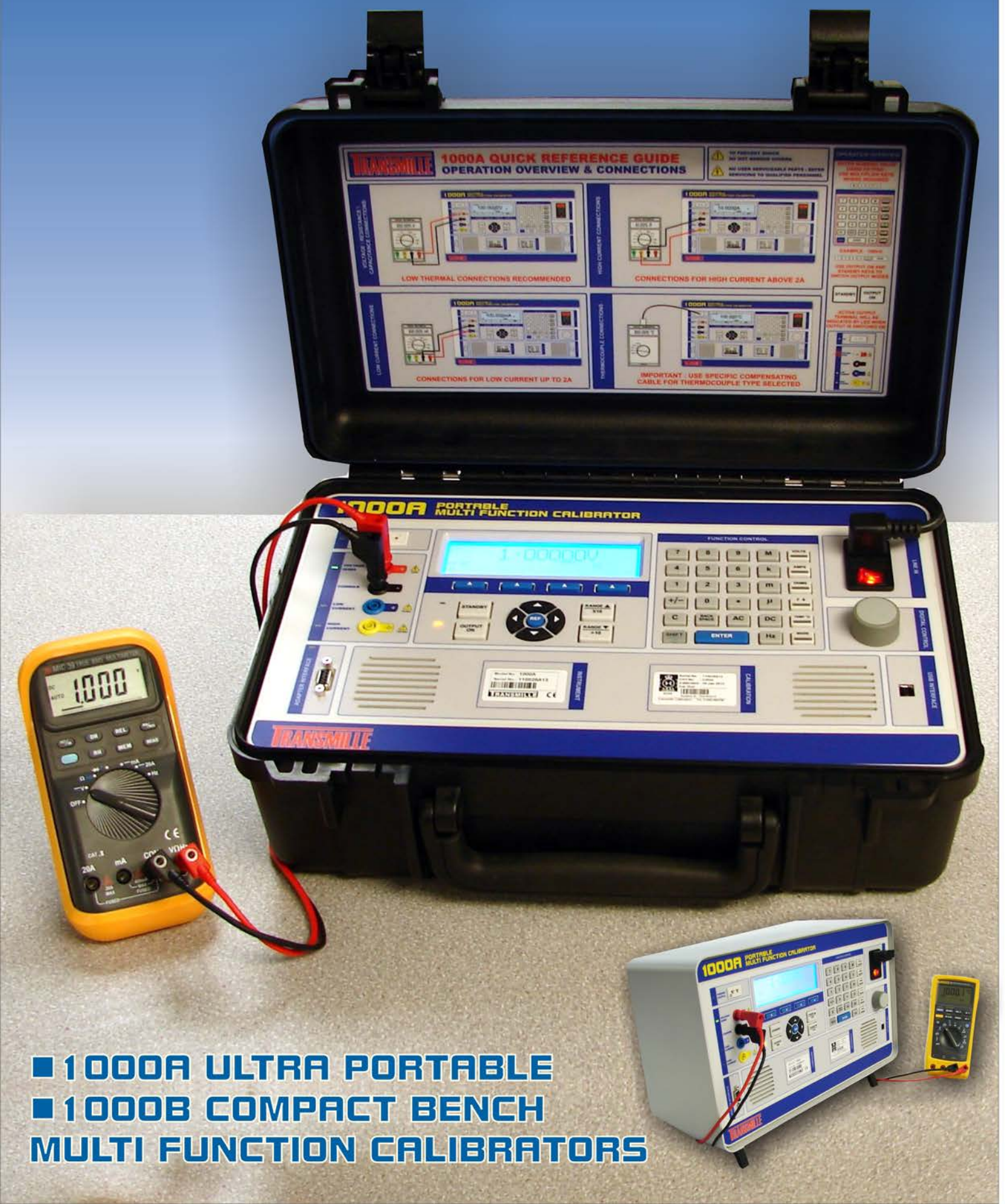
1000 SERIES

EXTENDED SPECIFICATIONS

TRANSMILLE
SOLUTIONS IN CALIBRATION



- 1000A ULTRA PORTABLE
- 1000B COMPACT BENCH

MULTI FUNCTION CALIBRATORS

Warm Up Time	Double the time since last used up to 20 minutes maximum	
Standard Interfaces	USB	
Temperature Performance	Storage : -5°C to +60°C Operation : 0°C to +50°C	
Relative Humidity	Operation : <80% to 30°C, <70% to 40°C, <40% to 50°C Storage : <95%, non-condensing	
Altitude	Operation : 3000m (10,000ft) Maximum Transit : 12000m (40,000ft) Maximum	
EMC & Safety	The calibrator line input plug must be earthed See D.O.C for full details	
Line Power	Line Voltage : 110V or 230V Line Frequency : 50Hz to 60Hz Line Voltage Variation : -6% +10%	
Power Consumption	28 Watts (Standby)	200 Watts (Maximum)
Low Analogue Isolation	100V	
Connections	Voltage / Resistance / Capacitance Common 'Low' Terminal Low Current (<=1A) High current (>1A) Adapter Interface USB Interface	1x Red 4mm Safety socket 1x Black 4mm Safety socket 1x Blue 4mm Safety socket 1x Yellow 4mm Safety socket 1x Female 'D' type socket 1x Female Type B socket
Display Information	Type Viewing Area Resolution Backlight Type Brightness	Backlit blue on white STN Type 133mm * 39mm 240 x 64 dots LED 230 to 260 cd/m^2
Indicators	Voltage / Current / High Current Adapter Interface	Red LED (between terminals) Green LED (above 'D' type connector)
Keyboard	Ergonomic Rubber Keyboard	
Fuses	Mains Inlet	3.15A A/S (240 Volt) 5A A/S (110 Volt operation)
Isolation	Outputs are opto-isolated from mains earth and the USB interface Maximum common mode voltage between earth and the low terminals 30 Volts ac/dc.	
Dimensions & Weights	1000A (Ruggedised Case) 1000B (Bench Model)	H=180 • W=447 • D=297 : Weight 9.2kg H=257 • W=432 • D=185 : Weight 9.5kg
Warranty Period	1 Year (Parts & Labour)	
Recommended Service Interval	1 Year	
Supplied Connections	1x USB Interface Lead 1x Adaptor Connection Lead (if at least one adaptor ordered)	1x Mains Lead
Optional Lead Set Kit	1x Voltage connection leadset 1x Low Current connection leadset 1x High current connection leadset 1x AC connection leadset 1 x Thermocouple Type K Lead	
Mounting Kit	Model 1000M	
Case Colour	1000A : Black • 1000B : Cream (RAL9002)	

1 Year Total Accuracy Specifications at TCal ±5°C & Range Parameters

Range	Resolution	Max. Burden Current	Typical Output Resistance[1]	Overload Protection	1 Year Total ppm set	+	uV
0 to 104mV	1uV	100mA	0.5ohms	20 V	80	+	10
0.104 to 1.04V	10uV	100mA	0.5ohms	150V	80	+	30
1.04V to 10.4V	100uV	100mA	0.5ohms	150V	80	+	300
10.4V to 104V	1mV	12mA[2]	1.5ohm	1200V	80	+	3000
104 to 1020V	10mV	12mA[2]	1.5ohm	1200V	80	+	30000

Notes

Note 1 : Allowance must be made for output resistance when driving into a load.

Note 2 : Internally adjustable from 2mA to 15mA - Factory set to 12mA as standard.

For safety the trip is controlled by a fail-safe circuit independant of the processor which shuts the high voltage output off in the event of an overload.

Note 3: Typical RMS noise figures at 50% of full scale, bandwidth 1Hz to 10Hz

2 Wire output / Remote sensing not available.

Specifications apply at TCal ± 5°C

Outside this range an allowance of 0.18 x 1 Year Spec. per °C should be added.

High Voltage Safety

High voltage output is ramped to allow instrument under test to auto range.

Standby is automatically activated when setting voltages greater than 10V or 100V from a lower voltage.

Standby is automatically selected for high voltage (>10V) after 20 minutes on the same setting.

High voltage (> 20V) output is indicated to user through an audible warning beep.

1 Year Total Accuracy Specifications at TCal ±5°C & Range Parameters

Range	Resolution	Max. Inductive Load	Compliance Voltage	Overload Protection	1 Year Total % set		uA
0 to 104uA	1nA	10mH	4.2 Volts	150V	0.0300	+	0.03
0.104 to 1.04mA	10nA	10mH	4.2 Volts	150V	0.0300	+	0.1
1.04 to 10.4mA	100nA	10mH	4.2 Volts	150V	0.0300	+	1
10.4 to 104mA	1uA	10mH	4.2 Volts	150V	0.0300	+	10
104 to 1040mA	10uA	10mH	4.2 Volts	150V	0.0300	+	150
1.04 to 10.2A	100uA	10mH	3.9 Volts	150V	0.0500	+	2000

Notes

Note 1 : Power & temperature sensor on 10A range - microprocessor monitors & protects from overheating.

Note 2 : Specifications apply to loads of less than 10% of the maximum burden voltage.

Note 3 : Zero or floor allowance.

Specifications apply at TCal ± 5°C

Outside this range an allowance of 0.18 x 1 Year Spec. per °C should be added.

Typical Over-temperature cutout times - 10A output 23°C ambient into a short circuit		
240V mains	From Cold	90 secs
240V mains	After 3 mins cool down	70 secs
220V mains	From Cold	160 secs
220V mains	After 3 mins cool down	90 secs

1 Year Total Accuracy Specifications at TCal ±5°C & Range Parameters

Range	Frequency	Resolution	Max. Burden Current	Typical Output Resistance	Overload Protection	1 Year Accuracy % set		mv
0 to 104mV	10Hz to 1.999kHz	1uV	100mA	0.5 Ohms	20 V	0.080	+	0.03
	2kHz to 20kHz	1uV	100mA	0.5 Ohms	20 V	0.150	+	0.07
0.104 to 1.04V	10Hz to 1.999kHz	10uV	100mA	0.5 Ohms	1200V	0.080	+	0.3
	2kHz to 20kHz	10uV	100mA	0.5 Ohms	1200V	0.150	+	0.7
1.04 to 10.4V	10Hz to 1.999kHz	100uV	100mA	0.5 Ohms	1200V	0.080	+	3
	2kHz to 20kHz	100uV	100mA	0.5 Ohms	1200V	0.150	+	7
10.4 to 104V	40Hz to 1kHz	1mV	12mA[1]	1.5 Ohms	1200V	0.080	+	30
104V to 1020V	40Hz to 1kHz	10mV	12mA[1]	1.5 Ohms	1200V	0.080	+	300

All specifications apply from 10% of full scale.
AC Frequency Accuracy = 30ppm of Setting

Notes

Note 1 : Internally adjustable from 2mA to 15mA - Factory set to 12mA as standard

Note 2 : For safety the trip is controlled by a fail-safe circuit independant of the processor which shuts the high voltage output off in the event of an overload.

Note 3 : Allowance must be made for output resistance when driving into a load.

Note 4 : 2 Wire output / Remote sensing not available.

Note 5 : THD less than .6%

Specifications apply at TCal ± 5°C. Outside this range an allowance of 0.18 x 1 Year Spec. per °C should be added.

High Voltage Safety

High voltage output is ramped to allow instruments under test to auto-range.

Standby is automatically activated when setting voltages greater than 10V or 100V from a lower voltage.

Standby is automatically selected for high voltage (>20V) after 20 minutes on the same setting for frequencies

High voltage (> 20V) output is indicated to user through an audible warning beep.

1 Year Total Accuracy Specifications at TCal ±5°C & Range Parameters

Range	Frequency	Resolution	Maximum Burden Voltage (Peak)	Overload Protection	1 year Accuracy %Set		uA
10.4 to 104uA	10Hz to 2kHz	1nA	4V	150V	0.100	+	0.4
0.104 to 1.0mA	10Hz to 2kHz	10nA	4V	150V	0.100	+	0.8
1.04 to 10.4mA	10Hz to 2kHz	100nA	4V	150V	0.100	+	8
10.4 to 104mA	10Hz to 2kHz	1uA	4V	150V	0.100	+	80
104 to 1040mA	10Hz to 2kHz	10uA	4V	150V	0.100	+	800
1.04 to 10.4A	10Hz to 2kHz	100uA	3.6V	150V	0.100	+	15000

Notes

All specifications apply from 10% of full scale.

Settling Time: For 50% change in output: Less than 3 second from standby to within specifications

Inductive Loads: Up to 1H may be connected without additional protection providing the frequency / inductance combination does not exceed the maximum burden voltage.

Temperature sensor on 10A range - microprocessor monitors & protects from overheating. Higher resistance loads allow a longer ON period.

Specifications apply to loads of less than 10% of the maximum burden voltage.

Specifications apply at TCal ± 5°C. Outside this range an allowance of 0.18 x 1 Year Spec. per °C should be added.

Driving Coils and Inductive Loads

When driving any load exceeding the maximum compliance voltage will cause the calibrator to trip into standby

The maximum compliance voltage on the 10Amp range mains supply dependant.

Slightly higher compliances are available when powered from a 240V supply.

When using EA002 with leads supplied it is possible to drive 10Amps/50Hz from a 230V supply.

Typical Over-temperature cutout times - 10A output 23°C ambient into a short circuit		
240V mains	From Cold	90 secs
240V mains	After 3 mins cool down	70 secs
220V mains	From Cold	160 secs
220V mains	After 3 mins cool down	90 secs

1 Year Total Accuracy Specifications at TCal ±5°C & Range Parameters

Range	Display Resolution	Meas. I (Max.)	1 year	
			% (Rng)	Zero
0R to 10R	1mΩ	320mA	0.02	50mΩ
10.1R to 100R	10mΩ	30mA	0.02	50mΩ
101R to 1kR	100mΩ	3mA	0.02	50mΩ
1.01kR to 10kR	1Ω	300uA	0.02	50mΩ
10.1kR to 100kR	10Ω	40uA	0.02	50mΩ
101kR to 1MR	100Ω	4uA	0.02	50mΩ
1.01MR to 10MR	1κΩ	0.4uA	0.05	50mΩ

Notes
Minimum terminal voltage = 80mV
Maximum input current = 320mA
Input measurement current must be a constant DC current, isolated from earth.
Current must be stable for a period of 1s. Use manual range on the UUT.
The 2-Wire value is measured at the terminals.
DC measurement technique used. Use passive resistance for AC component bridges.
Specifications apply at TCal ± 5°C.
Outside this range an allowance of 0.18 x 1 Year Spec. per °C should be added.

1 Year Total Accuracy Specifications at TCal ±5°C & Range Parameters

Range	Display Resolution	Meas. I (Max.)	1 year	
			% (Rng)	Zero
0R to 10R	1mΩ	320mA	0.2	25mΩ
10.1R to 50R	10mΩ	320mA	0.2	25mΩ
50.1R to 500R	100mΩ	30mA	0.2	25mΩ
501R to 5.01kR	1Ω	3mA	0.2	25mΩ

Notes

Minimum terminal voltage = 80mV
Maximum input current = 320mA
Input measurement current must be a constant DC current, isolated from earth.
Current must be stable for a period of 1s. Use manual range on the UUT.
The 2-Wire value is measured at the terminals.
DC measurement technique used. Use passive resistance for AC component bridges.
Specifications apply at TCal ± 5°C.
Outside this range an allowance of 0.18 x 1 Year Spec. per °C should be added.

For the highest possible accuracy and dependability of the measured value, regardless of the measurement technique used, the 1000 Series calibrators use passive standard resistors, the calibrated value of which is displayed when selected.

1 Year Total Accuracy Specifications at TCal ±5°C & Range Parameters

Range	Maximum Current	Maximum Voltage	Display Resolution	1 Year Total Accuracy		
				% set		Ohms
10Ω	0.3A	-	100uΩ	0.050	+	0.05
100Ω	0.1A	-	1mΩ	0.050	+	0.05
1kΩ	-	10V	10mΩ	0.020	+	0.05
10kΩ	-	50V	100mΩ	0.020	+	0.4
100kΩ	-	100V	1Ω	0.020	+	4
1MΩ*	-	100V	10Ω	0.050	+	40
10MΩ*	-	100V	100Ω	0.100	+	400
100MΩ*	-	100V	1kΩ	0.200	+	4000

2-Wire only

Notes

The 2 Wire value for each resistor is calibrated. The 2-Wire value is measured at the terminals.
Specifications apply at TCal ± 5°C.
Outside this range an allowance of 0.18 x 1 Year Spec. per °C should be added.

For the highest possible accuracy and dependability of the measured value, regardless of the measurement technique used, the 1000 Series calibrators use passive standard capacitors, the calibrated value of which is displayed when selected.

1 Year Total Accuracy Specifications at TCal ±5°C

Range	Maximum Voltage	Display Resolution	% Displayed Value	D
10nF	50V	0.1pF	0.8	0.006
100nF	50V	10pF	0.8	0.006
1uF	30V	100pF	0.8	0.002

Notes

Specifications apply at 1kHz. Allow 20pF for lead effects.
No appreciable variation is noticable at frequencies below 1kHz.
Capacitance is calibrated as value at the terminals, internal wiring is compensated for
Specifications apply at TCal ± 5°C.
Outside this range an allowance of 0.18 x 1 Year Spec. per °C should be added.

Measurement methods
C_p up to 1uF

1 Year Total Accuracy Specifications at TCal ±5°C & Range Parameters

Simulated PRT	Range	1 Year[1] Rel. (°C)	Calibrator Range
R0 = 100ohms	-200°C to 0°C	0.3°C	100R range
	0°C to 800°C	0.5°C	1k range

Notes
Minimum terminal voltage = 80mV
Maximum input current = 320mA
Input measurement current must be a constant DC current, isolated from earth.
Current must be stable for a period of 1s. Use manual range on the UUT.
The 2-Wire value is measured at the terminals.
DC measurement technique used. Use passive resistance for AC component bridges.
Specifications apply at TCal ± 5°C.
Outside this range an allowance of 0.18 x 1 Year Spec. per °C should be added.

1 Year Total Accuracy Specifications at TCal ±5°C

Thermocouple Type	Range	1 Year[1] Rel. (°C)	1 Year[1] Inc. CJC
J	-210°C to -100°C	0.46	1.16
	-100°C to 150°C	0.22	0.92
	150°C to 760°C	0.28	0.98
	760°C to 1200°C	0.38	1.08
K	-200°C to -100°C	0.54	1.24
	-100°C to 120°C	0.30	1.00
	120°C to -1370°C	0.52	1.22
T	-250°C to -150°C	1.20	1.90
	-150°C to 400°C	0.22	0.92
R	0°C to 250°C	1.60	2.30
	250°C to 1760°C	1.02	1.72
S	0°C to 250°C	1.60	2.30
	250°C to 1760°C	1.02	1.72
B	600°C to 1820°C	1.50	2.20
N	-200°C to -100°C	0.84	1.54
	-100°C to 410°C	0.40	1.10
	410°C to 1300°C	0.48	1.18
E	-250°C to -100°C	1.00	1.70
	-100°C to 650°C	0.24	0.94
	650°C to 1000°C	0.30	1.00
L	-200°C to 900°C	0.68	1.38
U	-200°C to 600°C	0.8	1.54
C	0°C to 1000°C	0.6	1.34
	1800°C to 2310°C	1.4	2.06

1 Year Total Accuracy Specifications at TCal ±5°C

Range	Resolution	Spec. ppm
1Hz to 100kHz	1Hz	20

2V RMS sinewave output
Specifications apply at TCal ± 5°C.
Outside this range an allowance of 0.18 x 1 Year Spec. per °C should be added.

1 Year Total Accuracy Specifications at TCal ±5°C

Voltage Ranges

Range	Resolution	Accuracy
100V	1V	1% ± 1 Digit
250V	1V	1% ± 1 Digit
500V	1V	1% ± 1 Digit
1kV	1V	1% ± 1 Digit

Resistance Ranges

Resistance Range	Nominal Voltage	Resolution	Accuracy ppm
250kOhms to 100MOhm	100V	10kOhms	0.8% ± 1 Digit
250kOhms to 250MOhm	250V	10kOhms	0.8% ± 1 Digit
500kOhms to 500MOhm	500V	10kOhms	0.8% ± 1 Digit
1MOhm to 1GOhm	1kV	10kOhms	0.8% ± 1 Digit

Specifications apply at TCal ± 5°C.
Outside this range an allowance of 0.18 x 1 Year Spec. per °C should be added.