



Issue Date: 02-21-2025

Certificate of Calibration



Certificate # 0866.01
Calibration Lab

Equipment calibration was performed for:

[Redacted] **Inc**
[Redacted]
[Redacted]

Thursday, February 20, 2025

Calibration performed by:
[Redacted]

Calibration Summary

Applied Force	Average Microstrain (µε)	Max Bending (%)	Max Bending Strain (µε)	ASTM E-1012 Tolerance	Uncertainty (µε)	Pass/Fail
6000-lbf	1019.0	7.98	N/A	≤10% Bending	15	PASS
12000-lbf	2058.1	4.57	N/A	≤10% Bending	26	PASS
18000-lbf	3095.6	3.33	N/A	≤10% Bending	36	PASS

ALIGNMENT VERIFICATION INFORMATION

ASTM Round Specimen, .500" Dia, 1" Shanks, Inconel 718 Stainless material - Serial# 10408920

ALIGNMENT TRANSDUCER INFORMATION

Instrumentation consists of 12 foil type strain gauges adhesively fastened to the specimen. The gauges are arranged at four positions around the specimen on each plane. Strain measuring device has a sensitivity of 0.1 micro strain, and relative accuracy of +/- 1.0% - 1.0 micro strain.

DESCRIPTION: LOAD TRAIN AND GRIPPING METHOD

Load train consists of the following in order from top: Castle nut atop threaded rod on top of crosshead, threaded rod through crosshead, alignment fixture, load cell, upper hydraulic grip, axial alignment specimen, lower hydraulic grip mounted to base.

* Decision Rule: Simple Acceptance Rule was used - readings fall within tolerance. Measurement uncertainty is stated, but not used to determine pass/fail status. TUR is > 4:1, unless stated.

Cal-Rite has calibrated the testing equipment described above in accordance with the latest applicable specifications (ISO/IEC 17025, ANSI Z-540-1 and 10-CFR-21). All calibration measurements are traceable to the International System of Units (SI) through NIST. The results of this calibration apply only to the unit that was calibrated. The uncertainty of the calibration process was estimated approximately at the 95% confidence level (k=2).

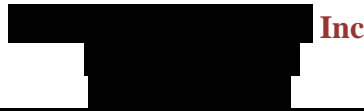
Service Notes

Alignment performed IAW ASTM E1012 Class 10. All readings within tolerance.

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Axial Alignment Verification



Instrument Profile

Manufacturer:	TensileMill	Machine Serial No.:	VTS240720	Max Force:	18,000 lbf	Temp/Humidity:	72.6°F/42.6%RH	Date:	2/20/2025
Model/Type:	EML 305D	Load Cell Serial No.:	34037757	Direction:	Tension	Verification Type:	Type 2	Next Due:	As Required
Asset ID#:	N/A	Alignment Fixture Serial No.:	Not Marked	Specimen Type:	Round	Software Version:	MaxTest 7.79	Class:	10%

Calibration Results

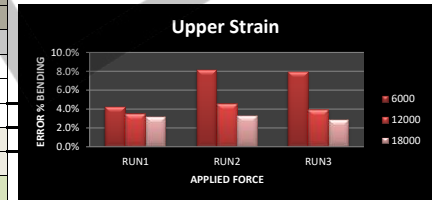
Strain Gage Configuration



Run 1						
Rotation - 0°			Applied Force lbf			
Free	Grip	Gage	6000	12000	18000	
0	12	e ₁	1046	2111	3167	
0	4	e ₂	988	2014	3035	
0	-9	e ₃	993	2009	3027	
0	7	e ₄	1056	2114	3171	
Load	Load	e _{avg}	1021	2062	3100	
Max Bending Strain			43	71	98	
Error % Bending			4.2%	3.5%	3.1%	

Run 2						
Rotation - 180°			Applied Force lbf			
Free	Grip	Gage	6000	12000	18000	
0	4	e ₁	941	1965	2994	
0	-11	e ₂	993	2058	3118	
0	9	e ₃	1097	2153	3198	
0	14	e ₄	1051	2069	3088	
Load	Load	e _{avg}	1021	2061	3100	
Max Bending Strain			83	94	103	
Error % Bending			8.2%	4.6%	3.3%	

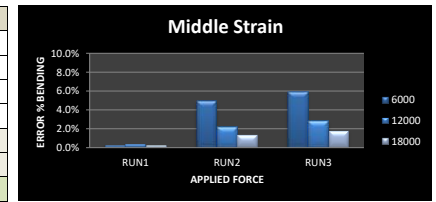
Run 3						
Rotation - 0°			Applied Force lbf			
Free	Grip	Gage	6000	12000	18000	
0	18	e ₁	1071	2132	3183	
0	12	e ₂	1086	2104	3124	
0	-11	e ₃	969	1989	3009	
0	-7	e ₄	959	2025	3081	
Load	Load	e _{avg}	1021	2063	3099	
Max Bending Strain			81	82	90	
Error % Bending			8.0%	4.0%	2.9%	



Free	Grip	Gage	6000	12000	18000	
0	4	e ₁	1019	2058	3093	
0	2	e ₂	1016	2055	3090	
0	7	e ₃	1024	2070	3112	
0	6	e ₄	1014	2046	3092	
Load	Load	e _{avg}	1018	2057	3097	
Max Bending Strain			3	8	10	
Error % Bending			0.3%	0.4%	0.3%	

Free	Grip	Gage	6000	12000	18000	
0	-17	e ₁	974	2019	3062	
0	3	e ₂	1000	2047	3090	
0	15	e ₃	1069	2108	3143	
0	11	e ₄	1032	2058	3082	
Load	Load	e _{avg}	1019	2058	3094	
Max Bending Strain			50	45	41	
Error % Bending			4.9%	2.2%	1.3%	

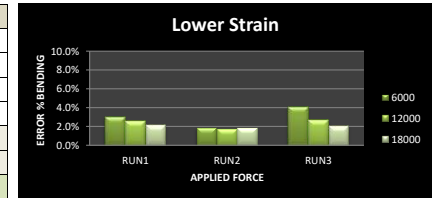
Free	Grip	Gage	6000	12000	18000	
0	11	e ₁	1042	2081	3116	
0	4	e ₂	1074	2108	3138	
0	-5	e ₃	1003	2047	3088	
0	1	e ₄	960	1998	3032	
Load	Load	e _{avg}	1020	2059	3094	
Max Bending Strain			60	58	55	
Error % Bending			5.9%	2.8%	1.8%	



Free	Grip	Gage	6000	12000	18000	
0	6	e ₁	994	2009	3025	
0	16	e ₂	1038	2083	3130	
0	-9	e ₃	1039	2099	3152	
0	-13	e ₄	997	2028	3090	
Load	Load	e _{avg}	1017	2055	3099	
Max Bending Strain			30	53	67	
Error % Bending			3.0%	2.6%	2.1%	

Free	Grip	Gage	6000	12000	18000	
0	-1	e ₁	1009	2072	3128	
0	-3	e ₂	1000	2024	3047	
0	4	e ₃	1025	2035	3049	
0	7	e ₄	1035	2085	3133	
Load	Load	e _{avg}	1017	2054	3089	
Max Bending Strain			19	36	58	
Error % Bending			1.9%	1.7%	1.9%	

Free	Grip	Gage	6000	12000	18000	
0	5	e ₁	1015	2035	3054	
0	16	e ₂	1059	2106	3145	
0	1	e ₃	1019	2073	3121	
0	-9	e ₄	976	2003	3035	
Load	Load	e _{avg}	1017	2054	3089	
Max Bending Strain			42	55	64	
Error % Bending			4.1%	2.7%	2.1%	



Calibrating Apparatus Used

Asset Number	Manufacturer:	Model	Serial Number	Calibration Date	Calibration Due	Calibrated By
AS3	MTS	709.20E	1DE61E7	5/4/2024	5/4/2025	CRC

PROCEDURE: CR113 rev 7
 SPECIFICATION: ASTM E1012-19
 QMS REVISION: 3.01

GIL GUTIERREZ
 Service Technician

Service Order #:	N/A
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Purchase Order #:	N/A
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