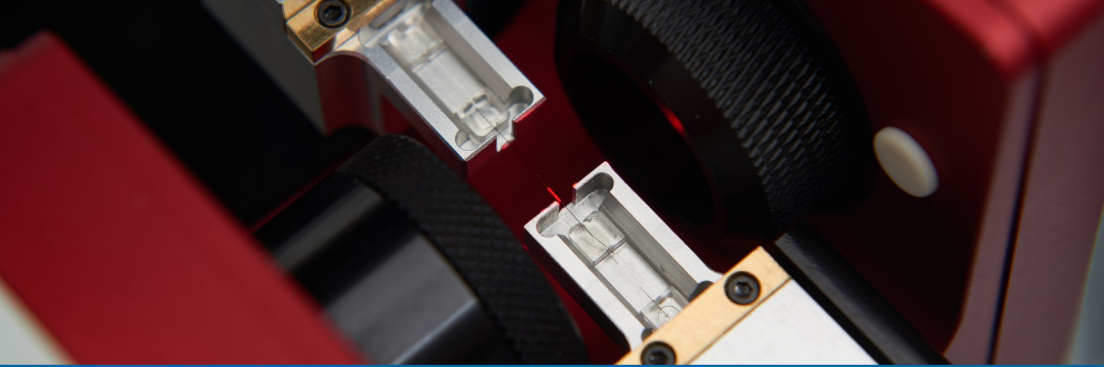




DIA-STRON
DELIVERING MEASUREMENT SOLUTIONS

LEX820/LDS0200



Overview

The integration of the LEX820 Linear Extensometer and the LDS0200 Laser Diffraction System provides users with a single solution for dimensional and tensile measurements of single fibres and filaments.

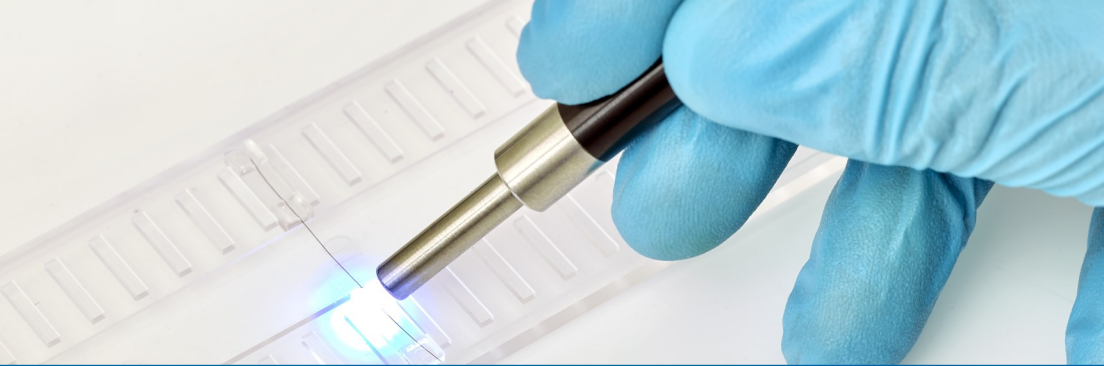
Combined with Dia-Stron's unique sample mounting and handling options, the LEX/LDS ensures accurate, repeatable data, and is perfectly suited to brittle fibres that fail at low strain values such as carbon and ceramic.

Principal benefits:

- Combined dimensional and tensile testing for increased accuracy
- Unique sample preparation method for repeatable sample mounting
- Sample handling options available, including an automated option
- Testing compatible with ISO 11566, JIS R 7601 and ASTM c1557 standards

Applications and claims:

- Single carbon fibre tensile testing
- Diameter measurement of ultra-fine fibres
- Compliance testing



Metrology principle —

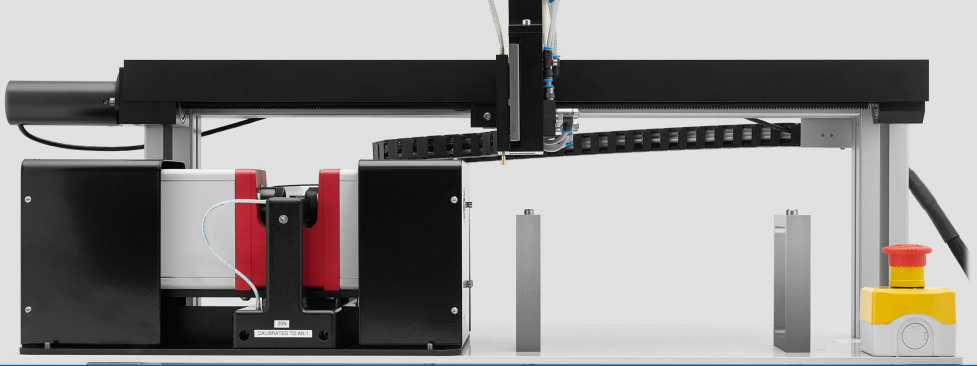
The LEX820 is a high resolution extensometer, developed for brittle fibres that fail at low strain values. The DC micrometer-drive delivers exceptionally smooth travel, combined with a high positional repeatability required to capture accurate strain data. The LEX820 is supplied with either a 20N or 2N load cell which measure force data with an excellent linearity and low compliance. The LEX820 open frame design means that it can also be used in conjunction with techniques such as X-Ray diffraction or neutron scattering.

The LDS0200 is designed for direct, non-contact diameter measurements of small, opaque fibres. When the fibre is placed in the laser beam, an interference pattern is produced. The spacing of the features in the diffraction pattern is directly related to the filament diameter.

Integrating the LDS0200 with the LEX820 guarantees alignment between the fibre and the laser beam, ensuring accurate measurements. In addition, the unique LDS0200 tilting platform ensures that misalignment due to specimen mounting is automatically corrected.

Dedicated software – UvWin

The LEX/LDS is controlled using Dia-Stron UvWin software. Through UvWin, multiple test methods can be run on the system, including extension, stress-relaxation, hysteresis and creep. The software includes a number of built-in analysis methods as well as automatic data correction for compliance in line with ISO and ASTM standards. Raw data can also 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.



Sample Preparation —

Dia-Stron have developed a unique sample mounting method utilising plastic tabs to align, mount and secure samples in place. A vacuum fibre selection needle and pick-up pen are used to separate and transport single fibres, which are mounted between pairs of plastic tabs and secured using a UV-curing adhesive. Specimen cassettes are available in a range of gauge lengths to suit a variety of applications, and keep the specimens aligned and square prior to testing.

There are 2 sample loading options for the LEX/LDS, manual and automatic, which both use vacuum suction to transport fragile specimens from the storage cassette to the metrology modules efficiently and safely.

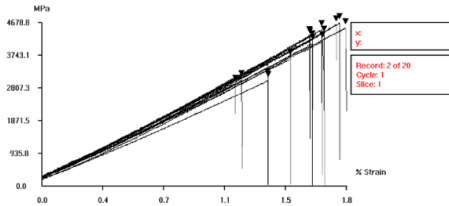
Automation —

The LEX/LDS can be integrated with Dia-Stron's ALS1500 automation platform for increased throughput and 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.

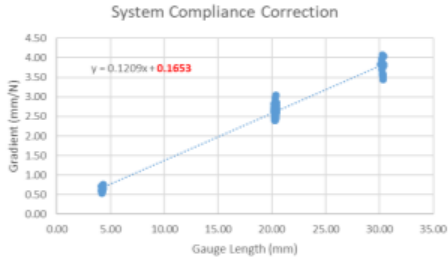
The main benefits from the automated sample loading system:

- High testing productivity
- Improved data quality
- Specimen integrity
- Safety and ergonomics

Sample data and analysis —



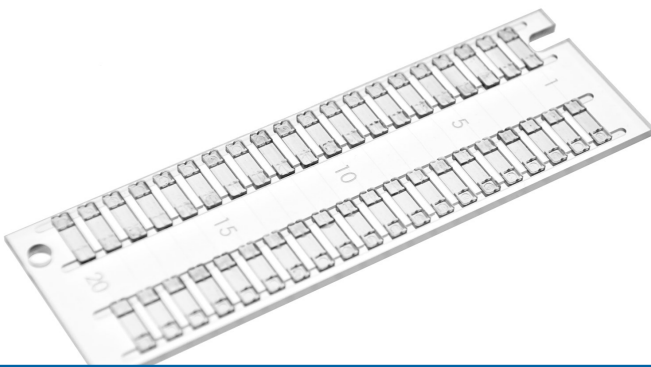
Typical stress-strain graph from carbon fibre tensile testing



Graph calculating compliance correction based on ISO 11566: 2006, where **K** (the compliance correction coefficient) is Y intercept X=0

Toray T700	Unit	Dia-Stron LEX/LDS	Product Specification
Fibre Diameter	µm	6.8	7.0
Modulus	GPa	226	230
Break Strain	%	1.6	2.1
Break Stress	MPa	4011	4900

Table comparing the product specification sheet of Toray T700s with measurements recorded on Dia-Stron LEX/LDS



References —

Mesquita et al (2021): "Single carbon and glass fibre properties characterised using large data sets obtained through automated single fibre tensile testing"; Composites Part A: Applied Science and Manufacturing, Volume 145, 2021. <https://doi.org/10.1016/j.compositesa.2021.106389>.

Bengtsson et al (2018): "Improved yield of carbon fibres from cellulose and kraft lignin"; Holzforschung, vol. 72, no. 12, 2018, pp. 1007-1016. <https://doi.org/10.1515/hf-2018-0028>

Islam et al (2018): "Improvements in Determination of Carbon Fibre Strength Distribution Using Automation and Statistical Data Analysis"; Fiber Society's Spring 2018 Conference, The Fiber Society, Jun 2018, Tokyo, Japan. (hal-01959309)

Technical Specifications

Sample Mounting	
Capacity	Up to 50 specimens per cassette
Specimen gauge lengths	4, 10, 12, 20, 25, 30 and 40mm (to be specified at point of order)
Specimen mounting	1-part plastic tabs
Programmable Features	
Methods	Extension Stress relaxation Creep Hysteresis
Content	
UV1000 control unit PU1110 pneumatic unit Sample loading system LEX/LDS module USB and power cables UvWin software for Windows OS	
Requirements	
Power supply	Universal 85-265V AC 47-63Hz, 100W
Compressed air	Dry and clean 4.5 bar 20 l/min
Computer	Windows OS: 7 and 10 2 x USB port

LEX820

General Specifications	
Instrument footprint	100 x 450mm
Extension range	3 to 53mm
Speed range	0.01 to 2.6mm/s
Extension Force range	0 to 2N 0 to 20N (supplied with 1 load cell, to be specified at point of order)
Force resolution	0.05mN (2N) 0.5mN (20N)
Displacement resolution	1µm
Displacement accuracy	50µm
Load cell linearity	±0.1% full scale

LDS0200

General Specifications	
LEX/LDS footprint	380 x 450mm
Measurement range	5 to 150µm
Diameter resolution	0.01µm
Diameter repeatability	±0.03% of the diameter

Control Unit and Pneumatic Unit (UV1000 and PU1110)

Net weight (each)	2kg
Unit depth (each)	230mm
Unit width (each)	100mm
Unit height (each)	120mm

Automated Sample Loading System

Overall width (ALS1500)	800mm
Overall depth (ALS1500)	500mm
Overall height (ALS1500)	400mm
Overall weight (ALS1500)	15kg



Contact Us

Dia-Stron Ltd.

9 Focus Way
Andover, Hampshire
SP10 5NY | United Kingdom
T. +44(0) 1264 334700

Dia-Stron Inc.

9 Trenton Lakewood Road
Clarksburg, NJ
08510 | U.S.A.
T. +1 (609) 454 6008

Email: enquiry@diastron.com

www.diastron.com