Sympatec GmbH – System | Partikel | Technik

Range of Instruments & Services

With continuous innovations Sympatec makes a prominent contribution to the evolution of particle characterisation. Its product-oriented approach leads the way in developing powerful instruments for laboratory and process applications

» in product and methods development,
» on every step of the scale-up process (from lab bench to production scale),
» in continuous process control,
» in quality control settings (from incoming goods to finished products).

All instruments reliably deliver most accurate, reproducible and comparable results at shortest measuring times. By employing the same measuring principles even comparability between laboratory and process applications is accomplished.

Particle Measurement | Laboratory

Laser Diffraction | Particle Size and Size Distribution with HELOS | RODOS & Co. from below 0.1 µm to 8,750 µm

The proven HELOS series – with its classical parallel beam laser diffraction set-up – offers a powerful technology for particle size distribution analysis of powders, granules, suspensions, emulsions, sprays and numerous other particulate systems. A size range from below 0.1 µm to 8,750 µm is mastered. The modular system design together with a great variety of dispersing and dosing units provides a flexible adaptation to the most diverse industrial and research applications.

In the early 1980s, Sympatec introduced a breakthrough innovation which was leading laser diffraction to another dimension: dry powder dispersion for even the finest, cohesive powders came true with RODOS. And with the R series of our laser diffraction sensor HELOS new benchmarks for precision and accuracy have been achieved. Latest improvements comprise enhanced application of parameter-free Fraunhofer evaluation down to the submicron regime (below 1 µm), the greatest measuring signal frequency for best resolution with range combination technology and more powerful evaluation modes (Fraunhofer & Mie). Laser diffraction is now even closer to absolute standards. Continually, ISO 13320 requirements and limits are considerably outmatched.

Image Analysis | Particle Size and Particle Shape with QICPIC | RODOS & Co. from 1 µm to 30,720 µm

The modular image analysis sensor QICPIC combines size and shape analysis of disperse particle systems within a size range of 1 µm to 30,720 µm. Flexible sensor adaptation for analysis of powders, granules, fibres, suspensions and emulsions is provided by a wide range of dispersing and dosing units. Numerous implementations in pharmaceutical and
chemical industry, food and beverage technology or soil science just denote the array of applications in industry and research.

The most prominent feature is an exposure time within the sub-nanoseconds regime allowing for an image capturing frequency of up to 450 frames per second. Initially, this ensures a high confidence level for measuring results based on a great number of observations. At the same time, the characterisation of finest, cohesive powders with RODOS becomes an option. The necessary level of energy application for effective dry dispersion results in particle flows with velocities of up to 100 m/s. The extremely short exposure times ensure capturing and clear imaging of even fastest singular particles. Powerful evaluation software supports the simultaneous determination of all relevant size and shape characteristics. A particle gallery together with diverse screening criteria facilitate creation of specific and meaningful reports even if several millions of particles are captured.

**Ultrasonic Extinction | Particle Size and Concentration with NIMBUS from below 0.1 µm to 3,000 µm**

Ultrasonic extinction with NIMBUS is deployed for particle size distribution and concentration analysis in turbid and highly concentrated suspensions and emulsions within a size range from below 0.1 µm to 3,000 µm. Disperse media which is impenetrable for light waves is now penetrated by low energetic sound waves and analysed using a sample-specific extinction function. So there is no need for a laborious sample preparation which is necessary for competing optical technologies. Lab applications are found e.g., in petroleum engineering (analysis of oil sands) or in anode production for aluminium smelting (characterisation of anode grade coke in liquid pitch).

**Photon Cross-correlation Spectroscopy (PCCS) | Particle Size and Stability with NANOPHOX from 1 nm to 10,000 nm**

In general, the acquisition of scattered light intensities of particles under thermal motion is deployed for nanoparticle characterisation (principle of dynamic light scattering (DLS)). The method known as Photon Correlation Spectroscopy (PCS) applies auto-correlation of scattered light intensities in order to determine particle size distribution. However, this conventional technology requires extremely diluted samples in order to deliver meaningful results.

NANOPHOX brings Photon Cross-correlation Spectroscopy (PCCS) to life, which allows for nanoparticle size analysis in turbid suspensions and emulsions ranging from 1 nm to 10,000 nm at up to a hundred times higher solid contents. In addition, stability of nano-suspensions and emulsion may be analysed. The outstanding technological feature of NANOPHOX is the acquisition of two separately induced scattered light intensities which then are cross-correlated. This allows for robust measurement even at higher sample concentrations. Typical applications comprise e.g., pharmaceutical ingredients, pigments and research on nanomaterials in general.
Particle Measurement | Process

Laser Diffraction | Particle Size and Size Distribution with MYTOS | TWISTER & Co. from 0.25 µm to 3,500 µm

MYTOS integrates the established core technologies of HELOS laser diffraction and RODOS dry dispersion in a single robust body: a process-proven laser diffraction sensor for dry powders ranging from 0.25 µm to 3,500 µm. In combination with continuously operating sampling system TWISTER a complete integration into the processing pipe is realised making it a true in-line solution delivering representative results. Alternatively, MYTOS may be operated on-line either with TWISTER, MIXER, L-probes or existing sampling solutions. Integrated at-line operation in automated lab environments is succeeded with vibratory feeder VIBRI. For instance, typical applications comprise milling operations or spray granulation.

MYTIS is first choice for granules or fragile particles. It combines HELOS laser diffraction technology with gravitational disperser GRADIS in a robust industrial system for a size range from 0.5 µm to 3,500 µm.

The process-specific laser diffraction sensors find a wide range of applications from cement to pharmaceuticals, from roughest industrial conditions to GMP environments. If required, both systems may be configured for ATEX zones.

Image Analysis | Particle Size and Particle Shape with PICTOS | TWISTER & Co. from 2 µm to 20,480 µm

Process-related particle size and shape characterisation is opened up by integrated image analysis sensors PICTOS, PICTIS & PICCELL covering a size range from 2 µm to 20,480 µm. PICTOS integrates QICPIC dynamic image analysis and RODOS dry dispersion technology in a robust body, which was specifically developed for on-line applications. PICTIS combines image analysis and gentle gravitational disperser GRADIS, allowing at-line or on-line applications in process environments. And PICCELL with its flow-through cuvette finally transfers wet dispersion to on-line operations of image analysis.

Feeding of PICTOS, PICTIS & PICCELL is realised either with dynamic and representative sampling system TWISTER, blending MIXER or static L-probes. Also, automatic or user-operated manual feeding is an option.

Ultrasonic Extinction | Particle Size and Concentration with OPUS from below 0.1 µm to 3,000 µm

Liquid dispersions with a high concentration of solid particles or droplets, often totally opaque, are typically found in production processes. Optical analysers would require a high degree of dilution. Dilution not only causes an extensive preparation effort but changes the original state of dispersion. Ultrasonic extinction provides an outstanding performance for particle size analysis of suspensions and emulsions. One of the major benefits of ultrasonic extinction is the ability to operate in highly concentrated mediums, which typically come along with wet process stages. A solid content between 5 and 50 % by volume is the typical
range of concentration. These are perfect conditions for OPUS, which even may be applied at concentrations up to 70% by volume – typical for paste-like particulate systems.

Using sound waves instead of light waves, suspension or emulsion analysis is independent of transparency and may be conducted in totally opaque disperse matter like water droplets in crude oil, ore slurries or even carbon particles in liquid pitch. Paints, sugar pastes or pharmaceutical suspension also belong to the regular field of application.

Ultrasonic extinction allows a rugged and robust probe design that resists typical process conditions such as high temperatures, pressures or aggressive media and abrasive materials. For applications in hazardous atmospheres an ATEX compliant OPUS version is available.

Application Support, Contract Analysis and Trainings

Sympatec’s application lab prepares measuring instructions for customer products and is pleased to assist in the development of standard operating procedures (SOPs) in order to promote meaningful analysis results. For execution of contract analysis the whole range of Sympatec’s laboratory instruments is available. As a GMP-certified laboratory, product release analysis may be conducted based on individual contractual terms and conditions.

Additionally, the application lab offers modular trainings that help users get the best out of their systems. Half-day training modules give great flexibility in designing a training program that suits the customer’s needs. Trainings may be conducted at any of our office locations but are also available as in-house trainings at customer sites. A comprehensive introduction to the most common methods in particle characterisation is presented in a two-day particle seminar in our main laboratory in Pulverhaus. Lectures in combination with hands-on training provide a deeper understanding of fundamentals. An introduction to methods development with laser diffraction and image analysis tops off this seminar.

After Sales Services

A team of professionally trained and highly qualified service technicians supports all Sympatec instruments worldwide. This ensures an optimum utilization of the systems for the benefit of our customers.

In addition to systems installation at customer site our service staff cares for initial user training when first operating the instrument. A qualified telephone support is accessible for every question throughout the lifetime of a Sympatec instrument – free of charge. By means of efficient maintenance and repair together with a fast supply of spare parts and consumables high system availability is promoted. Maintenance contracts offer dependable system care that guarantees enduring operational safety and availability at predictable, transparent costs. Depending on customer requirements, different contract options include e.g., preventive maintenance and reliability check, cleaning and adjustment, re-certification as well as repair visits at defined response times. On-site system validations and certifications maintain an outstanding and enduring system quality.