

GELLER MICROANALYTICAL LABORATORY

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http://www.gellermicro.com



Certification Date: 24-April-2017

In compliance with ISO/IEC 17025

Recertification Due:

CERTIFICATION OF MEASUREMENT

MRS4-XY R26-197

	X-Traversal		Y-Traversal	
	Left	Right	Top	Bottom
500µm pitch				
1	500.06	499.96	499.96	499.98
2	499.99	500.07	499.99	499.99
3	499.97	500.00	499.95	499.89
4	499.93	499.96	499.91	499.90
5	499.93	499.96	499.92	499.90
6	<u>499.99</u>	<u>500.00</u>	<u>499.93</u>	<u>499.96</u>
Average	499.98	499.99	499.94	499.94
2-Sigma	0.10	0.09	0.06	0.09
50µm pitch				
1	50.00	50.01	50.01	50.01
2	50.03	50.00	49.98	49.99
3	50.05	50.03	50.01	49.98
4	49.96	49.99	50.02	50.02
5	50.00	49.95	49.94	49.96
6	49.97	50.01	49.99	49.99
7	50.03	50.00	50.03	50.01
8	<u>49.97</u>	<u>49.98</u>	<u>50.02</u>	<u>50.04</u>
Average	50.00	50.00	50.00	50.00
2-Sigma	0.06	0.05	0.06	0.05
2µm pitch				
1	1.997	2.003	1.998	2.007
2	1.999	2.000	2.001	1.995
3	1.993	2.005	1.995	1.997
4	1.999	2.008	1.994	1.997
5	2.005	1.999	1.997	2.005
6	1.997	1.988	1.999	1.997
7	1.998	1.996	1.993	1.997
8	<u>2.002</u>	<u>1.999</u>	<u>2.006</u>	<u>1.990</u>
Average	1.999	2.000	1.998	1.998
2-Sigma	0.007	0.012	0.009	0.011

	X-Traversal		Y-Traversal	
	Left	Right	Top	Bottom
1µm pitch				
1	1.031	1.003	1.010	1.011
2	0.999	0.999	0.990	0.996
3	0.989	1.001	1.000	0.991
4	1.003	0.990	1.005	1.005
5	0.992	0.999	0.986	0.993
6	0.989	1.003	1.001	0.997
7	1.004	0.990	1.000	1.001
8	<u>0.994</u>	<u>0.993</u>	<u>0.993</u>	<u>0.995</u>
Average	1.000	0.997	0.998	0.999
2-Sigma	0.027	0.011	0.016	0.013
0.50µm pitch				
1	0.500	0.507	0.506	0.506
2	0.509	0.502	0.503	0.506
3	0.496	0.502	0.510	0.507
4	0.501	0.498	0.499	0.499
5	0.509	0.500	0.501	0.504
6	0.505	0.496	0.509	0.500
7	0.502	0.501	0.500	0.506
8	0.499	0.502	0.502	0.505
9	0.498	0.493	0.497	0.493
10	<u>0.498</u>	<u>0.499</u>	<u>0.496</u>	<u>0.498</u>
Average	0.502	0.500	0.502	0.502
2-Sigma	0.009	0.008	0.009	0.009

Z = 0.1041µm
Z Uncertainty = ±0.005µm
Temperature = 70.5 Deg F
Z Primary Standard: MRS-2 S/N R5-14

Pitch	Uncertainty(k=2)	Traceable to:
500µm	±0.25µm	MRS-4 S/N R23-169
50µ	±0.104µm	MRS-4 S/N R23-169
2µm	±0.031µm	MRS-4 S/N R23-169

XY Working Standard: MRS-4 S/N R24-171

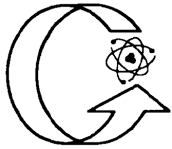
The "ruler" is not traceable.

Pitch	Uncertainty	Traceable to:
1µm	±0.03µm	MRS-4 S/N R23-169
1/2µm	±0.038µm	MRS-4 S/N R23-169

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Research Scientist

Joseph D. Geller
President & Reviewer

**This is a sample certificate for the MRS-4XYZ.
The certificates for the MRS-3 are similar but without the extra measurements.**



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AC-1236

Certification of Measurement

Magnification Reference Standard

<p><u>Received Condition:</u></p> <p><input type="checkbox"/> New standard from stock</p> <p><input type="checkbox"/> Like New</p> <p><input type="checkbox"/> Contaminated (needs cleaning)</p> <p><input type="checkbox"/> Damaged (comments below)</p> <p><input type="checkbox"/> Cannot be certified (comments below)</p> <p>Comments: _____</p> <p>_____</p> <p>_____</p>	<p><u>Returned Condition:</u></p> <p><input type="checkbox"/> New standard from inspection</p> <p><input type="checkbox"/> Recertified as New</p> <p><input type="checkbox"/> Cleaned</p> <p><input type="checkbox"/> Recoated for conductivity</p> <p><input type="checkbox"/> Rejected (cannot be certified, comments below)</p> <p>Comments: _____</p> <p>_____</p> <p>_____</p>
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Test Method: (in compliance with ISO/IEC-17025)

All measurements are performed in vacuum with a modified scanning electron microprobe. The 500µm, 50µm, 2µm pitch measurements are made between the horizontal and vertical tracks through the center of the device. For the MRS-4 the 1µm and ½µm pitch measurements are made through the center of the northwest patterns. For the 500µm through 1µm pitch patterns the measurements start at the inside edge of the left most bar (left column) and the left side of the first bar to the right of center (right column) of the center pattern. The vertical measurements are made the same way starting at the top pattern. For the ½µm pattern twenty measurements are made on the left side and top side of center, starting with the inside of the first bar. Measurements are made through direct comparison with a MRS that has been calibrated against a similar device measured by the National Physical Laboratory (NIST counterpart in the U.K.) thereby establishing an unbroken link of traceability. Each measurement is reported as a "pitch" value, which is the sum of an adjacent bar and space (edge-to-edge) on the pattern. Optional Z-axis measurements (step height) are provided by referencing the measured value against a NIST measured MRS using a Dektak 3030 stylus profilometer. The Z measurements are taken in 5 locations between the tracks in the southernmost 500µm pitch lines. The X & Y data was measured in vacuum while Z measurements are performed in air. For usage: 25°C ± 10°C, humidity <90%. Expanded uncertainties are reported with a coverage factor of k=2.

Notice:

Results reported here relate only to the specific device measured. Physical damage to the device incurred after calibration may invalidate the reported measurements. This certification shall not be reproduced except in full, without prior written approval of Geller MicroAnalytical Laboratory.

Handling Instructions:

1. If ordering without retainer- handle by tweezers being careful not to contact the top surface. The fused silica substrate is highly stressed and chips easily. If you later decide to order a retainer, we suggest returning the standard to us. We will, at no extra charge, re-mount your MRS.
2. To clean the MRS, use an ultrasonic bath at low power with solvents such as isopropanol, methanol or ethanol for a short time. DO NOT use acetone. It weakens the silver epoxy. Do not "scrub" the surface.
3. It has been reported that oil immersion techniques can be used when followed by solvent cleaning.
4. For SEM applications, do not exceed 5 X 10⁻⁸ amperes beam current in a stationary & focused beam!

Please be sure to return your registration form. We will advise you of product updates as they become available. If you have any questions about MRS applications, don't hesitate to call.