

## The New Portable Environmental Dust Monitor **11-E** Mini Laser Aerosol Spectrometer (Mini-LAS)



The Mini Laser Aerosol Spectrometer (Mini-LAS) **11-E** is the result of continuous development of GRIMM's world-wide known and appreciated spectrometer. The combination of advanced data communication, innovative design and reliable optical measurement technique makes the **11-E** the **world champion** of all portable fine dust measuring devices.

With our proven measurement cell, based on the laser scattering light method, we reliably count every single particle in a wide size range from 0.25 to 32  $\mu\text{m}$  and classify them into 31 separate size channels. This patented method guarantees a precise assignment of particles according to their size, and thus the single PM mass fractions can be accurately calculated. Data storage and retrieving of the mass specific PM<sub>10</sub>, PM<sub>2.5</sub> and PM<sub>1</sub> values and (optionally) the particle size distribution in 31 size channels is done in real-time advanced data communication interfaces.

### Customer's benefits

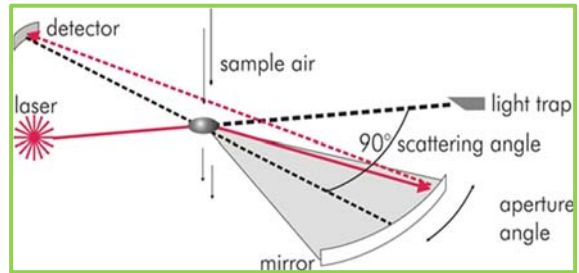
- The efficiency of the device meets the standards PM<sub>10</sub> (EN12341) and PM<sub>2.5</sub> (EN14907), the US EPA, the Russian GOST and the Chinese requirements.
- Simultaneous display and output of measurement data of all PM dust mass fractions every minute
- Particle size distribution in 31 size channels (optional)
- Advanced data communication interfaces (SD-card, USB, Bluetooth and Ethernet)
- Small, portable, tough, battery powered and remote controllable via Bluetooth
- Integrated, removable 47 mm PTFE-filter for subsequent gravimetical and chemical analysis (dual technology)
- Self-test at each start-up
- Permanent rinsing air for keeping the optical measurement cell clean

The **11-E** offers the user all possibilities when saving or retrieving the measurement data. The measurement data can be conveniently accessed and shown online via Bluetooth or Ethernet at the workplace via laptop or tablet. Even accessing the data in real-time per App (Android) is possible. Additionally, the measurement data can be stored on SD-card and/or on USB flash drive.

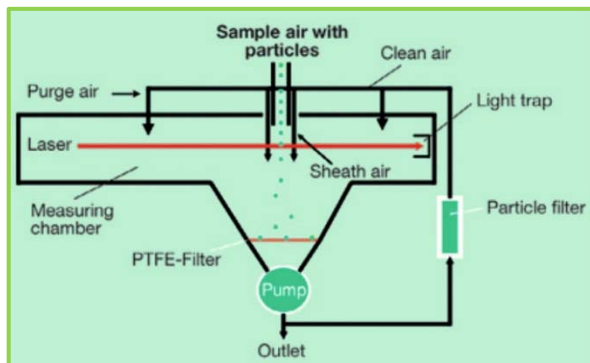
**Data interface of the new 11-E:** SD-card, USB, Ethernet, Bluetooth, RS-232

## Instrument operation

GRIMM's more than 30 years of experience in manufacturing of aerosol spectrometers are reflected in the **patented scattered light** measurement cell and its electronic signal output for every particle size. This know-how combined with high-quality material ensures precision and high data quality.



Measurement principle



## Device concept

The pneumatic scheme shown on the left demonstrates that the sample air enters the measuring chamber from the top in such a way, so that **only one particle at a time** is measured (this is the difference to any Nephelometer method). The outlet after the pump is closed prior each start, so that there is only internal filtered air circulation and therefore the count is "zero" (self-test).

## Gravimetric filter

Additionally, in the patented **11-E** device the measured dust sample is always **collected** on an integrated **PTFE-filter**, so that a subsequent analysis is possible at any time.



**For fine dust analysis in highest precision** ranging from 0.25 to 32  $\mu\text{m}$  in 31 size channels, this top of the line device is unique and has no equal! The areas of use range from fine dust monitoring in industrial and manufacturing facilities to all kind of outdoor measurements. With the advanced data communication interfaces, the **Mini-LAS 11-E** offers its users utmost flexibility and mobility.

## Specification Mini-LAS 11-E

### Measurement Data

|                       |   |
|-----------------------|---|
| <b>Size channels:</b> | 31 channels<br>0.25/0.28/0.3/0.35/0.4/0.45/0.5/0.58/0.65/0.7/0.8/1.0/<br>1.3/1.6/2/2.5/3/3.5/4/5/6.5/7.5/8.5/10/12.5/15/17.5/20/25/30/32[ $\mu\text{m}$ ] |
| <b>Count range:</b>   | 1 to 3,000,000 particles/liter  |
| <b>Particle mass:</b> | From 0.1 to 10,000 $\mu\text{g}/\text{m}^3$   |

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**Environmental data:** Through extrapolation and concentration adaptation. The mass calculation is optimized with the gravimetric reference method to PM10 and PM2.5 (EN12341, EN14907)

**Optional information:** Particle counts in all size channels

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### Instrument Data

|                                   |   |
|-----------------------------------|---|
| <b>Reproducibility:</b>           | $\pm 3$ % over the total measuring range  |
| <b>Sample flow:</b>               | Measurement volume of 1.2 l/min $\pm 5$ % automatically regulated   |
| <b>Rinsing flow:</b>              | 0.3 l/min, self-controlled, automatically, with optical cleaning on start-up and in the stand-by mode   |
| <b>Sample collection:</b>         | 47 mm PTFE-filter, removable  |
| <b>Laser wavelength:</b>          | 660 nm  |
| <b>Power:</b>                     | $P_{\text{max}} = 40$ mW, $P_{\text{nom}} = 0.5/30$ mW CW (multiplex)   |
| <b>Operation:</b>                 | Via foil-keyboard or PC (Software or HyperTerminal)   |
| <b>LCD-display:</b>               | 2 x 16 alphanumeric characters  |
| <b>Self-test:</b>                 | Automatically after each start-up   |
| <b>Measurement intervals:</b>     | From 6 seconds upwards (for 31 channels or PM values) or 1 second for 15 channels   |
| <b>Storage intervals:</b>         | Adjustable: from 6 seconds to 1 hour in preset intervals  |
| <b>Data storage:</b>              | Internal 80 kB standard, optional on SD-card or USB flash drive   |
| <b>Communication:</b>             | Via PC, USB, Bluetooth, Ethernet and RS-232-interface   |
| <b>Data output:</b>               | LCD-display: PM10, PM2.5, PM1, mean value and collected dust weight, alarm level, date and time, battery capacity, measuring location no., sensor values available optional |
| <b>Analog input:</b>              | 3 (0-10 V) signals, resolution 10 bits (ca. 10 mV) for meteorological sensor(s)   |
| <b>Power supply:</b>              | Battery 12 V/2.3 Ah for continuous operation up to 8 hours with internal charger  |
| <b>Power adapter:</b>             | 18-24 VDC or 95-250 VAC, 47-63 Hz, maximum current 2.5 A  |
| <b>Dimensions:</b>                | 27 x 17 x 5 cm (10.6 x 6.7 x 2.0 inches)  |
| <b>Weight and color:</b>          | 2.1 kg (4.6 lb), green housing  |
| <b>Max. operation altitude:</b>   | Up to 2,000 m   |
| <b>Operating temperature:</b>     | +4 to +40 °Celsius (39 to 104 °F), RH < 95 % (non-condensing), non-corrosive or explosive gases   |
| <b>Storage and transport:</b>     | -20 to +50 °Celsius (-4 to 122 °F), RH < 95 % (non-condensing)  |
| <b>Sample air pressure range:</b> | 1013 hPa +/- 120 hPa<br>If measuring in areas with high or very low over a low air pressure over a longer period of time, the sample air recirculation should be used.      |

### Software

Version 1.178, LabView® for Windows XP upwards (*see next page*)

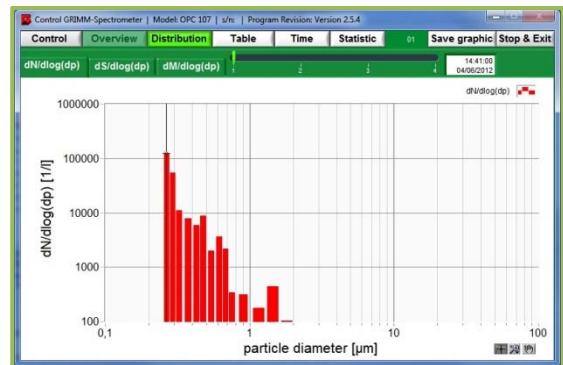
## LabView® Software 1.178

With the new **software 1.178** GRIMM programmed an excellent, user-friendly application software based on LabView®, which is compatible to all 32-/64-bit Windows operating systems from XP and upwards. PM10, PM2.5 and PM1 values are displayed numerically or graphically. Additionally, values of external climatic sensors and service data can be displayed.

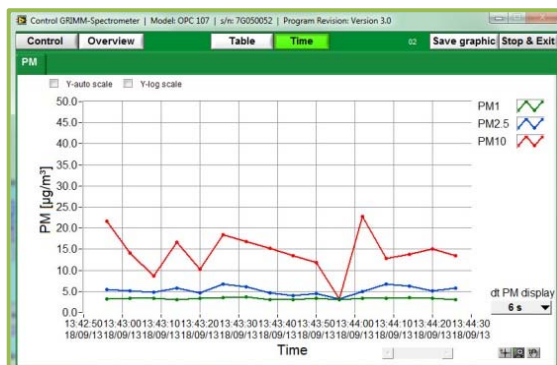
The display and output of measuring data takes place in real-time (every 6 seconds) and is therefore suitable not only for data recording and data evaluation, but also for data presentation.



Page to select the measurement interval



Particle size distribution by number



PM values over time

| date & time         | PM10 | PM2.5 | PM1 |
|---------------------|------|-------|-----|
| 18/09/2013 13:42:56 | 21.6 | 5.5   | 3.2 |
| 18/09/2013 13:43:02 | 14.1 | 5.1   | 3.3 |
| 18/09/2013 13:43:08 | 8.6  | 4.8   | 3.4 |
| 18/09/2013 13:43:14 | 16.8 | 5.7   | 3.1 |
| 18/09/2013 13:43:20 | 10.3 | 4.7   | 3.4 |
| 18/09/2013 13:43:26 | 16.5 | 6.8   | 3.6 |
| 18/09/2013 13:43:32 | 16.9 | 6.1   | 3.7 |
| 18/09/2013 13:43:38 | 15.3 | 4.6   | 3.1 |
| 18/09/2013 13:43:44 | 13.4 | 4.6   | 3.1 |
| 18/09/2013 13:43:50 | 11.8 | 4.5   | 3.3 |
| 18/09/2013 13:43:56 | 3.2  | 3.2   | 3.0 |
| 18/09/2013 13:44:02 | 22.8 | 5.8   | 3.4 |
| 18/09/2013 13:44:08 | 12.8 | 6.8   | 3.4 |
| 18/09/2013 13:44:14 | 13.8 | 6.2   | 3.6 |
| 18/09/2013 13:44:20 | 15.0 | 5.1   | 3.4 |
| 18/09/2013 13:44:26 | 13.4 | 5.8   | 3.8 |
| 18/09/2013 13:44:32 | 15.6 | 5.2   | 3.4 |
| 18/09/2013 13:44:38 | 15.8 | 5.1   | 3.3 |
| 18/09/2013 13:44:44 | 12.9 | 4.9   | 3.3 |

PM values as table

## Accessories

- 1111 Radial symmetrical sample head
- 1112C Power adapter 220/110 V
- 1113A PTFE-filter 47 mm
- 1119 Straight sampling pipe
- 1148 Mini filter for zero test
- 1144B Carrying case
- 1153FH Sensor for temperature and relative humidity



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