

# FibreShape CROSS SC system

## for recycled carbon (rCF), recycled glass, basalt and ceramic fibres

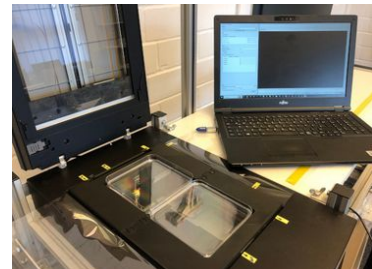
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## 1. Test equipment

The FibreShape CROSS SC system consists of an A4 scanner, an inlay for two Petri dishes, a laptop with i7 CPU, 8 GB Ram, Windows 10 and the FibreShape CROSS software. Compared to the FibreShape basic software, the FibreShape CROSS software additionally enables the length analysis of crossing stiff fibres.

The FibreShape systems are based on transmitted light scanners and digital microscopes, which are also operated in transmitted light mode. Analysis, visualisation and evaluation are carried out by the FibreShape CROSS software. A major advantage of working with scanners is that many fibres can be analysed in a single measurement. Microscopes are used when a higher resolution is required, such as for width measurement in the micrometre range.



Scanner with inlay, two Petri dishes and a notebook

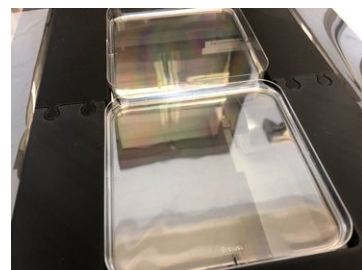
## 2. Dimensions and scan area

Dimensions FibreShape CROSS SC:

- Scanner: 50cm x 31cm x 15cm (L x W x H)

Scan Area:

- A4 scanner: 625cm<sup>2</sup>
- Inlay with two Petri dishes: 200cm<sup>2</sup> (10cm x 10cm each)
- Glass tray: 525 cm<sup>2</sup> (25cm x 21cm)

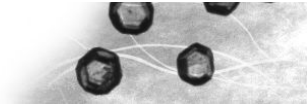


Inlay with two Petri dishes

## 3. Measuring range FibreShape CROSS SC

Measuring range of the Epson V850 (A4 scanner) with an optical resolution of approx. 1600 dpi or 15µm:

- Length measurement range: 55 µm to 20 cm



For the thickness analysis the FibreShape CROSS SC system can be complemented by a high resolution scanner or a transmitted light microscope with digital camera.

- Thickness measurement range of microscope: 2  $\mu\text{m}$  to 30  $\mu\text{m}$
- Thickness measurement range of high resolution scanner: 10  $\mu\text{m}$  to 100  $\mu\text{m}$

#### 4. Sample types, sample preparation and applications

Different fibres can be measured with the FibreShape CROSS SC system:

- Carbon fibre bundles (or roving segments)
- Recycled carbon fibres
- Recycled glass fibres
- Basalt fibres
- Ceramic fibres

Measuring the length of fibres requires a sufficient dispersion of the fibers! The samples are prepared in two Petri dishes or a glass tray that fit in the inlay inserted in the A4 scanner.

FibreShape is used in different steps of fibre processing, e.g. for quality control of raw materials or cutting processes, for monitoring fibre processing or for predicting material properties. For textile manufacturers, the system allows to monitor the fiber properties throughout the production process, potentially detecting sources of high fiber breakage, allowing them to improve their own processes. Component or composite manufacturers, on the other hand can check the quality of their textile or composite products and better predict the final properties of their products. Fiber length and diameter are important to know the properties of a composite. While the aspect ratio of the fibers (length to diameter) determines the stiffness of a composite, the strength of a composite is determined by the ratio between the critical fiber length (the area required to transfer stress from the matrix to the fibre and back) and the actual fibre length.

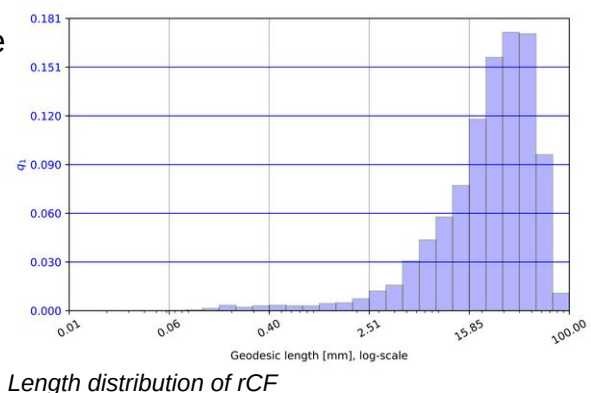
#### 5. Evaluation and representation of results

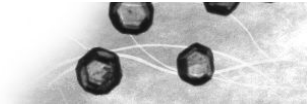
The FibreShape CROSS system enables the measurement of fibre length and fibre width as well as their statistical evaluation according to various methods in accordance with ISO 9276. A large number of fibres can be measured in a short time and good statistics are provided. The reporting system is interactive and allows the creation of the graphical representation and statistics.

Measurement output:

- Statistics (fibre count, percentiles, mean and standard deviation, median, length weighted/unweighted length distribution and others)
- Graphical representation (e.g. length histogram)

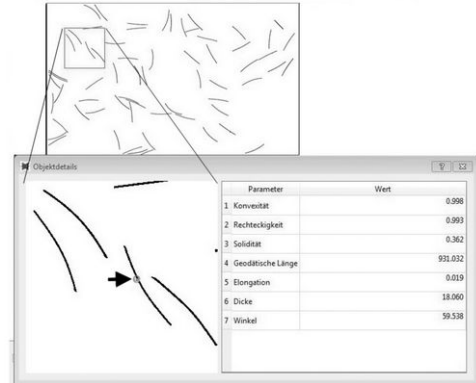
The output of the reports is available as PDF or odt. The raw measurement data are available as csv files.





## 6. Single fibre measurement

An important feature in FibreShape CROSS is the possibility to output data of individual measured fibres or fibre bundles. For the exact identification of any fibre, a fibre is selected and marked. The values of the relevant size and shape parameters of this measured fibre appear.



Measured values for individual fibres

## 7. Analysis time

With the FibreShape CROSS Software it is possible to perform a sample analysis from preparation to evaluation in 10 to 15 minutes. Up to 60000 fibres can be measured in one image. The number of fibres per measurement is highly dependent on the fibre material, fibre length and sample preparation. Samples with longer fibres should be smaller to facilitate the sample preparation.

## 8. Standards

- Image analysis and result representation is reported according to ISO 13322-1 and ISO 9276
- The FibreShape tester is adjusted and calibrated for resolution using USAF 1951 standards

## 9. Safety

The preparation of pulmonary fibres must be carried out with increased safety measures! Pulmonary fibres according to WHO: length: <7  $\mu\text{m}$ , diameter: <3  $\mu\text{m}$ .

## 10. What's new?

The FibreShape CROSS SC system uses an A4 scanner that significantly increases the scanning area compared to the FibreShape CROSS MF. Previously, the effective sample area was about 70  $\text{cm}^2$ , now the entire A4 area is available. This means two Petri dishes with an effective sample area of 100 $\text{cm}^2$  each can be placed. The two scans of the two Petri dishes are automatically performed by the software in one coherent step. The 185% increase in sample area reduces preparation time and, especially when combined with the automation, results in higher overall measurement efficiency and quality.