

# CERTIFICATE OF CALIBRATION

Issued By Transmille Ltd.

Certificate Number 30109

Date of Issue 20 January 2016



Approved Signatory



Transmille Ltd.  
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G.A. Shapland  M.A. Bailey  S.A. Hawkins  J.A. Bailey

**Customer :** TRANSMILLE LTD.  
UNIT 4 SELECT BUSINESS CENTRE, LODGE ROAD  
STAPLEHURST KENT. TN12 0QW

Date Received : 14 January 2016

<b>Instrument :</b>	System ID :	T00006131	Job Number :	59790
	Description :	Electrical Test Calibrator	Site :	
	Manufacturer :	Transmille	Location :	
	Model Number :	3200B		
	Serial Number :	M1402A16		
	Procedure Version :	1.7AT/N		

## Environmental Conditions

Temperature :	20°C +/- 1°C	Mains Voltage :	230V +/- 12V
Relative Humidity :	50% +/- 20%	Mains Frequency :	50Hz +/- 1Hz

## Comments

Instrument was allowed to stabilise for at least 12 hours before calibration.  
Instrument calibrated with Bond lead supplied  
4 Wire kelvin connections were used for ohms measurements below 10kOhms  
Tests marked # are not UKAS accredited have been included for completeness

## Calibration Information

The instrument was calibrated against laboratory standards whose values are traceable to recognised National Standards. The uncertainty limits quoted refer to the measured values only, with no account being taken of the instruments ability to maintain its calibration.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k=2$ , providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

Calibrated By : G.A. Shapland

Date of Calibration : 20 January 2016

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

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Test Title	Applied Value	Reading	Uncertainties
Download Cal Factors	---	Pass	
<b>3200A Version 10.3.2</b>			
<b>Insulation Resistance (0.01M Ohms to 2000M Ohms)</b>			
10k $\Omega$	10.000 0k $\Omega$	9.994 6k $\Omega$	430m $\Omega$
20k $\Omega$	20.000 0k $\Omega$	20.007 3k $\Omega$	610m $\Omega$
30k $\Omega$	30.000 0k $\Omega$	29.994 6k $\Omega$	610m $\Omega$
40k $\Omega$	40.000 0k $\Omega$	40.009 0k $\Omega$	610m $\Omega$
60k $\Omega$	60.000 0k $\Omega$	60.009 3k $\Omega$	610m $\Omega$
100k $\Omega$	100.000k $\Omega$	100.033k $\Omega$	2 $\Omega$
200k $\Omega$	200.000k $\Omega$	200.038k $\Omega$	6 $\Omega$
400k $\Omega$	400.000k $\Omega$	400.051k $\Omega$	10 $\Omega$
600k $\Omega$	600.000k $\Omega$	600.171k $\Omega$	14 $\Omega$
1M $\Omega$	1.000 00M $\Omega$	1.000 35M $\Omega$	22 $\Omega$
2M $\Omega$	2.000 00M $\Omega$	2.000 39M $\Omega$	250 $\Omega$
3M $\Omega$	3.000 00M $\Omega$	3.000 74M $\Omega$	310 $\Omega$
4M $\Omega$	4.000 00M $\Omega$	4.000 60M $\Omega$	370 $\Omega$
5M $\Omega$	5.000 00M $\Omega$	5.012 23M $\Omega$	430 $\Omega$
6M $\Omega$	6.000 00M $\Omega$	6.012 58M $\Omega$	500 $\Omega$
7M $\Omega$	7.000 00M $\Omega$	7.012 53M $\Omega$	580 $\Omega$
8M $\Omega$	8.000 00M $\Omega$	8.012 85M $\Omega$	660 $\Omega$
9M $\Omega$	9.000 00M $\Omega$	9.012 63M $\Omega$	740 $\Omega$
10M $\Omega$	10.000 0M $\Omega$	10.045 7M $\Omega$	830 $\Omega$
20M $\Omega$	20.000 0M $\Omega$	20.051 2M $\Omega$	14k $\Omega$
30M $\Omega$	30.000 0M $\Omega$	30.095 9M $\Omega$	20k $\Omega$
40M $\Omega$	40.000 0M $\Omega$	40.090 4M $\Omega$	25k $\Omega$
50M $\Omega$	50.000 0M $\Omega$	49.872 6M $\Omega$	32k $\Omega$
60M $\Omega$	60.000 0M $\Omega$	59.929 0M $\Omega$	38k $\Omega$
70M $\Omega$	70.000 0M $\Omega$	69.941 1M $\Omega$	44k $\Omega$
80M $\Omega$	80.000 0M $\Omega$	79.991 7M $\Omega$	51k $\Omega$
90M $\Omega$	90.000 0M $\Omega$	89.990 8M $\Omega$	57k $\Omega$
100M $\Omega$	100.000M $\Omega$	99.661M $\Omega$	64k $\Omega$
200M $\Omega$	200.000M $\Omega$	199.236M $\Omega$	1.6M $\Omega$
400M $\Omega$	400.000M $\Omega$	398.832M $\Omega$	3.2M $\Omega$
600M $\Omega$	600.000M $\Omega$	600.357M $\Omega$	4.9M $\Omega$
800M $\Omega$	800.000M $\Omega$	799.742M $\Omega$	6.5M $\Omega$
1000M $\Omega$	1 000.0M $\Omega$	995.6M $\Omega$	8.1M $\Omega$
2000M $\Omega$ #	2 000.0M $\Omega$	1 994.9M $\Omega$	8.9M $\Omega$
<b>10G (10 000M) Ohm Option</b>			
4G $\Omega$ #	4.000G $\Omega$	3.998G $\Omega$	18.1M $\Omega$
6G $\Omega$ #	6.000G $\Omega$	5.976G $\Omega$	27M $\Omega$
8G $\Omega$ #	8.000G $\Omega$	7.981G $\Omega$	36M $\Omega$
10G $\Omega$ #	10.000G $\Omega$	9.974G $\Omega$	45M $\Omega$

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## Continuity Resistance

Connection to the 3200 insulation test terminals was made using 4 wire ohms with the system nulled when shorted at the terminals. The readings recorded are the resistance measured at the terminals and include any residual resistance of the 3200.

50m $\Omega$	50.0m $\Omega$	50.0m $\Omega$	270 $\mu\Omega$
100m $\Omega$	100.0m $\Omega$	100.3m $\Omega$	270 $\mu\Omega$
200m $\Omega$	200.0m $\Omega$	200.3m $\Omega$	270 $\mu\Omega$
210m $\Omega$	210.0m $\Omega$	210.1m $\Omega$	270 $\mu\Omega$
220m $\Omega$	220.0m $\Omega$	219.9m $\Omega$	270 $\mu\Omega$
230m $\Omega$	230.0m $\Omega$	230.4m $\Omega$	270 $\mu\Omega$
240m $\Omega$	240.0m $\Omega$	240.3m $\Omega$	270 $\mu\Omega$
250m $\Omega$	250.0m $\Omega$	250.1m $\Omega$	270 $\mu\Omega$
260m $\Omega$	260.0m $\Omega$	260.6m $\Omega$	270 $\mu\Omega$
270m $\Omega$	270.0m $\Omega$	270.4m $\Omega$	270 $\mu\Omega$
280m $\Omega$	280.0m $\Omega$	280.2m $\Omega$	270 $\mu\Omega$
290m $\Omega$	290.0m $\Omega$	290.7m $\Omega$	270 $\mu\Omega$
300m $\Omega$	300.0m $\Omega$	300.5m $\Omega$	270 $\mu\Omega$
400m $\Omega$	400.0m $\Omega$	400.5m $\Omega$	270 $\mu\Omega$
500m $\Omega$	500.0m $\Omega$	500.5m $\Omega$	270 $\mu\Omega$
600m $\Omega$	600.0m $\Omega$	600.4m $\Omega$	270 $\mu\Omega$
700m $\Omega$	700.0m $\Omega$	700.4m $\Omega$	270 $\mu\Omega$
800m $\Omega$	800.0m $\Omega$	800.4m $\Omega$	270 $\mu\Omega$
900m $\Omega$	900.0m $\Omega$	900.4m $\Omega$	270 $\mu\Omega$
1 $\Omega$	1.000 0 $\Omega$	1.000 3 $\Omega$	270 $\mu\Omega$
2 $\Omega$	2.000 0 $\Omega$	2.000 9 $\Omega$	270 $\mu\Omega$
4 $\Omega$	4.000 0 $\Omega$	4.001 2 $\Omega$	290 $\mu\Omega$
6 $\Omega$	6.000 0 $\Omega$	6.001 0 $\Omega$	310 $\mu\Omega$
8 $\Omega$	8.000 0 $\Omega$	8.001 3 $\Omega$	330 $\mu\Omega$
10 $\Omega$	10.000 0 $\Omega$	10.000 9 $\Omega$	350 $\mu\Omega$
20 $\Omega$	20.000 0 $\Omega$	20.022 1 $\Omega$	890 $\mu\Omega$
50 $\Omega$	50.000 0 $\Omega$	50.031 9 $\Omega$	1.7m $\Omega$
100 $\Omega$	100.000 $\Omega$	100.040 $\Omega$	2.3m $\Omega$
500 $\Omega$	500.000 $\Omega$	500.074 $\Omega$	8m $\Omega$
1k $\Omega$	1.000 00k $\Omega$	1.000 86k $\Omega$	17m $\Omega$
5k $\Omega$	5.000 0k $\Omega$	5.001 1k $\Omega$	93m $\Omega$
10k $\Omega$	10.000 0k $\Omega$	10.001 2k $\Omega$	430m $\Omega$
20k $\Omega$	20.000 0k $\Omega$	20.000 6k $\Omega$	610m $\Omega$
40k $\Omega$	40.000 0k $\Omega$	40.002 8k $\Omega$	860m $\Omega$
50k $\Omega$	50.000 0k $\Omega$	50.001 7k $\Omega$	860m $\Omega$

## Continuity Current (Range 0 to 320mA D.C.)

10mA	10.00mA	10.0mA	0.4mA
50mA	50.00mA	50.1mA	0.4mA
100mA	100.00mA	100.0mA	0.4mA
200mA	200.00mA	200.0mA	0.4mA
300mA	300.00mA	300.0mA	0.4mA

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## AC Voltage Output (100V - 200V - Line - 300V - 400V)

100 Volts Nom @ 50Hz	100.65V	100.8V	140mV
200 Volts Nom @ 50Hz	201.71V	201.8V	150mV
Line Volts @ 50Hz	242.77V	242.6V	160mV
300 Volts Nom @ 50Hz	302.60V	302.7V	190mV
400 Volts Nom @ 50Hz	403.82V	403.7V	230mV

## Insulation Resistance Voltage Measurement

### Insulation Resistance Voltage Measurement -16th Edition (D.C. Voltage)

50V	50.00V	50.0V	120mV
100V	100.00V	100.0V	120mV
250V	150.00V	150.1V	300mV
250V	200.00V	200.0V	300mV
250V	250.00V	250.0V	300mV
500V	500.00V	500.0V	520mV
1000V	1 000.00V	1 000.1V	1.2V

### Insulation Resistance D.C. Current Measurement -16th Edition 500V / 1000V Ranges

1.0mA @ 500V	1.000 0mA	1.000mA	4uA
1.0mA @ 1000V	1.000 0mA	1.000mA	4uA

### Insulation Resistance Voltage Measurement -17th Edition (D.C. Voltage)

50V	50.00V	50.0V	120mV
100V	100.00V	100.0V	120mV
250V	150.00V	150.1V	300mV
250V	200.00V	200.0V	300mV
250V	250.00V	250.0V	300mV
500V	500.00V	500.1V	520mV
1000V	1 000.00V	999.9V	1.2V

### Insulation Resistance D.C. Current Measurement -17th Edition 500V / 1000V Range

0.5mA @ 500V	0.500 0mA	0.500mA	4uA
1.0mA @ 1000V	1.000 0mA	1.000mA	4uA

## Loop Resistance

*Loop impedance was measured using 4 wire ohms connections between the earth pin of the 3200 loop test socket and the earth pin of the 3200 mains supply lead. The supply loop impedance was manually entered as zero and the measurement system was nulled. The recorded readings are the differences recorded from the zero value.*

Loop Res.	0.053 6 $\Omega$	0.053 6 $\Omega$	1m $\Omega$
Loop Res.	0.119 2 $\Omega$	0.119 2 $\Omega$	1.1m $\Omega$
Loop Res.	0.217 3 $\Omega$	0.217 3 $\Omega$	1.1m $\Omega$
Loop Res.	0.338 3 $\Omega$	0.338 5 $\Omega$	1.2m $\Omega$
Loop Res.	0.479 3 $\Omega$	0.479 0 $\Omega$	1.3m $\Omega$
Loop Res.	0.959 4 $\Omega$	0.959 6 $\Omega$	1.5m $\Omega$
Loop Res.	5.010 1 $\Omega$	5.009 2 $\Omega$	1.5m $\Omega$
Loop Res.	9.033 0 $\Omega$	9.033 1 $\Omega$	6m $\Omega$
Loop Res.	90.299 $\Omega$	90.299 $\Omega$	18m $\Omega$
Loop Res.	990.507 $\Omega$	990.512 $\Omega$	35m $\Omega$

## RCD Current

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10mA @ 50Hz	2.000mA	2.00mA	20uA
10mA @ 50Hz	10.000mA	10.00mA	20uA
30mA @ 50Hz	6.000mA	6.00mA	80uA
30mA @ 50Hz	30.000mA	29.99mA	80uA
100mA @ 50Hz	20.000mA	19.99mA	150uA
100mA @ 50Hz	90.000mA	89.98mA	160uA
100mA @ 50Hz	100.000mA	99.98mA	160uA
100mA @ 50Hz	110.000mA	109.97mA	170uA
300mA @ 50Hz	60.000mA	60.01mA	240uA
300mA @ 50Hz	150.000mA	149.89mA	240uA
300mA @ 50Hz	300.000mA	299.98mA	840uA
1000mA @ 50Hz	200.00mA	200.1mA	1.7mA
1000mA @ 50Hz	1 000.00mA	999.5mA	1.7mA
3000mA @ 50Hz	400.00mA	400.3mA	3mA
3000mA @ 50Hz	2 000.00mA	1 999.7mA	3mA

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Test Title	Applied Value	Reading	Uncertainties
<b>RCD Trip time - 0°</b>			
20ms	20.0ms	20.3ms	0.5ms
30ms	30.0ms	29.7ms	0.5ms
40ms	40.0ms	40.3ms	0.5ms
100ms	100.0ms	100.3ms	0.5ms
200ms	200.0ms	200.2ms	0.5ms
390ms	390.0ms	389.8ms	0.5ms
900ms	900.0ms	899.7ms	8.1ms
<b>RCD Trip time - 180°</b>			
30ms	30.0ms	30.4ms	0.5ms
<b>PAT : Insulation Resistance</b>			
<i>The PAT Insulation Resistance is produced from the same decade resistance arm as used for the Insulation Resistance output. The following Tests are only to confirm the operation of the output switching. For the Full range of values, use the Insulation measurements on this certificate.</i>			
1M $\Omega$	1.000 35M $\Omega$	1.000 30M $\Omega$	22 $\Omega$
2M $\Omega$	2.000 39M $\Omega$	2.000 31M $\Omega$	170 $\Omega$
4M $\Omega$	4.000 60M $\Omega$	4.000 38M $\Omega$	330 $\Omega$
6M $\Omega$	6.012 58M $\Omega$	6.010 75M $\Omega$	500 $\Omega$
8M $\Omega$	8.012 85M $\Omega$	8.010 66M $\Omega$	660 $\Omega$
10M $\Omega$	10.045 7M $\Omega$	10.042 6M $\Omega$	830 $\Omega$
<b>PAT : Earth Bond Resistance</b>			
<i>The resistances recorded include the resistance of the PAT test mains lead (approx 25milliohms)</i>			
PAT Lead No	1 000a	3 639a	
PAT Lead Resistance	25.0m $\Omega$	19.7m $\Omega$	260u $\Omega$
Bond Res.	0.045 6 $\Omega$	0.045 6 $\Omega$	1m $\Omega$
Bond Res.	0.102 2 $\Omega$	0.102 1 $\Omega$	1m $\Omega$
Bond Res.	0.169 0 $\Omega$	0.169 0 $\Omega$	1.1m $\Omega$
Bond Res.	0.277 9 $\Omega$	0.277 9 $\Omega$	1.1m $\Omega$
Bond Res.	0.399 7 $\Omega$	0.399 8 $\Omega$	1.2m $\Omega$
Bond Res.	0.539 8 $\Omega$	0.539 8 $\Omega$	1.3m $\Omega$
Bond Res.	1.018 7 $\Omega$	1.018 2 $\Omega$	1.5m $\Omega$
Bond Res.	5.055 3 $\Omega$	5.053 0 $\Omega$	3.5m $\Omega$
Bond Res.	9.077 5 $\Omega$	9.077 8 $\Omega$	6m $\Omega$
Bond Res.	90.368 $\Omega$	90.367 6 $\Omega$	18m $\Omega$
Bond Res.	990.839 $\Omega$	990.844 0 $\Omega$	35m $\Omega$

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Test Title	Applied Value	Reading	Uncertainties
<b>PAT : Earth Bond Current Measurement at 0.1 Ohm load</b>			
500mA Rng @ 50Hz	100.0mA	101mA	1.2mA
500mA Rng @ 50Hz	200.0mA	200mA	1.2mA
500mA Rng @ 50Hz	400.0mA	401mA	1.2mA
10A Rng @ 50Hz	4.000A	4.00A	15mA
10A Rng @ 50Hz	8.000A	8.00A	15mA
10A Rng @ 50Hz	10.000A	10.01A	16mA
30A Rng @ 50Hz	12.000A	12.01A	22mA
30A Rng @ 50Hz	20.000A	20.01A	22mA
30A Rng @ 50Hz	25.000A	25.00A	22mA
<b>PAT : Earth Bond Current Measurement at 0.02 Ohm load</b>			
10A Rng @ 50Hz	4.000A	4.00A	15mA
30A Rng @ 50Hz	25.000A	25.00A	22mA
<b>PAT: Load Testing</b>			
S/C Test	0.00Ω	0.23Ω	10mΩ
O/C test	---	Pass	
0.13kVA Test	440Ω	435.1Ω	0.1Ω
<b>PAT: Leakage Current</b>			
Leakage @ 240V	2.000mA	2.000mA	9.3uA
Leakage @ 240V	4.700mA	4.703mA	9.3uA
Leakage @ 240V	7.700mA	7.699mA	9.3uA
Final Checks	---	Pass	
<b>End of results</b>			