DeFelsko®

Management Procedure 2553
Revision: D
Date Issued: November 4, 2014
Date Revised: October 26, 2021

Calibration Procedure

Certified SPG Standards

Table of Contents

1 Introduction and UUC Performance Requirements 2
Table 1-1 2
2 Measurement Standards and Support Equipment Performance Requirements 2
Table 2-1 UUC Accuracy Requirements and Description 2
Table 2-2 Minimum Use Specification 2
Table 2-3 Actual Equipment Specification 2
Table 2-4 Calibration Environmental and Warm-up Requirements 2
3 Preliminary Operations 3
4 Calibration Process 3
5 Performance Requirements 4
Table 5-1 Performance Requirements and Data 4
Management Procedure Change Notice 5

1 Introduction and UUC Performance Requirements

1.1 This procedure describes the calibration of DeFelsko Corporation Certified SPG Standards STDSPG-B.

Table 1-1

Measurement Range
51 - 508 microns (2 - 20 mils)

1.2 The unit 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 The 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	Performance Specifications	Test Method
51 - 508 microns (2 - 20 mils)	± 1.25 microns (± 0.05 mils)	Height Gage

Table 2-2 Minimum Use Specification

Range	Accuracy
51 - 508 microns (2 - 20 mils)	± 0.31 microns (± 0.01 mils)

Table 2-3 Actual Equipment Specification

Equipment Generic Name	Range	Accuracy	Manufacturer/Model #'s Applicable
Height Gage	0 – 25.4 mm (0 – 1")	± 0.10 microns (± 0.004 mils)	Heidenhain CT2501 with ND287 display

***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	Temperature: 23 ± 5° C.

Environmental Requirements:	Relative Humidity: Less than 95%
Measurement Standards & Support Equipment Warm-up and Stabilization Requirements:	15 minutes

2.4 Factors Determining Accuracy

2.4.1 The best stated accuracy for any SPG probe is ± (5 um +5%) or ± 5 um at zero so to maintain a 4:1 test ratio the minimum required accuracy for the standards is ± 1.25 um as indicated in table 2-1.

The holding plate surface variation is ± 1 um over the diameter of the SPG probe foot.

The gage blocks are allowed a ± 0.4 um tolerance when measured. The SPG probe foot rests on two blocks and the probe tip rests on a third so there are three blocks contributing to the accuracy.

The height gage accuracy is ± 0.10 um as indicated in table 2-3 and contributes error to each of the 3 blocks plus the measurement of the holding plate

Using the sum of squares method, the errors of the measurement standard is as follows:

$= ((\text{block1})^2 + (\text{block2})^2 + (\text{block3})^2 + (\text{plate variation})^2 + (4*(\text{Height gage})^2))^{1/2}$
$= ((0.4)^2 + (0.4)^2 + (0.4)^2 + (1)^2 + (4*(0.1)^2))^{1/2}$
$= (1.52)^{1/2}$
$= 1.23\text{um}$

3 Preliminary Operations

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

3.1 For new production measure the surface of the plate at either end and the middle and confirm the range is less than 3um.

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 Table 5-1.

4.2 Place one of the gage blocks, printed side facing up, on the vacuum plate and turn on the vacuum pump. Allow the vacuum to draw for about 1 minute.

4.3 Take a height reading on the top of the vacuum plate. Set this as the reference point by pressing “Reset” on the ND 287 display.

4.4 Take three readings (in microns) in the middle of the gage block. Determine the average of the readings rounding to the nearest 0.1 micron.

4.5 Verify the average reading is within ± 0.4 microns of the nominal values listed in table 5-1. If the reading exceeds this verify the measurement surfaces are clean and repeat steps 4.2 - 4.4.

4.6 Record the gage block serial number and the average reading on the calibration certificate.

4.7 Repeat steps 4.2 - 4.6 for the remaining blocks in the standard set.

5 Performance Requirements

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

Table 5-1 Performance Requirements and Data

Nominal (inch)	Nominal (microns)	Measurement 1 (microns)	Measurement 2 (microns)	Measurement 3 (microns)	Average (microns)
0.130	3302.0				
0.143	3632.2				
0.148	3759.2				
0.150	3810.0				
0.150	3810.0				
0.150	3810.0				
0.150	3810.0				

Min. allowed = Nominal – 0.4 microns.
Max. allowed = Nominal + 0.4 microns

Management Procedure Change Notice

Procedure Number: MP 2553
Revision Level: D
Date of Change: October 26, 2021
Title: Calibration Procedure, Certified SPG Standards

Reason for Change: • New revision standard.
Description of Change: • Complete re-write

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

Printed Name	Signature	Date

Management Form 0010.02-05/1998