TRANSMILLE
SOLUTIONS IN CALIBRATION

TRANSMILLE 4010 ADVANCED MULTIPRODUCT CALIBRATOR

EXTENDED SPECIFICATIONS

Warm Up Time	Double the time since last used up to 20 minutes maximum	
Standard Interfaces	USB, GPIB (IEEE-488)	
Optional Interfaces	RS232	
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 Selectable : 110V / 230V (100V Option Available) Line Frequency : 50Hz to 60Hz Line Voltage Variation : -6% +10%	
Power Consumption	28 Watts (Standby)	200 Watts (Maximum)
Low Analogue Isolation	100V	
Front Panel Connections	Voltage / 2 Wire Resistance	1x Black : 1x Red 4mm Binding Posts
	Low Current (<=2A)	1x Black : 1x Red 4mm Binding Posts
	High current (>2A)	1x Blue : 1x Yellow 4mm Binding Posts
	Earth Connection	1x Green 4mm Binding Posts
	Oscilloscope Functions	2x BNC terminal
	Adapter Interface	1x Female 'D' type socket
	USB Interface	1x Female 'B' type socket
	High Bandwidth Output	1 x Female Type 'N' socket
Display Information	Type	Touchscreen LCD
	Viewing Area	7"
	Resolution	800 * 480
	Backlight Type	LED
Indicators	Voltage / Current / High Current	Red LED (left of terminals)
	Negative to ground	Green LED (left of Earth terminal)
	Oscilloscope	Green LED (right of BNC Connector)
	RF Frequency Output	Green LED (right of Type N Connector)
	Standby Indicator	Red LED (left of Standby Key)
	Output Indicator	Green LED (left of Operate Key)
	Adapter Interface	Green LED (right of 'D' type connector)
Keyboard	Rubber key	
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	Calibrator Only	19cm x 43cm x 46cm : 15kgs
	Calibrator in Shipping Box	65cm x 56cm x 37cm : 18kgs
	Calibrator in Hard Transit case	65cm x 56cm x 26cm : 25kgs
Warranty Period	1 Years (Parts & Labour)	
Recommended Service Interval	1 Year	
Supplied Connections	1x USB Interface Connection	1x Mains Lead
	1x Adaptor Connection Lead (if at least one adaptor ordered)	
Optional Lead Set Kit	1x Voltage connection lead set 1x Low Current connection lead set 1x High current connection lead set 1x AC connection lead set	
Mounting Kit (optional)	4U rack mount kit	
Case Colour	Grey	

Interpreting Specifications

Transmille have taken great care over presenting the extended specifications in a manner that is easy to read while including high levels of details

Transmille specify specifications as both Absolute and Relative Specifciation, with varying calibration intervals, from 24 Hours to 2 Years

By 'Absolute Uncertainties', this means that all internal components of the calibrator have been compensated for. This includes stability, line voltage variations, temperature, humidity as well as the uncertainty of calibration as performed by Transmille Ltd.

This does NOT include external sources of uncertainty, such as the leads that are used to connect to the calibrator, and resolution of the UUT

Relative Accuracy' refers to the stablity of the instrment itself, without any external factors except temperature variation.

During re-calibration, the 'Absolute Uncertainties' should be used for verification of the instrument. If the calibration laboratory offers better uncertainties than those offered by Transmille, new uncertainties can be calculated by combining the relative specification and the new imported uncertainties.

All of Transmilles Absolute uncertainties are presented to 95% confidence, k=2.

This is for ease of use in a 17025 accredited laboratory, where other contributions will likely also be calculated for k=2, minimising the need for re-calibration of uncertainties.

1 year Total Accuracy Specifications at Tcal ±5°C

Range	Resolution	Max. Burden Current	Typical Output Resistance[1]	Overload Protection	1 Year Total ppm set + uV
0-202mV	0.01uV	1mA[2]	50 Ohms	20 V	15 + 2
0.2-2.02V	0.1uV	50mA	0.2 Ohms	150V	9 + 2.5
2-20.2V	1uV	50mA	0.2 Ohms	150V	8 + 24
20-202V	10uV	20mA[3]	0.5 Ohms	1200V	12 + 240
200-1025V	100uV	20mA[3]	0.7 Ohms	1200V	12 + 2400

Stability (Accuracy relative to calibration Standards)

Range	24 Hour Stability		Noise[4]	90 day Rel		180 Day Rel		1 year Rel		2 year Rel	
	ppm Set	uV	uV	ppm Set	uV	ppm Set	uV	ppm Set	uV	ppm Set	uV
0-202mV	2 +	1	0.3	9.6 +	2	10.8 +	2	12 +	2	16.8 +	2.8
0.2-2.02V	2 +	1.2	0.4	5.6 +	2.5	6.3 +	2.5	7 +	2.5	9.8 +	3.5
2-20.2V	2 +	9	3	4.8 +	24	5.4 +	24	6 +	24	8.4 +	33.6
20-202V	3.5 +	120	40	8 +	240	9 +	240	10 +	240	14 +	336
200-1020V	5 +	1100	363	8 +	2400	9 +	2400	10 +	2400	14 +	3360

Notes

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

Note 2 : Limited by 50 Ohm output impedance.

Note 3 : Internally adjustable from 2mA to 30mA - Factory set to 20mA 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 4 : Typical RMS noise figures at 50% of full scale, bandwidth 1Hz to 10Hz.

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 20V or 200V from a lower voltage

Standby is automatically selected for high voltage (>20V) after 20 minutes on the same setting. This function can be disabled

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

An external high voltage output/standby control switch is available as an option.

2 Wire output / Remote sensing not available.

Isolation : Floating or grounded selection available as standard.

Maximum floating voltage : 100V

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	Resolution	Max. Inductive Load	Compliance Voltage	Overload Protection	1 Year Total % set	uA
0-202uA	10pA	10mH	4.2 Volts	150V	0.01 +	0.01
0.2-2.02mA	100pA	10mH	4.2 Volts	150V	0.005 +	0.03
2-20.2mA	1nA	10mH	4.2 Volts	150V	0.005 +	0.2
20-202mA	10nA	10mH	4.2 Volts	150V	0.005 +	2
0.2-2.02A	100nA	10mH	4.2 Volts	150V	0.013 +	30
2-20.2A	1uA	10mH	3.9 Volts	150V	0.03 +	300
20.2-30A	10uA	10mH	3.9 Volts	150V	0.05 +	450

Stability (Accuracy relative to calibration Standards)

Range	Noise[1] 0.1-1Hz	90 Day Rel %Set	uA	180 Day Rel %Set	uA	1 Year Rel %Set	uA	2 Year Rel %Set	uA
0-202uA	180pA	0.006 +	0.01	0.007 +	0.01	0.008 +	0.01	0.011 +	0.014
0.2-2.02mA	500pA	0.0032 +	0.03	0.0036 +	0.03	0.004 +	0.03	0.006 +	0.042
2-20.2mA	4nA	0.0032 +	0.2	0.0036 +	0.2	0.004 +	0.2	0.006 +	0.28
20-202mA	40nA	0.0032 +	2	0.0036 +	2	0.004 +	2	0.006 +	2.8
0.2-2.02A	1uA	0.0056 +	30	0.006 +	30	0.007 +	30	0.01 +	42
2-20.2A[2]	20uA	0.016 +	300	0.018 +	300	0.02 +	300	0.028 +	420
20.2-30A[2]	20uA	0.024 +	450	0.027 +	450	0.03 +	450	0.042 +	630

Notes

Note 1 : Typical RMS noise figures at 50% of full scale.

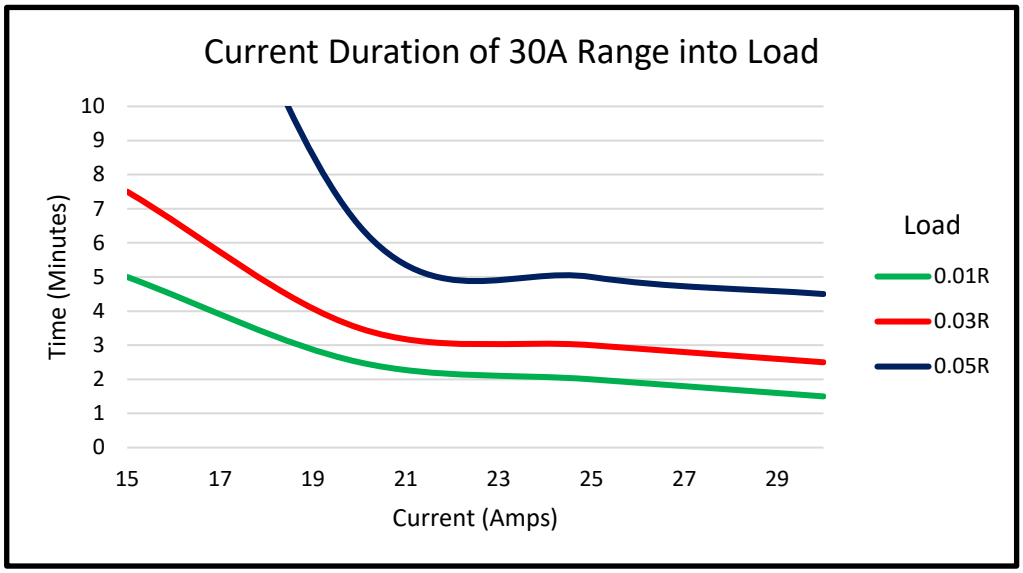
Note 2 : Power & temperature sensor on 30A range - microprocessor monitors & protects from overheating. Higher resistance loads allow a longer ON period. See graphs 1 and 2 for details.

Note 3 : Specifications apply to loads of less than 10% of the maximum burden voltage.

Note 4: 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.



Measurement Conditions : Ambient Temperature 20'C, Mains Voltage 230V, Mains Frequency 50Hz
Allow at least 7 minutes 'off' period between current output

Shorter periods will reduce the output time availiable.

A higher ohmic value load (for example, a 0.1R Shunt) allows greater output time as more heat is dissapated within the shunt / load. With lower loads more heat is dissapated within the instrument, reducing output time

Into a 0.1R Load outputs of up to 20A are available for periods of greater than 30 minutes continously, considerations of self heating of the external load/Uut should be considered due to the power being dissapate

1 year Total Accuracy Specifications at TCal ±5°C

Range	Frequency	Resolution	Max. Burden Current	Typical Output Resistance	Overload Protection	1 Year Accuracy % set	uV
0-202mV	10 to 45Hz	1uV	1mA [1]	50 Ohms	20 V	0.0800 +	15
	45Hz to 1kHz	1uV	1mA [1]	50 Ohms	20 V	0.0160 +	15
	1 to 20kHz	1uV	1mA [1]	50 Ohms	20 V	0.0200 +	28
	20 to 100kHz	1uV	1mA [1]	50 Ohms	20 V	0.1000 +	40
	100 to 500kHz	1uV	1mA [1]	50 Ohms	20 V	0.4000 +	100
0.2-2.02V [6]	10 to 45Hz	10uV	50mA	0.2 Ohms	1200V	0.0500 +	180
	45Hz to 1kHz	10uV	50mA	0.2 Ohms	1200V	0.0160 +	120
	1 to 20kHz	10uV	50mA	0.2 Ohms	1200V	0.0210 +	180
	20 to 100kHz	10uV	50mA	0.2 Ohms	1200V	0.0650 +	300
	100kHz to 1MHz	10uV	50mA	0.2 Ohms	1200V	0.3000 +	450
2-20.2V	10 to 45Hz	100uV	50mA	0.2 Ohms	1200V	0.0500 +	1600
	45Hz to 1kHz	100uV	50mA	0.2 Ohms	1200V	0.0160 +	1000
	1 to 20kHz	100uV	50mA	0.2 Ohms	1200V	0.0210 +	1600
	20 to 100kHz	100uV	50mA	0.2 Ohms	1200V	0.0600 +	3000
20 - 202V [8]	30Hz to 45Hz	1mV	20mA [2]	0.5 Ohms	1200V	0.0500 +	20mV
	45Hz to 1kHz	1mV	15mA [2]	0.5 Ohms	1200V	0.0150 +	12mV
	1 to 10kHz	1mV	15mA [2]	0.5 Ohms	1200V	0.0200 +	16mV
	10 to 40KHz	1mV	2mA [2]	0.5 Ohms	1200V	0.0300 +	30mV
	40 to 100kHz	1mV	2mA [2]	0.5 Ohms	1200V	0.2000 +	50mV
200-1020V [3,9]	30 to 45Hz	10mV	20mA [2]	0.7 Ohms	1200V	0.0550 +	200mV
	45Hz to 1kHz	10mV	15mA [2]	0.7 Ohms	1200V	0.0200 +	60mV
	1kHz to 10kHz	10mV	2mA [2]	0.7 Ohms	1200V	0.0250 +	120mV
	10kHz to 20kHz	10mV	2mA [2]	0.7 Ohms	1200V	0.0300 +	200mV

Stability (Accuracy relative to calibration Standards)

Range	Frequency	Frequency Resolution	90 day Rel %Set	90 day Rel uV	180 Day Rel %Set	180 Day Rel uV	1 year Rel %Set	1 year Rel uV	2 year Rel %Set	2 year Rel uV
0-202mV	10 to 45Hz	1Hz	0.0480 +	12	0.0540 +	13.5	0.0600 +	15	0.0840 +	21
	45Hz to 1kHz	1Hz	0.0080 +	12	0.0090 +	15	0.0100 +	15	0.0140 +	21
	1 to 20kHz	1Hz	0.0096 +	22.4	0.0108 +	28	0.0120 +	28	0.0168 +	39
	20 to 100kHz	1Hz	0.0720 +	32	0.0810 +	40	0.0900 +	40	0.1260 +	56
	100 to 500kHz	1Hz	0.2400 +	80	0.2700 +	100	0.3000 +	100	0.4200 +	140
0.2-2.02V [6]	10 to 45Hz	1Hz	0.0360 +	144	0.0405 +	180	0.0450 +	180	0.0630 +	252
	45Hz to 1kHz	1Hz	0.0112 +	96	0.0126 +	120	0.0140 +	120	0.0196 +	168
	1 to 20kHz	1Hz	0.0128 +	144	0.0144 +	180	0.0160 +	180	0.0224 +	252
	20 to 100kHz	1Hz	0.0464 +	240	0.0522 +	300	0.0580 +	300	0.0812 +	420
	100kHz to 1MHz	1Hz	0.2000 +	360	0.2250 +	450	0.2500 +	450	0.3500 +	630
2-20.2V	10 to 45Hz	1Hz	0.0344 +	1280	0.0387 +	1600	0.0430 +	1600	0.0602 +	2240
	45Hz to 1kHz	1Hz	0.0104 +	800	0.0117 +	1000	0.0130 +	1000	0.0182 +	1400
	1 to 20kHz	1Hz	0.0128 +	1280	0.0144 +	1600	0.0160 +	1600	0.0224 +	2240
	20 to 100kHz	1Hz	0.0416 +	2400	0.0468 +	3000	0.0520 +	3000	0.0728 +	4200
20 - 202V [8]	30Hz to 45Hz	1Hz	0.0344 +	20mV	0.0387 +	20mV	0.0430 +	20mV	0.0602 +	28mV
	45Hz to 1kHz	1Hz	0.0104 +	12mV	0.0117 +	12mV	0.0130 +	12mV	0.0182 +	16mV
	1 to 10kHz	1Hz	0.0128 +	16mV	0.0144 +	16mV	0.0160 +	16mV	0.0224 +	22mV
	10 to 40KHz	1Hz	0.0192 +	30mV	0.0216 +	30mV	0.0240 +	30mV	0.0336 +	56mV
	40 to 100kHz	1Hz	0.1600 +	50mV	0.1800 +	50mV	0.2000 +	50mV	0.2800 +	56mV
200-1020V [3,9]	30 to 45Hz	1Hz	0.0400 +	200mV	0.0450 +	200mV	0.0500 +	200mV	0.0700 +	280mV
	45Hz to 1kHz	1Hz	0.0120 +	60mV	0.0135 +	60mV	0.0150 +	60mV	0.0210 +	105mV
	1kHz to 10kHz	1Hz	0.0160 +	120mV	0.0180 +	120mV	0.0200 +	120mV	0.0280 +	180mV
	10kHz to 20kHz	1Hz	0.0200 +	200mV	0.0225 +	200mV	0.0250 +	200mV	0.0350 +	180mV

All specifications apply from 10% of full scale. [5]

AC Frequency Accuracy : 30ppm

Notes	
Note 1:	Current limited by 50 ohms output resistance.
Note 2 :	Internally adjustable from 2mA to 30mA - Factory set to 20mA 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 :	Frequency and voltage combinations are limited.
Note 4 :	Specifications apply up to 10% of maximum load current. Above this level, allowance must be made for output resistance.
Note 5 :	Zero or floor allowance.
Note 6 :	1V to 1 MHz, 2V to 500kHz
Note 7 :	THD less than 0.39% of output - 10Hz to 1MHz bandwidth at frequencies up to 50kHz
Note 8 :	Voltage above 40kHz limited to 100V
Note 9 :	Voltage above 10kHz limited to 330V

2 Wire output / Remote sensing not available.

Maximum floating voltage : 100V.

Isolation : Floating or grounded selection available as standard.

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 20V or 200V from a lower voltage.
Standby is automatically selected for high voltage (>20V) after 20 minutes on the same setting for frequencies up to 5kHz or 3 mins for frequencies above 5kHz. This function can be disabled by the user
High voltage (> 20V) output is indicated to user through an audible warning beep. This can be disabled by the user

An external high voltage output/standby control switch is available as an option.

1 Year Total Accuracy Specifications at TCal ±5°C

Range	Frequency	Resolution	Max. Burden Voltage (peak)	Overload Protection	1 year Accuracy %Set		uA
20-202uA	10Hz to 45Hz	1nA	3 Volts	150V	0.20	+	0.25
	45Hz to 1kHz				0.07	+	0.15
	1kHz to 10kHz				0.80	+	0.25
	10kHz to 30kHz				1.60	+	0.4
0.2-2.02mA	10Hz to 45Hz	10nA	3 Volts	150V	0.20	+	0.25
	45Hz to 1kHz				0.06	+	0.2
	1kHz to 10kHz				0.50	+	0.3
	10kHz to 30kHz				1.00	+	0.6
2-20.2mA	10Hz to 45Hz	100nA	3 Volts	150V	0.20	+	3
	45Hz to 1kHz				0.04	+	2
	1kHz to 10kHz				0.25	+	3
	10kHz to 30kHz				0.50	+	4
20-202mA	10Hz to 45Hz	1uA	3 Volts	150V	0.20	+	30
	45Hz to 1kHz				0.04	+	20
	1kHz to 10kHz				0.50	+	40
	10kHz to 30kHz				0.70	+	200
0.2-2.02A	10Hz to 45Hz	10uA	3 Volts	150V	0.20	+	300
	45Hz to 1kHz				0.06	+	200
	1kHz to 5kHz				0.50	+	400
	5kHz to 10kHz				0.60	+	1000
	10kHz to 30kHz				2.50	+	5000
2-30.0A[1,4]	30Hz to 45Hz	100uA	2.8 Volts	150V	0.20	+	3000
	45Hz to 100Hz				0.08	+	2000
	100Hz to 1kHz				0.30	+	4000
	1kHz to 5kHz				0.60	+	4000
	5kHz to 10kHz				3.00	+	5000

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

Settling Time: For 50% change in output: Less than 3 second from standby to within spec
Inductive Loads : Up to 1H may be connected without additional protection providing the frequency/inductance combination does not exceed the maximum burden voltage.

Stability (Accuracy relative to calibration Standards)

Range	Frequency	Frequency Resolution	90 Day Rel			180 Day Rel			1 Year Rel			2 Year Rel		
			%Set		uA	%Set		uA	%Set		uA	%Set		uA
20-202uA	10Hz to 45Hz	1Hz	0.128	+	0.25	0.144	+	0.25	0.160	+	0.25	0.224	+	0.35
	45Hz to 1kHz		0.040	+	0.15	0.045	+	0.15	0.050	+	0.15	0.070	+	0.21
	1kHz to 10kHz		0.640	+	0.2	0.720	+	0.2	0.800	+	0.2	1.120	+	0.28
	10kHz to 30kHz		1.200	+	0.4	1.350	+	0.4	1.500	+	0.4	2.100	+	0.56
0.2-2.02mA	10Hz to 45Hz	1Hz	0.120	+	0.25	0.135	+	0.25	0.150	+	0.25	0.210	+	0.35
	45Hz to 1kHz		0.032	+	0.2	0.036	+	0.2	0.040	+	0.2	0.056	+	0.28
	1kHz to 10kHz		0.320	+	0.3	0.360	+	0.3	0.400	+	0.3	0.560	+	0.42
	10kHz to 30kHz		0.640	+	0.6	0.720	+	0.6	0.800	+	0.6	1.120	+	0.84
2mA-20.2mA	10Hz to 45Hz	1Hz	0.120	+	3	0.135	+	3	0.150	+	3	0.210	+	4.2
	45Hz to 1kHz		0.028	+	2	0.032	+	2	0.035	+	2	0.049	+	2.8
	1kHz to 10kHz		0.160	+	3	0.180	+	3	0.200	+	3	0.280	+	4.2
	10kHz to 30kHz		0.320	+	4	0.360	+	4	0.400	+	4	0.560	+	5.6
20-202mA	10Hz to 45Hz	1Hz	0.120	+	30	0.135	+	30	0.150	+	30	0.210	+	42
	45Hz to 1kHz		0.028	+	20	0.032	+	20	0.035	+	20	0.049	+	28
	1kHz to 10kHz		0.320	+	40	0.360	+	40	0.400	+	40	0.560	+	56
	10kHz to 30kHz		0.400	+	40	0.450	+	40	0.500	+	40	0.700	+	56
0.2-2.02A [3]	10Hz to 45Hz	1Hz	0.120	+	300	0.135	+	300	0.150	+	300	0.210	+	420
	45Hz to 1kHz		0.032	+	200	0.036	+	200	0.040	+	200	0.056	+	280
	1kHz to 5kHz		0.320	+	400	0.360	+	400	0.400	+	400	0.560	+	560
	5kHz to 10kHz		1.120	+	1000	1.260	+	1000	1.400	+	1000	1.960	+	1400
	10kHz to 30kHz		1.920	+	5000	2.160	+	5000	2.400	+	5000	3.360	+	7000
2-30.0A [1,4]	30Hz to 45Hz	1Hz	0.120	+	3000	0.135	+	3000	0.150	+	3000	0.210	+	4200
	45Hz to 100Hz		0.032	+	2000	0.036	+	2000	0.040	+	2000	0.056	+	2800
	100Hz to 1kHz		0.320	+	4000	0.360	+	4000	0.400	+	4000	0.560	+	5600
	1kHz to 5kHz		0.400	+	4000	0.450	+	4000	0.500	+	4000	0.700	+	5600
	5kHz to 10kHz		2.240	+	5000	2.520	+	5000	2.800	+	5000	3.920	+	7000

Notes

Note 1 : Temperature sensor on 30A range - microprocessor monitors & protects from overheating.
Higher resistance loads allow a longer ON period. See graph 5 for details.
Note 2 : Specifications apply to loads of less than 10% of the maximum burden voltage.
Note 3 : Limited to 1A above 5kHz
Note 4 : Limited to 10A above 5kHz

Driving Coils and Inductive Loads

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

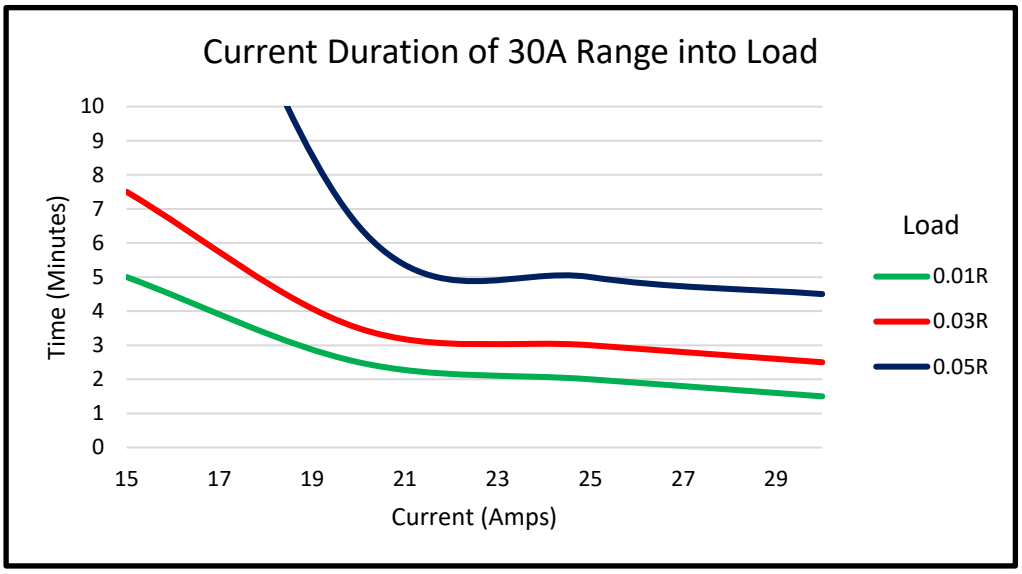
The maximum compliance voltage on the 30Amp range is specified at a max 2.8V RMS, 7.8V Peak to Peak at 220V supply

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

When using EA002 with leads supplied it is possible to drive 30Amps/50Hz from a 230V supply, falling to 10Amps at 400Hz

Specifications apply at TCal ± 5°C

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



Measurement Conditions : Ambient Temperature 20'C, Mains Voltage 230V, Mains Frequency 50Hz
Allow at least 7 minutes 'off' period between current output

Shorter periods will reduce the output time availiable.

A higher ohmic value load (for example, a 0.1R Shunt) allows greater output time as more heat is dissapated within the shunt / load. With lower loads more heat is dissapated within the instrument, reducing output time

Into a 0.1R Load outputs of up to 20A are available for periods of greater than 30 minutes continously, considerations of self heating of the external load/Uut should be considered due to the power being dissapated

Total Accuracy

Range	Resolution	90 day ppm	180 Day ppm	1 year ppm	2 year ppm
1Hz - 1MHz*	1Hz	0.8	0.9	1	1.4
10MHz	1Hz	0.8	0.9	1	1.4

* Frequency continuously variable.

Specifications apply at TCal ± 5°C

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

PWM (%) - Frequency Range 5Hz to 50kHz	Duty Cycle Accuracy
5% to 95%	Better than 0.001%

PWM (Level)	Level Accuracy
2V to 10V	Better than 0.05V

PWM (DC Offset)	Level Accuracy
+0V to +5V	Better than 0.1V

PWM Output provides a square wave output with variable level, duty cycle and DC offset

For the highest possible accuracy and dependability of the measured value, regardless of the measurement technique used, the 4000 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
0Ω	0.5A	-	1uΩ			0.005
0.1Ω	0.5A	-	1uΩ	0.0025	+	0.005
1Ω	0.4A	-	1uΩ	0.0025	+	0.005
10Ω	0.3A	-	1uΩ	0.0025	+	0.005
100Ω	0.1A	-	10uΩ	0.0018	+	0.005
1kΩ	-	10V	100uΩ	0.0018	+	0.005
10kΩ	-	50V	1mΩ	0.0008	+	0.05
100kΩ	-	100V	10mΩ	0.0018	+	0.5
1MΩ*	-	100V	100mΩ	0.0025	+	5
10MΩ*	-	100V	1Ω	0.009	+	100
100MΩ*	-	100V	1kΩ	0.18	+	2000
1000MΩ*		100V	10kΩ	1	+	30000

*** 2-Wire only**

Stability (Accuracy relative to calibration Standards)

Range	90 Day Rel			180 Day Rel			1 Year Rel			2 Year Rel		
	%		Ohms	%		Ohms	%		Ohms	%		Ohms
0Ω	-		0.005	-		0.005	-		0.005	-		0.005
0.1Ω	0	+	0.005	0	+	0.005	0	+	0.005	0	+	0.005
1Ω	0	+	0.005	0	+	0.005	0	+	0.005	0	+	0.005
10Ω	0	+	0.005	0	+	0.005	0	+	0.005	0	+	0.005
100Ω	0.0012	+	0.005	0.00135	+	0.005	0.0015	+	0.005	0.0021	+	0.005
1kΩ	0.00128	+	0.005	0.00144	+	0.005	0.0016	+	0.005	0.0022	+	0.005
10kΩ	0.00048	+	0.05	0.00054	+	0.05	0.0006	+	0.05	0.0008	+	0.05
100kΩ	0.00096	+	0.5	0.00108	+	0.5	0.0012	+	0.5	0.0017	+	0.5
1MΩ	0.00144	+	5	0.00162	+	5	0.0018	+	5	0.0025	+	5
10MΩ	0.0064	+	100	0.0072	+	100	0.008	+	100	0.0112	+	100
100MΩ	0.136	+	2000	0.153	+	2000	0.17	+	2000	0.238	+	2000
1000MΩ	0.72	+	30000	0.81	+	30000	0.9	+	30000	1.26	+	30000

For 2-Wire connection allow 35mW on all resistance specifications.

The 2 and 4 Wire value for each resistor is calibrated. The 2-Wire value is measured at the terminals

The 4-Wire values are taken using the zero position to NULL the measuring system.

Specifications apply at TCal ± 5°C.

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

Total Accuracy

Range	Display Resolution	Measurement Current (Max.)	1 year	
			% of Range	Zero
0Ω to 100Ω	10mΩ	20mA	0.01	50mΩ
100Ω to 330Ω	10mΩ	20mA	0.01	50mΩ
330Ω to 1kΩ	100mΩ	2mA	0.01	50mΩ
1kΩ to 3.3kΩ	100mΩ	2mA	0.01	50mΩ
3.3kΩ to 10kΩ	1Ω	300uA	0.01	50mΩ
10kΩ to 33kΩ	1Ω	300uA	0.01	50mΩ
33kΩ to 100kΩ	10Ω	40uA	0.01	50mΩ
100kΩ to 330kΩ	10Ω	40uA	0.01	50mΩ
330kΩ to 1MΩ	100Ω	4uA	0.01	50mΩ
1MΩ to 3.3MΩ	100Ω	4uA	0.01	50mΩ
3.3MΩ to 10MΩ	1kΩ	0.4uA	0.01	50Ω
10MΩ to 33MΩ	1kΩ	0.4uA	0.01	2.5kΩ
33MΩ to 100MΩ	10kΩ	0.2uA	0.05	100kΩ
110MΩ to 330MΩ	10kΩ	0.2uA	1	100kΩ
330MΩ to 1GΩ	100kΩ	10nA	2	500kΩ

Note : Specifications apply for 12 hours from 'Zero' operation

Minimum terminal voltage = 80mV

Maximum current input = 20mA

Input measurement current must be a constant DC current isolated from earth

Performance/compatibility may be affected using other measurement methods/techniques for the simulated resistance function eg. AC or pulsed, in which case passive resistance functionality may be employed.

Current must be stable for a period of 1s - it is therefore recommended the UUT range is selected manually

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 4000 Series calibrators use passive standard capacitors, the calibrated value of which is displayed when selected.

General Specifications

Range	Maximum Voltage	Display Resolution	D	R_s
1nF	50V	0.1pF	0.006	N/A
2nF	50V	0.1pF	0.006	N/A
5nF	50V	0.1pF	0.006	N/A
10nF	50V	0.1pF	0.006	N/A
100nF	50V	10pF	0.006	N/A
1uF	30V	100pF	0.002	N/A
10uF	20V	1nF	0.014	0.2mΩ

Specifications apply at 1kHz. Allow 20pF for lead effects.
No appreciable variation is noticable at frequencies below 1kHz.

Total Accuracy

Range	90 day %	180 Day %	1 year %	2 year %
1nF	0.2	0.225	0.25	0.35
2nF	0.2	0.225	0.25	0.35
5nF	0.2	0.225	0.25	0.35
10nF	0.2	0.225	0.25	0.35
100nF	0.2	0.225	0.25	0.35
1uF	0.32	0.36	0.4	0.56
10uF	0.48	0.54	0.6	0.84

Measurement methods
C_p up to 1uF
C_s above 1uF

Capacitance is calibrated as value at the terminals
ie. displayed value incorporates capacitance of circuit up to and including 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.

General Specifications

Range	Maximum Voltage	Display Resolution
0.95uF to 9.5uF	8V	1nF
9.5uF to 95uF	8V	10nF
95uF to 0.95mF	8V	100nF
0.95mF to 9.5mF	8V	1uF
9.5mF to 100mF	8V	1uF

Total Accuracy

Range	90 day %	180 Day %	1 year %	2 year %
0.95uF to 9.5uF	0.56	0.63	0.7	0.98
9.5uF to 95uF	0.56	0.63	0.7	0.98
95uF to 0.95mF	0.56	0.63	0.7	0.98
0.95mF to 9.5mF	0.56	0.63	0.7	0.98
9.5mF to 100mF	0.56	0.63	0.7	0.98

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

Minimum terminal voltage = 80mV
Maximum terminal voltage = 8V
Maximum current input = 20mA
Performance/compatibility may be affected using other measurement methods/techniques for the simulated capacitance function in which case passive capacitance functionality may be employed.
A constant charging current is required for specifications to apply. AC measurement techniques will fall outside of the specification

General Specifications

Range	Maximum Current	DC Resistance	Q	Display Resolution
1mH	30mA	7.8Ω	1	100nH
10mH	25mA	24Ω	2.8	1uH
19mH	20mA	33Ω	3.8	1uH
29mH	20mA	41Ω	4.7	1uH
50mH	20mA	54Ω	6.1	1uH
100mH	20mA	78Ω	8.6	10uH
1H	10mA	260Ω	29	100uH
10H	1mA	950Ω	110	1mH

All Inductance specifications ± 50uH.
Specifications apply at 1kHz

Accuracy Relative to Calibration Standards Specifications

Range	90 day Rel %	180 Day Rel %	1 year Rel %	2 year Rel %
1mH	0.4	0.45	0.5	0.7
10mH	0.4	0.45	0.5	0.7
19mH	0.4	0.45	0.5	0.7
29mH	0.4	0.45	0.5	0.7
50mH	0.4	0.45	0.5	0.7
100mH	0.4	0.45	0.5	0.7
1H	0.4	0.45	0.5	0.7
10H	0.4	0.45	0.5	0.7

Measurement methods
L_s up to 1H
L_p from 1H to 10H

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

General Specifications	
Voltage Range	1V to 1000V DC
Current Range	0.5mA to 30A DC
Output Terminals	Voltage output from top (Black & White) terminals 0.5mA to 2A current output from middle 2A (Black & Red) terminals 2.01A to 30A current output from bottom 30A (Blue & Yellow) terminals Note : Indicator LEDs for both sets of terminals will illuminate to indicate DC Power mode

1 Year Accuracy Relative to Calibration standards

Current Range	Resolution	Setting	Zero
0.5mA to 300mA	10uA	0.100%	40uA
0.3A to 2A	0.1mA	0.015%	400uA
2.01A to 30A	1mA	0.04%	4mA

1 Year Accuracy Relative to Calibration standards

Voltage Range	Resolution	Setting	Zero
20V	1uV	0.0025%	40uV
200V	10uV	0.0030%	400uV
1000V	100uV	0.0030%	4000uV

High Voltage Safety

High voltage output is ramped to allow instruments to auto range

Standby is automatically activated when setting voltages greater than 20V or 200V from a lower voltage

Standby is automatically selected for high voltage (>20V) after 20 minutes on the same setting.This function can be disabled

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

An external high voltage output/standby control switch is available as an option

30A available as standard - external amplifier **not** required

Specifications apply at TCal ± 5°C.

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

General Specifications	
Voltage Range	1V to 1000V AC
Current Range	0.5mA to 30A AC
Frequency Range	10Hz to 400Hz
Output Terminals	Voltage output from top (Black & White) terminals 200mA to 2A current output from middle 2A (Black & Red) terminals 2.01A to 30A current output from bottom 30A (Blue & Yellow) terminals Note : Indicator LEDs for both sets of terminals will illuminate to indicate AC Power mode

1 Year Accuracy Relative to Calibration standards

Current Range	Resolution	Setting	Zero
0.5mA to 0.2A	10uA	0.2%	40uA
0.2A to 2A	0.1mA	0.1%	400uA
2.01A to 30A	1mA	0.05%	4mA

1 Year Accuracy Relative to Calibration standards

Voltage Range	Resolution	Setting	Zero
20V	1uV	0.035%	900uV
200V	10uV	0.04%	7.5mV
1000V	100uV	0.04%	75mV

Frequency Specifications

Frequency	
Range	40 to 400Hz (1V to 699V) : 46 to 400Hz (700V to 1000V)

Phase Specifications

Phase Angle	Resolution	Accuracy
0° to 359.9°	0.1°	0.1° + 6us*

*6us represents 0.109° at 50Hz or 0.87° at 400Hz

Note : Phase accuracy specification applies for levels above 10V/.5A into loads of 100mOhms and greater

4010 calibrators **automatically correct for any errors in the phase** caused by inductive loading, for example when using the clamp coil adaptor.

Note that when in Power output mode the Voltage and Current negative terminals are internally tied together, and as default negative to ground is selected. Phase speciications apply only when the UUT current and voltage measurement channels are isolated from eachother. Ground loops caused by externally earthing or tieing low's together will cause phase errors

High Voltage Safety

High voltage output is ramped to allow instruments to auto range

Standby is automatically activated when setting voltages greater than 20V or 200V from a lower voltage

Standby is automatically selected for high voltage (>20V) after 20 minutes on the same setting. This function can be disabled

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

An external high voltage output/standby control switch is available as an option

30A available as standard - external amplifier **not** required

Specifications apply at TCal ± 5°C.

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

DDS Harmonic Specifications (in addition to AC Power Specifications) (apply only if Power DDS Option fitted)

DDS Harmonic Power Simulation - General Specifications	
Harmonics in a User Defined Waveform ProWave PC software required to upload waveform data - supplied when PWRDDS option fitted	**48** from 2nd to 49th Harmonic
Fundamental Frequency	**40Hz to 400Hz**
Harmonic Frequency Range	**Up to 20kHz**
Harmonic Frequency Accuracy	**0.1% + (N x 0.08%)** Where N is the Harmonic number
Harmonic Amplitude Resolution	**0.10%** of Fundamental
Harmonic Phase Range (relative to fundamental)	**0 to 360°**
Harmonic Phase Resolution	**0.1°** Relative to Fundamental
Composite Voltage Waveform Range	**2V to 1000V**
Composite Current Waveform Range	**300mA to 30A**

DDS Harmonic Power Simulation - Pre Loaded Waveforms
3rd 5%
3rd 10%
5th 10%
12th 10%
21st 10%
USER+SINE
USER

Amplitude

Range	Resolution
2mV/Div. to 10mV/Div.	10nV
20mV/Div. to 100mV/Div.	100nV
200mV/Div. to 2V/Div.	1uV
5V/Div. to 20V/Div.	10uV
50V/Div.	100uV

Sequence	1, 2, 5
Waveshapes	Square Wave (positive going from ground), DC
Square Wave Frequency	1kHz
Frequency Accuracy	30ppm
Graticule Height	6 Graticules
Rise Time	2us
Fall Time	2us
Output Terminal	Front BNC (Green LED indicates terminal active)

DC Level

Range	90 Day Rel.			180 Day Rel.			1 Year Rel.			2 Year Rel.		
@ 1MOhm load	%		uV	%		uV	%		uV	%		uV
2mV to 50V/Div.	0.009	±	20	0.01	±	20	0.01	±	20	0.014	±	20

AC Square Wave

Range	90 Day Rel.			180 Day Rel.			1 Year Rel.			2 Year Rel.		
@ 1MOhm load	%		uV	%		uV	%		uV	%		uV
2mV to 50V/Div.	0.09	±	40	0.08	±	40	0.1	±	40	0.14	±	40

High Voltage Safety

High voltage output is ramped to allow instruments to auto range

Auto standby is activated when passing through 20V or 200V output values

Standby is automatically selected for high voltage (>20V) after 20 minutes on the same setting. This function can be disabled

An external high voltage output/standby control switch is available as an option

Amplitude Deviation

Deviation Range	±10%
Deviation Resolution	3010 : Better than 10ppm

Range	90 Day Rel.			180 Day Rel.			1 Year Rel.			2 Year Rel.		
	%		uV	%		uV	%		uV	%		uV
-10% to +10%	0.008	±	20	0.01	±	20	0.01	±	20	0.014	±	20

Timebase				
Ranges	2ns/Div. : 5ns/Div. : 10ns/Div. : 20ns/Div. : 50ns/Div. : 100ns/Div. : 200ns/Div. 500ns/Div. : 1ms/Div. : 2ms/Div. : 5ms/Div. : 10ms/Div. : 20ms/Div. : 50ms/Div. 100ms/Div. : 200ms/Div. : 500ms/Div. : 1s/Div. : 2s/Div. : 5s/Div.			
Sequence	1, 2, 5			
Waveshape	Comb below 100ns Sine Wave above 100ns			
Oscillator	Internal Crystal TCXO			
Output Terminal	Front BNC (Green LED indicates terminal active)			
Range	**90 Day Rel. ppm**	**180 Day Rel. ppm**	**1 Year Rel. ppm**	**2 Year Rel. ppm**
2ns/Div. to 5s/Div.	4.5	4.75	5	6

Timebase Deviation				
Deviation Range	±10% in 0.001% Steps			
Deviation Resolution	0.001%			
Range	**90 Day Rel. %**	**180 Day Rel. %**	**1 Year Rel. %**	**2 Year Rel. %**
-9.5% to +9.5%	0.01	0.01	0.01	0.01

Levelled Sweep				
Sweep Range	5MHz to 350MHz			
Waveform	Sine Wave			
Levelled Sweep	600mV pk-pk into 50 Ohms			
Reference Level	50kHz			
Output Terminal	Front BNC (Green LED indicates terminal active)			
Range	**90 Day Rel. db**	**180 Day Rel. db**	**1 Year Rel. db**	**2 Year Rel. db**
5MHz to 350MHz	0.8	0.90	1	1.4

Levelled Sweep	
Frequency Accuracy	See Time markers

50kHz Reference				
Accuracy	**90 Day Rel.**	**180 Day Rel.**	**1 Year Rel.**	**2 Year Rel.**
Frequency Accuracy	27 ppm	29 ppm	30 ppm	36 ppm
Level Accuracy	0.4 %	0.45 %	0.5 %	0.7 %

Fast Rise Output	
Rise/Fall Time	Typically 1ns, Maximum 1.5ns*

*Note : Rise time can be affected by leads and impedance mismatch. 1.5ns should be used for certification

Specifications apply at TCal ± 5°C.

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

Amplitude

Range	Resolution
2mV/Div. to 10mV/Div.	10nV
20mV/Div. to 100mV/Div.	100nV
200mV/Div. to 2V/Div.	1uV
5V/Div. to 20V/Div.	10uV
50V/Div.	100uV

Sequence	1, 2, 5
Waveshapes	Square Wave (positive going from ground), DC
Square Wave Frequency	1kHz
Frequency Accuracy	30ppm
Graticule Height	6 Graticules
Rise Time	2us
Fall Time	2us
Output Terminal	Front BNC (Green LED indicates terminal active)

DC Level

Range	90 Day Rel.			180 Day Rel.			1 Year Rel.			2 Year Rel.		
@ 1MOhm load	%		uV	%		uV	%		uV	%		uV
2mV to 50V/Div.	0.009	±	20	0.01	±	20	0.01	±	20	0.014	±	20

AC Square Wave

Range	90 Day Rel.			180 Day Rel.			1 Year Rel.			2 Year Rel.		
@ 1MOhm load	%		uV	%		uV	%		uV	%		uV
2mV to 50V/Div.	0.09	±	40	0.08	±	40	0.1	±	40	0.14	±	40

High Voltage Safety

High voltage output is ramped to allow instruments to auto range

Auto standby is activated when passing through 20V or 200V output values

Standby is automatically selected for high voltage (>20V) after 20 minutes on the same setting. This function can be disabled

An external high voltage output/standby control switch is available as an option

Amplitude Deviation

Deviation Range	±10%
Deviation Resolution	4010 : Better than 10ppm

Range	90 Day Rel.			180 Day Rel.			1 Year Rel.			2 Year Rel.		
	%		uV	%		uV	%		uV	%		uV
-10% to +10%	0.008	±	20	0.01	±	20	0.01	±	20	0.014	±	20

Timebase				
Ranges	2ns/Div. : 5ns/Div. : 10ns/Div. : 20ns/Div. : 50ns/Div. : 100ns/Div. : 200ns/Div. 500ns/Div. : 1ms/Div. : 2ms/Div. : 5ms/Div. : 10ms/Div. : 20ms/Div. : 50ms/Div. 100ms/Div. : 200ms/Div. : 500ms/Div. : 1s/Div. : 2s/Div. : 5s/Div.			
Sequence	1, 2, 5			
Waveshape	Comb below 100ns Sine Wave above 100ns			
Oscillator	Internal Crystal TCXO			
Output Terminal	Front BNC (Green LED indicates terminal active)			
Range	**90 Day Rel. ppm**	**180 Day Rel. ppm**	**1 Year Rel. ppm**	**2 Year Rel. ppm**
2ns/Div. to 5s/Div.	4.5	4.75	5	6

Timebase Deviation				
Deviation Range	±10% in 0.001% Steps			
Deviation Resolution	0.001%			
Range	**90 Day Rel. %**	**180 Day Rel. %**	**1 Year Rel. %**	**2 Year Rel. %**
-9.5% to +9.5%	0.01	0.01	0.01	0.01

Levelled Sweep				
Sweep Range	5MHz to 600MHz			
Waveform	Sine Wave			
Levelled Sweep	600mV pk-pk into 50 Ohms			
Reference Level	50kHz			
Output Terminal	Front BNC (Green LED indicates terminal active)			
Range	**90 Day Rel. db**	**180 Day Rel. db**	**1 Year Rel. db**	**2 Year Rel. db**
5MHz to 600MHz	0.8	0.90	1	1.4

Levelled Sweep	
Frequency Accuracy	See Time markers

50kHz Reference				
Accuracy	**90 Day Rel.**	**180 Day Rel.**	**1 Year Rel.**	**2 Year Rel.**
Frequency Accuracy	27 ppm	29 ppm	30 ppm	36 ppm
Level Accuracy	0.4 %	0.45 %	0.5 %	0.7 %

Fast Rise Output	
Rise/Fall Time	Typically 1ns, Maximum 1.5ns*

*Note : Rise time can be affected by leads and impedance mismatch. 1.5ns should be used for certification

Specifications apply at TCal ± 5°C.

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

Amplitude

Range	Resolution
2mV/Div. to 10mV/Div.	10nV
20mV/Div. to 100mV/Div.	100nV
200mV/Div. to 2V/Div.	1uV
5V/Div. to 20V/Div.	10uV
50V/Div.	100uV

Sequence	1, 2, 5
Waveshapes	Square Wave (positive going from ground), DC
Square Wave Frequency	1kHz
Frequency Accuracy	30ppm
Graticule Height	6 Graticules
Rise Time	2us
Fall Time	2us
Output Terminal	Front BNC (Green LED indicates terminal active)

DC Level

Range	90 Day Rel.			180 Day Rel.			1 Year Rel.			2 Year Rel.		
@ 1MOhm load	%		uV	%		uV	%		uV	%		uV
2mV to 50V/Div.	0.009	±	20	0.01	±	20	0.01	±	20	0.014	±	20

AC Square Wave

Range	90 Day Rel.			180 Day Rel.			1 Year Rel.			2 Year Rel.		
@ 1MOhm load	%		uV	%		uV	%		uV	%		uV
2mV to 50V/Div.	0.09	±	40	0.08	±	40	0.1	±	40	0.14	±	40

High Voltage Safety

High voltage output is ramped to allow instruments to auto range

Auto standby is activated when passing through 20V or 200V output values

Standby is automatically selected for high voltage (>20V) after 20 minutes on the same setting. This function can be disabled

An external high voltage output/standby control switch is available as an option

Amplitude Deviation												
Deviation Range	±10%											
Deviation Resolution	4010 : Better than 10ppm											
Range	**90 Day Rel.**			**180 Day Rel.**			**1 Year Rel.**			**2 Year Rel.**		
	%		uV	**%**		uV	**%**		uV	**%**		uV
-10% to +10%	0.008	±	20	0.01	±	20	0.01	±	20	0.014	±	20

Timebase				
Ranges	2ns/Div. : 5ns/Div. : 10ns/Div. : 20ns/Div. : 50ns/Div. : 100ns/Div. : 200ns/Div. 500ns/Div. : 1ms/Div. : 2ms/Div. : 5ms/Div. : 10ms/Div. : 20ms/Div. : 50ms/Div. 100ms/Div. : 200ms/Div. : 500ms/Div. : 1s/Div. : 2s/Div. : 5s/Div.			
Sequence	1, 2, 5			
Waveshape	Comb below 100ns Sine Wave above 100ns			
Oscillator	Internal Crystal TCXO			
Output Terminal	Front BNC (Green LED indicates terminal active)			
Range	**90 Day Rel.** **ppm**	**180 Day Rel.** **ppm**	**1 Year Rel.** **ppm**	**2 Year Rel.** **ppm**
2ns/Div. to 5s/Div.	4.5	4.75	5	6

Timebase Deviation				
Deviation Range	±10% in 0.001% Steps			
Deviation Resolution	0.001%			
Range	**90 Day Rel.** **%**	**180 Day Rel.** **%**	**1 Year Rel.** **%**	**2 Year Rel.** **%**
-9.5% to +9.5%	0.01	0.01	0.01	0.01

Variable Level Output	
Sweep Range	250kHz to 6.4GHz
Frequency Accuracy	2ppm
Frequency Resolution	10 kHz
Waveform	Sine Wave
Level	Variable from -50dBm to +10 dBm
Level Resolution	0.01 dBm
Output Terminal	Front Type N (Green LED indicates terminal active)

Range	**90 Day Rel. db**	**180 Day Rel. db**	**1 Year Rel. db**	**2 Year Rel. db**
-50 to -30dBm				
0.25 - 10MHz	0.8	0.90	1	1.4
10 - 35MHz	0.8	0.90	1	1.4
35 - 4000MHz	0.8	0.90	1	1.4
35 - 4000MHz	0.8	0.90	1	1.4
-30 to 0dBm				
0.25 - 10MHz	0.8	0.90	1	1.4
10 - 35MHz	0.8	0.90	1	1.4
35 - 4000MHz	0.8	0.90	1	1.4
35 - 4000MHz	0.8	0.90	1	1.4
0dBm - 10dBm				
35 - 4000MHz	0.8	0.90	1	1.4
4 - 6.4 GHz	0.8	0.90	1	1.4

Fast Rise Output	
Rise/Fall Time	Typically 1ns, Maximum 1.5ns*

*Note : Rise time can be affected by leads and impedance mismatch. 1.5ns should be used for certification

Specifications apply at TCal ± 5°C.

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

General Specifications

Range	Actual Value (Ohms)	Max. Power Rating (Watts)	Maximum Voltage (V)	Maximum Current (mA)	Display Resolution
-100°C	60.25	0.2	3.47	57.62	1m°C
0°C	100.00	0.2	4.47	44.72	1m°C
+30°C	111.67	0.2	4.73	42.32	1m°C
+60°C	123.24	0.2	4.96	40.28	1m°C
+100°C	138.50	0.2	5.26	38.00	1m°C
+200°C	175.84	0.2	5.93	33.73	10m°C
+400°C	247.04	0.2	7.03	28.45	10m°C
+800°C	375.51	0.2	8.67	23.08	10m°C

4-Wire connection. Allow 1mW on all resistance specifications.

Accuracy Relative to Calibration Standards Specifications

Range	Actual Value (Ohms)	90 day Rel %	180 Day Rel %	1 year Rel %	2 year Rel %
-100°C	60.25	0.008	0.009	0.01	0.014
0°C	100.00	0.008	0.009	0.01	0.014
+30°C	111.67	0.008	0.009	0.01	0.014
+60°C	123.24	0.008	0.009	0.01	0.014
+100°C	138.50	0.008	0.009	0.01	0.014
+200°C	175.84	0.008	0.009	0.01	0.014
+400°C	247.04	0.008	0.009	0.01	0.014
+800°C	375.51	0.008	0.009	0.01	0.014

Specifications apply at TCal ± 5°C.

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

General Specifications

PRT Type	Range °C	1 Year * ± °C
PT25	-200 to 0	0.50
	0 to 800	0.60
PT100	-200 to 0	0.13
	0 to 800	0.55
PT250	-200 to 0	0.25
	0 to 800	0.30
PT500	-200 to 260	0.10
	260 to 500	0.90
PT1000	-200 to 0	0.08
	0 to 800	0.45

2-Wire connection only

Display resolution : 10m°C

Minimum terminal voltage = 80mV

Maximum current input = 20mA

Input measurement current must be a constant DC current isolated from earth

Performance/compatibility may be affected using other measurement methods/techniques for the variable PRT function e.g.. AC or pulsed, in which case passive resistance functionality may be employed.

Current must be stable for a period of 1s - it is therefore recommended the UUT range is selected manually

* Specifications apply at TCal ± 5°C.

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

We truly believe in offering Solutions in Calibration, offering bespoke solutions for calibration laboratories and manufacturers across the globe. Our mission statement is not just a phrase, it is our design and support philosophy, offering support and advice that cannot be found elsewhere with a friendly atmosphere.

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Ever since releasing the very first products Transmille have continued to innovate and develop new products for the metrology community, from world first products such as the 2100 Electrical Test Equipment calibrator, through to the worlds lowest cost multi product calibrator the 1000 series.

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