



Certificate of Calibration

1000178065

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Customer Information

Accurate Calibration & Repair
1924 Pinnacle Drive
Aurora, IL 60504

PO #: 344234
Reference #: 1436826Rg
Account #: 00317
SO #: 36826

Instrument Identification

Instrument Id: **R051089**

Location: **R051089**

Noun: Handheld Calibrator

Model: Memocal 2000

Mfr: ERO Electronic

Serial #: 02.41.002791

Accuracy: See manufacturer's specifications

Certification Information

Reason For Service: Calibration with Data

Technician: Appealle Bullock

Type Of Calibration: Accredited 17025 with Uncertainties

Cal Date: 25 JUL 14

As Found Condition: In Tolerance

Cal Due: 25 OCT 14

As Left Condition: Left As Found

Temperature: 22.9 °C

Procedure: MFR Manual :

Humidity: 47.0 %

Technician Remarks: Datasheet reflects customer specified calibration points. Unit calibrated per AMS 2750 E. Measurement Uncertainty is noted in the As Left column of datasheet.

- No sampling plan or other procedure was used for this calibration. Measurements and information on this certificate are valid at time of calibration only and any number of factors may cause calibration to drift out of tolerance prior to calibration due date.
- This instrument has been calibrated using standards with accuracies traceable to the National Institute of Standards and Technology, derived from natural physical constants, from ratio measurements, or compared to consensus standards.
- The expanded uncertainty of the measurement process has not exceeded 25% of the tolerance allowed for the individual characteristics measured, unless otherwise stated. The uncertainties are based on a 95% confidence level, K=2.
- Measurement uncertainties are not used in the determination of In or Out of Tolerance of the Unit under test.
- J.H. Metrology Co., Inc's Calibration Control System complies with applicable requirements of ANSI Z540-1-1994, ISO 9001, and ISO/IEC 17025-2005.
- The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without the written approval of J.H. Metrology Co., Inc.

Approved By:

President

Date: Jul 25, 2014

Printed: 7/29/2014 07:05:45

JH Metrology Co, Inc. • 1801 Hicks Road, Unit E • Rolling Meadows, Illinois 60008 • Phone: (847) 991-0290 • Fax: (847) 991-0348

✓ In Tolerance ✗ Out of Tolerance

Calibration Data

Range	Nominal	As Found	As Left	Min	Max
mV Output					
-4 mV to 20 mV	-4.000	-3.99776	✓ 0.000647 mV	-4.004	-3.996

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Calibration Data

Range	Nominal	As Found		As Left		Min	Max
mV Output							
	0.000	0.00223	✓	0.000621 mV		-0.004	0.004
	5.000	5.00288	✓	0.000653 mV		4.996	5.004
	10.000	10.00285	✓	0.000686 mV		9.996	10.004
	15.000	15.00324	✓	0.000718 mV		14.996	15.004
	20.000	20.00338	✓	0.000751 mV		19.996	20.004
-40 mV to 200 mV	-40.00	-40.00075	✓	0.005381 mV		-40.04	-39.96
	0.00	-0.00381	✓	0.005121 mV		-0.04	0.04
	50.00	50.00168	✓	0.005446 mV		49.96	50.04
	100.00	100.00521	✓	0.005771 mV		99.96	100.04
	150.00	150.00465	✓	0.006096 mV		149.96	150.04
	200.00	200.0092	✓	0.00641 mV		199.96	200.04
-400 mV to 2000 mV	-400.0	-400.0369	✓	0.05231 mV		-400.4	-399.4
	0.0	-0.05452	✓	0.050121 mV		-0.4	0.4
	500.0	499.9639	✓	0.05276 mV		499.6	500.4
	1000.0	999.9656	✓	0.05501 mV		999.6	1000.4
	1500.0	1499.9742	✓	0.05726 mV		1499.6	1500.4
	2000.0	1999.987	✓	0.0641 mV		1999.6	2000.4
-4000 mV to 20000 mV	-4000	-4000.398	✓	0.5231 mV		-4005	-3995
	0	-0.49768	✓	0.500121 mV		-5	5
	5000	5000.134	✓	0.5276 mV		4995	5005
	10000	9999.722	✓	0.5501 mV		9995	10005
	15000	15000.117	✓	0.5726 mV		14995	15005
	20000	20000.79	✓	0.691 mV		19995	20005
mV Measurement							
-20 mV to 20 mV	-20.000	-19.997	✓	0.0012 mV		-20.006	-19.994
	0.000	0.000	✓	0.0005 mV		-0.006	0.006
	5.000	4.999	✓	0.0011 mV		4.994	5.006
	10.000	9.998	✓	0.0011 mV		9.994	10.006
	15.000	14.998	✓	0.0011 mV		14.994	15.006
	20.000	19.998	✓	0.0012 mV		19.994	20.006
-200 mV to 200 mV	-200.00	-199.99	✓	0.007 mV		-200.06	-199.94
	0.00	0.00	✓	0.005 mV		-0.06	0.06
	50.00	49.99	✓	0.006 mV		49.94	50.06
	100.00	99.99	✓	0.006 mV		99.94	100.06

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Range	Nominal	As Found		As Left		Min	Max
mV Measurement							
	150.00	149.99	✓	0.007 mV		149.94	150.06
	200.00	199.99	✓	0.007 mV		199.94	200.06
-2000 mV to 2000 mV	-2000.0	-1999.8	✓	0.06 mV		-2000.6	-1999.4
	0.0	0.0	✓	0.05 mV		-0.6	0.6
	500.0	500.0	✓	0.05 mV		499.4	500.6
	1000.0	999.8	✓	0.06 mV		999.4	1000.6
	1500.0	1499.9	✓	0.06 mV		1499.4	1500.6
	2000.0	1999.9	✓	0.06 mV		1999.4	2000.6
-20000 mV to 20000 mV	-20000	-19997	✓	0.6 mV		-20008	-19992
	0	0	✓	0.5 mV		-8	8
	5000	4999	✓	0.5 mV		4992	5008
	10000	9999	✓	0.5 mV		9992	10008
	15000	14999	✓	0.6 mV		14992	15008
	20000	19998	✓	0.6 mV		19992	20008
mA Output							
0 mA to 21 mA	0.000	-0.00005445	✓	0.000500405 mA		-0.003	0.003
	1.000	0.9995985	✓	0.00052005 mA		0.997	1.003
	5.000	4.999493	✓	0.0006305 mA		4.997	5.003
	10.000	9.999854	✓	0.0007205 mA		9.997	10.003
	15.000	14.999451	✓	0.0008105 mA		14.997	15.003
	21.000	20.99979	✓	0.0009185 mA		20.997	21.003
mA Measurement							
-20 mA to 20 mA	-20.000	-19.997	✓	0.0014 mA		-20.006	-19.994
	0.000	0.000	✓	0.0005 mA		-0.006	0.006
	5.000	5.000	✓	0.0008 mA		4.994	5.006
	10.000	9.999	✓	0.0010 mA		9.994	10.006
	15.000	15.000	✓	0.0012 mA		14.994	15.006
	20.000	19.999	✓	0.0014 mA		19.994	20.006
-130 mA to 130 mA	-130.00	-130.00	✓	0.012 mA		-130.05	-129.95
	0.00	0.00	✓	0.005 mA		-0.05	0.05
	10.00	10.00	✓	0.005 mA		9.95	10.05
	50.00	50.00	✓	0.008 mA		49.95	50.05
	100.00	100.00	✓	0.011 mA		99.95	100.05
	130.00	130.01	✓	0.012 mA		129.95	130.05



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Calibration Data

Range	Nominal	As Found		As Left		Min	Max
RTD Pt. 100 Ohm Measurement (-200° to 850°C)							
20.68 Ohms	-195.0	-194.9	✓	0.05 °C		-195.3	-194.7
60.26 Ohms	-100.0	-99.9	✓	0.05 °C		-100.3	-99.7
100.00 Ohms	0.0	0.1	✓	0.05 °C		-0.3	0.3
138.51 Ohms	100.0	100.1	✓	0.06 °C		99.7	100.3
280.98 Ohms	500.0	500.2	✓	0.06 °C		499.7	500.3
389.02 Ohms	845.0	845.2	✓	0.06 °C		844.7	845.3
Ohms Measurement							
0 to 800 Ohms	0.0	0.0	✓	0.05 Ohms		-0.2	0.2
	10.0	10.0	✓	0.05 Ohms		9.8	10.2
	100.0	100.0	✓	0.05 Ohms		99.8	100.2
	300.0	300.0	✓	0.06 Ohms		299.8	300.2
	500.0	500.1	✓	0.06 Ohms		499.8	500.2
	790.0	790.1	✓	0.06 Ohms		789.8	790.2
Thermocouple Measurement							
Type E -328° to 1832°F	-328.0	-327.8	✓	0.092 °F		-328.4	-327.6
	-200.0	-199.8	✓	0.108 °F		-200.4	-199.6
	0.0	0.1	✓	0.107 °F		-0.4	0.4
	32.0	32.0	✓	0.107 °F		31.6	32.4
	200.0	199.9	✓	0.106 °F		199.6	200.4
	400.0	399.9	✓	0.107 °F		399.6	400.4
	600.0	599.9	✓	0.107 °F		599.6	600.4
	800.0	799.9	✓	0.107 °F		799.6	800.4
	1000.0	1000.0	✓	0.107 °F		999.6	1000.4
	1200.0	1199.8	✓	0.108 °F		1199.6	1200.4
	1400.0	1399.8	✓	0.108 °F		1399.6	1400.4
	1600.0	1599.8	✓	0.108 °F		1599.6	1600.4
	1832.0	1832.0	✓	0.109 °F		1831.6	1832.4
Type J -328° to 2192°F	-328.0	-327.8	✓	0.098 °F		-328.5	-327.5
	-200.0	-199.8	✓	0.109 °F		-200.5	-199.5
	0.0	0.0	✓	0.107 °F		-0.5	0.5
	32.0	32.0	✓	0.107 °F		31.5	32.5
	200.0	199.9	✓	0.107 °F		199.5	200.5
	400.0	399.9	✓	0.107 °F		399.5	400.5
	600.0	600.1	✓	0.108 °F		599.5	600.5



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Range	Nominal	As Found		As Left		Min	Max
Thermocouple Measurement							
	800.0	800.1	✓	0.108 °F		799.5	800.5
	1000.0	999.9	✓	0.108 °F		999.5	1000.5
	1200.0	1199.8	✓	0.108 °F		1199.5	1200.5
	1600.0	1600.0	✓	0.077 °F		1599.5	1600.5
	1800.0	1800.0	✓	0.081 °F		1799.5	1800.5
	2192.0	2192.0	✓	0.085 °F		2191.5	2192.5
Type K -328° to 2498°F	-328.0	-327.8	✓	0.120 °F		-328.5	-327.5
	-200.0	-199.8	✓	0.111 °F		-200.5	-199.5
	0.0	0.0	✓	0.108 °F		-0.5	0.5
	32.0	32.0	✓	0.108 °F		31.5	32.5
	200.0	200.1	✓	0.108 °F		199.6	200.4
	400.0	399.9	✓	0.109 °F		399.6	400.4
	600.0	599.9	✓	0.109 °F		599.6	600.4
	800.0	800.1	✓	0.109 °F		799.6	800.4
	1000.0	999.9	✓	0.109 °F		999.6	1000.4
	1200.0	1200.0	✓	0.110 °F		1199.6	1200.4
	1400.0	1400.0	✓	0.111 °F		1399.6	1400.4
	1600.0	1600.0	✓	0.112 °F		1599.6	1600.4
	1800.0	1800.0	✓	0.113 °F		1799.3	1800.7
	2000.0	1999.9	✓	0.114 °F		1999.3	2000.7
	2200.0	2199.9	✓	0.115 °F		2199.3	2200.7
	2498.0	2497.8	✓	0.105 °F		2497.1	2498.9
Type T -328° to 752°F	-328.0	-327.9	✓	0.112 °F		-328.5	-327.5
	-200.0	-199.8	✓	0.113 °F		-200.5	-199.5
	0.0	0.1	✓	0.108 °F		-0.5	0.5
	32.0	32.0	✓	0.108 °F		31.5	32.5
	200.0	199.9	✓	0.107 °F		199.7	200.3
	400.0	399.9	✓	0.107 °F		399.7	400.3
	600.0	599.9	✓	0.107 °F		599.7	600.3
	752.0	752.2	✓	0.070 °F		751.7	752.3
Type R -58° to 3214°F	-50.0	-50.3	✓	0.303 °F		-52.6	-47.4
	0.0	-0.8	✓	0.197 °F		-2.6	2.6
	32.0	32.4	✓	0.197 °F		29.4	34.6
	200.0	200.1	✓	0.165 °F		198.4	201.6
	400.0	399.9	✓	0.147 °F		398.8	401.2



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Range	Nominal	As Found		As Left		Min	Max
Thermocouple Measurement							
	600.0	600.1	✓	0.148 °F		599.2	600.8
	800.0	800.2	✓	0.138 °F		799.2	800.8
	1000.0	1000.2	✓	0.139 °F		999.2	1000.8
	1200.0	1200.2	✓	0.132 °F		1199.2	1200.8
	1400.0	1400.3	✓	0.133 °F		1399.2	1400.8
	1600.0	1600.2	✓	0.134 °F		1599.2	1600.8
	1800.0	1800.1	✓	0.129 °F		1799.2	1800.8
	2000.0	1999.8	✓	0.137 °F		1999.2	2000.8
	2200.0	2199.9	✓	0.131 °F		2199.2	2200.8
	2800.0	2800.0	✓	0.133 °F		2799.2	2800.8
	3200.0	3199.6	✓	0.149 °F		3198.8	3201.2
Type S -58° to 3214°F	-50.0	-50.3	✓	0.219 °F		-52.0	-48.0
	0.0	0.0	✓	0.197 °F		-2.0	2.0
	32.0	32.2	✓	0.197 °F		30.0	34.0
	200.0	200.1	✓	0.165 °F		198.8	201.2
	400.0	400.1	✓	0.147 °F		398.8	401.2
	600.0	599.9	✓	0.148 °F		599.2	600.8
	800.0	799.9	✓	0.150 °F		799.2	800.8
	1000.0	1000.0	✓	0.151 °F		999.2	1000.8
	1200.0	1200.0	✓	0.140 °F		1199.2	1200.8
	1400.0	1400.0	✓	0.141 °F		1399.2	1400.8
	1600.0	1599.8	✓	0.142 °F		1599.2	1600.8
	1800.0	1800.0	✓	0.134 °F		1799.2	1800.8
	2000.0	1999.9	✓	0.136 °F		1999.2	2000.8
	2200.0	2199.9	✓	0.137 °F		2199.2	2200.8
	2800.0	2800.0	✓	0.143 °F		2799.2	2800.8
	3200.0	3200.0	✓	0.162 °F		3199.2	3200.8
Type N 32° to 2570°F	32.0	32.0	✓	0.111 °F		31.6	32.4
	200.0	199.9	✓	0.110 °F		199.6	200.4
	400.0	399.9	✓	0.109 °F		399.6	400.4
	600.0	599.9	✓	0.110 °F		599.6	600.4
	800.0	799.9	✓	0.110 °F		799.6	800.4
	1000.0	999.9	✓	0.110 °F		999.6	1000.4
	1200.0	1200.0	✓	0.111 °F		1199.3	1200.7
	1400.0	1400.0	✓	0.111 °F		1399.3	1400.7



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Calibration Data

Range	Nominal	As Found		As Left		Min	Max
Thermocouple Measurement							
	1600.0	1600.0	✓	0.111 °F		1599.3	1600.7
	1800.0	1800.0	✓	0.112 °F		1799.3	1800.7
	2000.0	2000.1	✓	0.113 °F		1999.3	2000.7
	2200.0	2200.1	✓	0.116 °F		2199.2	2200.8
	2370.0	2370.0	✓	0.097 °F		2369.2	2370.8
Type B 122° to 3276°F	150.0	150.6	✓	0.555 °F		126.3	173.7
	200.0	198.1	✓	0.511 °F		176.3	223.7
	400.0	399.1	✓	0.511 °F		396.2	403.8
	600.0	599.5	✓	0.271 °F		596.2	603.8
	800.0	799.5	✓	0.200 °F		798.0	802.0
	1000.0	999.4	✓	0.200 °F		998.0	1002.0
	1200.0	1200.0	✓	0.203 °F		1198.0	1202.0
	1400.0	1400.0	✓	0.150 °F		1398.7	1401.3
	1600.0	1600.2	✓	0.150 °F		1598.7	1601.3
	1800.0	1800.0	✓	0.151 °F		1799.2	1800.8
	2000.0	1999.8	✓	0.152 °F		1999.2	2000.8
	2200.0	2200.1	✓	0.154 °F		2199.2	2200.8
	2600.0	2599.9	✓	0.148 °F		2599.2	2600.8
	3000.0	2999.8	✓	0.137 °F		2999.2	3000.8
	3276.0	3276.0	✓	0.155 °F		3275.2	3276.8
Thermocouple Output							
Type E -328° to 1832°F	-328.0	-327.98	✓	0.063 °F		-328.4	-327.6
	-200.0	-199.88	✓	0.105 °F		-200.4	-199.6
	32.0	32.02	✓	0.054 °F		31.6	32.4
	600.0	600.04	✓	0.056 °F		599.6	600.4
	1000.0	1000.08	✓	0.106 °F		999.6	1000.4
	1829.0	1831.78	✓	0.106 °F		1831.6	1832.4
Type J -328° to 2192°F	-328.0	-327.84	✓	0.064 °F		-328.5	-327.5
	-200.0	-200.07	✓	0.106 °F		-200.5	-199.5
	32.0	31.95	✓	0.054 °F		31.5	32.5
	800.0	800.04	✓	0.106 °F		799.5	800.5
	1600.0	1600.02	✓	0.063 °F		1599.5	1600.5
	2192.0	2192.04	✓	0.068 °F		2191.5	2192.5
Type K -328° to 2498°F	-328.0	-327.75	✓	0.070 °F		-328.5	-327.5



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Range	Nominal	As Found		As Left		Min	Max
Thermocouple Output							
	-200.0	-199.97	✓	0.106 °F		-200.5	-199.5
	32.0	32.02	✓	0.055 °F		31.5	32.5
	600.0	600.13	✓	0.059 °F		599.6	600.4
	1600.0	1599.94	✓	0.066 °F		1599.6	1600.4
	2498.0	2497.98	✓	0.076 °F		2497.1	2498.9
Type T -328° to 752°F	-328.0	-327.77	✓	0.067 °F		-328.5	-327.5
	-200.0	-200.02	✓	0.061 °F		-200.5	-199.5
	32.0	32.02	✓	0.055 °F		31.5	32.5
	200.0	199.94	✓	0.056 °F		199.7	200.3
	400.0	399.92	✓	0.056 °F		399.7	400.3
	752.0	751.86	✓	0.058 °F		751.7	752.3
Type R -58° to 3214°F	-50.0	-49.2	✓	0.111 °F		-52.6	-47.4
	32.0	31.93	✓	0.090 °F		29.4	34.6
	600.0	600.10	✓	0.077 °F		599.2	600.8
	1600.0	1600.05	✓	0.075 °F		1599.2	1600.8
	2200.0	2200.06	✓	0.076 °F		2199.2	2200.8
	3200.0	3199.46	✓	0.087 °F		3198.8	3201.2
Type S -58° to 3214°F	-50.0	-49.4	✓	0.091 °F		-52.0	-48.0
	32.0	32.01	✓	0.090 °F		30.0	34.0
	600.0	600.17	✓	0.077 °F		599.2	600.8
	1600.0	1599.94	✓	0.079 °F		1599.2	1600.8
	2200.0	2200.08	✓	0.078 °F		2199.2	2200.8
	3200.0	3199.86	✓	0.090 °F		3199.2	3200.8
Type N 32° to 2570°F	32.0	32.04	✓	0.059 °F		31.6	32.4
	600.0	600.17	✓	0.060 °F		599.6	600.4
	1400.0	1399.87	✓	0.063 °F		1399.3	1400.7
	1600.0	1599.96	✓	0.077 °F		1599.3	1600.7
	2000.0	1999.81	✓	0.068 °F		1999.3	2000.7
	2370.0	2369.93	✓	0.071 °F		2369.2	2370.8
Type B 122° to 3276°F	150.0	149.2	✓	0.171 °F		126.3	173.7
	1200.0	1199.98	✓	0.095 °F		1198.0	1202.0
	1600.0	1600.11	✓	0.079 °F		1598.7	1601.3
	2000.0	2000.08	✓	0.082 °F		1999.2	2000.8
	2600.0	2600.04	✓	0.080 °F		2599.2	2600.8



Certificate of Calibration

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✓ In Tolerance ✗ Out of Tolerance

Calibration Data

Range	Nominal	As Found	As Left	Min	Max
Thermocouple Output					
	3276.0	3275.92	✓ 0.085 °F	3275.2	3276.8

End of Datasheet

Calibration Standards

<u>NIST Traceable #</u>	<u>Instrument ID#</u>	<u>Description</u>	<u>Model</u>	<u>Calibration Date</u>	<u>Date Due</u>
1000164861	00889	Current Coil, 50 Turn	5500A/Coil	10 OCT 2012	31 OCT 2015
1000170121	02022	Calibrator	5520A/SC1.1GHz	21 AUG 2013	31 AUG 2014
1000173241	01223	PRT Probe	5628	04 DEC 2013	31 DEC 2014
1000173595	00888	Calibrator	5720A	07 JAN 2014	31 JAN 2015
1000175154	00809	Ice Point Dry Well	9101	10 MAR 2014	28 FEB 2015
1000176109	00522	Resistance Standard	RS925A	21 APR 2014	30 APR 2015
1000176110	00266	High Impedance Voltmeter-Null Detector	845AR	21 APR 2014	30 APR 2015
1000176473	00765	Temperature Reference Probe	TRP-J	13 MAY 2014	31 MAY 2015
1000176474	00766	Temperature Reference Probe	TRP-K	13 MAY 2014	31 MAY 2015
1000176475	00767	Temperature Reference Probe	TRP-T	13 MAY 2014	31 MAY 2015
1000176476	00768	Temperature Reference Probe	TRP-E	13 MAY 2014	31 MAY 2015
1000176725	02037	Humidity/Temperature Chart Recorder	RH520	22 MAY 2014	31 MAY 2015
1000177323	00885	Thermometer	1502A	30 JUN 2014	30 JUN 2015