FLEXBAR PORTABLE
SURFACE-ROUGHNESS TESTER

A Precision, Fully Self-Contained Compact Tester Incorporating An Advanced Microprocessor. Performs data acquisition, data processing and display of all test measurements.

The **Model No. 15950** Portable Surface Roughness Tester features an integrated processor, display and sensor, and allows for user selectable readings in Ra and Rz. Measures flat, round and sloping planes and grooves and recesses up to 3.1” x 1.2”. Other features include:
- Multi-functional LCD
- Ra, Rz, µm, µinch at touch of a button
- Coatings from 0 to 1.25mm (0 to 1250 microns)
- 3 cut-off lengths
- Rechargeable
- “Soft calibration facility”

**Specifications:**
- Measuring accuracy <5% of reading
- Cut-off length: 0.009 in, 0.03 in, 0.09 in (0.25mm, 0.8mm, 2.5mm)
- Measuring length: 0.06 in, 0.16 in, 0.2 in (1.25mm, 4.0mm, 5.0mm)
- Automatic tracing
- Tracing length: 0.23 in (6.0mm)
- Measuring range: Ra 0.05-10µm, Rz 0.1-50µm
- Piezoelectric sensor
- Contact force on probe: <1.8 ozf (<50gf)
- Static measuring force of sensor stylus: <0.06 ozf (<1.6gf)
- Stylus traveling speed: 0.04 in/s (1.0 mm/s)
- Operating temperature: 32°F-104°F (0°C-40°C)
- Weight: 0.4 lbs (0.2kg)
- Dimensions: 4.9 x 2.8 x 1.0 in (125 x 73 x 26mm)
- Compact, durable carrying case

**Ordering:**
- **Model No. 15950**, Flexbar Portable Surface Roughness Tester, complete with certified reference specimen, instructions and case
- **Model No. 15951**, Replacement Stylus for No. 15950

**OPTIONAL PRECISION REFERENCE STANDARD WITH SIGNED CERTIFICATE OF TRACEABILITY TO N.I.S.T, see page 56.**
- **Model No. 16037**, Precision Reference Standard & Stylus Check
A variety of available probes which are easily interchangeable increases the gage’s capability for a wide range of applications, such as flats, O.D.s, I.D.s (including small bores), sharp edges and inside grooves.

The Pocket Surf gage can measure in any one of four switch-selectable parameters:
- $R_a$ - Average Roughness
- $R_{max}$ - Maximum Roughness Depth (DIN)
- $R_z$ - Mean Roughness Depth (DIN) also called $R_{zm}$
- $R_{max}$ is a convenient “burr” and “scratch” control parameter and a valuable addition to $R_a$ and $R_z$
- $R_y$ - Maximum Roughness Depth (DIN)

The Pocket Surf gage operates in four probe positions:
- Closed (with probe accessibility through an opening in the base of its housing) - Or with the probe at 90°, 180° or 270° - for measurement of flat surfaces, inside or outside diameters, as well as many difficult to gage surfaces, such as journals between crankshaft throws.

Additional accessories include:
- Model No. 17859, Bottom Plate for measuring short workpieces
- Model No. 17860, Vee Adapter Kit for hand-held measurements of cylindrical surfaces
- Model No. 17861, Bore Adapter Kit for hand-held bore measurements.

The Pocket Surf gage's digital display is located on the top of the unit for optimum visibility. The LCD display presents the roughness value in microinches or micrometers, within half a second after the surface is traversed. Out-of-range (high or low) and ”battery low” signals are also displayed.
### Specifications:

**Overall Dimensions**
- Approximately 5-1/2" x 3" x 1"
  - 140mm x 76mm x 25mm

**Weight**
- Approximately 14 oz./435g

**Measuring Ranges**
- \( R_s \) = 1µ" to 250µ"/0,03µm to 6,35µm
- \( R_{max} \) = 8µ" to 999µ"/0,2µm to 25,3µm
- \( R_{z} \) = 8µ" to 999µ"/0,2µm to 25,3µm

**Display Resolution**
- 1µ"/0.01µm

**Measurement Accuracy**
- Meets ANSI-B46.1, ISO, DIN standards and MIL specifications

**Digital Readout**
- LCD; 3 digit; "Battery Low" signal; "H" and "L" (out-of-range measured values)

**Traverse Length**
- 255/6.47mm

**Assessment Length**
- 150/4.00mm

**Traverse Speed**
- 2"/5.08mm per second

**Cutoff**
- 0.30"/0.8mm

**Probe Type**
- Piezoelectric

**Maximum Stylus Force**
- 1500mgf/15.0mN

**Power**
- 9 volt consumer-type alkaline battery

**Battery Capacity**
- Approx. 3000 measurements, depending on frequency of use and output option

**Operating Temperature**
- 50°C to 113°F/10°C to 45°C

**Storage Temperature**
- -4°C to 149°F/-20°C to 65°C

*per DIN 4768

### Probes:

**General Purpose Probes**—For most surface roughness applications. No. 17852 has a 90° conical diamond stylus, .0004"/.010µm radius, per ANSI-B46.1, ISO and MIL specifications. No. 17853 has a 90° conical diamond stylus, .0002"/.005µm radius, per ISO and DIN standards.

**Transverse Chisel Probe No. 17854**
- Optional extra—For gaging sharp edges or small O.D.'s where probe is aligned with (in 180° or closed position) to axis of traverse. 90° sapphire chisel, .0004"/.010µm radius.

**Parallel Chisel Probe No. 17855**
- Optional extra—For gaging sharp edges or small O.D.'s where probe is perpendicular (in 90° or 270° position) axis of traverse. Also for O.D.'s smaller than 1/4"/6.35mm staged on V fixture. 90° sapphire chisel, .0004"/.010µm radius.

**Small Bore Probes**—Optional extra—For gaging small bores (1/8"/.32mm min. I.D.) up to a depth of 3/4"/19mm. No. 17856 has a 90° conical diamond stylus, .0004"/.010µm radius. No. 17857 has a 90° conical diamond stylus, .0002"/.005µm radius.

**Groove Bottom Probe—No. 17858**
- Optional extra—For measuring the bottom of grooves, recesses and small holes to depths of 3/4"/19mm. Also used for short lands and shoulders. 90° conical diamond stylus—.0004"/.010µm radius.

Note: Small Bore Probes can only be used in the "180° Position" with the Pocket Surf unit supported in a height stand or other fixture.

**ORDERING:**

Flexbar Pocket Surf Kit is furnished complete in a fitted case and includes the following:
- Pocket Surf Unit
- General Purpose Probe No. 17852
- 125µ"/3.2 µm (certified) Reference Specimen
- 9 volt Alkaline Battery
- Riser Plate, for calibrating the gage with the Reference Specimen

**MODEL NO. 17850,** Flexbar Pocket Surf Complete

**ACCESSORIES:**

**MODEL NO. 17851,** Adjustable Height Stand for above

**MODEL NO. 17859,** Bottom Plate

**MODEL NO. 17860,** Vee Adapter Kit

**MODEL NO. 17861,** Bore Adapter Kit

**MODEL NO. 17862,** Portable "V" Fixture

  For measuring small outside diameter parts up to 1".

**MODEL NO. 17863,** Setting Pin, 1/8" Diameter

  For adjusting the "V" Fixture.

**OPTIONAL PROBES:**

**NO. 17852,** General Purpose, .0004"

**NO. 17853,** General Purpose, .0002"

**NO. 17854,** Traverse Chisel

**NO. 17855,** Parallel Chisel

**NO. 17856,** Small Bore, .0004"

**NO. 17857,** Small Bore, .0002"

**NO. 17858,** Groove Bottom
Ideal for use in the Drafting Room, Engineering Department or in the small shop. This set has 30 specimens, each are 7/8" x 3/8" comprising:

- 3 Specimens Flat Lapping — 2, 4 and 8µ" AA
- 3 Specimens Reaming — 16, 32 and 63µ" AA
- 6 Specimens Grinding — 2, 4, 8, 16, 32 and 63µ" AA
- 6 Specimens Horizontal Milling — 16, 32, 63, 125, 250 and 500µ" AA
- 6 Specimens Vertical Milling — 16, 32, 63, 125, 250 and 500µ" AA
- 6 Specimens Turning — 16, 32, 63, 125, 250 and 500µ" AA

The scale conforms to S.A.E. and military specifications for visual and tactile inspection.

FEATURES: Our economy, composite Set No. 16008 as shown here consists of 30 specimens 7/8" x 3/8" of electroformed solid nickel. Each type of surface finish, such as flat lapping, reaming, grinding, horizontal milling, vertical milling, and turning, is truly and consistently reproduced so as to give the operator or designer a realistic idea of the feel, appearance, and texture of the machined components. A set of instructions is included with each set. By means of this set, or one of our individual (larger) standards specimen scale sets, quick and easy comparisons can be made, thus eliminating costly checking methods, saving valuable production time, and stopping the production of scrap caused by poor finishes.

Manufactured to ANSI-B-46.1-1985

MADE OF SOLID ELECTROFORMED NICKEL
A TRULY INTERNATIONAL SET WITH MARKINGS IN AA (microinches) and METRIC IN Ra (micrometers)

Set No. 16008, Composite Set - Surface Roughness Standards (Includes Certificate of Conformance)
Set No. 16008-CAL, Composite Set - Surface Roughness Standards complete with Long Form Calibration Report Traceable to N.I.S.T.

PHONE OR FAX FOR SAMPLE CALIBRATION REPORT
MICROINCH™ COMPARATOR PLATES

SURFACE ROUGHNESS (Texture) COMPARISON STANDARDS MADE OF SOLID ELECTROFORMED NICKEL

The LARGEST VARIETY OF STANDARDS available for assessing and specifying, by Symbol, the DEGREE OF ROUGHNESS of machined parts - including every machining method known.

EVERY OBTAINABLE VALUE
• 17 DIFFERENT SETS AVAILABLE (This Page)
• Each value size is 16mm x 25mm (or 5/8" x 1").
• Overall dimensions of each plate 25mm x 128mm (or 2-1/16" x 5").
• Light in weight - can be carried in pocket. Supplied in Plastic Wallet.

MARKINGS: Graduated in American values - AA (microinches) as well as I.S.O. standards such as Metric Equivalents RA (µ,) and "N" values.

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Machining Method</th>
<th>No. of Specimens</th>
<th>Range Ra µm</th>
<th>Range AA µ&quot;</th>
<th>N Numbers</th>
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<tbody>
<tr>
<td>16009</td>
<td>Surface Grinding</td>
<td>8</td>
<td>.025-3.2</td>
<td>1,2,4,8,16,32,63,125</td>
<td>1-8</td>
</tr>
<tr>
<td>16010</td>
<td>Cylindrical Grinding</td>
<td>8</td>
<td>.025-3.2</td>
<td>1,2,4,8,16,32,63,125</td>
<td>1-8</td>
</tr>
<tr>
<td>16011</td>
<td>Face Turning</td>
<td>8</td>
<td>0.4-50</td>
<td>16,32,63,125,250,500,1000,2000</td>
<td>5-12</td>
</tr>
<tr>
<td>16012</td>
<td>Cylindrical Turning</td>
<td>8</td>
<td>0.4-50</td>
<td>16,32,63,125,250,500,1000,2000</td>
<td>5-12</td>
</tr>
<tr>
<td>16013</td>
<td>End Milling</td>
<td>8</td>
<td>0.4-50</td>
<td>16,32,63,125,250,500,1000,2000</td>
<td>5-12</td>
</tr>
<tr>
<td>16014</td>
<td>Reaming &amp; Drilling</td>
<td>8</td>
<td>0.4-12.5</td>
<td>16,32,63,125,250,500 Reaming 63,125,250,500 Drilling</td>
<td>5-10</td>
</tr>
<tr>
<td>16015</td>
<td>Horizontal Milling</td>
<td>8</td>
<td>0.4-50</td>
<td>16,32,63,125,250,500,1000,2000</td>
<td>5-12</td>
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<tr>
<td>16016</td>
<td>Planing or Shaping</td>
<td>8</td>
<td>0.8-100</td>
<td>32,63,125,250,500,1000,2000</td>
<td>6-13</td>
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<tr>
<td>16017</td>
<td>E.D.M.</td>
<td>8</td>
<td>0.4-50</td>
<td>16,32,63,125,250,500,1000,2000</td>
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<tr>
<td>16019</td>
<td>Cylindrical Lapping</td>
<td>8</td>
<td>.025-0.2</td>
<td>1,2,4,8 Cyl. Lap</td>
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<tr>
<td></td>
<td>Superfinishing</td>
<td></td>
<td>.025-0.2</td>
<td>1,2,4,8 Superfin.</td>
<td></td>
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<tr>
<td>16020</td>
<td>Vertical Grinding</td>
<td>6</td>
<td>0.2-6.3</td>
<td>8,16,32,63,125,250</td>
<td>4-9</td>
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<tr>
<td>16021</td>
<td>Grit Blasting</td>
<td>8</td>
<td>3.2-18</td>
<td>128,320,520,720,200</td>
<td>5-10</td>
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<tr>
<td></td>
<td>Shot Blasting</td>
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<td>3.2-25</td>
<td>128,420,720,1000</td>
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<tr>
<td>16022</td>
<td>Hand Filing</td>
<td>5</td>
<td>0.4-6.3</td>
<td>16,32,63,125,250</td>
<td>5-9</td>
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<tr>
<td>16023</td>
<td>Casting</td>
<td>7</td>
<td>0.8-50</td>
<td>32,63,125,250,500,1000,2000</td>
<td>6-12</td>
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<tr>
<td>16024</td>
<td>Honing</td>
<td>6</td>
<td>0.05-1.6</td>
<td>2,4,8,16,32,63</td>
<td>2-7</td>
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<tr>
<td>16026</td>
<td>Polishing</td>
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<td>.025-0.20</td>
<td>0.5,1,2,4,8</td>
<td>0-4</td>
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<tr>
<td>16044</td>
<td>Belt Sanding</td>
<td>6</td>
<td>0.10-3.2</td>
<td>4,8,16,32,63,125</td>
<td>3-8</td>
</tr>
</tbody>
</table>

• Manufactured to ANSI-B-46.1-1985
• Each set is supplied in rugged vinyl case which contains a durable instruction card with valuable information in easily understood language. This enables the user to obtain best results when assessing roughness or finish by sight and touch.
• All 18 plates conform to S.A.E. and Mil specs.

ABOVE MODELS ALSO AVAILABLE WITH LONG FORM CALIBRATION REPORT FOR ADDITIONAL CHARGE:
Add -CAL to above Model Nos.

Made in U.S.A.
Made in U.S.A.

THE EVER POPULAR —
MICROCOMPARATOR
ORIGINAL MADE IN U.S.A. MODEL

Composite Set of 22 Specimens
5 MACHINE FINISHES - MOST USEFUL VALUES
Made of Solid Electroformed Nickel — Premium Quality

INCH AND METRIC MODELS AVAILABLE

Model No. 16038 (in microinches)
Lapped 2, 4, 8
Ground 8, 16, 32, 63
Blanchard Ground 16, 32
Shape Turned 32, 63, 125, 250, 500
Profiled 63, 125, 250, 500
Milled 63, 125, 250, 500

No. 16038 (microinches) Made of Solid Electroformed Nickel
All Complete with Case and Instructions

No. 16038-M (micrometers) Made of Solid Electroformed Nickel
All Complete with Case and Instructions

CAST MICROFINISH COMPARATORS
9 - SPECIMENS — Made in U.S.A

9 Specimens provided. Cast surface values for Die Casting, Investment, Shell, Centrifugal, Permanent Mold Ferrous and Non-Ferrous, Sand and Green Sand from 20 to 900 microinches.

No. 16039 Complete with Instructions, Engineering Data and Case
No. 16039-M (metric) 0.51 to 22.86 micrometers

GRIND AND TURN COMPARATORS
Made in U.S.A.

4 MODELS — INCH AND METRIC
MADE OF SOLID NICKEL

Furnished in attractive vinyl case with instructions.
Each model has 10 specimens:
5 each Internal Diameter (concave) and 5 each Outside Diameter (convex)

Cylindrical Turning Comparator
10 Specimens - (shows I.D. and O.D.)
5 each I.D. (concave) 16, 32, 63, 125 and 250 R₉
5 each O.D. (convex) 16, 32, 63, 125 and 250 R₉

No. 16041 (in microinches)

Cylindrical Grinding Comparator
10 Specimens - (shows I.D. and O.D.)
5 each I.D. (concave) 4, 8, 16, 32 and 63 R₉
5 each O.D. (convex) 4, 8, 16, 32 and 63 R₉

No. 16042 (in microinches)

Metric Cylindrical Turning Comparator
10 Specimens - (shows I.D. and O.D.)
5 each I.D. (concave) 0.4, 0.81, 1.6, 3.18, 6.35
5 each O.D. (convex) 0.4, 0.81, 1.6, 3.18, 6.35

No. 16041-M (micrometers)

Metric Cylindrical Grinding Comparator
10 Specimens - (shows I.D. and O.D.)
5 each I.D. (concave) 0.1, 0.2, 0.4, 0.81, 1.6
5 each O.D. (convex) 0.1, 0.2, 0.4, 0.81, 1.6

No. 16042-M (micrometers)
SURFACE FINISH COMPARATORS

For Engineers, Inspectors, Purchasing Agents
HANDY, INEXPENSIVE, USE AS A GIVE-AWAY
For Classes on Drafting, etc.

• ACCURATE - Exact Reproductions.
  Range: 16 to 500 Microinch Finish.
• CONVENIENT - Pocket Size (3 1/2" x 5"), Weight: 1 oz.
• Has handy "hang-up hole".
• VERSATILE - Specimens include Mill, End Mill, Grinding,
  Shape Turning, and Flame Cut.

18 SPECIMENS:
  Machining Method Microinches (AA or Ra)
  Grinding  16, 32, 63, 125 and 250
  End Milling  63, 125, 250 and 500
  Milling  63, 125, 250 and 500
  Shape Turning  63, 125, 250 and 500
  Flame Cutting  500

Complete with Plastic Wallet.


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SURFACE ROUGHNESS SCALES

Scale No. **16053** (shown above)
• Solid electroformed Nickel Reproductions of actual machine surfaces.
• Overall Dimensions: 1 3/8" x 6". • 12 - Specimens. • 250 to 2,000 Microinches.
• 4 Machined Finishes - Milled, Shape Turned, Profiled, Ground.
• Supplied in leatherette case with engineering data & instructions.

Scale No. **16052** (not shown)
• Solid electroformed Nickel Reproductions of actual machine surfaces.
• Overall Dimensions: 1 3/8" x 6". • 12 - Specimens.
• 4 to 125 Microinches.
• 5 Machined Finishes - Milled, Shape Turned, Profiled, Ground, Lapped.
• Supplied in leatherette case with engineering data & instructions.
PRECISION REFERENCE STANDARD
AND STYLUS CHECK
Made in U.S.A.

Shows actual patch mean values certified by
the National Institute of Standards and Technology (NIST)

CALIBRATE YOUR SURFACE ANALYZING
EQUIPMENT TO PEAK EFFICIENCY.

The Precision Reference Standard provides an
economical calibration tool which permits the tech-
nician to calibrate surface analyzing equipment
to its peak efficiency. It is the only calibration block
on the market to show the actual patch mean val-
ues of low and high microinch surfaces and certified
by N.I.S.T.

The surface of the Precision Reference Standard
consists of a series of parallel, uniform, "V-shaped"
grooves having an included angle of 150° be-
tween the sides. Since the surface character of
the Precision Reference Standard is unlike nor-
mally machined surfaces, it is not recommended
for use in visual or tactual comparison.

Report of Calibration by N.I.S.T.
The property of surface roughness in the 125
microinch range and below is maintained by N.I.S.T. by
means of master roughness specimens conforming to
ANSI-B 46.1. The master specimens were calibrated
by measuring their surface profile with a stylus
instrument which in turn was calibrated by an interfero-
metrically measured step. The areas under the profile
curves were then measured and the roughness aver-
age computed. The accuracy of this measurement
is 2% for the 119.5 and 1 microinch for the 16.1.

Set No. 16037, Complete with
Metric Conversion Chart plus
signed Certificate of Traceability
to NIST. Made of pure electro-
formed nickel. Provided with
protective case.

EIGHT BLOCK MASTER VISUAL-TACTUAL SET

This Master Set contains eight individual rectangular
blocks, each measuring 1-3/8" x 1-7/8". They are
made of corrosion resistant electroformed nickel and
are duplicates of actual conventionally machined
surfaces. There are fifteen replicated machined
surface finish specimens ranging from 2 to 125
microinches.

Inside of cover contains
data on terminology
(lay, flaws, waviness, AA, etc.)
Now available in a complete
set or individual blocks.

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Roughness Average (Ra)</th>
<th>Machining Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>15200</td>
<td>2</td>
<td>Hone Lap Grind</td>
</tr>
<tr>
<td>15201</td>
<td>4</td>
<td>Hone Lap Grind</td>
</tr>
<tr>
<td>15202</td>
<td>8</td>
<td>Grind</td>
</tr>
<tr>
<td>15203</td>
<td>16</td>
<td>Grind</td>
</tr>
<tr>
<td>15204</td>
<td>32</td>
<td>Turn or Shape, Grind</td>
</tr>
<tr>
<td>15205</td>
<td>63</td>
<td>Turn or Shape, Grind, Mill with Periphery</td>
</tr>
<tr>
<td>15206</td>
<td>90</td>
<td>Turn or Shape, End of Face Mill, Mill with Periphery</td>
</tr>
<tr>
<td>15207</td>
<td>125</td>
<td>Turn or Shape, End of Face Mill, Mill with Periphery</td>
</tr>
</tbody>
</table>

The Master Visual-Tactual Set is supplied in a
protective velvet-lined case complete with engineer-
ing data and instructions. Individual blocks are
available and can be purchased separately.

Complete Set of Blocks:
Model No. 16040, Supplied in a deluxe velvet-lined case