

CERTIFICATE OF CALIBRATION

ISSUED BY : INSTRON CALIBRATION LABORATORY

DATE OF ISSUE : 17-Oct-2014

CERTIFICATE NUMBER : 22101714113000



Lab code: 200301-0

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APPROVED SIGNATORY

**Walt
Szymanowski**

Digitally signed by Walt Szymanowski
DN: cn=Walt Szymanowski, c=US,
[=Norwood, st=MA, o=Instron, ou=America's
- MAR, Calibration Laboratory, A division of
Illinois Tool Works, Inc. (ITW, Inc.),
email=Walt_Szymanowski@Instron.com
Date: 2014.10.17 11:59:14 -04'00'

Type of Calibration: Speed
Relevant Standard: ASTM E2658-11
Date of Calibration: 17-Oct-2014

Customer Requested Due Date: 17-Apr-2016

Customer

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

Machine

Serial No : 4665
Make : Instron
Model : 5500R1123

P.O. Number :
Contact :

Ambient Temperature : 73.4 °F

Readout Verified

1. Digital Readout (in/min)

Resolution of Indicator: .00001 in/min

Certification Statement

This certifies that each speed verified with machine indicator 1 (listed above) was verified by Instron in accordance with ASTM E2658 (Start and Stop Method) and Instron work instruction ICA-8-07, and that the ASTM E2658 classification for each speed was:

PASSED Class A - for .05 in/min speed
PASSED Class A - for 2 in/min speed
PASSED Class A - for 12 in/min speed

Method of Verification

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 9001:2008, and ISO/IEC 17025:2005. The Instron measurement equipment used for verification is traceable to NIST.

The testing machine was verified on-site at customer location. The testing machine was verified in the 'As Found' condition with no adjustments or repairs carried out. This is also the 'As Left' condition.

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.

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Datapoint Summary - Indicator 1 - Digital Readout(in/min)

Indicated Speed (in/min)	Run1 Error(%)	Run2 Error(%)	Run3 Error(%)	Repeat Error (%)	Uncertainty (in/min)*	Coverage Factor = k
.05	.088	.104	-.047	.151	0.000055	2.31
2	-.024	.010	.003	.034	0.0020	2
12	-.065	.004	-.043	.069	0.012	2

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

Data - Indicator 1 - Digital Readout(in/min)

Temperature at start of verification : 73.4 °F

Indicated Speed (in/min)	Run 1			Run 2			Run 3		
	Disp. (in)	Time (min)	Actual Speed (in/min)	Disp. (in)	Time (min)	Actual Speed (in/min)	Disp. (in)	Time (min)	Actual Speed (in/min)
.05	.17876	3.57833	.0499562	.17729	3.54950	.0499479	.16201	3.23868	.0500234
2	.38109	.19050	2.0004724	.35363	.17683	1.9997926	.35799	.17900	1.9999441
12	2.09937	.17483	12.0078360	2.13592	.17800	11.9995506	2.27897	.18983	12.0051097

Temperature at end of verification : 74.4 °F

Direction of Displacement: Down i.e. in Compression

Verification Equipment

Make/Model	Serial No.	Description	Cal Agency	Cal Date	Due Date
Instron LDS-10	080712B	Linear Gage	A.A. Janson	11-Aug-14	11-Aug-16
Exttech 445580	1001333	Thermometer	Masy	10-Feb-13	10-Feb-15
---	JHG5GV1	Computer Clock	Instron Calibration	2-Jul-14	2-Jul-16

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Verification Equipment Specifications

Serial No.	Resolution	Accuracy (+/-)
080712B	0.00001 in	0.000200 in
1001333	0.1 °F	2 °F
JHG5GV1	0.01 ms	10 ms

Instron standards are traceable to the SI (The International System of Units) through standards maintained by the National Institute of Standards and Technology (NIST) or other internationally recognized National Metrology Institutes (NMIs).

The accuracy of the verification equipment used was equal to or better than the accuracy indicated in the table above.

The Standard Reference Speed ("Actual Speed") is derived from the combined effect of the Displacement and Computer Clock Time references with a Performance Specification of +/- .125% of reading.

Comments

Verified By: Walt Szymanowski
Field Systems Engineer