

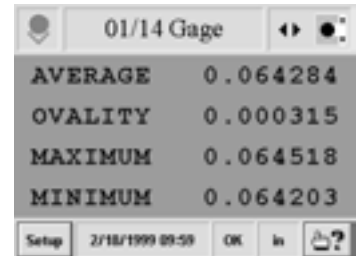
Application Note

Wire & Cable Measurement Solutions

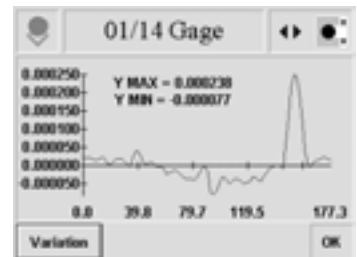
Making The Model 283 BenchMike Work For You

When you're making wire or cable, a single diameter measurement often isn't enough. Most manufacturers also need to know the maximum, minimum, ovality, and average diameter of their products to monitor die wear, ensure quality, and reduce scrap.

The Beta LaserMike Model 283 BenchMike meets this challenge. The BenchMike's user-friendly graphical interface and touch-screen make it easy for you to monitor crucial dimensions and evaluate product quality. The main data page (shown, right) displays the four data items needed for your application (selected by the user) and gives you quick access to libraries and setup parameters.



A family of motorized and manual fixtures is available to ensure measurement accuracy for different applications. The Intelligent Fixtures interface directly with the BenchMike for precise control of the product during measurement. As shown in the graphical profile from a Rotating Fixture (shown, right), the BenchMike allows you to monitor diameter variations using small increments (2 degree increments shown).



For these reasons and more, the Model 283 BenchMike brings a new level of performance excellence to the measurement of wire and cable products.



B E N E F I T S

- Accurate, non-contact measurements of product ovality, average, maximum, and minimum diameter
- Automated fixture reduces inspection time
- User-friendly BenchMike simplifies the measurement process
- Quality control data both on-screen and in printout

Software Options

- Model 1 offers basic functionality
- Model 2 option adds sixteen libraries for customized product setup
- Model 3* option has sixteen libraries and linked measurements (features) with extended math functions: sin, cos, tan, pi, degrees, abs, exponents, radians, square root.

*With this option, conductor circular mils can be calculated.

Hardware Options

- Second RS232 serial port
- Special ultra-fine wire measurement range option 25 μm (0.001 in.) to 10.16 mm (0.4 in.)
- 4 or 8 additional digital inputs and outputs for special applications

System Features

- Designed specifically for accurate measurement of wire and cable products
- Fast, simple operation with a user-friendly graphical user interface, Windows-style menus, and a state-of-the-art touch-screen designed for industrial environments
- Allows you to quickly view values or graphics merely touching the ◀▶ icon in the upper right of the BenchMike's touch screen and by selecting the desired view
- Graphs allow you to monitor product variation
- Multiple measurements at known radial positions on the sample allow collection of average, difference (out-of-round), maximum, and minimum data values
- Rotation angle is programmable in 1 degree increments
- User-selectable measurement data such as maximum, minimum, average, and difference values can be sent to a computer via the RS232 serial port for data analysis
- Visual and audible out-of-tolerance alarms on size values
- Printed reports can be generated both automatically and manually
- RS232 interface for remote setup of the BenchMike from a remote device using Beta LaserMike's Programmable Universal Remote Language (PURL)
- Optional circular and X-Y graphical displays show the angular location of the maximum and minimum values
- Measurement results can be displayed in user-selected units of mm, microns, mils, inches, or microinches
- V-block measurement mode for simple measurements
- Two modes of operation for rotating fixtures for maximum flexibility

BenchMike Printed Reports

- Supports parallel dot matrix printers (Epson compatible) or reports can be sent to RS232 serial port
- Sample and Batch reports for V-Block measurement
- Sample and Batch reports for Rotating Fixture measurement for multi-sample and stranded wire applications
- User-entered report names for product or line identification

Sample Report for V-Block Measurement

```

Your Name Here                               Sample Report
Library 01/Untitled/F01                       3/31/1999 4:11p

Mode:Diameter, Units:Inches (in)

Sample #1  0.188788
Sample #2  0.187759
Sample #3  0.211803
Sample #4  0.188627
    
```

Sample Report for Rotating Fixture Measurement

```

0.033282 0.033277 0.033460 0.033607 0.033713 0.033709 0.033596
0.033438

MAX: 0.033713 MIN: 0.033277 DIFF: 0.000436 AVG: 0.033510 SD: 0.0001739
READINGS: 8

0.033284 0.033277 0.033460 0.033608 0.033714 0.033707 0.033595
0.033435

MAX: 0.033714 MIN: 0.033277 DIFF: 0.000437 AVG: 0.033510 SD: 0.0001735
READINGS: 8

0.033282 0.033278 0.033460 0.033609 0.033715 0.033705 0.033594
0.033434

MAX: 0.033715 MIN: 0.033278 DIFF: 0.000437 AVG: 0.033510 SD: 0.0001736
READINGS: 8
    
```

Batch Report for V-Block Measurement

```

Your Name Here                               Batch Report
Library 01/Untitled                           3/31/1999 4:11p

Mode:Diameter, Units:Inches (in)

Average                0.194244
Diff/TIR               0.024044
Maximum                0.211803
Minimum                0.187759
Standard Deviation     0.0117146
Undersize Samples      0
Oversize Samples       0
Total Number of Samples 4
    
```

Batch Report for Rotating Fixture Measurement

```

Your Name Here                               Fixture Batch Report
Library 01/Untitled                           3/31/1999 3:55p

Mode:Diameter, Units:Inches (in)

Report on All Readings
Average                0.033510
Std Dev               0.0001659
Highest               0.033715
Lowest                0.033277
Range                 0.000438
Oversize              0
Undersize             0

Report on Sample/Part Summaries
Average                0.033510
Std Dev of Sample Averages 0.0000003
Highest Sample Average 0.033510
Lowest Sample Average 0.033510
Highest - Lowest Sample Average 0.000001
Average Range/R-Bar   0.000437
Oversize Samples      0
Undersize Samples     0
Total Number of Samples 3
    
```

Two Operating Modes for Rotating Fixtures

The **Continuous Rotation Mode** is used to capture the peak diameter variation (Max-Min) on parts where there is concern that the peak value will fall between measured positions in the Fixed Increment Mode. Measurement coverage is essentially continuous in this mode. No graphical data displays are available in this mode.

For example, by selecting a 0.1 second reading duration (10 readings per second), a sample rotation rate of 1 RPM, and rotating the sample 1 revolution, 600 total readings will be taken. This means that a reading is performed every 0.6 degrees.

Other applications may benefit from Continuous Rotation Mode. For example, it can be used to measure the width and thickness of products such as two- or three-conductor ribbon cable or ribbon fiber. The maximum and minimum sizes can be captured and displayed as width and thickness, respectively.

The **Fixed Increment Rotation Mode** allows the user to define the number of positions to be measured. Up to 180 positions can be Selected. Radial increments can be entered as the number of positions, or as the angular increment between measured positions. The product is measured at each defined measurement position. No measurements are made during sample rotation.

The measurement cycle time can be increased or decreased, depending on the measurement repeatability required, by increasing or decreasing the scans averaging rate, or the number of scans averaged per reading. With the optional graphic screen software, the size at each measured position can be viewed. The maximum and minimum sizes are displayed in red and green, and color keyed red and green arrows point to their radial positions.

Application Examples With Rotating Fixtures

In-process sample inspection

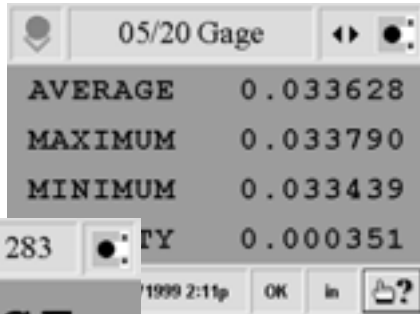
Using a Rotating Chuck Fixture, you can capture the diameter and ovality of wire on a draw line or the maximum and average diameter of jacketed cable on the production floor.

The operator enters the number of points to be measured. As the number of measured positions is increased, the sample can be characterized more accurately. Products with little ovality can be adequately characterized with eight data points.



In this example, eight points were measured. The locations corresponding to the maximum (red) and minimum (green) measurements are indicated by arrows on the graph and data values on the right of the screen. The top arrow can be scrolled to any point to display its measurement data.

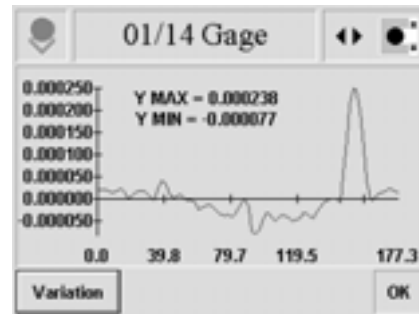
Note the four items selected for display for this application. Any data item can be magnified to fill the data display by simply touching it.



A magnified view of any line of measurement data can be displayed by touching that line on the display. Touch again to restore normal view.

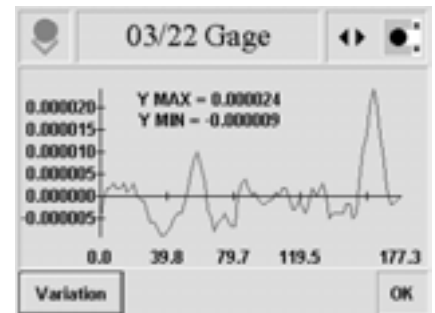
Draw die inspection and evaluation

Using a Rotating Chuck Fixture, drawn wire samples can be accurately profiled in the die shop to evaluate die condition before and after use and to evaluate or monitor die life due to different process variables such as lubricants and material alloys. The angular relationship between the maximum and minimum diameters can also be observed. The sample screens below show the diameter profiles for two different products: a 14-gage wire sample with a nick, and a 22-gage gage pin. Measurements are taken every 2 degrees. The deviation from the nominal value is displayed in millionths. The graph automatically scales to display the total deviation or variation.



Diameter profile of 14-gage wire sample with measurements taken every 2 degrees. Peak shows at 238 millionths, where wire was nicked.

Diameter profile of 22-gage gage pin with measurements taken every 2 degrees. Diameter variation is 33 millionths.



Model 283 Fixture Selection Guide

Rotating Fixtures

Manual Fixtures

Fine Wire Auto-Rotating Chuck

Material	Stiff; able to support its own weight without bending over 75 mm (3 in.).
Chuck Type	3-Jaw Jacobs Key
Minimum Size	0.30 mm (0.012 in.)
Maximum Size	4.00 mm (0.157 in.)
Height	V-block height is adjustable in four steps over the measurement range. Hold down arm to the sample aligned in the V-block.
Part Number	84005

Spring-Loaded Auto-Rotating Chuck

Material	Stiff; able to support its own weight without bending over 75 mm (3 in.).
Chuck Type	Spring-loaded iris
Minimum Size	0.254 mm (0.010 in.)
Maximum Size	3.00 mm (0.120 in.)
Height	V-block height is adjustable in four steps over the measurement range. Hold down arm to the sample aligned in the V-block.
Part Number	84007

Wire & Rod Auto-Rotating Chuck

Material	Stiff; able to support its own weight without bending over 75 mm (3 in.).
Chuck Type	Keyless precision ground and hardened
Minimum Size	0.76 mm (0.030 in.)
Maximum Size	12.7 mm (0.500 in.)
Part Number	84015

Power Cable & Rod Auto-Rotating Chuck

Material	Stiff; able to support its own weight without bending over 75 mm (3 in.).
Chuck Type	3-Jaw Lathe
Minimum Size	1.57 mm (0.062 in.)
Maximum Size	50.8 mm (2.25 in.)
Part Number	84022

Fine Wire Heanium V-Guide

Material	Designed for short, small samples that are not straight enough to lay properly in a longer V-block. Sample rests on two points. Distance between V's is 19 mm (0.75 in.).
Minimum Size	0.25 mm (0.010 in.)
Maximum Size	3.175 mm (0.125 in.)
Part Number	83883

General Purpose Fixed V-Block

Material	Straight, stiff samples.
Minimum Size	0.762 mm (0.030 in.)
Maximum Size	Model 283-10: 22.86 mm (0.900 in.) Model 283-20: 45.72 mm (1.800 in.)
Description	Hardened 120 degree V, polycarbonate spacer for thermal isolation.
Part Number	Model 283-10: 83855 Model 283-20: 83854

General Purpose Full-Range V-Block

Material	Straight stiff samples. Permits measurement of samples through the full measurement range of the BenchMike with lead screw positioning mechanism.
Minimum Size	0.25 mm (0.010 in.)
Maximum Size	3.175 mm (0.125 in.)
Description	Hardened 120 degree V
Part Number	83976



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