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SVERKER 750™/760™

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Relay Test Unit

The Sverker 750/760™ Relay Test Unit is the engineer's toolbox. The control panel features a logical layout, still SVERKER 650™ 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 (in addition to time, voltage and current) Z, R, X, S, P, Q, phase angle and cos φ. The voltmeter can also be used as a 2nd ammeter (when testing differential relays for example). All values are presented on a single easy-to-read display.

You can also test directional protective equipment efficiantly by means of the built-in variable voltage source. In SVERKER 760™ this has a continuous phase shift function as well. Automatic reclosing devices can also be tested – just as easily.

Designed to comply with EU standards and other personal and operational 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™ weighs only 18 kg (39 lbs), it's easy to move from site to site.

Two or more SVERKER™ units can also be synchronized, which for example allows the user to connect three SVERKER™ into a basic 3-phase test set.

APPLICATION

Relay Testing

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

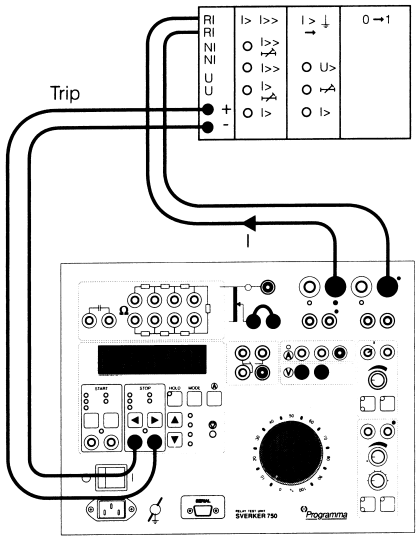
SVERKER 750/760 is able to test three-phase protection that can be tested one phase at a time, and also a number of protective relay systems that require phase shifting. Moreover, automatic reclosing devices can be tested.

Examples of what SVERKER 750/760 can test:	**IEEE No.**
Overcurrent relays	50/76
Inverse time overcurrent relays	51
Undercurrent relays	37
Ground fault relays	50
Directional overcurrent relays	67
Directional ground fault relays	67N
Overvoltage relays	59
Undervoltage relays	27
Directional voltage relays	91
Directional power relays	32
Power factor relays	55
Differential protection (differential circuits)	87
Distance protection equipment (phase by phase)	21
Negative sequence overcurrent relays	46N
Motor overload protection	51/86
Automatic reclosing devices	79
Tripping relays	94
Voltage regulating relays	
Overimpedance relays, Z>	
Underimpedance relays, Z	
Thermal relays	
Time-delay relays	

OTHER FIELDS OF APPLICATION

- Plotting excitation curves
- Current and voltage transformer ratio tests
- Burden measurement for protective relay test equipment
- Impedance measurement
- Efficiency tests
- Polarity (direction) tests

APPLICATION EXAMPLE



Testing the pick-up and drop-out (SVERKER 760)

1. Connect as shown in the diagram.
2. Select stop conditions, dry or wet contact.
3. Select **HOLD** to freeze the current reading.
4. Press button **SEL**/Ⓐ until you get a red light at the built-in ammeter. ***Note!*** *Maximum allowed current through the separate ammeter used in this connection example is 6 A. The other measurement points do not have this limitation.*
5. Press the **MODE** button.
6. Use the key ▼ to select Ω, φ, **W**, **VA**...
7. Press **CHG** (Change)
8. Select φ (°, **Iref**) or (°, **Uref**) by using the key ▼.
9. Press **SEL** (Select)
10. Press **ESC**
11. Set the voltage amplitude with the upper small knob.
12. Make sure the main knob is set to **0**.
13. Turn on the SVERKER output by activating **ON** using the start switch ▼.
14. Set the phase-angle. Use the lower knob for fine adjustment, and the middle knob for step of 90°. ***Note!*** *A small current flowing in the circuit is required to measure the phase angle.*

Testing the operation time

15. Increase the current to 1.5 times the pick-up value.
16. Invoke the ON+TIME state by means of the start switch. The outputs will now remain turned on until the protective relay equipment operates.
17. Read the time from the display. Check also the high current setting using the same procedure.

SPECIFICATIONS

AC Current outputs

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
The output transformer is equipped with built-in temperature protection. The primary side is protected by a miniature circuit breaker.				

AC/DC outputs

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	250 V	3 A	10 min/45 min
0-300 V DC	320 V	250 V	2 A	10 min/45 min

Separate AC voltage output 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.			

Separate AC voltage output SVERKER 760

Range	No-load voltage (min)	Full-load voltage (min)	Full-load current (max)
0-140 V AC	165 V	140 V	0.25 A/cont.
Phase angle	**Resolution**	**Accuracy**	
60-120 V AC	130 V	120 V	

DC auxiliary output

Range	Voltage	Max. current
20-130 V DC	130 V	0.4 A
130-220 V DC	220 V	0.4 A

Timer

Display options: In seconds or in mains-voltage periods.
Seconds: Range: 0.000-99999.9 s. Accuracy: 1 ms.
Periods: Range: 0.0-4999995 cycles at 50 Hz or 0.0- 5999994 cycles at 60 Hz. Accuracy: 0.1 cycles.
Max. input voltage: 250 V AC or 275 V DC

Ammeter

Ranges: Internal range: 0.00-250.0 A.
External range: 0.000-6.000 A.
Accuracies: Internal range: 1%. External range: 1% for AC and 0.5% for DC.
Measurement method: True RMS for AC or average for DC.
Display option: Reading can be displayed as a percentage of a presettable nominal value if so desired.
Max. current, ext. input: 6 A AC or DC

Voltmeter

Range: 0.00-600.0 V
Accuracy: 1% for AC and 0.5% for DC
Measurement method: True RMS for AC or average for DC.
Display option: Reading can be displayed as a percentage of a presettable nominal value if so desired.
The voltmeter can also be used as a 2nd ammeter.
Max. input voltage: 600 V AC or DC

Extra entities

AC: Z (Ω, φ), Z (Ω), R, X (Ω, Ω), S (VA), Q (VAr), cos φ, φ (°, Iref), and φ (°, Uref).
DC: R (Ω) and P (W).

Entity	Range	Accuracy
Cos φ (cap, ind)	-0.99 to + 0.99	± 0.04
Phase angle	000-359°	± 2°
Other entities	Up to 999 kX (X=unit)	

Make/Break contact

Max. current: 1 A
Max. voltage: 250 V AC or 120 V DC
The make/break contact is protected with a 1 A miniature circuit breaker.

Reclosing tests

Items measured: Tripping times 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

Set of resistors and a capacitor

Resistors: 0.5 Ω to 2.5 kΩ
Capacitor: 10 µF, max. voltage 450 V AC (SVERKER 750)

Other

Application field: The instrument is intended for use in high-voltage substations and industrial environments.
Languages in menu: English, German, French, Spanish and Swedish.
Mains voltage: 230 V AC or 115 V AC ± 10%, 50-60 Hz
Dimensions instrument: 350 x 270 x 220 mm (13.8" x 10.6" x 8.7")
Dimensions transport case: 610 x 290 x 360 mm (24.0" x 11.4" x 14.2")
Weight: 18 kg (39 lbs). 27 kg (59 lbs) with accessories and transport case.
Test lead set: With touch-proof contacts. 2 x 0.25 m (10")/2.5 mm², 2 x 0.50 m (20")/2.5 mm², 8 x 2.0 m (80")/2.5 mm² and 2 x 3.0 m (120")/10 mm² (with spade-tongue connectors).
Operating temperature: 0 to +50°C (+32 to +122°F)
Storage temperature: -40 to +70°C (-40 to +158°F)
Warranty: 1 year
SVERKER 750/760 is designed to comply with EU standards in accordance with IEC 1010 directive and the EU EMC directives.

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

OPTIONAL ACCESSORIES

CSU20A
Current and Voltage Source

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 mains input/output. Connecting the SVERKER 750/760 mains to the mains output of the CSU20A gives an in-phase synchronization of the two units.

Specifications CSU20A
Outputs

AC current	Minimum output voltage	Load time
20 A setting		
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		
Idle/non-load	52 V	Continuous
3 A	50 V	Continuous
5 A	47 V	Continuous
10 A	41 V	10 min

DC current: As above, less the voltage drop over the rectifying diodes.
Current measurements: Current shunt 0.1 A / 1 V, ± 2%
Mains voltage: 230 V AC or 115 V AC ± 10%, 50-60 Hz
Operating temperature: -20 to +50°C (-4 to +122°F)
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
Warranty: 1 year
The above specifications are valid at nominal input voltage and an ambient temperature of +25°C (+77°F).
Specifications are subject to change without notice.

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

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

❸ **Freeze function (HOLD)**
This makes it possible to measure voltages and current as short as a quarter of a mains-voltage period 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 frozen on the display.

❼ **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 an be set so that new generation will start when the timer's start input is activated by the closing command.

⓫ **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).

⓬ **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.

❹ **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 generation with an external signal.

❺ **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.

❻ **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.

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

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

❿ **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.

⓭ **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.

⓮ **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.

⓯ **Main knob**
Used to set current output from the current source.

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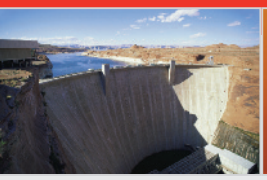

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