Megger.

Programma
SVERKER 750/760 Relay Test Sets

- ■ **High current/high power output**
- ■ **Freeze and hold readings**
- ■ **Interconnect up to three test sets for three phase relays**
- ■ **Read external volts and current**
- ■ **0 to 360 degrees phase shift capability**
- ■ **Optional software automates testing**

DESCRIPTION

The SVERKER 750/760 Relay Test Unit is the test engineer's toolbox. The control panel features a logical layout, still SVERKER 750/760 users will find it comfortably familiar and will be able to start work right away.

The SVERKER 750/760 features many functions that make relay testing more efficient. For example, its powerful measurement section can display voltage, current, time, impedance, resistance, reactance, apparent power, active power, reactive power, phase angle and power factor. The voltmeter can also be used as a second ammeter (when testing differential relays for example). All values are presented on a single easy-to-read display.

The SVERKER 760 has a continuous phase shift function enabling you to test directional relays. Automatic reclosing devices can also be tested just as easily.

The SVERKER 750/760 is designed to comply with OSHA and EU safety standards. SVERKER 750/760 is also equipped with a serial port for communication with personal computers and the PC software SVERKER Win. Since the compact SVERKER weights only 18 kg (39 lbs), it is easy to move from site to site.

The SVERKER 750/760 is capable of testing most single and polyphase protection relays including overcurrent, directional, undercurrent, differential and many others.

APPLICATION

SVERKER 750/760 is intended primarily for secondary testing of protective relay equipment. Virtually all types of single-phase protection can be tested.

SVERKER 750/760 is able to test three-phase protection that can be tested one phase at a time, and also a number of protective relay systems that require phase shifting. Moreover, automatic reclosing devices can be tested.

The SVERKER has the flexibility to perform tests in these other varied applications.

- Plotting excitation curves
- Current and voltage transformer ratio tests
- Burden measurement for protective relay test equipment
- Impedance measurement
- Efficiency tests
- Polarity (direction) tests
- Injection current or voltage or both
    Maintained
        Injection continues without any time limitation.
    Momentary
        Injection continues only as long as defined by the user.
    Max. time
        Injection stops automatically when the preset maximum time is reached.
- **Filtering**
    When filtering is selected, five successive readings are averaged. The following can be filtered: current, voltage and external measured equipment.
- **Off delay**
    The turning off of outputs can be delayed tripping throughout a specified time interval expressed in cycles.

FEATURES AND BENEFITS

- **Set of resistors** — Fine regulation of current and voltage are easy thanks to the built-in set of resistors.

- **Display** — Presents time, current, voltage and other entities. Also used to make many settings, when you enter the setting mode by pressing button marked MODE.

- **Freeze function (HOLD)** — This function makes it possible to measure voltages and current as short as a quarter of a cycle by immobilizing the reading on the display. Voltage and current readings are frozen when the timer stops. If the timer does not stop, the reading present when the current was interrupted is captured on the display.

- **Start and stop conditions** — The timer's start and stop inputs respond to changes, voltage or contact closing/openings. The timer's start input is also used when testing auto-reclosing relays, to synchronize two or more SVERKER units and to start output with an external signal.

- **Status indicator** — The timer's start and stop inputs are each equipped with indicator lamps which, when lighted, indicate a closed circuit (useful for detecting contact closings/openings) or the presence of voltage. These indicator lamps make it possible (for example) to check circuits before starting a measurement cycle.

- **Timer inputs** — The timer has separate start and stop inputs, and it can be used to measure both external cycles and sequences initiated by SVERKER. The measured time appears on the display. Each input can be set to respond to the presence or absence of voltage (AC or DC) at a contact.

- **Start switch** — Controls the turning on and off of the current source and timer. Can be set to one of four states. ON+TIME. Starts generation and timing simultaneously. Used to test over... relays (...means current, voltage or some other entity). Generation continues a) until the protective relay equipment operates and stops the timer or b) until the maximum time expires or the start switch is released if time-limited generation has been selected. OFF. Turns off the current source, whereupon generation is interrupted. ON. Turns on the current source in the generating state. OFF+TIME. Interrupts generation and starts the timer simultaneously. Used when testing under ...relays (...means current, voltage or some other entity). The timer is stopped when the protective relay equipment operates. When automatic reclosing is to be tested, SVERKER can be set so that new generation will start when the timer's start input is activated by the closing command.

- **Computer communication interface** — SVERKER is equipped with a serial port for communication with personal computers and the PC software Sverker Win.

- **Make/break contact** — Changes state automatically when a test is started. Can be used to synchronize two or more SVERKER units, other external equipment or to switch the voltage applied to the protective relay equipment back and forth between non-faulty and faulty.

- **Current source** — Provides 0-250 A AC, 0-250 V AC or 0-300 V DC, depending on the output that is being used. Settings are made using the main knob. The readings of current, voltage and other entities appear on the display. The start switch is used to turn the current source on and off. When time is being measured, this is done in synchronization with the timer.

- **Ammeter and voltmeter** — Current and voltage are measured by the built-in ammeter and voltmeter. Resistance, impedance, phase angle, power and power factor can also be measured. Readings appear on the display. These instruments can also be used to take measurements in external circuits. The voltmeter can also be used as a 2nd ammeter (when testing differential relays for example). Current and voltage can be displayed either as amperes and volts or as percentages of a given current or voltage (the present settings of the protective relay equipment for example).

- **Auxiliary voltage source** — Provides 20-220 V DC in two ranges. Equipped with overload protection and separated from the other outputs. Used frequently to supply the object being tested.

- **AC voltage source** — Intended primarily for use with voltage inputs to the protective relay equipment. Can provide 0-140 V AC and 0-359° phase shift (SVERKER 760). Since the AC voltage source is separated from the other outputs, it can be set independently of the current source.

- **Tripping indicator** — Lights when a stop condition is fulfilled to indicate operation of the protective relay equipment. If the test being conducted incorporates timing, this indicator starts to blink when relay operation occurs.

- **Main knob** — Used to set current and voltage outputs.

OPTIONAL ACCESSORIES
CSU20A

Current and Voltage Source (CSU20A)
CSU20A is a small light-weight current and voltage source primarily intended to work together with the SVERKER 750/760 Relay Testing Unit when testing differential relays. Using the CSU20A together with SVERKER 750/760 gives the user two independent current sources, and the timer/measurement section in SVERKER 750/760 is used both for measuring the two outputs as well as measuring the trip time of the relay. Besides testing differential relays, the unit can be used as a multi-purpose AC/DC source. The CSU20A features one AC current/voltage output, one fully rectified DC output and one half-wave rectified DC output for harmonic restraint testing. Other features are a current measurement shunt, selectable current/voltage ranges and an AC supply input/output. Connecting the SVERKER 750/760 to the supply output of the CSU20A gives an in-phase synchronization of the two units.

PSS750

Phase Selector Switch (PSS750)
The PSS750 is specifically designed to work with SVERKER 750/760 when testing three-phase relays. It is connected between SVERKER 750/760 and the relay inputs and allows the user to easily select which phase to test. The PSS750 handles both the current and voltage sources and single-phase or phase-phase testing can be selected. Together with the output-input switching, the unit also contains a variable resistor that can be used together with the built-in capacitor in SVERKER 750/760. This feature gives the user the possibility to create a variable phase shift at a decreased amplitude of the test voltage. The design is passive which makes it very general. You may for example use any of the inputs for current or voltage as long as you do not exceed the specification. It is also possible to connect the measuring inputs of the SVERKER 750/760 to the PSS750 and use the switch for selecting measurement signals. The PSS750 simplifies phase switching, selecting type of fault, phase reversing and gives a possibility to create a variable phase shift.

SVERKER Win Software
The SVERKER Win software makes fieldwork easier while providing printed reports. The SVERKER Win software enables you to control the SVERKER from a PC. The SVERKER is connected to the PC's serial port. Test results can be reported either directly with table and graph, or from an external program, e.g. Microsoft® EXCEL.

SVERKER Win enables customized reports in an easy way. The reference graphs are very useful, together with the current/voltage graph presentation for each test point during the test. Graphs can be printed on the test report if required.

A new feature is the ready-made current curves available for many relay types.

During relay testing, each measured value is stored in a log list. In this list you can add comments to each test point. When the entire test is finished, you can save everything as a data file. Later, you can print out the test results. You save time by not having to write your report in the field. All report writing can be done conveniently back at the office.

The SVERKER Win software provides easy access to connection instructions and test instructions which can be prepared in advance. These instructions, which can contain both text and graphics, can be prepared using standard word processing packages.

The settings you make on SVERKER are also saved in a file, so that the next time you want to test the same or similar protective relay equipment, the settings may be recalled from the data file.

The SVERKER Win software comprises a 32-bit program written to run under Windows® 95/98/2000/NT/XP. We recommend a Pentium® computer with at least 16 MB of RAM. The software is available in the following languages: English, Spanish, French, German, Czech and Swedish.
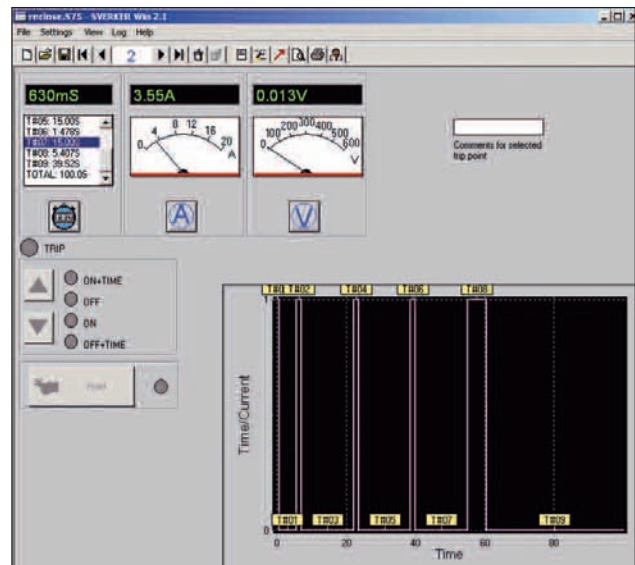
SVERKER Win Software

SPECIFICATIONS
Specifications are valid at nominal input voltage and an ambient temperature of +25° C, (77° F). Specifications are subject to change without notice.

Environment

Application field
The instrument is intended for use in high-voltage substations and industrial environments.

Temperature
Operating:	0°C to +50°C (32°F to +122°F)
Storage & transport:	-40°C to +70°C (-40°F to +158°F)
Humidity:	5% – 95% RH, non-condensing

CE-marking
LVD:	Low Voltage Directive 73/23/ EEC am. by 93/68/EEC
EMC:	EMC Directive 89/336/EEC am. by 91/263/EEC, 92/31/EEC and 93/68/EEC

General
Voltage	115/230 V AC, 50/60 Hz
Power consumption (max)	1380 W
Protection	Thermal cut-outs, automatic overload protection
Dimensions	
Instrument	350 x 270 x 220 mm (13.8" x 10.6" x 8.7")
Transport case	610 x 350 x 275 mm (24.0" x 13.8" x 10.8")
Weight	
SVERKER 750	17.3 kg (38.1 lbs)26.3 kg (58 lbs) with accessories and transport case
SVERKER 760	17.9 kg (39.5 lbs)26.9 kg (59.3 lbs) with accessories and transport case
Test lead set, with 4 mm stackable safety plugs	2 x 0.25 m (0.8 ft), 2.5 mm^2 2 x 0.5 m (1.6 ft), 2.5 mm^2 8 x 2.0 m (6.6 ft), 2.5 mm2
Test leads with spade-tonge connectors	2 x 3.0 m (9.8 ft), 10 mm2
Display	LCD
Available languages	English, French, Spanish, German, Swedish

Measurement section

Timer
Time can be displayed in seconds or in mains-frequency cycles.

Range	Resolution	Inaccuracy
000-9.999 s	1 ms	±(1 ms + 0.01%)*
10.00-99.99 s	10 ms	±(10 ms + 0.01 %)*
100.0-999.9 s	100 ms	±(100 ms + 0.01 %)*

* For the OFF+TIME start condition in INT mode, 1 ms shall be added to the above measurement error.

Range	Resolution	Inaccuracy
0.0-999.9 cycles	0.1 cycles	±(0.1 cycles + 0.01%)
1000-49999 cycles at 50 Hz		
1000-59999 cycles at 60 Hz	1 cycle	±(1 cycle + 0.01 %)

Ammeter
Measurement method	AC, true RMS DC, mean value

Ranges
Internal	0.00 – 250.0 A
External	0.000 – 6.000 A

Accuracy
Internal range[1]
0–10 A AC	±(1% + 20 mA)
0–40 A AC	±(1% + 40 mA)
0–100 A AC	±(1% + 200 mA)

External range[1]
0–0.6 A AC	±(1% + 20 mA)
0–6 A AC	±(1% + 20 mA)
0–0.6 A DC	±(0.5% + 2 mA)
0–6 A DC	±(0.5% + 20 mA)

Resolution
Internal range	10 mA (range <100 A)100 mA 100 mA (range >100 A)
External range	1 mA

Voltmeter
Measurement method	AC, true RMS DC, mean value
Range	0.00 – 600.0 V
Accuracy[1]	AC, ±(1% + 200 mV) Max. value DC, ±(0.5% + 200 mV) Max. value. Values are range depending

Current and Voltage Source (CSU20A)

Extra measurements
Power factor and phase angle measurements

	Range	Resolution	Accuracy
Power factor cos	-0.99 (cap) to +0.99 (ind)	0.01	±0.04
Phase angle (°)	000 – 359°	1°	±2°

Impedance and power measurements
AC	Z (Ω and °), Z (Ω), R and X (Ω and Ω), P (W), S (VA), Q (VAR)
DC	R (Ω), P (W)
Range	Up to 999 kX (X= unit)

Make/Break contact
Max. current	1 A
Max. voltage	250 V AC or 120 V DC

Reclosing test
Items measured	Tripping and reclosing times
Display	After test is finished a list of all times appears in display
Breaker state feedback	The Make/Break contact can be used to feed back the breaker state
Max. number of reclosings	49
Max. testing time	999 s

Sets of resistors and a capacitor
Resistors	0.5 Ω to 2.5 kΩ
Capacitor[1]	10µF, max voltage 450 V AC

1- Measurement intervals longer than 100 ms.   2- SVERKER 750

Outputs

Current outputs – AC

Range	No-load voltage (min)	Full-load voltage (min)	Full-load current (max)	Load/unload times On (max)/Off (min)
0 – 10 A	90 V	75 V	10 A	2/15 minutes
0 – 40 A	25 V	20 V	40 A	1/15 minutes
0 – 100 A	10 V	8 V	100 A	1/15 minutes
0 – 100 A	10 V	-	250 A	1 sec/5 minutes

Voltage outputs – AC/DC

Range	No-load voltage (min)	Full-load voltage (min)	Full-load current (max)	Load/unload times On (max)/Off (min)
0 – 250 V AC	290 V AC	250 V AC	3 A	10 min/45 min
0 – 300 V DC	320 V DC	250 V DC	2 A	10 min/45 min

Separate AC voltage source
SVERKER 750

Range	No-load voltage (min)	Full-load voltage (min)	Full-load current (max)
0 – 60 V AC	70 V	60 V	0.25 A
60 – 120 V AC	130 V	120 V	0.25 A

Both ranges are divided into voltage steps of 10 V that are steplessly variable.

SVERKER 760

Range	No-load voltage (min)	Full-load voltage (min)	Full-load current (max)
0 – 130 V AC	140 V	130 V	0.25 A cont. 0.35 A, 1 minute

Phase angle	Resolution	Inaccuracy
0 – 359°	1°	±2°

Auxiliary DC output

Range	Voltage	Max. current
20 – 130 V DC	20 V DC 130 V DC	300 mA 400 mA
130 – 220 DC	130 V DC 220 V DC	235 mA 400 mA

Specifications Current and Voltage Source (CSU20A)
Specifications are valid at nominal input voltage and an ambient temperature of +25° C, (77° F). Specifications are subject to change without notice.

Operating temperature:	-20° C to +50° C (-4° F to +122° F)
Voltage:	115 / 230 V AC, 50 / 60 Hz
Thermal protection:	Built-in
Dimensions:	280 x 178 x 246 mm (11" x 7" x 9.7")
Weight:	5.9 kg (13 lbs) excl. transport case
Current measurements:	Current shunt 0.1 A/1 V, ±2%

Output, AC

20 A setting	Output voltage (min)	Load time
Idle/non-load	26 V	Continuous
5 A	25 V	Continuous
10 A	22 V	Continuous
20 A	18 V	2 min
10 A setting	**Output voltage (min)**	**Load time**
Idle/non-load	52 V	Continuous
3 A	50 V	Continuous
5 A	47 V	Continuous
10 A	41 V	10 min

Output, DC

DC current	As above, less the voltage drop over the rectifying diodes

Specifications Phase Selector Switch (PSS750)
Specifications are valid at nominal input voltage and an ambient temperature of +25° C, (77° F). Specifications are subject to change without notice.

Max input voltage	250 V AC / 3 A
Max input current	6 A / 250 V AC
Max resistor loading	200 V AC / 200 mA (0.5 A during 5 seconds)
Dimensions	200 x 120 x 85 mm (7.9" x 4.7" x 3.3")
Weight	1.3 kg (2.9 lbs)

Phase Selector Switch (PSS750)

ORDERING INFORMATION

Item (Qty)	Cat. No.
SVERKER 750 115 V Mains voltage	CD-11190
SVERKER 750 230 V Mains voltage	CD-12390
Complete with:	
Test lead set	GA-00030
Transport case	GD-00182
SVERKER 760 115 V Mains voltage	CD-21190
SVERKER 760 230 V Mains voltage	CD-22390
Complete with:	
Test lead set	GA-00030
Transport case	GD-00182

Item (Qty)	Cat. No.
Optional accessories	
SVERKER Win PC Software	
Please specify the SVERKER serial number when ordering. SVERKER Win contains software, a copy-protection key and a cable used to connect the PC to SVERKER. Note that the software key can be installed on a single SVERKER. The software itself, however, can be installed on an unlimited number of PCs.	CD-8102X
SVERKER Win Upgrade	CD-8101X
PROM* update, done by Megger	CD-89010
PROM* update, done by customer	CD-89011
* SVERKER Win requires PROM-version R04A or higher	
CSU20A	
Complete with cables and transport case	
115 V Mains voltage	BF-41190
CSU20A	
Complete with cables and transport case	
230 V Mains voltage	BF-42390
Phase selector switch, PSS750	CD-90020