FIDAS® FROG

Das mobile Feinstaubmessgerät Fidas® Frog ermöglicht eine schnelle, zuverlässige und qualitätsgesicherte Bestimmung der Feinstaubbelastungen z. B. im Rahmen der Überwachung von Gesundheit, Sicherheit und Umweltschutz (GSU) am Arbeitsplatz oder im Bereich der Innenraumlufthygiene. Es misst simultan die umweltbedingten Massefraktionen PM_1, $PM_{2,5}$, PM_4, PM_{10}, TSP sowie die Partikelanzahl und die Partikelgrößenverteilung im Partikelgrößenbereich von 0,18 – 93 μm. Durch die Bereitstellung der zeitlich hochaufgelösten Feinstaubmesswerte werden dem Anwender umfangreiche Informationen zur Bewertung und Beurteilung der Feinstaubbelastung im Untersuchungsbereich zur Verfügung gestellt.

Der sehr kompakte und leichten Aufbau als tragbares Handgerät mit Akku- oder Netzbetrieb sowie eine Akkubetriebszeit von bis zu 8 Stunden, ermöglichen einen flexiblen Einsatz des Fidas® Frog an den unterschiedlichsten Messorten.

OPERATION PRINCIPLE

PORTABLE FINE DUST MEASUREMENT DEVICE

Fidas® Frog communicates via WLAN with its wireless operator´s panel (Tablet). By this, it is possible to perform measurements with a distance between the measurement site itself and the operator of the Fidas® Frog, e.g., for sites challenging to access. This concept furthermore allows for integrating one or more Fidas® Frog in an existing network and controlling® Frog in an existing network and controlling the connected devices from one central PC, e.g., for area-wide monitoring of a production facility.

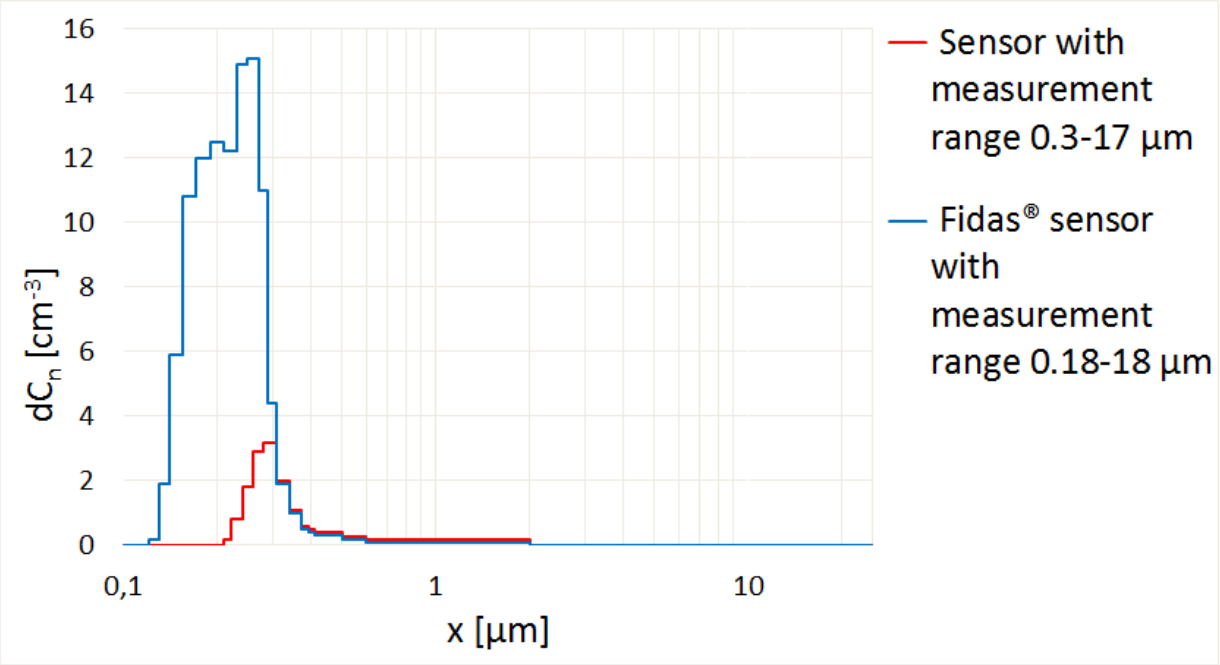
Fidas® Frog uses the recognized measurement technology of optical light scattering of single particles and is equipped with a LED light source with high intensity (dp min = 180 nm), highly stable output, and a long lifetime. The sensor and the evaluation routines of the Fidas® Frog are also used in the Fidas® 200, which is certified for monitoring of $PM_{2.5}$ and PM_{10} in ambient air by TÜV/Umweltbundesamt and which have been validated in comprehensive comparison campaigns versus the gravimetric reference method. By implementing this well-approved technique and by the numerous measures for quality assurances during production (e.g., comparison of each Fidas® Frog with a certified Fidas® 200), precise and quality-assured measurements can be ensured.

The system's calibration can be checked and adjusted, if necessary, easily and quickly under field conditions on-site at any time with the help of a monodisperse test powder.

Fidas® Frog operates with a volume flow of 1.4 l/min and is equipped with sensors for environmental conditions, temperature, atmospheric pressure, and relative humidity.

The actual aerosol sensor is an optical aerosol spectrometer that determines the particle size using Lorenz-Mie scattered light analysis of single particles. The single particles move through an optically differentiated measurement volume that is homogeneously illuminated with white light. Each particle generates a scattered light impulse detected at an angle of 85° to 95° degrees. The particle number is measured based on the number of scattered light impulses. The level of the scattered light impulse is a measure of the particle size diameter.

The lower detection limit for immission measurement could be reduced to 180 nm through improved optics, higher light density using a new white LED as the light source, and improved signal analysis (logarithmic analog, digital converter). This enables greatly improved detection, especially of smaller particles mainly found at high concentrations near roadsides (see Fig. 1).



Certified fine dust measurement device Fidas 200, TÜV Rheinland certified, TÜV cer

Fig. 1: Higher sensitivity with the Fidas® fine dust measurement system for the 0.18 – 18 μm particle size range

The better the classification accuracy and the resolution capacity, the more accurate the definition of the particle size distribution.

A white light source enables a precise and unambiguous calibration curve, resulting in an extremely high size resolution. The patented T-stop provides a precisely defined optical measurement volume and enables particle measurement without border-zone errors, resulting in a precise size measurement. The new digitized electronic signal analysis system enables the rapid identification and correction of coincidence, as necessary.

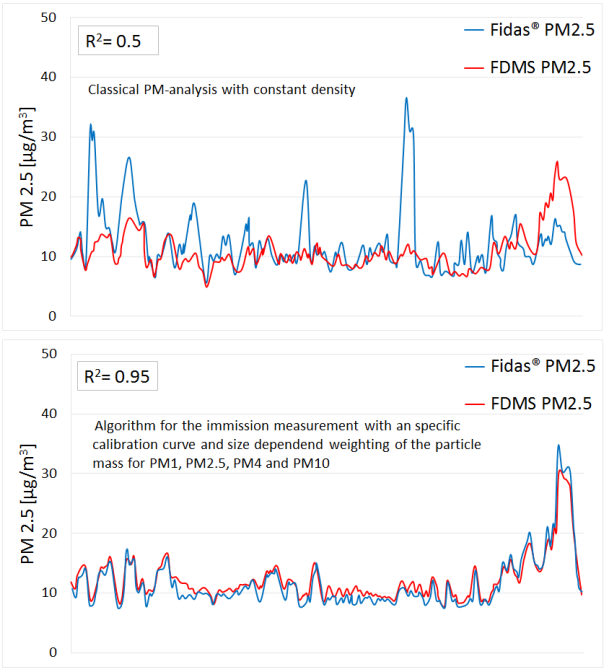


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Fig. 2: Comparison of the algorithms for conversion of the particle size distribution by PM values

To convert the measured values into a mass or mass fraction, the high-resolution particle size distribution in each value is multiplied by a correlation factor that reflects the different sources (e.g., combustion aerosols, tire wear, pollen) of the environmental aerosol (see Fig. 2). A mass fraction is obtained by additionally applying the separation curve to the determined particle size distribution. Multiple separation curves can be used simultaneously for the same size distribution, which enables the simultaneous output of PM_{10}, $PM_{2.5}$, PM_1 (and others). For example, the Fidas® Frog can be operated with the same conversion algorithm, which has also been implemented in the type-approved and certified ambient air monitoring system Fidas® 200 for regulatory monitoring of ambient $PM_{2.5}$ and PM_{10} concentrations.

The operation of the Fidas® Frog is intuitive and simple. All measured data can be evaluated and compared directly with the operator interface. Already during the measurement, messages on exceeded limit values are possible. These limit values can be defined based on legal requirements or individual needs (see limit values in Fig. 3).

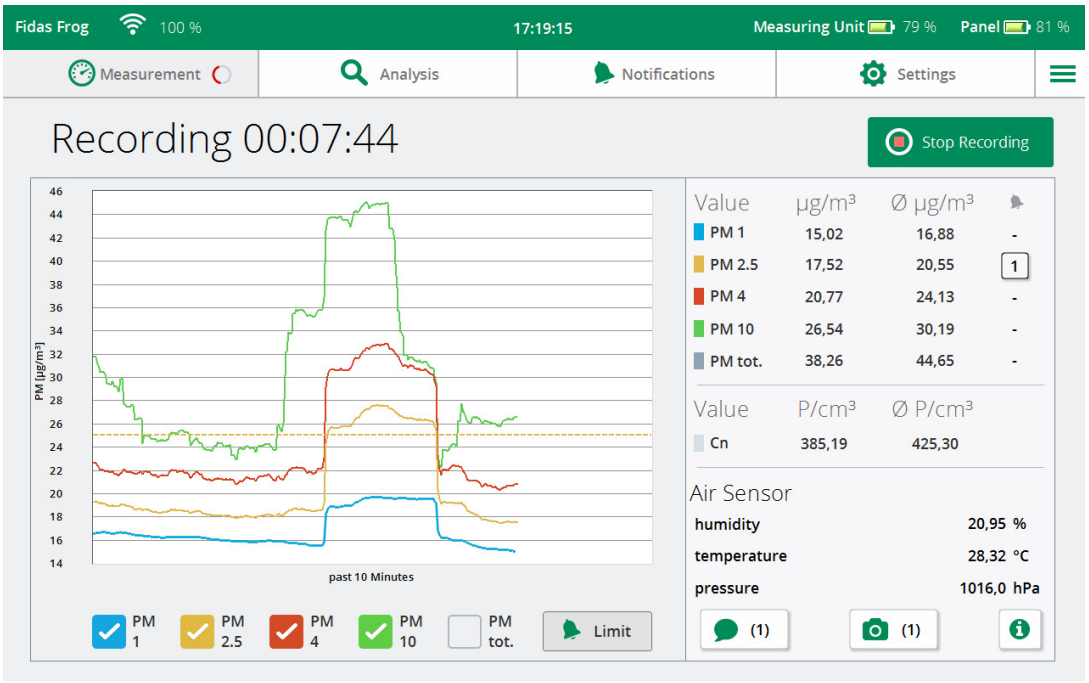

Fig. 3: Display of measured values during a measurement

An integrated camera documents the measurement setup. By this, pictures can be added for documentation directly and comfortably to the measured data set or the measurement report in pdf generated by the device itself. Fig. 4 shows such a measurement report in pdf, including data of the measurement conditions saved by the user and a graphical evaluation of the measurement data. Pictures of a workplace measurement have also been attached to this report.

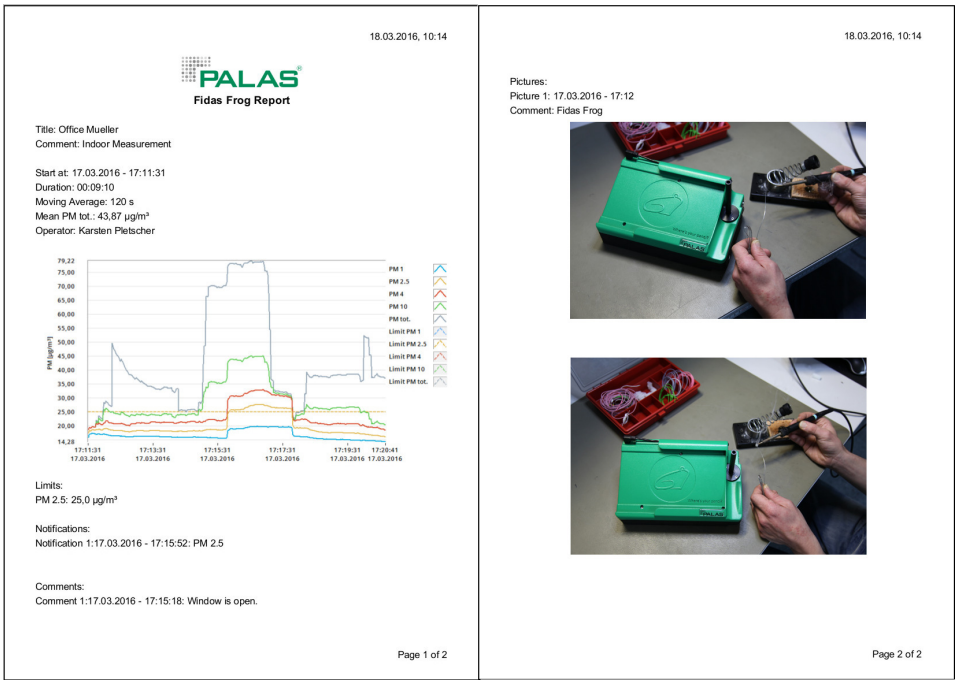

Fig. 4: Example for a measurement report (pages 1 and 2)

The measured data can be directly printed or transferred to an USB stick via the micro-USB-port and processed on an external PC. In this case, the evaluation software PDAnalyze Fidas® offers various data evaluations, especially for the particle size distribution, and it gives possibilities for export.

Benefits

- Kontinuierliche und simultane Echtzeit-Messung der PM_1-, $PM_{2,5}$-, PM_{10}- und TSP-Werte
- Zusätzlich Partikelanzahlkonzentration und Partikelgrößenverteilung
- Großer Messbereich: 0,18 – 93 μm
- Zeitliche Auflösung einstellbar ab 1 s
- Direkter Vergleich von verschiedenen Messungen
- Konfiguration von Grenzwerten möglich
- Hohe Qualität der Messdaten sichergestellt durch Implementierung des Sensors / Auswertealgorithmus des EN-zertifizierten Fidas® 200
- Zusätzlich erweiterter Einsatzbereich durch mögliche Trennung zwischen Messgerät und Tablet-PC zur Steuerung (Kommunikation via WLAN)
- Ergonomisches Design und geringes Gewicht
- Intuitive und einfache Bedienung
- Integrierte Kamera zur Dokumentation der Messung
- Exportfunktion für Messdaten
- Möglichkeit der Generierung eines Messreports als pdf im Fidas® Frog
- Fernüberwachung und -bedienung über Netzwerkeinbindung einfach möglich
- Wartungsarm

DATASHEET

Measuring principle	Optical light scattering at single particles
Reported data	PM_1, $PM_{2.5}$, PM_4, PM_{10}, TSP, C_N, particle size distribution
Measurement range (number C_N)	0 – 20,000 particles/cm³
Measurement range (size)	0.18 – 93 μm (2 measurement ranges)
Measurement range (mass)	0 – 100 mg/m^3 (depending on the composition of the aerosol)
Volume flow	1.4 l/min
Size channels	32/decade, 256 raw data channels
Interfaces	USB, Ethernet (LAN) by USB-adapter, Wi-Fi access point
User interface	Touchscreen, 1,280 • 800 pixel, 8″ (20.32 cm)
Data logger storage	Approx. 16 GB (extendable by micro-SD)
Data acquisition	Digital, 20 MHz processor, 256 raw data channels
Light source	LED
Gehäuse	Synthetic housing
Operating system	Windows 10
Power consumption	13 W
Installation conditions	0 – +40 °C
Battery operation	Li-ion batteries, non-removable, base unit: 77 Wh (14.8 V; 5,200 mAh), 8 cells tablet: 20 Wh (3.8 V; 5,200 mAh), 2 cells
Dimensions	100 • 240 • 150 mm (H • W • D)
Weight	Approx. 2.1 kg (operating panel: 0.4 kg, measuring unit: 1.7 kg)

APPLICATIONS

- Fine dust monitoring at alternating locations or in movement
- Air quality monitoring indoors, at the workplace, or inside vehicles
- Use as an aerosol spectrometer in setups where space is limited

Mehr Informationen:
https://www.palas.de/product/fidasfrog