

2050 MULTI-PRODUCT CALIBRATOR

50ppm ENTRY LEVEL CALIBRATOR



EXTENDED SPECIFICATIONS



TRANSMILLE LTD., UNIT 4 SELECT BUSINESS CENTRE, LODGE ROAD, STAPLEHURST, KENT. TN12 0QW. UK.
www.transmille.com : sales@transmille.com : Tel : +44 (0) 1580 890700 : Fax : +44 (0) 1580 890711

DECLARATION OF CONFORMITY CE

Manufacturer's Name: Transmille Ltd.
Manufacturer's Address: Unit 4, Select Business Centre
Lodge Road
Staplehurst
TN12 0QW

Declares, that the product

Product Name: Multi-product Calibrator
Model Number: 2050 / 2041A / 2006A
Product Options: This declaration covers all options of the above product(s)

Conforms with the following European Directives:

The product herewith complies with the requirements of the Low Voltage Directive 73/73EEC and the EMC Directive 89/336/EEC (including 93/68/EEC) and carries the CE Marking accordingly

Conforms with the following product standards:

EMC

Standard	Limit
IEC616326-1:1997+A1:1998 / EN 61326-1:1997+A1:1998 EN55011:1991	
<i>IEC 61000-4-2:1995+A1:1998 / EN 61000-4-2:1995 Group 1Class A</i>	
<i>IEC 61000-4-3:1995 / EN 61000-4-3:1995</i>	<i>4kV CD, 8kV AD</i>
<i>IEC 61000-4-4:1995 / EN 61000-4-4:1995</i>	<i>3 V/m, 80-1000 MHz</i>
<i>IEC 61000-4-5:1995 / EN 61000-4-5:1995</i>	<i>0.5kV signal lines, 1kV power lines</i>
<i>IEC 61000-4-6:1996 / EN 61000-4-6:1996</i>	<i>0.5kV line-line, 1kV line-ground</i>
<i>IEC 61000-4-11:1994 / EN 61000-4-11:1994</i>	<i>3V, 0.15-80 MHz 1 cycle, 100%</i>
	<i>Dips: 30% 10ms; 60% 100ms</i>
	<i>Interrupt > 95%@5000ms</i>

SAFETY

IEC 61010-1:1990+A1:1992+A2:1995 / EN 61010-1:1993+A2:1995

12/12/2001



Revision No: 1.1
Date :12/12/2001

Managing Director

2050 General Specifications

TRANSMILLE
Solutions In Calibration

Warm Up Time	Double the time since last used up to 20 minutes maximum	
Standard Interfaces	RS232	
Optional Interfaces	USB (Universal Serial Bus)	
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 Line Frequency : 50Hz to 60Hz Line Voltage Variation : -6% +10%	
Power Consumption	28 Watts (Standby)	200 Watts (Maximum)
Low Analogue Isolation	100V	
Connections	Voltage / 2 Wire Resistance Low Current (<=2A) High current (>2A) Earth Connection Oscilloscope Functions Feature (Ext. Pod) RS232 Interface	1x Black : 1x White 4mm Safety sockets 1x Black : 1x Red 4mm Safety sockets 1x Blue : 1x Yellow 4mm Safety sockets 1x Green 4mm Safety Socket 1x BNC terminal 1x Female 'D' type socket 1x Female 'D' type socket
RS232 Settings	Baud Rate Parity Data Bits Stop Bits	9600 None 8 1
Display Information	Type Viewing Area Resolution Backlight Type Brightness	Backlit Black on white film STN type 124.3mm * 34mm 256 * 94 dots Cold fluorescent lamp 70 to 90 cd/m ²
Indicators	Voltage / Current / High Current Negative to ground Oscilloscope Feature Connector (Ext. Pod)	Red LED (between terminals) Green LED (left of Earth terminal) Green LED (right of BNC Connector) Green LED (right of 'D' type connector)
Keyboard	Membrane type with tactile feedback	
Fuses	Mains Inlet	3A A/S (240 Volt) 5A A/S (110 Volt operation)
Isolation	Outputs are opto-isolated from mains earth and the RS-232 interface Maximum common mode voltage between earth and the low terminals 30 Volts ac/dc.	
Dimensions & Weights	Calibrator Only Calibrator in Shipping Box Calibrator in Soft Carry Case Calibrator in Hard Transit case	14cm x 43cm x 46cm : 12.5kgs 58cm x 56cm x 37cm : 15kgs 49cm x 50cm x 19cm : 13.5kgs 55cm x 56cm x 26cm : 22kgs
Warranty Period	3 Years (Parts & Labour)	
Recommended Service Interval	1 Year	
Supplied Connections	1x Serial Interface Connection 1x Adaptor Connection Lead (if at least one adaptor ordered)	
Optional Lead Set Kit	1x Voltage connection leadset 1x Low Current connection leadset 1x High current connection leadset 1x AC connection leadset	
Mounting Kit (optional)	3U rack mount kit	
Case Colour	Matt Dark Grey (RAL7016)	

Due to continuous development specifications may be subject to change.

General Specifications

Range	Resolution	Max. Burden Current ¹	Output Resistance	Overload Protection
0-202mV	0.1uV	1mA ²	50 Ohms	20 V
0.2-2.02V	1uV	50mA	0.2 Ohms	150V
2-20.2V	10uV	50mA	0.2 Ohms	150V
20-202V	100uV	10mA ³	0.5 Ohms	1200V
200-1020V	1mV	10mA ³	0.7 Ohms	1200V

Accuracy Relative to Calibration Standards Specifications

Range	90 day Rel		180 Day Rel		1 year Rel		2 year Rel	
	ppm Set	Rng	ppm Set	Rng	ppm Set	Rng	ppm Set	Rng
0-202mV	48	+ 5	54	+ 5	60	+ 5	84	+ 7
0.2-2.02V	48	+ 5	54	+ 5	60	+ 5	84	+ 7
2-20.2V	40	+ 4	45	+ 4	50	+ 4	70	+ 5.6
20-202V	56	+ 5	63	+ 5	70	+ 5	98	+ 7
200-1020V	56	+ 10	63	+ 10	70	+ 10	98	+ 14

All specifications allow 5uV for lead and thermal emf effects

Notes

Note 1: Current limited by self resetting thermal fuse. Shown as max. current for 10 seconds/continuous operating current

Note 2: Limited by 50 Ohm output impedance

Note 3: Internally adjustable from 2mA to 30mA - Factory set to 10mA as standard

For safety the trip is controlled by a fail-safe circuit independent 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.

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 5 minutes on the same setting

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

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

Due to continuous development specifications may be subject to change.

General Specifications

Range	Resolution	Max. Inductive Load	Compliance Voltage	Overload Protection
0-202uA	100pA	10mH	4.2 Volts	150V
0.2-2.02mA	1nA	10mH	4.2 Volts	150V
2-20.2mA	10nA	10mH	4.2 Volts	150V
20-202mA	100nA	10mH	4.2 Volts	150V
0.2-2.02A	1uA	10mH	4.2 Volts	150V
2-20.2A	10uA	10mH	3.9 Volts	150V

Accuracy Relative to Calibration Standards Specifications

Range	90 day Rel		180 Day Rel		1 year Rel		2 year Rel	
	%Set	%Rng	%Set	%Rng	%Set	%Rng	%Set	%Rng
0-202uA	0.012	+ 0.010	0.014	+ 0.010	0.015	+ 0.010	0.021	+ 0.014
0.2-2.02mA	0.010	+ 0.005	0.011	+ 0.005	0.012	+ 0.005	0.017	+ 0.007
2-20.2mA	0.010	+ 0.005	0.011	+ 0.005	0.012	+ 0.005	0.017	+ 0.007
20-202mA	0.012	+ 0.005	0.014	+ 0.005	0.015	+ 0.005	0.021	+ 0.007
0.2-2.02A	0.040	+ 0.005	0.045	+ 0.005	0.050	+ 0.005	0.070	+ 0.007
2-20.2A	0.064	+ 0.008	0.072	+ 0.008	0.080	+ 0.008	0.112	+ 0.011

All specification +/- 4nA.

Power & temperature sensor on 20A range - microprocessor monitors & protects from overheating
Duty Cycle into 0 Ohms = 90 seconds ON, 5 minutes OFF²

Notes

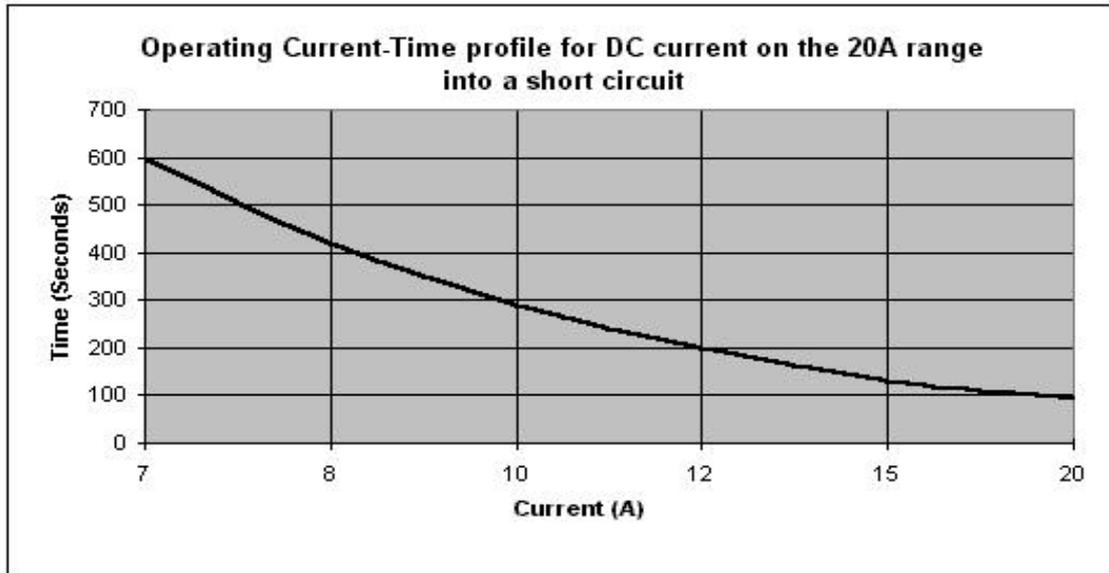
Note 1 : Typical RMS noise figures at 50% of full scale.

Note 2 : Higher resistance loads allow a longer ON period

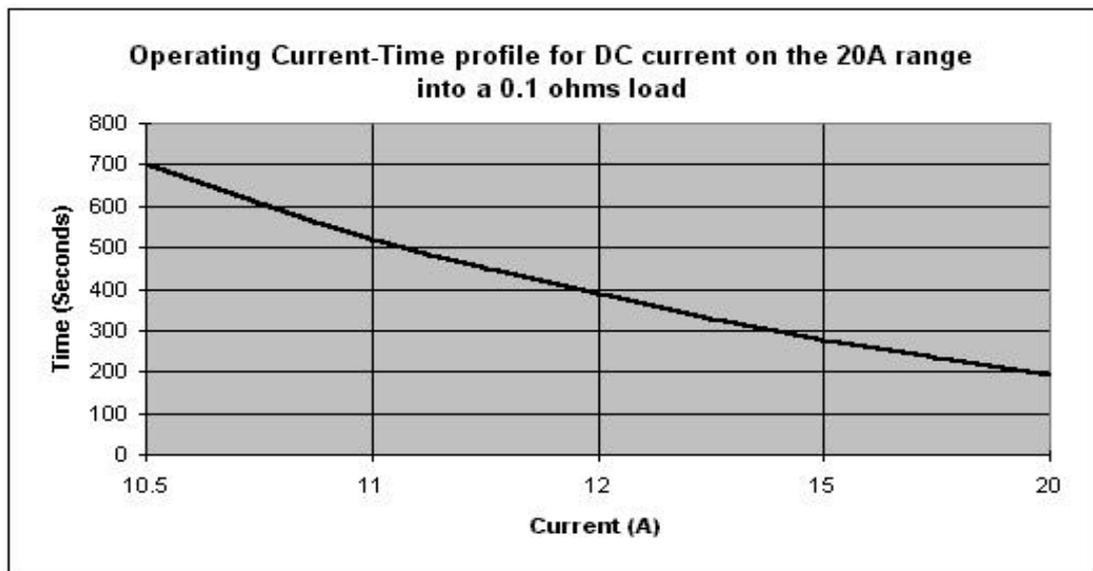
Specifications apply between 17°C and 30°C.

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

Due to continuous development specifications may be subject to change.



Graph 1* : Operating time on 20A range with current into a short circuit at 20 deg C. Continuous current in available below 7A output.



Graph 2* : Operating time on 20A range with current into a 0.1ohm load at 20 deg C. Continuous current in available below 10.5A output.

* Note Timing is started after a minimum period of 7 minutes at zero output. Shorter periods will reduce the output time available.

General Specifications

Range	Frequency	Resolution	Max. Burden Current ¹	Output Resistance	Overload Protection
0-202mV	40Hz to 1kHz	1uV	1mA ²	50 Ohms	20 V
	1kHz to 10kHz	1uV	1mA ²	50 Ohms	20 V
0.2-2.02V	40Hz to 1kHz	10uV	50mA	0.2Ohms	1200V
	1kHz to 10kHz	10uV	50mA	0.2 Ohms	1200V
2-20.2V	40Hz to 1kHz	100uV	50mA	0.2 Ohms	1200V
	1kHz to 10kHz	100uV	50mA	0.2 Ohms	1200V
20-202V	40Hz to 1kHz	1mV	10mA ³	0.5 Ohms	1200V
	1kHz to 10kHz	1mV	5mA ³	0.5 Ohms	1200V
200-1020V	40Hz to 1kHz	10mV	10mA ³	0.7 Ohms	1200V

Accuracy Relative to Calibration Standards Specifications

Range	Frequency	Frequency Resolution	90 day Rel		180 Day Rel		1 year Rel		2 year Rel	
			%Set	%Rng	%Set	%Rng	%Set	%Rng	%Set	%Rng
0-202mV	40Hz to 1kHz	1Hz	0.064	+ 0.02	0.072	+ 0.015	0.08	+ 0.015	0.112	+ 0.021
	1kHz to 10kHz	1Hz	0.080	+ 0.06	0.090	+ 0.06	0.10	+ 0.060	0.140	+ 0.084
0.2-2.02V	40Hz to 1kHz	1Hz	0.064	+ 0.01	0.072	+ 0.012	0.08	+ 0.012	0.112	+ 0.017
	1kHz to 10kHz	1Hz	0.080	+ 0.06	0.090	+ 0.06	0.10	+ 0.060	0.140	+ 0.084
2-20.2V	40Hz to 1kHz	1Hz	0.056	+ 0.01	0.063	+ 0.012	0.07	+ 0.012	0.098	+ 0.017
	1kHz to 10kHz	1Hz	0.080	+ 0.05	0.090	+ 0.05	0.10	+ 0.050	0.140	+ 0.070
20-202V	40Hz to 1kHz	1Hz	0.064	+ 0.02	0.072	+ 0.015	0.08	+ 0.015	0.112	+ 0.021
	1kHz to 10kHz	1Hz	0.080	+ 0.06	0.090	+ 0.06	0.10	+ 0.060	0.140	+ 0.084
200-1020V	40Hz to 1kHz	1Hz	0.064	+ 0.03	0.072	+ 0.03	0.08	+ 0.030	0.112	+ 0.042

All specifications ± 20uV. All AC specifications apply from 10% of full scale.

Notes

Note 1: Current limited by self resetting thermal fuse. Shown as max. current for 10 seconds/continuous operating current

Note 2: Limited by 50 Ohm output impedance

Note 3: Internally adjustable from 2mA to 30mA - Factory set to 10mA as standard

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

2 Wire output / Remote sensing not available

Maximum floating voltage : 100V

Isolation : Floating or grounded selection available as standard

Specifications apply between 17°C and 30°C.

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

Due to continuous development specifications may be subject to change.

2050 AC Voltage Specifications

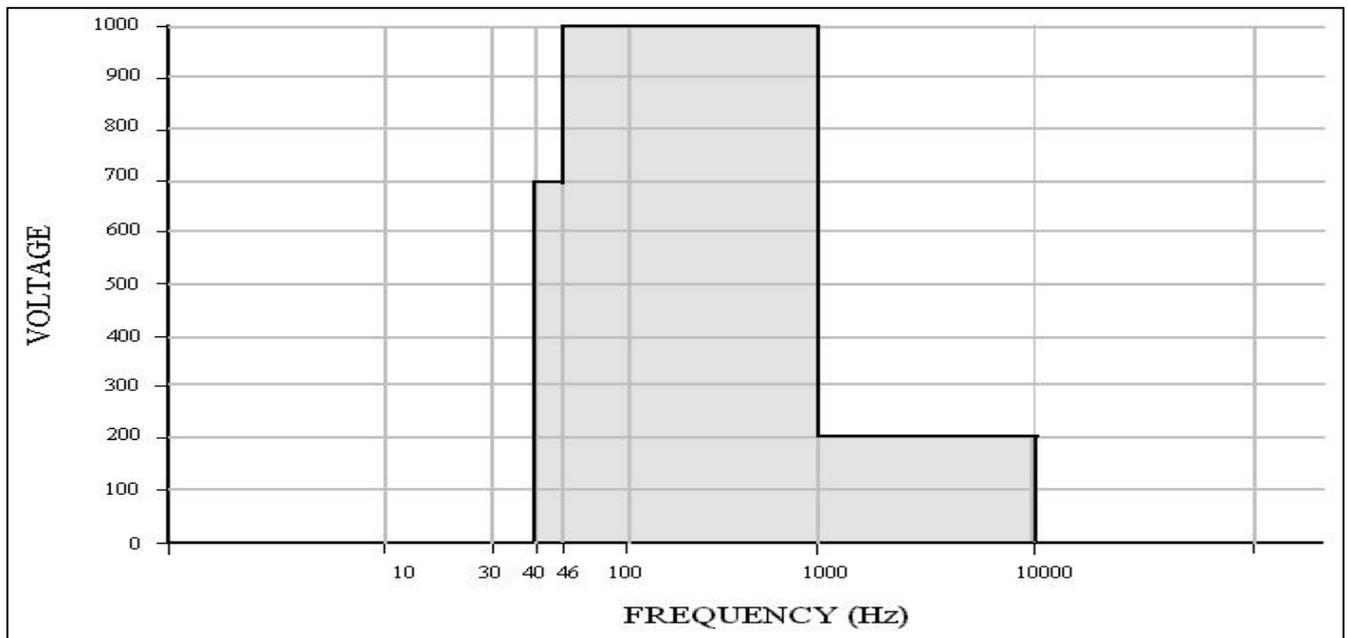
High Voltage Safety

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

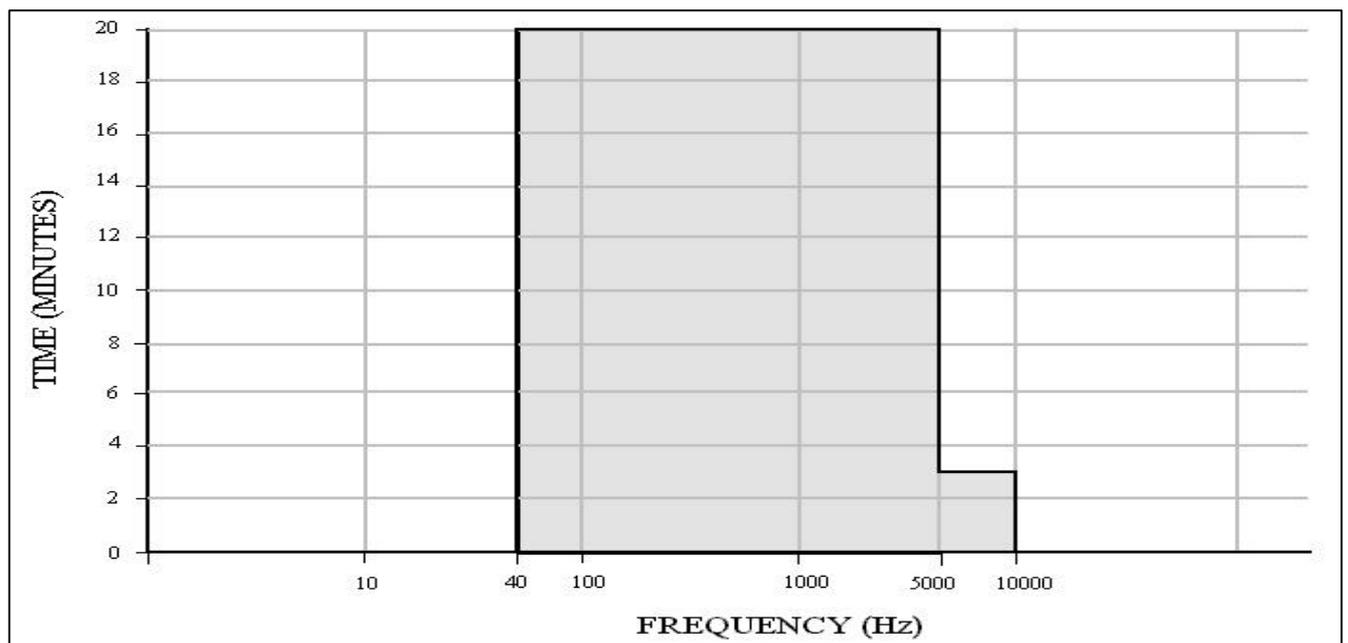
Worked Accuracy Calibration of 1V output at 5kHz on the 2V range at 20°C using 180 day spec.

0.09% Set (Output setting on calibrator = 1V)	0.09% of 1V =	900uV
0.06% Rng (Full scale of range selected = 2V)	0.06% of 2V =	1200uV
Zero or floor allowance		<u>20uV</u>
<i>Total accuracy of calibrator only =</i>		± 2120uV

Absolute accuracy must also include the accuracy (uncertainty) of the original calibration of the 2050 and the accuracy of the instrument used to verify its performance.



Graph 3 : Volt-Hertz profile for 1000V AC range



Graph 4 : Time-Hertz profile for voltages above 20V

General Specifications

Range	Frequency	Resolution	Maximum Burden Voltage	Overload Protection	Inductive Load
20-202uA	40Hz to 500Hz	1nA	3 Volts	150V	5mH
0.2-2.02mA	40Hz to 500Hz	10nA	3 Volts	150V	5mH
2-20.2mA	40Hz to 500Hz	100nA	3 Volts	150V	5mH
20-202mA	40Hz to 500Hz	1uA	3 Volts	150V	5mH
0.2-2.02A	40Hz to 500Hz	10uA	3 Volts	150V	5mH
2-20.2A	40Hz to 500Hz	100uA	2.8 Volts	150V	0.8mH

All specifications +/- 650nA. All AC specifications apply from 10% of full scale.

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.

High current output is limited to a maximum of 2 Mins.

Accuracy Relative to Calibration Standards Specifications

Range	Frequency	Frequency Resolution	90 day Rel		180 Day Rel		1 year Rel		2 year Rel	
			%Set	%Rng	%Set	%Rng	%Set	%Rng	%Set	%Rng
20-202uA	40Hz to 500Hz	1Hz	0.08	+ 0.06	0.09	+ 0.06	0.10	+ 0.06	0.14	+ 0.084
0.2-2.02mA	40Hz to 500Hz	1Hz	0.08	+ 0.05	0.09	+ 0.05	0.10	+ 0.05	0.14	+ 0.070
2mA-20.2mA	40Hz to 500Hz	1Hz	0.08	+ 0.03	0.09	+ 0.03	0.10	+ 0.03	0.14	+ 0.042
20-202mA	40Hz to 500Hz	1Hz	0.08	+ 0.03	0.09	+ 0.03	0.10	+ 0.03	0.14	+ 0.042
200-2.02A	40Hz to 500Hz	1Hz	0.12	+ 0.05	0.135	0.05	0.15	0.05	0.21	+ 0.070
2-20.2A	40Hz to 500Hz	1Hz	0.16	+ 0.10	0.18	+ 0.10	0.20	+ 0.10	0.28	+ 0.140

Power & temperature sensor on 20A range - microprocessor monitors & protects from overheating
Duty Cycle into 0 Ohms = 90 seconds ON, 5 minutes OFF¹

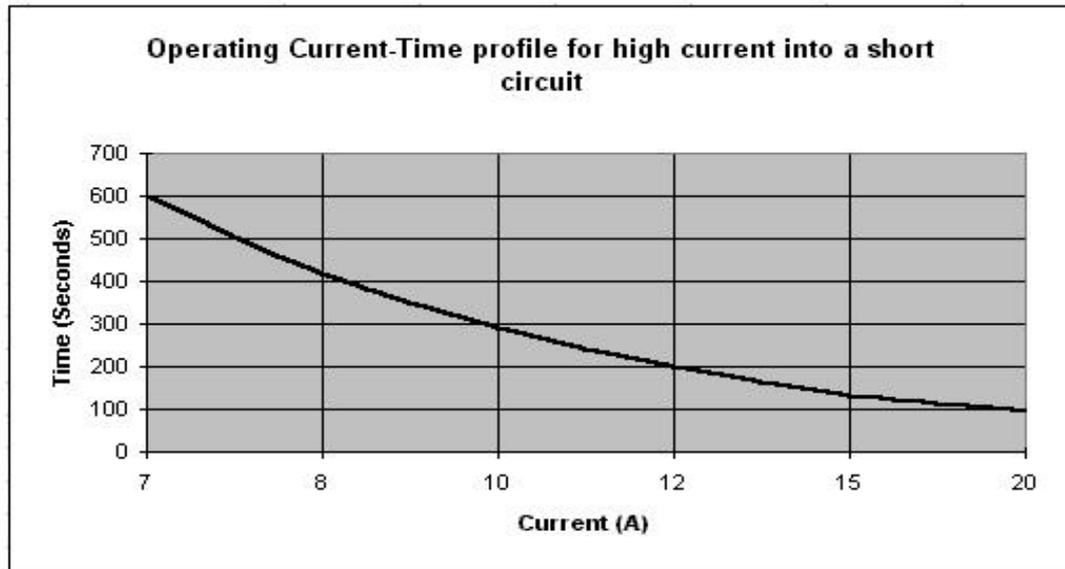
Notes

Note 1 : Higher resistance loads allow a longer ON period

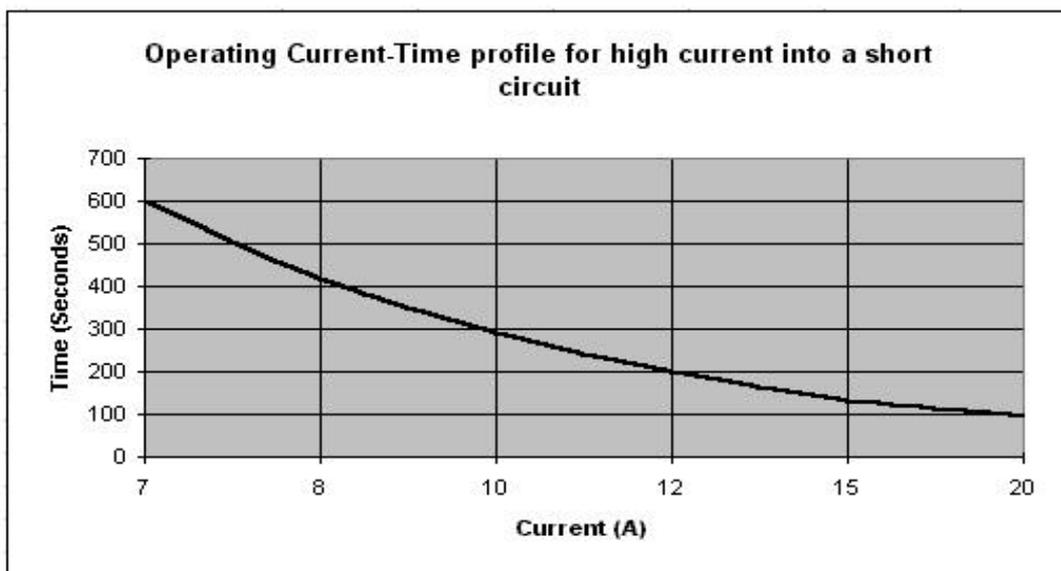
Specifications apply between 17°C and 30°C.

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

Due to continuous development specifications may be subject to change.



Graph 5* : Operating time on 20A range with current into a short circuit at 20 deg C. Continuous current in available below 7A output.



Graph 6* : Operating time on 20A range with current into a 0.1ohm load at 20 deg C. Continuous current in available below 10.5A output.

* Note Timing is started after a minimum period of 7 minutes at zero output. Shorter periods will reduce the output time available.

For the highest possible accuracy and dependability of the measured value, regardless of the measurement technique used, the 2000 Series calibrators use passive standard resistors, the calibrated value of which is displayed when selected.

General Specifications

Range	Maximum Current	Maximum Voltage
10Ω	100mA	5 Volts
100Ω	50mA	5 Volts
1kΩ	10mA	10 Volts
10kΩ	3mA	30 Volts
100kΩ	1mA	100 Volts
1MΩ	0.1mA	100 Volts
10MΩ	10uA	100 Volts

2050 provides 2 wire resistance for all values

Accuracy Relative to Calibration Standards Specifications

Range	90 day Rel %	180 Day Rel %	1 year Rel %	2 year Rel %
10Ω	0.04	0.045	0.05	0.07
100Ω	0.0064	0.0072	0.008	0.0112
1kΩ	0.004	0.0045	0.005	0.007
10kΩ	0.004	0.0045	0.005	0.007
100kΩ	0.004	0.0045	0.005	0.007
1MΩ	0.008	0.009	0.01	0.014
10MΩ	0.04	0.045	0.05	0.07

Allow 40mW on all resistance specifications.

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

Specifications apply between 17°C and 30°C.

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

Due to continuous development specifications may be subject to change.

For the highest possible accuracy and dependability of the measured value, regardless of the measurement technique used, the 2000 Series calibrators use passive standard capacitors, the calibrated value of which is displayed when selected.

General Specifications

Range	Maximum Voltage	D	R _s
10nF	50V	0.006	N/A
1uF	30V	0.002	N/A

Specifications apply at 1kHz. Allow 20pF for lead effects.
No appreciable variation is noticeable in value above 1kHz.

Accuracy Relative to Calibration Standards Specifications

Range	90 day Rel %	180 Day Rel %	1 year Rel %	2 year Rel %
10nF	0.2	0.225	0.25	0.35
1uF	0.32	0.36	0.4	0.56

Measurement methods

C_p up to 1uF

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

Specifications apply between 17°C and 30°C.

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

Due to continuous development specifications may be subject to change.