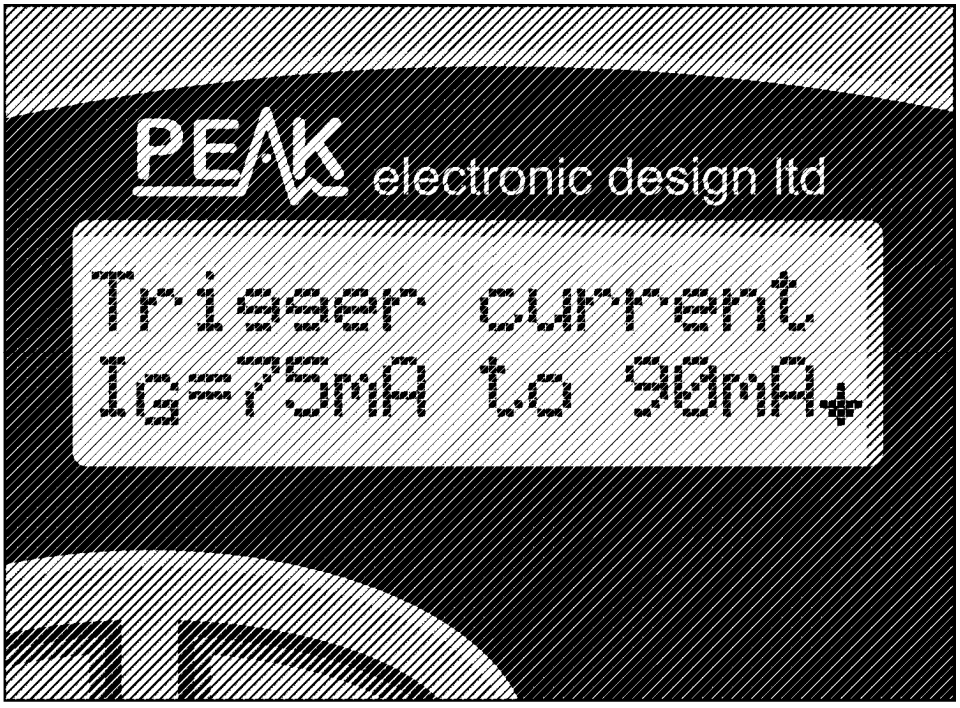
EN100-9

Atlas SCR100

Triac and Thyristor Analyser

Model SCR100 (Firmware: 4.0)



Designed and manufactured with pride in the UK

User Guide

UK CA CE

PEAK® electronic design ltd

Want to use it now?

We understand that you want to use your **SCR100** right now. The unit is ready to go and you should have little need to refer to this user guide, but please make sure that you do at least take a look at the notices on page 4!

Contents Page

This user guide has been written to accompany the **SCR100** with revision 4.0 firmware. Other revisions of firmware may differ in operation, features and specifications. The firmware version is displayed briefly upon power-up.

Introduction

The **Peak Atlas SCR100** is an advanced instrument designed specifically for the analysis of SCR (Thyristor) and Triac devices.

Summary Features:

- Automatic component identification (Thyristor or Triac).
- Automatic pinout identification.
- Displays actual trigger (gate) current classification.
- Measures gate voltage during trigger.
- Fixed load current of 100mA.
- Unique automatic boost function ensures a device test voltage of 12V regardless of battery condition.
- Suitable for devices requiring gate currents up to 90mA.
- Automatic and manual power-off.

Safety Considerations

WARNING:

This instrument must NEVER be connected to powered equipment/components or equipment/components with <u>any</u> stored energy (e.g. charged capacitors). Failure to comply with this warning may result in personal injury, damage to the equipment under test, damage to the SCR100 and invalidation of the manufacturer's warranty.

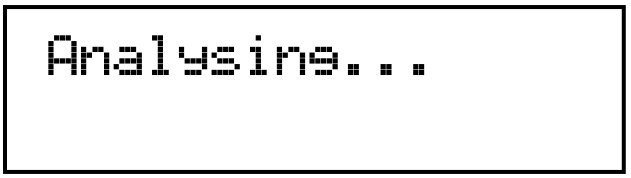
"Analysis of discrete, unconnected components is recommended."

The **SCR100** is designed to provide accurate and reliable information for the majority of supported component types (SCRs and Triacs) as described in this user guide. Testing of other component types or component networks may give erroneous results and may also cause damage. It is important that you familiarise yourself with the test conditions presented by this instrument as shown in the technical specifications.

Analysing Components

The **SCR100** is designed to analyse discrete, unconnected, unpowered Triacs and Thyristors. This ensures that external connections don't influence the measured parameters. The three test probes can be connected to the component any way round.

The **SCR100** will start component analysis when the **on-test** button is pressed.



The analysis typically takes less than a second to complete, after which the results of the analysis are displayed. Information is displayed a "page" at a time, each page can be displayed by briefly pressing the **scroll-off** button.

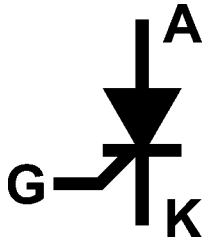
If the **SCR100** cannot recognise the component connected to the test probes, or the component under test is outside the specifications covered by this instrument, the following message will be displayed:

Note:

An arrow symbol on the display indicates that more pages are available to be viewed.

The unit will switch off automatically after a period of inactivity, however the unit can be switched off manually by pressing and holding the **scroll-off** button for around 1 second.

Silicon Controlled rectifiers (Thyristors)



The **SCR100** will analyse almost any SCR provided that a gate trigger current of no more than 90mA is required.

The three test clips can be connected to the device under test any way round. If the **SCR100** detects an SCR, the following message will be displayed:

```
SCR detected
Press scroll...+
```

```
RED GREEN BLUE
Anod Cath Gate +
```

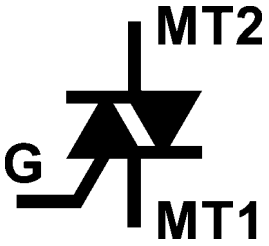
Pressing the **scroll-off** button will then display the pinout details for the device.

In this example, the Anode of the SCR is connected to the Red test clip, the Cathode is connected to the Green test clip, and the Gate terminal is connected to the Blue test clip. The gate trigger current is displayed on the next screen.

Note that SCRs are often only specified to have a certain maximum trigger current – the actual (tested) trigger current may be well below that value.

```
Trigger current
IG=50mA to 60mA+
```

Triacs



The **SCR100** will analyse almost any Triac, provided that it requires a gate trigger current of no more than 90mA. The three test clips can be connected to the device under test any way round. If the **SCR100** detects a Triac, the following message will be displayed:

```
Triac detected
Press scroll...+
```

Note: The device under test will be analysed in quadrants 1 and 3. The definition of these quadrants is given later in this guide.

```
RED GREEN BLUE
MT1  MT2  Gate +
```

Pressing the **scroll-off** button will then display the pinout details for the device.

In this example, the MT1 terminal of the Triac is connected to the Red test clip, the MT2 terminal is connected to the Green test clip, and the Gate terminal is connected to the Blue test clip. The gate trigger current is displayed on the next screen. Note that Triacs are often only specified to have a certain maximum trigger current – the actual (measured) trigger current may be well below that value.

The gate trigger current[1] displayed is that for quadrant 3. (Quadrant 1 will usually be very similar).

```
Trigger current
IG=10mA to 25mA+
```

The load current at which the Triac was tested is also displayed. This value is fixed for all devices, and simply serves as a reminder. The + symbol indicates that this is the final page of information. Pressing the **scroll-off** button again will return the display to the first page of information.

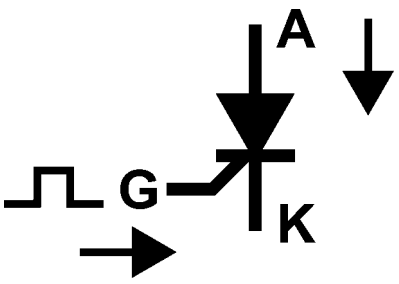
Note 1. See the "Gate Sensitivity" section later in this guide.

Notes on SCRs and Triacs

Silicon Controlled Rectifiers (Thyristors)

SCR Turn-On

SCRs (Thyristors) act as a controlled diode. They block reverse current between the cathode (K) and the anode (A) at all times, and they conduct in the forward direction only when triggered by a pulse of current to the control (gate) terminal. Once triggered, the SCR will continue to conduct current in the forward direction between the anode and the cathode until the device is turned off.



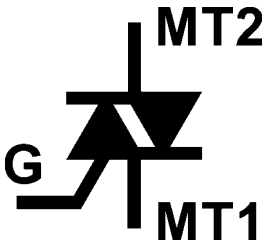
SCR Turn-Off

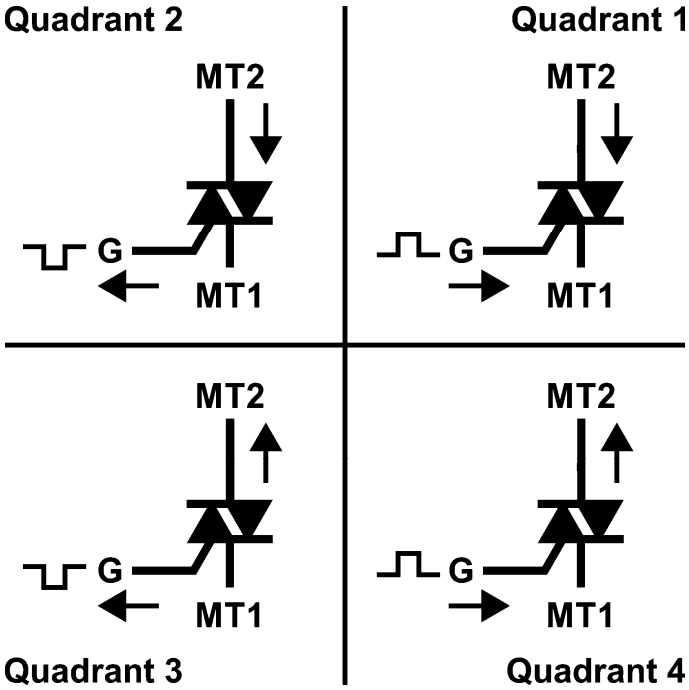
In order to turn off a triggered SCR, it is necessary to reduce the anode-cathode load current below the holding current for typically 5-200µs. Shorter periods may leave insufficient time for free charge carriers to recombine, and thus when load current is reapplied, the device may remain triggered.

Notes on SCRs and Triacs

Triacs

Triacs are a well established technology, designed specifically for the solid-state control of AC loads. They offer bi-directional load current switching (for both half cycles of the mains supply) and also bi-directional gate current capability to trigger the device. The combinations of the load currents and gate control currents are referred to as "quadrants". These quadrants are shown below:





The main load current is handled by the connections MT1 and MT2. The device is switched to the on state by a current into (or out of) the gate terminal with respect to the MT1 terminal.

Once triggered, main load current will continue to flow until a zero-cross in the mains cycle is encountered, at this point the device switches off. Therefore, if the device is to be kept on, a continuous gate current must be provided or at least a gate current pulse that occurs immediately after each mains zero-cross.

Many triacs however are only capable of operating reliably in 3 of the 4 quadrants. (In particular, Q1, Q2 and Q3). Quadrant 4 (negative gate current and negative load current) can be troublesome with some triacs, suffering from poor gate sensitivity and slow response.

Gate Sensitivity

The **SCR100** attempts to trigger the device under test at nine discrete gate currents, in ascending order.

Trigger level 1	100µA	First test
Trigger level 2	1mA	
Trigger level 3	10mA	
Trigger level 4	25mA	
Trigger level 5	35mA	
Trigger level 6	50mA	
Trigger level 7	60mA	
Trigger level 8	75mA	
Trigger level 9	90mA	Last test

As an example, a reported trigger current of 10-25mA means that device triggering occurred at a gate current of 25mA, but not at 10mA. Therefore the trigger current for the device under test is between 10mA and 25mA.

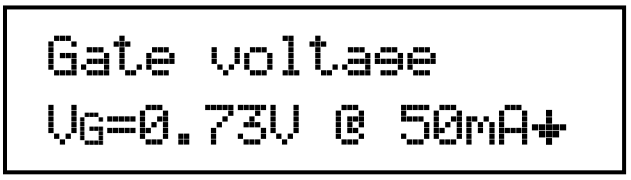
Although Triacs are tested in both quadrants 1 and 3, the reported gate trigger current is that which applies to quadrant 3.

Gate Voltage

If the **SCR100** has successfully tested a triac or thyristor, it will be able to display the gate voltage as well as the gate sensitivity.

The gate voltage is the voltage measured across the gate and the cathode (for a thyristor) or across the gate and MT1 for a triac. The voltage is measured during the time that the device under test has actually triggered.

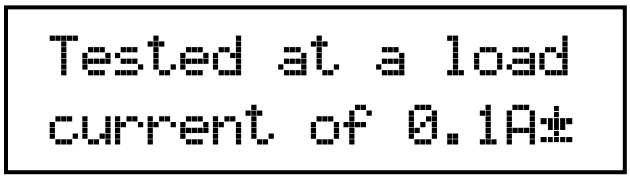
An example of the displayed value is shown here:



Note that the gate voltage is measured at the upper end of the displayed gate trigger current.

For example, if the gate sensitivity is shown as 35 to 50mA, then the displayed gate voltage will be the voltage measured during a gate current of 50mA.

The gate voltage may also be dependent on the load current, for the **SCR100**, the load current is fixed at 100mA, higher load currents may result in a higher gate voltage.



The load current at which SCRs and Triacs are tested is displayed. This value is fixed for all devices, and simply serves as a reminder.

The + symbol indicates that this is the final page of information. Pressing the **scroll-off** button again will return the display to the first page of information.

Care of your SCR100

The **SCR100** should provide many years of service if used in accordance with this user guide. Care should be taken not to expose your unit to excessive heat, shock or moisture. Additionally, the battery should be replaced at least every 12 months to reduce the risk of leak damage.

As battery voltage falls over time, the automatic boost function will ensure that the test voltage is maintained at 12V. For progressively lower battery voltages the boost function will take longer to achieve the target of 12V and the following may be displayed:

If the boost function cannot generate the required test voltage then the following message is displayed:

Replacement of the battery is then mandatory. The **SCR100** will not continue to operate if this condition is encountered.

Battery type: AAA cell (Alkaline, NiMh or Lithium-Iron-Disulphide).

Battery access: To replace the battery, place the unit face down on a clean smooth surface and unscrew the three screws to remove the rear panel. Remove the old battery and insert a new one, take care to observe the correct polarity. Carefully replace the rear panel and ensure that you do not pinch the test leads. Do not over-tighten the screws.

Self Test Procedure

Each time the **SCR100** is powered up, a self test procedure is performed. In addition to a battery voltage test, the unit measures the performance of many internal functions such as the voltage and current sources, amplifiers, analogue to digital converters and test lead multiplexers. If any of these function measurements fall outside tight performance limits, a message will be displayed and the unit will switch off automatically.

If the problem was caused by a temporary condition, such as applying power to the test clips, then simply restarting the **SCR100** may clear the problem.

If a persistent problem does arise, it is likely that damage has been caused by an external event such as excessive power being applied to the test clips or a large static discharge taking place. If the problem persists, please contact us for further advice, quoting the displayed fault code.

If there is a low battery condition, the automatic self test procedure may not be performed.

Appendix A – Accessories

A range of useful additions is available to enhance your **SCR100**.

Carry Case
A specially designed case with custom made foam compartments and a smart tough exterior is ideal for protecting your **SCR100** and probes. There is even space for spare batteries and this user guide.

Replacement Probes
If your probes become damaged, you may wish to purchase a new set of probes.

Replacement Battery
Replacement Alkaline AAA batteries are available from Peak Electronic Design Limited, your local agent or any good electronics store.

All accessories are available from Peak Electronic Design Limited or an authorised agent.

Appendix B - Technical Specifications

All values are at 20°C unless otherwise specified.

Parameter	Minimum	Typical	Maximum	Note
Peak test current into S/C		100mA	120mA	1
Peak test voltage across O/C	11.0V	12.0V	12.5V	1,2
Gate current (I_{GT}) range	0.1mA		90mA	
Gate current (I_{GT}) accuracy		±10%		3
Gate voltage (V_{GT}) resolution		20mV	40mV	
Gate voltage (V_{GT}) accuracy	-80mV		+80mV	
Test Load Current	90mA	100mA	110mA	4
Gate pulse width (I_{GT}=100µA)	550µs	575µs	800µs	
Gate pulse width (I_{GT}>100µA)	250µs	275µs	300µs	
Load pulse width (I_{GT}=100µA)	1000µs	1100µs	1200µs	
Load pulse width (I_{GT}>100µA)	460µs	510µs	560µs	
Battery type	AAA 1.5V Alkaline			
Battery voltage range	1.0V	1.5V	1.7V	
Low battery warning		1.1V		
Battery life	Typically ~1600 operations			6
Inactivity power-down period	15 seconds if no result found			
	60 seconds if result found			
Dimensions (enclosure)	103 x 70 x 20 mm			
Operating temperature range	15°C		35°C	5

1. Between any pair of test clips.
2. For battery voltage greater than 0.9V.
3. Stated for nominal gate-anode voltage of 0.83V developed during trigger.
4. Typical MT2/Anode load current applied to a Triac/SCR.
5. Also subject to acceptable LCD visibility.
6. Based on <1 minute per operation.

Specifications subject to revision.

Appendix C – Statutory Information

Peak Satisfaction Warranty

If for any reason you are not completely satisfied with the **SCR100,** within 14 days of purchase, you may return the unit to your distributor. You will receive a refund covering the full purchase price if the unit is returned in perfect condition.

Statutory Warranty

The statutory warranty is valid for 24 months from date of purchase. This warranty covers the cost of repair or replacement due to defects in materials and/or manufacturing faults.

The warranty does not cover malfunction or defects caused by:

a) Operation outside the scope of the user guide.
b) Unauthorised access or modification of the unit (except for battery replacement).
c) Accidental physical damage or abuse.
d) Normal wear and tear.

The customer's statutory rights are not affected by any of the above.
All claims must be accompanied by a proof of purchase.

WEEE (Waste of Electrical and Electronic Equipment), Recycling of Electrical and Electronic Products

It is not permissible to simply throw away electrical and electronic equipment. Instead, these products must enter the recycling process. Each country has implemented the WEEE regulations into national law in slightly different ways. Please follow your national law when you want to dispose of any electrical or electronic products. **More details can be obtained from your national WEEE recycling agency.**