

## **Ambient Air Monitoring**

Only those who understand particles can take the right measures to protect people and the environment.

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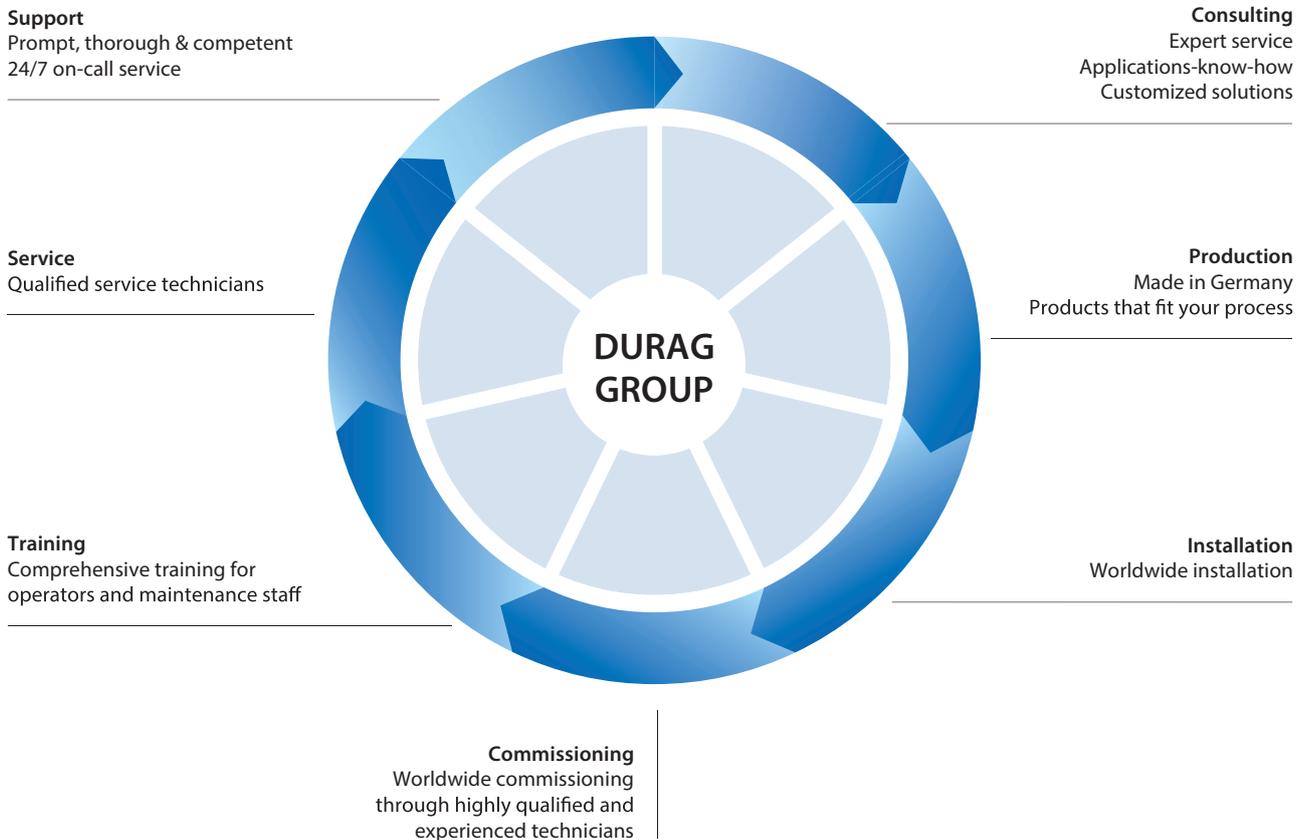
# 1 | DURAG GROUP

The DURAG GROUP is a market leader for intelligent solutions in combustion technology, emission and ambient air monitoring, multigas analysis, tunnel sensors as well as environmental and process data management. With around 500 specialists, we offer modern technology, certified instruments, and reliable services for the individual requirements of our customers around the world.

As a family owned company we hold ourselves to the highest standards in the development and manufacturing of our products. Our staff have extremely deep knowledge, and develop our products and solutions with innovative ideas.

## Our services

- We offer a comprehensive product portfolio for industrial combustion and flame control technology, the visualization and online analysis of thermal processes, gas analysis as well as the measurement and analysis of emissions and ambient air monitoring.
- Our products help comply with regulated emission limit values and minimize the environmental impact of industrial processes.
- Our specialists offer analysis, consulting, and product recommendations, ensure a smooth commissioning, and support our customers with training and full service.





## History of the DURAG GROUP

1948 – DURAG founded by H. Wilhelm Schaumann. The company name is taken from the duratron, a gamma ray detector.

1960 – Start of development of instruments for process monitoring, electronic counters and controls.

1970 – Start of development of dust measuring devices, monitoring and combustion systems.

1996 – Expansion of the product portfolio in combustion technology through acquisition of Hegwein GmbH in Stuttgart.

1997 – Acquisition of VEREWA Umwelt- und Prozessmesstechnik GmbH. Headquarters moved from Mülheim an der Ruhr to Hamburg.

2006 – Acquisition of Smitsvonk in the Netherlands, a leading supplier of high-energy ignition systems, pilot burners and ignition burners.

2015 – Acquisition of GRIMM, a world market leader in the field of optical measurement of fine particles.

2018 – 70-year anniversary of the DURAG GROUP. Expansion of the product portfolio with multigas analyzers through acquisition of ap2e.

## 2 | DURAG GROUP Companies

### DURAG



For more than 70 years **DURAG GMBH** has been an expert provider of combustion and emission monitoring equipment. Since 1948 we have offered modern technology, certified instruments, and reliable services for the individual requirements of our customers around the world. Our own rigorous quality standards in the development and manufacture of our products are our trademark. Our employees have deep knowledge, and continually develop our products and solutions with innovative ideas.

### DURAG DATA SYSTEMS



**DURAG DATA SYSTEMS** has over 40 years of experience in the manufacture of software and hardware for environmental and process data management. Our emissions data evaluation solutions are developed by experience engineers, software developers, and service technicians. We are pioneers in this special area of environmental protection, covering legal limit values, emissions data remote monitoring, and greenhouse gas trading. We advise small and large plant operators, industry-neutral and with long experience and worldwide expertise.

### DURAG SIENA



**DURAG SIENA** is geared to the South American and especially to the Brazilian market. Production, assembly, development and production of products for combustion technology take place with focus on the region. The product portfolio is supplemented by emission monitoring devices, which are supplied according to the requirements of our customers.



**ap2e** is an innovative company in the gas analysis business for scientific and industrial application such as environment, process optimization and ambient air monitoring. Since 2006, ap2e designs, manufactures and services on-line advanced TDL gas analyser systems, powered by two patented technologies (Extended cavity TDL with Low Pressure Sampling). ap2e multigas analyzers cover a wide & dynamic range, from PPT to %, with unmatched sensitivity, selectivity, stability, fast response time within simple or complex background gas mixtures with no need for sample conditioning/heating.



**GRIMM Aerosol Technik Ainring GmbH & Co. KG** in Ainring is one of the world leading suppliers of instrumentation in the field of environmental and occupational safety measurements, in service of governmental authorities, research and teaching facilities, safety engineers, or accredited bodies for air quality measurements. For over 30 years, GRIMM has been standing for the optical aerosol measurement „made in Europe“. The measuring range of our systems extends from less than 1 nanometer to 35 micrometers. The measuring instruments are usable stand-alone or integrated in measuring containers. The analysis is made via an intelligent evaluation and control software. Many thousands of systems are in use worldwide, on a daily basis, reliably and with high precision, partly under the most extreme conditions. Our product portfolio for measuring aerosol and particle concentrations, ranges from measuring ultrafine and nano particles to fine dust measurements in indoor and outdoor applications, in the industrial field as well as in basic research.



**Smitsvonk** specializes in high-energy ignition systems, pilot burners, and ignition burners for use in industrial combustion processes. The company's electrical and electronic ignition systems have been used around the world for over 70 years, thanks to their high reliability under the most demanding conditions – ignition is not effected by dirt, air humidity, extreme temperatures, or aggressive gases. Smitsvonk is your expert for reliable ignition, and develops solutions tailored to any industrial need. About 75% of its business is within the petrochemical industry, and 10% within the iron and steel industry.



For 70 years, **Hegwein** has been the specialist in the field of gas and oil ignition burners as well as gas burners for industrial applications. Our experienced experts individually analyze your specific needs and supply pilot burner and gas burner systems that are specially tailored to your process requirements. For this purpose, solutions such as our „ZAVEX“ series are available for use in all explosion-proof zones, as well as pilot burners and burners in a compact design with integrated ignition transformer, flame detector and automatic burner control. We are your reliable partner with our individual and expert advice as well as with our long-lasting products that have already been launched on the market.



## 3 | Business Units

### Emission Monitoring

Our solutions for emission monitoring are also prepared for further deducted emission limit values and stricter safety requirements in the near future.

### Combustion Technology

Our products ensure safe ignition and controlled combustion, as well as control and monitoring of various ignition systems.

### Gas Analysis

Our analyzers measure 30 different gases (pollutants or toxic or explosive or process) by laser spectroscopy for the safety, process optimization and pollution monitoring required by industries.

### Ambient Air Monitoring

Our product portfolio for measuring aerosols and particle concentration ranges from the measurement of ultrafine and nano particles to particulate matter monitoring indoors, in outdoor areas as well as for application in basic research fields.

### Data Management

Our new, certified D-EMS 2020 system is the next generation of environmental and process data management. Its modular structure enables individual adaption to any system requirement.



Ignition



Combustion



Control



Monitoring



Measuring



Acquisition



Evaluation



Classification



Counting



## 4 | Classification + Counting



200 years ago the primary sources of fine and ultrafine airborne particles were volcanic eruptions, forest fires, erosion, and dust turbulence. Since the 20th century anthropogenic – human-caused – airborne particles have increasingly dominated. They cause on people affect the environment and atmosphere, and are serious drivers of the climate exchange and emission of green house gases.

The study of these effects and monitoring of compliance with mandated limits requires reliable robust measurement methods and instruments. This is our competence!

### Highlights in Classification + Counting

- We offer nano devices and spectrometers for measurement of airborne particles in the range of 0.8 nm to 35 µm.
- Our systems have been developed, manufactured and distributed for more than 30 years
- More than 5,000 of our devices are in use worldwide, in research, air quality measurement and industry.
- Our international network of 69 partners and sales offices grants best service on every continent.
- We deliver quality and engineering „made in Germany“.

#### Find out more

For more details, see [www.grimm-aerosol.com](http://www.grimm-aerosol.com).



## 5 | Applications of Classification + Counting

With different measuring methods we identify size, size distribution and number concentration of particles. Our devices are successfully used in many different applications.

### **ENVIRO = Environmental Dust Monitors**

The common component of all environmental dust monitors is the officially approved measuring cell. In the portable devices and compact mobile system solutions, as well as in the stationary 19" monitors, the international recognized measuring algorithm is used to precisely determine the PM values. As the only manufacturer in the world, we offer the customer a compact and weatherproof solution for the continuous measurement of ultrafine particles from 4 nm upwards.

Combined with the EDM 180, the first ever officially approved optical PM monitor, we also offer the customer a unique wide-range system for measuring aerosols from 4 nm to 32 µm.

### **IAQ = Indoor Air Quality**

The IAQ line offers the customer full flexibility. The light measuring devices inform the user in research, industry, occupational safety, and authorities, simultaneously about aerosol number and size, dust masses according to the official environmental guidelines and the occupational medically defined mass fractions for the assessment of the health burden. Our precision is based on a full-flow analysis of all existing particles in the range of 250 nm to 32 µm and their division into 31 size classes.

The MiniWRAS (Mini Wide Range Aerosol Spectrometer) is a unique device worldwide. GRIMM perfected the wide-range measurement from 10 nm to 35 µm in a portable device, without the need of radioactive sources or flammable liquids. The enormously extended measuring range provides important information on aerosols that are otherwise invisible to optical particle counters.

### **NANO = Nanoparticle Measurement Systems**

The nanosystems count and classify particles from 0.8 nm up to 1 µm and are available as mobile, stationary and 19" rack devices. Our systems can be found in inhalation, exposure, environmental and climate studies, are used for filter testing and emission measurements, and are standard devices of the basic aerosol research. Our measuring systems are adjustable to the requirements of universities, research institutes, industrial companies, meteorological institutes and authorities.



**More information?**

The following products are only one reduced selection. Other products, versions and accessories can be found on [www.grimm-aerosol.com](http://www.grimm-aerosol.com).



## 6 | Products Classification + Counting

### 11-D

#### Portable Aerosol Spectrometer

Model	Benefits	Applications
	<ul style="list-style-type: none"> <li>▪ 31 size channels, equidistant</li> <li>▪ Particle size range 0.25–35 µm</li> <li>▪ TSP, PM<sub>10</sub>, PM<sub>4</sub>, PM<sub>2.5</sub>, PM<sub>1</sub> PMcoarse, inhalable, thoracic, respirable</li> <li>▪ Counts and Mass</li> <li>▪ Built-in filter for gravimetric analysis</li> <li>▪ Real-time and portable</li> <li>▪ Advanced software</li> </ul>	<ul style="list-style-type: none"> <li>▪ Aerosol science</li> <li>▪ PM monitoring</li> <li>▪ Indoor air quality (IAQ)</li> <li>▪ Workplace monitoring</li> <li>▪ Process control in industry</li> </ul>

### Mini-WRAS 1371

#### Mini Wide Range Aerosol Spectrometer

Model	Benefits	Applications
	<ul style="list-style-type: none"> <li>▪ 41 size channels, equidistant</li> <li>▪ Particle size range 10 nm–35 µm</li> <li>▪ PM<sub>10</sub>, PM<sub>2.5</sub>, PM<sub>1</sub>, inhalable, thoracic, respirable acc. to EN 481</li> <li>▪ Counts and Mass</li> <li>▪ Built-in sample air dryer</li> <li>▪ Real-time and portable</li> <li>▪ Advanced software; wireless Bluetooth operation</li> <li>▪ No need for butanol; no radioactive source</li> </ul>	<ul style="list-style-type: none"> <li>▪ Nanoparticle and PM monitoring</li> <li>▪ Indoor air quality (IAQ)</li> <li>▪ Cabin air monitoring in vehicles, airplanes, cockpits, busses, trains</li> <li>▪ Nanoparticle source identification</li> <li>▪ Workplace monitoring</li> <li>▪ R&amp;D testing in industry</li> </ul>

### SMPS+C

#### Scanning Mobility Particle Sizer with Condensation Particle Counter

Model	Benefits	Applications
	<ul style="list-style-type: none"> <li>▪ Condensation Particle Counter (CPC) and 2 Vienna type Differential Mobility Analyzers (DMAs)</li> <li>▪ Particle Size range: 5–350 nm (M-DMA) 10–1094 nm (L-DMA)</li> <li>▪ Stepping mode: 45 up to 255 channels</li> <li>▪ Scanning mode: 64 channels per decade, logarithmic spacing</li> <li>▪ Various accessories to accommodate a variety of experimental needs</li> </ul>	<ul style="list-style-type: none"> <li>▪ Fundamental aerosol research</li> <li>▪ Environmental and climatic studies</li> <li>▪ Inhalation and exposure studies</li> <li>▪ Studies on NP growth, coagulation and transport</li> <li>▪ Engine exhaust studies</li> <li>▪ Mobile aerosol studies</li> <li>▪ Workplace monitoring</li> </ul>

## SMPS+E

## Scanning Mobility Particle Sizer with Faraday Cup Electrometer

Model	Benefits	Applications
 A photograph of the SMPS+E instrument, consisting of a tall, cylindrical Faraday Cup Electrometer on the left and a smaller, boxy unit with a control panel on the right.	<ul style="list-style-type: none"><li>▪ Faraday Cup Electrometer, 3 Differential Mobility Analyzers (S, M, L) and DMA controller</li><li>▪ Size range 0.8 nm–1094 nm</li><li>▪ Concentration range 100 to 10<sup>8</sup> particles/cm<sup>3</sup></li><li>▪ Sampling up to 16 Hz</li><li>▪ Advanced software</li></ul>	<ul style="list-style-type: none"><li>▪ Fundamental aerosol research</li><li>▪ Studies on atmospheric nucleation</li><li>▪ Size distributions of airborne ion clusters</li><li>▪ Macromolecule studies</li><li>▪ Nanotechnology process monitoring</li><li>▪ Combustion studies</li><li>▪ Reference for calibration of CPCs</li></ul>

## EDM 465

## Mobile Environmental Ultrafine Particle Counter

Model	Benefits	Applications
 A photograph of the EDM 465 instrument, a mobile environmental ultrafine particle counter, shown in a rack-mounted configuration with its front door open.	<ul style="list-style-type: none"><li>▪ Butanol CPC (n-butanol)</li><li>▪ Particle size range 4 nm–1 µm</li><li>▪ Concentration range: 1–150 000 particles/cm<sup>3</sup></li><li>▪ Built-in isothermal sample air dryer</li><li>▪ Data logger with GSM</li><li>▪ Fully automatic 24/7 monitoring system in real-time</li><li>▪ Meteorological sensors, weather housing</li></ul>	<ul style="list-style-type: none"><li>▪ Mobile monitoring of ultrafine particles</li><li>▪ Traffic emission monitoring</li><li>▪ Public site and urban monitoring</li><li>▪ Epidemiological health studies</li><li>▪ Source identification</li></ul>

## EDM 665

## Wide Range Aerosol Spectrometer

Model	Benefits	Applications
 A photograph of the EDM 665 instrument, a wide range aerosol spectrometer, shown in a rack-mounted configuration with its front door open.	<ul style="list-style-type: none"><li>▪ 2 systems (SMPS+C and EDM 180)</li><li>▪ 71 particle size channels</li><li>▪ Particle size range 5 nm–32 µm</li><li>▪ PM<sub>10</sub>, PM<sub>2.5</sub>, PM<sub>1</sub>, inhalable, thoracic, respirable</li><li>▪ Counts and Mass</li><li>▪ Built-in isothermal sample air dryer</li><li>▪ Fully automatic 24/7 monitoring system in real-time</li><li>▪ Meteorological sensors, weather housing</li></ul>	<ul style="list-style-type: none"><li>▪ Atmospheric monitoring of ultrafine particles and dust</li><li>▪ Atmospheric science</li><li>▪ Source identification</li><li>▪ Traffic emission monitoring</li></ul>

## 7 | Products Measuring + Monitoring

### EDM 180

### Environmental Dust Monitor for automated PM measurement

Model	Benefits	Applications
 <p>The EDM 180 is a compact, light-colored rectangular device with a digital display and control buttons on the front panel. It has a red emergency stop button on the left side and a handle on the right.</p>	<ul style="list-style-type: none"> <li>▪ Certificates and Approvals: US-EPA, MCERTS, UMEG, CMA</li> <li>▪ 31 particle size channels</li> <li>▪ Particle size range 0.25–32 µm</li> <li>▪ PM<sub>10</sub>, PM<sub>2.5</sub>, PM<sub>1</sub>, Total Counts and size distribution</li> <li>▪ Built-in isothermal sample air dryer</li> <li>▪ Fully automatic 24/7 monitoring system in real-time</li> <li>▪ Automatic cleaning of the optical measuring cell</li> <li>▪ No radioactive source</li> <li>▪ Modular expandability of the measuring modes</li> <li>▪ Very low maintenance and no consumables</li> </ul>	<ul style="list-style-type: none"> <li>▪ Automated Measurement System for PM networks</li> <li>▪ Urban and rural PM monitoring</li> <li>▪ Environmental and climatic studies</li> <li>▪ Epidemiological studies</li> <li>▪ Monitoring of construction and mining sites</li> </ul>

### EDM 164

### Transportable Air Quality Monitoring Station

Model	Benefits	Applications
 <p>The EDM 164 is a larger, light-colored rectangular unit with a vertical sampling probe extending from the top. It has a control panel on the front with a dial and buttons.</p>	<ul style="list-style-type: none"> <li>▪ Optical measuring cell and algorithm equivalent to EDM 180</li> <li>▪ 31 particle size channels</li> <li>▪ Particle size range 0.25–32 µm</li> <li>▪ PM<sub>10</sub>, PM<sub>2.5</sub>, PM<sub>1</sub>, Total Counts, and size distribution</li> <li>▪ Fully automatic 24/7 monitoring system in real-time</li> <li>▪ Automatic cleaning of the optical measuring cell</li> <li>▪ Low maintenance and operating costs</li> <li>▪ Meteorological sensors</li> </ul>	<ul style="list-style-type: none"> <li>▪ Mobile and simultaneous monitoring of PM<sub>10</sub>, PM<sub>2.5</sub>, PM<sub>1</sub></li> <li>▪ Hot Spot Monitoring</li> <li>▪ Urban and rural PM monitoring</li> <li>▪ Source identification</li> <li>▪ Quantification of diffusive emissions according to VDI 4285, part 3</li> <li>▪ Early warning system for fires</li> <li>▪ Road side monitoring</li> <li>▪ Fence line monitoring</li> </ul>

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## Environmental Dust Monitor for automated PM measurement

Model	Benefits	Applications
	<ul style="list-style-type: none"><li>▪ Continuous monitoring of smallest PM<sub>2.5</sub> or PM<sub>10</sub> dust concentrations in ambient air</li><li>▪ Suitability tested and QAL1 certified for PM<sub>2.5</sub> and PM<sub>10</sub>: 2008/50/EG, DIN EN 15267</li><li>▪ Cost savings through low maintenance requirements</li><li>▪ No cleaning of the measuring cell required</li><li>▪ Integrated data storage with accessibility of up to 9 months</li><li>▪ Up to 1.5 years operation without filter change through multiple filter spot usage</li><li>▪ Enhanced Gesytech protocol allows remote access to measurement data and device control</li><li>▪ Factory pre-calibrated monitor measures accurately without local calibration</li><li>▪ Easy integration into existing ambient air quality measuring networks</li></ul>	<ul style="list-style-type: none"><li>▪ Automated, certified monitor for PM networks</li><li>▪ Extremely robust and reliable 24-h-mean values for fine dust mass concentration monitoring</li><li>▪ Urban and rural PM monitoring</li><li>▪ Monitoring of construction and mining sites</li><li>▪ Fence line monitoring around industrial facilities</li><li>▪ Applicable even for high dust concentrations</li></ul>

## Contact

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