CERTIFICATE OF CALIBRATION

ISSUED BY: INSTRON CALIBRATION LABORATORY

DATE OF ISSUE: 21-Mar-11 CERTIFICATE NUMBER: **22011011123024A**

NVLAP

Lab code: 200301-0

Instron
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APPROVED SIGNATORY

Justin Fry

Digitally signed by Justin Fry
DN: cn=Justin Fry, c=US, ou=Instron
Reason: I am approving this document
Date: 2011.03.21 19:45:55 -04'00'

Type of Calibration: **Force**
Relevant Standard: **ASTM E4 - 10**
Date of Calibration: **10-Jan-11**

Customer Requested Due Date: 10-Jul-12

Customer

Name: US Army Rodman Test Center
Address: Bldg. 4600
Aberdeen Proving Grounds, Md. 21005

P.O./Contract No.:
Contact:

Machine

Manufacturer: Instron
Serial Number: 5500R1125 / 6539
System ID: 5500R1125 / 6539
Range Type: Single

Transducer

Manufacturer: Instron
Transducer ID: 2511-301 / 323
Capacity: 1124.8 lbf
Type: Tension/Compression

Classification

1. Service Port - PASSED**

Certification Statement

This certifies that the forces verified with machine indicator(s) (listed above) that passed are WITHIN ± 1 % accuracy, 1 % repeatability, and zero return tolerance.
All machine indicators were verified on-site at customer location by Instron in accordance with ASTM E4.
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 certification is based on runs 1 and 2 only. A third run is taken to satisfy uncertainty requirements according to ISO 17025 specifications.

**** within ± .5% accuracy and .5% repeatability.**

Method

The testing machine was verified in the 'as found' condition with no adjustments carried out.

The load cell indicated on this certificate was removed and interchangeability has been established, demonstrated and verified per ASTM E4, section 7.3.

Instron CalproCR Version 3.20

The results indicated on this certificate and the following 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 the issuing laboratory.

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Summary of Results

Temperature at start of verification: 75.70 °F.

Indicator 1. - Service Port (lbf)

Range Full Scale (%)	Tested Force Range (lbf)	Mode	ASTM E4 Max Error (%)	ASTM E4 Max Repeat Error (%)	Zero Return	Resolution (lbf)	ASTM E4 Lower Limit (lbf)
100	10.017 to 951.6832	T	-0.15	0.08	Pass	0.011248	2.2496
	-12.3675 to -1002.602	C	-0.39	0.08	Pass	0.011248	2.2496

Temperature at end of verification: 75.00 °F.

Data Point Summary - Indicator 1. - Service Port (lbf)

TENSION

% of Range	Run 1 Error (%)	Run 2 Error (%)	Run 3 Error (%)	ASTM E4 Repeat Error (%)	Relative Uncertainty* (%)	Uncertainty of Measurement* (± lbf)
100% Range (Full Scale: 951.6832 lbf)						
1	0.05	0.06	-0.11	0.01	0.20	0.020
2	0.00	0.01	-0.04	0.01	0.15	0.037
4	-0.15	-0.07	0.00	0.08	0.16	0.072
7	-0.07	-0.03	-0.03	0.04	0.13	0.115
10	0.04	0.00	-0.08	0.04	0.15	0.166
20	-0.04	-0.04	-0.01	0.00	0.13	0.295
40	0.03	0.04	0.08	0.01	0.13	0.618
70	0.07	0.05	0.10	0.02	0.13	1.031
100	0.07	0.06	0.10	0.01	0.13	1.236

Data Point Summary - Indicator 1. - Service Port (lbf)

COMPRESSION

% of Range	Run 1 Error (%)	Run 2 Error (%)	Run 3 Error (%)	ASTM E4 Repeat Error (%)	Relative Uncertainty* (%)	Uncertainty of Measurement* (± lbf)
100% Range (Full Scale: -1002.602 lbf)						
1	0.02	-0.03	-0.35	0.05	0.28	0.037
2	-0.08	-0.09	-0.23	0.01	0.18	0.043
4	-0.39	-0.31	-0.44	0.08	0.15	0.073
7	-0.24	-0.28	-0.27	0.04	0.13	0.121
10	-0.24	-0.18	-0.20	0.06	0.13	0.165
20	-0.09	-0.10	-0.08	0.01	0.13	0.299
40	0.01	0.00	0.01	0.01	0.13	0.590
70	0.04	0.04	0.03	0.00	0.13	0.975
100	0.05	0.05	0.05	0.00	0.13	1.283

** The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%.*

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Data - Indicator 1. - Service Port (lbf)

TENSION

% of Range	Run 1 Indicated (lbf)	Run 1 Applied (lbf)	Run 2 Indicated (lbf)	Run 2 Applied (lbf)	Run 3 Indicated (lbf)	Run 3 Applied (lbf)
100% Range (Full Scale: 951.6832 lbf)						
0 Return	-0.032		-0.062		0.008	
1	10.762	10.7565	10.023	10.017	10.105	10.116
2	26.407	26.4075	25.586	25.5825	20.000	20.0085
4	48.158	48.23	46.368	46.3996	45.341	45.3388
7	89.467	89.5336	85.886	85.9144	88.019	88.0412
10	111.895	111.8468	114.832	114.8368	115.219	115.3152
20	226.997	227.0944	232.041	232.1332	225.758	225.7788
40	464.818	464.6564	477.685	477.5004	461.672	461.2972
70	791.058	790.504	780.397	780.0052	790.815	790.0568
100	950.834	950.196	952.229	951.6832	951.555	950.5912

Data - Indicator 1. - Service Port (lbf)

COMPRESSION

% of Range	Run 1 Indicated (lbf)	Run 1 Applied (lbf)	Run 2 Indicated (lbf)	Run 2 Applied (lbf)	Run 3 Indicated (lbf)	Run 3 Applied (lbf)
100% Range (Full Scale: -1002.602 lbf)						
0 Return	0.003		0.046		0.003	
1	-12.370	-12.3675	-13.130	-13.134	-13.782	-13.83
2	-23.881	-23.901	-23.065	-23.0865	-25.719	-25.779
4	-43.748	-43.9192	-49.997	-50.154	-53.305	-53.5392
7	-83.475	-83.6732	-97.715	-97.994	-98.012	-98.28
10	-129.085	-129.402	-111.295	-111.4984	-130.053	-130.312
20	-238.162	-238.368	-228.070	-228.2956	-234.478	-234.6708
40	-433.655	-433.6332	-469.824	-469.8096	-479.033	-478.998
70	-740.413	-740.1212	-781.574	-781.2324	-763.893	-763.646
100	-1002.953	-1002.4664	-1003.149	-1002.6016	-1002.176	-1001.6396

The Return to Zero tolerance is ± the indicator resolution, 0.1 % of the maximum force verified in the range, or 1% of the lowest force verified in the range, whichever is greater.

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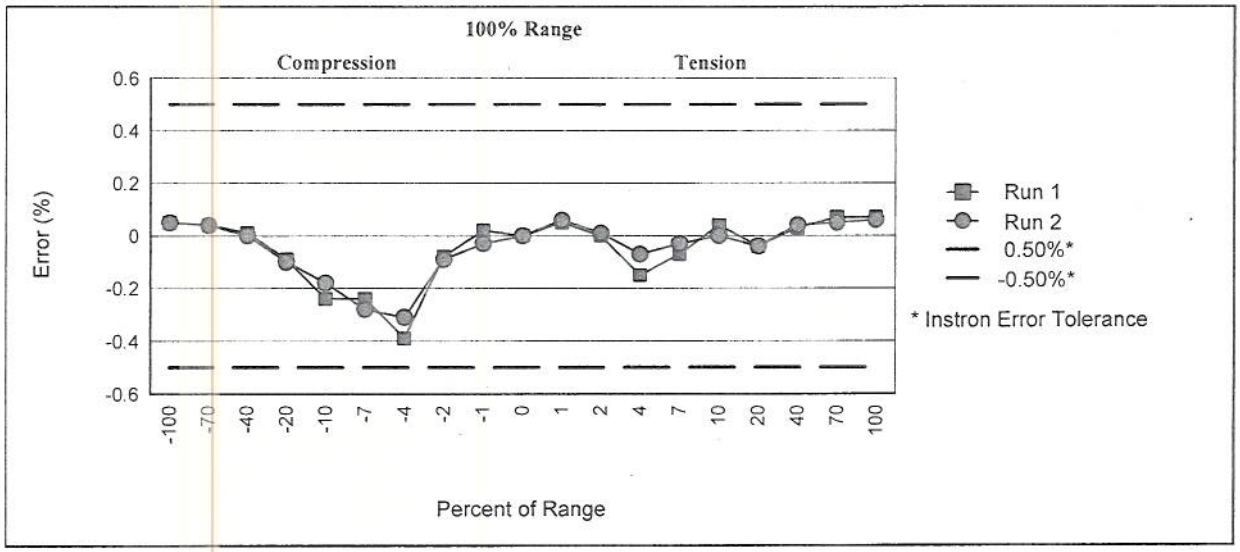
Graphical Data - Indicator 1. - Service Port (lbf)



Verification Equipment

Make/Model	Serial Number	Description	Calibration Agency	Capacity	Cal Date	Cal Due
Flintec 3401588	3401588	load cell	Instron	1200 lbf	22-Jan-10	22-Jan-12
Revere 300FMM	54626	load cell	Instron	335 lbf	04-Mar-10	04-Mar-11
Extech K4458CF	00561	temp. indicator	Sypris	NA	26-Mar-10	26-Mar-12
HBM DK38	29480	force indicator	Instron	NA	25-Aug-10	25-Aug-12

Verification Equipment Usage

Range Full Scale (%)	Standard Serial Number	Mode	Percent(s) of Range	Lower Limit for Standard Class A / A1 (lbf)
100	3401588	T	4/7/10/20/40/70/100	20 / 28
100	54626	T	1/2	5 / 8
100	3401588	C	4/7/10/20/40/70/100	20 / 31
100	54626	C	1/2	5 / 9

Instron standards are traceable to NIST.

The standard Class A lower limit is used for systems with an accuracy of +/- 1.0% and the standard Class A1 lower limit is used for systems with an accuracy of +/- 0.5%.

Standard forces have been temperature compensated as necessary.

Comments

Certificate 22011011123024A replaces 22011011123024 to reflect an 18 month calibration cycle due date.

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Verified by: Walt Szymanowski
Field Service Engineer

NOTE: Clause 20 of ASTM E4 states; It is recommended that testing machines be verified annually or more frequently if required. In no case shall the time interval between verifications exceed 18 months (except for machines in which long term test runs beyond the 18 month period). Testing machines shall be verified immediately after repairs that may in any way affect the operation of the weighing system or values displayed. Verification is required immediately after a testing machine is relocated and where there is a reason to doubt the accuracy of the force indicating system, regardless of the time interval since the last verification.