CERTIFICATE OF CALIBRATION

ISSUED BY : INSTRON CALIBRATION LABORATORY

DATE OF ISSUE : **02-Dec-2010** CERTIFICATE NUMBER: **22120210133000**

NVLAP

Lab code: 200301-0

INSTRON

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APPROVED SIGNATORY

Walt Szymanowski

Digitally signed by Walt Szymanowski
DN: cn=Walt Szymanowski, o=GeoTrust True Credentials Customer - Organization not validated, ou=CPS terms incorporated by reference liability limited, See True Credentials Express CPS www.geotrust.com/resources/CPS, Email contact validated by GeoTrust, Identity authenticated by Registration Authority (RA), Registration Authority (RA) - Calibration, lab@instron.com, email=Walt_Szymanowski@instron.com
Date: 2010.12.02 14:25:00 -05'00'

Type of Calibration: Displacement
Relevant Standard: astm e2309
Date of Calibration: 02-Dec-2010

Customer Requested Due Date: 02-Jun-2012

Customer

US Army ARL
4600 Rodman Test Ctr
Aberdeen Proving Grounds, Md 21005

Machine

Serial No :	6539
Make :	Instron
Model :	5500R1125

P.O. Number :
Contact :

Readout Verified

1. Digital Readout (in)

Certification Statement

This certifies that the displacements verified with machine indicator 1 (listed above) were verified by Instron in accordance with ASTM E2309-05 (Follow-the-Displacement Method) and Instron work instruction ICA-8-07.

The testing machine was verified on-site at customer location. Adjustments are noted in the comments section of this report with a reference to the "As Found" data.

The verification and equipment used conform to a controlled Quality Assurance program which meets the specifications outlined in ANSI/NCSL Z540-1, ISO 10012, ISO 9001:2000, and ISO/IEC 17025:2005. The Instron measurement equipment used for verification is traceable to NIST.

Summary of Results

Indicator 1- Digital Readout (in)

Verified Range (in)	Max Error (in)	Max Error (%)	Max Repeat Error (in)	Max Repeat Error (%)	System Class*	Resolution (in)	Resolution Class	ASTM Lower Limit (in)
0.8 - 4	0.0015	0.047	0.0008	0.034	A	.0001	A	0.8

**System Class is derived from assessment of the following: error, repeatability, resolution, and standard device classification.*

The results indicated on this certificate and report relate only to the items verified. If there are methods or data included that are not covered by the NVLAP accreditation it will be identified in the comments. Any limitations of use as a result of this verification will be indicated in the comments. This report must not be used to claim product endorsement by NVLAP or the United States government. This report shall not be reproduced, except in full, without the approval of Instron.

CalproSDS version 3.3

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Direction of Displacement : Ascending

Datapoint Summary - Indicator 1 - Digital Readout (in)

Suggested Value (in)	Run 1 Error (in)	Run 1 Error (%)	Run 2 Error (in)	Run 2 Error (%)	Run 3 Error (in)	Run 3 Error (%)	Repeat Error (in)	Uncertainty (in)*	Coverage Factor = k
0.8	-0.0002	-0.023	-0.0002	-0.025	-0.0003	-0.038	0.0001	0.0006	2.26
1.6	0.0002	0.013	0.0001	0.006	0.0001	0.006	0.0001	0.0006	2.26
2.4	0.0011	0.047	0.0006	0.025	0.0003	0.013	0.0008	0.0011	2.31
3.2	0.0012	0.038	0.0007	0.022	0.0009	0.028	0.0005	0.0010	2.26
4	0.0013	0.033	0.0015	0.038	0.0012	0.031	0.0003	0.0010	2.26

**The reported expanded uncertainty of measurement is based on a combined uncertainty multipied by a coverage factor k to provide a level of confidence of approximately 95 %.*

Runs 1 and 2 are performed to comply with the requirements of ASTM E2309, run 3 is performed to calculate the uncertainty of measurement.

Data - Indicator 1 - Digital Readout (in)

Temperature at start of verification : 75 °F

	Run 1			Run 2			Run 3	
Suggested Value	Applied	Indicated	Error Class	Applied	Indicated	Error Class	Applied	Indicated
0.8	0.8570	0.8568	A	0.7927	0.7925	A	0.7839	0.7836
1.6	1.5558	1.5560	A	1.5479	1.5480	A	1.5869	1.5870
2.4	2.3599	2.3610	A	2.3654	2.3660	A	2.3767	2.3770
3.2	3.1418	3.1430	A	3.1763	3.1770	A	3.1851	3.1860
4	3.8917	3.8930	A	3.9025	3.9040	A	3.8848	3.8860

For runs 1 and 2: the worst Resolution Class is A and the worst Repeatability Class is A.

Temperature at end of verification : 75.6 °F

Starting Point of crosshead : 0 in

Verification Equipment

Make/Model	Serial No.	Description	Cal Agency	Uncertainty of Calibration	Resolution	Cal Date	Due Date
Boeckeler DDI-104	5779	Linear Gage	A.A. Jansson	.000139 in	.0001 in	30-Jun-09	30-Jun-11
Extech K4458CF	00561	Thermometer	Sypris	1.8 °F	.1 °F	26-Mar-10	26-Mar-12

The standards used for this verification are traceable to NIST.

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Comments

Verified By: Walt Szymanowski
Service Engineer