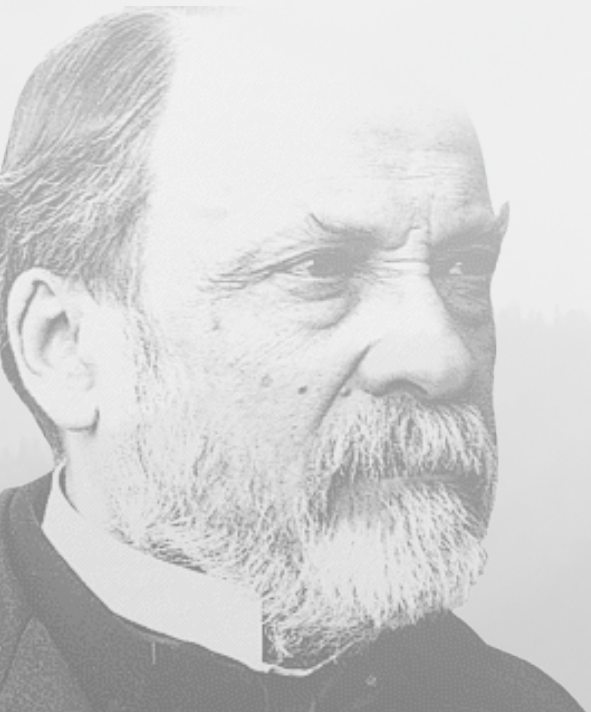
GRIMM AEROSOL TECHNIK

2021

THE CATALOG



"The role of the infinitely small in nature is infinitely great." - Louis Pasteur -

EXPLORE THE WORLD OF AEROSOLS

...with the products in this catalog.

GRIMM provides you with precision instrumentation for your applications in research, federally regulated monitoring, health & safety studies and many more, you name it.

table of contents

CONDENSATION PARTICLE COUNTERS FOR NANOPARTICLES

CPC 5410 5412 5416 5417 5420 5421

With the CPC lineup of models 5410 to 5421, GRIMM establishes a new standard for Condensation Particle Counters. The detection head enables single particle counting for concentrations up to 150 000 p/cm³; moreover, it features improved detection efficiency and response time. These models are optimized for stationary use in any indoor or outdoor application.

All models feature the well-established condensate removal pump and anti-spill saturator design. In addition, a novel saturator shutter enables transport of the CPC without the need for removing or drying the saturator.

We offer models with or without rugged internal pumps (the pumps fully meet the demands of continuous long-term measurements) and with or without a built-in DMA controller. The photometric mode for high concentrations (up to 10^7 p/cm³) is integrated in all models.

The CPCs can be combined with a GRIMM DMA for measurements of particle size distributions (see data-sheet for the Scanning Mobility Particle Sizer, SMPS+C) Furthermore, a GRIMM Optical Particle Counter can be combined with an SMPS+C system for expansion to a Wide Range Aerosol Spectrometer (WRAS) that measures particle size distributions with an upper particle size limit of 32 µm.

The CPC line also includes 19“ rack versions. GRIMM also offers mini-containers with additional meteorological sensors and online data transfer via mobile network - ideal for unattended long-term measurements at remote sites.

FEATURES

- six models optimized for laboratory and long-term use
- improved detection limit with D_{50} = 4.0nm determined with tungsten oxide particles
- single particle counting up to 150 000 p/cm³
- tolerant to high ambient temperatures (40°C)
- improved response time with t_{90} < 3 seconds
- pre-configured software on a netbook
- analog input for optional meteorological sensors
- comprehensive self-tests for high reliability

APPLICATIONS

- fundamental aerosol research
- filter testing
- environmental and climatic studies
- nanotechnology process monitoring
- printer emission studies
- inhalation and exposure studies
- workplace monitoring

CPC | SMPS+C | WRAS | n - butanol | real - time

TECHNICAL DATA

SPECIFICATIONS

	5410	5412	5416	5417	5420	5421
	basic CPC	standard CPC	high-end CPC SMPS option	high-end CPC PSMPS option	high-end CPC 19" rack version	standard CPC 19" rack version
max. conc. (p/cm³) single count mode (p/cm³) photometric mode	100 000 10^7	100 000 10^7	150 000 10^7	150 000 10^7	150 000 10^7	150 000 10^7
sample flow rate [L/min]	0.6	0.6	0.3	0.3 / 0.6	0.3	0.3
SMPS option	-	-	yes	yes	yes	-
internal pump(s)	-	yes	yes	yes	yes	yes
LCD display	yes	yes	-	-	yes	yes
size (h x w x d) (cm)	23 x 25 x 29	23 x 25 x 29	40 x 25 x 29	40 x 25 x 29	19", 22 x 48 x 41	19", 22 x 48 x 41
weight (kg)	8.9	8.9	12.4	12.4	16.2	16.2

particle detection system

particle size range	4.0 nm (D_{50} determined with tungsten oxide particles) to greater than 3 µm; adjustable to 7.0 nm for compliance with the standard CEN/TS 16976 : 2016 for determination of particle number concentration of atmospheric aerosols
concentration accuracy	>95% for single particle counting (up to 100 000 p/cm³ at 0.6 L/min, up to 150 000 p/cm³ at 0.3 L/min 10% for optional photometric mode (up to 10^7 p/cm³ at specified conditions)
rise time t_{10}- t_{90}	< 3 s

air flow system

flow rate sample air	0.6 L/min for CPC 5410 and 5412 0.3 L/min for CPC 5416, 5420, and 5421
flow rate sheath air	3.0 L/min for CPC 5416 and 5420 3.0 and 10.0 L/min for CPC 5417
flow control	critical orifice with stabilized temperature; constant volume flow independent from ambient conditions
aerosol carrier gas	air and inert gases
working fluid	n-butanol (n-butyl alcohol)
condensate removal	continuously drained with micropump

FUNCTION

connectivity	USB, RS-232, analog pulse out
data recording	directly on PC (GRIMM 5475 nanoSoftware for Counters), optionally on USB stick
status indication	four multicolor LEDs for CPC functions and three multicolor LEDs for SMPS functions
analog input	port for optional analog meteorological sensors; plug and play

HANDLING

ambient temperature	10 to 40°C (50 to 104°F)
ambient humidity	0 to 95% RH; non-condensing
absolute pressure range	500 - 1100 mbar
power supply	100 - 240 VAC, 50 - 60 Hz
power consumption	40 W standard operation, 30 W standby, 80 W warm-up

SCANNING MOBILITY PARTCLE SIZER WITH CONDENSATION PARTICLE COUNTER SMPS+C 5416 5420 DMA

The GRIMM SMPS+C systems feature the Vienna-type DMA design (Winklmayr et al., 1991; Reischl et al., 1997), well known for highest size resolution and minimal particle diffusional losses, even for the smallest particles.

The SMPS+C systems, based on the GRIMM 5416 and 19" rack-mount 5420 CPC, operate at an aerosol inlet flow rate of 0.3 L/min and a sheath flow rate of 3 L/min. For the SMPS+C, the design of the GRIMM Vienna-type DMA offers flexibility with two electrodes of different lengths to accommodate different measuring ranges for a variety of experimental needs.

To expand the measured size range, the GRIMM SMPS+C can be combined with a GRIMM Optical Particle Counter to create a Wide Range Aerosol Spectrometer (WRAS) which measures particle size distributions up to 35 µm.

FEATURES

- particle size distribution from 5 – 1094 nm
- two Vienna-type DMAs
- sample flow rate = 0.3 L/min
- sheath flow rate = 3 L/min
- rugged, compact and reliable
- fully automated use with GRIMM software
- analog input for optional meteorological sensors
- anti-spill CPC saturator design
- comprehensive self-test for highest reliability

APPLICATIONS

- fundamental aerosol research
- environmental and climate studies
- nanotechnology process monitoring
- printer emission studies
- inhalation and exposure studies
- studies on atmospheric nucleation
- studies on nanoparticle growth, coagulation and transport
- engine exhaust studies
- mobile aerosol studies
- workplace monitoring

SMPS+C	M-DMA 5 - 350 nm	L-DMA 10 - 1094 nm	AM-241, aDBD soft X-ray	real - time

TECHNICAL DATA

SPECIFICATIONS

detector type	condensation particle counter (CPC)
working fluid	n-butanol (n-butyl alcohol)
max. concentration single count mode	150 000 p/cm^3
max. concentration photometric mode	10^7 p/cm^3
reproducibility	> 95% for single count mode > 90% for photometric mode
response time t_{10}- t_{90}	< 3 s
size range	5 – 350 nm (M-DMA); 10 – 1094 nm (L-DMA)
size resolution	stepping mode: 45 - 255 channels scanning mode: 64 channels per decade; logarithmic spacing

FUNCTION

DMA dimensions	R_i = 13 mm, R_o = 20 mm; L= 88 mm (M) or 350 mm (L)
output HV module	5 – 10 000 V positive polarity; negative polarity on request
internal pump	yes
sample flow rate	0.3 L/min
sheath flow rate	3 L/min
port for external sensors	yes

HANDLING

ambient temperature	10 – 40°C (50 – 104°F)
ambient humidity	0 – 95% RH, non-condensing
absolute pressure range	600 – 1100 mbar at full voltage range
power supply	100 – 240 VAC, 50 – 60 Hz
power consumption	40 W standard operation, 30 W standby, 80 W warm-up
connectivity	USB, RS-232, analog pulse out
dimensions DMA (h x w x d)	M–DMA: 23.4 x 14 x 15.6 cm (9.2 x 5.5 x 6.1 in) L–DMA: 47.8 x 14 x 15.6 cm (18.8 x 5.5 x 6.1 in)
weight DMA	M–DMA: 5.7 kg (12.6 lbs); L–DMA: 7.9 kg (17.3 lbs)
dimensions CPC (h x w x d)	40 x 25 x 29 cm (15.7 x 9.8 x 11.4 in)
weight CPC	12.4 kg (27.3 lbs)

NANO MOBILITY PARTICLE SIZE SPECTROMETER
PSMPS SMPS + C Airmodus PSM

The PSMPS is a mobility particle size spectrometer that combines a Grimm SMPS+C system with the Airmodus Particle Size Magnifier (PSM). This combination allows accessing the 1 nm particle size range and offers the metrological coverage of the sub 2 nm size range that is indispensable for understanding the basic mechanisms of the highly dynamic processes of particle formation.

In studies on aerosol particle nucleation, the measurement of aerosol number size distributions starting from the sub 2 nm size range is crucial in order to understand the basic mechanisms of new particle formation (NPF) as well as the formation rate and growth rate of the particles (e.g. Kulmala et al., 20131). Particle nucleation processes are important in the atmosphere where they affect the formation of clouds and the radiative forcing but also in combustion related studies (e.g. the emissions of vehicle engines) and in material sciences (e.g. the synthesis of nano-particles).

FEATURES

- measuring number size distribution starting at 1.1nm
- combination of GRIMM SMPS+C with Airmodus PSM
- Airmodus PSM allowing expansion of SMPS+C measurement range to the smallest nanoparticles and clusters
- two-stage (DEG and n-butanol) CPC setup
- updated GRIMM DMAs with optimized nanoparticle transmission
- scanning, stepping and single channel mode of DMA
- usable with various aerosol neutralizers
- compact, all in one solution
- fully user configurable settings in our software

APPLICATIONS

- fundamental aerosol research
- nanotechnology process monitoring
- studies on atmospheric nucleation
- studies on nanoparticle growth, coagulation and transport
- ... and many more various nanoparticle applications

SMPS+C	PSM	S-DMA 1.1 - 55 nm	M-DMA 2.8 - 155 nm	real - time

TECHNICAL DATA

Airmodus Particle Size Magnifier (PSM-A10): first stage of particle detection

working fluid	diethylene glycol
50 % particle size cut-off	adjustable 1.3 - 3.5 nm (determined with Nickel Chromium particles)
sample flow rate (Q_{PSM})	2.5 L/min
external vacuum requirement	100 - 350 mbar at NTP
external compressed air requirement	1.5 - 2.5 bar at NTP; free of particles, oil and water
power requirements	100 - 240 VAC; 50/60 Hz; max. 280 W
connectivity	USB, RS-232
PSM size (h x w x d)	29 x 45 x 46.5 cm (11.4 x 17.7 x 18.3 in)
PSM weight	17.0 kg (37.5 lbs)

GRIMM 5417 CPC: second stage of particle detection

working fluid	n-butanol
50% particle size cut-off	4.0 nm (determined with tungsten oxide particles)
sample flow rate (Q_{CPC})	0.3 or 0.6 L/min
sheath air flow rate (Q_{sh})	3.0 or 10.0 L/min
internal pumps	yes
particle concentration range	single count mode: up to 150 000 p/cm^3 photometric mode: up to 10^7 p/cm^3
response time t_{10}–t_{90}	< 3 s
power requirements	90 -264 VAC; 47 - 63 Hz; 80 -130 W
connectivity	USB, RS-232, analog pulse out
GRIMM 5417 size (h x w x d)	40 x 25 x 29 cm (15.7 x 9.8 x 11.4 inch)
GRIMM 5417 weight	12.4 kg (27.3 lbs)

Classifier

DMA	GRIMM Vienna type S-DMA or M-DMA
particle size ranges	1.1 - 55 nm@10 L/min Q_{sh} 2.8 - 155 nm@10 L/min Q_{sh}
particle size resolution	stepping mode: 45 - 255 channels scanning mode: 64 channels per decade; logarithmic spacing

PSMPS handling

data output	particle number size distribution (dN/dlogD)
sample humidity	0 – 95% RH, non-condensing
absolute pressure range	600 - 1050 mbar
operating temperature	15 - 30 °C (59 - 86 °F)
operating humidity	0 - 95 % RH, non-condensing

SCANNING MOBILITY PARTICLE SIZER WITH FARADAY CUP ELECTROMETER

SMPS+E 5705 5706 DMA

The GRIMM SMPS+E systems feature the Vienna-type DMA design (Winklmayr et al., 1991; Reischl et al., 1997), well known for the highest size resolution and minimal particle diffusional losses – even for the smallest particles – with the Faraday Cup Electrometer (FCE) as a detector.

The SMPS+E systems include the GRIMM 5706 DMA controller with the GRIMM 5705 fast, low-noise FCE and can be operated at aerosol inlet flow rates of 1 – 5 L/min and sheath flow rates of 3 – 20 L/min.

For the SMPS+E, the design of the GRIMM Vienna-type DMA offers flexibility with three electrodes of different lengths to accommodate different measuring ranges for a variety of experimental needs. GRIMM's unique FCE design applies a rinsing air flow around the insulator of the Faraday Cup to minimize effects of leakage currents due to internal particle contamination.

The instrument is optimized to reduce the effects of mechanical shocks and pressure differences, enabling the SMPS+E as a reference instrument for the calibration of nanoparticle counters.

FEATURES

- particle size distribution from 0.8 – 1094 nm
- three Vienna-type DMAs
- sample flow rate = 1 – 5 L/min
- sheath flow rate = 3 – 20 L/min
- rugged, compact and reliable
- fully automated use with GRIMM software
- analog input for optional meteorological sensors
- data sampling rate up to 16 Hz
- no consumables
- operates with air and inert gases
- comprehensive self-test for highest reliability

APPLICATIONS

- fundamental aerosol research
- filter testing
- environmental and climate studies
- nanotechnology process monitoring
- printer emission studies
- inhalation and exposure studies
- studies on atmospheric nucleation
- studies on nanoparticle growth, coagulation and transport
- engine exhaust studies
- mobile aerosol studies
- workplace monitoring

SMPS+E	3 DMAs S, M, L	L-DMA 10 - 1094 nm	SI traceable reference	16 Hz

TECHNICAL DATA

SPECIFICATIONS

detector type	Faraday Cup Electrometer (FCE)
sensitivity	0.1 fA at 1 Hz
noise	0.35 fA
maximum current	± 4000 fA
maximum particle concentration	10^8 p/cm^3
response time t_{10}– t_{90}	200 ms
feedback resistor	1 TΩ
size range	0.8 – 1094 nm (depending on sheath flow rate; 0.8 – 53 nm (S–DMA); 5 – 350 nm (M–DMA); 10 – 1094 nm (L–DMA)
size resolution	stepping mode: 45 – 255 channels scanning mode: 64 channels per decade; logarithmic spacing

FUNCTION

DMA dimensions	R_i = 13 mm, R_o = 20 mm; L = 15 (S) or 88 mm (M) or 350 mm (L)
output HV module	5 – 10 000 V positive polarity; negative polarity on request
sample flow rate	1 – 5 L/min
sheath flow rate	3 – 20 L/min
rinsing air flow rate	0.6 L/min
port for external sensors	yes

HANDLING

ambient temperature	0 – 40°C (32 – 104°F)
ambient humidity	0 – 95% RH, non-condensing
absolute pressure range	600 – 1100 mbar
power supply	230V/50Hz; optional 110V/60Hz
connectivity	USB, RS-232
dimensions DMA (h x w x d)	S–DMA: 16.1 x 14 x 15.6 cm (6.3 x 5.5 x 6.1 in) M–DMA: 23.4 x 14 x 15.6 cm (9.2 x 5.5 x 6.1 in) L–DMA: 47.8 x 14 x 15.6 cm (18.8 x 5.5 x 6.1 in)
weight DMA	S–DMA: 5.6 kg (12.2 lbs); M-DMA: 5.7 kg (12.6 lbs); L–DMA: 7.9 kg (17.3 lbs)
dimensions FCE (h x w x d)	19 x 9 x 9 cm (7.5 x 3.5 x 3.5 in)
weight FCE	1.36 kg (3.0 lbs)
dimensions DMA controller (h x w x d)	31 x 25.5 x 22 cm (12.2 x 10.0 x 8.7 in)
weight DMA controller	12.2 kg (26.9 lbs)

INDOOR WIDE RANGE AEROSOL SPECTROMETER
WRAS SMPS+C & 11-D

The Indoor Wide Range Aerosol Spectrometer combines two technologies for particle counting and classifying: a Scanning Mobility Particle Sizer with a butanol condensation particle counter for nanoparticles (SMPS+C) and a portable optical aerosol spectrometer (11-D) for dust particles.

The system can be used for accurate, high-resolution measurements of the entire particle size range from 5 nm to 35 µm with 31 logarithmic equidistant size channels for the 11-D and a user-selectable number of channels for the SMPS+C (e. g. 64 per decade).

The system is easy to operate and suitable for all kinds of aerosol research.

FEATURES

- real-time monitoring of a wide particle size range
- high precision with CPC and OPC at both low and high concentrations
- excellent counting statistics and reproducibility
- low diffusion losses
- self-test of all optical and pneumatic components for high quality standards
- instrument parameters secured against data loss

APPLICATIONS

- monitoring of ultrafine particles and dust
- aerosol science
- workplace monitoring

SMPS+C	11-D	5478 software	5 nm - 35 µm	real - time

TECHNICAL DATA

SPECIFICATIONS

SMPS+C

measurement principle	electrostatic classification with subsequent detection by condensational growth
particle size range	selectable M–DMA (5 – 350 nm) or L–DMA (10 – 1094 nm)
minimum scan time	150 s
max concentration single count mode	150 000 p/cm^3
max concentration photometric mode	10^7 p/cm^3
reproducibility	> 95% for single particle count mode
working fluid	n-butanol (n-butyl alcohol)

11-D optical aerosol spectrometer

measurement principle	light scattering of single particles; aerodynamically focused detection volume, no border zone error
particle size range	0.253 µm - 35.15 µm
concentration range	1 – 5 300 000 p/L
reproducibility	98.2% for 0.3 µm, 99,5% for 0.5 µm, 91.8% for 1.0 µm, 91.0% for 5 µm, meets ISO 21501-1

FUNCTION

sample air flow rate	0.3 L/min CPC, flow control with critical orifice, temperature stabilized 1.2 L/min aerosol spectrometer, ± 3% constant due to self-regulation

HANDLING

operation	Wide Range Aerosol Spectrometer Software 5478 for online data presentation
connectivity	SMPS+C :USB, RS-232, analog pulse out 11-D: Ethernet, USB, RS-232, Bluetooth, USB flash drive
power supply	SMPS+C: 90 -264 VAC; 47 - 63 Hz; 80 -130 W 11-D: 100 – 240 VAC, 47 – 60 Hz; out: 13 VDC
temperature range	10 to +35°C (50 to 95°F), RH < 95%
pressure range	SMPS+C: 600 – 1100 mbar 11-D: 530 - 1100 mbar; flow rate automatically adjustable to pressure

PARTICLE COUNTERS FOR AUTOMOTIVE EMISSION MEASUREMENTS

PMP-CPC 5430 5431

The GRIMM 5430 and 5431 are high-accuracy stationary particle counters for automotive emission measurements, featuring an improved response time (t_{10}– t_{90}< 3 s) and an aerosol inlet flow rate of 0.6 L/min.

The instruments comply with the GPRE particle measurement program (PMP) for Euro 5 and 6 regulation 83. The new detection head enables single particle counting up to 50 000 p/cm³ with a coincidence correction <10% for up to 23 000 p/cm³. The model 5431 is equipped with an internal sample pump.

As with all GRIMM CPC models, the 5430 and 5431 feature the well-established condensate removal and anti-spill saturator design with an integrated saturator shutter, enabling the transport of the CPC without removing or drying the saturator.

FEATURES

- compact and rugged counter for automotive emission measurements
- aerosol flow rate = 0.6 L/min (with external pump)
- single particle counting up to 50 000 p/cm³
- coincidence correction <10% up to 23 000 p/cm³
- linearity $R^2 \geq 0.98$ for 1 – 23 000 p/cm³
- improved response time with $t_{10} - t_{90} < 3$ s
- counting efficiency within 50 ± 12% at 23 nm and ≥ 90% at 41 nm
- anti-spill saturator design
- operates with air and inert gases
- continuous condensate removal
- comprehensive self-test for maximum reliability

APPLICATIONS

- engine emissions for Euro 5 and 6 certifications
- testing of diesel particulate filters
- particle counter in dilution systems
- 1 Hz resolution for number concentration measurement in driving cycles

CPC | 23 nm | PMP | EURO 5 and 6 | real - time

TECHNICAL DATA

SPECIFICATIONS

working fluid	n-butanol (n-butyl alcohol)
concentration range	0 – 23 000 p/cm^3 single particle counting
coincidence correction	< 10%
concentration linearity	$R^2 \geq 0.98$
concentration accuracy	≤ 10%
response time $t_{10} - t_{90}$	< 3 s
counting efficiency at 23 nm	50 ± 12%, independent of altitude above sea level
counting efficiency at 41 nm	≥ 90%, independent of altitude above sea level
false background counts	< 0.001 p/cm^3
readability	0.1 p/cm^3

FUNCTION

internal pump	available in model 5431
sample flow rate	0.6 L/min
flow control	temperature stabilized critical orifice

HANDLING

ambient temperature	10 – 40°C (50 – 104°F)
ambient humidity	0 – 95% RH, non-condensing
absolute pressure range	500 – 1100 mbar
power supply	100 – 240 VAC, 50 – 60 Hz
power consumption	40 W standard operation, 30 W standby, 80 W warm-up
connectivity	USB, RS-232, analog pulse out
dimensions (h x w x d)	22.6 x 25.4 x 22.3 cm (8.9 x 10.0 x 8.8 in)
weight	8.9 kg (19.6 lbs)

MINI WIDE RANGE AEROSOL SPECTROMETER
MiniWRAS 1371

The miniature Wide Range Aerosol Spectrometer (MiniWRAS) is the only portable instrument on the market that allows simultaneous and real-time monitoring of both micro- and nanoparticles.

Designed and specifically built for indoor air quality monitoring, the MiniWRAS is a fit for purpose, state-of-the-art system that combines optical and electrical particle detection in one instrument.

The MiniWRAS features an ultra-wide particle size range from 10 nm - 35 µm with 41 high resolution particle size channels and the simultaneous measurement of pm_{10}, $pm_{2.5}$ and pm_1 with remote instrument control and wireless data transmission.

This portable and ready-to-use instrument can be flexibly deployed for various indoor air quality monitoring projects.

FEATURES

- ultra-wide size range from 10 nm to 35 µm
- pm_{10}, $pm_{2.5}$, pm_1 and particle size distribution, particle surface and dust mass
- high precision over 41 equidistant channels
- no consumables
- non-radioactive particle charger
- versatile data acquisition and communication interfaces (Bluetooth, USB, RS-232)
- easy to use with GRIMM software
- optional sensor for temperature and relative humidity
- self-test of all optical and pneumatic components for high quality standards
- rinsing air for protecting laser and detector in optical cell

APPLICATIONS

- nanoparticle and PM monitoring
- Indoor Air Quality (IAQ) in buildings
- IAQ in vehicles, airplane cabins, cockpits, busses, trains
- nanoparticle source identification
- workplace monitoring
- R&D testing in industry

nano	pm_{10} $pm_{2.5}$ pm_1	10 nm - 35 µm	IAQ	real - time

TECHNICAL DATA

SPECIFICATIONS

measured parameters	dust fractions acc. to EN 481 (inhalable, thoracic, respirable) pm_{10}, $pm_{2.5}$, pm_{1}, number concentration and size distribution
dust mass	0 – 100 000 µg/m³
particle size range	10 nm – 35 µm (10 – 193 nm electrical, 0.253 – 35 µm optical)
size channels	41 (10 electrical and 31 optical)
particle number	3 000 – 500 000 p/cm³ (electrical) 1 – 5 300 000 p/L (optical)
reproducibility	98.2% for 0.3 µm, 99,5% for 0.5 µm, 91.8% for 1.0 µm, 91.0% for 5µm, meets ISO 21501-1

FUNCTION

detection principle optical	light scattering of single particles with diode laser; aerodynamically focused detection volume, no border zone error
detector	fast signal processing with 2 µs pulse length, 2 x 16 raw data channels
time resolution	6 s, 31 channels (storage interval 1 min)
detection principle electrical	electrical mobility spectrometer with Faraday Cup Electrometer
detector sensitivity	0.25 fA
time resolution	60 s, 10 channels 6 s each (storage interval 1 min)
volume flow	1.2 L/min, ± 3% constant due to self-regulation
internal rinsing air flow rate	0.4 L/min, protects laser optics, reference air for self-test

HANDLING

operation	GRIMM MiniWRAS software (wireless or data cable)
connectivity	Bluetooth, USB, RS-232
analog input	external sensor for temperature and relative humidity
power supply	in: 100 – 240 VAC, 47 – 63 Hz, out: 18 VDC, 2.5 A
battery	Li-Ion battery, 14.4 VDC, 6.5 Ah for 10 h operation
dimensions (h x w x d)	34 x 31 x 12 cm (13.4 x 12.2 x 4.7 in)
weight	7.6 kg (16.8 lbs)
operating conditions	+4 to +40°C (39 - 104°F), RH < 95%, non-condensing

PORTABLE AEROSOL SPECTROMETER
DUST DECODER 11-D

The model 11-D, in its compact and rugged design, combines all advantages of the previous portable GRIMM aerosol spectrometers with improved optical detection, long-term battery operation, and effortless handling.

This configuration positions the 11-D as a leader of portable aerosol spectrometers for monitoring inhalable, thoracic and respirable dust, PM values, and particle number concentration.

The 11-D is the optimal solution for reliable, flexible real-time measurements for aerosol research and indoor air quality, e.g. at workplaces, in vehicle interiors, or for process analysis.

FEATURES

- real-time monitoring of particle number, occupational dust mass fractions and PM values
- additional information on particle number, particle surface, and dust mass distribution
- 31 equidistant size channels, PSL traceable particle distribution
- integrated 47 mm PTFE filter (GRIMM dual technology)
- versatile data acquisition and communication interfaces (Bluetooth, USB, Ethernet, RS-232)
- rinsing air for protecting laser and detector in optical cell
- internal sensor for temperature (T) and relative humidity (RH) in optical cell
- total inlet flow (1.2 L/min) analyzed in optical cell
- self-test of all optical and pneumatic components for high quality standards

APPLICATIONS

- aerosol science
- $PM_{2.5}$ in indoor environments according to VDI 4300, part 11
- Indoor Air Quality (IAQ) in buildings and vehicles
- industrial process control
- workplace monitoring (inhalable, thoracic, respirable) according to EN 481
- monitoring of Permissible Exposure Limit (PEL) with high time resolution
- dust pollution measurements

inhalable
thoracic
respirable

TSP PM_{10} PM_4
$PM_{2.5}$ PM_1 PM_{coarse}

counts & mass

0.253 - 35.15µm

real - time
portable

TECHNICAL DATA

SPECIFICATIONS

measured parameters	TSP, PM_{10}, PM_4, $PM_{2.5}$, PM_1, and PM $_{coarse,}$ Total Counts inhalable, thoracic, respirable pm_{10}, $pm_{2.5}$, pm_1 number concentration and size distribution
dust mass	0 µg/m³ … 100 mg/m³
particle size range	0.253 – 35.15 µm
size channels	31, equidistant
particle number	1 – 5 300 000 p/L, diluter available for higher concentrations
reproducibility	98.2% for 0.3 µm, 99,5% for 0.5 µm, 91.8% for 1.0 µm, 91.0% for 5 µm, meets ISO 21501-1

FUNCTION

detection principle	light scattering of single particles with diode laser; aerodynamically focused detection volume , no border zone error
detector	fast signal processing, 2 x 16 raw data channels
time resolution	6 s, 31 channels (selectable storage intervals 6 s, 1, 5, 10, 15, 30 min, 1 h) 1 s, 16 channels (two selectable size intervals below or above 2.989 µm)
volume flow rate	1.2 L/min, ± 3% constant due to self-regulation, according to ISO 21501-1; automatic altitude correction up to 5000 m
rinsing air	0.4 L/min, protects laser optics, reference air for self-test
gravimetric control	47 mm PTFE filter

HANDLING

data interfaces	Ethernet, USB (Type-B), RS-232, Bluetooth, USB flash drive
power supply	in: 100 – 240 VAC, 47 – 60 Hz, out: 13 VDC, 2.5 A
power input	5.4 W
battery	Li-Ion battery, 10.8 V, 6.8 Ah for minimum 10 h operation recharge: 3 h with desktop smart quick charger
operating conditions	0 to +40°C (32 - 104°F), RH < 95%, non-condensing, non-corrosive, or explosive gases
transport and storage	-20 to +50°C (-4 – 122°F), RH < 95%
dimensions (h x w x d)	28.2 x 12.4 x 6.7 cm (11.1 x 4.9 x 2.6 inch)
weight	1.6 kg (3.5 lbs), Li-Ion battery 0.33 kg (0.7 lbs)
accessories	1146 GPS sensor 1152 Isokinetic sampling probe for 4 - 25 m/s 1158 TRH External sensor for temperature and relative humidity 1159-10, 1159-100 capillary diluter (1:10 or 1:100)

STAND-ALONE ENVIRONMENTAL DUST MONITOR
EDM 264

The EDM264, in its compact and mobile weatherproof housing, is suitable for both short and long-term mobile measurements in outdoor areas and at production sites.

The Model EDM264 features a powerful and robust measuring cell based on optical particle counting (OPC) technology .

The system is equipped with a heated sampling inlet, sigma 2head, a data-logger and meteorological sensor.

The EDM264 provides all fine dust fractions for ambient air measurements: TSP, PM_{10}, PM_4, $PM_{2.5}$, PM_1, PM_{coarse}, calculated with GRIMM's proven enviro-algorithm, as well as six additional dust mass fractions: pm_{10}, $pm_{2.5}$, pm_1, inhalable, thoracic and respirable for IAQ and workplace measurements.

This versatile instrument performs real-time monitoring of particle number and particle size and provides information on particle surface distribution and dust mass distribution.

FEATURES

- unique measurement range in one device
  TSP, PM_{10}, PM_4, $PM_{2.5}$, PM_1, PM_{coarse} and Total Counts
  inhalable, thoracic, respirable, pm_{10}, $pm_{2.5}$ and pm_1
- high precision with 31 equidistant size channels
  PSL traceable particle size distribution
- versatile data acquisition and communication (high-class data logger, WLAN, LTE, remote access and real-time data analysis)
- rinsing air for protecting laser and detector for long-term stability and very low zero drift
- meteorological sensors for P, T, RH, wind speed, wind direction, and precipitation
- GPS position for high spatial and temporal resolution
- aerodynamic aerosol focusing
  total inlet flow volume (1.2 L/min) entirely analyzed in optical cell
- low maintenance

APPLICATIONS

- mobile PM monitoring
- fence-line monitoring
- construction site monitoring
- source apportionment
- early warning system for forest fires

inhalable
thoracic
respirable

TSP PM_{10} PM_4
$PM_{2.5}$ PM_1 PM_{coarse}

counts & mass

0.253 – 35.15 µm

real - time
stand-alone

TECHNICAL DATA

SPECIFICATIONS

measured parameters	TSP, PM_{10}, PM_4, $PM_{2.5}$, PM_1, PM_{Coarse} and Total Counts inhalable, thoracic, respirable, pm_{10}, $pm_{2.5}$ and pm_1 number concentration and size distribution GPS position, meteorological data
particle size range	0.253 – 35.15 µm
size channels	31, equidistant
particle number	1 – 5 300 000 p/L
dust mass	0 µg/m³ – 100 mg/m³
reproducibility	98.2% for 0.3 µm, 99,5% for 0.5µm, 91.8% for 1.0 µm, 91.0% for 5µm, meets ISO 21501-1

FUNCTION

detection principle	light scattering of single particle with diode laser aerodynamically focused detection volume , no border zone error
detector	fast signal processing, 2 x 16 raw data channels
time resolution	selectable storage intervals 6 s; 1, 5, 10, 15, 30, 60 min
sample flow rate	1.2 L/min, ± 3% constant due to self-regulation according to ISO 21501-1, automatic altitude correction up to 5000 m
rinsing air	0.4 L/min, protects laser optics, reference air for self-test
sampling probe (standard)	µ-Sigma-2 inlet and heated sampling pipe

HANDLING

data interfaces	Pro-Version: Data logger, WLAN, LTE ; USB (type B), Ethernet (TCP-IP), USB-flash drive with GRIMM software Eco-Version: USB (type B), Ethernet (TCP-IP), USB-flash drive with GRIMM software
power supply	100 - 240 VAC, 50 - 60Hz, 2.6 A or 12 VDC, 12.5 A, e.g. via solar panel
power input	P_{max} = 120 W
temperature range	-20 to +40°C (-4 to 104 °F), RH < 99%, non-condensing
pressure range	533 - 1133 mbar
dimensions (h x w x d)	housing only: 44 x 45 x 21 cm (17.3 x 17.7 x 8.3 in) with meteo sensor and sampling probe: 73 x 51 x 23 cm (28.7 x 20.0 x 9.1 in)
weight	housing only: 10 kg (22.0 lbs) with meteo sensor and sampling probe: 15 kg (33.1 lbs)
accessories	configurable meteorological sensors: 157L for temperature, relative humidity, barometric pressure 158L plus wind speed and wind direction 159L plus precipitation high-class data logger to upgrade Eco-Version interchangeable sampling probe with catalytic stripper for SVC removal

ENVIRONMENTAL DUST MONITOR FOR APPROVED PM MEASUREMENTS EDM 180

The GRIMM EDM180 is the leading Automated Measuring System (AMS) for measuring particulate matter concentration (PM_{10}, $PM_{2.5}$) in ambient air.

This system offers outstanding features such as simultaneous PM measurements with 31 particle size channels, 0.1 µg/m³ resolution, and an isothermal inlet with an integrated Nafion dryer. The EDM180 runs silent, requires low maintenance, and can be validated on site using the field test kit together with our system diagnosis software.

The EDM180 is the optimal solution for reliable environmental monitoring, e.g. automated PM measurements in environmental networks, epidemiological studies, and urban and rural PM monitoring. The EDM180 is in service with governmental networks and institutes in over 30 countries.

FEATURES

- certificates and approvals: US-EPA, UK-MCERTS, CN-CMA; demonstration of equivalence in over 20 countries
- real-time measurement of PM_{10}, $PM_{2.5}$, PM_1, Total Counts (TC), and particle number distribution
- fully automated monitoring system with remote access
- extremely energy-efficient, low maintenance, no consumables
- no loss of semi-volatile compounds
- no radioactive source, insensitive to vibrations (applicable also in vehicles)
- versatile data acquisition and communication (GSM data logger)
- self-test of all optical and pneumatic components for high quality standards
- rinsing air for protecting laser and detector in optical cell
- temperature and relative humidity sensors
- total inlet flow analyzed in optical cell
- excellent counting statistics and reproducibility at low and high dust concentrations

APPLICATIONS

- AMS for PM networks
- PM monitoring
- epidemiological studies
- monitoring of construction and mining sites

PM_{10} $PM_{2.5}$ PM_1	US EPA PM2.5	MCERTS PM_{10} $PM_{2.5}$	EN 12341 PM_{10}	EN 14907 $PM_{2.5}$

TECHNICAL DATA

SPECIFICATIONS

measured mass fractions	PM_{10}, $PM_{2.5}$, PM_1
optionally	TC (Total Counts) and particle number for all size channels
particle size range	0.25 - 32 µm
size channels	31
particle number	0 - 3 000 000 p/L
reproducibility	> 97% of total measuring range
dust mass range	0 - 10 000 µg/m³ (PM_{10}), 0 - 6 000 µg/m³ ($PM_{2.5}$)

FUNCTION

detection principle optical	light scattering of single particles with diode laser aerodynamically focused detection volume, no border zone error
detector	fast signal processing, 2 x 16 raw data channels
time resolution	selectable storage intervals: 6 s; 1, 5, 10, 15, 30, 60 min
sample air flow rate	1.2 L/min, ± 3% constant due to self-regulation
internal rinsing air flow rate	0.4 L/min, protection for laser optics, reference air for self-test
sampling inlet	isothermal humidity extraction via Nafion membrane, sensor-controlled, without loss of semi-volatile compounds (SVC)

HANDLING

operation	keypad or PC with GRIMM software or Hyper Terminal
interfaces	RS-232 (GESYTEC)
analog input	1 port (0 - 10 V) for auxiliary sensors
power supply	in: 230 V/50 Hz; optional 115 V/60 Hz; or 220 V/60 Hz
power consumption	18 W standard, 104 W with Nafion dryer, 116 W maximum, I_{max}: 1.4 A
temperature range	-20 to +50°C (-4 to 122°F), non-condensing
absolute pressure range	900 - 1100 mbar; adjustable sample flow rate at high altitudes over 2000 m
weather protection housing	model **199**, stand-alone, fully air-conditioned, providing space for EDM180 and other 19" rack instruments (see Accessories)
dimensions (h x w x d)	26.6 x 48.3 x 36.4 cm (10.5 x 19 x 14.3 in) without sampling inlet (19" rack, 4 HU, extra 2 HU for rack adapter)
weight	18 kg (39.7 lbs) without rack adapter and sampling pipe

MOBILE ENVIRONMENTAL ULTRAFINE PARTICLE COUNTER EDM 465

The EDM465 combines the reliable technology of our butanol condensation particle counters with easy handling and a wide range of applications for environmental monitoring due to a compact, robust, and mobile weather housing.

The EDM465 is applicable for short and long-term continuous monitoring of ultrafine particles and enables real-time data analysis of nanoparticles and meteorological measurement data.

This configuration positions the EDM465 as a leader in mobile ultrafine particle monitoring. The EDM465 is a fit for purpose, state-of-the-art system capable of performing accurate, high-resolution measurements.

FEATURES

- real-time monitoring of ultrafine particles according to CEN/TS 16976:2016
- fully automatic 24/7 monitoring system
- low maintenance, 30 days unattended operation, remote access
- energy-efficient sampling with isothermal drying system
- high precision at low and high concentrations
- excellent counting statistics and reproducibility
- low diffusion losses
- versatile data acquisition and communication (data logger with GSM via internet)
- self-test of all optical and pneumatic components for high quality standards
- rinsing air for protecting laser and detector in optical cell
- meteorological sensors
- instrument parameters secured against data loss

APPLICATIONS

- mobile monitoring of ultrafine particles
- traffic emission monitoring
- source identification
- epidemiological health studies
- public site and urban monitoring

CPC | CEN/TS 16976 | 24/7 | GPS | real - time

TECHNICAL DATA

SPECIFICATIONS

measurement principle	condensation particle counter
working fluid	n-butanol (n-butyl alcohol)
particle size range	4 nm to 1 µm (pre-impactor)
detection efficiency	D_{50} = 7 nm (verified with silver particles), D_{90} < 14 nm
max concentration single count mode	150 000 p/cm^3
max concentration photometric mode	10^7 p/cm^3
reproducibility	> 95% for single particle count mode
response time	t_{rise}<5 s, t_{fall}< 5 s

FUNCTION

sampling and conditioning	1 m sampling pipe with sampling head, isothermal humidity extraction via Nafion membrane, sensor-controlled
diffusion losses	< 30% for smallest relevant particle size of 7 nm
weather housing	stainless steel, powder-coated, thermally isolated, temperature-controlled
climate sensors	wind speed and direction, precipitation, pressure, temperature relative humidity; GPS positioning
pumps	pulse free carbon vane pumps, flow rate of sample air 0.3 L/min
flow control	critical orifice, temperature stabilized
total flow rate	1.5 L/min, ≤ 5% difference to the nominal flow rate

HANDLING

operation	data logger and netbook integrated in housing for online data, meteorological sensor and GPS position
interfaces	data logger, USB, GSM with SIM card for mobile network
analog input	port for optional meteorological sensors
power supply	110 – 220 VAC, 50 – 60 Hz
power consumption	100 – 150 W
temperature range	- 20 to + 40°C (- 4 to 104°F), RH < 95%
pressure range	500 – 1100 mbar
dimensions (d x w x h)	housing: 49 x 28 x 65 cm (19.3 x 11 x 25.6 in), total height with sampling pipe and meteorological sensor: 140 cm (55.1 in)
weight	38 kg (83 lbs)

WIDE RANGE AEROSOL SPECTROMETER
EDM 665

The EDM665 Environmental Wide Range Aerosol Spectrometer combines two technologies for particle counting and classifying in one device: the Scanning Mobility Particle Sizer with a butanol condensation particle counter for nanoparticles (SMPS+C) and the approved EDM180 for the larger fraction.

Designed and specifically built for atmospheric monitoring, the EDM665 is a unique, high-tech system for accurate and highly resolved measurements over the entire particle size range from 5 nm to 32 µm with 31 size channels for the EDM180 and a user-selectable number of channels for the SMPS+C (e. g. 64 per decade).

The system requires low maintenance and can be transported and deployed in the field for short and long-term atmospheric monitoring projects. This configuration positions the EDM665 as a leader of the atmospheric particle monitoring systems.

FEATURES

- real-time monitoring of the entire particle size range, fully automatic 24/7 monitoring system
- low maintenance, 30 days unattended operation, remote access
- energy-efficient, sampling with isothermal drying system
- high precision with CPC and OPC at low and high concentrations
- excellent counting statistics and reproducibility
- low diffusion losses
- versatile data acquisition and communication (data logger with GSM via internet)
- self-test of all optical and pneumatic components for high quality standards
- meteorological sensors for wind speed and direction precipitation, pressure, temperature and relative humidity
- instrument parameters secured against data loss

APPLICATIONS

- atmospheric monitoring of ultrafine particles and dust
- source identification
- atmospheric science
- traffic emission monitoring

SMPS+C | EDM 180 | 24/7 | 5 nm - 32 µm | real - time

TECHNICAL DATA

SPECIFICATIONS

SMPS+C

measurement principle	electrostatic classification with subsequent detection by condensational growth
particle size range	selectable M–DMA (5 – 350 nm) or L–DMA (10 – 1094 nm)
minimum scan time	150 s
max concentration single count mode	150 000 p/cm^3
max concentration photometric mode	10^7 p/cm^3
reproducibility	> 95% for single particle count mode
working fluid	n-butanol (n-butyl alcohol)

optical aerosol spectrometer

measurement principle	light scattering of single particles; aerodynamically focused detection volume, no border zone error
particle size range	0.25 µm – 32 µm
concentration range	1 to 3 000 000 p/L
reproducibility	> 97% of total measuring range

FUNCTION

sampling and conditioning	1 m sampling pipe with sampling head, isothermal humidity extraction via Nafion membrane, sensor-controlled, without loss of semi-volatile compounds (SVC)
weather housing	stainless steel, powder-coated, air-conditioned
climate sensors	wind speed and direction, precipitation, pressure, temperature relative humidity; GPS positioning
total flow rate	1.5 L/min, ≤ 5% difference to the nominal flow rate
sample air flow rate	0.3 L/min CPC, flow control with critical orifice, temperature-stabilized 1.2 L/min aerosol spectrometer, ± 3% constant due to self-regulation

HANDLING

operation	data logger and netbook integrated in housing for online data, meteorological sensor and GPS position
interfaces	data logger, USB, GSM with SIM card for mobile network
power supply	230 VAC, 60 Hz
power consumption	750 W
temperature range	-20 to +55°C (-4 to 131°F), RH < 95%
pressure range	optical aerosol spectrometer: 900 - 1100 mbar; flow rate adjustable to pressure
dimensions (h x w x d)	housing: 107 x 65 x 224 cm (42.1 x 25.6 x 88.2 in) total height with meteorological sensor: 270 cm (106.3 in)
weight	250 kg (551 lbs)

AEROSOL DILUTERS
1159-10 1159-100
1159-100 N

CAPILLARY DILUTER (1:10) 1159-10
CAPILLARY DILUTER (1:100) 1159-100
1159-100 N

The 1159-10 / -100 is a diluter with a fixed dilution ratio for a defined sample flow rate. It can be easily connected to any portable GRIMM aerosol spectrometer.

For nano applications we offer a 1:100 diluter for 0.3 L/min (1159-100 N) on request.

The aerosol flow is split by a precision capillary into a sample and bypass flow. In the bypass flow, all particles are removed by the built-in high-efficiency HEPA filter capsule. Downstream, both flows are mixed again. The actual dilution ratio is monitored by measuring the differential pressure over the capillary.

No compressed air is needed.

EMISSION SAMPLING SYSTEM
ESS 7917

EMISSION SAMPLING SYSTEM (ESS) 7917

The Emission Sampling System (ESS) combines a heated sampler and diluter for direct sampling in hot emissions up to 500°C.

The variable two-stage diluter operates with recirculated conditioned air. All process air is generated by the ESS. No compressed air supply is required.

ESS is suitable for all GRIMM SMPS and CPC systems.

TECHNICAL DATA

principle	capillary diluter
dilution media	internal HEPA filtered air
sample flow rate	1.2 L/min
flow control	differential pressure sensor, manually set
dilution ratio	depending on capillary flow dilution ratio — capillary flow — sample flow rate 1:10 — 0.12 L/min — 1.2 L/min 1:100 — 0.012 L/min — 1.2 L/min 1:100 — 0.003 L/min — 0.3 L/min
temperature range	0 to +40 °C (32 to 104 °F)
pressure range	± 50 mbar
power supply	in: 110 – 220 VAC, 50 – 60 Hz, out: 9 – 12 VDC

principle	injector nozzle
dilution media	internal conditioned air
sample flow rate	variable
flow control	heated critical orifices
inlet nozzles	variable with two-stage diluter depending on sample flow rate, e. g. dilution ratio — nozzles — sample flow rate 1: 10 — one (1:10) — 1L/min 1:100 — two (1:10 x 1:10) — 1L/min 1: 31 — one (1:31) — 0,3 L/min 1: 961 — two (1:31 x 1:31) — 0,3 L/min
temperature range	up to 500 °C
pressure difference	± 100 mbar
power supply	230 VAC, 50 Hz or 115 VAC, 60 Hz

AEROSOL GENERATORS
7811 7860

7811

The Grimm 7811 multi-purpose nebulizer is a ready-to-use aerosol generator with two integrated pumps to provide air for atomizing particles and an optional dilution and drying of the raw aerosol.

Both flow rates can be independently controlled and the dilution air flow can be monitored by an integrated flowmeter.

A diffusion dryer column is located at the front of the instrument for easy maintenance and regeneration of the silica gel.

For convenience, up to six nebulizers can be stored inside the removable cover on the instrument's backside.

7860

The Grimm 7860 WO_x generator is a ready-to-use instrument to produce well defined aerosol particles in the size range between 1.2 – 20 nm. Its principle of operation is based on the sublimation of tungsten oxide. Heated tungsten reacts in dry, clean air to several oxides and nitrates. A heating cell around a WO_x coil provides a temperature of approximately 900°C – the sublimation temperature of WO_3. Tungsten oxide sublimates into a controlled fraction of the carrier gas and is immediately diluted when exiting the heated zone by a flow of purified air. (Reischl et al. 1997, Ankilov et al. 2002, Steiner 2006).

By means of three adjustable flows (WO_x air, carrier air, dilution air) and a variable heating source, the mean particle diameter and output number concentration of the aerosols can be controlled.

The generator operates with an external compressed air supply (2 – 6 bar). An automatically operating security valve secures the instrument in the case of accidental overpressure.

The unit is designed in accordance with the German VDI Standard 3491.

TECHNICAL DATA

SPECIFICATIONS

particle generation method	nebulizer
particle concentration	dependent on material (e.g. DEHS > 10^7 p/cm^3)
outlet aerosol flow rate	nebulizer: ~ 2.5 – 7.0 L/min; dryer: ~ 7.5 – 17 L/min
power supply	100 – 240 VAC / 50 – 60 Hz / 1.7 A
air supply	two integrated pumps (two controllable flows)
maximum altitude	2000 m (6500 ft)
ambient temperature	0 – 40°C (32 – 104°F)
ambient humidity	0 – 90% RH, non-condensing
size (h x w x d)	32.5 x 31 x 28 cm (12.8 x 12.2 x 11 in)
weight	11 kg (24.3 lbs)

FEATURES

- generation of aerosols from all kinds of liquids, suspensions, and solutions e.g. NaCl, DEHS, PSL
- integrated pumps
- no compressed air needed
- independently controllable flows (nebulizer flow and dry air flow)
- suitable for small liquid volumes

APPLICATIONS

- instrument calibration and testing
- filter efficiency testing
- inhalation and toxicology studies
- multi-purpose test aerosol generation

SPECIFICATIONS

particle size range	1.2 – 20 nm
particle concentration	variable up to 10^7 p/cm^3
outlet aerosol flow rate	~ 0.03 – 33 L/min
material	tungsten oxide
power supply	85 – 264 VAC / 47 – 440 Hz max. 1 A (RMS by 110 VAC)
air supply	external compressed air (2 – 6 bar; oil and particle-free)
cleaning system	integrated
size (h x w x d)	22 x 17.7 x 27 cm (8.7 x 7 x 10.6 in)
weight	7.5 kg (16.5 lbs)

FEATURES

- particle size range 1.2 – 20 nm
- well-defined aerosol material (WO_x)
- controllable mean particle diameter
- controllable particle number concentration
- external compressed air supply (2 – 6 bar)
- integrated cleaning system

APPLICATIONS

- fine filter efficiency test
- inhalation and toxicology studies
- mixing and coating processes (e.g. for ceramic technology)
- determination of the detection limits and efficiency of condensation particle counters

AEROSOL NEUTRALIZERS

5523-Ni 5522-A 5524-X 5520 5520-19“

5523-Ni

- Ni-63 radioactive β-source
- nominal activity 95 MBq
- aerosol flow rate up to 1 L/min
- no handling license required[1]
- low maintenance
- easy and safe to operate
- compatible with GRIMM SMPS+C and SMPS+E
- best suited for ambient aerosol measurements

[1]hazardous goods transportation according to UN 2910; no special measures needed

5522-A

- Am-241 radioactive α-source
- nominal activity 3.7 MBq
- aerosol flow rate up to 5 L/min
- low maintenance
- easy and safe to operate
- compatible with GRIMM SMPS+C and SMPS+E
- suited for a wide range of applications

5524-X

- non-radioactive source
- no transport / storing restrictions
- no particle, ozone, or external electromagnetic wave generation
- low maintenance
- easy and safe to operate
- embedded controller
- compatible with GRIMM SMPS+C and SMPS+E
- suited for a wide range of applications

5520, 5520-19“

- non-radioactive source
- no license needed
- low maintenance
- easy and safe to operate
- available as mobile (5520) and 19“ version (5520-19“)
- compatible with GRIMM SMPS+C systems
- best suited for mobile applications

TECHNICAL DATA

source type	Ni-63; unsealed radioactive source; cleaning not permitted
ion generation method	beta (β) radiation, maximum energy 66 keV, no photons
nominal activity	95 MBq (+0 / -10%)
half-life	96 y
aerosol flow rate	up to 1 L/min
aerosol medium	air or N_2
housing	stainless steel with additional lead sheath
size (h x w x d)	18 x 6.9 x 6.9 cm (7.1 x 2.7 x 2.7 in)
weight	2.5 kg (5.5 lbs)

source type	Am-241; sealed radioactive source; covered with gold layer
ion generation method	alpha (α) radiation, maximum energy 5.6 MeV
nominal activity	3.7 MBq
half-life	433 y
aerosol flow rate	up to 5 L/min
aerosol medium	air or N_2
housing	stainless steel
size (h x w x d)	4.0 x 5.4 x 5.0 cm (1.8 x 2.1 x 2.0 in)
weight	0.6 kg (1.2 lbs)

ion generation method	soft X-ray < 11 keV
tube acceleration voltage	11kV
equivalent X-ray dose	< 0.13 µSv/h at 10 cm distance
aerosol flow rate	0.3 – 5 L/min
maximum particle concentration	10^7 p/cm^3
aerosol medium	air or N_2
power supply	in: 100 – 240 VAC, 50/60 Hz , out: 12 VDC, 3.33 A
power consumption	7.2 W
cooling	natural cooling with ambient air
size (h x w x d)	19.1 x 7.2 x 27.3 cm (7.5 x 2.8 x 10.8 in)
weight	1.1 kg (2.5 lbs)

ion generation method	dielectric barrier discharge plasma
high voltage supply	6 – 8 kV; frequency 20 kHz ± 20%
aerosol flow rate	0.3 L/min
maximum particle concentration	>10^4 p/cm^3
aerosol medium	air (not useable with Ar, N_2 or corrosive gases)
ambient temperature	0 – 40°C (50 – 104°F)
ambient humidity	20 – 95% RH
ambient pressure	700 – 1100 mbar
power supply	100 - 240 VAC, 50/60 Hz
power consumption	15 W
dimensions (h x w x d)	16.0 x 21.0 x 6.5 cm (6.3 x 8.3 x 2.6 in)
weight	1.6 kg (3.5 lbs)

ACCESSORIES

WEATHER SENSOR 1158-TRH

- for temperature and relative humidity, with 0.6 or 1.5 meter cable
- for operation with our handheld instruments

WEATHER SENSOR 158-TRH Kit

- for temperature and relative humidity, with 3.5 meter cable and rain protection housing
- for operation with our outdoor instruments

DIGITAL WEATHER SENSOR 157L

- for temperature, relative humidity, and barometric pressure
- for operation with our outdoor instruments

DIGITAL WEATHER SENSOR 158L

- for temperature, relative humidity, barometric pressure, wind speed, and wind velocity
- for operation with our outdoor instruments

DIGITAL WEATHER SENSOR 159L

- for temperature, relative humidity, barometric pressure, wind speed, wind velocity, and precipitation
- for operation with our outdoor instruments

RADIAL-SYMMETRICAL SAMPLING HEAD 1111

- with a defined inlet slit simulating the average human breathing behavior

47 MM PTFE DISC FILTER 1113A

- for our handheld instruments where all optically measured particles are deposited for later analysis (gravimetric, microscopic, or chemical)

ISOKINETIC SAMPLING SET 1152

- for applications at higher wind speeds than 2.5 m/s up to 25 m/s and high or low pressure areas.

DATA LOGGER 164-DL | 180-DL

- for our measurement equipment including the capability to transmit all data live via GSM onto a password-protected platform

FIELD TEST KIT 184

- consisting of a polystyrene latex (PSL) generator nebulizing a 1.0 µm or 2.5 µm PSL suspension to validate the instrument´s performance and some other tools for leak checks, Nafion cleaning, and more

WEATHER PROTECTION HOUSING 199

- compact and fully air-conditioned, providing space for several 19" rack instruments. It measures 65 x 62.5 x 95 cm (25.6 x 24.6 x 37 in) and is nearly theft-proof due to its weight of 125 kg (275 lbs)

ACCESSORIES

FLOW SPLITTER 5483

- with an integrated mixing chamber assuring equal aerosol concentrations at all outlets
- easy to use, install, handle, and clean
- simple and effective tool for calibration setups, aerosol research, or comparisons of up to four devices

material	stainless steel
inlet	1 x hose nozzle for 8 mm inner diameter
outlet	4 x hose nozzle for 6 mm inner diameter
flow range	Re < 2 300 for up to 3.0 L/min
temperature range	0 – 140 °C (32 – 284 °F)
dimensions	9.5 x 2.2 cm (3.7 x 0.9 in)

NANO AEROSOL SAMPLER (PRECIPITATOR) 5561

- samples aerosol particles over a wide size range due to electrostatic deflection
- particles can be collected for offline analysis on different substrates suitable for a variety of common analytical tools: transmission & scanning electron microscopes (TEM & SEM) or atomic force microscopes(AFM)
- compatible to all GRIMM DMAs

size range	from 0.8 to 1094 nm, user-selectable voltage
flow range	1 to 5 L/min
sampling efficiency	100% for < 220 nm (for single charged particles)
power supply	in: 110 – 220 VAC, 50 – 60 Hz, out 12 VDC
weight	2.2 kg (4.7 lbs)
dimensions	11.5 x 23 cm (4.5 x 9.1 in)

SHEATH AIR DRYER AND ADSORBER 5540

- filled with silica gel and active carbon
- recommended for continuous measurements with the SMPS+C or +E system in high humidity environments
- compatible with GRIMM SMPS systems

sheath air flow rate	3 to 20 L/min
weight	2.2 kg (4.7 lbs)
dimensions (Ø x H)	15 x 52.5 cm (5.9 x 20.7 in)

SMALL DIFFUSION DRYER 7813 | LARGE DIFFUSION DRYER 7814

- filled with silica gel
- reduces relative humidity of the aerosol sample
- refillable and regenerable silica gel for low maintenance and operational costs
- compatible with Grimm SMPS systems

sample flow rate	0.3 to 5 L/min
weight	small 2.3 kg (5.07 lbs) | large 7.4 kg (16.3 lbs)
dimensions (Ø x H)	small 29 x 19 cm (11.4 x 7.5 in) large 50 x 19 cm (19.7 x 7.5 in)

GRIMM Aerosol Technik Ainring GmbH & Co. KG
Dorfstr. 9 | 83404 Ainring, Germany
www.GRIMM-aerosol.com