

# SVERKER 650

## Relay Test Unit

# User's Manual



# Megger

WWW.MEGGER.COM

# Contents

<b>1 Safety</b>	<b>4</b>
.....	
1.1 Symbols on the instrument .....	4
1.2 Safety instructions.....	4
<b>2 Introduction</b>	<b>6</b>
.....	
<b>3 Control panel</b>	<b>8</b>
.....	
<b>4 Operating instructions</b>	<b>10</b>
.....	
4.1 General.....	10
4.2 Testing current relays .....	10
4.3 Testing voltage relays .....	11
4.4 Testing power relays.....	11
4.5 Time measurement .....	12
4.6 Time measurement of over-current and over-voltage relays .....	12
4.7 Time measurement of under-current and under-voltage relays .....	13
<b>5 Specifications</b>	<b>14</b>
.....	

# SVERKER 650

## Relay Test Unit

# User's Manual

#### NOTICE OF COPYRIGHT & PROPRIETARY RIGHTS

© 2007-2015, Megger Sweden AB. All rights reserved.

The contents of this manual are the property of Megger Sweden AB. No part of this work may be reproduced or transmitted in any form or by any means, except as permitted in written license agreement with Megger Sweden AB. Megger Sweden AB has made every reasonable attempt to ensure the completeness and accuracy of this document. However, the information contained in this manual is subject to change without notice, and does not represent a commitment on the part of Megger Sweden AB. Any attached hardware schematics and technical descriptions, or software listings that disclose source code, are for informational purposes only. Reproduction in whole or in part to create working hardware or software for other than Megger Sweden AB products is strictly prohibited, except as permitted by written license agreement with Megger Sweden AB.

#### TRADEMARK NOTICES

Megger® and Programma® are trademarks registered in the U.S. and other countries. All other brand and product names mentioned in this document are trademarks or registered trademarks of their respective companies.

Megger Sweden AB is certified according to ISO 9001 and 14001.

#### Postal address:

Megger Sweden AB  
Box 724  
SE-182 17 DANDERYD  
SWEDEN

#### Visiting address:

Megger Sweden AB  
Rinkebyvägen 19  
SE-182 36 DANDERYD  
SWEDEN

T +46 8 510 195 00    [seinfo@megger.com](mailto:seinfo@megger.com)  
F +46 8 510 195 95    [www.megger.com](http://www.megger.com)



# 1 Safety

## 1.1 Symbols on the instrument



Caution, refer to accompanying documents.



Protective conductor terminal.



WEEE, Waste Electrical and Electronic Equipment. Please utilize your local WEEE collection facilities in the disposition of this product and otherwise observe all applicable requirements.

## 1.2 Safety instructions



### Important

Read and comply with the following instructions.

Always comply with local safety regulations.



### Warning

High voltage/current on input/output terminals.

Do not attempt to service the instrument yourself. Opening or removing covers may expose you to dangerous voltage. If you attempt to service the instrument yourself the warranty is no longer valid.

Do not use any accessories that are not intended for use together with the instrument.

Disconnect the instrument from the mains before cleaning. Use a damp cloth for cleaning. Do not use liquid cleaners or aerosol cleaners.



### Important

Always turn the equipment off before connecting.

The terminal of the current transformer shall always be short-circuited when current is flowing from the instrument, either through the short-circuit clamp or through an external ammeter.

Always use safety connecting leads.

Always connect protective earth (ground).

Never leave the instrument unattended while it is turned on.

Use only approved mains detachable cable set with the instrument. Main supply cables shall be rated for the maximum current for the equipment and the cable shall meet the requirements of IEC 60227 or IEC 60245. Mains supply cables certified or approved by a recognized testing authority are regarded as meeting this requirement.

Unplug the instrument from the mains supply when it is left unattended or not in use.

Refer all servicing to Megger authorized personnel.

If you need to return the instrument, please use either the original crate or one of equivalent strength

# 2 Introduction

The SVERKER 650 is a rugged instrument but it still should be handled with care.

The relay testing unit is electrically fully isolated in all measuring ranges, except for the mains output. The set of resistors is not connected with the rest of the relay testing unit set.

When current measurement is crucial; use an external instrument with a more accurate resolution. The external instrument can be connected to the built-in current transformer (terminal W2).

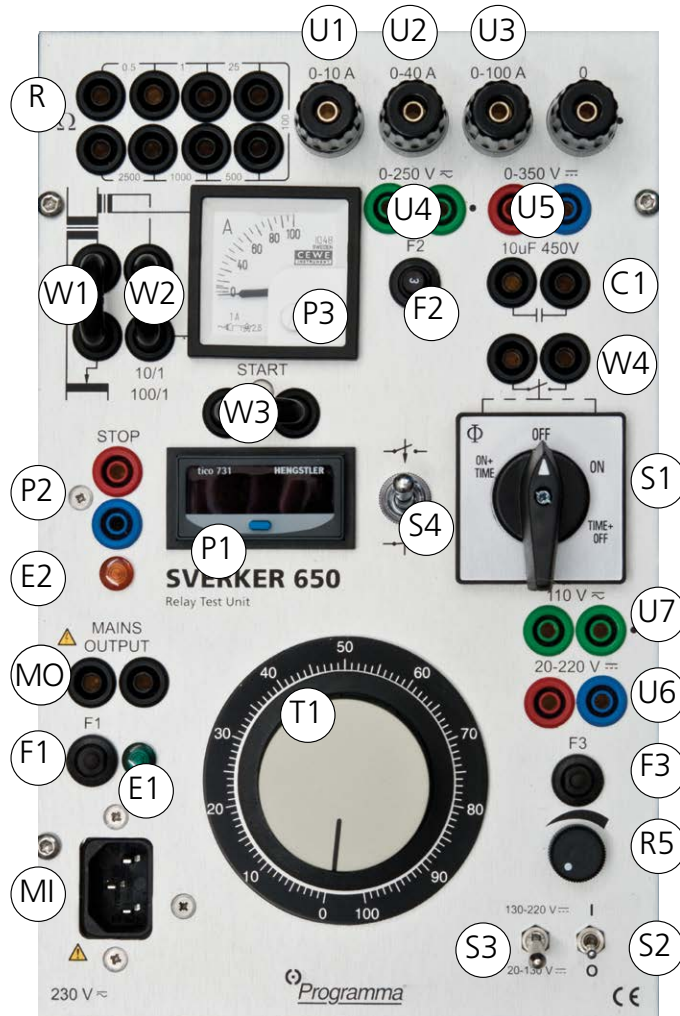
Relays with non-linear impedance can cause distortion of the current. This can be restrained by connecting a resistance (as high as possible) in series with the primary winding of the output transformer (terminal W1).

The output transformer is protected by a thermal contact. If the thermal contact trips, the display of the timer will go out. The thermal contact will be reset automatically when the temperature drops.

The output (U6) is provided with over-current protection, that will break the circuit in case of overload. The protection is reset if (S2) is switched off in approx. 30 seconds.



# 3 Control panel



Terminals		Unloaded (Mains 230 V)	Settable with
U1	0-10 A	85-90 V CA	T1
U2	0-40 A	25-27 V CA	T1
U3	0-100 A	10.0-11.0 V CA	T1
U4	0-250 V, 3 A	250-270 V CA	T1
U5	0-350 V, 2 A	350-370 V DC	T1
U6	20-220 V DC		R5
<ul style="list-style-type: none"> <li>■ The voltage is stabilized and variable in two steps with the switch S3.</li> <li>■ Characteristics at input voltage 220 V AC + 10 % Ripple (peak to peak) max 4 %</li> <li>■ Load regulation 3 %</li> <li>■ Line regulation less than 4 %</li> </ul>			
U7	110 V 0.3 A	110-125 V CA	
F1	Automatic cut-out for the mains voltage, 4 A		

F2	Automatic cut-out 3 A
F3	Automatic cut-out 0.5 A
E1	Green indicator for mains voltage
E2	Yellow signal lamp in the trip circuit
MI	Mains input
MO	Mains output
P1	Electric timer, independent of mains frequency Measuring range 0-999.999 sec. Accuracy 0.002% of readout +0,-2 ms
P2	Input for stop of timer
P3	Ammeter class 1.5
R	Resistors 
C1	Capacitor 10 μF/450 V AC for reactive power relays



S1	Main switch
S2	On/off switch for terminals U6 and U7
S3	Selector voltage range terminal U6
S4	Make/break switch for timer
R5	Voltage adjustment terminal U6
W1	Terminal for connection of a resistor on the primary side of the output transformer
W2	Terminal for an external ammeter
W3	Terminal for external start and stop of timer
W4	Terminal for starting external operation

# 4 Operating instructions

## 4.1 General



### Important

Read the manual and comply with the Safety instructions, see page 5, before using SVERKER 650.

Always comply with local safety regulations.

The terminal of the current transformer shall always be short-circuited when current is flowing from the instrument, either through the short-circuit clamp or through an external ammeter..

## 4.2 Testing current relays

- 1] Set the variable transformer in position "0".
- 2] Connect the circuit, use output terminals 0-10 A (85 V), 0-40 A (25 V) or 0-100 A (10 V).
- 3] Increase the current to the operating value using the variable transformer.
- 4] Check the current on the ammeter or external instrument during the test.

### 4.3 Testing voltage relays

- 1] Set the variable transformer in position "0".
- 2] Connect the circuit. Output terminals 0-250 V, or at a voltage below 10 V, output terminals 0-100 A. If you need a higher CA-voltage, terminals 0-250 V can be connected in series with the mains output terminals. When testing DC-voltage relays, use terminals 0-350 V=.
- 3] Increase the current to the operating value using the variable transformer.
- 4] Check the current on the ammeter or external instrument during the test. Use an external measuring instrument for better accuracy.

### 4.4 Testing power relays

- 1] Set the variable transformer in position "0".
- 2] Connect the circuit. Output terminals 0-10 A, 0-40 A or 0-100 A are used for the current coil. Use an external measuring instrument for better accuracy.  
When testing reactive relays, the current coil is to be connected in series with the built-in 10  $\mu$ F capacitor that will give a 90° phase shift.  
The voltage coil is to be connected directly to the 110 V CA terminals or across the set of resistors used as a voltage divider.
- 3] Increase the current to the operating value using the variable transformer.
- 4] Check the current on the ammeter or external instrument during the test.

**Note** *Shift polarity of the voltage or current if function has failed to appear.*

## 4.5 Time measurement

- 1] Connect the time measuring circuit to potential free terminals or DC voltage 3-350 V.

**Note** *If the polarity is shifted the timer does not stop. The timer is independent of mains frequency.*

- 2] When the timer is stopped, the circuit is broken and the yellow signal lamp is lit.
- 3] For continued measuring, the main switch (S1) first has to be reset in position "OFF". If the tripping circuit is connected and the switch is set in position "ON", the yellow signal lamp is lit when the operating value is obtained without breaking the current.

**Note** *The timer can be started externally by a make at terminal (W3). The switch (S1) should then be in position "ON+TIME" or "OFF+TIME". When using the timer internally, the terminal (W3) has to be short-circuited.*

## 4.6 Time measurement of over-current and over-voltage relays

- 1] Connect the current and tripping circuits.
- 2] Set the switch in position "ON".
- 3] Increase the current/voltage to 25-50% over the operating value and let the variable transformer be in that position.
- 4] Reset the switch to position "0".
- 5] Set the changeover switch for time measurement in position make/break
- 6] Set the switch to position "ON + TIME".

## 4.7 Time measurement of under-current and under-voltage relays

- 1] Connect the tripping circuit.
- 2] Set the changeover switch for time measurement in position make/break.
- 3] Set the switch in position "ON".
- 4] Increase the voltage/current until the relay picks up.
- 5] Then set the switch in position "OFF + TIME".

# 5 Specifications

## Specifications SVERKER 650

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* 2004/108/EC  
*EMC* 2006/95/EC

### General

*Mains voltage* 115/230 V CA, 50/60 Hz  
*Power consumption* 1100 VA (max)  
*Protection* Thermal cut-outs, miniature circuit breakers

*Dimensions*  
*Instrument* 280 x 178 x 250 mm (11" x 7" x 9.8")  
*Transport case* 560 x 260 x 360 mm (22" x 10.2" x 14.2")

*Weight* 16 kg (35.3 lbs)  
 26 kg (57.3 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<sup>2</sup>  
 2 x 0.5 m (1.6 ft), 2.5 mm<sup>2</sup>  
 8 x 2.0 m (6.6 ft), 2.5 mm<sup>2</sup>

*Test leads with spade-tongue connectors* 2 x 3.0 m (9.8 ft), 10 mm<sup>2</sup>

### Measurement section

#### Current measurement

##### Built-in ammeter

*Ranges* 0 – 10 A / 0 – 100 A  
*Inaccuracy* ±5%

##### External ammeter

*Output for external ammeter* Connected to built-in current transformer  
*Inaccuracy* ±1%

##### Timer

*Range* 0 – 999.999 s  
*Resolution* 1 ms  
*Inaccuracy* ±0.02% of displayed value, +2 ms Independent of mains frequency

### Outputs

#### Current outputs, CA

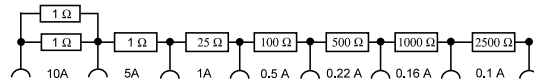
Range	No-load voltage (min)	Output voltage (min)	Load/un-load times On (max)/Off (min)
0 – 10 A	85 V	75 V (10 A)	2 min/30 min
0 – 40 A	25 V	19 V (40 A)	20 s/15 min
0 – 100 A	10 V	7.7 V (100 A)	20 s/5 min

#### Voltage outputs, CA/DC

Range	Output voltage (min)
0 – 250 V CA	220 V (2.7 A)
110 V CA (fixed)	110 V (0.3 A)
0 – 350 V DC	280 V (2 A)
20 – 220 V DC (stab.)	200 V (0.25 A)

### Other

Built-in capacitor provides phase shift when testing directional protection.  
 Output used to start external cycles.  
 Terminal for external start/stop of built-in timer.  
 Terminal for connecting serial impedance when testing nonlinear protection.  
 Resistor set used to divide voltages. Max load as shown in figure below.





## Your "One Stop" Source for all your electrical test equipment needs

- Battery Test Equipment
- Cable Fault Locating Equipment
- Circuit Breaker Test Equipment
- Data Communications Test Equipment
- Fiber Optic Test Equipment
- Ground Resistance Test Equipment
- Insulation Power Factor (C&DF) Test Equipment
- Insulation Resistance Test Equipment
- Line Testing Equipment
- Low Resistance Ohmmeters
- Motor & Phase Rotation Test Equipment
- Multimeters
- Oil Test Equipment
- Portable Appliance & Tool Testers
- Power Quality Instruments
- Recloser Test Equipment
- Relay Test Equipment
- T1 Network Test Equipment
- Tachometers & Speed Measuring Instruments
- TDR Test Equipment
- Transformer Test Equipment
- Transmission Impairment Test Equipment
- Watthour Meter Test Equipment
- STATES® Terminal Blocks & Test Switches
- Professional Hands-On Technical and Safety Training Programs

Megger is a leading global manufacturer and supplier of test and measurement instruments used within the electric power, building wiring and telecommunication industries.

With research, engineering and manufacturing facilities in the USA, UK, Germany and Sweden, combined with sales and technical support in most countries, Megger is uniquely placed to meet the needs of its customers worldwide.

Megger is certified according to ISO 9001 and 14001. Megger is a registered trademark.

**Megger Group Limited**  
**UNITED KINGDOM**  
**Dover, Kent CT17 9EN**  
**ENGLAND**

- |                      |                        |
|----------------------|------------------------|
| ■ AUSTRALIA          | ■ POLAND               |
| ■ BULGARIA           | ■ ROMANIA              |
| ■ CANADA             | ■ RUSSIA               |
| ■ CZECH REPUBLIC     | ■ SINGAPORE            |
| ■ CHINA              | ■ SLOVAK REPUBLIC      |
| ■ FRANCE             | ■ SOUTH AFRICA         |
| ■ GERMANY            | ■ SPAIN                |
| ■ HUNGARY            | ■ SWEDEN               |
| ■ INDIA              | ■ SWITZERLAND          |
| ■ INDONESIA          | ■ TAIWAN               |
| ■ KINGDOM OF BAHRAIN | ■ THAILAND             |
| ■ KOREA              | ■ UNITED ARAB EMIRATES |
| ■ MALAYSIA           | ■ USA                  |
| ■ PAKISTAN           | ■ VIETNAM              |
| ■ PHILIPPINES        |                        |



# Megger

WWW.MEGGER.COM

**Postal address:**

Megger Sweden AB  
Box 724  
SE-182 17 DANDERYD  
SWEDEN

**Visiting address:**

Megger Sweden AB  
Rinkebyvägen 19  
SE-182 36 DANDERYD  
SWEDEN

T +46 8 510 195 00    seinfo@megger.com  
F +46 8 510 195 95    www.megger.com