GELLER
MICROANALYTICAL LABORATORY
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Certified to ISO-9001 and Accredited to ISO-17025

ANAB ACCREDITED ISO/IEC 17025 CALIBRATION LABORATORY

Certification Date: 10-September-2018
Recertification Due: _____

CERTIFICATION OF MEASUREMENT

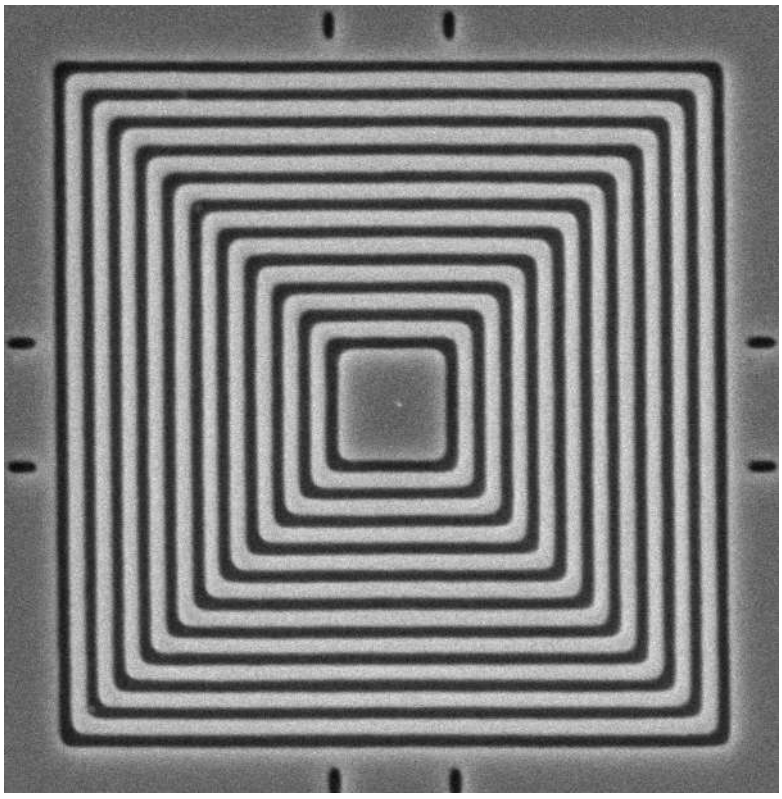
MRS-6XY 4-058

2µm pitch		X-Traverse Left	X-Traverse Right	Y-Traverse Top	Y-Traverse Bottom
	1	2.024	2.00	2.025	2.022
	2	1.988	2.00	2.007	2.010
	3	2.016	1.99	2.027	1.999
	4	1.986	2.00	2.013	2.027
	5	1.993	2.00	2.026	2.028
	6	1.998	2.00	2.011	2.016
	7	2.014	1.99	2.013	2.009
	8	1.983	2.00	2.010	2.022
	9	1.996	2.00	2.035	2.020
Average		**2.000**	**1.997**	**2.019**	**2.017**
2-Sigma		**0.027**	**0.013**	**0.018**	**0.018**

1µm pitch	X-Traverse Left	X-Traverse Right	Y-Traverse Top	Y-Traverse Bottom
	1.001	1.00	1.007	1.005
	1.001	0.99	1.008	1.009
	0.992	0.99	0.994	1.013
	1.005	0.99	1.011	1.005
	0.985	1.01	1.010	0.990
	1.009	0.99	1.000	1.008
	0.992	0.99	1.000	1.013
	1.001	0.99	1.005	0.998
	0.994	0.99	1.003	1.008
Average	**0.998**	**0.995**	**1.004**	**0.988**
2-Sigma	**0.014**	**0.013**	**0.011**	**0.018**

0.1µm (100nm) pitch				
1	0.105	0.104	0.103	0.101
2	0.100	0.103	0.101	0.101
3	0.101	0.096	0.101	0.102
4	0.098	0.102	0.100	0.099
5	0.102	0.100	0.101	0.107
6	0.099	0.100	0.102	0.099
7	0.102	0.101	0.103	0.097
8	0.102	0.101	0.101	0.101
9	0.100	0.098	0.101	0.103
Average	**0.101**	**0.101**	**0.101**	**0.101**
2-Sigma	**0.004**	**0.005**	**0.002**	**0.006**
Sum	**0.910**	**0.905**	**0.913**	**0.908**

Pitch	Uncertainty	Traceable to:
2µm	±0.031µm	MRS-4 S/N R23-169
1µm	±0.030µm	MRS-4 S/N R23-169
XY Working Standard: MRS-4 S/N R24-171		
0.1µm	±0.003µm	MRS-6 S/N 1-012



100nm pitch pattern

MRS-6XY 4-058
JSM IT500HR - 3 keV

Certified by
Joseph D. Geller

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Certification of Measurement

ACLASS Cert# AC-1236

MRS-6 Magnification Reference Standard

As Received Condition:	**Returned Condition**:
X New	X New
☐ Like New	☐ Recertified as New
☐ Contaminated (needs cleaning)	☐ Cleaned
☐ Damaged (comments below)	☐ Recoated for conductivity
☐ Cannot be certified (comments below)	☐ Rejected (cannot be certified, comments below)
Comments:_____	Comments:_____
_____	_____
_____	_____
_____	_____
_____	_____

Test Method: (in compliance with ISO-17025)
All measurements are performed in vacuum with a field-emission SEM. The traceable 2μm, 1μm and 100nm pitch measurements are made between the horizontal and vertical tracks through the center of the pattern. There are four 100nm patterns; measurements are made through the center of one of those patterns the number of which is next to the micrograph on the certification. For each pattern, horizontal measurements start at the left edge of the first bar on the left, proceeding toward the center, then from the right edge of the first bar on the right side of the center, continuing to the right. The vertical measurements are made the same way starting at the top of each pattern. The value for each pitch is the average of approximately 100 scan lines between the tracks. Measurements are made through direct comparison with a MRS that has been measured by the National Physical Laboratory (NIST counterpart in the U.K.) using a calibrated atomic force microscope (AFM) with a sharpened tip, 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. For the 100nm pattern, edge-to-edge pitches are traced to a mean peak-to-peak value established by NPL. The standard was measured in vacuum. For usage: 25°C ± 10°C, humidity <90%.

Notice:
Results reported here relate only to the specific device measured. Physical damage to, or contamination of the device incurred after calibration may invalidate the reported measurements. All the pitch measurements are included in our ISO-17025 scope of accreditation. This certification shall not be reproduced except in full, without prior written approval of Geller MicroÅnalytical Laboratory.

Handling Instructions:
1. If ordering without a mount- handle by tweezers being careful not to contact the top surface. The silicon die is highly stressed and chips easily. The standard can be returned to us for cleaning and recertification. To clean the MRS-6, use an ultrasonic bath at low power with solvents such as DI water, isopropanol, methanol, ethanol or acetone for a short time. Preferably, cleaning can be done using a plasma cleaner with 80% N_2 and 20% O_2 taking care to use a very low power setting and not letting the temperature exceed 100°C. Do not "scrub" the surface. It has been reported that oil immersion techniques can be used when followed by solvent cleaning.
2. For SEM applications, beam current should be appropriate for high resolution imaging, never exceeding 1 X 10^{-9} 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, please don't hesitate to call.