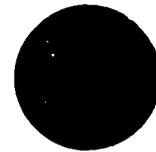


**T.O. 33K6-4-661-1**

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**TECHNICAL MANUAL**  
**CALIBRATION PROCEDURE**  
**FOR**  
**INSIDE MICROMETER**

**GGGC105**



**(FEDERAL SPECIFICATION)**

This publication replaces T.O. 33K6-4-661-1 dated 30 January 1998 and incorporates Interim Operational Supplement T.O. 33K6-4-661-1S-1 dated 24 April 1998.

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**30 JULY 1998**

**INSIDE MICROMETER**  
**GGGC105**  
**(FEDERAL SPECIFICATION)**

**1 CALIBRATION DESCRIPTION:***Table 1.*

Test Instrument (TI) Characteristics	Performance Specifications	Test Method
Length	Range: All  Accuracy: See Corresponding Table for TI being calibrated.	Compared to a known length

**2 EQUIPMENT REQUIREMENTS:**

Name	Minimum Use Specifications	Calibration Equipment	Sub- Item
2.1 GAGE BLOCK SET	Range: 0.05 to 4 in  Accuracy: $\pm 10 \mu\text{in}$ from stated value	L.S. Starrett Co. 36	L.S. Starrett Co. 81
2.2 GAGE BLOCK SET	Range: 5 to 20 in  Accuracy: $\pm 5 \mu\text{in/in}$	L.S. Starrett Co. 8	
2.3 SUPERMICROMETER	Range: 0 to 10 in  Accuracy: $\pm 0.0001 \text{ in}$	Pratt & Whitney 2100	
2.4 STANDARD MEASURING MACHINE	Range: 0 to 10 in  Accuracy: $\pm 50 \mu\text{in}$	Pratt & Whitney 2000	

**3 PRELIMINARY OPERATIONS:**

- 3.1 Review and become familiar with entire procedure before beginning Calibration Process.
- 3.2 The TI must be brought into the calibration area at least two hours prior to calibration.
- 3.3 Ascertain that all working surfaces are free of rust, nicks and burrs.

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3.4 Use only portions of this T.O. that apply to the TI being calibrated.

3.5 Laboratory Temperature Range affects the TI accuracy. Refer to Table 4 for temperature vs accuracy specifications.

**WARNING**

Unless otherwise designated, and prior to beginning the Calibration Process, ensure that all test equipment voltage and/or current outputs are set to zero (0) or turned off, where applicable. Ensure that all equipment switches are set to the proper position before making connections or applying power.

**NOTE**

If the TI being calibrated is listed in Table 4 or Table 5, it must be calibrated in an environment of 67 to 69 °F. If this is not possible, due to lack of facilities, the Limited Certification Label must be annotated with the calibration accuracy stated in Table 4 for the environment in which the TI was calibrated.

**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 INSIDE MICROMETER CALIBRATION:**

**NOTE**

Inside Micrometers with nibs, that do not indicate zero when fully closed should indicate the approximate nib width when jaws are closed.

4.1.1 Utilizing proper Gage Blocks with Outside Calipers, ascertain that the TI, when set to its shortest length, indicates as near zero as possible. The zero reading must not exceed the TI tolerance.

4.1.2 Increase length of Gage Block of step 4.1.1 by the value listed in the Applied column of Table 2 or Table 3 as applicable within the TI range.

4.1.3 Use the TI to measure the distance between Caliper Jaws.

4.1.4 The TI Micrometer must indicate within the limits listed in the Limits column of Table 2 or Table 3 for each applied value.

**NOTE**

If the Inside Micrometer being calibrated has two caps that can be removed and interchanged, they must be checked for wear and must be of the same length. If one of the caps differs from the other in length by more than  $\pm 250 \mu\text{in}$  (as measured on Supermicrometer), both caps must be replaced.

**NOTE**

The tolerance of the TI is based on the accessories supplied in combination.

Table 2.

Range (in)	Applied (in)	Limits (in)
<i>(0.001 in)</i>		
0.250	0.050	0.049 to 0.051
	0.120	0.119 to 0.121
	0.200	0.199 to 0.201
0.500	0.120	0.119 to 0.121
	0.250	0.249 to 0.251
	0.370	0.369 to 0.371
1.00	0.256	0.255 to 0.257
	0.512	0.511 to 0.513
	0.768	0.767 to 0.769
	0.950	0.949 to 0.951
<i>(0.0001 in)</i>		
2.00	0.512	0.5119 to 0.5121
	0.950	0.9499 to 0.9501
	1.256	1.2559 to 1.2561
	1.768	1.7679 to 1.7681

Table 3.

Range (mm) Screw Movement	Applied (in)	Limits (mm)
0 to 7	0.05	1.26 to 1.28
	0.120	3.04 to 3.06
	0.200	5.07 to 5.09
0 to 13	0.120	3.04 to 3.06
	0.250	6.34 to 6.36

Table 3. (Cont.)

Range (mm) Screw Movement	Applied (in)	Limits (mm)
0 to 13	0.370	9.39 to 9.41
0 to 25	0.120	3.04 to 3.06
	0.342	8.68 to 8.70
	0.565	14.34 to 14.36
	0.787	19.98 to 20.00
	0.909	23.08 to 23.10

Table 4.

±Tolerance for Resolution/DIV of 0.001 Inch		
Range (in)	Lab Temperature 67 to 69 °F	Lab Temperature 67 to 79 °F
0 to 1	0.001	0.001
1 to 2	0.001	0.001
2 to 3	0.001	0.001
3 to 4	0.001	0.001
4 to 5	0.001	0.001
5 to 6	0.001	0.001
6 to 7	0.001	0.002
7 to 8	0.001	0.002
8 to 9	0.001	0.002
9 to 10	0.001	0.002
10 to 11	0.001	0.003
11 to 12	0.001	0.003
12 to 18	0.001	0.004
18 to 24	0.0010	0.005

Table 4. (Cont.)

<b>±Tolerance for Resolution/DIV of 0.001 Inch</b>		
<b>Range (in)</b>	<b>Lab Temperature 67 to 69 °F</b>	<b>Lab Temperature 67 to 79 °F</b>
24 to 30	0.0020	0.006
30 to 36	0.0020	0.007
36 to 40	0.0020	0.008
<b>±Tolerance for Resolution/DIV of 0.0002 mm</b>		
<b>Range (mm)</b>	<b>Lab Temperature 67 to 69 °F</b>	<b>Lab Temperature 67 to 79 °F</b>
0 to 13	0.0025	0.0025
0 to 25	0.004	0.0050
25 to 50	0.004	0.010
50 to 75	0.004	0.015
75 to 100	0.005	0.020
100 to 125	0.005	0.025
125 to 150	0.005	0.030
150 to 175	0.006	0.035
175 to 200	0.006	0.040
200 to 225	0.006	0.045
225 to 250	0.0075	0.050
250 to 275	0.0075	0.055
275 to 300	0.0075	0.060
<b>Note: When Micrometer Resolution per Division is 0.01 mm, the allowable tolerance shall be at least 0.01 mm.</b>		

Table 5.

<b>±Tolerance for Resolution/DIV of 0.0001 Inch</b>		
<b>Range (in)</b>	<b>Lab Temperature 67 to 69 °F</b>	<b>Lab Temperature 67 to 79 °F</b>
0 to 1	0.0001	0.0002
1 to 2	0.0002	0.0004
2 to 3	0.0002	0.0006
3 to 4	0.0002	0.0008
4 to 5	0.0002	0.0010
5 to 6	0.0002	0.0012
6 to 7	0.0003	0.0014
7 to 8	0.0003	0.0016
8 to 9	0.0003	0.0018
9 to 10	0.0003	0.0020
10 to 11	0.0003	0.0022
11 to 12	0.0003	0.0024
12 to 18	0.0004	0.0026
18 to 24	0.0005	0.0028
24 to 30	0.0006	0.0030
30 to 36	0.0007	0.0032

**4.2. EXTENSION ROD CALIBRATION:**

4.2.1 Remove the TI Rod utilized in steps 4.1.1 through 4.1.4 and replace with another TI.

4.2.2 Wring together Gage Blocks with Outside Caliper Jaws to a dimension within the range of the TI. Allow Gage Blocks to stabilize 1 hour for sizes over 8 inches. This only applies to TIs with 100  $\mu$ m resolution which require  $\pm 100$   $\mu$ m accuracy. This does not apply to sizes over 8 inches that are not wrung together to form the desired size.

4.2.3 Using the TI measure the distance between Outside Caliper Jaws.

4.2.4 The TI must indicate the length of the Gage Block within limits of Table 4 or 5.

4.2.5 Repeat steps 4.2.3 through 4.2.5 for each TI Rod.

4.2.6 Disconnect and secure all test equipment.

**CALIBRATION PERFORMANCE TABLE**

**Not Required**