

## **GMP 8**

### **Good Measurement Practice for Reporting Tape Calibrations**

Tape calibration results should be reported as described in SOP 1, Preparation of Calibration Certificates. The use of the Calibration Certificate and Test Report Review Checklist, (SOP 1, Appendix B), is highly recommended.

Information pertinent to this type of calibration should include:

1. A note that reported lengths may be converted to catenary suspension support lengths by use of the “Equations for Metallic Tapes” (GMP 9);
2. Description of the procedure, and the position of the test artifact relative to the observer;
3. Tension applied to the tape during the test;
4. Type of support, e.g., continuous, catenary (include information regarding spacing);
5. The assumed linear coefficient of expansion for the tape material;
6. The relationship between the International System of Units (SI) and US customary units;
7. The degrees of freedom (effective) associated with the coverage factor  $k$ ;
8. AE value, if requested by customer; and
9. Weight per Unit Length, if requested by customer.

An example of a Calibration Certificate follows in the Appendix.

**Appendix – Example****COMPLIANT CALIBRATION LABORATORY**

123 Some Ave.  
City, State 12312-1231

**CALIBRATION CERTIFICATE****FOR****25 foot Iron-Nickel Alloy Tape**

Maker: LUFSTARTOYO

Serial No.: C917R

**Lab Test No.: TI-14-056**

NMI Test No.: 822/1234

**SUBMITTED BY****YOUR CUSTOMER, INC.**

Customer's Address

City, State

This tape has been compared to the standards of Compliant Calibration Laboratory. The horizontal distances between the centers of graduations of the indicated intervals have the following lengths at 20 °C (68 °F) when the tape is subjected to 10 pound horizontally applied tension and supported on a horizontal flat surface. The terminal points of the indicated intervals are the centers of the graduations at the edge of the tape ribbon nearest the observer when the zero graduation is to the left.

Interval (feet)	Length (inches)	Uncertainty (inches)	Interval (feet)	Length (inches)	Uncertainty (inches)
0 to 1	12.000 3	0.001 0	0 to 14	167.999 4	0.001 0
0 to 2	24.000 5	0.001 0	0 to 15	180.000 1	0.001 0
0 to 3	36.000 3	0.001 0	0 to 16	192.000 4	0.001 0
0 to 4	48.000 2	0.001 0	0 to 17	204.000 3	0.001 0
0 to 5	59.999 8	0.001 0	0 to 18	216.000 2	0.001 0
0 to 6	71.999 6	0.001 0	0 to 19	220.000 4	0.001 0
0 to 7	84.000 2	0.001 0	0 to 20	239.999 8	0.001 0
0 to 8	96.000 1	0.001 0	0 to 21	252.000 4	0.001 0
0 to 9	108.000 2	0.001 0	0 to 22	264.000 1	0.001 0
0 to 10	120.000 4	0.001 0	0 to 23	275.999 7	0.001 0
0 to 11	132.000 4	0.001 0	0 to 24	287.999 6	0.001 0
0 to 12	144.000 2	0.001 0	0 to 25	300.000 7	0.001 0
0 to 13	155.999 6	0.001 0			

The data in the above table only applies to those items specifically listed on this report.

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Reported lengths may be converted to catenary suspension support lengths by use of the “Equations for Metallic Tapes” (GMP 9).

The exact relationship between the International System of Units (SI) and the US customary units of length is one foot equals 0.304 8 meter.

**Uncertainty statement:**

The combined standard uncertainty includes the standard uncertainty reported for the standard, the standard uncertainty for the measurement process, the standard uncertainty of the coefficient of expansion, the standard uncertainty of the tension weights, the standard uncertainty of the graduated reticle, and a component of uncertainty to account for any observed deviations from NIST values that are less than surveillance limits. The combined standard uncertainty is multiplied by a coverage factor of 2.07, for 35 effective degrees of freedom, to provide an expanded uncertainty, which defines an interval having a level of confidence of approximately 95 percent. The expanded uncertainty presented in this report is consistent with the ISO/IEC Guide to the Expression of Uncertainty in Measurement (2008). The expanded uncertainty is not to be confused with a tolerance limit for the user during application.

**Traceability statement:**

The Standards of the Compliant Calibration Laboratory are traceable to the International System of Units (SI) through the National Institute of Standards and Technology, and are part of a comprehensive measurement assurance program for ensuring continued accuracy and measurement traceability within the level of uncertainty reported by this laboratory. The laboratory test number identified above is the unique report number to be used in referencing measurement traceability for artifacts identified in this report only.

**Supplemental Information**

**Description of artifacts submitted for testing:**

25 foot, iron-nickel alloy (invar), tape. A linear coefficient of thermal expansion of 0.000 000 4 /°C (0.000 000 22 /°F) was assumed.

**Conditions of artifacts submitted for testing:**

Artifact showed evidence of proper handling. No bents or kinks were observed. A light film of oil covered the tape ribbon.

**Treatment of artifacts prior to testing:**

Artifact was cleaned with cheesecloth and alcohol to remove the protective oil film. The artifact was kept in the length laboratory, next to the standard, for 36 h to allow for thermal equilibrium.

**Equipment & Standards**

**Standard:** Length bench      **Calibrated:** August 2014

**Tension weights:** 10 pound, Class F

**Microscope:** B&L, 0.002 inch graduated reticle

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**Procedure used:** NISTIRXXXX, SOP 11, Calibration of Metal Tapes, Bench Method

**Environmental conditions at time of test:**

Temperature: 20.1 °C to 20.2 °C      Barometric Pressure: 752.7 mm Hg  
Relative Humidity: 43.35 % to 43.40 %

Date artifact was received: September 15, 2014  
Date of test: September 17, 2014  
Due date per customer's request: September 17, 2016  
Date of report preparation: September 18, 2014

*Josh Balani, Jr.*

Test performed by: Josh Balani, Jr.  
Metrology Expert

Member:

NCSLI  
NCWM  
ASQ  
ASTM

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