



Management Procedure 2570
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Calibration Procedure

DeFelsko Corporation

PosiTest AT-M, AT-P, AT-C & AT-CM

Adhesion Tester

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1 Introduction and UUC Performance Requirements

1.1 This procedure describes the calibration of DeFelsko Adhesion Testers, PosiTest AT-M, AT-P, AT-C and AT-CM. Table 1-1 shows the measurement ranges.

Table 1-1 Measurement Ranges

Gage	Measurement Range
AT-M, AT-C & AT-CM	0 to 3100 psi
AT-P	0 to 1000 psi

Table 1-2 Calibration Requirements and Description

Gage	Performance Specifications	Test Method
AT-M, AT-C, AT-CM, AT-P	± 1% of full measurement range	Compare to Load Cell Assembly.

2 Measurement Standards and Support Equipment Performance Requirements

2.1 Minimum-Use-Specifications are the calculated minimum performance specifications required for the measurement standards and support equipment to be utilized for comparison measurements required in the Calibration Process.

2.2 The Minimum-Use-Specifications are developed through uncertainty analysis and are calculated through assignment of a defined and documented uncertainty ratio or margin between the specified tolerances of the Unit-Under-Calibration (UUC) and the capabilities (uncertainty specifications) required of the measurement standards system.

2.3 The uncertainty ratio applied in this Calibration Procedure for the AT-M, AT-C & AT-CM models is 4:1. The uncertainty ratio for the AT-P model is 1.8:1.

Table 2-1 Calibration Environmental and Warm Up Requirements

Measurement Standards & Support Equipment Environmental Requirements:	Temperature: $23 \pm 5^\circ \text{C}$. Relative Humidity: Less than 95%
Measurement Standards & Support Equipment Warm-up and Stabilization Requirements:	Pressurize system to maximum of range and release at least 3 times prior to use

Table 2-2 AT-M, AT-C, AT-CM Measurement Standards & Support Equipment Performance Requirements

Equipment Generic Name (Quantity)	Minimum-Use-Specifications		Manufacturer/Model #'s
	Manufacturing Specifications		
	Range	Accuracy	Applicable
Measurement system (load cell + meter)	0 - 1550lbs	+/- 0.24% F.S	Transducer Techniques Meter DPM-3, Sensor SBO-5K
	0 - 5000 lbs	+/- 0.06% F.S.	

Table 2-3 AT-P Measurement Standards & Support Equipment Performance Requirements

Equipment Generic Name (Quantity)	Minimum-Use-Specifications		Manufacturer/Model #'s
	Manufacturing Specifications		
	Range	Accuracy	Applicable
Measurement system (load cell + meter)	0 – 500 lbs	+/- 0.24% F.S	Transducer Techniques Meter DPM-3, Sensor SBO-5K
	0 – 5000 lbs	+/- 0.06% F.S.	

3 Preliminary Operations

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

3.1 Visual Inspection

3.1.1 Visually inspect the UUC for:

- Hydraulic fluid leaks
- Cracked or broken hoses, fittings, dial, pump or actuator
- Proper identification
- Zero reading within allowable range

3.1.2 Damage or excess wear should be repaired prior to beginning the calibration process.

4 Calibration Process

4.1 Setup

4.1.1 Setup Pressure system of the UUC per the PosiTest Adhesion Tester instruction manual.

4.1.2 Setup the Load Cell per manufacturer's instructions. The DPM should be scaled to show 0.1 lb increments.

4.1.3 Screw in the 20mm threaded dolly to top of Load Cell. Leave enough clearance to attach quick coupling and actuator standoff.

4.1.4 Attach the quick coupling of the UUC's actuator to the dolly on the load cell.

4.2 Accuracy Measurement

4.2.1 Pump the unit to full pressure and then release and allow the load cell to stabilize.

4.2.2 Zero the display on the load cell.

4.2.3 Pump handle as directed in instruction manual until UUC gage indicates the first reading per the applicable table in section 5.

Note: Ensure all readings are taken with the eye focused on the center of the gage.

- 4.2.4 Record the reading on the load cell display.
- 4.2.5 Increase pressure with the pump handle and repeat steps 4.2.3 and 4.2.4 for all readings of the table.
- 4.2.6 Verify all test results are within the allowed readings.
- 4.2.7 If the differences between the UUC and load cell readings are consistently positive or negative, then carefully adjust the zero pointer by removing the glass cover for the dial and adjusting the set screw. This process may also be used to shift readings that are near or outside of tolerance limits.
- 4.2.8 Repeat steps 4.2.3 through 4.2.7 until all readings are centered and within tolerance.

5 Performance Requirements

Note: The technician should collect the data needed to complete the Actual Load Cell Reading column of the appropriate table below. Because the load cell readings will fluctuate the usable resolution of the DPM-3 meter is 1 lb. The values in the table are rounded to maintain the 1% accuracy claim based on the 1 lb resolution. Do not write in this procedure.

Table 5-1 Performance Requirements and Calibration Data for PosiTest AT-M, AT-C & AT-CM

UUC Reading	Expected Load Cell Reading ^❶	Actual Load Cell Reading	Min. Reading Allowed ^❷	Max. Reading Allowed ^❷
psi	lbs	lbs	lbs	lbs
500	243		229	258
1000	487		472	502
1500	730		716	745
2000	974		959	989
2500	1217		1203	1232
3000	1461		1446	1476

❶ Calculation: UUC reading (psi) * .487 (piston area in²) = expected cell reading (lbs)

❷ Calculation: Expected Load cell reading + or - 15 lbs. UUC full range tolerance +/-15 lbs = (1% * 3100 psi * .487 in²)

Table 5-2 Performance Requirements and Calibration Data for PosiTest AT-P

UUC Reading	Expected Load Cell Reading ^❸	Actual Load Cell Reading	Min. Reading Allowed ^❹	Max. Reading Allowed ^❹
psi	lbs	lbs	lbs	lbs
200	97		93	101
400	194		190	198
600	292		288	296
800	389		385	393
1000	487		483	491

❸ Calculation: UUC Reading (psi) * .487 (piston area in²) = expected cell reading (lbs)

❹ Calculation: Expected Load cell reading + or - 4 lbs. UUC full range tolerance +/-4 lbs = (1% * 1000 psi * .487 in²)

Management Procedure Change Notice

Procedure Number: 2570

Revision Level: B

Date of Change: May 1, 2006

Title: Calibration Procedure for PosiTest AT-M, AT-P, AT-C & AT-CM

Reason for Change: <ul style="list-style-type: none">• Correct information displayed in tables.
Description of Change: <ul style="list-style-type: none">• In table 1-2 changed +/- 1% of reading full scale to +/- 1% of full measurement range.• Section 2.3 added uncertainty ratio for AT-P version.• In table 2-2 changed range to read 5000 instead of 9999. Changed accuracy to +/- 0.06% instead of -0.01% this is 0.05% for load cell nonlinearity, hysteresis is not a factor because of rezeroing, plus 0.01% DPM-3.• Added table 2-3 to specify the AT-P requirement• Section 4.1.2 added DPM resolution requirement.• Added 4.2.1 and renumbered• In table 5-1 and 5-2 changed readings to not utilize decimal places as they fluctuate too fast to be recorded. Values in table are artificially restricted to maintain 1% accuracy claim.• For notes 1 and 3 added units of measure and “= expected cell reading”• For note 4 changed tolerance to +/-4 lbs from 4.8 because of display resolution.

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

Printed Name	Signature	Date