

# Certificate of Accreditation



**Techmaster Electronics, LLC.**

**2453 Cades Way**

**Vista CA 92081**

having satisfactorily demonstrated conformance to the requirements of

**ISO/IEC 17025:1999**

and technical competence for the activities identified on the attached schedule,

**TUV Rheinland of North America, Inc.**

hereby grants accreditation for the following activities:

**Calibration**

Initial Approval: May 9, 2002

Current Approval: September 1, 2005

Current Expiration: August 31, 2008

**Accreditation Certificate 74 400 2037**

Revision: 3

A handwritten signature in black ink, appearing to read 'Dave Moody', written over a horizontal line.

Dave Moody – Program Manager

Laboratory Accreditation Services

Youngsville NC

# Schedule of Accreditation



## Techmaster Electronics, LLC. Vista CA

### Accreditation Certificate 74 400 2037

Revision: 3

Parameter	Range	Uncertainty <sup>1</sup>	Notes
DC Volts Source			732A
	10 VDC	4.5 ppm	
	1 VDC and 1.018 VDC	12.5 ppm	
		+/- (ppm of output + $\mu$ V)	5720A
	220mV	7.5 + 0.4 $\mu$ V	Resolution 10 nV
	2.2V	5 + 0.7 $\mu$ V	Resolution 100 nV
	11V	3.5 + 2.5 $\mu$ V	Resolution 1 $\mu$ V
	22V	3.5 + 4 $\mu$ V	Resolution 1 $\mu$ V
	220V	5 + 40 $\mu$ V	Resolution 10 $\mu$ V
1100V	6.5 + 400 $\mu$ V	Resolution 100 $\mu$ V	

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Parameter	Range	Uncertainty <sup>1</sup>	Notes
<b>DC Volts Measure</b>		+/- (ppm of rdg + ppm range)	3458A
	100.0000 mV	15.7 + 10	Resolution 10nV
	1.000000 V	13.7 + 1	Resolution 10nV
	10.00000 V	12.4 + 0.2	Resolution 100nV
	100.0000 V	16 + 0.3	Resolution 1µV
	1000.000 V	18.9 + 0.1	Resolution 10µV
	40000.000V	+/- 1%	
<b>AC Volts Source</b>		+/- (ppm of output + µV)	5720A
10 Hz - 20 Hz	2.2 mV	240 + 4 µV	Resolution 1 nV
20 Hz - 40 Hz		90 + 4 µV	
40 Hz - 20 kHz		80 + 4 µV	
20 kHz - 50 kHz		200 + 4 µV	
50 kHz - 100 kHz		500 + 5 µV	
100 kHz - 300 kHz		1050 + 10 µV	
300 kHz - 500 kHz		1400 + 20 µV	
500 kHz - 1 MHz		2700 + 20 µV	

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<b>AC Volts Source</b>		+/- (ppm of output + $\mu$ V)	5720A
10 Hz - 20 Hz	22 mV	240 + 4 $\mu$ V	Resolution 10nV
20 Hz - 40 Hz		90 + 4 $\mu$ V	
40 Hz - 20 kHz		80 + 4 $\mu$ V	
20 kHz - 50 kHz		200 + 4 $\mu$ V	
50 kHz - 100 kHz		500 + 5 $\mu$ V	
100 kHz - 300 kHz		1050 + 10 $\mu$ V	
300 kHz - 500 kHz		1400 + 20 $\mu$ V	
500 kHz - 1 MHz		2700 + 20 $\mu$ V	
10 Hz - 20 Hz	220 mV	240 + 12 $\mu$ V	Resolution 100 nV
20 Hz - 40 Hz		90 + 7 $\mu$ V	
40 Hz - 20 kHz		80 + 7 $\mu$ V	
20 kHz - 50 kHz		200 + 7 $\mu$ V	
50 kHz - 100 kHz		460 + 17 $\mu$ V	
100 kHz - 300 kHz		900 + 20 $\mu$ V	

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Parameter	Range	Uncertainty <sup>1</sup>	Notes
300 kHz - 500 kHz		1400 + 25 $\mu$ V	
500 kHz - 1 MHz		2700 + 45 $\mu$ V	
<b>AC Volts Source</b>		+/- (ppm of output + $\mu$ V)	5720A
10 Hz - 20 Hz	2.2 V	240 + 40 $\mu$ V	Resolution 1 mV
20 Hz - 40 Hz		90 + 15 $\mu$ V	
40 Hz - 20 kHz		45 + 8 $\mu$ V	
20 kHz - 50 kHz		75 + 10 $\mu$ V	
50 kHz - 100 kHz		110 + 30 $\mu$ V	
100 kHz - 300 kHz		420 + 80 $\mu$ V	
300 kHz - 500 kHz		1000 + 200 $\mu$ V	
500 kHz - 1 MHz		1700 + 300 $\mu$ V	
10 Hz - 20 Hz	22 V	240 + 400 $\mu$ V	Resolution 10 mV
20 Hz - 40 Hz		90 + 150 $\mu$ V	
40 Hz - 20 kHz		45 + 50 $\mu$ V	
20 kHz - 50 kHz		75 + 100 $\mu$ V	
50 kHz - 100 kHz		100 + 200 $\mu$ V	

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Parameter	Range	Uncertainty <sup>1</sup>	Notes
100 kHz - 300 kHz		275 + 600 $\mu$ V	
300 kHz - 500 kHz		1000 + 2000 $\mu$ V	
500 kHz - 1 MHz		1500 + 3200 $\mu$ V	
<b>AC Volts Source</b>		+/- (ppm of output + mV)	5720A
10 Hz - 20 Hz	220 V	240 + 4 mV	Resolution 100 mV
20 Hz - 40 Hz		90 + 1.5 mV	
40 Hz - 20 kHz		52 + 0.6 mV	
20 kHz - 50 kHz		80 + 1 mV	
50 kHz - 100 kHz		150 + 2.5 mV	
100 kHz - 300 kHz		900 + 16 mV	
300 kHz - 500 kHz		4400 + 40 mV	
500 kHz - 1 MHz		8000 + 80 mV	
15 Hz - 50 Hz	1100 V	300 + 16 mV	Resolution 1 mV
50 Hz - 1 kHz		70 + 3.5 mV	

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Parameter	Range	Uncertainty <sup>1</sup>	Notes
<b>AC Volts Measure</b>			
10Hz - 30MHz	700 $\mu$ V to 7V	+/- 0.35%	5790A
10Hz - 1MHz	700 $\mu$ V to 1000V	+/- 24ppm	
		+/-(% of rdg + % of range)	3458A
1 Hz - 40 Hz	10.0000 mV	0.082 + 0.03	Resolution 10 nV
40 Hz - 1 kHz		0.091 + 0.011	
1 kHz - 20 kHz		0.101 + 0.011	
20 kHz - 50 kHz		0.189 + 0.011	
50 kHz - 100 kHz		0.049 + 0.011	
100 kHz - 300 kHz		4.14 + 0.02	
300 kHz -1 MHz		1.48 + 0.05	
1 MHz - 4 MHz		7.0 + 0.07	

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4 MHz -8 MHz		20 + 0.08	
8 MHz - 10 MHz		N/A	
<b>AC Volts Measure</b>			
	100mV - 10 V	+/-(% of rdg + % of range)	3458A
1 Hz - 40 Hz		0.011 + 0.004	10 mV Resolution 10 nV
40 Hz - 1 kHz		0.013 + 0.002	1V Resolution 100 nV
1 kHz - 20 kHz		0.02 + 0.002	10 V Resolution 1 µV
20 kHz - 50 kHz		0.041 + 0.002	
50 kHz - 100 kHz		0.101 + 0.002	
100 kHz - 300 kHz		0.362 + 0.01	
300 kHz -1 MHz		1.18 + 0.01	
1 MHz - 4 MHz		4.26 + 0.07	
4 MHz -8 MHz		4 + 0.08	
8 MHz - 10 MHz		15 + 0.1	

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Parameter	Range	Uncertainty <sup>1</sup>	Notes
<b>AC Volts Measure</b>		+/-(% of rdg + % of range)	3458A
1 Hz - 40 Hz	100 V	0.025 + 0.004	Resolution 100 µV
40 Hz - 1 kHz		0.027 + 0.002	
1 kHz - 20 kHz		0.027 + 0.002	
20 kHz - 50 kHz		0.048 + 0.002	
50 kHz - 100 kHz		0.133 + 0.002	
100 kHz - 300 kHz		0.418 + 0.01	
300 kHz -1 MHz		1.5 + 0.01	
1 MHz - 4 MHz		N/A	
4 MHz -8 MHz		N/A	
8 MHz - 10 MHz		N/A	

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Parameter	Range	Uncertainty <sup>1</sup>	Notes
<b>AC Volts Measure</b>		+/-(% of rdg + % of range)	3458A
1 Hz - 40 Hz	1000V	0.047 + 0.004	Resolution 1 mV
40 Hz - 1 kHz		0.047 + 0.002	
1 kHz - 20 kHz		0.067 + 0.002	
20 kHz - 50 kHz		0.127 + 0.002	
50 kHz - 100 kHz		0.307 + 0.002	
60Hz	40000V	+/- 5%	80K-40HV

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DC Current Source		+/- (ppm of output + nA)	5720A
	220µA	50 + 7 nA	Resolution 0.1 nA
	2.2mA	40 + 8 nA	Resolution 1 nA
	22mA	40 + 50 nA	Resolution 10 nA
		+/- (ppm of output + µA)	
	220mA	50 + 0.8 µA	Resolution 0.1 µA
	2.2A	90 + 15 µA	Resolution 1 µA
	+/- (% of output + µA)		

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Parameter	Range	Uncertainty <sup>1</sup>	Notes
<b>DC Current Source</b>		+/- (ppm of output + $\mu$ A)	5520A
	0 A - 329.999 $\mu$ A	150ppm + 0.02 $\mu$ A	Resolution 1nA
	0 A - 3.29999 mA	100ppm + 0.03 $\mu$ A	Resolution 0.01 $\mu$ A
	0 A - 32.9999 mA	100ppm + 0.2 $\mu$ A	Resolution 0.1 $\mu$ A
	0 A - 329.999 mA	100ppm + 2 $\mu$ A	Resolution 1 $\mu$ A
	0 A - 1.09999 A	200ppm + 40 $\mu$ A	Resolution 10 $\mu$ A
	1.1 A - 2.99999 A	380ppm + 40 $\mu$ A	Resolution 10 $\mu$ A
	0A-10.9999A	500ppm + 330 $\mu$ A	Resolution 100 $\mu$ A

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	11A-20.5A	1000ppm + 750µA	Resolution 100 µA
		+/-(% of range + % of output)	
	100 A	0.03 + 0.03	2555A
<b>DC Current Measure</b>		+/- (ppm of rdg + ppm range)	3458A
	100 nA	30 + 400	
	1 µA	20 + 40	
	10 µA	20 + 10	
	100 µA	172 + 8	
	1 mA	74 + 5	
	10 mA	71 + 5	

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	100 mA	89 + 5	
	1.00 A	150 + 5	
		+/-(% of rdg + % of range)	
	300 A	0.50%	300 AMP/100mV
<b>AC Current Source</b>		+/- (ppm of output + nA)	5720A
10 Hz - 20 Hz	220µA	250 + 16 nA	Resolution 1 nA
20 Hz - 40 Hz		160 + 10 nA	
40 Hz - 1 kHz		120 + 8 nA	
1 kHz - 5 kHz		280 + 12 nA	
5 kHz - 10 kHz		1100 + 65 nA	

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10 Hz - 20 Hz	2.2mA	250 + 40 nA	Resolution 10 nA
20 Hz -40 Hz		160 + 35 nA	
40 Hz - 1 kHz		120 +35 nA	
1 kHz - 5 kHz		200 + 110 nA	
5 kHz - 10 kHz		1100 + 650 nA	
10 Hz - 20 Hz	22 mA	250 + 400 nA	Resolution 100 nA
20 Hz -40 Hz		160 + 350 nA	
40 Hz - 1 kHz		120 +350 nA	
1 kHz - 5 kHz		200 + 550 nA	
5 kHz - 10 kHz		1100 + 5000 nA	
<b>AC Current Source</b>		+/- (ppm of output + $\mu$ A)	5720A
10 Hz - 20 Hz	220 mA	250 + 4 $\mu$ A	Resolution 1 $\mu$ A
20 Hz -40 Hz		160 + 3.5 $\mu$ A	
40 Hz - 1 kHz		120 + 2.5 $\mu$ A	
1 kHz - 5 kHz		200 + 3.5 $\mu$ A	

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Parameter	Range	Uncertainty <sup>1</sup>	Notes
5 kHz - 10 kHz		1100 + 10 $\mu$ A	
20 Hz - 1 kHz	2.2 A	260 + 35 $\mu$ A	Resolution 10 $\mu$ A
1 kHz - 5 kHz		450 + 80 $\mu$ A	
5 kHz - 10 kHz		7000 + 160 $\mu$ A	
		+/-(% of output + $\mu$ A)	5520A
10 Hz - 20 Hz	29.00 $\mu$ A - 329.99 $\mu$ A	0.2% + 0.1 $\mu$ A	
20 Hz - 45 Hz		0.15% + 0.1 $\mu$ A	
45 Hz - 1 kHz		0.125% + 0.1 $\mu$ A	
1 kHz - 5 kHz		0.3% + 0.15 $\mu$ A	
5 kHz - 10 kHz		0.8% + 0.2 $\mu$ A	
10kHz - 30kHz		1.6% + 0.4 $\mu$ A	
<b>AC Current Source</b>		+/- (ppm of output + $\mu$ A)	5520A
10 Hz - 20 Hz	0.33 mA - 3.2999 mA	0.2% + 0.15 $\mu$ A	
20 Hz - 45 Hz		0.125% + 0.15 $\mu$ A	
45 Hz - 1 kHz		0.1% + 0.15 $\mu$ A	

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1 kHz - 5 kHz		0.2% + 0.2 $\mu$ A	
5 kHz - 10 kHz		0.5% + 0.3 $\mu$ A	
10kHz - 30kHz		1.0% + 0.6 $\mu$ A	
10 Hz - 20 Hz	3.3 mA - 32.999 mA	0.18% + 2 $\mu$ A	
20 Hz -45 Hz		0.09% + 2 $\mu$ A	
45 Hz - 1 kHz		0.04% + 2 $\mu$ A	
1 kHz - 5 kHz		0.08% + 2 $\mu$ A	
5 kHz - 10 kHz		0.2% + 3 $\mu$ A	
10kHz - 30kHz		0.4% + 4 $\mu$ A	
<b>AC Current Source</b>		+/- (ppm of output + $\mu$ A)	5520A
10 Hz - 20 Hz	33.0 mA - 329.99 mA	0.18% + 20 $\mu$ A	
20 Hz -45 Hz		0.09% + 20 $\mu$ A	

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45 Hz - 1 kHz		0.04% + 20 $\mu$ A	
1 kHz - 5 kHz		0.10% + 50 $\mu$ A	
5 kHz - 10 kHz		0.2% + 100 $\mu$ A	
10kHz - 30kHz		0.4% + 200 $\mu$ A	
10 Hz - 45Hz	0.33 A - 1.09999 A	0.18% + 100 $\mu$ A	
45 Hz - 1 kHz		0.05% + 100 $\mu$ A	
1 kHz- 5 kHz		0.6% + 1000 $\mu$ A	
5kHz - 10kHz		2.5% + 5000 $\mu$ A	
10 Hz - 45Hz	1.1A - 2.99999A	0.18% + 100 $\mu$ A	
45 Hz - 1 kHz		0.06% + 100 $\mu$ A	
1 kHz- 5 kHz		0.6% + 1000 $\mu$ A	
5kHz - 10kHz		2.5% + 5000 $\mu$ A	
<b>AC Current Source</b>		+/- (ppm of output + $\mu$ A)	5520A
45 Hz - 100Hz	3.0A - 10.9999A	0.06% + 2000 $\mu$ A	

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Parameter	Range	Uncertainty <sup>1</sup>	Notes
100Hz- 1 kHz		0.10% + 2000 $\mu$ A	
1kHz - 5kHz		3% + 2000 $\mu$ A	
45 Hz - 100Hz	11.0A - 20.5A	0.12% + 5000 $\mu$ A	
100Hz- 1 kHz		0.15% + 5000 $\mu$ A	
1kHz - 5kHz		3% + 5000 $\mu$ A	
		+/-(% of range + % of output)	
100 Hz	100 A	0.3 + 0.1	2555 A
400 Hz		0.4 + 0.2	
1000 Hz		0.6 + 0.3	
<b>AC Current Measure</b>		+/-(% of rdg + % of range)	34401A

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Parameter	Range	Uncertainty <sup>1</sup>	Notes
3 Hz - 5 Hz	1.000000 A	1.00% + 0.04	
5 Hz - 10 Hz		0.30% + 0.04	
10 Hz - 5 kHz		0.10% +0.04	
3 Hz - 5 Hz	3.00000 A	1.10% + 0.06	
5 Hz - 10 Hz		0.35% + 0.06	
10 Hz - 5 kHz		0.15% +0.06	
	300 A	2.00%	300 AMP/100mV
<b>Phase Source</b>			5720A
	+/- 180 Degrees	+/- 1 Deg (0, +/- 90, +/-180 Deg) +/- 2 Degrees (elsewhere)	Resolution 1 Degree

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Parameter	Range	Uncertainty <sup>1</sup>	Notes
Resistance Source		+/- ppm	5720A
	1 $\Omega$	95 ppm	
	1.9 $\Omega$	95 ppm	
	10 $\Omega$	23 ppm	
	19 $\Omega$	23 ppm	
	100 $\Omega$	10 ppm	
	190 $\Omega$	10 ppm	
	1 k $\Omega$	8.5 ppm	
	1.9 k $\Omega$	8.5 ppm	
	10 k $\Omega$	8.5 ppm	
	19 k $\Omega$	8.5 ppm	
	100 k $\Omega$	11 ppm	
	190 k $\Omega$	11 ppm	

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<b>Resistance Source</b>		+/- ppm	5720A
	1 MΩ	20 ppm	
	1.9 MΩ	21 ppm	
	10 MΩ	40 ppm	
	19 MΩ	50 ppm	
	100 MΩ	100 ppm	
	1 GΩ	0.05%	
	10 GΩ	0.07%	
100 GΩ	0.10%		
<b>Resistance Measure</b>		+/- (ppm of rdg + ppm range)	3458A
	10.00000 Ω	8 + 1	
	100.0000 Ω	5.7 + 1	
	1.000000 kΩ	4.7 + 0.1	
	10.00000 kΩ	4.7 + 0.1	
	100.0000 kΩ	4.5 + 0.1	
	1.000000 MΩ	5.9 + 1	
	10.00000 MΩ	23.6 + 2	
100.0000 MΩ	173 + 2		

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Parameter	Range	Uncertainty <sup>1</sup>	Notes
	1.000000 GΩ	250 + 2	
Resistance Shunt	0.333469 mΩ	+/-0.25%	Resolution 300A/100mV
Inductance Measure			6425
	3 μH - 200 H	+/- 0.1 %	Resolution 0.1 nH
Inductance Source	10.0 mH	+/-0.1%	1482H
Capacitance Source	100 pF - 1.1 mF	+/- 0.05 %	11680A
	1pF	+/- .10%	
	10pF	+/- .10%	
	100pF	+/- .10%	
	1000pF	+/- .10%	

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Parameter	Range	Uncertainty <sup>1</sup>	Notes
<b>Attenuation dB Source</b>	0 - 12 dB ( 1dB steps)	+/-0.1 dB @ 1000 Hz +/-0.25 dB: dc - 0.5 GHz +/-0.35 dB: dc - 1.0 GHz	355C
	0 - 120 dB ( 10 dB steps)	+/-0.3 dB @ 1000 Hz +/-1.5 dB to 90 dB, and +/-3.0 dB to 120 dB @ 1 GHz	355D
<b>Attenuation dB Measure</b>	0 - 100 dB	+/-0.005 dB/ 10 dB Step	8902A/11722A
	100.001 dB - 120.00 dB	+/-0.050 dB/ 10 dB Step	

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Parameter	Range	Uncertainty <sup>1</sup>	Notes
<b>Amplitude Modulation % Measure</b>			8902A/11722A
20 Hz - 100 kHz	0 - 99% AM	+/-1% of rdg and 1 digit for rates 50 Hz to 50 kHz and depths > 5%	
<b>Frequency Modulation Hz Measure</b>			8902A/11722A
	20 Hz - 200 kHz	+/-1% of rdg and 1 digit for rates 50 Hz to 100 kHz	
<b>Phase Modulation Measure</b>			8902A/11722A
200 Hz - 20 kHz	0 - 400 radians	+/-3% of rdg and 1 digit	

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Parameter	Range	Uncertainty <sup>1</sup>	Notes
Impedance Source	DC to 40 GHz	+/- 0.001% -6.0 %	8751A/8722C
Noise Figure Source	10 MHz - 26.5 GHz	+/- 0.20 dB	346C
Power Source	0.1 - 10 mW(10MHz - 26.5GHZ)	+/- 1 - 5%	F1117A/F1119
Power Measure 50 MHz	1 mW Reference	+/- 0.7 %	8478A
VSWR Measure	DC - 40 GHz	> 36 dB	8751A/8722C

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<b>Fiber Optics Source</b> 850 nm 1330 nm 1550 nm	-20 to -10dBm		LS1310/1550
<b>Fiber Optics Measure</b>	-50 to 0 dBm	2%	81521B/8152A
<b>Frequency Source</b> 50GHz	Loran C	1 x 10E-12 1 x 10E-10	FS700 83650A
<b>Frequency Measure</b>	Loran C	1 x 10E-12	FS700

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### Accreditation Certificate 74 400 2037

Revision: 3

Parameter	Range	Uncertainty <sup>1</sup>	Notes
	0.1 Hz to 26.5 GHz	1 x 10E-12	
Risetime Source	0-90%	<25pS	S-52
Inside Diameter	1.0000 Inch	+/-0.00012	
	1.5000 Inch	+/-0.00012	
Inside Diameter	1.0000 Inch	+/-30 ulnches	
	1.5000 Inch	+/-30 ulnches	
Length	0.1 Inch - 4.00 Inch	+/- 0.000014	516-935
	1.000 Inch	+/-0.00011 Inch	167-913
	2.000 - 5.000 Inch	+/-0.00012 Inch	167-913
	6.000 - 7.000 Inch	+/-0.00026 Inch	167-913
	8.000 - 10.000 Inch	+/-0.00044 Inch	167-913

A handwritten signature in black ink, appearing to read 'Dave Moody', is written over a horizontal line.

Dave Moody – Program Manager  
Laboratory Accreditation Services  
Youngsville NC

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Parameter	Range	Uncertainty <sup>1</sup>	Notes
	11.000 Inch	+/- .00024 Inch	167-913
	14.000 Inch	+/- .000061 Inch	167-154
	17.000 Inch	+/- .00065 Inch	167-157
	23.000 Inch	+/- .0007 Inch	167-163
<b>Torque Measure</b>	2oz.in - 250 ft/lbs	+/- 0.3125 %; 10 % - FS	BMX20Z / 950-DT
<b>Torque Source</b>	2 to 370ft/lbs		W4.0
<b>Optical Flatness Measure</b>		+/- 4 ulnch	157-901
<b>Thickness Measure</b>	0.3 - 30 mm	+/- 1.0 um	Laser Scan Micrometer
<b>Surface Flatness Measure</b>		+/- 4 arc seconds	517-715

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Parameter	Range	Uncertainty <sup>1</sup>	Notes
<b>Pressure Source</b>	-14 to 16000psi	+/- 0.04%	CCK-L-1-3
<b>Pressure Measure</b>	-15 to 600psi	+/- 0.04%	CCK-L-1-3
<b>Air Velocity Measure</b>		+/- 0.80 m/s	425
<b>Temperature Degrees C</b>			CL27
Type K	-200 °C to -50 °C	+/- 0.5555 °C or +/- 1.0 °F	
Type K	-50 °C to +1372 °C	+/- 0.2777 °C or +/- 0.5 °F	

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Parameter	Range	Uncertainty <sup>1</sup>	Notes
Type K	-100 °C to 1,372 °C	0.1% + 0.3 °C	
Type T	-200 °C to -50 °C	+/- 0.5555 °C or +/- 1.0 °F	
Type T	-50 °C to +400 °C	+/- 0.2777 °C or +/- 0.5 °F	
Type T	-100 °C to 400 °C	0.1% + 0.3 °C	
Type TDIN	-200 °C to -100 °C	0.1% + 0.6 °C	
Type TDIN	-100 °C to 600 °C	0.1% + 0.3 °C	
Type J	-210 °C to -50 °C	+/- 0.5555 °C or +/- 1.0 °F	
Type J	-50 °C to +760 °C	+/- 0.2777 °C or +/- 0.5 °F	
Type JDIN	-200 °C to -40 °C	0.1% + 0.6 °C	
<b>Temperature Degrees C</b>			CL27
Type JDIN	-40 °C to 900 °C	0.1% + 0.3 °C	
Type N	-200 °C to -50 °C	+/- 0.5555 °C or +/- 1.0 °F	
Type N	-50 °C to +1300 °C	+/- 0.2777 °C or +/- 0.5 °F	
Type N	400 °C to 1,300 °C	+/- 0.2777 °C or +/- 0.5 °F	
Type E	-230 °C to -50 °C	+/- 0.5555 °C or +/- 1.0 °F	
Type E	-50 °C to +1000 °C	+/- 0.2777 °C or +/- 0.5 °F	
Type E	-100 °C to 775 °C	+/- 0.2777 °C or +/- 0.5 °F	

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## Techmaster Electronics, LLC. Vista CA

### Accreditation Certificate 74 400 2037

Revision: 3

Parameter	Range	Uncertainty <sup>1</sup>	Notes
Type R	0 °C to +1768 °C	+/- 0.94445 °C or +/- 1.0 °F	
Type R	450 °C to 1,767 °C	+/- 0.94445 °C or +/- 1.0 °F	
Type S	0 °C to +1768 °C	+/- 0.94445 °C or +/- 1.0 °F	
Type S	450 °C to 1,767 °C	+/- 0.94445 °C or +/- 1.0 °F	
Type B	+500 °C to +1820 °C	+/- 0.94445 °C or +/- 1.0 °F	
Type B	900 °C to 1,820 °C	+/- 0.94445 °C or +/- 1.0 °F	
Type C	0 °C to +2316 °C	+/- 0.94445 °C or +/- 1.0 °F	
Type C	300 °C to 1,830 °C	+/- 0.94445 °C or +/- 1.0 °F	
Type C	1,830 °C to 2,320 °C	+/- 0.94445 °C or +/- 1.0 °F	
<b>Humidity Measure</b>	0 - 90%RH	+/-1%RH	HMI41/HMP46
	90 - 100%RH	+/-2%RH	HMI41/HMP46
<b>Infrared Calibration Source</b>			QC-IR Quick Cal
	30°C to 350°C	± 0.5°C	
<b>Mass Source</b>	1/8 oz - 1.0 lbs	Class C	Troemner

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Parameter	Range	Uncertainty <sup>1</sup>	Notes
	5.0 lbs	Class F	
	10.0 lbs	Class F	
	20.0 lbs	Class F	
	5.0 lb	Class F	
	10.0 lb	Class F	
	20.0 lb	Class F	
	50.0 lbs	Class F	
<b>Mass Measure</b>			MC 5-0CE
	0.1mg,5.1g	+/-0.05mg	Resolution 0.001mg
	14.46oz , 410g	+/-0.002	XL410
	215.15oz, 6100g	+/- 0.1	CR6101
	423.24oz, 12000g	+/- 0.1	SG12000

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Parameter	Range	Uncertainty <sup>1</sup>	Notes
pH	4.01 Ph	+/- 0.01 Ph	Cole- Parmer
	7.00 Ph	+/- 0.01 Ph	Cole- Parmer
	10.00 Ph	+/- 0.01 Ph	Cole- Parmer
Conductivity Source	445 - 3900 microsiems	+/- 1%	Myron L Company

**Notes:**

1 All uncertainties determined with a coverage factor of k - 2

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