DIA-STRON
DELIVERING MEASUREMENT SOLUTIONS

fibra.one

All-in-one testing solution for hair tresses

Overview

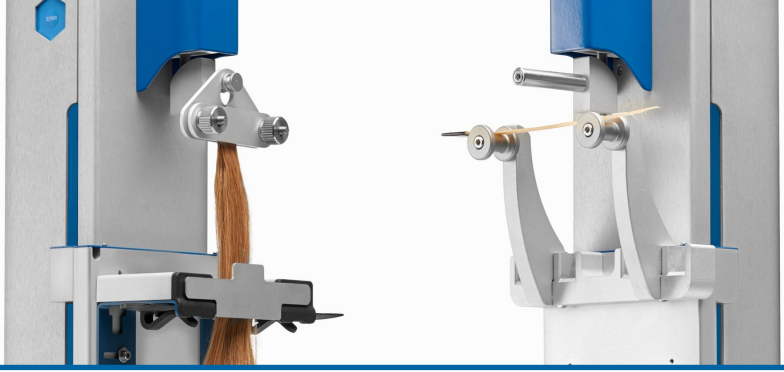
fibra.one is a multi-functional tress testing instrument, with multiple interchangeable accessories for combing, 3-point bend, hair friction, curl compression, stress and tensile testing. Measurements of hair tress properties can be used to develop new hair care ingredients and technologies, evaluate the technical performance of new formulations and support hair product claims.

Principal benefits:

- Intuitive icon-based software programme
- Quick-change accessories designed for an efficient workflow
- One instrument, multiple measurement options

Applications and claims:

- Ease of combing/conditioning claims
- Strengthening/hydrating/damage repair claims
- Styling hold/flexibility claims
- Softness/curl retention claims
- Smoothness/surface damage claims



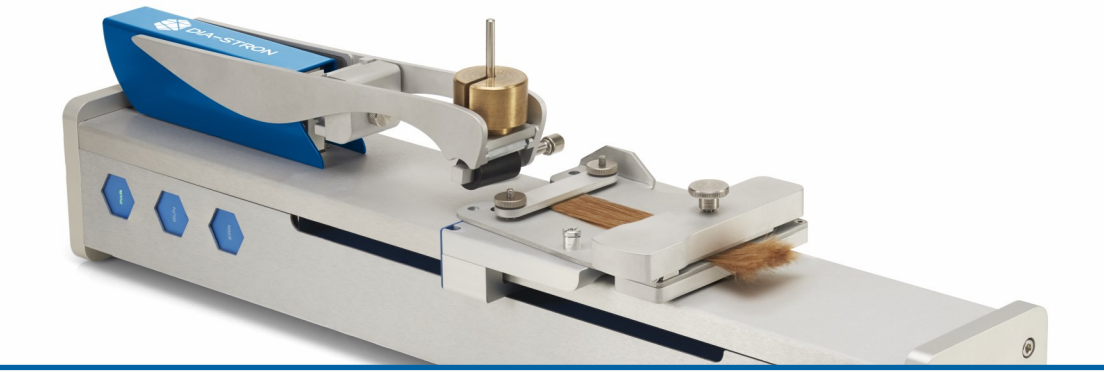
Combing —

The design of this accessory enables rapid tress mounting/dismounting (to change samples or re-wet samples during testing), flexibility for a range of comb sizes and thicknesses and a magnetic clamp plate to hold tresses within the comb during testing.

Combing measurements provide invaluable information about the conditioning performance of a product, and can be performed on both wet and dry tresses. Hair combing properties correlate well with consumer attributes e.g. “ease of combing”, “manageability” or “detangling”.

3-Point Bend —

This ergonomically designed accessory measures flexural properties of hair tresses, and is most commonly used for styling claims such as “hold”, “stiffness” or “feel” in the claims packages for styling polymers, hair gels and hair sprays. This can be used in the same vertical orientation as the combing accessory, reducing the time spent changing between accessories and testing methods.



Friction —

The friction accessory (used in the horizontal orientation) combines a rubber probe mimicking hand/skin compliance and texture properties, and a base plate with mechanism for secure and quick hair clamping. New design features include a detachable platen for rapid tress mounting/dismounting, simplified indexing of the probe position and an integrated auto-lift mechanism, removing the need for a compressed air supply.

Hair friction properties correlate well with consumer attributes such as “smoothness” or “surface damage” (heat, environmental, bleaching, repeated styling).

Dedicated software – fibra.

fibra.one is operated using Dia-Stron’s newest application software — fibra.

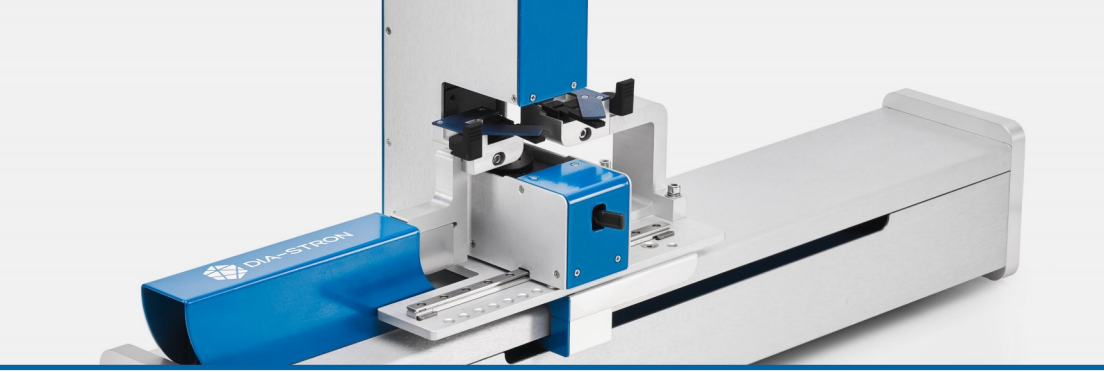
fibra.’s intuitive graphical interface is icon driven, making it uncluttered and easy to navigate. The parameters for each testing method can be easily edited within the software. fibra. is based on native scientific HDF5 format, offers a number of integrated data processing tools and raw data can be exported as a text file, for use in Excel or other statistical packages.

Curl compression —

The curl accessory was developed to measure the compression properties of circular hair curls formed from hair tresses as a technical test, predictive of consumer hair curl sensory feel. The hair curl compression method is perfect for “softness” or “curl retention” claims, for styling products such as hair gels, mousses, hair sprays, pomades as well as wash and care products.

The two-part accessory consists of a curl clamp barrel and curl clamp fork. The barrel slots into a curl rod around which curls are formed, clamped with the fork and then removed securely, forming consistent, repeatable curls with minimal handling. The accessory is supplied with a 35mm diameter curl rod for the formation of tress curls, with alternative diameter curl rods available on request. The pre-formed curls, held by the accessory, are mounted onto a load cell and compressed by the upward movement of a compression plate. Adjustable baffles on the compression plate prevent the curl from spreading during the compression, and the force required to compress and decompress the curl is measured by the load cell.

The curl compression method in the Dia-Stron fibra. software offers various adjustments such as number of cycles, compression speed or contact force.



Stress —

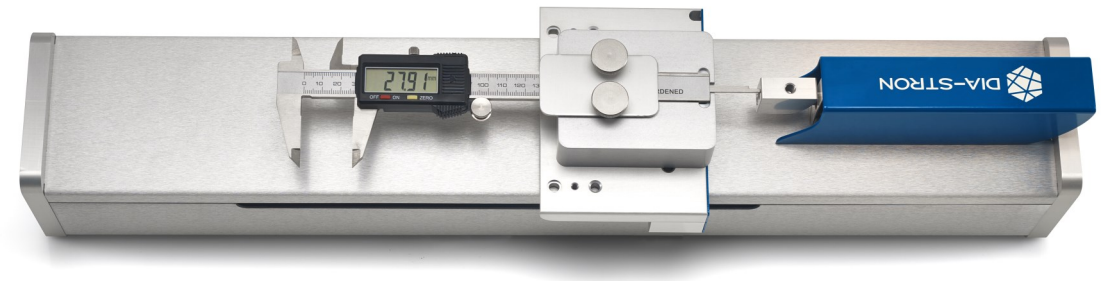
The stress accessory has been designed to offer dimensional and tensile testing of single fibres on the fibra.one system. Various fibre types can be measured, including single hair, textile or natural fibres.

The accessory combines a laser scanning micrometer module (LSM500) which records the fibre dimensions to enable the calculation of uniaxial normal stress data. Normalising tensile data with hair fibre cross-sectional area reduces data variability up to 80%, helping with group significant discrimination. Samples are easily loaded into two pockets, one fixed on a moving platform and one attached to a load cell which measures the force being applied to the sample. The fibre can be extended to either a specific extension or to failure in order to obtain tensile parameters such as the elastic modulus, break stress and break strain.

Test methods in the Dia-Stron fibra. software include single tensile deformation, hysteresis, and cyclic, with stress relaxation to be released soon. Testing data on hair fibres can be used to substantiate “strengthening”, “hydrating” and “damage repair” claims.

Tensile —

The tensile accessory operates in the same way as the stress accessory, without the additional dimensional capability and therefore no conversion to stress data. Comparisons on the same fibre samples before and after treatment can also be made with this accessory, using a non-destructive tensile method.



Calibration check —

This accessory enables users to conduct internal intermediate calibration checks between Dia-Stron service visits.

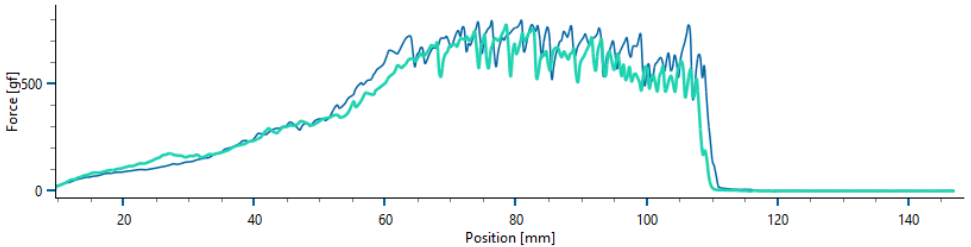
The kit includes a digital caliper for positional measurement checks and a calibrated weight hanger/weights for the load cell checks, which are performed as follows:

Positional check: the digital caliper mounts onto the moving platform, in either the horizontal or vertical orientation, and allows the user to accurately measure the distance between the load cell and the platform. This correlates to the horizontal “position” axis in the fibra. software. The live measurement can be viewed on the drive control page of fibra. for verification.

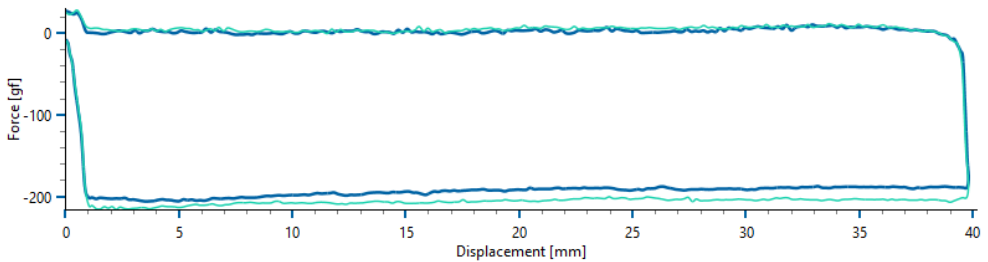
Load cell check: with the fibra.one in vertical orientation, the calibrated weight hanger attaches to the load cell to check the force measurement, with the option to add additional 200g weights. This correlates to the vertical “force” axis in the fibra. software. The live measurement can be viewed on the drive control page of fibra. for verification.

Sample data —

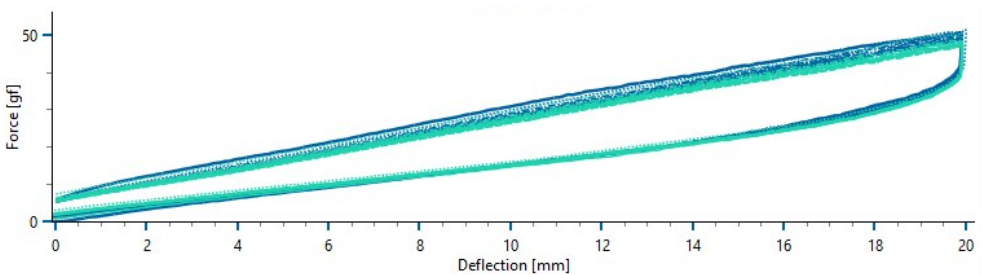
Combing Data



Friction Data



3-Point Bend Data



References —

Publications:

Gama R., Baby AR., Velasco MVR. (2017): “In Vitro Methodologies to Evaluate the Effects of Hair Care Products on Hair Fiber”; Cosmetics Open Access Journal, Vol. 4, Issue 1

Dario, MF., (2016): “Development and evaluation of the effectiveness of bioactive cationic nanoemulsion in protecting hair photo-oxidative damage”; Thesis (Ph.D.), Faculty of Pharmaceutical Sciences, University of Sao Paulo, 2016

Hartung C., Kortemeier U., Westerholt U. et al; (2013): “T-shaped Siloxane Microemulsion for Improved Hair Conditioning and Protection”; Cosmetics & Toiletries magazine, March 2013, Vol. 128, No. 3

Evans T.; (2011): “Evaluating Hair Conditioning with Instrumental Combing”; Cosmetics & Toiletries magazine, August 2011, Vol. 126, No. 8

Keenan AC, Antrim RF, Powell T (2011): “Characterization of hair styling formulations targeted to specific multicultural needs”; Journal of Cosmetic Science, 2011, 62(2):149-160.

Smith D., Morgen S., Johnson D. and St. Usaire R. (2000): "Enhancing Conditioner Substantivity"; Soap & Cosmetics 40-43.

McMullen R. L., Jchowicz J., and Keltry S. P. (2000): "Correlation of AFM/LFM with Combing Forces of Human Hair"; IFSCC Magazine 3, 39-43.

References —

Examples of use in patent claims:

US20180193242 Method for coloring or bleaching hair fibers (Friction accessory, Ashland LLC), Dec 2018

WO2017081698A1 Water-in-oil microemulsions for personal care (Combing accessory, Galaxy Surfactants Ltd.), May 2017

WO2016189276A1 Hair Care Formulation (Combing and Friction accessories, Croda International), Dec 2016

US20140234247 Aminofunctional Organosiloxanes (Combing accessory, Dow Corning), Aug 2014

US20120167401 Wet friction materials for hair removal devices (Friction accessory, Gillette), July 2012

Uses for claims in technology advertising:

- AkzoNobel
- Ashland
- BASF
- Evonik
- GHD
- Lubrizol
- Momentive
- Tri-K

General Specifications	
Operating temperature range	10 to 30°C
Operating humidity range	10-90% non-condensing
Environmental protection	IP31
Height	75cm
Weight	8kg
Footprint	25 x 25 cm
Power supply	Universal 85-265V AC, 47-63Hz
Power	Less than 50W
Compressed air	Not required
Drive system	
Travel range	10 to 250 mm
Speed range	10 to 3000 mm/min (note 1)
Displacement resolution	0.5µm
Displacement accuracy	50µm

Force measurement system	
Load cell	± 20N (standard, note 2)
Force resolution	0.0005N
Force accuracy	± 0.50%
Load cell non-linearity	± 0.02%
Load cell non-repeatability	± 0.02%
Methods	Extension and compression
Other requirements	
Software	fibra. (x64 bit)
Operating system	Windows 7 or Windows 10 (Professional)
PC	1 x USB port
Communications	Ethernet network, static IP address

Notes:

1. Optional high-speed leadscrew option available to special order
2. Alternative load cell options 10N, 100N, available to special order
3. Specifications subject to change

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