Certificate of Calibration

1000227639

ACCREDITED
CERT #1618.01

Customer Information

Accurate Calibration & Repair
1924 Pinnacle Drive
Aurora, IL 60504

PO #: 2209
Reference #: 2251405Rg
Account #: 00317
SO #: 51405

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: 24 JAN 22
As Found Condition: In Tolerance
Cal Due: 24 APR 22
As Left Condition: Left As Found
Temperature: 22.5 °C
Procedure: MFR Manual :
Humidity: 30.0 %
Technician Remarks: Datasheet reflects Customer specified calibration points. Calibrated per AMS 2750 F.

- *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 the calibrated item to drift out of tolerance before the assigned calibration interval.*
- *The calibration results published in this certificate were obtained using test equipment that has been calibrated by Certified Standards and are traceable through the National Institute of Standards and Technology (NIST), derived from natural physical constants, from ratio measurements, or compared to consensus standards to the International System of Units (SI).*
- *Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2. J.H. Metrology Co., Inc. does not apply the reported calculated measurement uncertainty to manufacturer or other sources of tolerances/specifications to determine the instrument pass or fail status. (Uncertainties are listed separately for each test point.) It is the responsibility of the Customer to consider measurement uncertainty when determining the instrument suitability.*
- *(!) Designates that the expanded uncertainty of measurement does not meet the 95% confidence level.*
- *This certificate may contain data that is not covered by our 17025 Scope of Accreditation and are marked with an asterisk (*). Pass/Fail tests are not accredited. Calibration Standards listed on this Certificate of Calibration with a Due Date of 00 0000 are support items that do not require calibration (NPCR).*
- *J.H. Metrology Co., Inc.'s Calibration Control System complies with applicable requirements of ANSI Z540-1, ISO 9001:2015 (by DQS, Inc), ISO/IEC 17025:2017 (by A2LA), and when required contractually, 10CFR21.*
- *The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without the written permission of J.H. Metrology Co., Inc.*

Metrology Technician

Neil Willert, President

Quality Approval Date: Jan 24, 2022

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	-4.00038	✓	As Found		-4.004	-3.996	0.00060 mV
	0.000	-0.00026	✓	As Found		-0.004	0.004	0.00059 mV
	5.000	4.99971	✓	As Found		4.996	5.004	0.00060 mV
	10.000	9.99997	✓	As Found		9.996	10.004	0.00061 mV
	15.000	14.99978	✓	As Found		14.996	15.004	0.00062 mV
	20.000	20.00009	✓	As Found		19.996	20.004	0.00063 mV
-40 mV to 200 mV	-40.00	-39.99969	✓	As Found		-40.04	-39.96	0.0058 mV
	0.00	-0.00274	✓	As Found		-0.04	0.04	0.0058 mV
	50.00	49.99932	✓	As Found		49.96	50.04	0.0058 mV
	100.00	100.00012	✓	As Found		99.96	100.04	0.0059 mV
	150.00	150.00023	✓	As Found		149.96	150.04	0.0059 mV
	200.00	200.0013	✓	As Found		199.96	200.04	0.0060 mV
-400 mV to 2000 mV	-400.0	-400.0016	✓	As Found		-400.4	-399.4	0.058 mV
	0.0	-0.02086	✓	As Found		-0.4	0.4	0.058 mV
	500.0	499.9709	✓	As Found		499.6	500.4	0.058 mV
	1000.0	999.9742	✓	As Found		999.6	1000.4	0.058 mV
	1500.0	1499.9889	✓	As Found		1499.6	1500.4	0.059 mV
	2000.0	2000.005	✓	As Found		1999.6	2000.4	0.060 mV
-4000 mV to 20000 mV	-4000	-3999.927	✓	As Found		-4005	-3995	0.58 mV
	0	0.01079	✓	As Found		-5	5	0.58 mV
	5000	5000.261	✓	As Found		4995	5005	0.58 mV
	10000	9999.937	✓	As Found		9995	10005	0.58 mV
	15000	14999.968	✓	As Found		14995	15005	0.59 mV
	20000	20000.31	✓	As Found		19995	20005	0.61 mV
mV Measurement								
-20 mV to 20 mV	-20.000	-19.998	✓	As Found		-20.006	-19.994	0.00090 mV
	0.000	-0.001	✓	As Found		-0.006	0.006	0.00077 mV
	5.000	4.999	✓	As Found		4.994	5.006	0.00080 mV
	10.000	9.998	✓	As Found		9.994	10.006	0.00083 mV
	15.000	14.998	✓	As Found		14.994	15.006	0.00086 mV
	20.000	19.999	✓	As Found		19.994	20.006	0.00090 mV
-200 mV to 200 mV	-200.00	-199.97	✓	As Found		-200.06	-199.94	0.0063 mV
	0.00	0.00	✓	As Found		-0.06	0.06	0.0058 mV
	50.00	50.00	✓	As Found		49.94	50.06	0.0059 mV

Calibration Data

✓ In Tolerance ✘ Out of Tolerance

Range	Nominal	As Found		As Left		Min	Max	Uncertainty
mV Measurement								
	100.00	99.99	✓	As Found		99.94	100.06	0.0060 mV
	150.00	150.00	✓	As Found		149.94	150.06	0.0061 mV
	200.00	199.99	✓	As Found		199.94	200.06	0.0063 mV
-2000 mV to 2000 mV	-2000.0	-1999.7	✓	As Found		-2000.6	-1999.4	0.060 mV
	0.0	0.0	✓	As Found		-0.6	0.6	0.058 mV
	500.0	500.0	✓	As Found		499.4	500.6	0.058 mV
	1000.0	999.9	✓	As Found		999.4	1000.6	0.059 mV
	1500.0	1500.0	✓	As Found		1499.4	1500.6	0.059 mV
	2000.0	1999.9	✓	As Found		1999.4	2000.6	0.060 mV
-20000 mV to 20000 mV	-20000	-19997	✓	As Found		-20008	-19992	0.59 mV
	0	0	✓	As Found		-8	8	0.58 mV
	5000	5000	✓	As Found		4992	5008	0.58 mV
	10000	9999	✓	As Found		9992	10008	0.58 mV
	15000	14999	✓	As Found		14992	15008	0.59 mV
	20000	20000	✓	As Found		19992	20008	0.59 mV
mA Output								
0 mA to 21 mA	0.000	-0.00007941	✓	As Found		-0.003	0.003	0.00058 mA
	1.000	0.9999726	✓	As Found		0.997	1.003	0.00058 mA
	5.000	4.999857	✓	As Found		4.997	5.003	0.00060 mA
	10.000	10.000436	✓	As Found		9.997	10.003	0.00062 mA
	15.000	15.000283	✓	As Found		14.997	15.003	0.00066 mA
	21.000	21.00062	✓	As Found		20.997	21.003	0.00072 mA
mA Measurement								
-20 mA to 20 mA	-20.000	-19.997	✓	As Found		-20.006	-19.994	0.0011 mA
	0.000	0.000	✓	As Found		-0.006	0.006	0.00058 mA
	5.000	5.000	✓	As Found		4.994	5.006	0.00063 mA
	10.000	9.999	✓	As Found		9.994	10.006	0.00074 mA
	15.000	14.999	✓	As Found		14.994	15.006	0.00087 mA
	20.000	19.999	✓	As Found		19.994	20.006	0.0011 mA
-130 mA to 130 mA	-130.00	-129.99	✓	As Found		-130.05	-129.95	0.0094 mA
	0.00	0.00	✓	As Found		-0.05	0.05	0.0058 mA
	10.00	10.00	✓	As Found		9.95	10.05	0.0058 mA
	50.00	50.00	✓	As Found		49.95	50.05	0.0067 mA

Calibration Data

✓ In Tolerance ✘ Out of Tolerance

Range	Nominal	As Found		As Left		Min	Max	Uncertainty
mA Measurement								
	100.00	100.00	✓	As Found		99.95	100.05	0.0082 mA
	130.00	130.00	✓	As Found		129.95	130.05	0.0094 mA
RTD Pt. 100 Ohm Measurement (-200° to 850°C)								
20.68 Ohms	-195.0	-195.0	✓	As Found		-195.6	-194.4	0.058 °C
60.26 Ohms	-100.0	-100.0	✓	As Found		-100.6	-99.4	0.058 °C
100.00 Ohms	0.0	0.0	✓	As Found		-0.6	0.6	0.058 °C
138.51 Ohms	100.0	100.0	✓	As Found		99.4	100.6	0.058 °C
280.98 Ohms	500.0	500.0	✓	As Found		499.4	500.6	0.059 °C
389.02 Ohms	845.0	844.9	✓	As Found		844.1	845.9	0.060 °C
Ohms Measurement								
0 to 800 Ohms	0.0	0.0	✓	As Found		-0.2	0.2	0.058 Ohms
	10.0	10.0	✓	As Found		9.8	10.2	0.058 Ohms
	100.0	100.0	✓	As Found		99.8	100.2	0.058 Ohms
	300.0	300.0	✓	As Found		299.8	300.2	0.058 Ohms
	500.0	500.0	✓	As Found		499.8	500.2	0.058 Ohms
	790.0	789.9	✓	As Found		789.8	790.2	0.059 Ohms
Thermocouple Measurement								
Type E -328° to 1832°F	-328.0	-328.0	✓	As Found		-329.0	-327.0	0.061 °F
	-200.0	-200.2	✓	As Found		-201.0	-199.0	0.058 °F
	0.0	-0.2	✓	As Found		-1.0	1.0	0.058 °F
	32.0	31.8	✓	As Found		31.0	33.0	0.058 °F
	200.0	199.	✓	As Found		199.0	201.0	0.058 °F
	400.0	399.9	✓	As Found		399.0	401.0	0.058 °F
	600.0	600.1	✓	As Found		599.0	601.0	0.058 °F
	800.0	799.9	✓	As Found		799.0	801.0	0.058 °F
	1000.0	1000.0	✓	As Found		999.0	1001.0	0.058 °F
	1200.0	1200.0	✓	As Found		1198.8	1201.2	0.058 °F
	1400.0	1400.0	✓	As Found		1398.6	1401.4	0.059 °F
	1600.0	1600.0	✓	As Found		1598.4	1601.6	0.059 °F
	1832.0	1832.2	✓	As Found		1830.2	1833.8	0.059 °F
Type J -328° to 2192°F	-328.0	-328.2	✓	As Found		-329.0	-327.0	0.058 °F
	-200.0	-200.0	✓	As Found		-201.0	-199.0	0.058 °F
	0.0	0.0	✓	As Found		-1.0	1.0	0.058 °F

✓ In Tolerance ✘ Out of Tolerance

Calibration Data

Range	Nominal	As Found		As Left		Min	Max	Uncertainty
Thermocouple Measurement								
	32.0	32.0	✓	As Found		31.0	33.0	0.058 °F
	200.0	199.8	✓	As Found		199.0	201.0	0.058 °F
	400.0	399.7	✓	As Found		399.0	401.0	0.058 °F
	600.0	600.1	✓	As Found		599.0	601.0	0.058 °F
	800.0	800.1	✓	As Found		799.0	801.0	0.058 °F
	1000.0	1000.0	✓	As Found		999.0	1001.0	0.059 °F
	1200.0	1200.0	✓	As Found		1198.8	1201.2	0.059 °F
	1600.0	1600.0	✓	As Found		1598.4	1601.6	0.059 °F
	1800.0	1800.0	✓	As Found		1798.2	1801.8	0.059 °F
	2192.0	2192.0	✓	As Found		2189.8	2194.2	0.060 °F
Type K -328° to 2498°F	-328.0	-328.0	✓	As Found		-329.0	-327.0	0.079 °F
	-200.0	-200.2	✓	As Found		-201.0	-199.0	0.058 °F
	0.0	-0.2	✓	As Found		-1.0	1.0	0.058 °F
	32.0	31.8	✓	As Found		31.0	33.0	0.058 °F
	200.0	199.9	✓	As Found		199.0	201.0	0.058 °F
	400.0	399.7	✓	As Found		399.0	401.0	0.058 °F
	600.0	599.9	✓	As Found		599.0	601.0	0.058 °F
	800.0	799.9	✓	As Found		799.0	801.0	0.058 °F
	1000.0	999.9	✓	As Found		999.0	1001.0	0.059 °F
	1200.0	1200.0	✓	As Found		1198.8	1201.2	0.059 °F
	1400.0	1400.0	✓	As Found		1398.6	1401.4	0.059 °F
	1600.0	1600.0	✓	As Found		1598.4	1601.6	0.059 °F
	1800.0	1800.0	✓	As Found		1798.2	1801.8	0.059 °F
	2000.0	1999.9	✓	As Found		1998.0	2002.0	0.059 °F
	2200.0	2199.9	✓	As Found		2197.8	2202.2	0.062 °F
	2498.0	2497.8	✓	As Found		2495.5	2500.5	0.062 °F
Type T -328° to 752°F	-328.0	-328.2	✓	As Found		-329.0	-327.0	0.066 °F
	-200.0	-200.2	✓	As Found		-201.0	-199.0	0.059 °F
	0.0	-0.2	✓	As Found		-1.0	1.0	0.058 °F
	32.0	31.8	✓	As Found		31.0	33.0	0.058 °F
	200.0	199.9	✓	As Found		199.0	201.0	0.058 °F
	400.0	399.9	✓	As Found		399.0	401.0	0.058 °F
	600.0	600.1	✓	As Found		599.0	601.0	0.058 °F
	752.0	752.0	✓	As Found		751.0	753.0	0.058 °F

Calibration Data

✓ In Tolerance ✗ Out of Tolerance

Range	Nominal	As Found		As Left		Min	Max	Uncertainty
Thermocouple Measurement								
Type R -58° to 3214°F	-50.0	-51.2	✓	As Found		-52.6	-47.4	0.065 °F
	0.0	-0.8	✓	As Found		-2.6	2.6	0.065 °F
	32.0	31.3	✓	As Found		29.4	34.6	0.065 °F
	200.0	199.4	✓	As Found		198.4	201.6	0.061 °F
	400.0	399.4	✓	As Found		398.8	401.2	0.060 °F
	600.0	599.7	✓	As Found		599.0	601.0	0.060 °F
	800.0	799.7	✓	As Found		799.0	801.0	0.060 °F
	1000.0	999.7	✓	As Found		999.0	1001.0	0.060 °F
	1200.0	1199.7	✓	As Found		1198.8	1201.2	0.060 °F
	1400.0	1399.8	✓	As Found		1398.6	1401.4	0.060 °F
	1600.0	1599.6	✓	As Found		1598.4	1601.6	0.060 °F
	1800.0	1799.6	✓	As Found		1798.2	1801.8	0.060 °F
	2000.0	1999.6	✓	As Found		1998.0	2002.0	0.060 °F
	2200.0	2199.6	✓	As Found		2197.8	2202.2	0.060 °F
	2800.0	2799.9	✓	As Found		2797.2	2802.8	0.063 °F
	3200.0	3199.6	✓	As Found		3196.8	3203.2	0.063 °F
Type S -58° to 3214°F	-50.0	-51.0	✓	As Found		-52.0	-48.0	0.065 °F
	0.0	-0.8	✓	As Found		-2.0	2.0	0.065 °F
	32.0	31.3	✓	As Found		30.0	34.0	0.065 °F
	200.0	199.6	✓	As Found		198.8	201.2	0.061 °F
	400.0	399.6	✓	As Found		398.8	401.2	0.060 °F
	600.0	599.4	✓	As Found		599.0	601.0	0.060 °F
	800.0	799.5	✓	As Found		799.0	801.0	0.060 °F
	1000.0	999.7	✓	As Found		999.0	1001.0	0.061 °F
	1200.0	1199.7	✓	As Found		1198.8	1201.2	0.061 °F
	1400.0	1399.6	✓	As Found		1398.6	1401.4	0.061 °F
	1600.0	1599.6	✓	As Found		1598.4	1601.6	0.061 °F
	1800.0	1799.4	✓	As Found		1798.2	1801.8	0.061 °F
	2000.0	1999.4	✓	As Found		1998.0	2002.0	0.061 °F
	2200.0	2199.6	✓	As Found		2197.8	2202.2	0.061 °F
	2800.0	2799.6	✓	As Found		2797.2	2802.8	0.064 °F
	3200.0	3199.4	✓	As Found		3196.8	3203.2	0.064 °F
Type N 32° to 2570°F	32.0	31.8	✓	As Found		31.0	33.0	0.058 °F
	200.0	199.8	✓	As Found		199.0	201.0	0.058 °F

Calibration Data

✓ In Tolerance ✘ Out of Tolerance

Range	Nominal	As Found		As Left		Min	Max	Uncertainty
Thermocouple Measurement								
	400.0	399.7	✓	As Found		399.0	401.0	0.058 °F
	600.0	599.9	✓	As Found		599.0	601.0	0.058 °F
	800.0	799.9	✓	As Found		799.0	801.0	0.058 °F
	1000.0	999.9	✓	As Found		999.0	1001.0	0.059 °F
	1200.0	1199.8	✓	As Found		1198.8	1201.2	0.059 °F
	1400.0	1400.0	✓	As Found		1398.6	1401.4	0.059 °F
	1600.0	1600.0	✓	As Found		1598.4	1601.6	0.059 °F
	1800.0	1800.0	✓	As Found		1798.2	1801.8	0.059 °F
	2000.0	1999.9	✓	As Found		1998.0	2002.0	0.059 °F
	2200.0	2199.9	✓	As Found		2197.8	2202.2	0.060 °F
	2370.0	2370.0	✓	As Found		2367.6	2372.4	0.060 °F
Type B 122° to 3276°F	150.0	144.9	✓	As Found		126.3	173.7	0.15 °F
	200.0	194.4	✓	As Found		176.3	223.7	0.15 °F
	400.0	397.4	✓	As Found		396.2	403.8	0.074 °F
	600.0	598.5	✓	As Found		596.2	603.8	0.064 °F
	800.0	798.6	✓	As Found		798.0	802.0	0.064 °F
	1000.0	999.3	✓	As Found		998.0	1002.0	0.062 °F
	1200.0	1199.5	✓	As Found		1198.0	1202.0	0.062 °F
	1400.0	1399.5	✓	As Found		1398.6	1401.4	0.060 °F
	1600.0	1599.4	✓	As Found		1598.4	1601.6	0.060 °F
	1800.0	1799.4	✓	As Found		1798.2	1801.8	0.060 °F
	2000.0	1999.6	✓	As Found		1998.0	2002.0	0.060 °F
	2200.0	2199.6	✓	As Found		2197.8	2202.2	0.060 °F
	2600.0	2599.7	✓	As Found		2597.4	2602.6	0.060 °F
	3000.0	2999.7	✓	As Found		2997.0	3003.0	0.061 °F
	3272.0	3271.5	✓	As Found		3268.7	3275.3	0.061 °F
Thermocouple Output								
Type E -328° to 1832°F	-328.0	-327.98	✓	As Found		-329.0	-327.0	0.061 °F
	-200.0	-199.82	✓	As Found		-201.0	-199.0	0.058 °F
	32.0	32.00	✓	As Found		31.0	33.0	0.058 °F
	600.0	600.01	✓	As Found		599.0	601.0	0.058 °F
	1000.0	1000.02	✓	As Found		999.0	1001.0	0.058 °F
	1832.0	1831.84	✓	As Found		1830.2	1833.8	0.059 °F
Type J -328° to 2192°F	-328.0	-327.87	✓	As Found		-329.0	-327.0	0.058 °F

Calibration Data

✓ In Tolerance ✘ Out of Tolerance

Range	Nominal	As Found		As Left		Min	Max	Uncertainty
Thermocouple Output								
	-200.0	-199.99	✓	As Found		-201.0	-199.0	0.058 °F
	32.0	31.98	✓	As Found		31.0	33.0	0.058 °F
	800.0	799.97	✓	As Found		799.0	801.0	0.058 °F
	1600.0	1599.91	✓	As Found		1598.4	1601.6	0.059 °F
	2192.0	2192.04	✓	As Found		2189.8	2194.2	0.060 °F
Type K -328° to 2498°F	-328.0	-327.55	✓	As Found		-329.0	-327.0	0.079 °F
	-200.0	-199.93	✓	As Found		-201.0	-199.0	0.058 °F
	32.0	32.00	✓	As Found		31.0	33.0	0.058 °F
	600.0	600.12	✓	As Found		599.0	601.0	0.058 °F
	1600.0	1599.85	✓	As Found		1598.4	1601.6	0.059 °F
	2498.0	2497.87	✓	As Found		2495.5	2500.5	0.062 °F
Type T -328° to 752°F	-328.0	-327.68	✓	As Found		-329.0	-327.0	0.066 °F
	-200.0	-199.97	✓	As Found		-201.0	-199.0	0.059 °F
	32.0	32.00	✓	As Found		31.0	33.0	0.058 °F
	200.0	199.90	✓	As Found		199.0	201.0	0.058 °F
	400.0	399.88	✓	As Found		399.0	401.0	0.058 °F
	752.0	751.86	✓	As Found		751.0	753.0	0.058 °F
Type R -58° to 3214°F	-50.0	-49.79	✓	As Found		-52.6	-47.4	0.065 °F
	32.0	31.91	✓	As Found		29.4	34.6	0.065 °F
	600.0	599.97	✓	As Found		599.0	601.0	0.060 °F
	1600.0	1599.93	✓	As Found		1598.4	1601.6	0.060 °F
	2200.0	2199.92	✓	As Found		2197.8	2202.2	0.060 °F
	3200.0	3199.59	✓	As Found		3196.8	3203.2	0.063 °F
Type S -58° to 3214°F	-50.0	-49.71	✓	As Found		-52.0	-48.0	0.065 °F
	32.0	31.91	✓	As Found		30.0	34.0	0.065 °F
	600.0	599.97	✓	As Found		599.0	601.0	0.060 °F
	1600.0	1599.85	✓	As Found		1598.4	1601.6	0.061 °F
	2200.0	2199.79	✓	As Found		2197.8	2202.2	0.061 °F
	3200.0	3199.82	✓	As Found		3196.8	3203.2	0.064 °F
Type N 32° to 2570°F	32.0	32.00	✓	As Found		31.0	33.0	0.058 °F
	600.0	600.17	✓	As Found		599.0	601.0	0.058 °F
	1400.0	1399.89	✓	As Found		1398.6	1401.4	0.059 °F
	1600.0	1599.91	✓	As Found		1598.4	1601.6	0.059 °F
	2000.0	1999.83	✓	As Found		1998.0	2002.0	0.059 °F

Certificate of Calibration

1000227639

ACCREDITED CERT #1618.01

Calibration Data

✓ In Tolerance ✘ Out of Tolerance

Range	Nominal	As Found		As Left		Min	Max	Uncertainty
Thermocouple Output								
	2370.0	2369.98	✓	As Found		2367.6	2372.4	0.060 °F
Type B 122° to 3276°F	150.0	146.3	✓	As Found		126.3	173.7	0.15 °F
	1200.0	1199.81	✓	As Found		1198.0	1202.0	0.062 °F
	1600.0	1599.91	✓	As Found		1598.4	1601.6	0.060 °F
	2000.0	1999.98	✓	As Found		1998.0	2002.0	0.060 °F
	2600.0	2599.93	✓	As Found		2597.4	2602.6	0.060 °F
	3272.0	3271.82	✓	As Found		3268.7	3275.3	0.061 °F

End of Datasheet

Calibration Standards

NIST Traceable #	Instrument ID#	Description	Model	Calibration Date	Date Due
1000220683	00890	Multimeter, 8.5 Digit Reference	8508A-01	26 JAN 2021	31 JAN 2022
1000222775	00266	High Impedance Voltmeter-Null Detector	845AR	22 APR 2021	30 APR 2022
1000222787	00522	Resistance Standard	RS925A	22 APR 2021	30 APR 2022
1000222817	01196	RH/Temperature Data Logger	EL-USB-2-LCD	29 APR 2021	30 APR 2022
1000226988	00888	Calibrator	5720A	11 JAN 2022	31 JAN 2023