CERTIFICATE OF CALIBRATION

ISSUED BY: INSTRON CALIBRATION LABORATORY

DATE OF ISSUE: See signature

CERTIFICATE NUMBER: **062031425112024**

NVLAP CALIBRATION
NVLAP Lab Code 200301-0

Instron
825 University Avenue
Norwood, MA 02062-2643
Telephone: (800) 473-7838
Fax: (781) 575-5750
Email: service_requests@instron.com

APPROVED SIGNATORY

Mike Spuzzillo

Digitally signed by Mike Spuzzillo
Reason: I attest to the accuracy and integrity of this document
Date: 2025.03.14 13:23:59 -07'00'

Type of Calibration: **Displacement**
Relevant Standard: **ASTM E2309/E2309M-20**
Date of Calibration: **14-Mar-2025**

Customer Requested Due Date: **14-Mar-2026**

* * * VERIFICATION RESULTS * * *

System ID: 34SC1B32396

Indicator - Service Port (mm)

Range: 10.0186 mm to 100.1088 mm - Ascending
PASSED Class A Starting Position: 430.00 mm Maximum Error: -0.306%

Range: -10.0246 mm to -100.1214 mm - Descending
PASSED Class A Starting Position: 560.00 mm Maximum Error: -0.194%

The starting position is measured from the base beam to the bottom of the crosshead.

Customer

Name:	Evergreen State College
Address:	Science Support Center - NIST 2713 McCann Plaza Drive NW Olympia, WA 98505 United States
Contact:	Carri LeRoy
Email:	leroyc@evergreen.edu
Service Order No.:	SV2412100254@@1

Machine/System

Manufacturer:	Instron
Serial No.:	34SC1B32396
Condition:	Good

Temperature

Starting Temperature:	67.2 °F
Final Temperature:	67.4 °F

Methodology

The assessment of the testing machine was conducted on site at the above customer location in accordance with ASTM E2309/E2309M-20 "Standard Practices for Verification of Displacement Measuring Systems and Devices Used in Material Testing Machines" (Follow-the-Displacement Method) using Instron procedure ICA-8-07.

The system was calibrated in the 'As Found' condition with no adjustments or repairs carried out. This is also the 'As Left' condition.

Prior to verification, a pre-calibration inspection was conducted. During the inspection, the testing system was found to be in Good condition.

The calibrated range of displacement includes only those displacements which are greater than or equal to the ASTM Lower Limit.

Three calibration tests were made with the testing machine in the vertical position.

System Classification

The calibration and equipment used conform to a controlled Quality Assurance program which meets the specifications

Instron CalproCR Version 3.58

outlined in ANSI/NCSL Z540.1-1994, ISO 10012:2003, ISO 9001:2015, ISO/IEC 17025:2017.

The displacement-measuring system has been verified for the displacements indicated using equipment calibrated within the requirements of ASTM E2309/E2309M-20.

The Simple Acceptance decision rule has been agreed to and employed in the determination of conformance to the identified metrological specification.

Classifications based upon ASTM E2309 Table 1.

	Resolution not to exceed the greater of:		Error/Repeatability not to exceed the greater of:	
Classification	Fixed Error mm [in]	% of Reading	Fixed Error mm [in]	Relative Error (% of Displacement)
Class A	0.013 [0.0005]	+/- 0.25	+/- 0.025 [0.001]	+/- 0.5
Class B	0.038 [0.0015]	+/- 0.5	+/- 0.075 [0.003]	+/- 1.0
Class C	0.064 [0.0025]	+/- 1.0	+/- 0.125 [0.005]	+/- 2.0
Class D	0.13 [0.005]	+/- 1.5	+/- 0.25 [0.010]	+/- 3.0

Note: Classification is based upon meeting both Resolution and Error/Repeatability requirements.

Data Summary - Indicator - Service Port (mm)

% of Range	Run 1 Error (mm)	Run 1 Error (%)	Run 1 Class	Run 2 Error (mm)	Run 2 Error (%)	Run 2 Class	Run 3 Error (mm)	Run 3 Error (%)	Run 3 Class	Repeat Error (mm)	Repeat Class
Range: 10.0186 mm to 100.1088 mm - Ascending											
10	-0.0165	-0.164	A	-0.0307	-0.306	A	-0.0306	-0.305	A	0.0142	A
25	-0.0284	-0.113	A	-0.0455	-0.182	A	-0.0505	-0.202	A	0.0221	A
50	-0.0471	-0.094	A	-0.0481	-0.096	A	-0.0673	-0.134	A	0.0202	A
75	-0.0652	-0.087	A	-0.0826	-0.110	A	-0.0871	-0.116	A	0.0219	A
100	-0.0782	-0.078	A	-0.0979	-0.098	A	-0.0998	-0.100	A	0.0216	A
Range: -10.0246 mm to -100.1214 mm - Descending											
10	0.0179	-0.178	A	0.0184	-0.184	A	0.0194	-0.194	A	0.0015	A
25	0.0390	-0.156	A	0.0390	-0.156	A	0.0418	-0.167	A	0.0028	A
50	0.0661	-0.132	A	0.0642	-0.128	A	0.0634	-0.127	A	0.0027	A
75	0.0901	-0.120	A	0.0835	-0.111	A	0.0823	-0.110	A	0.0078	A
100	0.1125	-0.112	A	0.1059	-0.106	A	0.1052	-0.105	A	0.0073	A

Data - Indicator - Service Port (mm)

% of Range	Run 1 Indicated (mm)	Run 1 Applied (mm)	Run 2 Indicated (mm)	Run 2 Applied (mm)	Run 3 Indicated (mm)	Run 3 Applied (mm)	Uncertainty of Measurement* %	Uncertainty of Measurement* (+/- mm)
Range: 10.0186 mm to 100.1088 mm - Ascending								
0	0.00000	0.0000	0.00000	0.0000	0.00013	0.0000		
10	10.00213	10.0186	10.00750	10.0382	10.00713	10.0376	0.066	0.0067
25	25.00600	25.0344	25.00850	25.0540	25.00663	25.0570	0.039	0.0097
50	50.00888	50.0560	50.02488	50.0730	50.00462	50.0718	0.033	0.016
75	75.00938	75.0746	75.00762	75.0902	75.00525	75.0922	0.031	0.024
100	100.00525	100.0834	100.00850	100.1064	100.00913	100.1088	0.031	0.031

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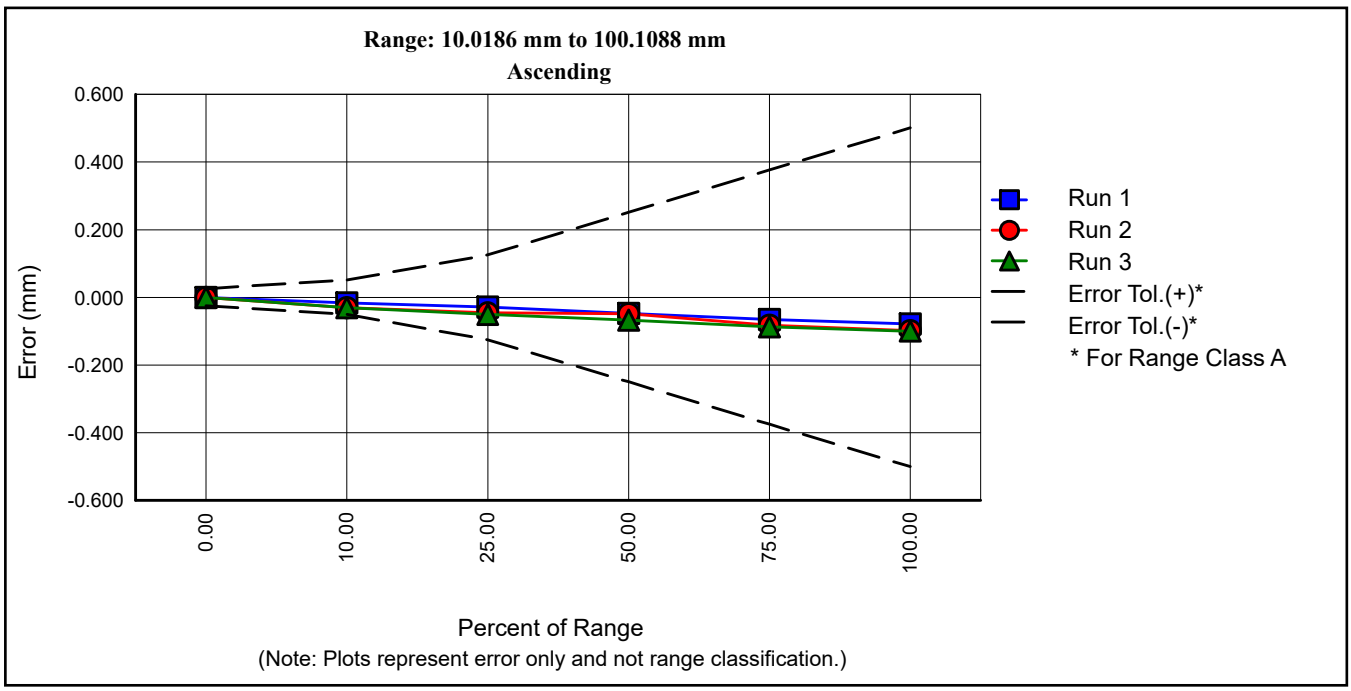
Data - Indicator - Service Port (mm)

% of Range	Run 1 Indicated (mm)	Run 1 Applied (mm)	Run 2 Indicated (mm)	Run 2 Applied (mm)	Run 3 Indicated (mm)	Run 3 Applied (mm)	Uncertainty of Measurement* %	Uncertainty of Measurement* (+/- mm)
Range: -10.0246 mm to -100.1214 mm - Descending								
0	0.00000	0.0000	-0.00025	0.0000	0.00000	0.0000		
10	-10.00675	-10.0246	-10.00825	-10.0264	-10.00838	-10.0278	0.066	0.0067
25	-25.00825	-25.0472	-25.00588	-25.0446	-25.00463	-25.0464	0.039	0.0096
50	-50.00512	-50.0712	-50.00825	-50.0722	-50.00600	-50.0694	0.033	0.016
75	-75.00650	-75.0966	-75.00574	-75.0890	-75.00713	-75.0894	0.031	0.024
100	-100.00887	-100.1214	-100.00775	-100.1134	-100.00500	-100.1102	0.031	0.031

** 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%.*

The uncertainty stated refers to values obtained during the calibration and makes no allowances for factors such as long-term drift, temperature and alignment effects - the influence of such factors should be taken into account.

Graphical Data - Indicator - Service Port (mm)



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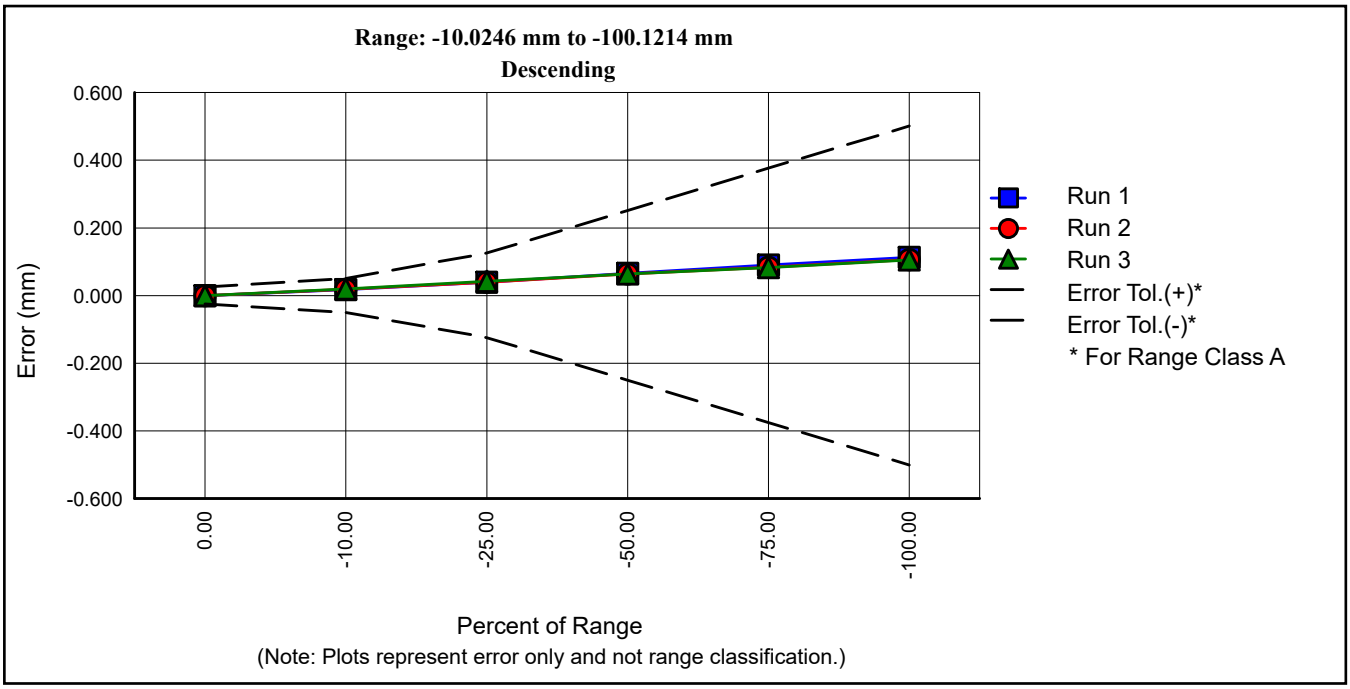

(Note: Plots represent error only and not range classification.)

Calibration Equipment

The measurement results produced with Instron standards are traceable to the SI (The International System of Units) through internationally recognized National Metrology Institutes (NIST, NPL, PTB, Inmetro, etc.).

Manufacturer/Model	Serial No.	Description	Cal Date	Cal Due	Certificate Ref.
Instron LDS (280/287)	051613C (ASTM)	disp. indicator	04-Jun-2024	04-Jun-2026	INS051613C
Extech 445580	1103444	temp. indicator	25-Jul-2024	25-Jul-2025	2024016106

The class of the calibration equipment was equal to or better than the class to which this testing machine has been calibrated.

Calibration Equipment Usage

Measurement Type	Serial No.	Direction	Percent(s) of Range	Accuracy (+/-)
Displacement	051613C (ASTM)	Ascending	10/ 25/ 50/ 75/ 100	0.0002 in
	051613C (ASTM)	Descending	10/ 25/ 50/ 75/ 100	0.0002 in
Temperature	1103444	All	All	1.8 °F

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

Comments

New Installation

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Performed By: Mike Spuzzillo
Field Service Engineer

It is Instron's recommendation that the displacement measuring system be calibrated at least annually or after any repair or adjustment which affects the accuracy of measurements.