Certificate of Calibration

1000183457

ACCREDITED
Calibration Laboratory
Certificate # 1618.01

Customer Information

Accurate Calibration & Repair
1924 Pinnacle Drive
Aurora, IL 60504

PO #: 344942
Reference #: 1538477Rg
Account #: 00317
SO #: 38477

Instrument Identification

Instrument Id: **R051089 / 02.41.002791**
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: Appeaelle Bullock
Type Of Calibration: Accredited 17025
Cal Date: 29 APR 15
As Found Condition: In Tolerance
Cal Due: 29 JUL 15
As Left Condition: Left As Found
Temperature: 23.2 °C
Procedure: MFR Manual :
Humidity: 34.0 %
Technician Remarks: Datasheet reflects customer specified calibration points. Unit calibrated per AMS 2750 E.

- *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

Printed: 5/28/2015 06:56:34

Date: Apr 30, 2015

Calibration Data

✓In Tolerance ✘Out of Tolerance

Range	Nominal	As Found		As Left		Min	Max	Uncertainty
mV Output								
-4 mV to 20 mV	-4.000	-4.00034	✓	As Found		-4.004	-3.996	0.000647 mV
	0.000	-0.00047	✓	As Found		-0.004	0.004	0.000621 mV

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

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✓ In Tolerance ✗ Out of Tolerance

Calibration Data

Range	Nominal	As Found		As Left		Min	Max	Uncertainty
mV Output								
	5.000	5.00056	✓	As Found		4.996	5.004	0.000653 mV
	10.000	10.00079	✓	As Found		9.996	10.004	0.000686 mV
	15.000	15.00146	✓	As Found		14.996	15.004	0.000718 mV
	20.000	20.00163	✓	As Found		19.996	20.004	0.000751 mV
-40 mV to 200 mV	-40.00	-40.00332	✓	As Found		-40.04	-39.96	0.005381 mV
	0.00	-0.00595	✓	As Found		-0.04	0.04	0.005121 mV
	50.00	50.00051	✓	As Found		49.96	50.04	0.005446 mV
	100.00	100.00473	✓	As Found		99.96	100.04	0.005771 mV
	150.00	150.00524	✓	As Found		149.96	150.04	0.006096 mV
	200.00	200.0109	✓	As Found		199.96	200.04	0.00641 mV
-400 mV to 2000 mV	-400.0	-400.0438	✓	As Found		-400.4	-399.4	0.05231 mV
	0.0	-0.05668	✓	As Found		-0.4	0.4	0.050121 mV
	500.0	499.9713	✓	As Found		499.6	500.4	0.05276 mV
	1000.0	999.9747	✓	As Found		999.6	1000.4	0.05501 mV
	1500.0	1499.9918	✓	As Found		1499.6	1500.4	0.05726 mV
	2000.0	2000.164	✓	As Found		1999.6	2000.4	0.0641 mV
-4000 mV to 20000 mV	-4000	-4000.449	✓	As Found		-4005	-3995	0.5231 mV
	0	-0.48251	✓	As Found		-5	5	0.500121 mV
	5000	5000.156	✓	As Found		4995	5005	0.5276 mV
	10000	9999.844	✓	As Found		9995	10005	0.5501 mV
	15000	15000.247	✓	As Found		14995	15005	0.5726 mV
	20000	20000.94	✓	As Found		19995	20005	0.691 mV
mV Measurement								
-20 mV to 20 mV	-20.000	-19.995	✓	As Found		-20.006	-19.994	0.0012 mV
	0.000	0.000	✓	As Found		-0.006	0.006	0.0005 mV
	5.000	5.000	✓	As Found		4.994	5.006	0.0011 mV
	10.000	9.999	✓	As Found		9.994	10.006	0.0011 mV
	15.000	14.998	✓	As Found		14.994	15.006	0.0011 mV
	20.000	19.998	✓	As Found		19.994	20.006	0.0012 mV
-200 mV to 200 mV	-200.00	-199.96	✓	As Found		-200.06	-199.94	0.007 mV
	0.00	0.00	✓	As Found		-0.06	0.06	0.005 mV
	50.00	49.99	✓	As Found		49.94	50.06	0.006 mV
	100.00	99.98	✓	As Found		99.94	100.06	0.006 mV
	150.00	149.99	✓	As Found		149.94	150.06	0.007 mV

✓ In Tolerance ✗ Out of Tolerance

Calibration Data

Range	Nominal	As Found		As Left		Min	Max	Uncertainty
mV Measurement								
	200.00	199.98	✓	As Found		199.94	200.06	0.007 mV
-2000 mV to 2000 mV	-2000.0	-1999.6	✓	As Found		-2000.6	-1999.4	0.06 mV
	0.0	0.0	✓	As Found		-0.6	0.6	0.05 mV
	500.0	500.0	✓	As Found		499.4	500.6	0.05 mV
	1000.0	999.9	✓	As Found		999.4	1000.6	0.06 mV
	1500.0	1499.9	✓	As Found		1499.4	1500.6	0.06 mV
	2000.0	1999.9	✓	As Found		1999.4	2000.6	0.06 mV
-20000 mV to 20000 mV	-20000	-19995	✓	As Found		-20008	-19992	0.6 mV
	0	0	✓	As Found		-8	8	0.5 mV
	5000	4999	✓	As Found		4992	5008	0.5 mV
	10000	9999	✓	As Found		9992	10008	0.5 mV
	15000	14999	✓	As Found		14992	15008	0.6 mV
	20000	19998	✓	As Found		19992	20008	0.6 mV
mA Output								
0 mA to 21 mA	0.000	-0.00005673	✓	As Found		-0.003	0.003	0.000500405 mA
	1.000	0.9996086	✓	As Found		0.997	1.003	0.00052005 mA
	5.000	4.999633	✓	As Found		4.997	5.003	0.0006305 mA
	10.000	9.999903	✓	As Found		9.997	10.003	0.0007205 mA
	15.000	14.999629	✓	As Found		14.997	15.003	0.0008105 mA
	21.000	20.99965	✓	As Found		20.997	21.003	0.0009185 mA
mA Measurement								
-20 mA to 20 mA	-20.000	-19.996	✓	As Found		-20.006	-19.994	0.0014 mA
	0.000	0.000	✓	As Found		-0.006	0.006	0.0005 mA
	5.000	5.000	✓	As Found		4.994	5.006	0.0008 mA
	10.000	9.999	✓	As Found		9.994	10.006	0.0010 mA
	15.000	14.999	✓	As Found		14.994	15.006	0.0012 mA
	20.000	20.000	✓	As Found		19.994	20.006	0.0014 mA
-130 mA to 130 mA	-130.00	-129.99	✓	As Found		-130.05	-129.95	0.012 mA
	0.00	0.00	✓	As Found		-0.05	0.05	0.005 mA
	10.00	10.00	✓	As Found		9.95	10.05	0.005 mA
	50.00	50.00	✓	As Found		49.95	50.05	0.008 mA
	100.00	100.00	✓	As Found		99.95	100.05	0.011 mA
	130.00	130.01	✓	As Found		129.95	130.05	0.012 mA

✓ In Tolerance ✗ Out of Tolerance

Calibration Data

Range	Nominal	As Found		As Left		Min	Max	Uncertainty
RTD Pt. 100 Ohm Measurement (-200° to 850°C)								
20.68 Ohms	-195.0	-194.9	✓	As Found		-195.3	-194.7	0.05 °C
60.26 Ohms	-100.0	-100.0	✓	As Found		-100.3	-99.7	0.05 °C
100.00 Ohms	0.0	0.0	✓	As Found		-0.3	0.3	0.05 °C
138.51 Ohms	100.0	100.1	✓	As Found		99.7	100.3	0.06 °C
280.98 Ohms	500.0	500.2	✓	As Found		499.7	500.3	0.06 °C
389.02 Ohms	845.0	845.3	✓	As Found		844.7	845.3	0.06 °C
Ohms Measurement								
0 to 800 Ohms	0.0	0.0	✓	As Found		-0.2	0.2	0.05 Ohms
	10.0	10.0	✓	As Found		9.8	10.2	0.05 Ohms
	100.0	100.0	✓	As Found		99.8	100.2	0.05 Ohms
	300.0	300.1	✓	As Found		299.8	300.2	0.06 Ohms
	500.0	500.2	✓	As Found		499.8	500.2	0.06 Ohms
	790.0	790.2	✓	As Found		789.8	790.2	0.06 Ohms
Thermocouple Measurement								
Type E -328° to 1832°F	-328.0	-327.8	✓	As Found		-328.4	-327.6	0.09 °F
	-200.0	-199.8	✓	As Found		-200.4	-199.6	0.11 °F
	0.0	0.1	✓	As Found		-0.4	0.4	0.11 °F
	32.0	32.0	✓	As Found		31.6	32.4	0.11 °F
	200.0	199.9	✓	As Found		199.6	200.4	0.11 °F
	400.0	399.9	✓	As Found		399.6	400.4	0.11 °F
	600.0	599.9	✓	As Found		599.6	600.4	0.11 °F
	800.0	799.9	✓	As Found		799.6	800.4	0.11 °F
	1000.0	999.9	✓	As Found		999.6	1000.4	0.11 °F
	1200.0	1200.0	✓	As Found		1199.6	1200.4	0.11 °F
	1400.0	1399.9	✓	As Found		1399.6	1400.4	0.11 °F
	1600.0	1599.9	✓	As Found		1599.6	1600.4	0.11 °F
	1832.0	1832.0	✓	As Found		1831.6	1832.4	0.11 °F
Type J -328° to 2192°F	-328.0	-327.8	✓	As Found		-328.5	-327.5	0.11 °F
	-200.0	-199.8	✓	As Found		-200.5	-199.5	0.11 °F
	0.0	0.0	✓	As Found		-0.5	0.5	0.11 °F
	32.0	32.0	✓	As Found		31.5	32.5	0.11 °F
	200.0	199.9	✓	As Found		199.5	200.5	0.11 °F
	400.0	399.9	✓	As Found		399.5	400.5	0.11 °F
	600.0	599.9	✓	As Found		599.5	600.5	0.11 °F

✓ In Tolerance ✗ Out of Tolerance

Calibration Data

Range	Nominal	As Found		As Left		Min	Max	Uncertainty
Thermocouple Measurement								
	800.0	799.9	✓	As Found		799.5	800.5	0.11 °F
	1000.0	999.9	✓	As Found		999.5	1000.5	0.11 °F
	1200.0	1199.8	✓	As Found		1199.5	1200.5	0.11 °F
	1600.0	1600.0	✓	As Found		1599.5	1600.5	0.08 °F
	1800.0	1800.0	✓	As Found		1799.5	1800.5	0.08 °F
	2192.0	2191.8	✓	As Found		2191.5	2192.5	0.09 °F
Type K -328° to 2498°F	-328.0	-327.7	✓	As Found		-328.5	-327.5	0.12 °F
	-200.0	-200.0	✓	As Found		-200.5	-199.5	0.11 °F
	0.0	0.0	✓	As Found		-0.5	0.5	0.11 °F
	32.0	32.0	✓	As Found		31.5	32.5	0.11 °F
	200.0	200.1	✓	As Found		199.6	200.4	0.11 °F
	400.0	399.9	✓	As Found		399.6	400.4	0.11 °F
	600.0	599.9	✓	As Found		599.6	600.4	0.11 °F
	800.0	800.1	✓	As Found		799.6	800.4	0.11 °F
	1000.0	999.9	✓	As Found		999.6	1000.4	0.11 °F
	1200.0	1200.0	✓	As Found		1199.6	1200.4	0.11 °F
	1400.0	1400.0	✓	As Found		1399.6	1400.4	0.11 °F
	1600.0	1600.0	✓	As Found		1599.6	1600.4	0.11 °F
	1800.0	1800.0	✓	As Found		1799.3	1800.7	0.11 °F
	2000.0	1999.8	✓	As Found		1999.3	2000.7	0.11 °F
	2200.0	2199.7	✓	As Found		2199.3	2200.7	0.12 °F
	2498.0	2497.8	✓	As Found		2497.1	2498.9	0.11 °F
Type T -328° to 752°F	-328.0	-327.8	✓	As Found		-328.5	-327.5	0.11 °F
	-200.0	-199.8	✓	As Found		-200.5	-199.5	0.11 °F
	0.0	0.1	✓	As Found		-0.5	0.5	0.11 °F
	32.0	32.0	✓	As Found		31.5	32.5	0.11 °F
	200.0	199.9	✓	As Found		199.7	200.3	0.11 °F
	400.0	399.9	✓	As Found		399.7	400.3	0.11 °F
	600.0	599.9	✓	As Found		599.7	600.3	0.11 °F
	752.0	752.0	✓	As Found		751.7	752.3	0.07 °F
Type R -58° to 3214°F	-50.0	-50.3	✓	As Found		-52.6	-47.4	0.30 °F
	0.0	-0.8	✓	As Found		-2.6	2.6	0.20 °F
	32.0	32.0	✓	As Found		29.4	34.6	0.20 °F
	200.0	199.9	✓	As Found		198.4	201.6	0.17 °F
	400.0	399.9	✓	As Found		398.8	401.2	0.15 °F

✓In Tolerance ✘Out of Tolerance

Calibration Data

Range	Nominal	As Found		As Left		Min	Max	Uncertainty
Thermocouple Measurement								
	600.0	599.9	✓	As Found		599.2	600.8	0.15 °F
	800.0	799.9	✓	As Found		799.2	800.8	0.14 °F
	1000.0	999.9	✓	As Found		999.2	1000.8	0.14 °F
	1200.0	1200.0	✓	As Found		1199.2	1200.8	0.13 °F
	1400.0	1400.0	✓	As Found		1399.2	1400.8	0.13 °F
	1600.0	1600.0	✓	As Found		1599.2	1600.8	0.13 °F
	1800.0	1799.8	✓	As Found		1799.2	1800.8	0.13 °F
	2000.0	1999.8	✓	As Found		1999.2	2000.8	0.14 °F
	2200.0	2199.9	✓	As Found		2199.2	2200.8	0.13 °F
	2800.0	2800.0	✓	As Found		2799.2	2800.8	0.13 °F
	3200.0	3199.6	✓	As Found		3198.8	3201.2	0.15 °F
Type S -58° to 3214°F	-50.0	-50.3	✓	As Found		-52.0	-48.0	0.22 °F
	0.0	0.0	✓	As Found		-2.0	2.0	0.20 °F
	32.0	32.0	✓	As Found		30.0	34.0	0.20 °F
	200.0	199.8	✓	As Found		198.8	201.2	0.17 °F
	400.0	400.1	✓	As Found		398.8	401.2	0.15 °F
	600.0	599.8	✓	As Found		599.2	600.8	0.15 °F
	800.0	799.7	✓	As Found		799.2	800.8	0.15 °F
	1000.0	1000.0	✓	As Found		999.2	1000.8	0.15 °F
	1200.0	1200.0	✓	As Found		1199.2	1200.8	0.14 °F
	1400.0	1400.0	✓	As Found		1399.2	1400.8	0.14 °F
	1600.0	1599.8	✓	As Found		1599.2	1600.8	0.14 °F
	1800.0	1800.0	✓	As Found		1799.2	1800.8	0.13 °F
	2000.0	1999.9	✓	As Found		1999.2	2000.8	0.14 °F
	2200.0	2199.9	✓	As Found		2199.2	2200.8	0.14 °F
	2800.0	2800.0	✓	As Found		2799.2	2800.8	0.14 °F
	3200.0	3199.8	✓	As Found		3199.2	3200.8	0.16 °F
Type N 32° to 2570°F	32.0	32.0	✓	As Found		31.6	32.4	0.11 °F
	200.0	199.9	✓	As Found		199.6	200.4	0.11 °F
	400.0	399.9	✓	As Found		399.6	400.4	0.11 °F
	600.0	599.9	✓	As Found		599.6	600.4	0.11 °F
	800.0	799.9	✓	As Found		799.6	800.4	0.11 °F
	1000.0	999.9	✓	As Found		999.6	1000.4	0.11 °F
	1200.0	1199.8	✓	As Found		1199.3	1200.7	0.11 °F
	1400.0	1400.0	✓	As Found		1399.3	1400.7	0.11 °F

✓In Tolerance ✘Out of Tolerance

Calibration Data

Range	Nominal	As Found		As Left		Min	Max	Uncertainty
Thermocouple Measurement								
	1600.0	1600.0	✓	As Found		1599.3	1600.7	0.11 °F
	1800.0	1800.0	✓	As Found		1799.3	1800.7	0.11 °F
	2000.0	2000.1	✓	As Found		1999.3	2000.7	0.11 °F
	2200.0	2200.1	✓	As Found		2199.2	2200.8	0.12 °F
	2370.0	2370.0	✓	As Found		2369.2	2370.8	0.10 °F
Type B 122° to 3276°F	150.0	153.7	✓	As Found		126.3	173.7	0.56 °F
	200.0	200.1	✓	As Found		176.3	223.7	0.51 °F
	400.0	399.9	✓	As Found		396.2	403.8	0.51 °F
	600.0	600.1	✓	As Found		596.2	603.8	0.27 °F
	800.0	799.9	✓	As Found		798.0	802.0	0.20 °F
	1000.0	999.7	✓	As Found		998.0	1002.0	0.20 °F
	1200.0	1200.0	✓	As Found		1198.0	1202.0	0.20 °F
	1400.0	1400.0	✓	As Found		1398.7	1401.3	0.15 °F
	1600.0	1600.2	✓	As Found		1598.7	1601.3	0.15 °F
	1800.0	1800.0	✓	As Found		1799.2	1800.8	0.15 °F
	2000.0	1999.8	✓	As Found		1999.2	2000.8	0.15 °F
	2200.0	2200.1	✓	As Found		2199.2	2200.8	0.15 °F
	2600.0	2599.9	✓	As Found		2599.2	2600.8	0.15 °F
	3000.0	2999.8	✓	As Found		2999.2	3000.8	0.14 °F
	3276.0	3276.0	✓	As Found		3275.2	3276.8	0.16 °F
Thermocouple Output								
Type E -328° to 1832°F	-328.0	-327.93	✓	As Found		-328.4	-327.6	0.06 °F
	-200.0	-199.82	✓	As Found		-200.4	-199.6	0.11 °F
	32.0	32.07	✓	As Found		31.6	32.4	0.05 °F
	600.0	600.04	✓	As Found		599.6	600.4	0.06 °F
	1000.0	1000.09	✓	As Found		999.6	1000.4	0.11 °F
	1829.0	1831.96	✓	As Found		1831.6	1832.4	0.11 °F
Type J -328° to 2192°F	-328.0	-327.77	✓	As Found		-328.5	-327.5	0.06 °F
	-200.0	-200.07	✓	As Found		-200.5	-199.5	0.11 °F
	32.0	31.98	✓	As Found		31.5	32.5	0.05 °F
	800.0	800.10	✓	As Found		799.5	800.5	0.11 °F
	1600.0	1600.00	✓	As Found		1599.5	1600.5	0.06 °F
	2192.0	2192.08	✓	As Found		2191.5	2192.5	0.07 °F
Type K -328° to 2498°F	-328.0	-327.58	✓	As Found		-328.5	-327.5	0.07 °F

✓In Tolerance ✘Out of Tolerance

Calibration Data

Range	Nominal	As Found		As Left		Min	Max	Uncertainty
Thermocouple Output								
	-200.0	-199.88	✓	As Found		-200.5	-199.5	0.11 °F
	32.0	32.08	✓	As Found		31.5	32.5	0.06 °F
	600.0	600.24	✓	As Found		599.6	600.4	0.06 °F
	1600.0	1599.96	✓	As Found		1599.6	1600.4	0.07 °F
	2498.0	2498.09	✓	As Found		2497.1	2498.9	0.08 °F
Type T -328° to 752°F	-328.0	-327.69	✓	As Found		-328.5	-327.5	0.07 °F
	-200.0	-199.95	✓	As Found		-200.5	-199.5	0.06 °F
	32.0	32.06	✓	As Found		31.5	32.5	0.06 °F
	200.0	199.99	✓	As Found		199.7	200.3	0.06 °F
	400.0	399.96	✓	As Found		399.7	400.3	0.06 °F
	752.0	751.89	✓	As Found		751.7	752.3	0.06 °F
Type R -58° to 3214°F	-50.0	-49.8	✓	As Found		-52.6	-47.4	0.11 °F
	32.0	32.52	✓	As Found		29.4	34.6	0.09 °F
	600.0	600.36	✓	As Found		599.2	600.8	0.08 °F
	1600.0	1600.21	✓	As Found		1599.2	1600.8	0.08 °F
	2200.0	2200.33	✓	As Found		2199.2	2200.8	0.08 °F
	3200.0	3199.79	✓	As Found		3198.8	3201.2	0.09 °F
Type S -58° to 3214°F	-50.0	-49.5	✓	As Found		-52.0	-48.0	0.09 °F
	32.0	32.45	✓	As Found		30.0	34.0	0.09 °F
	600.0	600.39	✓	As Found		599.2	600.8	0.08 °F
	1600.0	1600.23	✓	As Found		1599.2	1600.8	0.08 °F
	2200.0	2200.17	✓	As Found		2199.2	2200.8	0.08 °F
	3200.0	3200.12	✓	As Found		3199.2	3200.8	0.09 °F
Type N 32° to 2570°F	32.0	32.11	✓	As Found		31.6	32.4	0.06 °F
	600.0	600.22	✓	As Found		599.6	600.4	0.06 °F
	1400.0	1399.87	✓	As Found		1399.3	1400.7	0.06 °F
	1600.0	1600.02	✓	As Found		1599.3	1600.7	0.07 °F
	2000.0	1999.88	✓	As Found		1999.3	2000.7	0.07 °F
	2370.0	2370.06	✓	As Found		2369.2	2370.8	0.07 °F
Type B 122° to 3276°F	150.0	149.1	✓	As Found		126.3	173.7	0.18 °F
	1200.0	1200.29	✓	As Found		1198.0	1202.0	0.10 °F
	1600.0	1600.36	✓	As Found		1598.7	1601.3	0.08 °F
	2000.0	2000.37	✓	As Found		1999.2	2000.8	0.08 °F
	2600.0	2600.24	✓	As Found		2599.2	2600.8	0.08 °F

Certificate of Calibration

1000183457

ACCREDITED
Calibration Laboratory
Certificate # 1618.01

Calibration Data

✓ In Tolerance ✗ Out of Tolerance

Range	Nominal	As Found		As Left		Min	Max	Uncertainty
Thermocouple Output								
	3276.0	3276.14	✓	As Found		3275.2	3276.8	0.09 °F

End of Datasheet

Calibration Standards

NIST Traceable #	Instrument ID#	Description	Model	Calibration Date	Date Due
1000176725	02037	Humidity/Temperature Chart Recorder	RH520	22 MAY 2014	31 MAY 2015
1000177333	02006	Calibrator	5500A/SC600	26 NOV 2014	30 NOV 2015
1000178178	01241	Precision Process Calibrator	7526A	24 JUL 2014	31 JUL 2015
1000180945	00890	Reference Multimeter	8508A-01	29 DEC 2014	31 DEC 2015
1000180960	00888	Calibrator	5720A	06 JAN 2015	31 JAN 2016
1000183402	00522	Resistance Standard	RS925A	23 APR 2015	30 APR 2016
1000183643	00266	High Impedance Voltmeter-Null Detector	845AR	23 APR 2015	30 APR 2016