Product sheet

Mütek™ DFR-05

Drainage Freeness Retention

FEATURES

- **RET-20 Lab sensor for consistency measurements**
- **Dosing module**
- **Automated separation of pre-filtrate**
- **Identical shear conditions for retention and drainage measurements**
- **Data available via USB**

BENEFITS

- **Measures automatically drainage, freeness and retention**
- **Saves time by automated consistency measurement**
- **Simulates mill conditions**
- **Highly accurate**
- **Transportable**

GENERAL / BACKGROUND

The lab device Mütek™ DFR-05 Drainage Freeness Retention simulates the retention and drainage conditions prevailing in a paper machine immediately before and during sheet forming. This enables a systematical assessment of chemical influences. Chemical addition is fully automatic via an integrated dosing module.

The optionally available RET-20 Lab Sensor directly measures the filtrate consistency, making a time-consuming manual determination of stock and ash consistencies superfluous.

The drainage behavior is characterized by gravimetry of the filtrate volume. Besides, the Schopper-Riegler freeness can be determined from which the Canadian Standard Freeness (CSF) may be calculated applying a correlation.

To ensure smooth production processes and high paper quality, an analysis of both retention and drainage is indispensable as they are crucial parameters in paper production. The Mütek™ DFR-05 Drainage Freeness Retention is designed to minimize efforts when Retention-Drainage-Formation trials need to be performed.

As fibers, fines and fillers are flocculated during the production process, the hydrated fiber layer is destroyed, which improves drainage of the pulp. These mechanisms are subject to a multitude of influential factors. Additives such as starch, dyes, optical brighteners, wet strength agents and retention aids enter into reactions with the fibers. In addition, process temperatures, shear forces and contact times play a major part. All these parameters ultimately impact PM runnability and paper quality.

Use QR-code or link for more information
https://www.btg.com/mybtg/en/instruments/dfr-05

SYSTEM REQUIREMENTS

The Mütek™ DFR-05 is designed for use with a PC application software, Mütek™ ChargeView. This software can be used for all Mütek™ LAB instruments. The PC should provide Windows® 2000 or higher, a main memory of 64 MB minimum, a Pentium II processor and an USB interface. The measured data is stored in the PC for further processing, such as for export to an Excel file. Data is also stored on an optional USB stick directly at the DFR-05.

MEASURING PRINCIPLE / MEASUREMENT
RETENTION

Retention measurements with the Mütek DFR-05 Drainage Freeness Retention rely on the Dynamic Drainage Jar method as per TAPPI Standard T261cm-94. The stock suspension is continuously stirred to prevent the formation of a filter layer. This is why retention is exclusively identified via flocculation – instead of via filtration effects – and the lab retention value shows a very good correlation with PM retention.

After dewatering, the optionally available RET-20 Lab is used to automatically determine the filtrate consistency from which total retention and filler/fines retention can be calculated. The novel two-way valve enables the first few milliliters of filtrate to be rejected for enhanced measuring accuracy and excellent reproducibility of results.
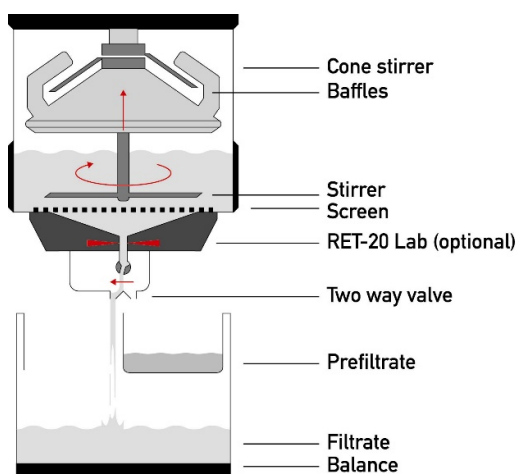

Figure 1: Retention measurement with the Mütek™ DFR-05

The RET-20 Lab relies on the patented BTG Peak Method to identify the thin stock consistency. The light transmission within a filtrate is measured with the aid of a high-frequency infrared source.

Figure 2: The RET-20 Lab Sensor

BENEFITS

- **Control of stirring speed and time**
- **Automatic valve operation and separation of pre-filtrate from filtrate**
- **High measurement precision**

DRAINAGE

To measure the drainage behavior of a pulp, the Mütek™ DFR-05 relies on the known free-fall method with build-up of a filter cake. The equipment configuration for drainage measurements is largely identical to that for retention measuring. Here, too, the suspension is transferred to a stirring chamber that is closed by a cone. After process additives and shear forces are introduced, the cone opens and the suspension is uniformly distributed. The filtrate amount is then gravimetrically deter-mined by a balance integrated in the base of the device. The resulting drainage curve (filtrate volume vs. drainage time) reflects the entire drainage process.

This method offers the striking advantage of measuring drainage over an extended period, thus allowing the pulp to undergo unimpeded agglomeration and flocculation. This ensures that even minor influential factors are identified in a reproducible manner. In addition, a graphic representation of the drainage rate derived from the drainage curve enables the first few seconds of drainage to be studied in detail.

BENEFITS

- **Sensitive to weak influential factors**
- **Small and compact design**
- **Evaluation by PC**
- **Robust integrated balance**

FREENESS

The Mütek™ DFR-05 employs a special algorithm to calculate the Schopper-Riegler (°SR) and Canadian Standard Freeness (CSF) values from the drainage diagram. Since the equipment dimensions and the screen have been selected in accordance with DIN EN ISO5267-1 2000, the DFR-04 provides identical drainage values to a manual SR test. From the °SR value, the CSF is calculated applying a special correlation. Being dependent upon the tested fibrous material, the correlation is different for primary fibers, TMP and recycled fiber.
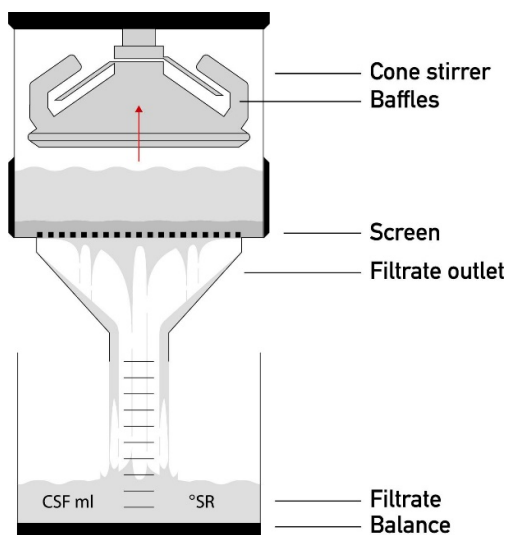

Figure 3: Freeness measurement with the Mütek™ DFR-05

BENEFITS

- **Determination of °SR and CSF in a single cycle**
- **Temperature compensation**
- **Drainage diagram for freeness measurement**
- **Ergonomic design**
- **High measuring accuracy**
- **Display of °SR and CSF results**
- **Data storage and export via USB stick**

DOSING MODULE

For additive dosage, BTG provides an automatic dosing module enabling the introduction of chemicals at exactly defined time points. This greatly enhances the measuring precision of the system. At the same time, contact times between fibers and additives can be exactly preset. The module is easy to handle, since it comprises commercially available pipettes that are easily filled and cleaned.

BENEFITS

- **Exact chemical dosage**
- **Addition of up to 3 different chemicals**
- **Defined contact times**
- **Fully automatic operation**
- **Easy handling**
- **Quick cleaning**

SAMPLE SPECIFICATION
RETENTION AND DRAINAGE

The Mütek™ DFR-05 handles original stock samples in the consistency range of 0.2 % to 2 %. A major sample volume to be measured by the DFR-05 should preferably be taken ahead of the pressurized screens of the paper machine. Care should be taken to ensure that the samples do not contain any flocculant.

A sample volume of 1 liter is required per measurement. Since the sample temperature strongly impacts the test result, the temperature should be kept constant or alternatively, the entire sample volume should be left to cool down to a uniform temperature.

FREENESS

The Mütek™ DFR-05 performs freeness measurements in line with DIN EN ISO 5267-1 2000 which specifies that the sample is to be diluted to 0.2 % consistency using distilled water. The temperature should be adjusted to 20 °C. If this is not feasible, the temperature compensation function is to be applied. A sample volume of 1 liter is required per measurement.

BTG reserves the right to make technical improvements.   Page 3

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TECHNICAL DATA / SPECIFICATIONS

GENERAL

Dimensions

Width	200 mm
Depth	260 mm
Height	450 mm

Weight

DFR-05	10.0 kg
Dosing module	1.4 kg
Transport case	7.0 kg

Power

Rated input voltage	230 VAC / 115 VAC
Frequency	50 Hz / 60 Hz
Consumption	up to 100 W
Equipment fuses	2 x 1 A
Results	Total retention [%]
	Filler/fines retention [%]
	Total consistency [g/l]
	Filler/fines consistency [g/l]
	Flocculation index
	Drainage curve[g/s] or [g/s²]
	Schopper-Riegler [°SR]
	Canadian Standard Freeness [ml]

Reproducibility

Filtrate weight [g]	0.6 %
Total consistency	1.5 %
Filler/fines consistency	1.5 %
Schopper-Riegler	3.0 %
Canadian Standard Freeness	3.0 %
Sample specification	1000 ml with 0.2 % to 2.0 % consistency

Measured variables

DFR-05	Filtrate weight [g]
RET-20 Lab	Solids concentration [g/l]
System requirements	Operating system Windows 2000 and higher Pentium II processor, 200 MHz, 64 MB main memory USB for PC support USB stick for data collection w/o PC

SAFETY & DIRECTIVES

Safety and protection class

Product safety	Protection class I

EU-directives

Designed in accordance with relevant CE standards.

Quality Assurance

Quality-assured in accordance with ISO 9001.

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