

Product sheet

Mütek™ PCD-05 Smart

Particle Charge Detector

FEATURES

- Streaming current detector in modular set-up
- WLAN interface
- Full operation via smartphone, tablet or laptop
- Basic operation via included Smartdisplay
- Travel Titrator module
- Open tube system to use alternative titrants directly from their bottles

BENEFITS

- Accurate results also at high conductivity
- No software installation required
- Results on smartphone to share and discuss anytime and anywhere
- Straight data management
- Compact and light for comfortable travelling



GENERAL / BACKGROUND

The Mütek™ PCD-05 Particle Charge Detector Smart measures the charge of colloidal dissolved substances in an aqueous sample.

The PCD-05 Smart offers a modular concept. It comes with an automatic titrator, the Travel Titrator module, and a small display, the Smartdisplay.

An integrated WLAN access point and a LAN connection port allow working with the PCD-05 Smart via various user devices such as a smartphone, tablet, laptop or a workstation.

The Smartdisplay hosts the web-based application pages to fully apply and parametrize the PCD-05 Smart as well as to manage data. These pages are accessible with a user device's web browser. Time-consuming IT sessions for installing software or USB drivers can thus be avoided.

The Smartdisplay features the most basic functions required to work with the PCD-05 Smart, like streaming potential measurement, titration and pH measurement (optional) also when no user device

such as a smartphone or similar is connected.

In aqueous systems, solid particles as well as colloidal dissolved substances carry electrical surface charges, a phenomenon occurring in suspensions and emulsions. These charges influence the interaction of suspended and dissolved material with chemical additives

In the paper industry, the PCD is a standard tool for detecting anionic trash levels but also for characterizing chemical additives. Identification of charge levels is not only very important for the paper industry but also for numerous other applications like waste water treatment, the food and beverage industry, ceramics, colors, textiles and pharmaceuticals.



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

MEASURING PRINCIPLE / MEASUREMENT

The surface charges of colloids and suspended solids in water lead to a concentration of oppositely charged ions, the so called counterions, at the particle surface. If these counterions are separated from or sheared off this particle, a streaming potential can be measured in mV. A streaming potential of zero mV denotes the point-of-zero-charge where all existing charges in a sample are neutralized.

Streaming potential measurements with the Mütek™ PCD are based on the following principle:

An accurate volume of an aqueous sample is placed in the measuring cell.



Figure 1: Measuring cell of a Mütek™ PCD-05

The dispersed sample material will adsorb at the cell wall (1) as well as at the piston. The counterions (2) remain comparatively free. A defined narrow gap is provided between cell wall and piston (3). Driven by a motor, the piston oscillates in the measuring cell and creates an intensive liquid flow. This entrains the free counterions and separates them from the adsorbed sample material.

At the built-in electrodes (4), the counterions induce a current which is rectified and amplified electronically. A streaming potential with the appropriate sign is shown on the display.

In order to quantify the charges, a polyelectrolyte of opposite charge is added until reaching the zero point of charge (0 mV). An automatic titration can be performed with the included Travel Titrator module by using an individual titration method or a pre-defined BTG titration method.



Figure 2: PCD-05 Smart connect to a tablet

APPLICATION EXAMPLE

The Mütek™ PCD-05 Smart is suitable for a wide range of industrial applications as well as R&D as for example in:

PAPER

Detection of anionic trash sources and effective dosage of fixatives. Characterization of sizing agents, wet strength agents, retention aids, pigments and their processability.

WASTE WATER

Optimization of coagulants and flocculants for waste water treatment of e.g. automobile paint shops, nuclear power plants and the petrol and mining industry.

FOOD & BEVERAGE

Characterization of flours and ground grain products, clarification of juice, wine fining, quality control in beer and processability of flavoring agents and colors.

CONSTRUCTION CHEMICALS

Evaluation of the dispersing power and adsorption capability of additives and admixtures in cement, concrete, mortar and gypsum.

SAMPLE SPECIFICATION

Basically, every aqueous sample can be measured with the Mütek™ PCD-05 Smart. Once the sample is in the cell and the detected mV-signal is comparatively stable, the sample can be measured. The motor will run smoothly, if the sample viscosity resembles the viscosity of water. Significantly higher viscosities cannot be measured.

In order to detect a streaming potential, the particle sizes in the sample should be between 1 nm and 500 µm.

If conductivities are generally high (20 mS/cm – 50 mS/cm) the streaming potential can – depending on the ion properties – become extremely low and even fluctuate between cationic and anionic, so that an endpoint detection by titration is no longer possible. In such a case, reducing the conductivity by dilution with deionized water is recommended.

FUNCTIONAL ADDITIVES

Use concentrations of 0.1% (0.1 g additive plus 99.9 g deionized water). Higher or lower concentrated solutions are possible, depending on titrant consumption.

PIGMENTS, SOLIDS, FIBERS

Use concentrations of 0.1% (0.1 g solids plus 99.9 g deionized water). Higher or lower concentrated solutions are possible, depending on titrant consumption.

BACK TITRATION

Particles with a size of >150 µm cannot be titrated directly in the Mütek™ PCD-05 measuring cell. However, a quantitative charge detection is possible by a so called back titration. Here, an excess of the oppositely charged titrant is added to the sample which is titrated back after a certain reaction time.

ACCESSORIES

MEASURING CELL

The Mütek™ PCD-05 Smart is equipped with a precision measuring cell (10 ml – 60 ml). The core made from Teflon is reinforced by a robust outer shell made of POM (Polyoxymethylen) for lifetime fit.

SCREEN FOR FILTRATING FIBER SUSPENSION

For sample preparation of fiber samples our beaker with screen for the Mütek™ PCD-05 and SZP-10 can be used.

TRANSPORTATION BOX (OPTIONAL)

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

PH MEASUREMENT (OPTIONAL)

To perform a pH and IEP Measurement

TITRANT SOLUTIONS

We offer certified standard titrants (0.001N, 0.0001N) of Poly-Dadmac and PES-Na / PVS-K as cationic respectively anionic titration solutions as they are practically pH-independent.

SUPPORT

ANALYTICAL SERVICES

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

RELATED INSTRUMENTS

The Mütek™ PCD-05 is also available as a light version and an online instrument, the SPC-5500 Charge Analyzer. To measure surface charges of solid particles, the Mütek™ SZP-10 System Zeta Potential is applied. For further information, please contact us at instruments@btg.com

TECHNICAL DATA / SPECIFICATIONS

GENERAL

| | |
|----------------------------|--|
| Dimension W / D / H | 343 / 209 / 319 mm [13,5 / 8.2 / 12.6 in] |
| Weight | 5.8 kg [12.8 lb] |
| Power supply | 100–240 VAC/2.92 A / 50–60 Hz |
| Ambient temperature | 15 – 40 °C [50 – 104 °F] No condensation |
| Storage temperature | 5 – 40°C [41 – 104 °F] |
| Measuring values | Streaming potential [mV] pH |
| Results | Anionic / Cationic demand [ml] Charge quantity [$\mu\text{eq/l}$] Isoelectric point [IEP] pH |
| Sample volume | 10 – 60 ml |
| Data Storage | Internal memory with capacity for 100 measurements |

Output

Csv file with results
Csv file with parameter
Downloadable via WIFI

Reproducibility

Titration Pes-Na vs. Poly-
Dadmac

End results via USB
Relative Standard
Deviation SD(X)<0,3%

Detection limit

Up to 1ppm depending
on sample specification

Communication Standards

IEEE 802.11g
(WIFI)
IEEE802.3
(Ethernet)

SAFETY & DIRECTIVES

Safety and protection class

Product safety Protection class III

EU-directives

Designed in accordance with relevant CE standards.

Quality Assurance

Quality-assured in accordance with ISO 9001.

YOUR LOCAL BTG OFFICE



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