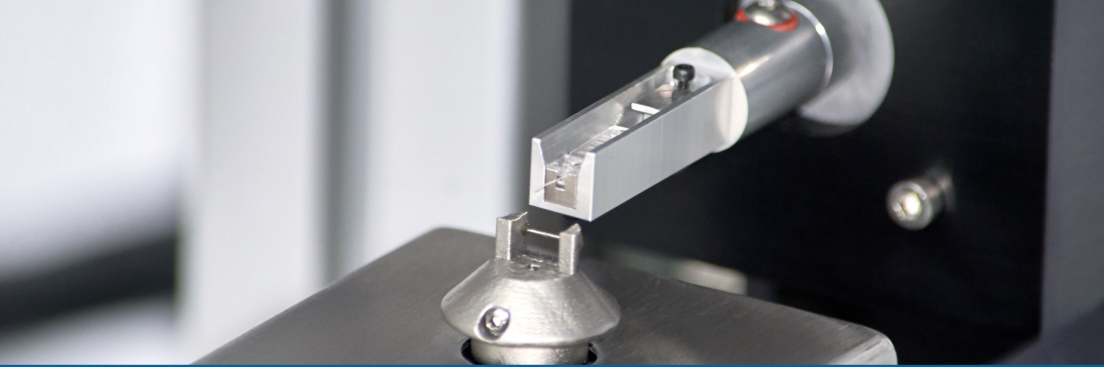




DIA-STRON
DELIVERING MEASUREMENT SOLUTIONS

FBS900 Bending System



Overview

The FBS900 fibre bending system can be used for measurements on single hair fibres, natural fibres and synthetic fibres, and is ideal for evaluating short specimens or studying a different mode of deformation, other than tensile or torsion, in order to assess fibre mechanical anisotropy.

Principal benefits:

- Sample rotation enables measurements over a range of orientations
- Measurement accuracy to better than 1mg
- High throughput testing and multi-test capability with the ALS1500

Applications and claims:

- Measuring how cuticle damage affects hair bending stiffness
- Impact of styling products on fibre rigidity
- Formulation development for mascaras and shaving products
- Evaluating natural fibre bending properties as a function of rotation angles
- Impact of treatment on newly grown hair fibres



Metrology principle —

The FBS900 is based on the single cantilever method, where the fibre specimen is flexed against a pin and the bending force measured using a micro-balance as a function of deflection. Combined with dimensional data, obtained using the Dia-Stron FDAS770, the bending modulus can be calculated and bending stress relaxation monitored.

Fibre specimens can be rotated to enable bending measurements to be taken over a range of angles.

Dedicated software – UvWin

The FBS900 module is controlled using Dia-Stron UvWin software, in which parameters for the following methods can be easily edited: simple deflection, stress relaxation and hysteresis.

UvWin also offers a number of integrated data processing tools and the raw data can be exported as a text file, for use in Excel or other statistical packages. UvWin is compatible with the latest versions of the Windows OS.



Automation —

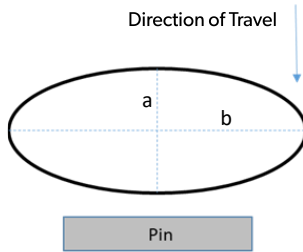
All Dia-Stron measurement modules can be used in conjunction with our automation platforms, delivering high throughput testing of single fibres for maximum productivity.

The “Pick & Place” mechanism transports fibre specimens from storage cassette to measurement modules and back continuously. An additional cassette hotel increases the capacity to 200 fibre specimens that can be measured without user intervention.

The benefits of automation include:

- Maximised productivity
- Improved data quality
- Consistent specimen integrity
- Improved safety/ergonomics

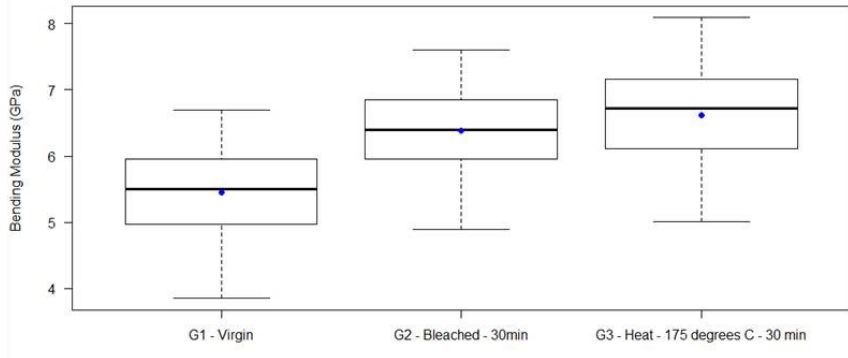
Sample data and analysis —



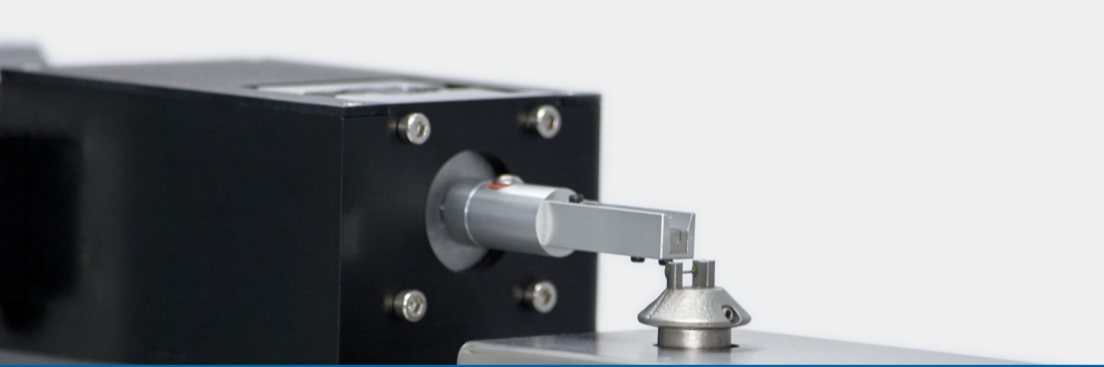
Steel Deflection Pin on the Force Balance

$$E_{Bend} = \frac{4FL^3}{3D\pi ba^3}$$

Where a = fibre radius in the direction of the bend, b = fibre radius orthogonal to the bend, F = force at deflection distance, D, D = deflection distance (vertical displacement) and L = cantilever length



Bending study conducted on Asian hair fibres at 40% RH, using a deflection distance of 100 μ m and a rate of 0.025mm/s. The bending modulus was calculated at angles of 0 $^\circ$ and 180 $^\circ$. A higher modulus indicates an increase in stiffness.



References —

Publications:

M. Ezure et al (Kao): “The Secrets of Beautiful Hair: Why is it Flexible and Elastic?”; Cosmetics (online journal) (2019)

A. Galliano et al: “Comparing touch senses of naïve and expert panels through treated hair swatches: which associated wording correlate with hair physical properties”; Int. J. Cosmet. Sci, 39, 653 - 663 (2017)

S. Bouabbache et al: “What is Caucasian ‘fine’ hair? Comparing instrumental measurements, self-perceptions and assessments from hair experts”; Int. J. Cosmet. Sci, 38, 581 - 588 (2016)

Examples of use in patent claims:

US20190254943A1 Hair cosmetic composition (Kao) August 2019

JP2015120660A Hair cleaning agent (Kao) March 2018

US8663614 Method of shaving using salicylic acid derivatives (L’Oreal) March 2014

Technical Specifications

FBS900	
Maximum bending force	49mg
Force balance resolution	0.02mg
Force balance accuracy	1mg
Force balance linearity	± 0.08% full scale
Data capture rate	10Hz
Movement speed	0.01 to 1.25mm/s
Movement range	15mm
Movement repeatability	0.1µm
UvWin resolution	1µm
Rotational range	0 - 360°
Rotational accuracy	± 2°

Content

UV1050	USB and power cables Fibre mounting system UvWin software for Windows OS
PU1110	
FBS900 Bending Module	
Balance control unit	

Requirements

Power supply	Universal 85-265V AC 47-63Hz, 50W
Compressed air	Dry and clean 4.5 bar 20 l/min
Computer	Windows OS: 7 and 10 2 x USB port

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