LABWAVE

4000 SERIES

ADVANCED MULTI PRODUCT CALIBRATOR

4000 SERIES ADVANCED MULTIPRODUCT CALIBRATOR

The 4000 Series is aimed at laboratories, manufacturers and design facilities requiring a wide range of outputs with accuracies up to 8ppm.

The 4000 Series builds on the trusted reliability of the 3000A series, offering an updated user interface accessed through a large 7” capacitive touch screen to enable advanced functionality, including a built-in procedure mode and inbuilt connection prompts to minimise errors.

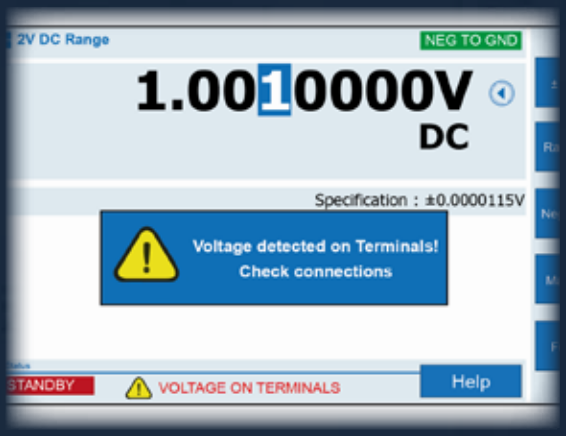
Procedures can be loaded into the 4000 Series via USB memory stick, with results stored for integration back into ProCal software.

The 4000 Series also provides USB printer connectivity as standard, supporting a wide range of PCL compatible printers.

KEY FEATURES

- Extended AC Voltage and Current Frequency range
- Variable resistance to 1 GOhm
- Variable capacitance to 100mF
- USB & GPIB (IEEE-488) Interfaces as standard
- Remote command emulation mode
- 7” Full Colour Touch Screen
- Embedded Calibration System

4000 SERIES HIGHLIGHTS



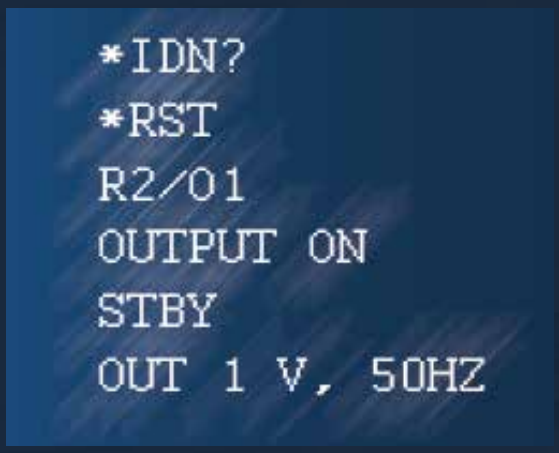
INNOVATIVE PROTECTION CIRCUITRY

The 4000 Series is protected by LabWave's I-GUARD protection circuitry protecting the calibrator against accidental damage through wrong connections up to ± 1000V RMS.

All LabWave calibrators have been protected by I-GUARD since 2006.

LOW THERMAL BINDING POSTS

Fitted with low thermal beryllium copper terminals, the 4000 Series enables connection with 4mm banana jacks, spades and bare wire without the need for additional adapters.



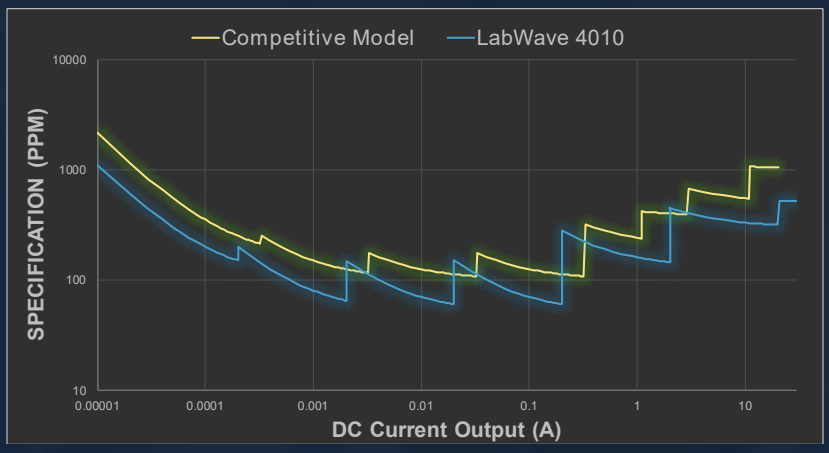
SOFTWARE COMPATIBILITY

The 4000 Series features an advanced command set including emulation modes for popular remote languages. This enables the 4000 Series to be used with Legacy metrology software that does not yet support LabWave equipment.

As with all LabWave products, compatibility with ProCal calibration software is guaranteed.

SUPERIOR ACCURACY

Using modern precision components LabWave offer superior accuracy and value. Compared to competitive models the 4000 Series offers higher performance and wider ranges for lower cost



LABWAVE

ACTIVE TERMINAL INDICATORS

All LabWave calibrators offer active terminal indication to assist with making connections, combined with dynamic prompts

7" HIGH RESOLUTION TOUCHSCREEN

Clear, easy to read menus enable fast access to key functions, display dynamic output specification and user assistance prompts.

CARRY HANDLES

Rugged handles protect output connections and assist movement around the laboratory

DEDICATED TYPE N CONNECTOR

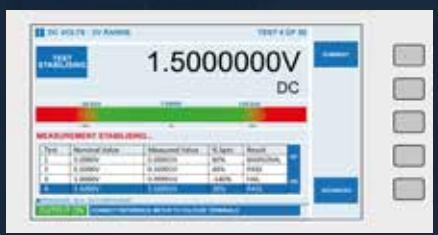
Low loss Type N connector used for high bandwidth output from 6GHz Oscilloscope option

CLEAR CONTROLS

Operation of the 4000 Series is simple, with enlarged keys for key functions, and output status marked with LEDs

EASY TO USE MENUS

Designed from the ground up to be easy to use through both touch and physical keys, menus and advanced functions of the 4000 Series feature intuitive controls. The 4000 Series interface is also fully translatable.



INPUT BY TOUCHSCREEN OR TACTILE SOFT-KEYS

Data entry and menu selection is available through both touch screen and physical keys allowing flexible interaction based on user preference

DEDICATED BUTTONS FOR KEY FUNCTIONS

Calculator style numerical entry with direct access to common units and multipliers accelerates manual entry of set points, saving time and minimising errors

USB & GPIB REMOTE INTERFACES AS STANDARD

LabWave's ProCal software provides auto configuration for the 4000 Series when connected over the convenient USB interface, and the GPIB (IEEE-488) interface enables fast connection to Legacy software and systems

FRONT MOUNTED USB PORT

For data offload, printing, updates and importing custom connection prompts

EXTEND WORKLOAD COVERAGE THROUGH ACCESSORIES

Using external accessories workload coverage can be extended while minimising upgrade fees

INTEGRATED CONNECTION PROMPTS

Using the touchscreen, dynamic connection prompts can be displayed for any output, showing a full colour connection diagram. For ease of use, the connection diagrams can easily be customised by users.

TEMPERATURE SIMULATION OPTION

OPTION PRT

The PRT Option simplifies calibration of high accuracy resistance thermometers.

Because the calibrator uses passive precision resistors, reliable readings are guaranteed regardless of the measurement technique used by the thermometer.

When the PRT option is calibrated, the exact temperature values on the ITS90 scale for PT-385 resistors is stored in memory. This value is recalled and displayed each time a specific resistor is selected, allowing accurate calibration to be performed.

When combined with the SIMRC option an additional 2 Wire variable output is available enabling simulation of any value.

ULTRA ACCURATE RESISTANCE VALUE

8 PASSIVE RESISTANCE VALUES

2, 3 OR 4 WIRE SIMULATION OF PRT PROBES

SIMULATED RESISTANCE & CAPACITANCE

OPTION SIMRC

Included in -SYS units, the simulated option provides for resistance calibration between cardinal points and gives a continuous resistance range from 0 Ohms to 1 GOhms, with variable capacitance from 0.95uF through to 100mF.

This option enables calibration of multimeters with non decade calibration points.

INDUCTANCE CALIBRATION OPTION

OPTION IND

By incorporating this option, the workload of the calibrator can be increased to allow calibration of LCR (Inductance, Capacitance and Resistance) meters/bridges and allow calibration of DMMs with inductance measurement ranges.

Incorporating 8 fixed values, including 19mH and 29mH for '3' range meters enables testing of these meters at points which can verify their linearity at near full scale points.

When the IND option is calibrated, the exact value of the inductor at 1kHz is stored in memory. This value is recalled and displayed each time a specific inductor is selected, allowing accurate calibration to be performed.

COMPATIBLE WITH AC & MAINS POWERED BRIDGES

8 PRECISION VALUES FROM 1mH TO 10H

IDEAL FOR CALIBRATION OF LCR METERS / BRIDGES

COST-EFFECTIVE OPTION

AUTOMATED CALIBRATION USING PROCAL SOFTWARE

HIGH STABILITY FREQUENCY OUTPUT

OPTION FRQ

For calibration of high accuracy frequency counters, a 1ppm high stability frequency output is available (Included in 4010)

This simplifies the equipment requirements for calibrating handheld frequency counters and removes the need for installation of 10MHz distribution throughout the laboratory or workshop.

LABWAVE

THERMOCOUPLE SIMULATION & MEASUREMENT ADAPTER

OPTION EA001A

For the ultimate in accuracy, LabWave has designed a dedicated source/measure external adapter. This keeps the electronics required to generate the low-level signals used for thermocouple simulation as close as possible to the measuring input of the thermometer, which also allows the signal to be as free from electrical noise as possible, while eliminating errors caused by heat generated by surrounding electronics.

The cold junction compensation (CJC) sensor is mounted in the thermocouple plug itself. By measuring the cold junction at the instrument's input, any type of thermocouple can be simulated without requiring the use of thermocouple compensation cables.

SUMMARY SPECIFICATIONS

TYPE	RANGE
J	-210°c to 1200°c
K	-200°c to 1370°c
T	-250°c to 400°c
R	0°c to 1760°c
S	0°c to 1760°c
B	-600°c to 1820°c
N	-200°c to 1300°c
E	-250°c to 1000°c
L	-200°c to 900°c
U	-200°c to 600°c
C	-0°c to 2316°c

SUPERIOR THERMOCOUPLE SIMULATION/MEASUREMENT

11 BUILT-IN TYPES (SEE SPECIFICATION TABLE)

THERMOCOUPLE MEASUREMENT USES NEUTRAL (COPPER) PLUG

CJC SENSOR BUILT INTO THERMOCOUPLE PLUG & SOCKET

OPTICAL TACHOMETER CALIBRATION ADAPTER

OPTION EA003

Using a high intensity LED light source, optical tachometers can be calibrated quickly and easily.

Simply enter the RPM value using the calibrator keypad or use with ProCal software for automated calibration.

With a range of 60 - 60,000 RPM the EA003 can be used to calibrate a wide range of optical tachometers.

60 - 60,000 RPM RANGE

2 / 10 / 50 TURN COIL ADAPTER (1500A)

OPTION EA002

Designed for the calibration of both wound AC and magnetic field hall effect AC/DC clamp meters, the LabWave EA002 current coil offers several unique features.

A robust construction allows for years of hard use without risk of damage to the coil element, and an included alignment table ensures repeatable results.

SPECIFICATIONS

Configuration	2 Turn (LHS)
	10 Turn (RHS)
	50 Turn (Centre)
Type	High Accuracy Balanced
Internal Dimensions	10mm (2/10 Turn)
	25mm (50 Turn)
Maximum Current	30A
Duty Cycle @ 20A	70% On / 30% Off
Maximum RMS Voltage	4V
Frequency Range	DC to 400Hz
Accessories	Detachable Platform

CALIBRATES CLAMP METERS UP TO 1500A

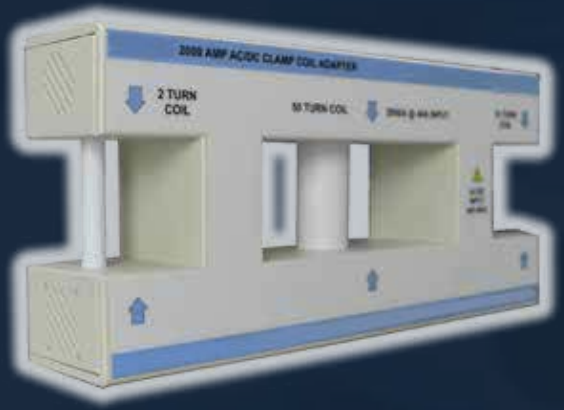
HIGH ACCURACY AC/DC BALANCED DESIGN

WIDE RANGE OF CLAMP SIZES COVERED

INCLUDES ALIGNMENT TABLE FOR REPEATABLE READINGS

2 / 10 / 50 TURN COIL ADAPTER (2000A)

OPTION EA019



Designed for the calibration of both wound AC and magnetic field hall effect AC/DC clamp meters, the LabWave current coil offers several unique features.

The EA019 option allows for a 40A input, allowing for calibration up to 2000A when using the 50 turn coil when used in conjunction with the EA3012A Transconductance Amplifier.

LABWAVE

MULTI-FUNCTION WORKSTATION

OPTION ERO15

The Multi-Function Workstation provides a central work area with all connections routed conveniently to remote terminals mounted at the front of the adapter.

Incorporating the advanced clamp coil, thermocouple simulation and tachometer calibration adapters, as well as process control source/measure capabilities, this workstation adapter provides a versatile platform for efficient calibration of a wide range of equipment.

CLAMP METERS

Using the built in 2, 10 and 50 turn coils, clamp meters can be accurately and quickly calibrated.

INSULATION TESTERS

Insulation to 2GOhms @ 1000V and continuity to 1kOhm is available from dedicated terminals.

PROCESS CONTROL

Integrates all required functions to both source and measure the required signals for process control calibration.

DIGITAL THERMOMETERS

Easily calibrate digital thermometers with the built in thermocouple simulation output with automatic cold junction compensation.

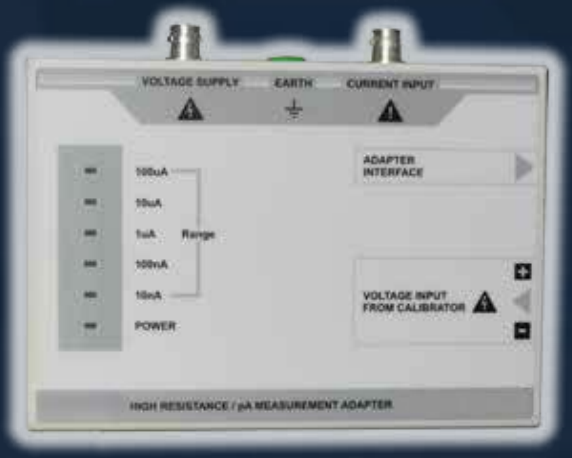
OPTICAL TACHOMETERS

Using a high density LED light source, optical tachometers can be calibrated quickly and easily.

LABWAVE

HIGH RESISTANCE/pA MEASUREMENT ADAPTER

OPTION EA008

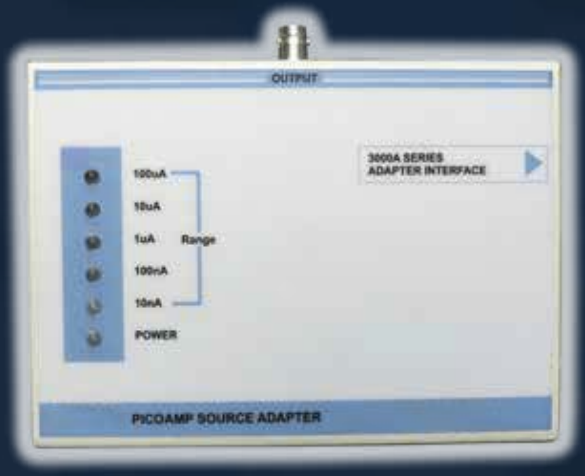


The high resistance/pA measurement adapter eliminates the need for a separate electrometer instrument. The low cost EA008 provides 5 current measurement ranges down to 10nA with a resolution of 1pA and incorporates a 'virtual ground' input, avoiding input impedance errors.

Using the high voltage output from the 4000 series calibrators together with the current measurement capability of the EA008 allows high accuracy resistance measurements to be at any voltage up to 1000V.

PICOAMP SOURCE ADAPTER

OPTION EA013



The high resistance/pA measurement adapter eliminates the need for a separate electrometer instrument. The low cost EA008 provides 5 current measurement ranges down to 10nA with a resolution of 1pA and incorporates a 'virtual ground' input, avoiding input impedance errors.

Using the high voltage output from the 4000 series calibrators together with the current measurement capability of the EA008 allows high accuracy resistance measurements to be at any voltage up to 1000V.

IDEAL FOR CALIBRATING ELECTROMETERS

SOURCE CURRENT ACCURATE DOWN TO PICO AMP LEVEL

LOW OPEN CIRCUIT COMPLIANCE VOLTAGE

SAFE TO USE ON SENSITIVE INPUT CIRCUITS

SUPPLIED WITH VFP SOFTWARE

LABWAVE

TEMPERATURE & HUMIDITY MONITORING ADAPTER

OPTION EA016

HUMIDITY MEASUREMENT 10% TO 90%

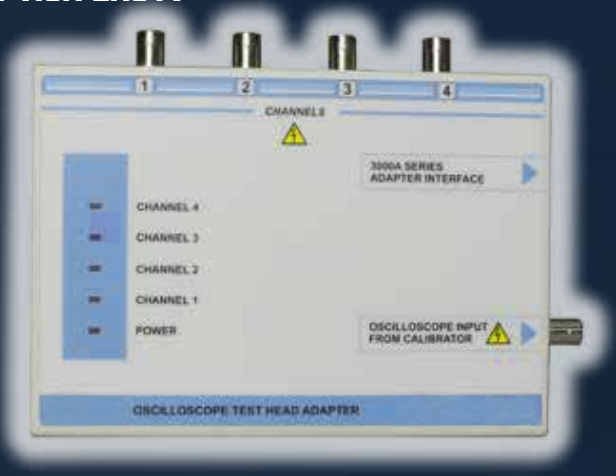
TEMPERATURE MEASUREMENT 0°C TO 50°C

The EA016 adapter provides the ability to measure the local temperature and humidity for recording on certificates and test reports.

Essential for on-site work to maintain accurate calibration records and avoids the requirement for humidity/ temperature probes.

4-CHANNEL OSCILLOSCOPE TEST HEAD ADAPTER

OPTION EA017



4 CHANNELS FOR AUTOMATING OSCILLOSCOPE CALIBRATION

CHOOSE BETWEEN DIRECT OR BUFFERED OUTPUTS

For automation of oscilloscope calibration, LabWave provide a 4-channel switching test head.

For accurate calibration of 50 Ohm input oscilloscopes, up to 1V/Division, a low impedance buffered amplitude output can be selected.

PRECISION ANALOGUE LEAD SET OPTION

OPTION 40XXLEAD

LOW THERMAL GOLD/COPPER VOLTAGE LEADS (0.7uV)

HIGH CURRENT 32A LEADS

ALL 4mm LEADS WITH SAFETY SHROUDS

Provided in a hard carry case for storage, the Precision Analogue Lead Set provides a comprehensive set of leads for making connections to typical test equipment.

TPMXX PRESSURE MODULES

TPM001 to TPM018

PRESSURE MEASUREMENT FROM 25mBAR TO 10,000 PSI

OPTIONAL HAND PUMP AVAILABLE

A modern calibration laboratory must calibration in multiple disciplines to remain

competitive. To assist, LabWave have a range of pressure modules to add pressure measurement capability to our products.

Select from a range of pressure modules that connect directly to our products and provide read-back directly on the screen.

OPTION	PRESSURE
PSI Gauge	**Accuracy 0.04%**
TPM001	1 PSI
TPM002	5 PSI
TPM003	10 PSI
TPM004	50 PSI
TPM005	100 PSI
TPM006	500 PSI
TPM007	1000 PSI
TPM008	5000 PSI
TPM009	10000 PSI
Bar Gauge	**Accuracy 0.04%**
TPM011	350 mBar
TPM012	1 Bar
TPM013	10 Bar
TPM014	35 Bar
TPM015	100 Bar
Bar Gauge (Vacuum)	**Accuracy 0.04%**
TPM016	-1 to +1 Bar
Bar Gauge (Displacement)	**Accuracy 0.04%**
TPM017	5 PSI

TORQUE CALIBRATION ADAPTER

OPTION EA014

By connecting the EA014 Torque Measurement adapter to a LabWave calibrator, torque calibration capabilities can be added to your laboratory in a cost-effective manner.

Housing an external torque transducer allows torque screwdrivers up to 10Nm to be calibrated, with a range of available torque transducers from 1Nm to 1500Nm.

LABWAVE

AC/DC TRANSCONDUCTANCE AMPLIFIER

OPTION EA3012A

The EA3012A is a powerful linear transconductance amplifier designed for use with LabWave calibrators to provide a cost-effective solution for the generation of high currents.

Use of linear technology throughout gives a very low noise output, completely free from switching spikes. Long-term accuracy is assured by using precision foil resistors and a custom internal shunt.

Higher currents are available by paralleling multiple EA3012A amplifiers to reach currents in excess of 300A.

LOW NOISE LINEAR MOSFET TECHNOLOGY

STACKABLE FOR HIGHER CURRENTS

CONTROL FROM FRONT PANEL OR THROUGH PROCAL SOFTWARE

IDEAL FOR HIGH POWER CURRENT SHUNTS & METERS

3A/63V CALIBRATION ADAPTER

OPTION EA3023

An essential option for simplifying calibration of power supplies. The PSU adapter can measure the output voltage and also provides a precision electronic current load allowing volts, current and even output resistance to be calibrated by one compact unit. 4 wire connection ensures accuracy and repeatability.

By measuring a power supply's on load/ off load voltages, the output resistance of the PSU can easily be measured. The operation is controlled using the virtual front panel software (supplied) or ProCal calibration software.

MEASURE PSU OUTPUT VOLTAGE TO 63V

DETERMINE OUTPUT RESISTANCE/VOLTAGE DROP

ACTIVE CURRENT LOAD TO 3 AMPS

CALIBRATE POWER SUPPLY CURRENT METER

AC/DC KILOVOLT AMPLIFIER

OPTION EA3024

The EA3024 kilovolt amplifier provides a simple and safe solution for the calibration of high voltage probes and dividers.

Using the advanced electronics inside the LabWave calibrators, the EA3024 provides a cost-effective solution for calibration of these common instruments.

The EA3024 is controlled via dedicated front panel software or via ProCal for safe calibration at high voltages.

DC OUTPUT 1 TO 10 KILOVOLTS

AC VOLTAGE 1 TO 5 KILOVOLTS

CONTROLLED BY PROCAL OR VIRTUAL FRONT PANEL

INDEPENDENT SOCKETS FOR DC OR AC OUTPUT

60A / 60V POWER SUPPLY CALIBRATION ADAPTER

OPTION EA3025A

The EA3025A provides an easy to use, low cost solution for the calibration of high current power supplies.

Overcoming many of the issues typically associated with measuring high current outputs, the EA3025A provides an all in one solution.

An accurate, stable electronic load simulates current loading on power supplies and provides measurement of voltage and output resistance, while minimising the equipment required for calibration of these common devices.

MEASURE OUTPUT VOLTAGE TO 60 VOLTS

MEASURES OUTPUT RESISTANCE

ACTIVE CURRENT LOAD TO 60 AMPS

APPLICATIONS INCLUDE BATTERY/UPS TESTING

OSCILLOSCOPE CALIBRATION

To expand the workload coverage of the 4000 Series calibrators a range of internal oscilloscope options are available.

Suitable for calibration of both digital and analogue oscilloscopes the oscilloscope options provide a flexible solution to calibrating a wide range of models.

AMPLITUDE TO 300V PEAK - PEAK

Providing both a 1kHz square wave and DC Level, the oscilloscope output covers from 2mV/Division through to 50V/Division in a 1,2,5 sequence. Each level can be deviated up to 10% from nominal. With the wide output range of 300V pk-pk the 4000 Series can calibrate the full range of any modern oscilloscope.

Fitted with a precision frequency source, oscilloscope options for the 4000 Series offer a frequency accuracy of 5ppm with outputs available as a comb waveform below 100ns and a sine wave above to assist triggering.

TIMEBASE FROM 2ns to 5s

BANDWIDTH TO 6 GHz

A levelled sinewave output provides a continuously variable sinewave to verify the bandwidth of an oscilloscope. Unique to the 6GHz oscilloscope option is the ability to vary this level from 2mV pk-pk to 2V to verify the bandwidth of multiple vertical gain channels.

A Fast Rise signal is available for evaluating overshoot, undershoot and ringing of oscilloscope attenuation and amplifier circuits.

< 1ns FAST RISE OUTPUT

OPTION	BANDWIDTH	BANDWIDTH LEVEL
SCP350	5 MHz - 350 MHz	600 mV
SCP600	5 MHz - 600 MHz	600 mV
SCP6GHz	250 kHz - 6.4 GHz	2 mV to 2 V

POWER CALIBRATION

Included in -SYS units as standard, the PWRSINE option for the 4000 Series enables calibration of power meters, offering DC power output and AC power with variable phase between Voltage and Current outputs. Dynamic phase control enables calibration of both capacitive and inductive loads without additional error.

DC POWER / AC POWER (TO 400HZ)

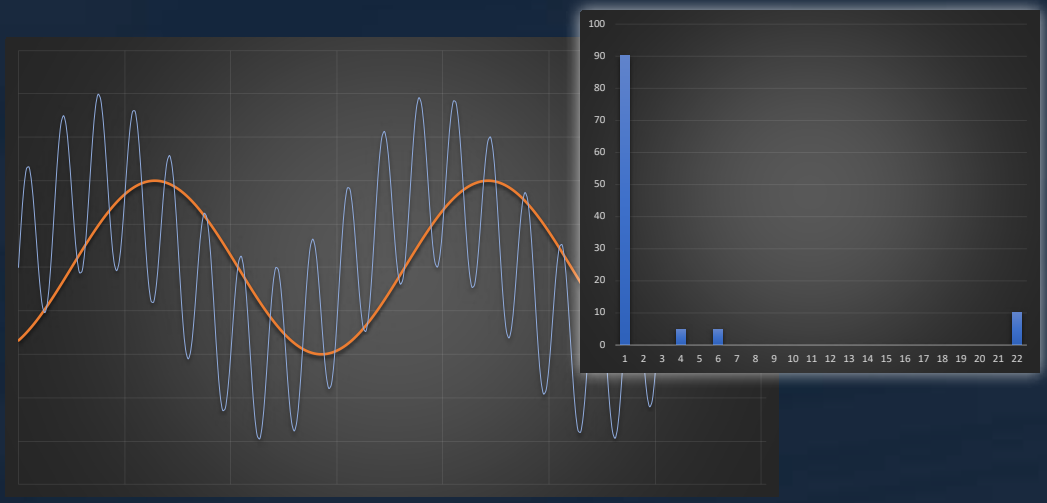
SIMULATE UP TO 1.5MW WITH EA002 CLAMP COIL ADAPTER

DYNAMIC PHASE COMPENSATION WITH 0.1° RESOLUTION

0° TO 359.9° / POWER FACTOR 1 TO -1

PWRDDS OPTION

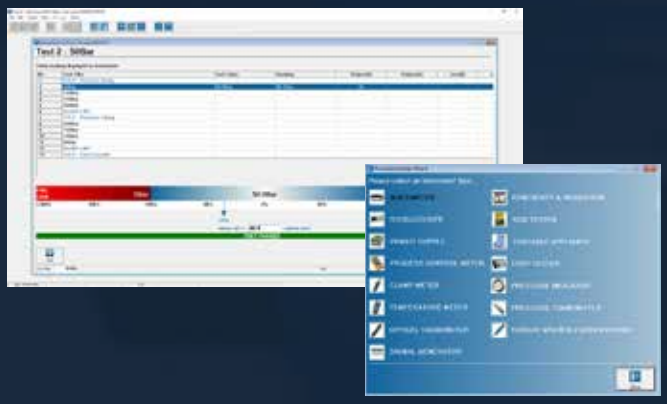
In addition to the standard Power option (PWRSINE), the PWRDDS option enables generation of distorted waveforms with both preset and user configurable waveforms, enabling simulation of harmonics, flicker and dropouts to calibration advanced power quality meters.



PROCAL CALIBRATION SOFTWARE

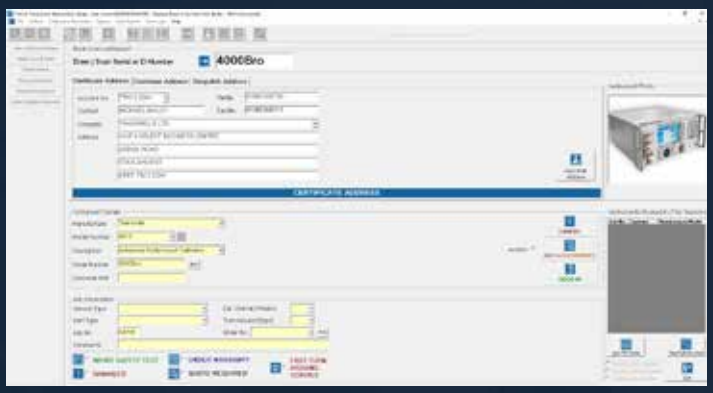
ProCal software suite provides a powerful and easy to use multi-discipline calibration software solution. The software allows for full control of the calibration laboratory, with a range of programs designed for system setup, instrument calibration, procedure management, certificate printing, instrument management, sales tracking and more.

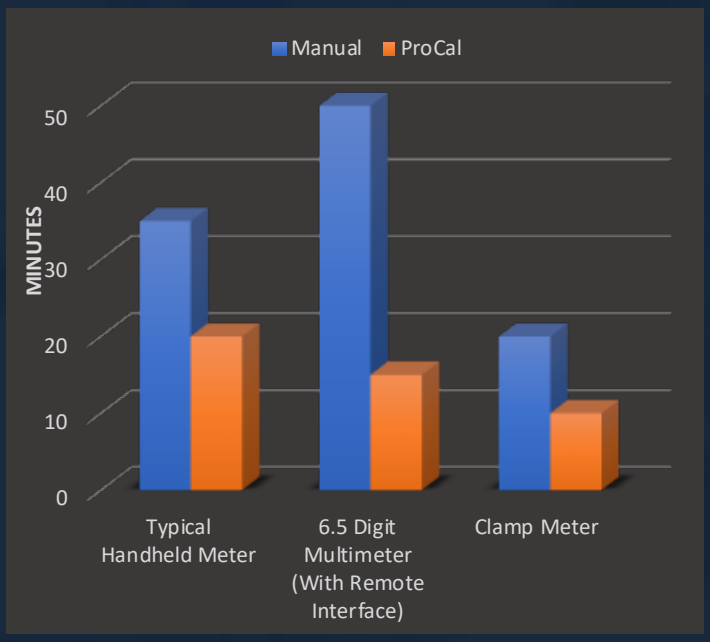
Ease of use is key for LabWave, and by using the Procal software suite you will be able to easily automate calibration with minimal training requirements.



ProCal simplifies the task of calibration by providing a graphical interface with clear indication of test status using a 'Traffic light' system, where Green indicates pass, Red indicates a fail and orange indicates a probable fail or probable pass condition.

Featuring powerful bar-code integration and instrument history management, ProCal Track provides all of the tools needed for the management of instruments from goods inwards through to despatch, and all points in-between.





ProCal and ProCal-Track provide a cost effective method of improving work-flow throughout your laboratory or organisation.

Turnaround time of calibrations can be decreased by over 50%, reducing the cost per calibration and improving customer satisfaction and competitiveness.

SUMMARY SPECIFICATIONS

LABWAVE

	4010	4015
DC VOLTAGE *Best 1 Year Total Accuracy*	**0 - ±1025V** *± 8 ppm*	**0 - ±1025V** *± 15 ppm*
DC CURRENT *Best 1 Year Total Accuracy*	**0 - 30A** *± 50 ppm*	**0 - 30A** *± 50 ppm*
AC VOLTAGE *Best 1 Year Total Accuracy*	**20mV - 1000V, 10Hz - 1MHz** *± 0.015 %*	**20mV - 1000V, 10Hz - 500kHz** *± 0.03 %*
AC CURRENT *Best 1 Year Total Accuracy*	**20uA - 30A, 10Hz - 30kHz** *± 0.04 %*	**20uA - 30A, 10Hz - 30kHz** *± 0.04 %*
RESISTANCE (Passive) *Best 1 Year Total Accuracy*	**0 Ohms - 1 GOhm** *± 8 ppm*	**0 Ohms - 1 GOhm** *± 40 ppm*
RESISTANCE (Variable) * *Best 1 Year Total Accuracy*	**0 Ohms - 1 GOhm** *± 100 ppm*	**0 Ohms - 1 GOhm** *± 100 ppm*
CAPACITANCE (PASSIVE) *Best 1 Year Total Accuracy*	**1nF - 10uF** *0.25 %*	**1nF - 10uF** *0.25 %*
CAPACITANCE (Variable) * *Best 1 Year Total Accuracy*	**0.95uF - 100mF** *0.7 %*	**0.95uF - 100mF** *0.7 %*
FREQUENCY *Best 1 Year Total Accuracy*	**1Hz - 10MHz** *1 ppm*	**1Hz - 10MHz** *20 ppm (1ppm option)*
POWER * *Best 1 Year Total Accuracy*	**DC / 10Hz - 400Hz** *0.06 % / 0.18%*	**DC / 10Hz - 400Hz** *0.08 % / 0.18%*
TEMPERATURE (THERMOCOUPLE) * *Best 1 Year Total Accuracy*	**11 Types** *±0.09°C*	
TEMPERATURE (PRT / RTD) * *Best 1 Year Total Accuracy*	**2 Wire Variable / 2,3,4 Wire Passive** *±0.08°C / ±0.02°C*	
INDUCTANCE * *Best 1 Year Total Accuracy*	**1 mH - 10 H** *0.5 %*	

Line Voltage	110V / 230V Selectable 100V Option Available
Line Frequency	50 to 60 Hz
Operating Temperature	0°C to +50°C 32°F to 122°C
Dimensions (LxWxH)	54.5 x 45 x 19 cm 21.4 x 17.7 x 7.5 inches
Weight	Calibrator : 20kgs Calibrator in Shipping Box : 25kgs Calibrator in Transit Case : 40kgs
Recommended Calibration Interval	12 Months
Warranty Period	1 Year

*** Denotes optional function - refer to available options for ordering details**


STANDBY