DeFelsko®

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Calibration Procedure

DeFelsko Corporation

Testex Digital Micrometer Calibration

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1 Introduction and UUC Performance Requirements

1.1 This procedure describes the calibration of Testex Micrometers with the following measurement range:

Table 1-1 Measurement Ranges

Version	Range	Resolution
Mils	0 – 0.0400”	0.0001”
Microns	0 – 1000 µm	1 µm

1.2 The micrometer being calibrated will be referred to as the UUC (unit-under-calibration).

2 Measurement Standards and Support Equipment Performance Requirements

2.1 The UUC accuracy requirements are based upon the published UUC performance specifications.

2.2 The test uncertainty ratio applied in this calibration procedure is 4:1 unless otherwise stated.

2.3 Minimum-Use-Specifications are the minimum test equipment specifications required to meet all the UUC accuracy requirements and the test uncertainty ratio applied.

Table 2-1 UUC Accuracy Requirements and Description

Range	Accuracy	Test Method
0 – 0.0100”	± 0.0002”	Gage Blocks
>0.0100 – 0.0400”	± (0.0002”+ 1%)	
0 – 250 µm	± 5 µm	Gage Blocks
> 251 -1000 µm	± (5 µm + 1%)	

Table 2-2 Minimum Use Specifications

Range	Accuracy
0 – 0.0100”	50 µin
>0.0100 – 0.0400”	75 µin
0 – 250 µm	1.25 µm
> 251 -1000 µm	1.89 µm

Table 2-3 Actual Equipment Specifications

Range	Accuracy	Manufacturer/Model #’s Applicable
0.0050 – 0.0350”	± 2.4 µin	Mitutoyo 516-926-26
100 – 900 µm	± 0.06 µm	Mitutoyo

***Caution*:** The instructions in this Calibration Procedure relate specifically to the equipment and conditions listed in Section 2. If other equipment is substituted, the information and instructions must be interpreted accordingly.

Table 2-4 Calibration Environmental and Warm Up Requirements

Measurement Standards & Support Equipment Environmental Requirements:	Temperature: 23 ± 1°C Relative Humidity: Less Than 95%
Measurement Standards & Support Equipment Warm-up and Stabilization Requirements:	Not required

Measurement System Uncertainty Analysis
Gage block uncertainty = 2.4 µin @ 20 ± 1°C

Laboratory Environment 22 - 24°C vs gage block calibration range of 19 - 21°C results in a maximum thermal expansion error of +3°C (5.4°F).

Thermal expansion of block is given as $6e^{-6}$in/°F

$$= 5.4^{\circ}F * 6e^{-6} \text{ in}/^{\circ}F = 32.4 \text{ µin}$$

Performing a sum of squares on the uncertainties = $\sqrt{(32.4^2 + 2.4^2)} = 32.5$ µin

Applying a K=2 coverage factor = 32.5*2 = 65 µin (1.7 µm) uncertainty.

3 Preliminary Operations

Note: Review the entire document before starting the calibration process.

3.1 Visually inspect the UUC for:
- Damage
- Wear

3.2 Verify the reference standards are clean. If necessary place them on a clean paper towel and use a Q-tip with alcohol and light pressure to clean both sides.

3.3 Clean the micrometer anvils.

3.4 Turn on the unit and in default operating mode it will read -2.0 mils. Actuate the micrometer several times and if it doesn't read -2.0 go into the menu and select the zero option.

Note: The gage must be in either C, XC or XC+ mode to properly zero.

Figure 3-1

3.5 Once properly zeroed, go into the menu and change the units to microns and change the measurement mode to no tape. Actuate the thumb lever to return to the measurement screen and it should now show 0 microns.

Figure 3-2

4 Calibration Process

Note: Whenever the test requirement is not met, verify the results of each test and take corrective action before proceeding.

4.1 Review the Performance Requirements in Tables 5-1 and 5-2.

4.2 Measure the center of the 0.1 mm gage block and enter the value in microns in the calibration certificate.

Note: Use tweezers when handling the 0.1 mm reference standard because it is easy to bend or break. Use care when handling all the reference standards, always handle them over a surface so if they are dropped they won't fall a significant distance.

4.3 Check the zero of the micrometer. If the zero needs adjustment, clean the anvils before adjusting the zero. If after cleaning the anvils, the zero still needs adjustment, you must go back into the menu and change the gage back into tape mode before zeroing.

4.4 Repeat steps 4.2 and 4.3 for the 0.3 and 0.9 mm gage blocks.

4.5 Perform a reset of the gage then turn it off. Place a piece of corrosion inhibitor paper between the anvils for storage.

5 Performance Requirements

Note: The technician shall collect the data needed to complete the table below. Do not write in this procedure.

Table 5-1 Performance Requirements and Calibration Data)

Nominal Value (µm)	Reference Value (µm)	Gage Reading (µm)	Min. Reading Allowed❶ (µm)	Max. Reading Allowed❷ (µm)
	A	B	C	D
100				
300				
900				

❶Calculation: B – 5 µm
❷Calculation: B + 5 µm

Management Procedure Change Notice

Procedure Number: MP 2500
Revision Level: A
Date of Change: April 29, 2024
Title: Testex Digital Micrometer Calibration

Reason for Change:
• New product.
Description of Change:
• New procedure.

I confirm I have read and understand the procedure and the change described above.

Printed Name	Signature	Date

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