

CERTIFICATE OF CALIBRATION

ISSUED BY: LAMBDA CALIBRATION LTD

DATE OF ISSUE: 29 January 2015 CERTIFICATE No: 335035



Lambda
CALIBRATION LTD

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APPROVED SIGNATAORY

AKM
A Kelly D Pilkington
D Whalley C Reed R Armitage

Customer: Premier Autoclaves Service & Solutions Ltd.
Address: Crown works, Worth Way
Keighley, West Yorkshire
BD21 5LR

Item Number: 9287001 (2592)
Description: Portable Calibrator
Model/Range: ASC 300
Manufacturer: Ametek
Date of Cal: 29 Jan 2015
Calibrated by: Thomas McKay
Procedure Name: Ametek, Portable Calibrator, ASC 300
Rev/Basis: 01:E-2000, Based on BS EN 60584.1 & BS EN 60751:2008
Temp/Humidity: 20.0°C ± 2°C <55%rh

The Results on the following pages are: As Found

All Measurements are Traceable to National Standards.

Note 1: The unit under test was calibrated using a Multifunction Calibrator and a long-scale Digital Multimeter.

Note 2: Where the reported value lies within the specified tolerances then this will be indicated by the word "PASS", if outside then by the word "FAIL".

Note 3: Values quoted in the "UUT Nominal Value" column are not necessarily quoted to the same resolution as the actual displayed value on the UUT.

Engineers' Notes: Refer to upper display voltage & current measurement results.

Standard(s) Used: LVD-21 / LVD-26 ✓ / LMMC-02 ✓ / LMMC-04 / LMMC-10 / LMMC-14

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.

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

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Parameter	UUT Nominal Value	True Value	Acceptance Limits Low	Acceptance Limits High	Pass/Fail
Visual/Operational Test					
Result of Operator Evaluation					PASS
DC Voltage Measurement					
Volts In Upper Display					
30	0.0000V	0.0000	-0.0020	0.0020	PASS
30	1.0000V	1.0020	0.9979	1.0022	PASS
30	5.0000V	5.0039	4.9973	5.0027	FAIL
30	10.0000V	10.0053	9.9965	10.0035	FAIL
30	20.0000V	20.0072	19.9950	20.0050	FAIL
30	29.0000V	29.0104	28.9936	29.0064	FAIL
mV In Lower Display					
75	0.0000mV	-0.0010	-0.0100	0.0100	PASS
75	75.0000mV	74.9787	74.9750	75.0250	PASS
Volts In Lower Display					
20	5.0000V	4.9989	4.9973	5.0027	PASS
20	19.0000V	18.9965	18.9951	19.0049	PASS
DC Current Measurement					
mA In Upper Display					
24	0.0000mA	-0.0003	-0.0020	0.0020	PASS
24	8.0000mA	8.0038	7.9968	8.0032	FAIL
24	16.0000mA	16.0057	15.9956	16.0044	FAIL
24	24.0000mA	24.0108	23.9944	24.0056	FAIL
mA In Lower Display					
24	4.0000mA	3.9998	3.9974	4.0026	PASS
24	12.0000mA	11.9976	11.9962	12.0038	PASS
24	24.0000mA	23.9967	23.9944	24.0056	PASS
Frequency Measurement					
1000	10.00Hz @ 5Vp	10.00	9.89	10.11	PASS
1000	100.00Hz @ 5Vp	100.00	99.85	100.15	PASS
1000	900.00Hz @ 5Vp	900.00	899.45	900.55	PASS
10	5.000kHz @ 5Vp	5.000	4.987	5.013	PASS
10	9.000kHz @ 5Vp	9.000	8.986	9.015	PASS
Resistance Measurement (4-wire)					
400	10.000 Ohm	10.002	9.947	10.053	PASS
400	390.000 Ohm	389.933	389.853	390.147	PASS
4000	1000.00 Ohm	999.75	999.25	1000.75	PASS
4000	3900.00 Ohm	3899.06	3898.53	3901.47	PASS
RTD PT100(385) Measurement (Electrical Simul.)					
	-190.00°C	-189.99	-190.20	-189.80	PASS
	100.00°C	99.83	99.70	100.30	PASS
	400.00°C	399.65	399.60	400.40	PASS
	800.00°C	799.69	799.60	800.40	PASS

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Parameter	UUT Nominal Value	True Value	Acceptance Limits Low	Acceptance Limits High	Pass/Fail
Thermocouple Measurement (Electrical Simulation)					
Type K	-100.0°C	-99.5	-101.0	-99.0	PASS
	0.0°C	0.3	-1.0	1.0	PASS
	200.0°C	200.1	199.3	200.7	PASS
	1200.0°C	1199.8	1199.1	1200.9	PASS
Type J	-100.0°C	-99.6	-100.8	-99.2	PASS
	0.0°C	0.3	-0.8	0.8	PASS
	200.0°C	200.1	199.4	200.6	PASS
	1000.0°C	999.9	999.3	1000.7	PASS
Type R	500.0°C	499.7	498.4	501.6	PASS
	1750.0°C	1749.5	1748.4	1751.6	PASS
Type T	-200.0°C	-199.0	-201.0	-199.0	PASS
	390.0°C	390.1	389.4	390.6	PASS
DC Voltage Source					
75	0.0000mV	0.0015	-0.0100	0.0100	PASS
75	75.0000mV	74.9860	74.9750	75.0250	PASS
20	0.0000V	0.0000	-0.0020	0.0020	PASS
20	1.0000V	0.9999	0.9979	1.0022	PASS
20	5.0000V	4.9991	4.9973	5.0027	PASS
20	10.0000V	9.9984	9.9965	10.0035	PASS
20	19.0000V	18.9969	18.9951	19.0049	PASS
DC Current Source					
24	0.0000mA	0.0000	-0.0020	0.0020	PASS
24	4.0000mA	3.9995	3.9974	4.0026	PASS
24	8.0000mA	7.9985	7.9968	8.0032	PASS
24	12.0000mA	11.9981	11.9962	12.0038	PASS
24	20.0000mA	19.9969	19.9950	20.0050	PASS
Resistance Source					
400	100.00 Ohm	100.01	99.88	100.13	PASS
400	390.0 Ohm	390.0	389.8	390.2	PASS
4000	1000.0 Ohm	999.8	999.3	1000.8	PASS
4000	3900.0 Ohm	3900.3	3898.5	3901.5	PASS
RTD PT100 (385) Source (Electrical Simulation)					
The UUT was set to the following temperatures. The output was measured with a long scale DMM and the temperature, based on the International Temperature Scale of 1990 and BS EN 60751:2008, was calculated.					
	0.00°C	0.03	-0.20	0.20	PASS
	100.00°C	100.03	99.70	100.30	PASS
	600.00°C	600.05	599.60	600.40	PASS
Thermocouple Source (Electrical Simulation)					
Type K	-190.0°C	-189.4	-191.0	-189.0	PASS
	0.0°C	0.2	-1.0	1.0	PASS
	500.0°C	500.0	499.3	500.7	PASS
	950.0°C	949.8	949.3	950.7	PASS
	1300.0°C	1299.9	1299.1	1300.9	PASS

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Parameter	UUT Nominal Value	True Value	Acceptance Low	Limits High	Pass/Fail
Type J	-100.0°C	-99.7	-100.8	-99.2	PASS
	1000.0°C	999.9	999.3	1000.7	PASS
Type R	500.0°C	499.3	498.4	501.6	PASS
	1000.0°C	999.6	998.4	1001.6	PASS

End of Calibration Data

ADDITIONAL EQUIPMENT

LTHE-158

Estimated Uncertainty of Measurement:

DC Voltage (generation)

Up to 200mV	±(10.4 ppm + 62nV)
200mV to 2V	±(7.5 ppm + 482nV)
2V to 20V	±(7.4 ppm + 2µV)
20V to 200V	±(12 ppm + 86µV)
200V to 1050V	±(12 ppm + 256µV)

DC Current (generation)

0µA to 200µA	±(120ppm + 0.5nA)
200µA to 2mA	±(117ppm + 5nA)
2mA to 20mA	±(117ppm + 48nA)
20mA to 200mA	±(118ppm + 1.2µA)
200mA to 1A	±(234ppm + 11µA)

Resistance (generation)

0 to 20 Ohm	± (23 ppm + 21 µOhm + 2 LSD)
20 to 200 Ohm	± (15 ppm + 68 µOhm + 2 LSD)
0.2 to 2.0 kOhm	± (12 ppm + 0.7 mOhm + 2 LSD)
2 to 20 kOhm	± (12 ppm + 7 mOhm + 2 LSD)
20 to 200 kOhm	± (14 ppm + 70 mOhm + 2 LSD)
0.2 to 2.0 MOhm	± (26 ppm + 1.5 Ohm + 2 LSD)
2 to 20 MOhm	± (46 ppm + 4 Ohm + 2 LSD)
20 to 200 MOhm	± (360 ppm + 10 kOhm + 2 LSD)
0.2 to 2.0 GOhm	± (0.36 % + 900 kOhm + 2 LSD)

Electrical Simulation of PT-100/PT1000

-200.0°C to 630.0°C:	±(0.26°C + 1LSD)
630.0°C to 850.0°C:	±(0.50°C + 1LSD)

Electrical Simulation of Thermocouples

Type: K	-200°C to -250°C	±(0.58°C + 2 LSD)
Type: K	-200°C to +1300°C	±(0.29°C + 2 LSD)

Electrical Simulation of Thermocouples

Type: J	-210°C to +1200°C	±(0.27°C + 2 LSD)
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Electrical Simulation of Thermocouples

Type: R +0°C to +1767°C ±(0.53°C + 2 LSD)

Electrical Simulation of Thermocouples

Type: T -250°C to -200°C ±(0.60°C + 2 LSD)

Type: T -200°C to +400°C ±(0.29°C + 2 LSD)

DC Voltage (measurement)

0mV to 200mV +/- (11 ppm + 0.6uV)

200mV to 2V +/- (7.5 ppm + 0.8uV)

2V to 20V +/- (7.4 ppm + 2.5uV)

20V to 200V +/- (12 ppm + 86uV)

200V to 1050V +/- (12 ppm + 260uV)

DC Current (measurement)

0uA to 200uA +/- (120ppm + 0.5nA)

200uA to 2mA +/- (120ppm + 5nA)

2mA to 20mA +/- (120ppm + 48nA)

20mA to 200mA +/- (120ppm + 1.2uA)

200mA to 1A +/- (230ppm + 11uA)

1A to 10A +/- (170ppm + 13uA)

10A to 1kA +/- (360ppm + 1.3mA)

Resistance (measurement)

0 Ohm to 20 Ohm ±(23ppm + 21µOhms)

20 Ohm to 200 Ohm ±(15ppm + 68µOhms)

200 Ohm to 2 kOhm ±(12ppm + 700µOhms)

2 kOhm to 20 kOhm ±(12ppm + 7mOhms)

20 kOhm to 200k Ohm ±(14ppm + 70mOhms)

200 kOhm to 2 MOhm ±(26ppm + 1.5Ohms)

2 MOhm to 20 MOhm ±(46ppm + 4Ohms)

20 MOhm to 200 MOhm ±(360ppm + 10kOhms)

200 MOhm to 2 GOhm ±(0.36% + 900kOhms)

Measurement of Electrical Simulation of PT-100

-200.0°C to 850.0°C: ±0.074°C

Electrical Measurement of Thermocouples

Type: K -200°C to -250°C ±(0.68°C + 2 LSD)

Type: K -200°C to +1300°C ±(0.39°C + 2 LSD)

Electrical Measurement of Thermocouples

Type: J -210°C to 1200°C ±(0.37°C + 2 LSD)

Electrical Measurement of Thermocouples

Type: R +0°C to +1767°C ±(0.63°C + 2 LSD)