

**INSTRUCTIONS FOR MEASURING CYLINDER SLEEVES**  
**USING THE PRECISION DEVICES, INC. MICROANALYZER 2000**  
**Rev. 001 8-26-2002**

1. Use a *green* Scotchbrite fiber pad and WD40 to clean the sleeve inside diameter above ring travel. Be sure to remove any traces of carbon. Clean away any remaining oil or dirt residue by wiping with a lens cleaning tissue dipped in alcohol.
2. The sleeve shall be marked every 30° (use the clock face positions numbered in a clockwise direction). Looking at the top of the sleeve, *front* shall be the 12 o'clock position.
3. It is recommended that the sleeve be fixed in V-blocks for tracing of the Wt data. This allows a full 360 degrees rotation of the sleeve on a common centerline. In order to obtain the  $\pm 0.1$  degree slope tolerance, the V-block should also be adjustable to facilitate rough leveling. Finer leveling can be accomplished by tilting the motor drive to align profile slope. For each measurement session, take a 50.8 mm (2 in) trace of the unworn portion of the liner to ensure proper leveling. No more than six liners may be measured before a new trace is taken to re-confirm proper leveling.
4. The stylus and trace area dimensions are shown in Figure 1. The overall length of the trace shall be 50.8 mm (2 in). Note that 2.54 mm (0.1 in) of the trace shall be above top ring turnaround.
5. Set the Trace Velocity to 0.63 mm/s. Set the Form Type to Least-Squares Line. Set the Roughness Filter Type to Gaussian and the Cutoff to 0.80 mm. Refer to Figure 2.
6. Leveling Lines – After taking the wear step trace, bracket the level lines by setting the right level line at the right end of the trace and the left level line 20 mm (0.8 in) from the right level line, unless anomalies are noted in the trace.
7. Wt Bracket Lines – the right parameter line shall be positioned at the right end of the trace and the left parameter line shall be placed to the left of the wear step maximum depth; the left parameter line shall intersect with the wear step trace below the leveling line.
8. Anomalies
  - 8.1. Right Side – a right side anomaly is evident when the right end of the trace shows a significant tail, either up or down. If a right side anomaly is present in the trace, it shall be excluded from both the leveling and Wt bracketed regions (i.e. move the right bracket lines to the left of the anomaly)
  - 8.2. Left Side – a left side anomaly is evident when a hump or dent exists in the trace, just to the right of the wear step. A left side anomaly requires the operator to use judgment to capture the best possible leveling line. A good leveling line is evident when the trace is horizontal; it should be not be skewed either up or down.
  - 8.3. Scratches – scratches below maximum wear depth require that the  $\Delta z$  measurement be used to determine the wear step value. Operator judgment shall be used to determine the best leveling line (refer to 8.2).
9. Output
  - 9.1. Waviness Parameter Wt represents the measured wear step value. Click on “Measure” from the top pull down menus. Select “Waviness Evaluation Length” brackets to generate a proper wear step value. Placements of lines are shown in Figure 2. Both the leveling and Wt brackets shall be shown on the trace. Additionally, the trace shall show both waviness and texture.

STYLUS: 60MM BEAM LENGTH WITH .002mm RADIUS DIAMOND TIP.

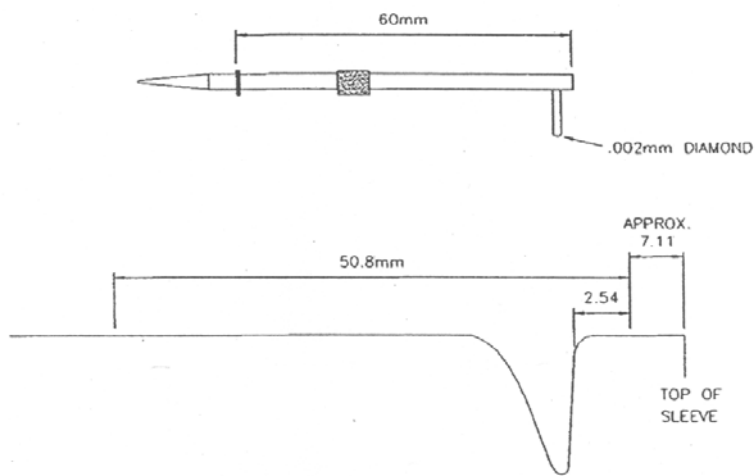
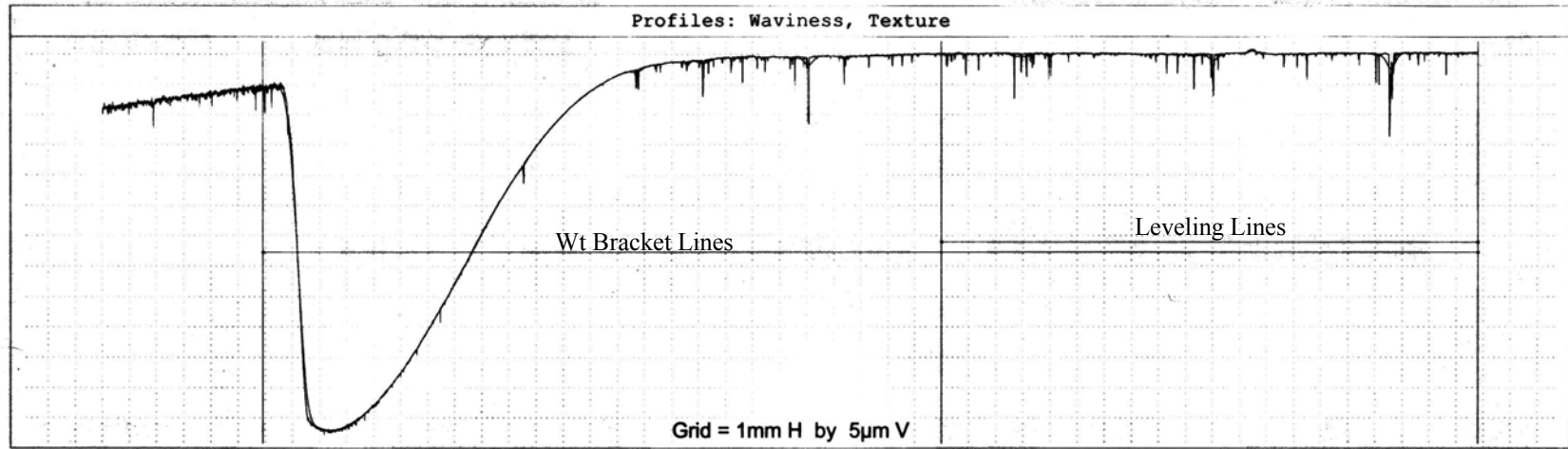


Figure 1: Stylus and Trace Area Dimensions



**Settings**

Software: 2.43; Advanced; 3.95  
 Data  
 Collected: Thu Mar 07 12:48 2002

Tracer Used: PDT-6-1512  
 Sampled Length: 50.80 mm  
 Sample Spacing: 0.48 µm

Description  
 Mack T-10 Liner 41147 Cyl. 1 Sam.S010-0895-01  
 EOT Trace Pos. 12:00 TRNPJMTQB  
 Set 02-01 Run 616-91-9N2852-95  
 File: C:\S-2000-2\DATA\T-10\2002TE-1\02-01\41147

Instrument  
 Name: MicroAnalyzer 2000  
 Serial #: PLP-4-1012  
 Current Tracer:PDT-6-1512  
 Travel Distance: 50.80  
 Trace Velocity: 0.63 mm/s

Form  
 Form Type: Least-Squares Line

Roughness Filter  
 Type: Gaussian  
 Cutoff: 0.80 mm  
 No Filter Width Removal at Ends

Parameter Calculation Settings  
 Peak Count Threshold: 0.50 µm  
 High Spot Count Threshold: 0.50 µm  
 tp Reference Percent: 5 %

**Parameters**

PARAMETER	VALUE	UNITS
Summary		
Standards System = ANSI/ASME B46.1 1995		
Roughness Height Parameters:		
Ra	0.24	µm
Waviness Parameters:		
Wt	62.62	µm

Precision Devices, Inc. MicroAnalyzer 2000

Figure 2: PDI Settings, Leveling Lines, and Wt Bracket Lines