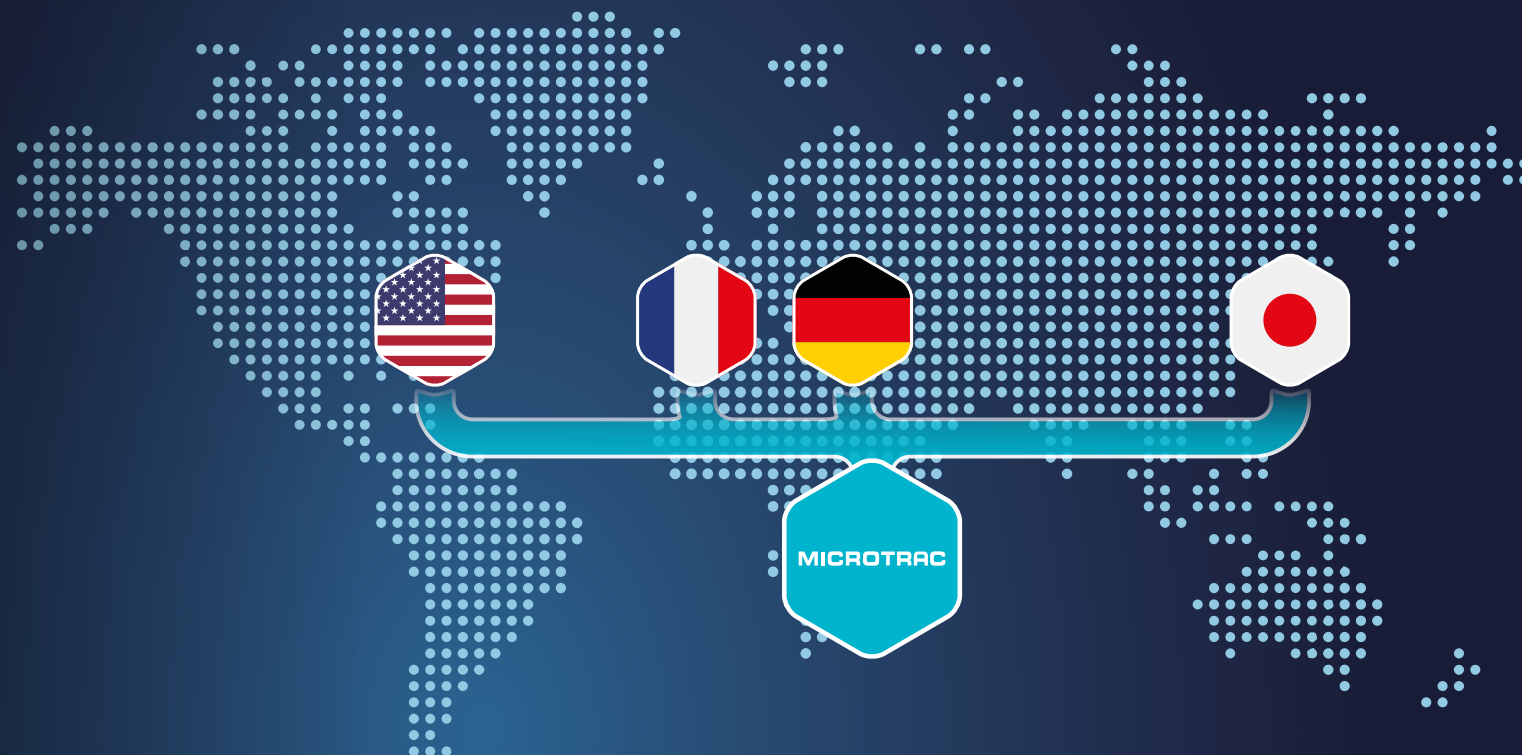




AERO TRAC II

PARTICLE SIZE ANALYZER FOR AEROSOLS AND SPRAYS



MICROTRAC

PARTICLE CHARACTERIZATION AT ITS BEST

MICROTRAC is your preferred partner for the comprehensive characterization of particulate systems. We provide our customers with advanced technologies to obtain consistently reliable results. Innovation and quality are at the core of everything we do.

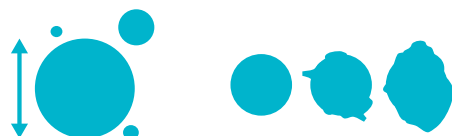
As part of Verder, we provide worldwide support through a network of subsidiaries and distributors.



Three Centers of Excellence

MICROTRAC: A SINGLE-SOURCE SOLUTION PROVIDER FOR PARTICLE CHARACTERIZATION

PARTICLE SIZE & SHAPE FOR PARTICLE ANALYSIS



Size
& Distribution

Shape

Our expertise in particle size distribution and shape analysis ensures optimal product quality control and supports advanced research efforts. At the core of our technology are **Dynamic Image Analysis (DIA) used on the CAMSIZER** and a combination of **Laser Diffraction (LD) and Dynamic Image Analysis used on the SYNC** systems. These two technologies cover all your needs for particle size analysis, ranging from 10 nm to 135 μ m, whether for dry or wet samples. Our unique size & shape analysis technology utilizes advanced light scattering, state-of-the-art cameras, and sophisticated computational software to deliver outstanding accuracy and repeatability.

COLLOIDS AND FORMULATIONS CHARACTERIZATION



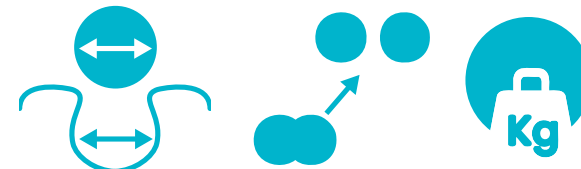
Particle size

Zeta potential

Stability
& Shelf-Life

When working with colloids or formulations, the three main parameters to consider are **particle size, zeta potential and stability/shelf-life**. At MICROTRAC, we address all these needs with our comprehensive technology platforms: **NANOTRAC, STABINO, and TURBISCAN**. Our solutions analyze these critical factors to ensure rapid R&D and quality control for the highest product quality. Utilizing **Dynamic Light Scattering (DLS), Static Multiple Light Scattering (SMLS), and Zeta Potential (ZP)**, our systems offer unique features such as non-dilution, high accuracy, and fast measurement enabling you to make fast decisions based on reliable data.

GAS ADSORPTION FOR MATERIALS CHARACTERIZATION



Surface Area
& Pore size

Catalysis

Density

We offer advanced solutions for measuring surface area, porosity, and catalytic properties of materials. The MICROTRAC analyzers, celebrated for their precision in **gas and vapor adsorption measurements**, determine BET surface area and pore size distribution for both porous and non-porous materials. These analyzers employ cutting-edge gas adsorption technology and are widely used in various sectors, including Research and Development, Quality Control, and Quality Assurance. These tools are trusted worldwide, reflecting the renowned craftsmanship and quality of Japanese engineering, with comprehensive support provided by our competence centers in Japan (Osaka), Germany (Haan), USA (Newtown, PA) and France (Toulouse). The **BELSORP** and **BELPORE** analyzers are essential for achieving accurate gas and vapor adsorption analysis.

AEROTRAC II

ADVANCED AEROSOL CHARACTERIZATION

With the **AEROTRAC II**, MICROTRAC uses its 50 years of development expertise in Laser Diffraction to provide fast, accurate particle size measurements for users working with aerosols or sprays. In either a quality control or a research and development environment, **AEROTRAC II** can characterize:

- | **Droplets:** from fuel injectors or nebulizers
- | **Mist:** from Humidifiers or Mist separators
- | **Sprays:** such as Insecticides or lotions
- | **Powder Aerosols:** such as powder paints

The System consists of a compact optical bench allowing for easy setup depending on the size and nature of the sample to be analyzed. A series of sample presentation devices can be used to ensure the measurement is carried out exactly as in a real use case. Safety is assured by using low power solid state laser diodes as opposed to HeNe Gas lasers and specific sample collector devices. (Diode lasers also contribute to lower cost of ownership as costly gas laser replacements over time are not required).

The intuitive **AEROTRAC** software facilitates easy measurement, display and processing of measurement data.





Aerosol Particle Size Analyzer

AEROTRAC II

- | Particle Size Analysis of Aerosols from 0.1 to 2000 μm using Laser Diffraction (ISO 13320:2020)
- | Accurate analyses at short measurement intervals of 0.02 to 500 msec.
- | High precision continuous measurements for particulates moving at the speed of sound.
- | Selectable Measurement Modes
 - Manual: Initiation by software operation
 - Automatic: measurement starts automatically on detecting scattered light from the sample
 - Remote: measurement initiated by external signal input
- | Multiple Scattering correction feature ensures integrity of analysis.
- | Compact Optical bench
- | Full IQ/OQ validation package compliant with FDA 21 CFR Part 11 and USP 1058 guidelines.

AEROTRAC

LASER DIFFRACTION ANALYSIS

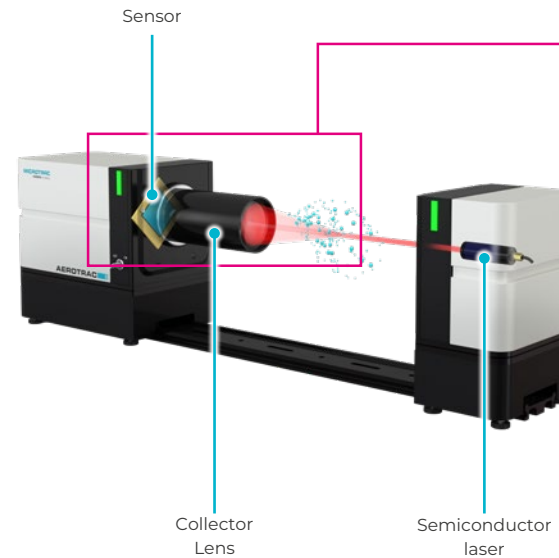
AEROTRAC II operates on the principle of measuring the angular scatter of Laser light incident on a sample of particles. If there are no particles in the laser path, the collimated beam entering the lens is focused at the lens's focal point. In the **AEROTRAC II**, a concentric light detector sensor is used to adjust the position of the sensor such that the center is in focus.

When there are particles present in the path, the laser beam is diffracted and scattered by the particles. The laser beam scattered at angle θ_1 is detected by a sensor at a distance r_1 from the focal point. Similarly, a laser beam

scattered at an angle of θ_2 is detected by a sensor at the distance r_2 from the focal point. By measuring the intensity of scattered light at various points on the sensor, the diffraction pattern of a sample can be obtained. Fraunhofer diffraction theory dictates that particles scatter light in an inverse relationship to their size. That is particles of a smaller size scatter light in larger angles while larger particles scatter light at smaller angles. By analyzing the intensity scatter pattern on the detector, a particle size distribution of the sample can be determined.

If particles are transparent, as well as light scattered around the edge of the particle, a

BASIC BLOCK DIAGRAM

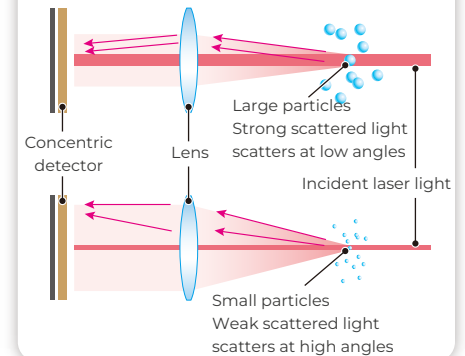


■ Measurement area

I Laser diffraction method

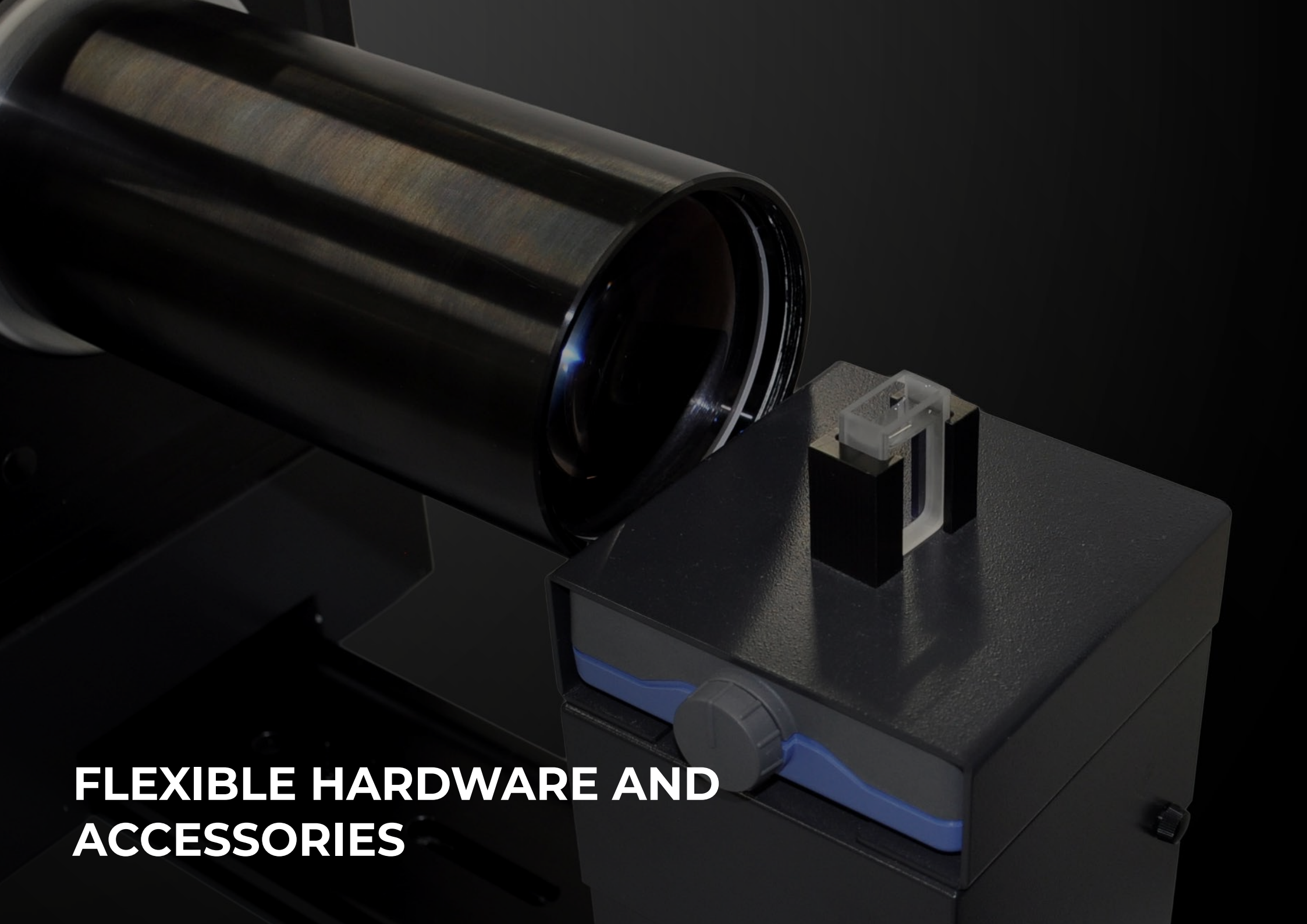
The scattered light that is generated when laser light is irradiated on particles has a scatter pattern that corresponds to the particle size.

The detector receives scattered light (mixed light) from particles of various sizes, and our unique algorithm is used to convert the result into particle size distribution.



separate scattering function is detected due to light entering the particle and being refracted by the particle. This results in refracted light as well as diffracted light being incident on the detector. **AEROTRAC II** also applies MIE compensation theory to the calculation whereby knowing the size and refractive index of the material allows the refracted element of the light scatter pattern to be calculated out of the particle size distribution.

AEROTRAC Software features a multiple scattering correction function as well as the Nukiyama-Tanasawa equation to predict size distribution of droplets in sprays.

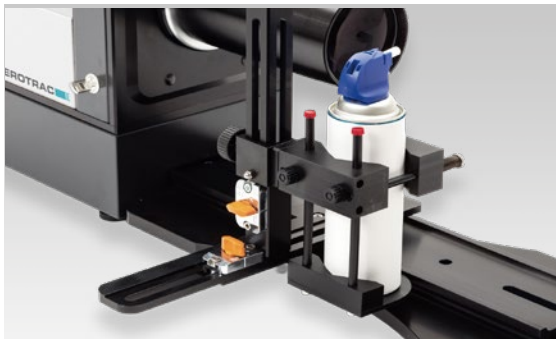


**FLEXIBLE HARDWARE AND
ACCESSORIES**

TECHNOLOGY

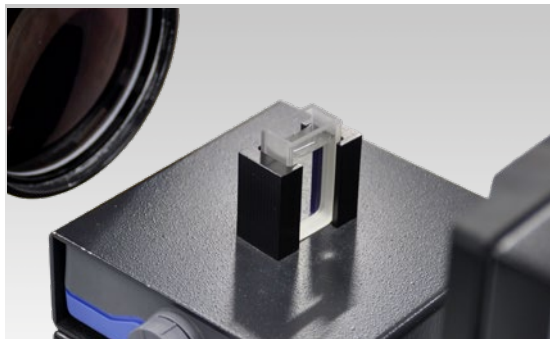
FLEXIBLE HARDWARE AND ACCESSORIES

AEROTRAC II is designed with user flexibility in mind. The smallest in class optical system can be used as a stand-alone instrument or can be integrated with customized process systems. Its size also allows for easy installation in fume hoods or glove boxes for maximum safety.



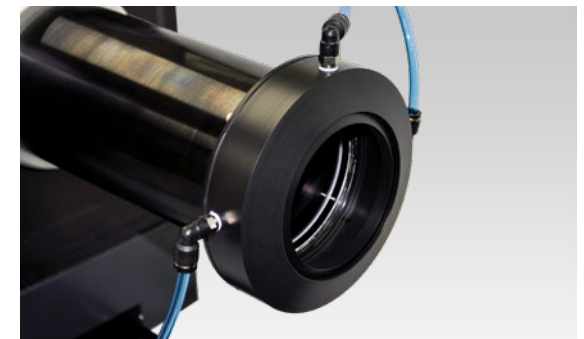
SPRAY ACCESSORY

The Spray Accessory is designed to hold different types of spray devices in fixed positions. This ensures the spray is injected in a consistent manner to ensure reliable measurements.



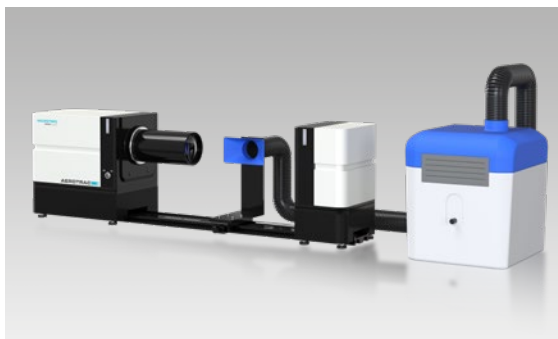
WET MEASUREMENT FRACTION CELL

The Wet Fraction Cell allows the **AEROTRAC II** to measure particle size distributions of suspended powders or emulsions.



AIR PURGE ACCESSORY

The Air Purge Accessory ensures the Collector Lens of the **AEROTRAC II** is not contaminated by airborne particles or droplets that may accidentally coat the lens surface. This accessory not only directs air away from the lens surface but also in the direction of the spray travel.



SAMPLE EXTRACTOR

The Sample Extractor accessory collects the samples injected across the measuring zone of the **AEROTRAC II**. The device is a lightweight (7.5 kg), quiet (50dB) solution that can be set to 3 levels of extraction depending on the sample. This ensures hazardous samples are collected and the laboratory area is kept clean.



NASAL SPRAY ACCESSORY

The Nasal Spray Accessory facilitates accurate and reproducible measurement of droplet and particle size distributions produced by nasal drug delivery devices.

The spray is actuated under controlled conditions, maintaining a consistent distance, height, position, and angle between the nozzle and the measurement lens, with laser alignment fixed for uniformity.

The system automatically regulates actuation force and speed to ensure standardized and repeatable performance.



NEBULIZER ACCESSORY

The particle size must be controlled to ensure that the aerosolized chemical solution delivered by the nebulizer achieves therapeutic effectiveness at the target site.

The Nebulizer Accessory ensures precise, reproducible measurements of droplet and powder particle size from metered-dose inhalers, dry powder inhalers, and nebulizers.

Designed for accuracy, it measures where the aerosol is stable—not in turbulent areas—giving you reliable, consistent results every time.



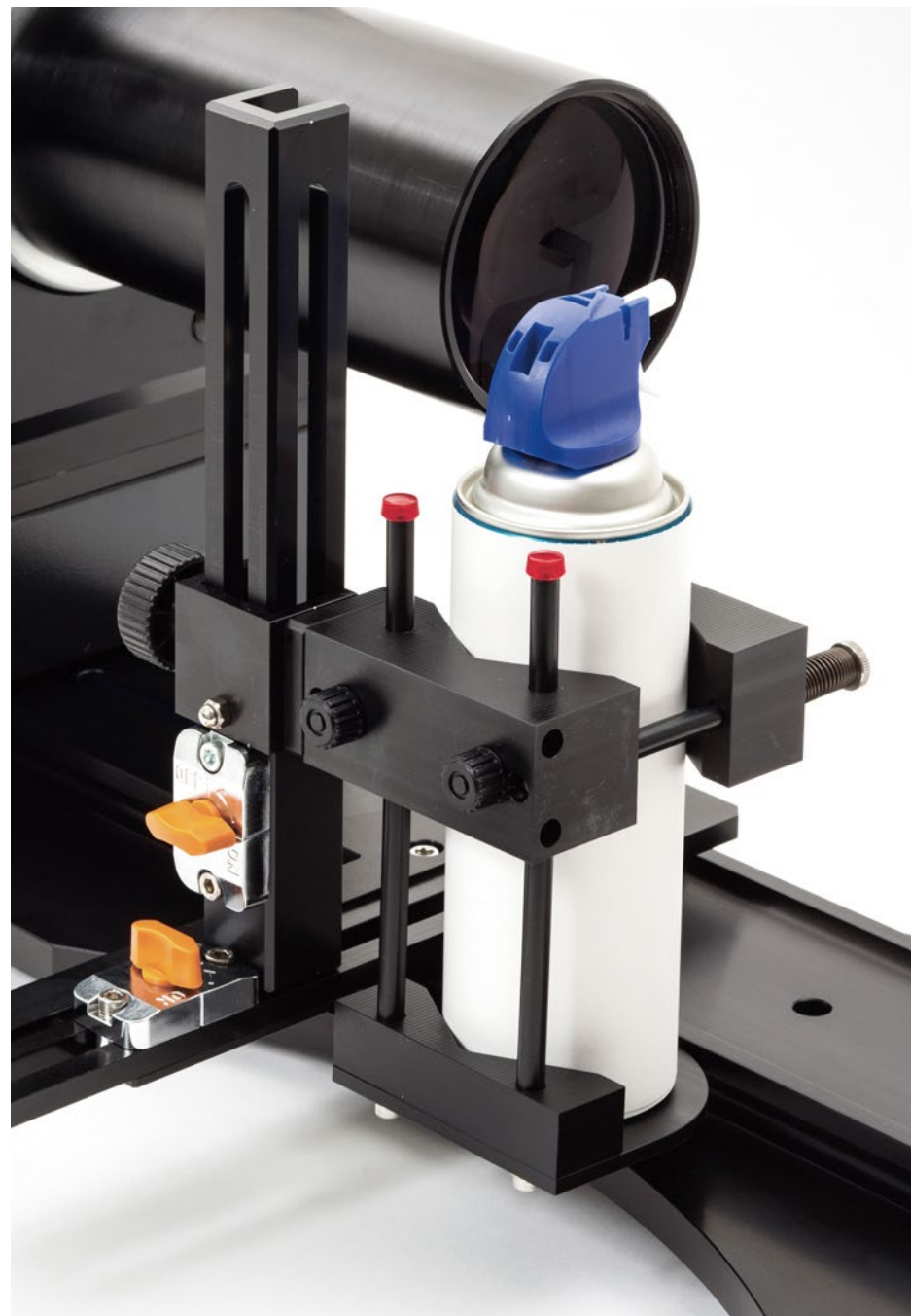
IP65 COMPLIANCE

To ensure compliance with the IP65 protection rating:

- Dust Protection (IP6X): Complete protection against dust ingress.
- Water Protection (IPX5): Protection against water jets from any direction, with no harmful effects on operation or safety.

The IP65 accessory provides complete protection against dust ingress and protection against water jets.

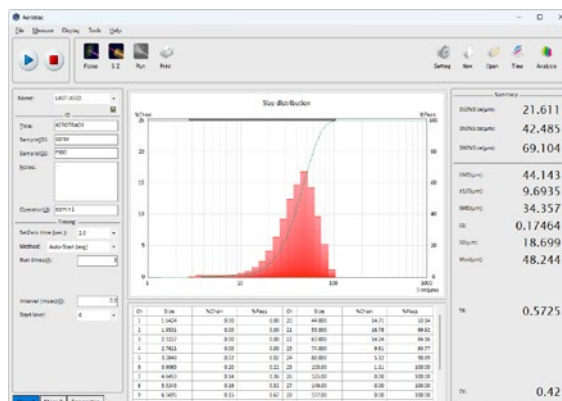
The enclosure is designed to cover and shield the laser and detector units, including all associated cables, and complies with the dust and water protection requirements of IEC 60529.



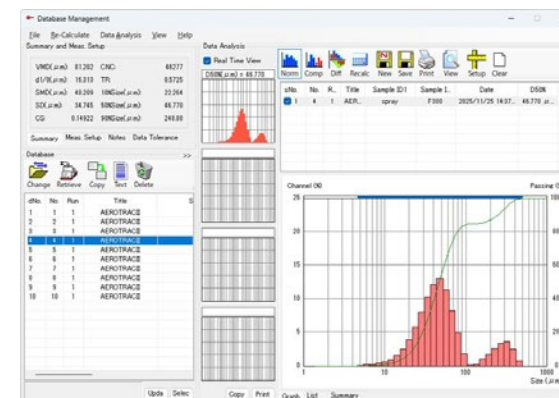
ADDITIONAL SOLUTIONS

SOFTWARE

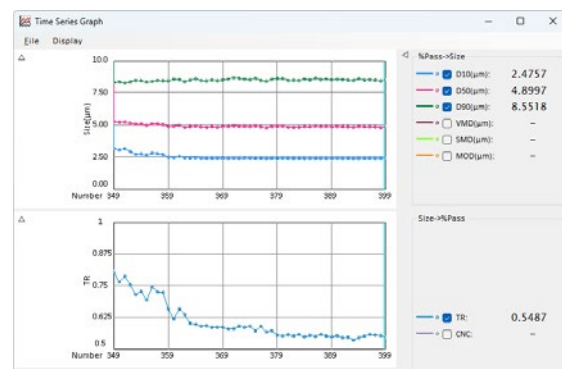
AEROTRAC II intuitive DMS software allows the user to measure, save, recall, export and process measurements easily.



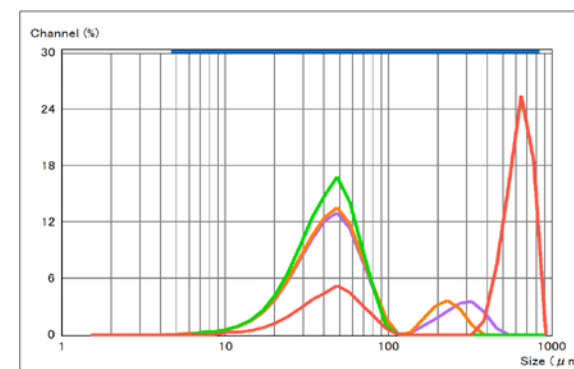
The **Measurement Screen** can initiate a measurement either manually, automatically or remotely. Simply initiate the measurement and as soon as the **AEROTRAC II** detects sample in the measurement zone, it begins measuring.



The **Analysis Screen** allows the user to compare multiple sets of data in overlapping displays. Users can view summaries of various parameters like median diameter, light transmittance etc.



The **Time Series Display** allows real-time monitoring and analysis of measurement results. Past data can be reviewed and analyzed while measurements are taking place.



Measurement results can be output in various file formats (CSV, JPEG, EMF, PNG, TIFF etc.) Particle Size Distribution graphs can be copied to the clipboard for use in other reports.

MICROTRAC

APPLICATIONS

AEROTRAC II can be used to measure particle size distributions for any material that is applied through a dispersion in air. For fuel injectors, the droplet surface area, represented by the Sauter mean diameter, is critical for efficient fuel usage. Measuring droplet size in sprays is crucial because it directly influences the efficiency, effectiveness, and safety of numerous applications, including agriculture, pharmaceuticals, firefighting, and industrial processes. The size of the droplets determines how the spray interacts with its target—affecting coverage, penetration, evaporation

rate, and potential for drift or unintended dispersion. For example, in agriculture, optimal droplet size ensures pesticides or fertilizers are delivered precisely to crops, minimizing waste and environmental impact. Accurate droplet size measurement enables better control over spray performance, ensures regulatory compliance, and supports the development of more effective and economical spraying systems. Measuring particle size in nebulizers and nasal sprays is essential because it determines how effectively medication is delivered to the intended region of the respiratory tract. Particle

size affects deposition: larger particles tend to settle in the upper airways, while smaller particles can penetrate deeper into the lungs or sinuses. Ensuring the correct particle size maximizes therapeutic efficacy, reduces side effects, and minimizes drug wastage by targeting the medication where it is most needed. Accurate measurement and control of particle size also support product consistency, regulatory approval, and patient safety in respiratory drug delivery systems.

TYPICAL FIELDS OF APPLICATION

- ▶ DROPLETS FROM INJECTOR
- ▶ NEBULIZERS
- ▶ INSECTICIDE

- ▶ LOTION
- ▶ HUMIDIFIERS
- ▶ POWDER PAINT

- ▶ MIST SEPARATORS
- ▶ PIGMENTS

APPLICATIONS

APPLICATIONS



| FUEL INJECTORS



| NASAL SPRAYS

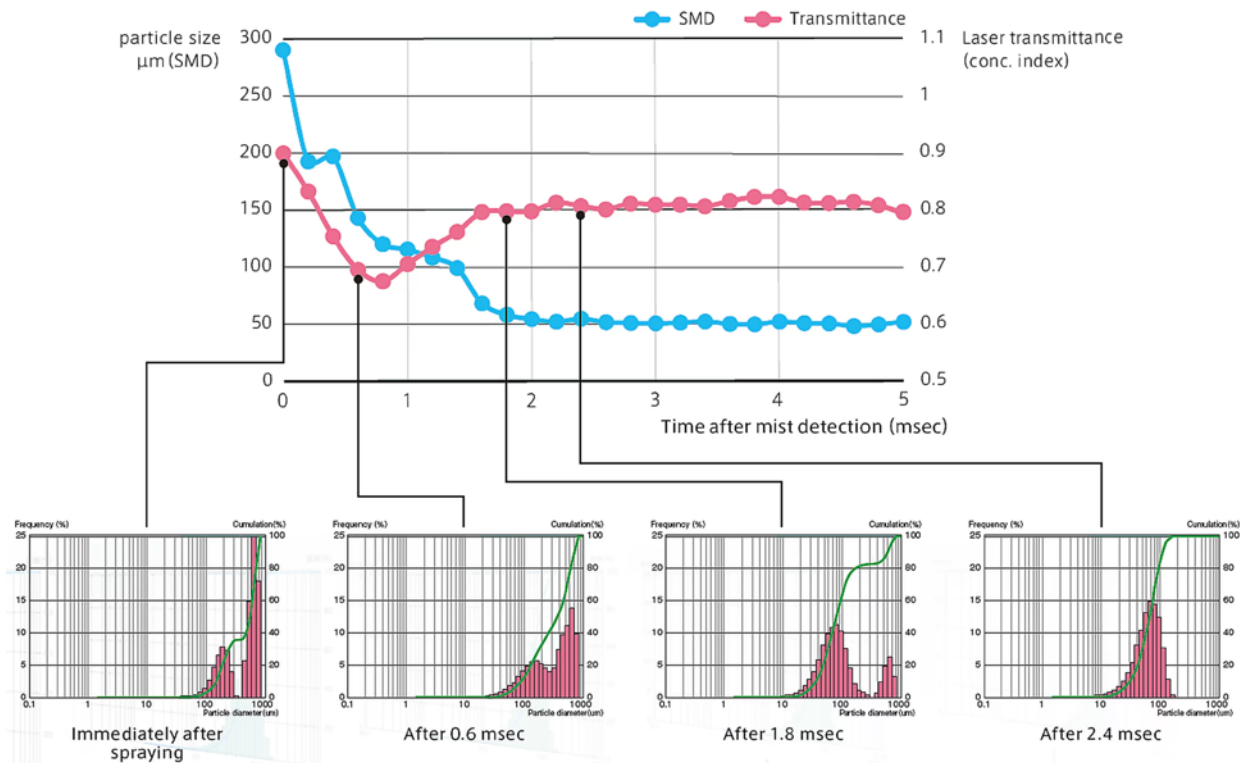


| AEROSOLS



| NEBULIZERS

ANALYSIS OF TEMPORAL CHANGE OF SPRAY MIST

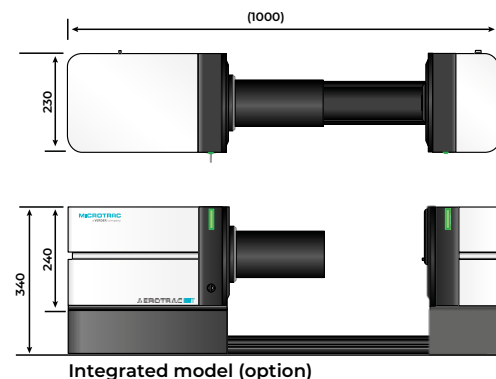
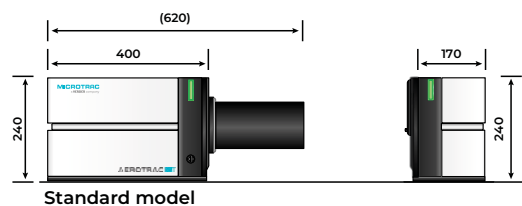


Graphs of concentration of spray mist, particle size and its distribution are shown above. The concentration of spray mist and particle size distribution are automatically and continuously measured in 0.2 msec intervals

the instant the **AEROTRAC II** detector detects scattered light from the mist particles. The mist concentration and particle size are not stable from 0 to 2 msec, but become stable after that time.

SPECIFICATIONS AT A GLANCE

Measuring principle	Laser diffraction
Measurement range	F100 lens: 0.5 (0.1)* to 350 µm F300 lens: 1.4 to 1000 µm F600 lens: 2.8 to 2000 µm * Use expansion mode to reduce the size down to 0.1 µm
Light source	Semiconductor laser Wavelength: 635 nm Output: 3.5 mW Laser class: Class 3R
Detector	32-element ring detector (with automatic optical axis adjustment function)
Measuring time	Spray measurement: 0.02 to 500 msec Continuous measurement: 1 to 600 sec
Number of measurements	Spray measurement: 1 to 100 times Continuous measurement: 1 to 9,999 times
Data	Particle size distribution (frequency/cumulation), summary data (D50% particle size, SMD, mode diameter etc.) density index
Sample Cell	Material: Tempax glass (with coating) Capacity: 5 to 7 ml
Environmental conditions	Ambient temperature: 10 to 35 °C Ambient humidity: 20 to 80% RH (no condensation)
Power requirements	85 to 264 VAC, 47 to 63 Hz
Dimensions (W x H x D)	Light emission module: 170 x 230 x 240 mm Detection module: 595 x 230 x 240 mm For connected modules (option): 1000 x 230 x 340 mm, 27 kg
Weight	Light emission module: 5.5 kg Detection module: 11.5 kg (with F300 lens attached) For connected modules (option): 27 kg
Operating unit	Windows PC (including laptop PC)



MICROTRAC

a **VERDER** company

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VERDER

Verder is composed of leading laboratory equipment companies active in sample preparation and analysis for quality control as well as research & development purposes.

As trusted solution partner, Verder Scientific enables thousands of companies to ensure economic, technological and environmental progress by mastering their scientific applications. Together, we make the world a healthier, safer and more sustainable place.

