Specifications FibreShape FH System

Table of contents

1. Test equipment

The FibreShape FH system consists of an A4 scanner with a sample preparation and sample feeding unit called "Sample Feeder", a laptop with i7 CPU, 8 GB Ram, Windows 10 and the FibreShape CROSS software.
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 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.

2. Automatic version

It allows an automatic transportation of the manually distributed fibers in the scanner. The scan process is intiated via a notebook.

3. Measuring range FibreShape FH

Measuring range for Epson V850 ,
- Epson A4 scanner (optical resolution approx. 1800 dpi):
  Length measurement: 30µm - 20 cm,
  Fineness or thickness measurement : 30µm to 3mm

4. Extension of measuring range

To cover the measurement range from 3 µm to 20 cm length and 2µm to 1mm fineness, the FibreShape FH system is complemented by the Reflecta T10 scanner, which has a higher resolution, and a transmitted light microscope with digital camera from Kern.
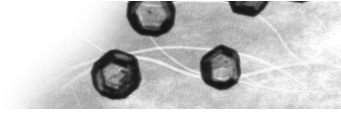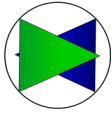
- Reflecta 10 T (optical resolution approx. 3600 dpi):
  Length measurement: 12µm – 1cm,
  Fineness measurement: 10µm - 100µm
- Digital light microscope:
  Length measurement: 3µm – 100µm
  Fineness measurement: 2µm - 20 µm
- SEM images are not included in this description

With these 3 optical systems, length measurements of fibres with a length of 3 µm to 20 cm and fineness measurements of 2µm to 1mm can be carried out.

5. Fibre sample types

Examples of different fibre samples that can be measured with the FibreShape FH. Length measurement and fineness measurement:
- Flock fibres
- Wood chips
- Aramid fibres
- Wool fibres
- Flax fibres
- Hemp fibres
- Other plant fibres (hemp, sisal, ...)

However, measuring the length of fibres requires that the fibres can be separated to such an extent that their beginning and end can be identified in a fibre network. With plant fibres in particular, this is usually only possible with < 2 cm fibre length.

6. Evaluation and presentation of the results

The FibreShape system allows the measurement of fibre lengths, fibre widths, fibre course (longitudinal shape) and fibre cross-section (cross-sectional shape) as well as their statistical evaluation according to various methods in accordance with ISO 9276 (the parameter for the measurement of the fibre fineness or fibre width is called thickness according to ISO 9276). Optical properties such as colour can also be analysed with FibreShape and used for quality inspection.
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.
FibreShape allows to process a large number of measurements in a short time and to provide good statistics. The reporting system is interactive (interactive reporting system) and allows the creation of the graphical representation and statistics.
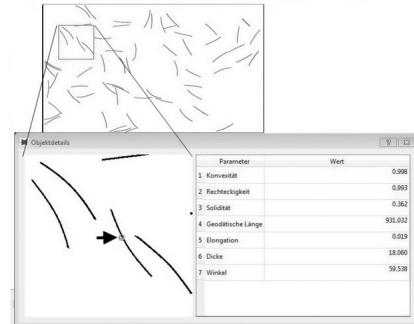Measurement output:
- Statistics (fibre count, percentiles, mean and standard deviation (CV), median, length weighted/unweighted length distribution and others).
- Graphical representation (e.g. length histogram)

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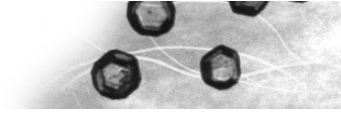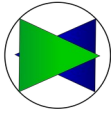
7. Single fibre measurement

An important feature in FibreShape is the possibility to output data of single 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. This tool was developed primarily for the development of optimal measurement parameters in order to recognise which changes in the measurement parameters affect the recognised objects and how.

8. Computing time

FibreShape typically takes 15s to analyse an image with 4000 fibres. 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 preparation.

9. Standards

Image analysis and reporting is done according to ISO 13322-1 and ISO 9276.

10. Add-on PowderShape

The PowderShape add-on enables the measurement parameters of FibreShape to be extended to characterise the particle size or grain size of powdery particles such as dust particles or agglomerates and to determine the area fractions of the particle-shaped objects in the entire sample image. The condition for analysing the size distribution of different materials is that the materials differ sufficiently from each other, be it in shape, size or colour. The condition of different diameters and/or optical properties applies to a fibre-particle mixture as well as to fibre mixtures.

11. Further information

- The FibreShape user interface and PDF reporting are available in 11 languages (such as Mandarin).
- The FibreShape tester is adjusted and calibrated for resolution and colour using USAF 1951 and IT8 standards.