ABB’s L&W Bending Tester is an easy-to-use and reliable instrument that measures bending resistance and stiffness of paper and board. Enhanced automation and digitalization allow mills to meet target specifications and ensure product performance in converting and end-use operations.

Overview
The L&W Bending Tester offers the best available features for ease-of-use, automation, customization, and digitalization, for easy, fast, operator independent testing that gives reliable and repeatable measurement results that mills require to ensure customer specifications are being met.

Benefits
• Easy to use and customize
• Ergonomic operation
• Fast, operator-independent testing
• Reliable and repeatable results
• Streamlined lab data management

Features
• Large touchscreen with user-friendly interface
• Test piece support and automatic clamping for easy and precise test piece loading
• Enhanced auto-touch function with improved post-processing for faster, operator independent testing
• Ergonomically placed start button
• Quick overview of results
• Graphical display of bending curve with break angle/force indication for analysis
• Bending length detection for ensuring correct program settings
• Adjustable bending angle
• Adjustable angular testing speed
• Easy instrument check and calibration
• Bending lengths of 1, 5, 10, 15, 20, 25 and 50 mm
• Available with 1N, 5N or 10N load cells
• Optional 25mm sample support available
Ease of operation
L&W Bending Tester is easy to use with a large touchscreen interface and intuitive menus, saving operator time and effort. Operators can quickly change settings from the screen, with correct authorization. It provides easy calibration and simple instrument check with included check plate and gives a quick overview of results for an entire series. The bending curve with break angle/force indication allows quick analysis of the test to identify any erroneous measurements.

Operation is automated once the operator hits start. First, the instrument is connected to power and pressurized air, and the operator selects either a standard or pre-set, custom program. The precisely cut test piece can be easily loaded in the measuring clamps and correctly aligned with the loadcell with the help of sample support.

The operator simply places the test piece inside the clamp with one hand, while the other hand starts operation with the ergonomically placed start button. The clamps are automatically closed with fixed pressure for precise measurement.

Bending length detection ensures that the bending length selected in program settings matches the manually set bending length, or otherwise warns the operator with an error message.

Repeatable, fast, operator independent results
The auto-touch function enables automatic detection of starting point, that is, the exact angle where the test piece makes contact with the load cell. Improved post-processing and noise filtering, make auto-touch more precise and very resistant to vibrations. From this position the test piece is bent through the predetermined angle and testing speed before populating results on the instrument display. The benefit of the auto-touch function is that no manual intervention is required to place the test piece in contact with the load cell; without this function, it can be difficult and time-consuming to ensure that the same force is used each time, and the results will be operator dependent.

Easy customization
L&W Bending Tester has easy to customize testing programs. In addition to standard options, operators can choose a custom bending angle and a custom testing speed, within the specified limits. The instrument features 1 mm bending length for very low bending strength applications. The instrument is available with 1N, 5N or 10N loadcell versions, so the right loadcell can be chosen for specific paper grades, to give higher accuracy of results.
**Digitalization enables mill connectivity**

L&W Bending Tester features Ethernet connectivity for connecting to a mill-wide network. This enables streamlined set-up of lab instruments with less hardware. It also offers connectivity to ABB’s L&W Lab Management System (LMS) for automatic capture, analysis and reporting of measurement results. This makes lab operations easier and faster, helping personnel increase the volume of tests. LMS is a web-based application with an intuitive user interface and can be connected to mill-wide systems for enhanced quality management and process optimization.

**Global service with a local touch**

As a global supplier with local service organizations in all markets, ABB is the worldwide technical support market leader for paper testing, including both calibration and maintenance services. We provide specialized testing using L&W-specific calibration devices that are regularly certified with traceable calibration from global certification institutes. All service requests can be managed through the myABB for L&W business portal.

**Optional add-ons**

ABB offers two options for sample cutting: the L&W Sample Punch can be used for precise sample preparation pneumatically while L&W Sample Cutter can be used for easy and quick manual preparation of accurate and precise test pieces. Both are ergonomically designed with safety features for easy and secure operation, while ensuring precision cutting over a wide range of paper grades and grammages.

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**Technical specifications – L&W Bending Tester, Code 286**

<table>
<thead>
<tr>
<th>Inclusive</th>
<th>Check plate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Measurement range</strong></td>
<td>0-1000 mN, 0-5000 mN, or 0-10000 mN</td>
</tr>
<tr>
<td><strong>Bending angle</strong></td>
<td>Standard measurement 5°, 7.5°, 15° and one custom angle</td>
</tr>
<tr>
<td><strong>Bending length</strong></td>
<td>1, 5, 10, 15, 20, 25 and 50 mm</td>
</tr>
<tr>
<td><strong>Bending velocity</strong></td>
<td>Standard measurement 5°/s, adjustable</td>
</tr>
<tr>
<td><strong>Test piece</strong></td>
<td>Standard width 38 mm, max thickness 3 mm</td>
</tr>
<tr>
<td><strong>Start functions</strong></td>
<td>Auto touch, Semi manual touch</td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td>0.3x0.4x0.3 m/11x15x12 in (WxDxH)</td>
</tr>
<tr>
<td><strong>Net weight</strong></td>
<td>12 kg/25 lb</td>
</tr>
</tbody>
</table>

**Measurement Method**

L&W 2-point bending method

**Results**

- Standard measurement values
  - Bending resistance at selected angles
  - Calculated bending stiffness at 5° and at custom angle
  - Taber values

**Statistics**

- Mean value
- Standard deviation
- Coefficient of variation
- Maximum and minimum approved values of the series

**Connections**

- Ethernet
- The instrument acts as an FTP-server and test results can be retrieved by an FTP-client
- Connectivity to L&W LMS and L&W Autoline DAW
- Network printer

**Installation requirements**

- Power: 30W
- Instrument air: 0.4-1.0 MPa

**Options**

- 4" Ethernet thermo-printer
- Sample support 25 mm width

**Applicable standards**

- Bending resistance: ISO 2493-1, TAPPI T 556
- Bending stiffness: ISO 5628, DIN 53121

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You can also add an external thermal printer for quick printout of test results.
**About the measurement**

Bending resistance is defined as the force (in Newton) that is required to bend a rectangular test piece to a specified angle, when the test piece is fixed at one end and the force is applied to its free end.

**Why measure bending resistance or stiffness?**

Bending resistance and stiffness is an important material property that can affect the product performance in many converting and end-use operations. Low bending resistance/stiffness causes runnability issues during printing of paper, foldability issues during converting of board into packaging boxes, and stackability issues during handling and storage of packaging boxes.

**Bending resistance and bending stiffness**

A – pivoting axis  
B – clamp device  
C – measuring edge  
D – load cell  
E – test piece  
F – bending length  
G – bending angle

Bending stiffness is defined as:

The result of the following equation at bending angle.

\[
S_b = \frac{60 \times F \times l^2}{\pi \times b \times \phi}
\]

**Symbols:**

- \( S_b \) = bending stiffness [mNm]  
- \( F \) = force [N]  
- \( l \) = length [mm]  
- \( b \) = width [mm]  
- \( \phi \) = bending angle [°]