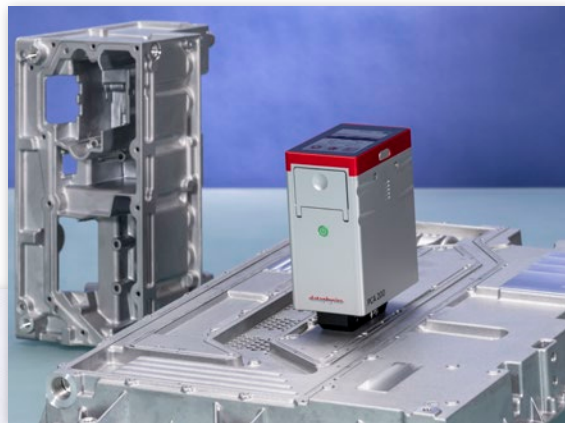


# PCA 200

Portable Contact Angle Goniometer



# Application: Surface Energy in Manufacturing and Quality Control

Measuring the surface energy has established itself as a quantitative method for characterising the surface chemical properties of solid materials. The surface energy can be determined both with stationary laboratory devices, for example for research and development purposes, and with mobile devices for applications in manufacturing and quality control processes.

## High or Low Surface Energy?

In detail, a higher surface energy of a solid surface suggests better wetting and better adhesion. Additionally, a high surface energy indicates that the surface is cleaned well and free of grease and other contaminants. Liquid droplets typically spread on such surfaces. Glass, ceramics and many metals are examples of materials whose surfaces naturally have a high surface energy.

A low surface energy indicates poor wetting and poor adhesion. Drops of liquid lie spherically on such surfaces. For example, many plastics originally have a low surface energy.

Depending on the area of application, a high or low surface energy is desirable. For example, materials are generally easier to print on or coat if they have a high surface energy. Bathroom ceramics

or windscreens, however, should have the lowest possible surface energy, so that liquids can roll off easily.

## Test Inks or Contact Angles?

Test inks are still frequently used in the quality control of material surfaces. However, checks with test inks are subjective and can only indicate a rough range in which the surface energy is located.

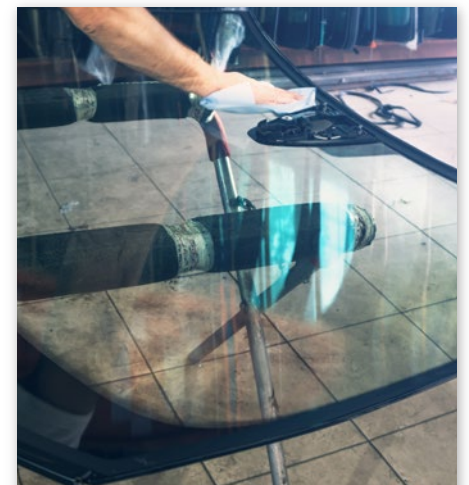
Determining the surface energy using contact angle measurements offers several advantages compared to test inks: the method is objective, reproducible, and provides additional information, as the surface energy can be divided into polar and dispersive components. Using the distinction between polar and dispersive components, statements can be derived as to whether the surface can be wetted better with aqueous or oil-based liquids, and how well materials adhere to each other.

## Analyse Surfaces of Any Size, Quickly and Non-destructively

Manufacturing parts are often too large or too heavy to be analysed with a stationary laboratory measuring device such as the contact angle goniometers of the OCA series, also developed by DataPhysics Instruments. With the help

of the PCA 200 portable contact angle goniometer, the surface energy can be measured non-destructively on surfaces of any size. This allows measurements, for example, on entire car windshields, car body parts, large wafers, and other composite materials.

The PCA 200 portable contact angle goniometer's one-click measurement delivers reliable surface energy results within seconds. This makes it possible to make statements about the quality of a coating or the sample cleanliness directly on site and during production.



The cleaning process of windshields can be reliably monitored with a portable contact angle goniometer.

# Theory: How to Determine the Surface Energy of Solids

The surface energy can be determined by measuring several contact angles using a contact angle goniometer and the sessile drop method.

## Measuring Procedure

In detail, the contact angles of at least two test liquids, such as water and diiodomethane, are measured on the



The contact angles of two test liquids serve as the basis for calculating the surface energy of the solid surface.

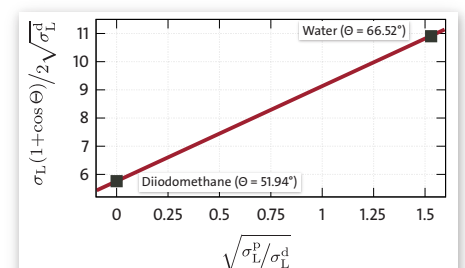
solid surface. Using a camera and software, the contour of the drops sitting on the surface is optically analysed and their contact angles measured.

## Calculating the Surface Energy

The surface energy can then be calculated from the contact angles using various models. Such models contain additional information on the interactions that take place between the solid surface and the liquid drops.

The subdivision into dispersive and polar components, which are used in the so-called OWRK model (after Owens, Wendt, Rabel, and Kaelble) has become well established. In addition, Young's equation, which expresses the relationship between contact angle, surface tension and surface energy, is used for the final calculation of the surface energy.

If the OWRK model is inserted into Young's equation, a new equation is created. Based on this equation, the software can produce a graphical regression line and use it to determine the surface energy of the solid surface, including its polar and dispersive components.



The regression line makes it possible to calculate the surface energy based on the measurement of contact angles with two test liquids.

# PCA 200 Portable Contact Angle Goniometer

The PCA 200 portable contact angle goniometer from DataPhysics Instruments is a hand-held device for autonomous and mobile measurement of the surface energy of solid surfaces. Its lightweight design and intuitive user interface make it the ideal tool for analysing surfaces in production and quality control.

## Stand-Alone, Mobile Device

As a compact and mobile hand-held device, the PCA 200 can be used directly on site, wherever it is needed. Thanks to the integrated computer and software, it can be operated as a wireless, stand-alone measurement solution.

## Display with Live Preview Image

Before the measurement, the device display provides a live preview image of the surface to be analysed. This function allows visual inspection and adjustment to ensure that each measurement is taken in exactly the right place. After the measurement, the device immediately shows the measured values on its display.

## Measurement with Two Test Liquids

The PCA 200 can dispense the test liquids diiodomethane and water simultaneously, and directly measure their contact angles on the solid sample. This makes it possible to determine the surface energy at the touch of a button, increasing the efficiency of work processes.



The integrated touchscreen of the PCA 200 makes it easy to manage measurements. Measurement results are displayed immediately.

## Quickly Determine the Surface Energy

The PCA 200 determines the surface energy of samples quickly and reliably using well established interaction models (OWRK and Wu model). These models enable a differentiated analysis of the polar and dispersive components of the surface energy.

## Long Operating Time

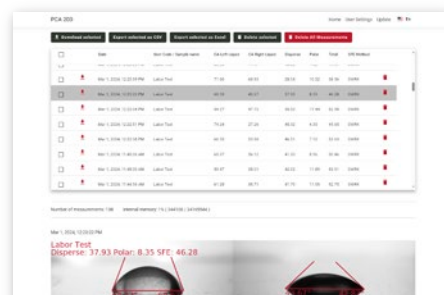
With a powerful lithium-ion battery, the PCA 200 is equipped for a long operating time. In addition, the cartridges for the two test liquids are sufficiently large to allow a great number of measurements without having to refill them.

## Versatile Software Packages

- The device includes an integrated computer. This allows users to perform autonomous measurements of the surface energy. The measurement results are immediately displayed and saved on the device.
- The device also connects to a PC via a USB-C port. Device settings can be made on an intuitive user interface, which can be accessed in any standard web browser. Users are also able to export their saved measurement results.
- With the optional dpiMAX, DataPhysics Instruments offers an expert software for advanced analyses. Measured values are transferred effortlessly and can be used for additional calculations. Users also benefit from the integrated database of the software which enables a straightforward data management.



The PCA 200 portable contact angle goniometer is ideal for quality control procedures during the production process. With a PCA 200, the surface energy can be measured quickly; the quality of a coating or cleaning procedure, for example, can be checked within seconds.



Measurement data can be exported and device settings changed in the browser-based, intuitive interface.

