

# welas<sup>®</sup> digital 3000



Aerosol spectrometer **with two aerosol sensors**, highest particle size resolution, measuring range from 200 nm to 100 µm for **quasi simultaneously measurements**

## Model Variations



welas<sup>®</sup> digital 3000 H  
With heating regulation up to 250 °C for welas<sup>®</sup> aerosol sensors



welas<sup>®</sup> digital 3000 HP  
With automatic regulation of sampling volume flow by the aerosol sensors  
welas<sup>®</sup> under overpressure up to 10 bar or in temperatures to 120 °C



welas<sup>®</sup> digital 3000 P  
With automatic regulation of sampling volume flow by the aerosol sensors  
welas<sup>®</sup> under overpressure up to 10 bar

## Description

The **welas<sup>®</sup> digital 3000** is a flexible, powerful and economical light-scattering spectrometer system with two aerosol sensors, which determines particle concentration and size precisely and reliably. Unique are up to four measuring ranges in only one device:

- 0.2 µm – 10 µm
- 0.3 µm – 17 µm
- 0.6 µm – 40 µm
- 2 µm – 100 µm (additionally for sensors 2300 and 2500).

welas<sup>®</sup> digital 3000 is famous for up to 128 size channels per measuring range and a concentration range from < 1 particle/cm<sup>3</sup> to 10<sup>6</sup> particles/cm<sup>3</sup>.

On the new **welas<sup>®</sup> digital 3000**, two **welas<sup>®</sup>** sensors are supplied with one light source and the scattered light pulses are detected by a photomultiplier. This enables a quasi-simultaneous particle measurement at two sampling locations that are up to 100 meters apart. **The quasi-simultaneous particle size and particle quantitative determination offers particular advantages for characterising separators with fluctuating raw gas concentrations.** With the **welas<sup>®</sup> digital 3000** the user effectively has two scattered-light spectrometers in one device with the same device characteristics:

- Particle size resolution capability
- Particle size classification accuracy
- Counting efficiency
- Zero counting rate

The various **welas<sup>®</sup>** sensors are characterized by a particularly good conformity of counting efficiency and particle size resolution (see data sheet: **welas<sup>®</sup>** sensors). **Opto-mechanical switching** Using opto-mechanical switching, the two sensors that are connected can be easily controlled. The sensors are controlled automatically with the software. The particular advantage over a manual measurement selector switch:

- Faster change of the measurement location
- No deposits in sampling lines
- Long service life; no wear of the seals due to dust particles

The **welas<sup>®</sup> digital 3000** is characterized by its optical fibre technology. The **welas<sup>®</sup>** sensor is connected via a fiber optic cable with a length up to 30 m with the **welas<sup>®</sup> digital** control unit. This leads to a minimization of particle losses in long sampling lines by simply installing the sensor directly at the sampling location. Connection via fiber-optic cable allows the **welas<sup>®</sup> 2000** and **2000 P** series sensors to be easily connected to the control and evaluation unit and interchanged as required. The **welas<sup>®</sup>** sensors are equipped with different sized measurement volumes. This allows adaptation of the measuring device to the particle concentration present in the application, such that a high counting rate can be achieved with a short measuring time. The aerosol sensors allow reliable measurement in the concentration range from < 1 particle/cm<sup>3</sup> up to 10<sup>6</sup> particles/cm<sup>3</sup>. The **welas<sup>®</sup> digital** is based on scattered-light analysis on a single particle. With the new **welas<sup>®</sup> digital**, the special advantages of the well-known and internationally acclaimed **welas<sup>®</sup>** system are combined with new and fast digital individual signal processing and coincidence correction is enabled. **The high size classification accuracy and the high size resolution are guaranteed by the following special feature (see Graph 1):**

- White light and 90° light-scattering detection  
⇒ **Unambiguous calibration curve**
- Patented T-aperture  
⇒ **No border zone error**

- New digital individual signal processing  
 ⇒ Coincidence detection and correction of the individual signal making it possible to measure in higher concentrations

The **welas<sup>®</sup> digital measurement technology** **welas<sup>®</sup> digital** offers a new, fast 20 MHz signal processing processor, which analyses the progression of each particle signal. This makes it possible to recognise coincidental events in light scattering measurement technology at the individual signal and correct them (according to Dr. Umhauer / Prof. Dr. Sachweh). This way it is possible to increase the maximum concentration limit up to  $10^6$  particles/cm<sup>3</sup> (welas<sup>®</sup> 2070 sensor). Also in low concentrations  $< 1$  particle/cm<sup>3</sup> with the **welas<sup>®</sup> nbsp 2500** sensor, this leads to a higher measuring accuracy. **High classification accuracy, high resolution capability and a high counting efficiency are the prerequisite for unambiguous particle measurement.**

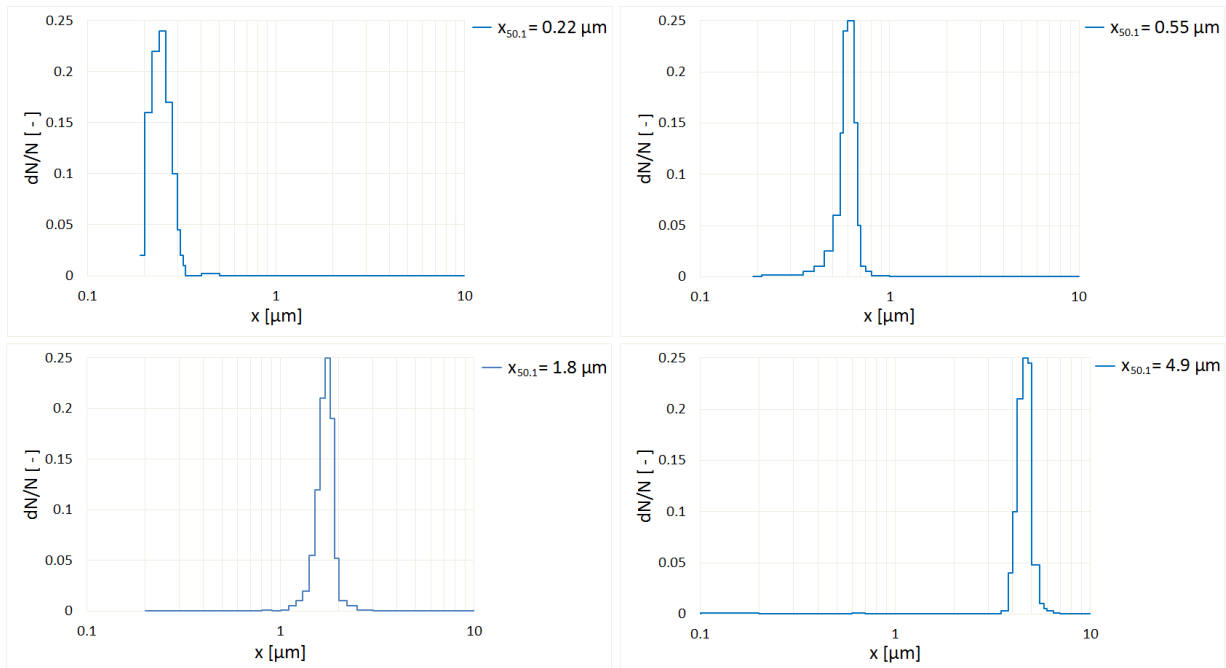


Fig. 1: Resolution capability and classification accuracy The **welas<sup>®</sup> digital** is characterized by its very high counting efficiency starting from 0.2  $\mu m$ !

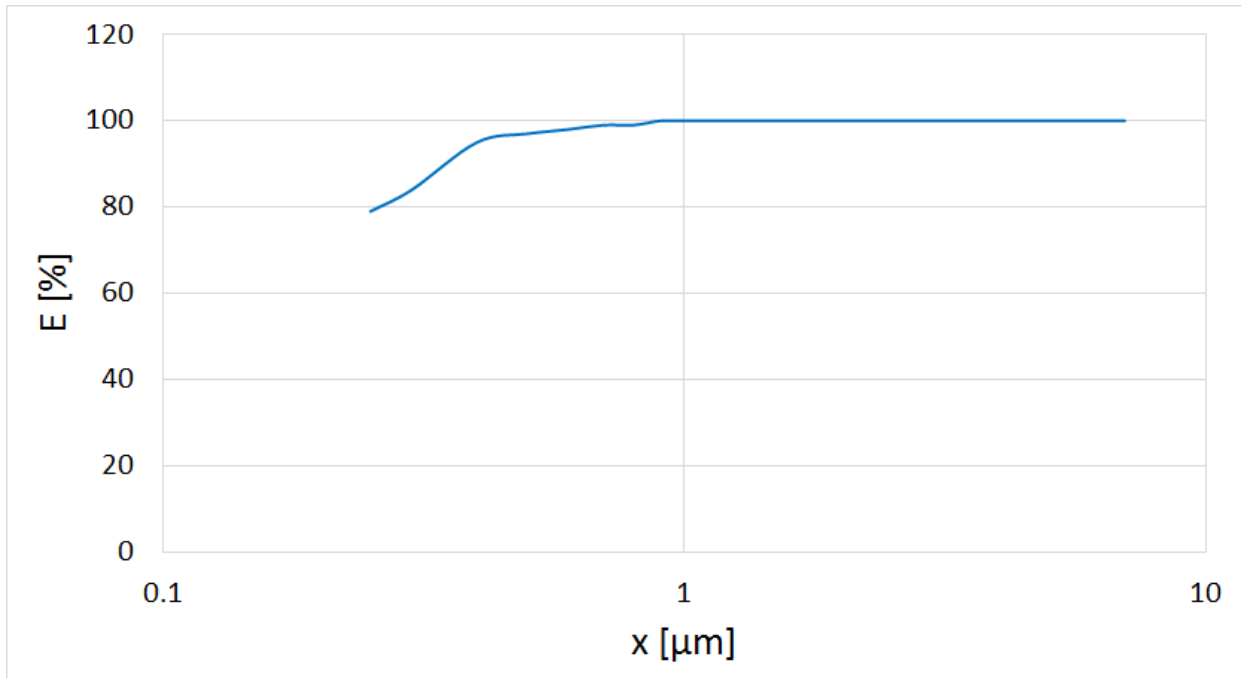


Fig. 2: Example with sensor **The welas<sup>®</sup> PDControl digital software** The welas<sup>®</sup> digital is controlled via a laptop using the PD-Control software. The software allows particle measurements and calibration of the measurement device. In addition, the measurements can be analyzed and compared in detail with a temporal resolution down to 10 ms. **The welas<sup>®</sup> digital filter test software FTControl** The FTControl software is used to flexibly program defined switching times between the two sensors. The measurement data are saved to a file and can be individually evaluated and compared in terms of particle size and concentration, as well as the fractional separation efficiency.

## Benefits

- Measuring range of 0.2 to 100  $\mu\text{m}$  (4 measuring ranges selectable in one device)
- Up to four measuring ranges in only one device:
  - 0,2  $\mu\text{m}$  – 10  $\mu\text{m}$
  - 0,3  $\mu\text{m}$  – 17  $\mu\text{m}$
  - 0,6  $\mu\text{m}$  – 40  $\mu\text{m}$
  - 2  $\mu\text{m}$  – 100  $\mu\text{m}$  (additionally for sensors 2300 and 2500)
- Up to 128 size channels per measuring range
- Concentration range of 1 particle/ $\text{cm}^3$  up to  $10^6$  particles/ $\text{cm}^3$
- Calibration curves for different refractive indices
- Very high and reproducible counting efficiency rate starting at 0.2  $\mu\text{m}$  (see Graph 2)
- High temporal resolution down to 10 ms
- Optical fibre technology
- Measurement in potentially explosive environment
- Long service life of the light source of 2000 h
- Extensive PDControl and FTControl software
- Simple operation
- Calibration, cleaning and lamp replacement can all be performed independently by the customer
- Low maintenance
- Reliable function
- Reduces your operating expenses

## Datasheet

Parameter	Description
<b>Interfaces</b>	USB
<b>Measurement range (size)</b>	0.2 µm – 10 µm, 0.3 µm – 17 µm, 0.6 µm – 40 µm, 2 µm – 100 µm
<b>Size channels</b>	up to 64/decade
<b>Measuring principle</b>	Optical light-scattering
<b>Measurement range (number C<sub>N</sub>)</b>	< 1 • 10 <sup>6</sup> particles/cm <sup>3</sup>
<b>Time resolution</b>	≥ 10 ms
<b>Thermodynamic conditions</b>	10 – 40 °C, -100 – 50 mbar
<b>Volume flow</b>	5 l/min
<b>Data acquisition</b>	20 MHz processor, 256 raw data channels, digital
<b>Light source</b>	Xenon arc lamp 35 W
<b>User interface</b>	Laptop
<b>Power supply</b>	115 – 230 V, 50 – 60 Hz
<b>Housing</b>	Table housing, optionally with mounting brackets for rack-mounting
<b>Dimensions</b>	185 • 450 • 315 mm (H • W • D) (19")
<b>Weight</b>	approx. 18 kg (control unit), ca. 2.8 kg (per sensor)
<b>Software</b>	PDCControl, FTControl
<b>Installation conditions</b>	+5 – +40 °C (control unit)

## Applications

- Determination of the separation efficiency of car interior filters, engine air filters, room air filters, compressed air filters, vacuum cleaner filters, cleanable filters, electrostatic precipitators, oil separators, cooling lubricant separators, wet scrubbers, cyclones and other separators
- Isothermal and isobaric particle size and quantitative determination, for instance in the automobile, chemical, pharmaceutical and food industries
- Analysis of fast, transient processes
- Inspection of smoke detectors
- Particle formation for cloud formation
- Emission measurements
- Immission measurements
- Breathing function: Inhalation / Exhalation (Particle size and number)

**Palas GmbH**  
Partikel- und Lasermesstechnik  
Greschbachstrasse 3 b  
**76229 Karlsruhe**  
Germany

**Managing Partner:**  
Dr.-Ing. Maximilian Weiß  
**Commercial Register:**  
register court: Mannheim  
company registration number: HRB 103813  
USt-Id: DE143585902



**Contact:** E-Mail: [mail@palas.de](mailto:mail@palas.de) Internet: [www.palas.de](http://www.palas.de) Tel: +49 (0)721 96213-0 Fax: +49 (0)721 96213-33