



SOURCE MEASURE UNITS

Safety Documentation & Quick Start Guide

Distribution in the UK & Ireland



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EN

ENGLISH

This document provides safety information for the following Aim-TTi Source Measure Units: SMU4001, SMU4201.

The Source Measure Units described in this document are designed to be used as general purpose test and measurement equipment. **Must not be used for measurements of Category II or higher mains circuits (as defined in IEC 60364).**

SAFETY	4
Symbols	4
Installation	5
Electrical Requirements	5
Switching on	5
REAR PANEL	6
FRONT PANEL	7
HOME SCREEN	8
GETTING STARTED	9

User manuals, technical specifications, additional support and service information can be found at: www.aimtti.com

FR

FRANÇAIS

Ce document fournit des renseignements de sécurité concernant les sourcemètres Aim-TTi suivants : SMU4001, SMU4201.

Les sourcemètres décrits dans ce document sont conçus pour être utilisés en tant qu'équipements de mesure et d'essais à usage général. **Ne doit pas être utilisé pour les mesures de circuits secteur de catégorie II ou supérieure (tel que défini dans la norme CEI 60364)**

SÉCURITÉ	12
Symboles	12
Installation	13
Règlementations électriques	13
Mise sous tension	13
PANNEAU ARRIÈRE	14
PANNEAU AVANT	15
ÉCRAN D'ACCUEIL	16
COMMENCER	17

Vous trouverez les manuels de l'utilisateur, les spécifications techniques, tout soutien supplémentaire et des informations sur l'entretien en consultant: www.aimtti.com

DE

DEUTSCH

Dieses Dokument enthält Sicherheitshinweise für die folgenden Aim-TTi Source Measure Units: SMU4001, SMU4201.

Die in diesem Dokument beschriebenen Source Measure Units sind für den Einsatz als universelle Prüf- und Messgeräte konzipiert. **Darf nicht für Messungen an Netzstromkreisen der Kategorie II oder höher verwendet werden (wie in IEC 60364 definiert)**

SICHERHEIT	20
Symbole	20
Installation	21
Stromversorgung	21
Einschalten	21
RÜCKSEITE	22
FRONTPLATTE	23
STARTBILDSCHIRM	24
EINSTIEG	25

Benutzerhandbücher, technische Daten, zusätzliche Support- und Serviceinformationen finden Sie unter: www.aimtti.com

IT

ITALIANO

Questo documento fornisce informazioni di sicurezza sulle seguenti unità di alimentazione e misurazione Aim-TTi: SMU4001, SMU4201.

Le unità di alimentazione e misurazione descritte in questo documento sono progettate per essere utilizzate come apparecchiature di test e misurazione per scopi generici. **Non deve essere utilizzato per misure di circuiti di rete di categoria II o superiore (come definito nella norma IEC 60364).**

SICUREZZA	28
Simboli	28
Installazione	29
Requisiti elettrici	29
Accensione	29
PANNELLO POSTERIORE	30
COLLEGAMENTI	31
SCHERMATA PRINCIPALE	32
INIZIARE	33

I manuali dell'utente, le specifiche tecniche, l'assistenza aggiuntiva e le informazioni di servizio sono disponibili all'indirizzo: www.aimtti.com

ES

ESPAÑOL

El presente documento proporciona información de seguridad para las siguientes unidades de medición de fuente (SMU) de Aim-TTi: SMU4001, SMU4201.

Las unidades de medición de fuente descritas en este documento están diseñadas para usarse como equipos de ensayo y medición con fines generales. **No debe utilizarse para mediciones de circuitos de red de Categoría II o superior (como se define en IEC 60364).**

SEGURIDAD	36
Símbolos	36
Instalación	37
Requisitos eléctricos	37
Encendido	37
PANEL POSTERIOR	38
PANEL FRONTAL	39
PANTALLA DE INICIO	40
EMPEZANDO	41

Puede encontrar manuales de usuario, especificaciones técnicas, ayuda adicional e información de mantenimiento en: www.aimtti.com

SAFETY

SYMBOLS

This document contains information and warnings which must be followed by the user to ensure safe operation and to keep the instrument in a safe condition.

The following symbols are displayed on the instrument and throughout the manual, to ensure the safety of the user and the instrument, all information must be read before proceeding.



WARNING-Indicates a hazard that, if not avoided, could result in injury or death.



Note/ Example- Indicates a helpful tip or an example to show further details



CAUTION-Indicates a hazard that could damage the product that may result in loss of important data or invalidation of the warranty.



'CE' marking is a certification mark that affirms the goods conformity with European health, safety, and environmental protection standards.



Standby Supply- Instrument is not disconnected from AC mains power when switch is off.



UKCA 'UK Conformity Assessed' marking is a certification mark that affirms conformity with the applicable requirements for products sold within Great Britain.



Alternating Current



WEEE (do not dispose in household waste)



Earth (ground) Terminal



Protective Earth Terminal

This instrument is:

- A safety Class I instrument according to IEC classification and has been designed to meet the requirements of EN61010-1 (Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use).
- An Installation Category II instrument intended for operation from a normal single-phase supply.
- Supplied in a safe condition and tested in accordance with EN61010-1.
- Designed for indoor use in a Pollution Degree 2 environment in the temperature range 5°C to 40°C, 20%- 80% RH (non-condensing) and less than 2000m.

WARNING



Do not operate while condensation is present.

Do not operate outside its rated supply voltages or environmental range.

THIS INSTRUMENT MUST BE EARTHED.

Any interruption of the mains earth connector, inside or outside, will make the instrument dangerous. Intentional interruption is prohibited.

Use of this instrument in a manner not specified by these instructions may impair the safety protection provided.

If any adjustment or repair of the opened instrument under voltage is inevitable it shall be carried out only by a skilled person who is trained to perform such adjustments and is aware of the hazards involved. When connected, terminals may be live and opening the covers or removal of parts (except those that can be accessed by hand) may expose live parts.

To avoid electric shock, or damage to the instrument, never allow water to get inside the case. If the instrument is clearly defective, has been subject to mechanical damage, excessive moisture or chemical corrosion the safety protection may be impaired and it must be withdrawn from use and returned for checking and repair.

Voltages above 60VDC are hazardous live according to EN 61010-1 and great care must be taken when using the SMU at voltages above this level.

Capacitors inside the SMU may still be charged even if it has been disconnected from all voltage sources, these will be safely discharged a few minutes after switching off. LEDs on the HV rail indicate the charge is still present, as such it's not safe to dismantle until all LEDs have gone out.

This instrument is protected by three internal fuses which are user serviceable (refer to Service Manual).

ELECTRICAL REQUIREMENTS

Mains operating voltage

CAUTION



The operating voltage is internally switch selectable between 115Vac or 230Vac. You must check that the local supply meets the AC input printed on the rear panel before connecting the unit to the supply. For details on how to change the mains input voltage, see the SMU4000 Series Instruction Manual.

Mains Lead

Connect the instrument to the AC supply using the mains lead provided.

Should a mains plug be required for a different mains outlet socket, a suitably rated and approved mains lead set should be used which is fitted with the required wall plug and an IEC60320 C13 connector for the instrument end. The minimum current rating of the lead-set for the intended AC supply is 6A or more.

WARNING



Any interruption of the mains earth conductor inside or outside the instrument will make the instrument dangerous. Intentional interruption is prohibited. Before use, inspect provided mains lead for any signs of damage, do not use if lead is damaged. Before use, inspect the instrument for any signs of damage, do not use if damaged.

INSTALLATION

Mounting

This instrument is suitable both for bench use and rack mounting.

For rack mounting the protective bezels and handle/stand should be removed such that the instrument can be fitted beside any other standard 2U half-rack instrument in a 19" rack.

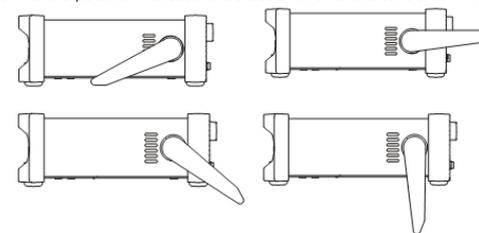
A suitable 2U 19" rack kit is available from the manufacturers or their overseas agents.

Ventilation

Take care not to restrict the rear air exit or the inlet vents at the front (sides and underneath). In rack-mounted situations allow adequate space around the instrument and/or use a fan tray for forced cooling. If the air inlet vents are restricted for any reason, the fan can be set to 'fast' to compensate for minimal restrictions, see the SMU4000 Series Instruction Manual for more details.

Handle / Stand

The instrument is fitted with a 4-position handle/stand. Pull out both sides of the handle at the case pivot points to free the position locking pegs and rotate the handle from the stowed position to the required stand or handle position. Release the sides of the handle to lock it in the new position.



SWITCHING ON

Connect the instrument to the AC supply using the mains lead provided.

Press the standby button; the button will illuminate to indicate start up.

At power-up the instrument will display a start-up message whilst initialising the application.

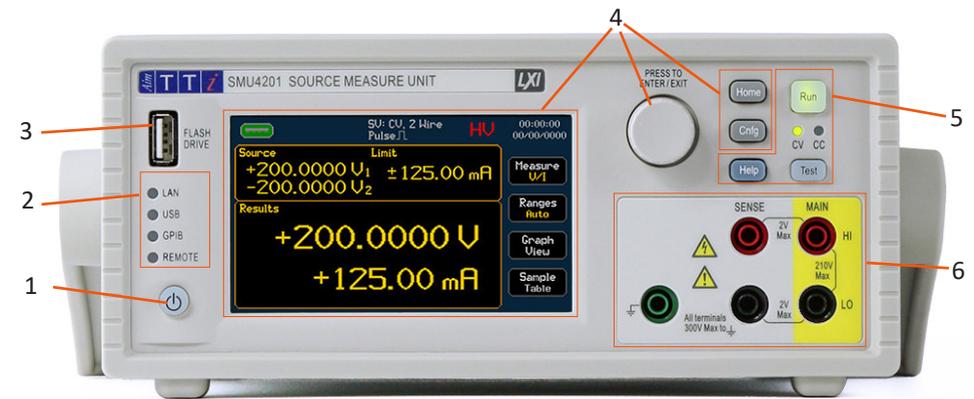
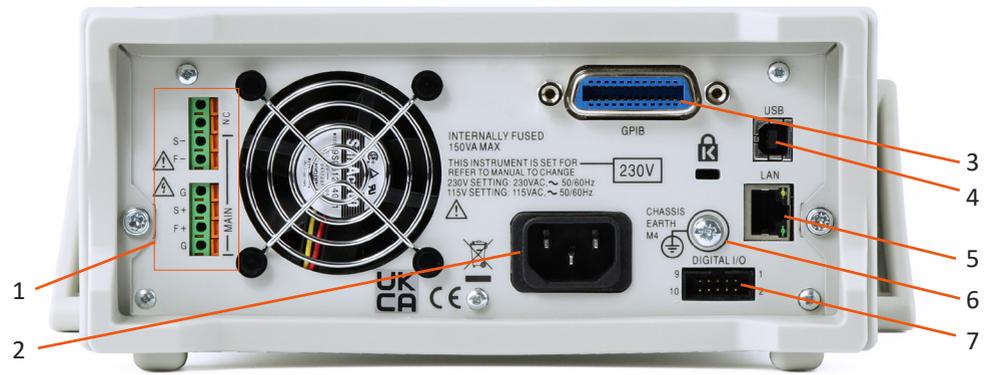
Loading takes a short while as the SMU will carry out self-testing and a self-calibration (at every power cycle), after which the home screen is displayed.

To switch off, press the standby button. When powered down into standby mode the LED is dimly lit, indicating mains power is still present.

WARNING

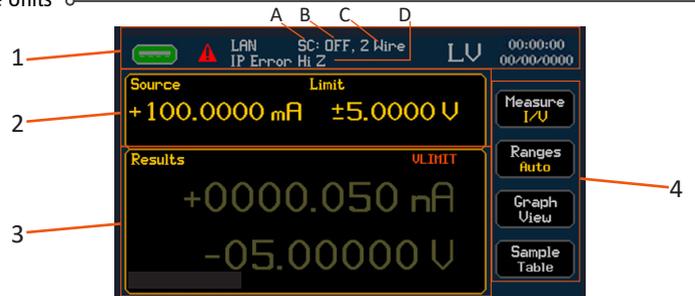


To fully disconnect from the AC supply, unplug the mains cord from the back of the instrument or switch off at the AC supply outlet; make sure that the means of disconnection is readily accessible. Disconnect from the AC supply when not in use.



1	TERMINAL BLOCK The terminal block provides rear access to the Main and Sense connections with the addition of Guard connections. To connect a wire, press the orange actuators of the screwless terminals, insert the connecting wire and release the actuator to secure the connection. Use insulated wire (Solid or stranded, 0.5mm ² to 1.5mm ² (21 to 16AWG), strip length 9mm to 10mm) suitable to meet local safety standard for 300Vpeak, i.e. tri-rated 600V equipment wire with uninsulated Ferrule. Ensure there are no loose strands. ⚠️WARNING Only ever use either the front or rear terminals exclusively at any given time. Hazardous voltages will appear on both sets of terminals. SMU4201 Terminals, Force(F)/ Main, Sense(S), and Guard(G) can be set and operate at voltages up to 210Vpeak, voltages greater than 60V are deemed hazardous voltages. Always make connections to the instrument with the OUTPUT OFF. ⚠️CAUTION All terminals are rated to 300Vpeak with respect to earth ground. Safety will be maintained if voltages up to 21Vpeak for SMU4001 or 210Vpeak for SMU4201, are accidentally applied between inappropriate terminals in excess of their marked ratings. The maximum differential between MAIN HI and SENSE HI and MAIN LO and SENSE LO should be < 2Vpeak. The SENSE terminals are protected against accidental connection of up to 21Vpeak for SMU4001 or 210Vpeak for SMU4201, between HI & LO. F=Force Force terminals source or sink voltage or current. S=Sense Sense terminals measure voltage. 4 Wire setups use the HI & LO Sense plus the HI & LO Main terminals. G=Guard Specific Guard terminals only feature on the rear panel.
2	AC POWER INLET: ⚠️CAUTION See Electrical Requirements.
3	GPIB (optional) For GPIB connection the SMU Requires a GPIB 1A user retrofittable option, available from the manufacturers or their overseas agents. The default GPIB address is 10. See Programming Manual for more details
4	USB The USB device port accepts a standard USB B cable. The Windows plug-and-play functions will automatically recognise that the instrument has been connected. See Programming Manual for more details.
5	LAN The LAN interface meets 1.5 LXI (LAN extensions for Instrumentation) Core 2016. Remote control using the LAN interface is possible using a TCP/IP Socket protocol. See Programming Manual for more details.
6	CHASSIS EARTH M4 The M4 threaded screw marked provides a connection point to safety earth ground. An M4 Ring tab must be used, with an appropriate washer.
7	DIGITAL I/O [DIO] The DIO is an input/output port that detects, and outputs signals through digital I/O lines. See Instruction Manual for more details. +5.25Vpk Max. (diode clamped to +5V). The 5V supply is internally fused (resettable fuse) to 500mA.

1	STANDBY When pressed to power up the instrument, the button will illuminate to indicate start up. When powered down into standby mode the LED is dimly lit, indicating mains power is still present
2	REMOTE LEDS When the instrument is being controlled remotely, the REMOTE indicator will be illuminated. One of the LAN, USB and GPIB indicators will also be illuminated, depending on the communication type.
3	FLASH DRIVE USB Host port for the connection of a flash drive.
4	NAVIGATION CONTROLS Menu keys There are two main menus: Home and Cnfg (configuration)- These are accessed using the hard keys on the front panel. <i>The items within these menus can be selected using the following options:</i> Rotary knob Turn the knob clockwise to initiate, once the desired button has been selected, press to engage the button. The knob can also be used to modify home screen parameters once they have been selected. Touch screen Direct selection and entry using touch. Simply touch the item with your finger. ⚠️CAUTION Do not use sharp or pointed objects to operate the touch screen, clean with a soft dry cloth . Menu scrolling Some menus offer a scrolling page of options, when this is the case, arrows will be available to scroll the page up or down. OK/ Cancel button The OK and Cancel buttons are available on all screens where changes can be made; pressing OK will apply any changes and return the previous menu. Cancel will return to the previous screen without making any changes. Back button The Back button is available on sub menus, when pressed it will return to the previous menu.
5	FUNCTION KEYS AND LED INDICATOR Run key Enables the output and executes the present configuration. NOTE For measurements to be recorded, the Run Key must be enabled. CV/CC LEDs When the output is running, shows whether the instrument is in constant voltage or constant current. Test key Performs a quick internal self-calibration and measurement zero. Help key Provides direct context sensitive assistance with menus, settings and parameters.
6	TERMINALS ⚠️WARNING ⚠️CAUTION See Rear Panel [1. Terminal Block] The input sockets are 4mm safety sockets on a 19mm pitch designed to accept 4mm safety plugs with fixed or retractable shrouds. ⚠️WARNING Only use test leads conforming to IEC61010-031. Always make connections to the instrument with the OUTPUT OFF. Main Main Terminals source or sink voltage or current. Sense Sense terminals measure voltage. The HI Sense terminal can be used as a guard in 2 Wire + Guard setups. 4 Wire setups use the HI & LO Sense plus the HI & LO Main terminals. Ground Chassis ground for ground reference purposes only.



1 STATUS BAR			
USB Flash Drive:		LAN status: Press to edit Interface setup	
	Not Connected	LAN	LAN detected
	Reading	↑↓	Data Transfer detected
	Connected	IP Error	LAN IP Address Error
	Not supported	Event log: Press to see logged event/s	Event logged
Setup Status: Press to edit the setup.			
A. Active Mode:		C. Terminal configuration:	
SV	Source Voltage	2 Wire	Main terminals- Source and Sense
SC	Source Current	2W+ Guard	Main terminals- Source and Sense, HI Sense terminal- Guard
LC	Load Current	4 Wire	Main terminals- Source and Sense, Sense Terminals- Sense
LR	Load Resistance		
LP	Load Power	D. Output Off (Off State):	
MV	Measure Voltage	0V/ 100uA	Source 0V/ 100uA current limit
MC	Measure Current	Hi Z	Terminals are high impedance
MR	Measure Resistance (Voltage Limited)	Zero	Source 0V
MHR	Measure Resistance (Current Limited)	Open	Terminals are open circuit
SEQ	Sequence Mode	Output On (Shape):	
		Steady	Source is steady
		Pulse	Source is pulsed between two levels
		Sweep	Source is swept in steps between start and end levels
		List	Source is defined by a custom list of levels
		Pulsed sweep	Source is swept in pulsed steps between start and end levels
NOTE If Sequence Mode is running, the 'Active Mode' for the step in the sequence will be shown.			
Operating Voltage Limit: (SMU4201 only.)			
LV	Low Voltage Mode. Press to activate the High Voltage Interlock		
HV	High Voltage Mode. Press to deactivate the High Voltage Interlock		
NOTE To access the High Voltage Interlock, the password protection may need to be removed first (Default Password = 123456)			
Time and Date: Press to edit Time and Date			
2 SOURCE AND LIMIT			
User defined source/sink level and imposed limitation depending upon the selected mode. Values can be modified by direct touch keypad entry or the rotary knob.			
3 RESULTS (Primary & secondary measurements).			
Real time measurements a voltage and current limit indicator and (if enabled) the measurement reference and math formula applied to the readings. If a limit is breached, VLIMIT/ ALIMIT is shown and the colour of the appropriate measurement is changed to orange.			
4 BUTTONS (White text = button name, yellow text= selected setting).			
Measure	Primary and secondary measurement selection.		
Ranges	Current and voltage range.		
Graph View	Plotted graphical view of the buffer data.		
Sample Table	Real time results in a table.		

Easy Setup

Example: Measure Resistance

The following setup example explains a simple way to measure resistance using a pre-configured Easy Setup.

Select Ohmmeter from the Easy Setup menu:

Cnfg > Easy Setup > ↓ > Ohmmeter > OK x3

Suggested Settings:

Resistance	Test current	Voltage limit	Terminals
10 Mohm	0.1uA	5V	2 wire
1 kohm	1mA	5V	2 wire or 4 wire
0.1 ohm	1A	1V	4 wire

Run the Setup:

Home > Run → Run (Setup Running)

Easy Setup	Settable parameters	Default settings	Mode
Power Supply	Voltage Output	+1V	SV
	Current Limit	0.1A	
Current Source	Current Output	+1mA	SC
	Voltage Limit	5V	
Load	Load Current	+1mA	LC
	Voltage Dropout	0V	
Voltmeter	-	-	MV
Ammeter	-	-	MC
Ohmmeter	Test Current	+1mA	MR
	Voltage Limit	5V	
IR Meter	Test Voltage	+20V	MC
	Current Limit	1mA	
LC Meter	Test Voltage	+20V	SV
	Current Limit	1mA	

Manual Setup

Example: Diode Characterisation

This example demonstrates one way to carry out a 3V3 Zener diode characterisation test:

Select Current Source from the Easy Setup menu:

Cnfg > Easy Setup > Current Source > OK x3

Select Shape and set to Sweep:

Manual Setup > Shape Steady > Sweep > OK

Select Sweep Setup and change the settings to:

Sweep Setup

Start -20mA End +10mA Total Points 301

Run the Setup:

Home > Run → Run (Setup Running)

The Manual Setup menu contains options and settings for source and measurement configurations. Once familiar with the easy setups, it is possible to use these as a base for more advanced setups using the manual modes. Using the 'Easy Setup' in this way will reset all the mode settings to the default settings for the associated manual setup, ensuring all the settings are configured appropriately for that type of test.

Export Results Data

Cnfg > Data Store

Save data to a USB Flash drive

Auto Store USB Store

Run → Run

Save after each run. Save when pressed.

View Results Data: Sample Table

Home > Sample Table

Index	Prim. Meas	Sec. Meas	Date	Time
155	-0.004699 n	-0.29428 u	22/08/2021	10:45:16
154	-0.004798 n	-0.30243 u	22/08/2021	10:45:16
153	-0.004900 n	-0.31026 u	22/08/2021	10:45:16
152	-0.004999 n	-0.31815 u	22/08/2021	10:45:15
151	-0.005098 n	-0.32561 u	22/08/2021	10:45:15
150	-0.005198 n	-0.33297 u	22/08/2021	10:45:15
149	-0.005299 n	-0.34031 u	22/08/2021	10:45:15
148	-0.005400 n	-0.34749 u	22/08/2021	10:45:15

The sample table contains all data measurements collected in real time.

View Results Data: Graph View

Home > Graph View

Graph View will display the measured buffer data to automatically fit the display area.

Graph Type	X Axis	Y Axis
YT	Time	Primary Measurement
Voltammogram	Voltage	Current

Example shows a 3V3 Zener diode characterisation test displayed as a Voltammogram.

For pan & zoom functions, use Graph

Markers

Marker 1 Marker 2

The Marker 1 & 2 buttons allow the user to measure a specified data point in the X or Y axis.

Once a marker is active and selected, the rotary encoder can be used to set the marker position.

Trace

Trace

A trace of the buffer data can be saved and loaded over a live set of test results as a blue line for comparison.

Save a Screen Shot (.bmp)

Further Information

Context sensitive Help key:

Select a button with the encoder, press the Help key to view on screen help.

TEST BRIDGE SMU

Test Bridge SMU is free downloadable software that provides full programmable control of multiple SMUs alongside:

- Complex sequence builder, with full access to configuration settings.
- Arbitrary waveform creation with built in pre-set options.
- Linear and logarithmic, X/Y, Y/T graphing functions.
- Advanced zooming and panning functions.
- Split view option for steps and repeats on sequenced data.
- Full access to remote commands with documentation for each command.

FREE

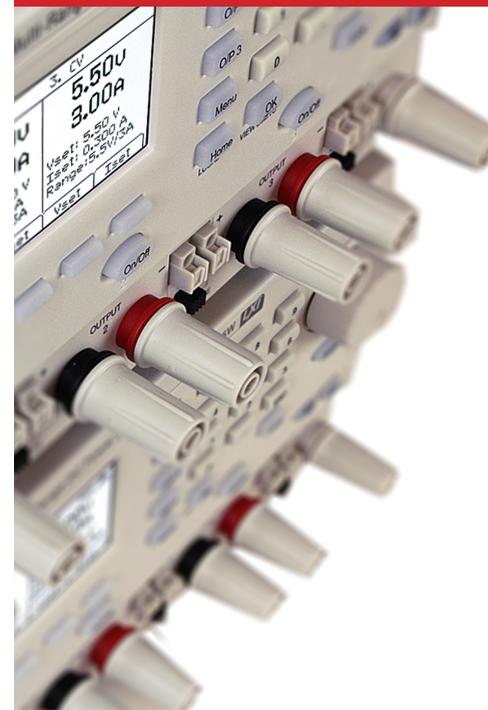
User manuals, software, additional support and service information can be found at:

www.aimtti.com/support



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- > RF signal generators with frequency capability up to 6GHz.
- > EMC analyzers for power Harmonics and Flicker.

Distribution in the UK & Ireland

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