

Mütek™ SZP-10 System Zeta Potential



FEATURES

- Detects the zeta potential of fibers and solid particles
- Plug formation via vacuum and automatic plug discharge
- Measures the streaming potential, conductivity and pH
- Removable touch-screen

BENEFITS

- Easy handling with intuitive user guidance
- Quick and accurate measurement
- No sample preparation
- Light and easily transportable

GENERAL

The Mütek™ SZP-10 System Zeta Potential identifies the surface charges of fibers, pigments and other solid materials. Measuring samples before and after chemical contact, it evaluates the performance of e.g. wet strength agents, sizing agents, dispersants or coatings in a manufacturing process. The SZP is a well accepted standard tool for chemical suppliers of the pulp and paper industry, especially because it measures process samples without further sample preparation, as would be necessary, e.g. for electrophoresis.

The device has been successfully employed to assess chemical additives in the papermaking process as well as for evaluating filter aids for beverages, other separation technologies or to control textile finishing.

SYSTEM REQUIREMENTS

The instrument is designed for indoor use at an ambient temperature of 10 °C to 40 °C (50 °F – 104 °F). It must be placed on a flat and stable surface at least 20 cm (8 inch) away from walls and should be protected against water. It must not be used in explosion prone rooms. The Mütek™ SZP-10 System Zeta Potential is rated for voltages of 100 - 240 VAC at 50 Hz / 60 Hz. The SZP-10 is a stand-alone unit. Data transfer to USB stick or directly into BTG Software is possible via a USB interface.

BACKGROUND

The Mütek™ SZP-10 System Zeta Potential detects the surface charge of solid materials. The surface charge is the overall charge of a solid particle in an aqueous system. This charge influences the interaction of the sample material with chemical additives.

MEASURING PRINCIPLE

Practically all colloids and solid particles when dissolved in water carry electric charges. This leads to a concentration of oppositely charged ions, the so called counterions, at the particle surface. If these counterions are separated from or sheared off the particle, a streaming potential can be measured in mV. In the Mütek™ SZP-10 only the solid particles remain fixed at a screen where they form a plug while the counterions are sheared off by a pulsating liquid flow.

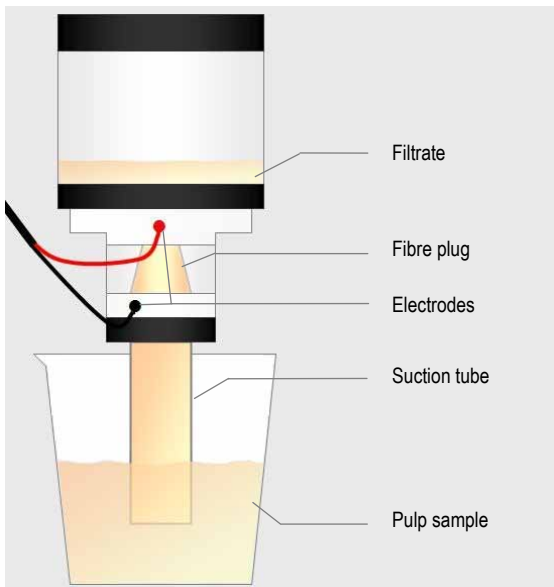


Fig.1 Measuring cell of Mütek™ SZP-10 with sample

This measurement will not take colloiddally dissolved substances into account as colloids can pass the screen.

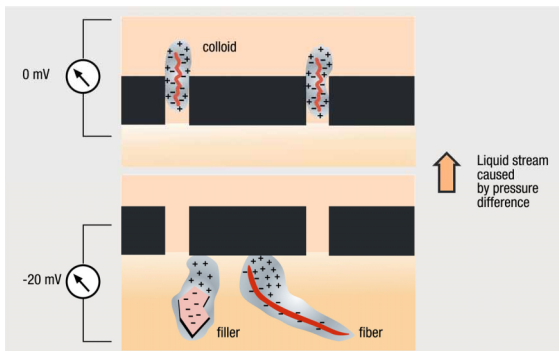


Fig. 2 Separation of counterions in a Mütek™ SZP-10 measuring cell

To calculate the zeta potential, the SZP-10 uses the detected streaming potential, conductivity and pressure differential.

BTG reserves the right to make technical improvements.

MEASUREMENT

A sample suspension is placed under the measuring cell which is equipped with a plastic screen and two pin electrodes. The sample is then vacuum-extracted into the cell where it forms a plug. By varying the vacuum pressure, an oscillating liquid flow is generated which induces a streaming potential. After several measurement cycles, the zeta potential is calculated on the basis of the measured streaming potential, the conductivity and the pressure differential. All results will be shown on a result screen.

Sample	Zeta	mV	mS/cm	mbar
Sample 1	-22.0	-1.234	0.206	200
Sample 2	31.8	0.956	1.209	199
Sample 3	-26.2	-1.367	0.285	201
Sample 4	-22.0	-1.063	0.206	200
Sample 5	30.3	0.872	1.278	200
Sample 6	-18.6	-1.063	0.164	200

Fig. 3 Result screen of the Mütek™ SZP-10 System Zeta Potential

SAMPLE SPECIFICATION

Generally, a streaming potential can be measured for particles larger than the openings (308 µm or 40 µm) of the screen electrode used. To measure samples containing particles smaller than 40 µm, a suitable paper filter has to be inserted.

FIBER MATERIALS

Samples with 3 % solids content or diluted. Conductivity should be between 100 µS/cm and 7 mS/cm.

SOLID PARTICLE SUSPENSIONS

Suspensions of 1% up to approx. 50% depending on hydrophilic/hydrophobic characteristics of the sample material.

PIGMENTS

Pigment slurries of up to 60% (60 g solids and 40 g distilled water) can be measured with the special electrodes for pigments.

TEXTILES, FILTER PLATES, FIBER MATS

Cut the material in small pieces and generate an e.g. 1% suspension. Alternatively, a piece of sample material can be punched out and clamped into the measuring cell.

APPLICATION EXAMPLES

The Mütek™ SZP-10 is suitable for a wide range of industrial applications as well as R&D as for example in:

PAPERMAKING

Optimization of fiber active chemicals like sizing agents, optical brighteners, wet strength agents and fillers.

SEPARATION TECHNOLOGY

Characterization of filter aids and filtration materials for waste water treatment, mining applications and selective adsorption of interfering substances in the food & beverage industry and in pharmaceutical uses.

BEVERAGE INDUSTRY

Characterization of filter aids for wine, beer and juice as well as the evaluation of their processability.

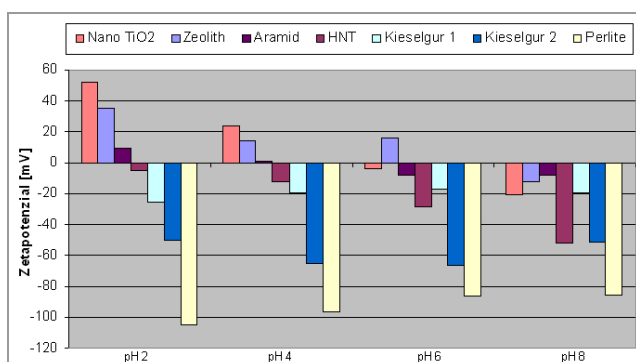


Fig. 4 SZP-results of various filter aids

TEXTILE FINISHING

Control of refinement process (finish) of textiles in regard to coatings (water-repellent, heat resistant etc.) and colors.

TOBACCO

Optimization of chemical additives in reconstituted tobacco production.

MÜTEK CHARGE RESULTS

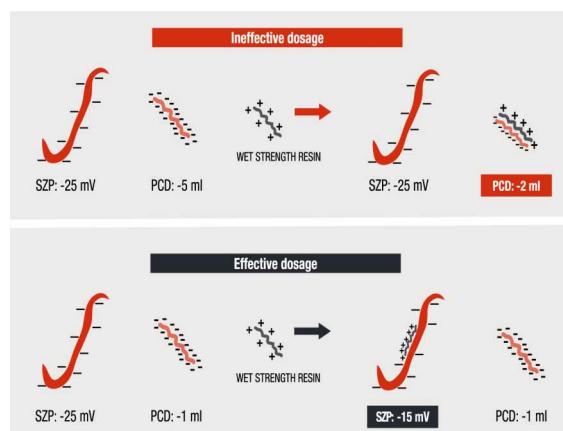


Fig. 5 Results of Mütek™ PCD-04 and Mütek™ SZP-10

Combining the Mütek™ PCD-04 with a Mütek™ SZP-10 will allow the user a comprehensive knowledge of the charge reactions taking place in a process. The measurement results of the PCD-04 and the SZP-10 complement each other. Whereas the PCD-04 measures the colloidal dissolved substances, SZP-10 results investigate the used fibers and prove whether or not chemical additives react with the fiber (Fig.5)

ACCESSORIES

ELECTRODES

The Mütek™ SZP-10 System Zeta Potential comes with a measuring cell with patented built-in platinum electrodes. Depending on the sample to be measured it can be equipped with a standard screen or a fine screen.

For pigment measurements, a special measuring cell with gold electrodes is available.

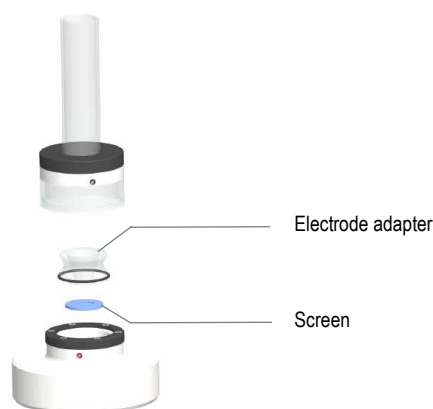


Fig. 6 Measuring cell of a Mütek™ SZP-10

SCREEN FOR FILTRATING FIBER SUSPENSION

Sample materials with high solids content (> 3 %) should be diluted with their own filtrate. To gain filtrate, the beaker with screen can be pressed into the thick stock.

TRANSPORTATION BOX

All Mütek™ lab devices are available with tailor-made carrying cases.

SUPPORT

ANALYTICAL SERVICES

Besides its service to measure customer's sample material, our application lab is available for developing special applications for many different industries. For further information please contact us at instruments@btg.com.

RELATED INSTRUMENTS

In order to measure surface charges of dissolved substances, the Mütek™ PCD-04 Particle Charge Detector is applied. This instrument is often combined with the Mütek™ SZP-10, see also paragraph "Mütek Charge Results".

TECHNICAL DATA

Dimensions

Width	215 mm (8.5 in)
- including display module	380 mm (14.9 in)
Depth	285 mm (11.2 in)
Height	365 mm (14.4 in)

Weight

SZP-10	9.0 kg (19.8 lb)
Transport case	7.5 kg (16.5 lb)

Power supply

External power supply	
Input	100 – 240 VAC / 1.5 A / 50– 60 Hz
Consumption	up to 100 W

Conditions of service

Sample temperature	5 – 60 °C (41– 140 °F)
Ambient temperature	10 – 40 °C (50 – 104 °F)
Storage temperature	-30 – 60 °C (-22 – 140 °F)

Measured variables

Streaming potential [mV]
Conductivity [mS/cm]
Pressure difference [bar]

Results

Zeta potential [mV]
pH (optional)

Sample volume

Fiber sample	500 ml (0.13 gal)
Pigment slurry	200 ml (0.052 gal)

Consistency

Fiber sample	0.1% – 3%
Pigment slurry	up to 60 %

Data output

Display
USB interface

Reproducibility

Standard deviation SD(x)	0.5 % – 5 % depending on sample
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Detection limit

0.05 mV streaming potential

Standards

DIN EN 61326
DIN EN 61010

Safety

Protection class I
