

CERTIFICATE OF CALIBRATION

ISSUED BY: INSTRON CALIBRATION LABORATORY

DATE OF ISSUE: 15-May-09 CERTIFICATE NUMBER: 4J64278



INSTRON

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Customer

MOSCOW STATE TECHNICAL UNIV

MOSCOW, RUSSIA

Contact:

Date of Verification: 15-May-09
Ambient Temperature: 70.2 °F

Machine

Manufacturer: Instron
Model: 55MT5
Serial No.: SATK6832
Type: Other
Extended Range
Capacity: 5000 IN-LB
Year of Mfg: 2009

Transducer

Manufacturer: Instron
Model: 300-8992-0858
Serial No.: 64580
Capacity: 565 N-m
Type: Clockwise/Counterclockwise

Classification

I. Digital Readout (N-m) - PASSED**

Certification Statement

This certifies that the forces verified with machine indicator 1 (listed above) are WITHIN $\pm 1\%$ accuracy, 1% repeatability, and zero return tolerance. All machine indicators were verified by Instron Corporation in accordance with ASTM E4-02.

** within $\pm .5\%$ accuracy and $.5\%$ repeatability.

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Method of Verification

The testing machine was verified in the 'as found' condition with no adjustments carried out. See also certificate number 4J62728.

The verification and equipment used conform to a controlled Quality Assurance program which meets the specifications outlined in ANSI/NCSL Z540-1, ISO 10012-1, ISO 9001, and ISO/IEC 17025 (formerly ISO/IEC Guide 25).

The certification is based on runs 1 and 2 only. A third run is taken to satisfy uncertainty requirements according to ISO 17025 specifications.

Summary of Results

Indicator 1. - Digital Readout (N-m)

Range F/S (%)	Tested Force Range (N-m)	Mode	Max Error	Max Repeat Error (%)	Zero Return	Resolution (N-m)	ASTM Lower Limit (N-m)
100	2.26 - 565	CW	-.23	.09	Pass	.01	2
	2.26 - 565	CCW	.31	.27	Pass	.01	2

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Datapoint Summary - Indicator 1. - Digital Readout (N-m)

CLOCKWISE

% of Range	Run 1 Error (%)	Run 2 Error (%)	Run 3 Error (%)	ASTME4 Repeat Error (%)	Uncertainty Repeat Error (%)	Relative Uncertainty * (%)	Uncertainty of Measurement * (N-m)
100% Range (Full Scale: 565 N-m)							
0.4	-.14	-.23	-.15	.09	.028	.263	± .006
0.8	-.09	-.08	-.22	.01	.045	.157	± .007
1.6	.05	-.01	.06	.06	.022	.079	± .007
2.8	.03	.01	.02	.02	.006	.041	± .007
4	.02	.03	.00	.01	.009	.035	± .008
8	.01	-.01	.00	.02	.006	.019	± .009
16	.02	.01	.01	.01	.003	.013	± .012
28	.02	.02	.03	.00	.003	.012	± .019
40	.02	.03	.03	.01	.003	.011	± .026
60	.04	.05	.05	.01	.003	.011	± .038
80	.05	.05	.06	.00	.003	.011	± .051
100	.07	.06	.07	.01	.003	.011	± .063
0 Return							

Datapoint Summary - Indicator 1. - Digital Readout (N-m)

COUNTERCLOCKWISE

% of Range	Run 1 Error (%)	Run 2 Error (%)	Run 3 Error (%)	ASTME4 Repeat Error (%)	Uncertainty Repeat Error (%)	Relative Uncertainty * (%)	Uncertainty of Measurement * (N-m)
100% Range (Full Scale: 565 N-m)							
0.4	-.06	-.21	-.03	.27	.079	.302	± .007
0.8	.22	.31	.31	.09	.030	.141	± .006
1.6	.00	.05	-.01	.05	.019	.075	± .007
2.8	-.02	.06	.02	.08	.023	.061	± .010
4	-.01	.03	.04	.04	.015	.043	± .010
8	-.14	-.14	-.11	.00	.010	.025	± .011
16	-.07	-.07	-.05	.00	.007	.017	± .016
28	-.02	-.02	-.01	.00	.003	.012	± .019
40	.01	.01	.01	.00	.000	.009	± .021
60	.03	.03	.03	.00	.000	.009	± .031
80	.05	.05	.05	.00	.000	.009	± .041
100	.07	.06	.06	.01	.003	.011	± .063
0 Return							

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* 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 %

Data - Indicator 1. - Digital Readout (N-m)

CLOCKWISE

% of Range	Run 1		Run 2		Run 3	
	Indicated (N-m)	Applied (N-m)	Indicated (N-m)	Applied (N-m)	Indicated (N-m)	Applied (N-m)
100% Range (Full Scale: 565 N-m)						
0.4	2.26	2.26320	2.26	2.26523	2.25	2.25345
0.8	4.52	4.52396	4.52	4.52341	4.53	4.54011
1.6	9.04	9.03580	9.04	9.04078	9.04	9.03469
2.8	15.82	15.81499	15.82	15.81776	15.82	15.81721
4	22.6	22.59641	22.6	22.59253	22.6	22.59973
8	45.2	45.19762	45.2	45.20304	45.2	45.20033
16	90.4	90.38438	90.4	90.39252	90.4	90.38710
28	158.2	158.16454	158.2	158.16996	158.2	158.15098
40	226	225.94469	226	225.93384	226	225.92300
60	339	338.87636	339	338.84111	339	338.83840
80	452	451.75651	452	451.75380	452	451.73211
100	565	564.58243	565	564.63666	565	564.61768
0 Return	0		0		0	

Data - Indicator 1. - Digital Readout (N-m)

COUNTERCLOCKWISE

% of Range	Run 1		Run 2		Run 3	
	Indicated (N-m)	Applied (N-m)	Indicated (N-m)	Applied (N-m)	Indicated (N-m)	Applied (N-m)
100% Range (Full Scale: 565 N-m)						
0.4	2.25	2.25137	2.29	2.28512	2.28	2.27940
0.8	4.56	4.54991	4.56	4.54578	4.55	4.53589
1.6	9.04	9.03967	9.04	9.03524	9.04	9.04078
2.8	15.82	15.82385	15.82	15.81112	15.82	15.81666
4	22.6	22.60139	22.6	22.59309	22.6	22.59143

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Data - Indicator 1. - Digital Readout (N-m)

COUNTERCLOCKWISE

% of Range	Run 1		Run 2		Run 3	
	Indicated (N-m)	Applied (N-m)	Indicated (N-m)	Applied (N-m)	Indicated (N-m)	Applied (N-m)
100% Range (Full Scale: 565 N-m)						
8	45.2	45.26541	45.2	45.26541	45.2	45.25185
16	90.4	90.46031	90.4	90.46031	90.4	90.44133
28	158.2	158.22691	158.2	158.23233	158.2	158.21606
40	226	225.98265	226	225.98537	226	225.97452
60	339	338.88992	339	338.90348	339	338.88721
80	452	451.76736	452	451.79448	452	451.77549
100	565	564.63124	565	564.66649	565	564.64209
0 Return	0		0		0	

The Return to Zero tolerance is \pm 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.

Verification Equipment

Make/Model	S/N	Description	Calibration Agency	Capacity	Cal Date	Cal Due
Lebow	770	Load Cell	Instron Corp.	5000 lbf-in	09-May-08	09-May-10
Lebow	1086	Load Cell	Instron Corp.	1000 lbf-in	23-Oct-07	23-Oct-09
Lebow	1123922	Load Cell	Instron	100 lbf-in	15-Dec-08	15-Dec-10
HBM DK38	42792	Load Cell Indicator	Instron Corp.	N/A	28-Apr-08	28-Apr-10

Verification Equipment Usage

Range F. S. (N-m)	Standard S/N	Mode	Percent(s) of Range	Uncertainty of Calibration (% of capacity)	Lower Limit (N-m) Standard Class A / A1
565	1086	CW	1.6, 2.8, 4	.005	5.6492 / 8.9258
	1086	CCW	1.6, 2.8, 4	.005	5.6492 / 9.8297
	1123922	CW	0.4, 0.8	.005	.226 / .5649
	1123922	CCW	0.4, 0.8	.005	.226 / .6779
	770	CW	8, 16, 28, 40, 60, 80, 100	.005	22.597 / 41.4654

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Verification Equipment Usage

Range F. S. (N-m)	Standard S/N	Mode	Percent(s) of Range	Uncertainty of Calibration (% of capacity)	Lower Limit (N-m) Standard Class A / A1
565	770	CCW	8, 16, 28, 40, 60, 80, 100	.005	22.597 / 41.3524

Standard Class A is used for machine accuracy errors greater than 0.5% and Standard Class A1 is used for machine accuracy errors that are less than or equal to 0.5%.

Comments:

Verified by: Mike Buchanan

Instron IPG Calibration Tech



NOTE: Clause 20 of ASTM E-4: 2002 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.