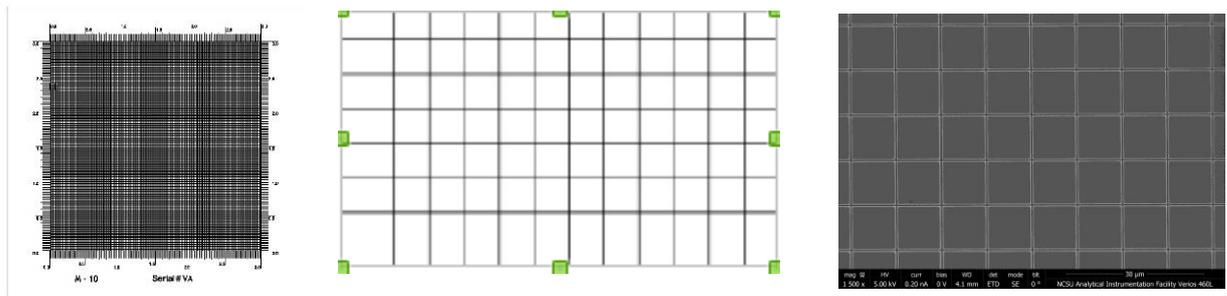


Wafer Level Certificate of Traceability for EM-Tec M-10 Grid Pattern Calibration Standard



Product Numbers: 31-T35000-U, 31-T35000-1, 31-T35000-2, 31-T35000-6, 31-T35000-8, 31-T35000-10

Product Description: EM-Tec M-10 Grid Pattern Calibration Standard

Product Serial Numbers: VA01-xxx through VA07-xxx

The accuracy of these products was determined by reference comparison to working standards traceable to the National Institute of Standards and Technology (NIST), Test No. 861/280822-11.

Line	Average pitch	Standard Deviation (1 σ)	Total expanded uncertainty (3 σ)
Horizontal	100.6 μm	$\pm 0.5 \mu\text{m}$	$\pm 1.5 \mu\text{m}$
Vertical	100.0 μm	$\pm 0.5 \mu\text{m}$	$\pm 1.5 \mu\text{m}$
Horizontal	10.06 μm	$\pm 0.05 \mu\text{m}$	$\pm 0.15 \mu\text{m}$
Vertical	10.00 μm	$\pm 0.05 \mu\text{m}$	$\pm 0.15 \mu\text{m}$

The average pitch was determined using a minimum of ten die sampled at random from a batch of seven production wafers (VA01 through VA07). 100 horizontal/vertical center-to-center measurements were taken randomly across each of the ten die. The total expanded uncertainty includes both Type A and Type B uncertainties corrected for sample size using an appropriate Student t-factor. At the narrowest point, the average measured line widths are: Horizontal $320 \pm 15 \text{ nm}$, $430 \pm 20 \text{ nm}$; Vertical $320 \pm 15 \text{ nm}$ and $430 \pm 20 \text{ nm}$. The etch depth measured by AFM for VA01 = $410 \text{ nm} \pm 10\%$, VA02 = $386 \text{ nm} \pm 10\%$, VA03 = $355 \text{ nm} \pm 10\%$, VA04 = $316 \text{ nm} \pm 10\%$, VA05 = $271 \text{ nm} \pm 10\%$, VA06 = $251 \text{ nm} \pm 10\%$ and VA07 = $245 \text{ nm} \pm 10\%$.



Equipment used:

Instrument	Model number	Serial #	NIST Certified CD/Recalibration	Resolution	Repeatability
FE-SEM	FEI Verios	9922557	CD-PG01-0211/June 2016	0.9nm	0.03%


Signature

Dudley S Finch
Certified by

August 17th 2015
Date

This certificate shall not be reproduced without the permission of Vof Micro to Nano.

TSB 31-T35000 Global Certificate of traceability 2015-08-18 Revision 1

