^{\circ}$	< 0.8 $^{\circ}$

Impedance and power measurement

AC	Z (Ω), R(Ω), X (Ω), P (W), S (VA),
DC	10 A (max)

1) Valid with current >1 A and voltage > 10 V

Generation section

Voltage outputs U1, U2, U3 and U4/DC

All voltage sources/generators are galvanically separated from each other and from ground.

Floating common return is made using jumper connectors.

VOLTAGE GENERATORS	
Range	4 x 300 V AC, 125 VA (max) 4 x 300 V DC, 125 W (max)
Phase	
Angle range	0 $^{\circ}$ –360 $^{\circ}$
Resolution	< 1 $^{\circ}$
Frequency range	10 Hz–600 Hz

Voltage generators in single-phase mode, AC or DC

	VOLTAGE	POWER (max)	CURRENT (max)
4 Voltage generators in parallel: U1 // U2 // U3 // U4	300 V	375 VA	1.2 A
	100 V	300 VA	3.0 A
	67 V	300 VA	4.5 A
	External load: min 7 Ω		
3 Voltage generators in parallel: U1 // U2 // U3	300 V	312 VA	1.0 A
	100 V	250 VA	2.5 A
	67 V	250 VA	3.7 A
	External load: min 9 Ω		
4 Voltage generators in series: U1 – U2 – U3 – U4	900 V	450 VA	1.0 A
	400 V	360 VA	2.5 A
	268 V	250 VA	3.7 A
	External load: min 100 Ω		
3 Voltage generators in series: U1 – U2 – U3	900 V	350 VA	0.4 A
	300 V	280 VA	0.9 A
	200 V	275 VA	1.4 A
	External load: min 75 Ω		



Specifications

Current Generators

Current outputs I1, I2 and I3

All current generators are galvanically separated from each other and from ground. Floating common return is made using jumper connectors.

CURRENT GENERATORS	
Range	
3-phase AC	3 x 35 A
3-phase DC	3 x 35 A
3-phase AC	3 x 20 A continuous
3-phase DC	3 x 17 A continuous
Power	
3-phase AC (max)	3 x 250 VA
3-phase DC (max)	3 x 250 W
Phase	
Angle range	3 x 250 VA
Resolution	< 1°
Frequency range	10 Hz–600 Hz

Current generators in single-phase mode, AC or DC

Current generators in parallel: I1 // I2// I3

CURRENT	POWER (max)	VOLTAGE (max)	DUTY CYCLE
15 A	750 VA	50 V	Continuous
45 A	750 VA	16.5 V	Continuous
50 A	750 VA	14.7 V	Continuous
60 A	600 VA	10 V	Continuous (AC)
105 A	300 VA	2.8 V	At least 15 repetitions: 10 s ON and 20 s OFF

Current generators in series: I1 – I2 – I3

CURRENT	POWER (max)	VOLTAGE (max)	DUTY CYCLE
10 A	625 VA	140 V	Continuous

External load : min 5 Ω

Ordering Information

Item	Art. No.
SVERKER 900 BASIC Main instrument Pre-fault – fault instrument	CR-19090
SVERKER 900 STANDARD Main instrument CT Magnetisation instrument Pre-fault – Fault instrument Ramping instrument Sequencer instrument	CR-19092
SVERKER 900 EXPERT* Main instrument CT Magnetization instrument Pre-fault – fault instrument Ramping instrument Sequencer instrument Impedance instrument	CR-19094

*Will be released later

ACCESSORIES – INCLUDED

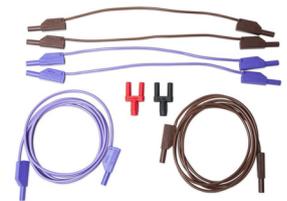
Test cable set standard	GA-00030
Protective cable	GA-00200
Cable set	GA-00036
Flight case with wheels	GD-00185

ACCESSORIES – OPTIONAL

Flight case (no wheels)	GD-00182
Low current adapter	CR-90010



Protective cable. (GA-00200)



Cable set, to be used up to 900 V. (GA-00036)



Test cable set standard. (GA-00030)



Flight case with wheels. (GD-00185)

DLRO100 series

Highly portable micro-ohmmeters

Weighing as little as 7 kg, this micro-ohmmeter outputs 100 A, offers CAT IV safety and can be operated using mains and/or battery.



SVERKER900

Relay and substation test system

The ultimate test box for engineers, addresses the increasing need for three-phase testing capability in substations and industrial applications.



TRAX series

Multifunctional transformer and substation test systems

This exciting new test system offers a plethora of automated standard transformer tests all in one box.



TDS NT series

Combined cable test and diagnosis systems

By combining VLF testing and damped AC, this system can more reliably diagnose the condition of cable insulation.



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SVERKER-900_BR_en_V01

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