

## The Ultimate New Model **11-R** Mini Laser Aerosol Spectrometer (Mini-LAS)



The Mini Laser Aerosol Spectrometer (Mini-LAS) **11-R** 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-R** the **world champion** of all portable fine dust measuring devices.

Because of the high-tech laser optics and the construction of the spectrometer, the **11-R** captures every single particle ranging from 0.25 to 32 µm and classifies it into 31 size channels.

### Customer's benefits

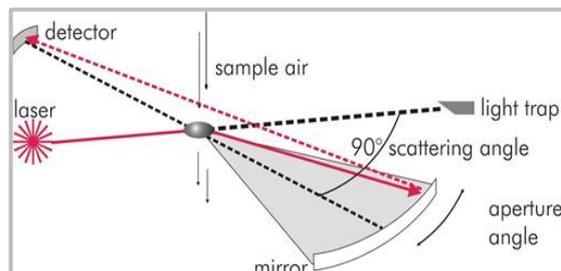
- Small, portable, tough, battery powered and remote controllable via Bluetooth
- Modern data communication interface (SD-card, USB, Bluetooth and Ethernet)
- Integrated, removable 47 mm PTFE-filter for subsequent gravimetric and chemical analysis (dual technology)
- Self-test at each start-up
- Flow and return of the permanent rinsing air for keeping the optical measurement cell clean
- Via software: PM<sub>10</sub>, PM<sub>2.5</sub> and PM<sub>1</sub> values in real-time
- Output of measuring data as particle count and output of dust mass fractions in 31 channels (via software: output of the results for occupational health purposes according to the European standard EN 481)

For the user, the **11-R** offers the complete possibilities when saving or retrieving the measurement data. The measurement data can be conveniently accessed and checked online at the workplace via laptop or tablet.

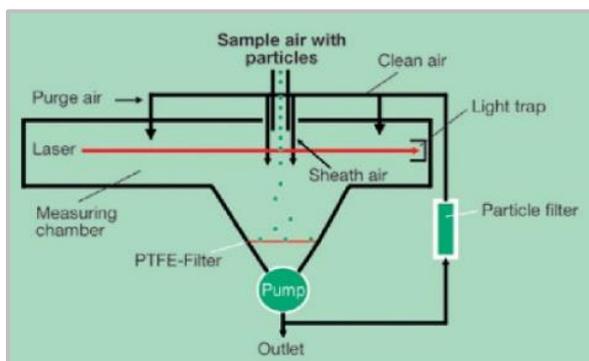
Even accessing the data in real-time per App (Android) is possible. Additionally, the measurement data can be stored on SD-card and/or USB flash drive.

## Instrument operation

GRIMM's more than 30 years of experience in manufacturing 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 ensure 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, with the **11-R** 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 workplace measurements. With the advanced data communication interfaces, the **11-R** offers its users utmost flexibility and mobility.

## Specification Mini-LAS 11-R

### MEASUREMENT DATA

<b>Size channels:</b>	31 channels 0.25/ 0.28/ 0.3/ 0.35/ 0.4/ 0.45/ 0.5/ 0.58/ 0.65/ 0.7/ 0.8/ 1.0/ 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 [µm]
<b>Count range:</b>	1 to 2,000,000 particles/liter
<b>Particle mass:</b>	From 0.1 µg/m <sup>3</sup> to 100 mg/m <sup>3</sup>

Occupational classification: Inhalable, thoracic and alveolic in accordance to EN 481 continuously and simultaneously

Environmental data: PM10 and PM2.5, PM1 continuously and simultaneously

### INSTRUMENT DATA

Reproducibility:	±3 % over the total measuring range
Sample flow:	Measurement volume of 1.2 l/min ±5 % automatically regulated
Rinsing flow:	0.3 l/min, self-controlled, automatically optical cleaning on start-up and in stand-by mode
Return air supply:	With integrated valve for pressure compensation
Sample collection:	47 mm PTFE-filter, removable
Laser wavelength:	660 nm
Power:	P <sub>max</sub> = 60 mW, P <sub>nom</sub> = 0.5/32 mW CW (multiplex)
Operation:	Via foil-keyboard or PC (Software or HyperTerminal)
LCD-display:	2 x 16 alphanumeric characters
Self-test:	Automatically after each start-up
Measurement intervals:	From 6 seconds upwards (for 31 channels) or 1 second for 15 channels
Storage intervals:	Adjustable: from 6 seconds to 1 hour in preset intervals
Data storage:	Internal 80 kB standard, expandable on removable SD-card and USB-stick
Communication:	Via PC, USB, Bluetooth, Ethernet and RS-232-interface
Data output:	LCD-display: dust mass/particle count as moving average over 1 minute or average value with associated sample air volume, alarm level, battery capacity, gravimetric factor, measuring location no., mean value and collected dust weight, date and time, sensor values available optional
Analog input:	3 (0-10 V) signals, resolution 10 bits (ca. 10 mV)
Power supply:	Battery 12 V/2.3 Ah for continuous operation up to 8 hours; with internal charger
Power adapter:	18 VDC, maximum current 2.5 A
Dimensions:	27 x 17 x 5 cm (10.6 x 6.7 x 2.0 inches)
Weight and color:	1.7 kg (3.7 lb) + 0.3 kg (0.7 lb) lead battery, grey housing
Max. operation altitude:	Up to 2,000 m; above adjustable volume flow control via PC
Operating temperature:	+4 to +40 °Celsius (39 to 104 °F), RH < 95 % (non-condensing), non-corrosive or explosive gases
Storage and transport:	-20 to +50 °Celsius (-4 to 122 °F), RH < 95 % (non-condensing)
Sample air pressure range:	1013 hPa - 50 hPa

### SOFTWARE

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

## LabView® Software 1.178

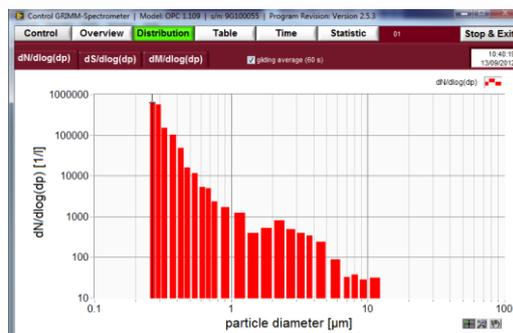
With the new **software 1.178** GRIMM programmed an excellent, user-friendly application software based on LabView®, which is compatible to all 32-/64-bit Windows operating systems from XP and up. Data is displayed numerically or graphically as follows:

- Mass fraction in all channels as  $\mu\text{g}/\text{m}^3$  and at the same time the occupational health data in  $\mu\text{g}/\text{m}^3$  (in conformity with EN 481)
- Particle count concentration in all channels as particle/liter
- Presentation of immission as PM10, PM2.5, PM1 (not mass specific)

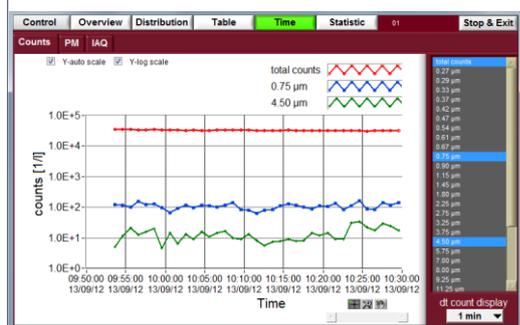
In addition to that, values of external climate sensors and service data of GRIMM devices can be displayed. The presentation and output of the measurement data happens in real-time (6 second intervals) and is therefore suitable not only for data recording and data evaluation, but also for data presentation.



Real time data per size channel



Particle count distribution by size



Particle counts (selectable size channels) over time



counts [1/l]	mass [ $\mu\text{g}/\text{m}^3$ ]	log	auto scrolling
32900.0	17200.0	10400.0	8700.0
28400.0	15300.0	9650.0	4750.0
32500.0	15650.0	9700.0	5600.0
34500.0	16400.0	9350.0	5800.0
29100.0	17300.0	10100.0	5700.0
31800.0	16800.0	8950.0	6200.0
31750.0	17550.0	8850.0	5600.0
30950.0	16400.0	9800.0	4400.0
30950.0	16650.0	11000.0	5500.0
32100.0	18800.0	11250.0	5700.0
31600.0	17800.0	10000.0	5400.0
31900.0	16800.0	10400.0	5600.0
32900.0	17750.0	8200.0	6200.0
30850.0	17800.0	10800.0	5500.0
31750.0	16550.0	8500.0	2750.0
30900.0	16300.0	8750.0	5600.0
31150.0	10100.0	8600.0	2100.0
30950.0	16700.0	10650.0	6300.0
33150.0	17300.0	10450.0	6400.0
32550.0	15300.0	9800.0	6300.0
31750.0	16200.0	8700.0	4400.0
28400.0	17300.0	9650.0	2950.0

Particle count distribution as table

## Accessories

- 1111 Radial symmetric sampling head
- 1112C Mains adapter/ Battery charger for 220/110 V
- 1113A PTFE-filter (25 pcs.)
- 1119 Straight sampling tube, 3 cm long
- 1141A Special GRIMM communication cable RS-232 to USB (with lager buffer)
- 1143E Special GRIMM communication cable RS-232 to RS-232
- 1144B PVC carrying case with rigid foamed plastic insert
- 1148 Mini filter for 0-Test
- 1153FH Sensor for temperature and rel. humidity, temperature range -25 to +55 °C, cable length 1.5 m
- 1154 Sensor for temperature, rel. humidity and velocity, temperature range 0 to +80 °C, cable length 3.0 m

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