

TECHNICAL MANUAL
INSTRUMENT CALIBRATION PROCEDURE

MAGNETIC COATING THICKNESS GAGES

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Page No. **	Revision*	Page No. **	Revision*	Page No. **	Revision*
Title	0				
A	0				
i	0				
1 to 5	0				
7	0				
9	0				
11	0				
A-1	0				

*Zero in this column indicates an original page.
 "R" in this column indicates a revised page.
 ** All pages not listed are blank pages.

TABLE OF CONTENTS

Section	Page
1 Introduction and Description.....	1
2 Equipment Requirements	1
3 Preliminary Operations	2
4 Calibration Process.....	3
4.1 Coating Thickness Indication Test	3
Navy Calibration Checklist	5
Appendix A: Representative Test Instruments.....	A-1

TABLES

Table	Page
1 Calibration Description	1
2 Equipment Requirements	2

SECTION 1

INTRODUCTION AND DESCRIPTION

1.1 This procedure describes the calibration of Magnetic Coating Thickness Gages. Instruments that can be calibrated by this procedure include, but are not limited to, the items listed in Appendix A. The instrument being calibrated is referred to herein as the TI (Test Instrument).

1.2 All comments concerning this procedure should be directed to the Measurement Science Department, Corona Division, Naval Surface Warfare Center, P.O. Box 5000, Corona, CA 92878-5000.

1.3 This procedure includes tests of essential performance parameters only. Any malfunction noticed during calibration, whether specifically tested for or not, should be corrected.

Table 1. Calibration Description

TI Characteristics	Performance Specifications	Test Method
Coating thickness indication	Range: 0 to 250 mils* (0 to 0.250 in.) Tolerance: $\pm 3\%$ iv or greater (See Appendix A)	Indications are compared to plastic shims placed over a steel (ferrous) surface. Shim thickness is directly measured using a supermicrometer.

*1 mil=25.38 microns=0.001 inch

SECTION 2

EQUIPMENT REQUIREMENTS

NOTES

Minimum use specifications are the principal parameters required for performance of the calibration, and are included to assist in the selection of alternate equipment, which may be used at the discretion of the using laboratory. Satisfactory performance of alternate items shall be verified prior to use. All applicable equipment must bear evidence of current calibration.

The instruments utilized in this procedure were selected from those known to be available at Navy calibration facilities, and the listing by make or model number carries no implication of preference, recommendation, or approval for use by other agencies. It is recognized that equivalent equipment produced by other manufacturers may be capable of equally satisfactory performance in this procedure.

Table 2. Equipment Requirements

Item	Minimum Use Specifications	Calibration Equipment
2.1 Plastic shims	Range: 1 to 250 mils (0.001 to 0.250 in.) Minimum size: 1 in. width x 2 in. length	Local supply (Submit with TI if manufacturer supplied)
2.2 Supermicrometer	Range: 0 to 0.250 in. Uncertainty: ± 0.00002 in.	Pratt and Whitney Model C
2.3 Gage block set	Range: 0.001 to 0.250 in. (Used to set the supermicrometer) Uncertainty: ± 0.00002 in.	Starrett L.S Co. Webber Gage Division SS36A1X
NOTE		
Item 2.4 must be a steel surface (ferrous). Non-ferrous metals such as aluminum, copper, stainless steel, lead and graphite cannot be used.		
2.4 Toolmakers flat	Used as a base steel surface (ferrous metal) for placement of plastic shims	Pratt Whitney Tool Division 1400

SECTION 3

PRELIMINARY OPERATIONS

- 3.1 Ensure that the TI is clean and free from defects that would impair its operation.
- 3.2 If applicable, ensure the TI battery or batteries are in good condition. If not, then they should be replaced prior to proceeding with further testing.
- 3.3 Ensure that the work area is clean, well illuminated, free from excessive drafts or humidity, and that the rate of temperature change does not exceed 2 °F per hour.
- 3.4 If a checklist is not provided, choose three equally spaced test points, one at the lower third, middle third, and upper third of the TI range.
- 3.5 Ensure that each shim (item 2.1) is clean, free from burrs and indentations that would impair its use.
- 3.6 Select the appropriate shim to perform the TI measurement of the three required test points over the range of the TI.
- 3.7 SUPERMICROMETER SETUP
- 3.7.1 Prepare the supermicrometer (item 2.2) to measure the standard shims as follows:
- 3.7.1.1 Set the supermicrometer power switch to on and allow a minimum of 15 minutes for warm up.
- 3.7.1.2 Set the gaging pressure adjusting knob to 8 oz of anvil pressure.

CAUTION

DO NOT APPLY SUPERMICROMETER SPINDLE PRESSURE IN EXCESS OF 8 OZ OR DAMAGE TO THE STANDARD SHIMS MAY RESULT.

3.7.1.3 Select a 0.100 inch gage block from the gage block set (item 2.3) to ensure that the supermicrometer measuring range is adequate to measure the standard shims.

3.7.1.4 Position the 0.100 inch gage block between the supermicrometer spindles and slowly move the tailstock until it is nearly in contact with the gage block.

3.7.1.5 Lightly engage the tailstock with the tailstock clamp and slowly use the adjustment knob on the tailstock to close the remaining gap between the tailstock anvil and headstock spindle until an onscale indication is indicated on the supermicrometer meter.

3.7.1.6 Slowly move the gage block between the spindle and anvil to ensure that the gage block is firmly in contact with the supermicrometer spindle and anvil.

3.7.1.7 Ensure firm and positive contact by moving the gage block back and forth and observing the meter until the meter reaches its lowest indication.

3.7.1.8 Close the headstock spindle and adjust the meter until a zero indication is achieved.

3.7.1.9 Firmly lock the tailstock clamp and re-zero the supermicrometer meter.

3.7.1.10 Zero the digital indicator or preset it to 0.100 inch.

3.8 If applicable, turn the TI on and allow it to warm-up for 10 minutes.

SECTION 4

CALIBRATION PROCESS

NOTE

Unless otherwise specified, verify the results of each test and take corrective action whenever the test requirement is not met, before proceeding.

4.1 COATING THICKNESS INDICATION TEST

4.1.1 Measure each shim's thickness as required at the midpoint with the use of a supermicrometer. Convert the measured value to mils (measured value * 1000= mils) and record the calculated mil value on the checklist in column (3) for step 4.1.5 and 4.1.6 as applicable.

4.1.2 Place the TI magnetic probe flush, in contact with the toolmakers flat (item 2.4) and verify its indication is zero.

4.1.3 If the TI does not indicate zero, set the TI indication by adjusting its zero knob or by pressing the - or + indication buttons until the display indicates zero.

NOTE

Particular TIs may require the user to hold the probe at an angle to the toolmakers flat while making a measurement or that the TI thickness dial be rotated until the magnet becomes flush with the toolmakers' surface. Also, analog meter types require that the indication be read while pulling the TI away from the surface (just after the magnet releases contact).

4.1.4 Place the shim corresponding to the first test point on the toolmakers flat. Position the TI at the midpoint of the shim so that the shim is between the flat and the TI magnetic probe.

4.1.5 Obtain the average of three indications and verify that the average indication is within the tolerance of the corresponding nominal value as recorded on the checklist.

NOTE

Some TIs output an audible beep or click, informing the user when the indication should be read.

4.1.6 Repeat step 4.1.4 and 4.1.5 for each of the remaining test points.

4.1.7 If the TI has more than one range, then repeat steps 4.1.1 and 4.1.4 through 4.1.6 for the remaining scale indications.

4.1.8 If applicable, turn off the TI.

4.1.9 If applicable, slide the TI probe cover fully closed or return it to its pouch to protect it while not in use.

4.1.10 If no other measurements are to be performed, disconnect and secure all the equipment.

4.1.11 Affix a black-on-white CALIBRATED label to the TI.

APPENDIX A

REPRESENTATIVE TEST INSTRUMENTS

TIs which may be calibrated by this procedure include, but are not limited, to the following:

Model	Manufacturer	Range	Tolerance
A	Paul Gardner	0.25-20 mils	±10% iv
468	Elektro-Physik	25-750 microns	±15% iv
6000F1	DeFelsko	0-60 mils	±3% iv
FM	DeFelsko	0-4 mils	±0.2 mils
”	”	4-80 mils	±5% iv