



# TRANSMILLE :: THE CALIBRATION SPECIALISTS



Transmille has over a decade's experience in calibration and instrumentation design & manufacture. Our products are in use throughout the world in both commercial and military laboratories, service centers and production facilities. Our reputation for innovation, reliability & value is second to none with complete solutions including instrumentation, software, support & training.



UKAS calibration is available for all Transmille products as an optional service.

0324

FUNCTION SUMMARY

FUNCTION	COMMENTS
CONTINUITY RESISTANCE SOURCE	HIACC OPTION AVAILABLE
CONTINUITY CURRENT MEASUREMENT	
INSULATION RESISTANCE SOURCE	15kV TESTER ADAPTER OPTION
INSULATION TEST VOLTAGE MEASUREMENT	16 <sup>th</sup> & 17 <sup>th</sup> EDITION COMPLIANT
AC VOLTAGE OUTPUT	
RCD TEST TIME MEASUREMENT	
RCD TEST CURRENT MEASUREMENT	AUTO WAVEFORM ANALYSIS
RCD TEST DURATION MEASUREMENT	
LOOP RESISTANCE SOURCE	AUTOLOOP OPTION AVAILABLE
PAT EARTH BOND RESISTANCE	
PAT EARTH BOND CURRENT	
PAT INSULATION RESISTANCE	
PAT LEAKAGE	
PAT LEAKAGE TEST VOLTAGE	
PAT LOAD TESTING	
PAT FLASH VOLTAGE TESTING	OPTIONAL ADAPTER
PAT FLASH CURRENT TESTING	OPTIONAL ADAPTER
LINE VOLTAGE MEASUREMENT	

ORDER DETAILS

MODEL 3200 CAL3200	ELECTRICAL TEST EQUIPMENT CALIBRATOR UKAS CALIBRATION CERTIFICATE
<b>INTERNAL OPTIONS</b>	
OPTION HIACC	HIGH ACCURACY INSULATION RESISTANCE OPTION
OPTION 10G	EXTENDED INSULATION RESISTANCE OPTION TO 10GOhms
OPTION AUTOLOOP	AUTOMATED LOOP (LINE-EARTH) MEASUREMENT
<b>EXTERNAL OPTIONS</b>	
OPTION FLASH	PAT FLASH TEST ADAPTER (CLASS 1 & CLASS 2)
OPTION EXT15KV	15kV INSULATION TESTER ADAPTER
OPTION BDOWN	HIPOT / BREAKDOWN TESTER ADAPTER
OPTION PROBE	EXTERNAL 12kV HIGH VOLTAGE PROBE
<b>GENERAL ACCESSORIES</b>	
3200SCASE	SOFT CARRY CASE
3200TCASE	HARD TRANSIT CASE

SOFTWARE

<b>AUTOMATE CALIBRATION WITH PROCAL SOFTWARE - SEE SOFTWARE BROCHURE FOR FULL DETAILS</b>	
3200CCP	3200 CALIBRATION CONTROL PANEL SOFTWARE
PC-SU	PROCAL PROFESSIONAL CALIBRATION SOFTWARE
PROSITE	ON-SITE DATABASE MANAGEMENT SOFTWARE FOR PROCAL
PROWEB	WEB SERVICE DATA EXPORTER FOR PROCAL
PCT-SU	PROCAL-TRACK LABORATORY MANAGEMENT SOFTWARE

EVALUATION VERSIONS OF ALL SOFTWARE PACKAGES ARE AVAILABLE FROM [www.transmille.com](http://www.transmille.com)



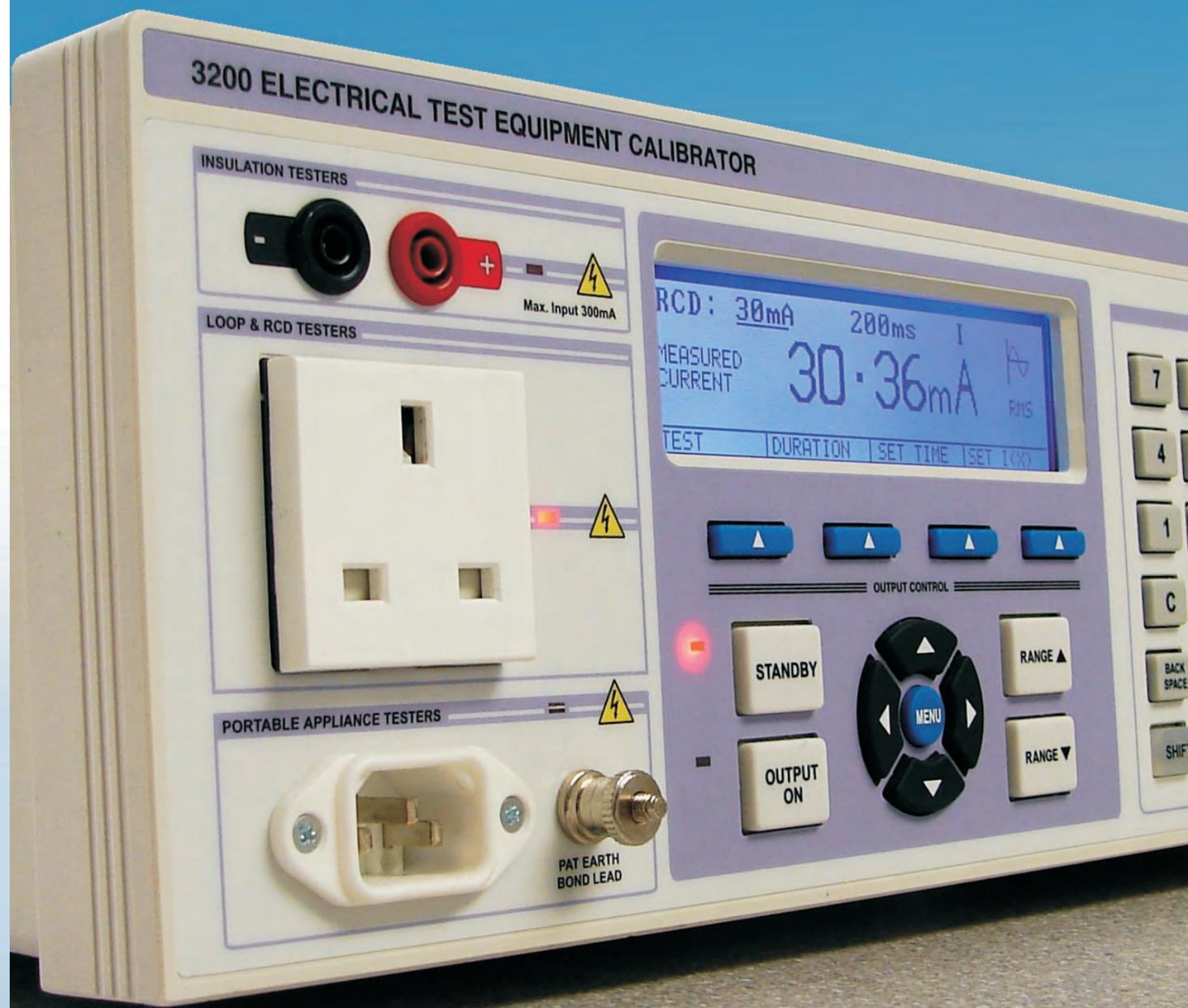
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AGENT

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# COMPLETE TESTING

## 17TH EDITION COMPLIANT



# 3200 SERIES

## ELECTRICAL TEST EQUIPMENT CALIBRATOR





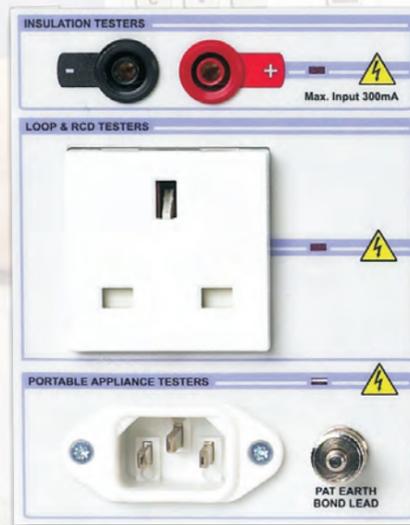
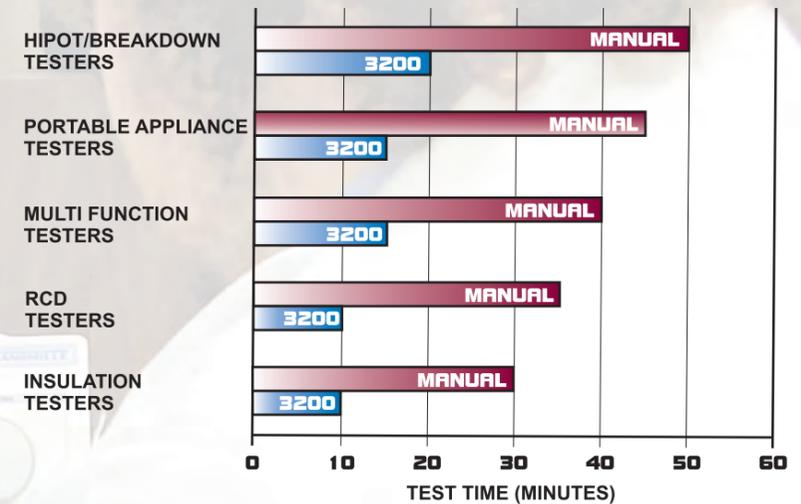
FAST, EFFICIENT ELECTRICAL CALIBRATION

The industry established 3200 Series provides by far the fastest solution for the calibration of Loop & RCD Testers, PATs and Insulation Testers, and also one of the safest solutions for calibrating Hi-Pot/Breakdown testers. Traditional testing practices required many items of test equipment and potential exposure to hazardous voltages with a typical multi function tester taking up to 45 minutes to calibrate.

Using the 3200 Series, calibration can be dramatically reduced to typically 15 minutes enabling safe, cost effective calibration to be put into practice offering fast return on investment.

INCREASED PRODUCTIVITY

REDUCED TEST TIMES = RAPID RETURN ON INVESTMENT



Dedicated mains sockets for Loop, RCD & PATs on the 3200 front panel avoids the need to make connection of mains voltages/power using 4mm type test leads. This important safety feature eliminates any risk of shock to the engineer as connections are made with standard mains type plugs.

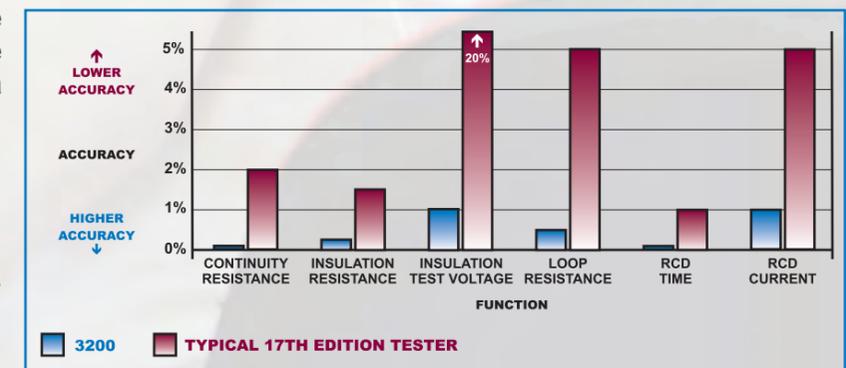
Loop and RCD testers can simply be plugged directly into the dedicated front panel mains socket - the advantages of this are :

- ✓ ELIMINATES THE RISK OF SHOCK TO THE OPERATOR
- ✓ REMOVES THE POSSIBILITY OF INCORRECT CONNECTION CAUSING UUT DAMAGE.
- ✓ FASTER CALIBRATION WITH EASIER CONNECTION, LESS TRAINING FOR OPERATORS.
- ✓ REDUCED UNCERTAINTY WITH FEWER CONNECTIONS FOR LOOP IMPEDANCE CALIBRATION.

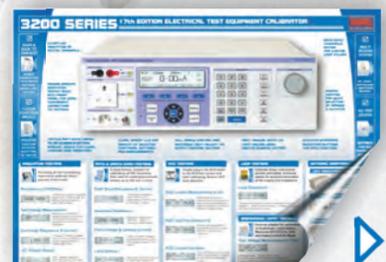
PAT testers plug directly into the 3200 IEC inlet socket using the calibrated lead supplied. The earth bond lead clips on to the earth bond post. This terminal is electrically floating with respect to mains earth allowing calibration of PATs which cannot be used on earthed appliances

For flash voltage measurement the external adapter allows the HV probe from the PAT to be pushed down onto a measurement point on the adapter.

The 3200 has been designed from the outset as a high accuracy reference for testing of electrical test equipment. Its accuracy provides a superior stand-off ratio better than 4:1 - essential for accurate, repeatable testing.



MULTI FUNCTION TESTING



FOLD OUT FOR OVERVIEW

MULTI FUNCTION ELECTRICAL TESTING

INSULATION TESTERS	RCD / RCCB TESTERS	LOOP TESTERS	INSTALLATION TESTERS	PATs / EARTH BOND TESTERS TO 30A	HIPOT / BREAKDOWN TESTERS	HV SOURCES



The 3200 Series calibrator complements the 3000 Series range of multi product calibrators, 8000 Series precision multimeters and the 3000 Precision range of reference standards. This comprehensive range of Queen's award winning instrumentation combined with the ProCal calibration software provides a complete solution for the modern calibration laboratory.

# 3200 SERIES 17th EDITION ELECTRICAL TEST EQUIPMENT CALIBRATOR



**SAFE & EASY TO CONNECT**



**DIRECT CONNECTION TO SOCKETS FOR SAFE MAINS / LINE TESTING**

**1-CLICK FUNCTION SELECT**



**DEDICATED FUNCTION KEYS FOR EACH TYPE OF TESTER**

**CLEAR LED INDICATION OF ACTIVE TERMINALS**

**REGION SPECIFIC DEDICATED SOCKET BUILT INTO FRONT PANEL FOR SAFE, CONVENIENT CONNECTION TO TESTERS.**

**TACTILE SOFT-KEYS LINKED TO ON-SCREEN FUNCTION-SPECIFIC MENUS FOR CLEAR, CONCISE USER OPERATION**

**CLEAR, BRIGHT LCD FOR DISPLAY OF SELECTED FUNCTIONS, SETTINGS AND MEASUREMENTS**

**FULL RANGE CONTROL AND INDIVIDUAL DIGIT ADJUST VIA OUTPUT CONTROL SECTION**

**EASY MANUAL ENTRY OF TEST VALUES USING BUILT-IN NUMERIC KEYPAD**

**INTUITIVE INTERFACE - DEDICATED BUTTONS FOR EACH FUNCTION**

**REAR INPUT TERMINALS OPTION FOR CUSTOM LOOP VALUES**

**MULTI REGION DESIGN**

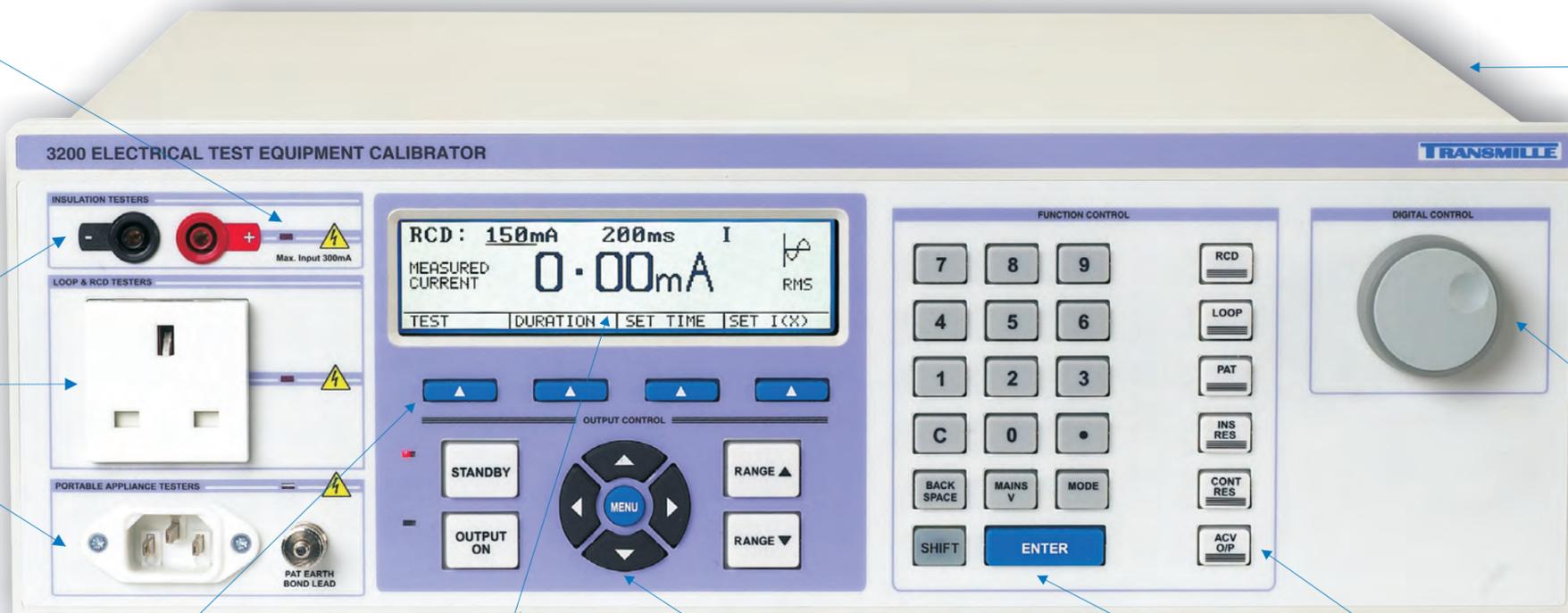


**UK / EURO / AUSTRALIAN + ADDITIONAL REGIONS**

**NO TRIP DESIGN**



**SUITABLE FOR RCD PROTECTED SUPPLIES**



## INSULATION TESTERS



Providing all the functionality required to calibrate these popular instruments.

### Resistance to 10GOhms



Continuously variable Insulation resistance to 10GOhms @ 1kV. Use the optional adaptor to check 15kV testers.

### Test Voltage Measurement



Measures insulation test voltage & current - with 16th/17th Edition compliance.

### Continuity Resistance & Current



3 ranges to 1kOhm (variable from 0.1Ohm to 20Ohms) and current measurement to 320mA (@10hm)

### AC Voltage Output



5 AC voltage outputs at 50V•100V•200V•230V•400V for calibrating voltage ranges

## PATS & EARTH BOND TESTERS



A rapid testing solution for calibrating all PAT functions. Also ideal for earth/ground bond testers up to 30A test current.

### Earth Bond Resistance & Current



10 precision resistance values with current measurement from 100mA to 30A into 0.1 Ohms

### Insulation Resistance



Adjustable resistance to 10GOhms - ideal for checking pass/fail levels

### Flash Voltage & Leakage Current



Class 1 & 2 flash voltage & current measurement plus 3 AC leakage ranges to 7mA.

### Load Testing



Open circuit, short circuit and 0.13kVA load checks PAT operation / run tests

## RCD TESTERS



Simply plug in the RCD tester to the RCD test socket and start calibrating. Built-in UUT fault detection.

### RCD Current Measurement to 3A



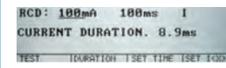
RMS and peak current measurements for all types of tester using digital waveform capture & analysis. Graphical Indication of phase start

### RCD Trip Time 20ms to 5s



Accurate & repeatable trip times entered simply via the keyboard provide easy calibration.

### RCD Current Duration



The 3200 makes this normally difficult measurement straight forward with this dedicated function

## LOOP TESTERS



Calibrate these instruments quickly and safely. Auto loop option for accurate correction of the supply line impedance.

### Loop Resistance



10 precision resistance values incorporating line input impedance - either entered directly or obtained using the auto loop measurement option.

## BREAKDOWN / HIPOT TESTERS



External adapter for calibration of breakdown / hipot testers. Measures ACV/DCV to 12kV and output current to 20mA

### High Voltage Measurement to 12kV



4 Voltage ranges : AC/DC 3kV & 12kV  
6 Current range : AC/DC 200µA, 2mA & 20mA  
9 Load resistors for current measurements: 50kW (20mA) to 20MW (20µA) @ 1kV

## OPTIONAL ADAPTERS

### 15kV INSULATION ADAPTER



- CALIBRATE UP TO 15kV INSULATION TESTERS
- 200hm to 200GOhms / 110hm\*
- CONNECTS DIRECTLY TO 3200

### PAT FLASH TEST ADAPTER



- CLASS 1 : 1.5kV TESTING
- CLASS 2 : 3kV TESTING
- CONNECTS DIRECTLY TO 3200

### BREAKDOWN / HIPOT ADAPTER



- 3kV & 12kV AC/DC MEASUREMENT RANGES
- 200µA / 2mA / 20mA CURRENT RANGES
- CONNECTS DIRECTLY TO 3200

### HIGH VOLTAGE PROBE



- 12kV INPUT
- CONNECTS DIRECTLY TO 3200
- IDEAL FOR TESTING HV SOURCES

# RCD TESTER CALIBRATION

## RCD TESTER CALIBRATION WITH DIGITAL WAVEFORM CAPTURE



### RCD OVERVIEW

Increasingly in modern installations, earth leakage circuit breakers are used to provide protection in addition to conventional fuses and circuit breakers. These devices are referred to by a variety of names including **RCD** (Residual Current Devices), **RCCB** (Residual Current Circuit Breaker), **ELCB** (Earth Leakage Circuit Breaker) and **GFI** (Ground Fault Interrupt).

The devices operate by sensing when the current in the phase and neutral conductors within an installation are not equal and opposite. Any imbalance would imply that an additional path existed for the current to flow, invariably through the earth due to excessive leakage and/or fault situation.

RCD testers are designed to simulate a range of fault currents, with restrictions on the duration of the fault current, and to time the operation of the device. This will indicate the ability of the RCD to interrupt a particular fault current within certain time limits to ensure protection against fire, damage and electrocution.

It is important to understand that an RCD tester does not generate the current, but acts as a resistor allowing current to flow from the live to earth, simulating a fault. The 3200 measures the current flowing back to earth taking by the tester and at the set time disconnects the supply allowing the trip time measurement function of the tester to be verified.

Simply plug in the RCD tester to the RCD test socket and start calibrating. Pre-trip tests & current ramps from the tester are detected automatically allowing quick, accurate measurements.

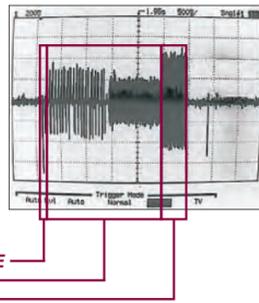


Safe, convenient connection to RCD test socket



### DIGITAL WAVEFORM CAPTURE

The 3200 incorporates digital waveform capture & analysis to monitor the input signal. Certain testers may produce a switch on 'spike' which can be larger than the trip current being tested. Most modern testers also perform a 'no-trip' pretest before the actual trip test begins. The 3200 seamlessly detects and handles these events to ensure accurate measurements are made every time.



### RCD CURRENT MEASUREMENT TO 3A



RMS and Peak current measurements for all types of tester using digital waveform capture & analysis.

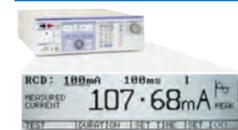
Graphical indication of phase start.  $\pm 180^\circ$  and DC test modes.

### RCD TIME MEASUREMENT 20ms TO 5s



Accurate & repeatable trip times entered simply via the keyboard provide easy calibration.

### RCD CURRENT DURATION



The 3200 makes this normally difficult measurement straight forward with this dedicated function to support current duration measurement.

### RCD / LOOP TESTER FAULT DETECTION



A common fault with RCD and loop testers is to fail with a short circuit between live and earth. Connection of such a faulty tester directly to mains power may result in blown fuses or calibrator damage. To overcome this problem the 3200 is designed with a built in fault detection system which ramps the loop impedance down, aborting the test should a faulty tester be detected.

# LOOP TESTER CALIBRATION

## LOOP TESTER CALIBRATION WITH LINE IMPEDANCE MEASUREMENT



Calibrate these instruments quickly and safely - the auto loop option ensures accurate correction for the supply loop impedance.



Safe, convenient connection to LOOP test socket



### LOOP OVERVIEW

Loop testers measure the resistance in ohms of the mains supply at a power socket. Most loop testers only measure the resistance of the live (Phase) to earth resistance, some testers can also measure the live to neutral circuit resistance.

Loop testers can also display the PSCC (Prospective Short circuit current), sometimes called the PFC (Prospective fault current). Loop testers work by applying a heavy load, usually 23 Amps, for a short duration and measuring the drop in voltage when the load is applied, then using ohms law display the loop resistance.

To calibrate a loop tester first the loop impedance of the supply must be known. Several known values of resistance must then be inserted in the loop to increase the loop resistance so the tester can be calibrated at several points.

The resistance can either be in the live or earth return (it is common practice to place the resistors in the earth return for safety reasons). The value displayed on the tester can then be compared to that of the known value of the resistor. plus the loop resistance of the supply.

The 3200 has 10 calibrated resistance values which are non inductive and are able to withstand the 23 Amps needed.

### LOOP TESTING : 10 VALUES



- 10 precision resistance values incorporating line impedance
- Supports manual entry or auto measurement of line impedance (auto loop option)

### AUTO LOOP IMPEDANCE CORRECTION



The auto loop impedance measurement and correction function provides an easy way to measure the loop impedance and add this to the calibrated resistance values stored in the 3200.

At the press of a button, the 3200 measures the loop impedance of the supply it is connected to and adds this measured value to the calibrated value displayed when a loop resistor is selected, eg. a measured loop impedance of 0.15 Ohms will result in a corrected value of the [calibrated value] + [0.15 Ohms]. This provides accurate and repeatable method for calibrating loop testers even when calibrating on-site.

### CUSTOM LOOP VALUE OPTION

The earth bond resistance function includes 10 precision resistance values from 0.05 Ohms to 1kOhm. Additional values are supported using the **rear terminal option** for connection of user's own custom loop resistors.

# INSULATION TESTER CALIBRATION

## COMPREHENSIVE INSULATION TESTER CALIBRATION



### CONTINUITY & INSULATION TESTERS

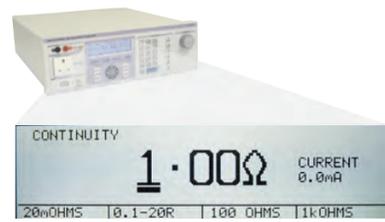
Providing all the functionality required to calibrate these popular instruments.



Safe, convenient connection to Insulation terminals



### CONTINUITY RESISTANCE & CURRENT

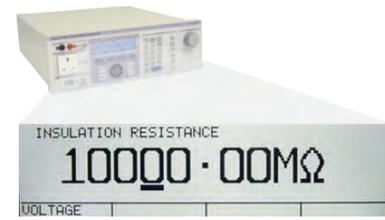


Continuity resistance & current testing ranges include :

- 0.02 Ohms (zero) test point
- 0.2 to 20 Ohms (continuously variable)
- 100 Ohms test point
- 1kOhm test point
- Current measurement to 320mA @ 10hm

A **high accuracy option (0.25%)** is available to support the new generation of higher accuracy insulation testers.

### INSULATION RESISTANCE TO 2GOhms (10GOhms / 1TOhm OPTIONS)



Continuously variable Insulation resistance to 2GOhms @ 1000V. A **high accuracy option (0.1%)** is available to support the new generation of higher accuracy insulation testers.

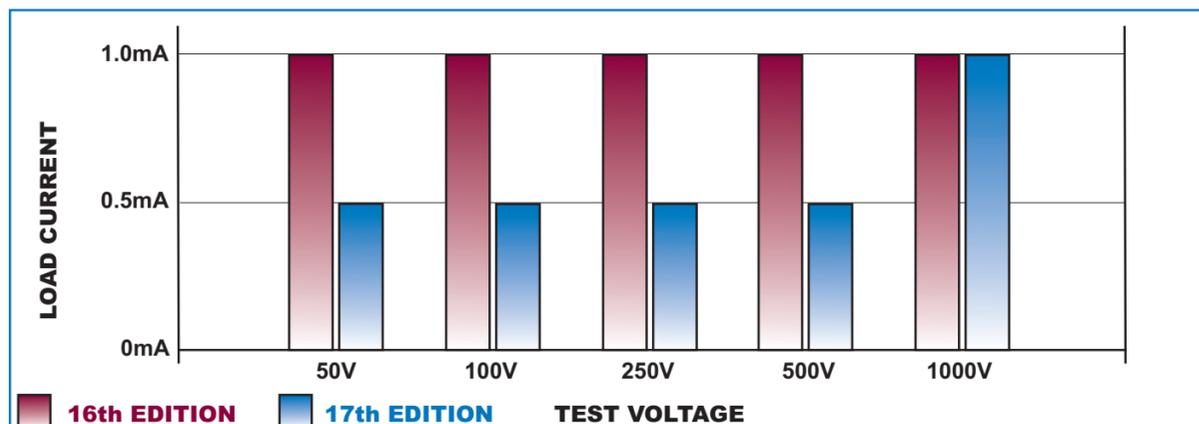
An extended 10GOhm option is available to support testers measuring higher resistance values. The high resistance adapter supports high voltage (to 15kV) testers with measurement capabilities up to 1TOhm.

### TEST VOLTAGE MEASUREMENT (16<sup>TH</sup>/17<sup>TH</sup> EDITION COMPLIANCE)

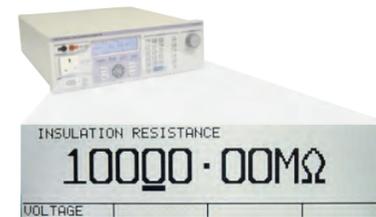


With the introduction of 17th Edition regulations, the minimum insulation resistance values have been changed from the 16th Edition requirements. The 3200 provides compliance to both sets of regulations, with 16th and 17th Edition modes available at the press of a button.

Insulation test voltage measurement is performed using the following 16th & 17th Edition settings :



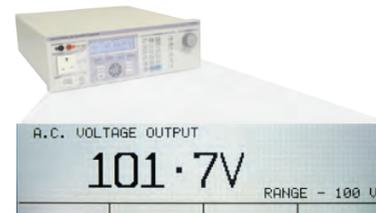
### 10 GOhm : INSULATION RESISTANCE OPTION



Extends the resistance range for the standard 2 GOhms to 10 GOhms to support the new generation of insulation testers with extended insulation ranges.

This internally fitted option is retro-fittable to allow upgrade to meet changing user workloads.

### AC VOLTAGE OUTPUT



5 AC voltage outputs @ 50V • 100V • 200V • 230V • 400V are available for checking the AC measurement function on testers. These outputs are monitored from the supply, with the measured value displayed on 3200 in real-time.

When used with ProCal software, the monitored value is automatically read back from the 3200 via the interface.

### HIGH RESISTANCE INSULATION ADAPTER

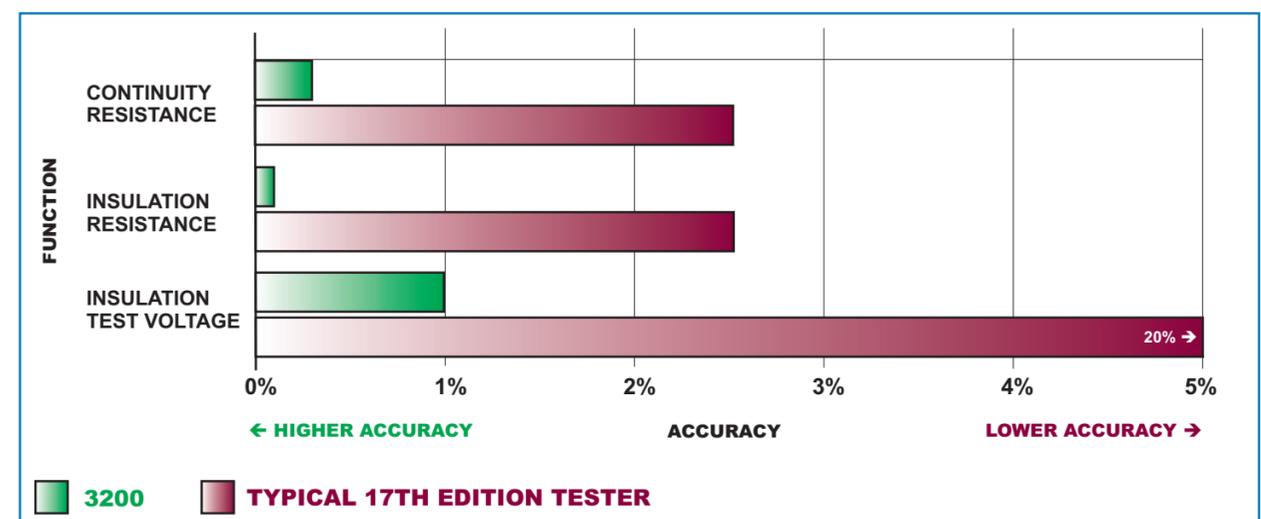


The high resistance insulation adapter for the 3200 provides a low cost solution for the resistance calibration of some makes of high voltage, above 1kV, insulation testers avoiding the problem of obtaining calibrated high value, high voltage resistors.

The adapter both increases the test voltage at which calibration can be performed, and also increases the Resistance range of the 3200 by a factor of 10. This allows the standard 3200 to be used for resistance calibration of testers up to 15kV at up to 200 GOhms. With the 10G option fitted to the 3200 values up to 1 TOhm can be simulated.

### SUPERIOR ACCURACY : COMPREHENSIVE TESTER SUPPORT

The 3200 has been designed from the outset as a high accuracy reference for testing of electrical test equipment. Its accuracy provides a superior stand-off ratio better than 4:1 - essential for complete and accurate testing.



## PORTABLE APPLIANCE TESTER CALIBRATION

COMPREHENSIVE TESTING WITH FLASH TESTING ADAPTER OPTION



### PORTABLE APPLIANCE TESTER CALIBRATION

A rapid testing solution for calibrating all PAT functions. Also ideal for earth/ground bond testers up to 30A test current.

The 3200 combines all the necessary functions to provide comprehensive portable appliance tester calibration.

Before the availability of a combined electrical test calibrator, techniques for calibrating PATs involved many separate items of test equipment including high current meters to 30A, high voltage measurement capabilities for flash test functions and high resistance boxes with potentially lethal voltages present.

The 3200 packages all these elements into a single box solution including high / low resistances, current measurement to 30A and flash test voltage and current measurement. These measurement functions use dedicated terminal connections on the front panel of the 3200, providing safe and convenient operation by the user.



### EARTH BOND RESISTANCE



The 3200 provides easy connection for earth bond resistance tests using a front panel mounted 'floating' earth stud. The 3200 is supplied with a calibrated PAT lead to connect to the PAT mains socket for the best accuracy.

The earth bond resistance function includes 10 precision resistance values from 0.05 Ohms to 1kOhm. Additional values are supported using the rear terminal option for connection of user's own custom resistors.



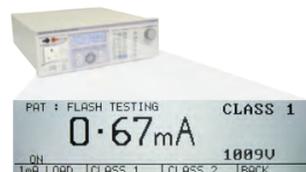
#### COMPREHENSIVE PAT SUPPORT

The 3200 supports older portable appliance testers which cannot be calibrated with the earth bond lead connected to earth - the bond resistors must be floating with respect to the earth supply current.

### EARTH BOND CURRENT MEASUREMENT

Fully featured with 3 ranges to match the most common test current, the 3200 includes 100mA, 10A and 30A ranges with 30% over range capability. The test current is measured over the 5 second period as required for earth bond testing and the value stored and displayed on the 3200. Earth bond current can be measured into 20 mOhms or 0.1 Ohm as required by the specifications of the PAT (UUT).

### LEAKAGE CURRENT



The 3200 provides 3 preset nominal leakage current ranges. This enables the 3200 to simulate substitute leakage and calibrate the PAT using 3 different current points.

Range
2mA
4.7mA
7.7mA

## PAT FLASH / HI-POT & BREAKDOWN TESTER CALIBRATION

PAT FLASH TEST ADAPTER · HIPOT-BREAKDOWN TESTER OPTION

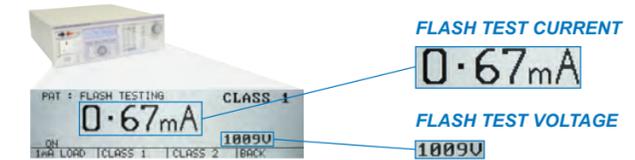


### FLASH VOLTAGE & CURRENT CALIBRATION



The flash test option provides a safe and easy method for measuring PAT flash voltage and current at Class 1 and Class 2 settings.

The design of the flash test adapter allows direct connection of the PAT flash probe, holding it down safely on the voltage input connector of the adapter.



### INSULATION RESISTANCE



The 3200 decade arm is connected from live / earth with any value set as required. Connection is made to the dedicated PAT IEC socket for this type of measurement.

### LOAD TESTING



Many PATs have a fuse check function. The 3200 can connect from Live to Neutral to either an open circuit, short circuit or a 0.13kVA load to test the fuse test function of a PAT.

## HIPOT / BREAKDOWN TESTER CALIBRATION (OPTION)



### 4 VOLTAGE / 6 CURRENT RANGES

- 4 Voltage ranges : AC/DC 3kV & 12kV
- 6 Current range : AC/DC 200uA, 2mA & 20mA
- 9 Load resistors for current measurements 50kOhms (20mA) to 20MOhms (20uA) @ 1kV

The Hipot / Breakdown tester adapter offers a unique solution to the safe, fast calibration of both voltage output and leakage current measurements on hipot & breakdown testers. Designed to sit flat on the worktop the high voltage probes, with a switch in the handle often used with breakdown testers, can be safely pressed down on the adapter terminals.

The breakdown adapter provides 3kV & 12kV voltage measurement ranges for both AC and DC. LED's indicate which terminal should be used.

To calibrate the output / leakage current display of the hipot / breakdown tester the adapter provides 9 high power resistors to provide current loads of up to 20mA @1000V - a function not available on other calibrators.



**EASY TO USE SOFTWARE FOR FAST & ACCURATE TESTING**

Transmille ProCal software provides easy control of the 3200, with pre-set test points for each model of tester. The software takes care of setting the 3200 to the correct function and output - the user simply follows on-screen prompts and confirms measurements or enters readings from the tester.



ProCal software provides an easy to use package, with simple function select using drop down boxes and is focused on providing a complete solution for the laboratory or service center, with an easylearning curve for new users ensuring rapid return on investment.

The use of software is the key to realising a cost-effective electrical test solution, whether it is for in-house / maintenance support or for commercial calibration services. Built-in procedure wizards for each type of tester allow procedures to be created in minutes, with a library of procedures is also available for popular testers.



**PROCAL : MULTI DISCIPLINE CALIBRATION SOFTWARE**

- > **UNIVERSAL CALIBRATION SOFTWARE**
- > **FAST PROCEDURE CREATION - PROCEDURE WIZARDS**
- > **CREATE & PRINT CERTIFICATES ON PLAIN PAPER**
- > **M3003 / GUM UNCERTAINTIES**
- > **SUPPORTS CRYSTAL REPORTS**
- > **CALIBRATION PRICING SUPPORT**



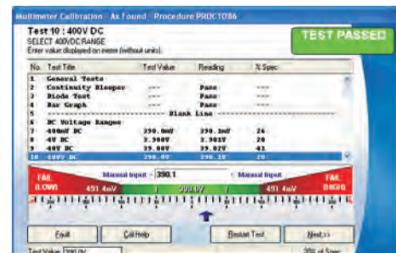
PROCAL



LABEL PRINTING



BARCODE SCANNING



GRAPHICAL CALIBRATION

PROCEDURE WIZARDS



PROCAL

**CONDENSED SPECIFICATIONS**

**3200 SERIES ELECTRICAL TEST EQUIPMENT CALIBRATOR**

**CONTINUITY TESTING**

**Continuity Resistance**  
 Continuity Variable Range : 0.2 to 20 (0.01 Resolution)  
 Continuity Fixed Outputs : 100 : 1k  
 Standard Accuracy : 1% ± 25m  
 High Accuracy (Option) : 0.25% ± 25m

**Continuity Current Measurement (Into 1 )**  
 Range : 0 to 320mA (0.1mA Resolution)  
 Accuracy : 1.3% ± 6 Counts

**INSULATION TESTING**

**Insulation Resistance**  
 Range : 10k to 2G (10G Option : 5%)  
 Accuracy : 10k to 5M 0.3% (0.1% Option)  
 5M to 2G 3% (1% Option)

**Resolution** : 10k  
**Max Volt/Power** : 1.1kV or 1 WATT (15kV Option)

**Insulation Test Voltage Measurement**  
 Ranges : 50V, 100V, 250V, 500V, 1kV (0.1V Resolution)  
 Current Measurement : 0.5mA, 1mA  
 Accuracy : 1% ± 8 Counts

**AC Voltage Output**  
 Range : 100V, 200V, 230V, 300V, 400V  
 Accuracy : 0.2% ± 1 Counts

**RCD TESTING**

**Time** Range : 20ms to 5s (10ms Resolution)  
 Accuracy : ± 0.7ms

**Current** Range : 3mA to 3A  
 Resolution : 0.01mA (to 200mA)  
 : 0.1mA (to 1A) • 1mA (to 3A)  
 Accuracy : < 190ms 5% ± 20 Counts  
 : up to 5s 1.2% ± 6 Counts  
 Timing Modes : Immediate & Zero Crossing  
 Current Modes : 1, 1/2 I, 2I, & 5I  
 Display Modes : 0° and 180° Phase

**Duration** Range : 10ms to 5s  
 Resolution : 0.1ms

**LOOP TESTING**

**Resistances**  
 0.05 , 0.1 , 0.22 , 0.33 , 0.5 , 1 , 5 , 10 , 100 , 1k  
 Resolution : 0.1m (to 10 ) ; 1m (to 1k )  
 Accuracy : 0.5% ± 4m

**Auto Loop (Option)**  
 Maximum Correction : 2  
 Resolution : 100µ  
 Accuracy : ±18m  
 Measurement Current : 4A

**AUTOMATICALLY CORRECTS FOR SUPPLY LOOP IMPEDANCE.**

**PAT TESTING**

**Earth Bond Resistance**  
 Values : See Loop Values  
 Accuracy : 0.5% ± 4m  
 Resolution : 0.1m (to 10 ) : 1m (to 1k )

**Earth Bond Current Measurements**  
 Ranges : 100mA, 10A, 30A  
 Resolution : 1mA, 10mA, 10mA  
 Accuracy : 1.5% ± 6 Counts

**PAT Insulation Resistance**  
 Range : 30k to 2G (10k Resolution)  
 Accuracy : See Insulation Resistance

**PAT Leakage**  
 Ranges : 2mA, 4.7mA, 7.7mA (1uA Resolution)  
 Accuracy : 1.5% ± 2 Counts

**PAT Leakage Test Voltage**  
 Range : 100V to 300V RMS (0.1V Resolution)  
 Accuracy : 1.5% ± 9 Counts

**Load Testing**  
 Ranges : S/C, O/C & 0.13kVA  
 Accuracy : 440 ± 5%

**PAT TESTING : FLASH (OPTION)**

**Flash Test Voltage**  
 Class 1 : 1kV to 1.8kV (1V Resolution)  
 Load Resistance : 600k (2.5mA @ 1.5kV)  
 Class 2 : 2kV to 3.6kV (1V Resolution)  
 Load Resistance : 1.2M (2.5mA @ 3kV)  
 Accuracy (Class 1&2) : 4% ± 10 Counts

**Flash Current Measurement**  
 Range : 1mA to 3mA  
 Resolution : 10uA  
 Accuracy : 5%

**BREAKDOWN TESTING (OPTION)**

**Voltage** Range : 3kV • 12kV  
 Resolution : 10V  
 Accuracy : 0.5% ± 3 Counts

**Current** Range : 200uA • 2mA • 20mA  
 Resolution : 100nA • 1uA • 10uA  
 Accuracy : 0.5% ± 4 Counts (200uA)

**LINE VOLTAGE MEASUREMENT**

Range : 200V to 260V  
 Resolution : 0.1V  
 Accuracy : 0.8% ± 6 Counts

**GENERAL SPECIFICATIONS**

Line Power : 230V/110V 50Hz /60Hz  
 Dimensions : 45 x 44 x 14cm • Weight : 10kgs  
 Warm-up Time : Double the time last used to 20 minutes max.  
 Interface : RS232 • USB (Via Adapter)