DeFelsko®

Management Procedure 2598
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Calibration Procedure

DeFelsko Corporation

PosiTector GLS Tile Calibration

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1 Introduction and UUC Performance Requirements

1.1 This procedure describes the calibration of PosiTector GLS Tiles with the following ranges:

Table 1-1 Measurement Ranges

Angle	Measurement Range
20°	86 - 90
60°	91 - 95
85°	97- 100

1.2 The tile 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. As indicated in section 5.5 the uncertainty is limited to a maximum of 0.5 so the actual test uncertainty ratio is 2:1.

2.3 The Minimum-Use-Specifications are the minimum test equipment specifications required to meet all the UUC accuracy requirements.

Table 2-1 UUC Accuracy Requirements and Description

Angle (°)	Range	Accuracy	Test Method
20	86 - 90	± 1.0 GU	Gloss Meter
60	91 - 95		
85	97 - 100		

Table 2-2 Minimum Use Specifications

Angle (°)	Range	Accuracy
20	86 - 90	± 0.25
60	91 - 95	
85	97 – 100	

Table 2-3 Actual Equipment Specifications

Equipment Generic Name	Range	Accuracy	Manufacturer/Model #'s Applicable
Gloss Meter	0 - 2000 GU	± 0.5 GU*	PosiTector GLS 206085

*By limiting the uncertainty described in Section 3 to 0.5 GU.

***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 ± 5°C Relative Humidity: Less Than 95%
Measurement Standards & Support Equipment Warm-up and Stabilization Requirements:	Not required

3 Uncertainty Determination

3.1 The uncertainty of the gloss tile is a combination of the errors of the individual instruments and the errors between the instruments.

3.2 The errors of an individual instrument's readings is determined by using the average deviations formula $D_x = (|X_1 - \overline{X}| + |X_2 - \overline{X}| + |X_3 - \overline{X}|)/3$.

3.3 The error between the three instruments is determined by calculating the error of the averages by $E = (\overline{X}_{max} - \overline{X}_{min})/2$

3.4 A sum of squares is performed on the average deviations and the error of averages to determine the uncertainty of the system.

For example:

Instrument	Reading 1	Reading 2	Reading 3	Average
1	89.1	88.5	89.3	89.0
2	88.8	88.7	88.9	88.8
3	89.2	89.0	89.3	89.2

$D_1 = (|89.1-89.0| + |88.5-89.0| + |89.3-89.0|)/3 = 0.3$
$D_2 = (|88.8-88.8| + |88.7-88.8| + |88.9-88.8|)/3 = 0.1$
$D_3 = (|89.2-89.2| + |89.0-89.2| + |89.3-89.2|)/3 = 0.1$
$E = (89.2-88.8)/2 = 0.2$

$$\text{Uncertainty} = (D_1^2 + D_2^2 + D_3^2 + E^2)^{0.5}$$
$$= (0.3^2+0.1^2+0.1^2+0.2^2)^{0.5}$$
$$= (0.15)^{0.5}$$
$$= 0.4$$

4 Preliminary Operations

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

4.1 Visually inspect the UUC for:

- Damage

- Wear
- Contamination

4.2 Tiles with damage or wear should not be calibrated.

4.3 Clean the UUC using a DeFelsko approved lens cleaning wipe. Clean by wiping an untouched portion of the wipe in one direction across the tile. Repeat the process using untouched or unused portions of the wipe until the tile is clean and there are no spots or haze left from cleaning solution evaporating.

Note: Do not use alcohol or unapproved cleaning wipes as these may leave a residue that can affect the readings.

4.4 Once the tile is cleaned any dust can be removed using clean canned air.

4.5 Verify the tiles for the three reference gloss meters are clean then power on the units and verify the self-calibration performed properly.

5 Calibration Process

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

5.1 Review the Performance Requirements Table 6-1.

5.2 Perform a calibration of the first reference gloss meter on a HG3 AMECAL tile. Take a reading on the HG3 tile to verify the calibration.
Note: Ensure the HG3 tile is oriented correctly before performing the calibration

5.3 Use the meter to take three readings of the UUC, removing and installing the probe on the UUC between each reading. Record the results in the calibration certificate form.

5.4 Repeat steps 5.2 - 5.3 using the other two reference meters collecting 9 readings for each of the three angles for a total of 27 readings.

5.5 The uncertainty calculated for each angle must 0.5 or less. If the uncertainty is greater than 0.5, clean the tile, check the probe calibrations and repeat the testing.

5.6 For recertification only: Verify the certified value is within ± 1.0 of the labeled value.

6 Performance Requirements

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

Table 6-1 Performance Requirements and Calibration Data

Instrument	Angle (^{o})	Reading 1	Reading 2	Reading 3	Average (GU)	Certified Value❶ (GU)	Uncertainty
1	20					-----	
2	20						
3	20					-----	
1	60					-----	
2	60						
3	60					-----	
1	85					-----	
2	85						
3	85					-----	

❶ (Minimum Average + Maximum average)/2

Management Procedure Change Notice

Procedure Number: MP 2599
Revision Level: A
Date of Change: March 14, 2022
Title: PosiTector GLS Tile 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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