Certificate of Calibration

Certificate Number: -L

Productivity Quality Inc.
15300 25th. Ave. North Suite 200
Plymouth, MN 55447
PH : 763-249-8130
FAX: 763-249-8150

ANAB ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY ACT-1608

Property of: MachinesUsed.com
Jill Hostad
2410 Niagra Lane N
Plymouth, MN 55447

Equipment Type: HAAS
Equipment Model: MINIMILL
Equipment Serial #: 1099641

Inspection Standard: ASME B5.54-2005
PQI Procedure: MTL_LLIN

Date of Inspection: 4/14/2023
Requested Due Date: 4/14/2024

Reference: Accreditation to ISO / IEC 17025 by ANSI-ASQ National Accreditation Board / ANAB

Calibration Results

		Temp. Range Start	Fahrenheit Finish	System Deviation	Maximum Reversal Deviation	Bidirectional Repeatability	Mean Deviation	Expanded Uncertainty (+/- at 95% confidence)	Units
As Received	X Axis:	74.40	74.40	.000368	.000048	.000389	.000343	.000300	IN
	Y Axis:	73.60	73.60	.000999	.000095	.000441	.000995	.000350	IN
	Z Axis:	75.10	75.10	.000508	.000108	.000286	.000460	.000170	IN
As Returned	X Axis:	74.40	74.50	.000133	.000014	.000257	.000126	.000300	IN
	Y Axis:	74.00	74.10	.000552	.000035	.000297	.000533	.000350	IN
	Z Axis:	75.20	75.20	.000284	.000053	.000142	.000262	.000170	IN

Calibration Equipment: Renishaw XM-60
Serial # : 4KGH31
Date of Last Calibration: 1/12/2023
Traceability Certificate # : 4KGH31-230112-00
Date Calibration Due: 1/31/2026

Traceability Certificate is traceable to NPL Standards. No assurances referencing the stability of results are made beyond the date of inspection.

Service Engineer: Adam Carlstrom

Approved By:

Any number of factors may cause a calibration item to drift out of calibration before the recommended interval has expired.

Measurement Uncertainty

Certificate Number: -L

Productivity Quality Inc.
15300 25th. Ave. North Suite 200
Plymouth, MN 55447
PH : 763-249-8130
FAX: 763-249-8150

ANAB ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY ACT-1608

RENISHAW LASER INTERFEROMETER SERIAL #: 4KGH31 **Standard Uncertainties**

Source of Uncertainty	Type	Value	Units	Dist.	Divisor	Constant	Length Depen.
Operator Reproducibility	A	0.000030	MM	NORMAL	1.000000	0.000030	
Base Number From Laser Spec	B	0.000025	MM	RECT.	1.732051	0.000014	
Machine Repeatability (Highest Value Shown)	B	0.007544	MM	RECT.	1.732051	0.004355	
Laser Measurement System Accuracy	B	0.700000	PPM	RECT.	1.732051		0.404145
Air Temp Changes Within Laser Path	B	1.000000	PPM	RECT.	1.732051		0.577350
Air Temp Diff.: Sensor To Laser Path*	B	0.046500	PPM	RECT.	1.732051		0.026847
Temp Sampling Error of ECU**	B	0.046500	PPM	RECT.	1.732051		0.026847

* OBSERVED TEMPERATURE DIFFERENCE: 0.05
** OBSERVED SAMPLING ERROR : 0.05

Uncertainty Summary Statement

	X Axis	Y Axis	Z Axis	Units
1. Combined Uncertainty for Constant Factors	0.003769	0.004356	0.002083	MM
2. Expanded Uncertainty for Constant Factors (k=2)	0.007538	0.008711	0.004165	MM
3. Combined Uncertainty for Dependent Factors	0.705768	0.705768	0.705768	PPM
4. Expanded Uncertainty for Dependent Factors (k=2)	1.411536	1.411536	1.411536	PPM

Stated Uncertainty

Expanded Uncertainty for Dependent Factors (k=2)	1.411536	1.411536	1.411536	PPM
Length of axis	406.4	304.8	241.3	MM
Expanded dependent uncertainty including axis length	0.000574	0.000430	0.000341	MM
Expanded uncertainty for constant factors	0.007538	0.008711	0.004165	MM
Expanded uncertainty for Single Axis (MM)	0.007600	0.008800	0.004200	MM
Expanded uncertainty for Single Axis (Inch)	.000300	.000350	.000170	IN

Expanded uncertainty Budget - Contains the single highest single axis uncertainty value

MM
0.008800
IN
.000350

The uncertainty is estimated using the principles of GUM, and a simple acceptance decision rule, in accordance to ASME B89.7.3.1-2001, applies for conformance verification. The uncertainty applies to this calibration only and not the measurement of customer parts. The uncertainty is the expanded uncertainty, with a coverage factor k=2, representing a confidence level of approximately 95%.

PRODUCTIVITY QUALITY INC

Calibration Summary

Certificate Number: -L

Productivity Quality Inc.
15300 25th. Ave. North Suite 200
Plymouth, MN 55447
PH : 763-249-8130
FAX: 763-249-8150

ANAB ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY ACT-1608

This “Summary” area is used by our Service Engineers to communicate concerns, special conditions, environmental instability, or any other information to expand upon your calibration service and equipment condition.

In many cases, it is difficult for us to make the decision whether or not your machine is “good”. This is better determined by your company using the data we provide for you.

In addition, please feel free to call us with any questions you may have on our services and on the interpretation of the data we have provided. We would be pleased to provide assistance over the phone, through a personal visit or by forwarding additional documentation on the practices and standards we use in our calibration services.

Summary

The "As Returned" data reflects adjustments made to the backlash and 10e9 values. The compensation tables were not activated.

The "As Received" data reflects the original, as found, values for backlash and 10e9. Once the calibration was completed, these values were re-entered.

Your machine was found to be within what we consider reasonable limits and operational capability. There were no specific issues requiring immediate attention.