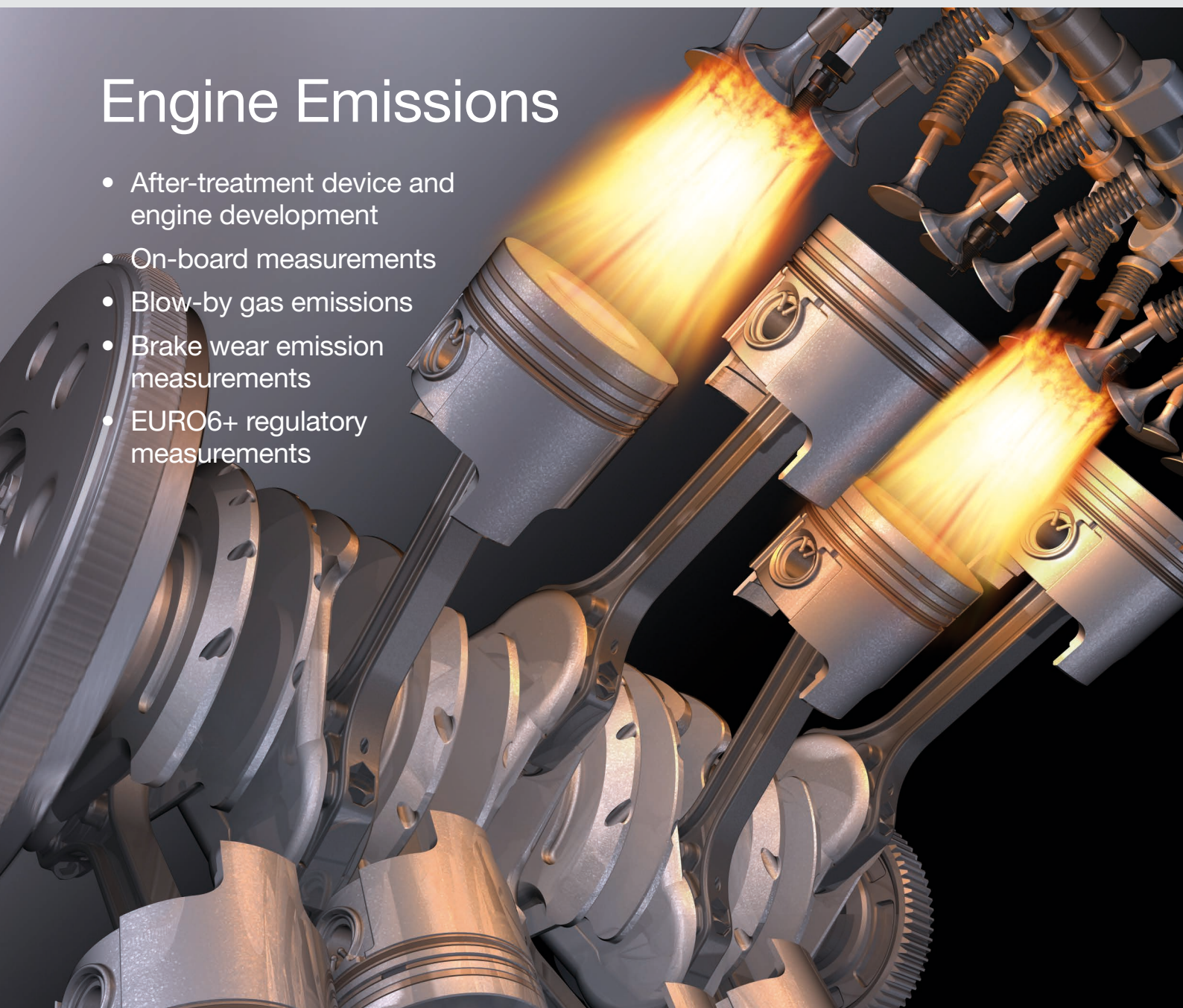
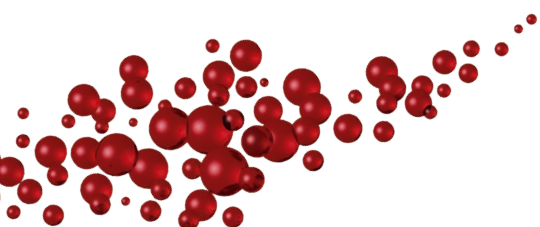


## Engine Emissions

- After-treatment device and engine development
- On-board measurements
- Blow-by gas emissions
- Brake wear emission measurements
- EURO6+ regulatory measurements



Excellence in Particle Measurements



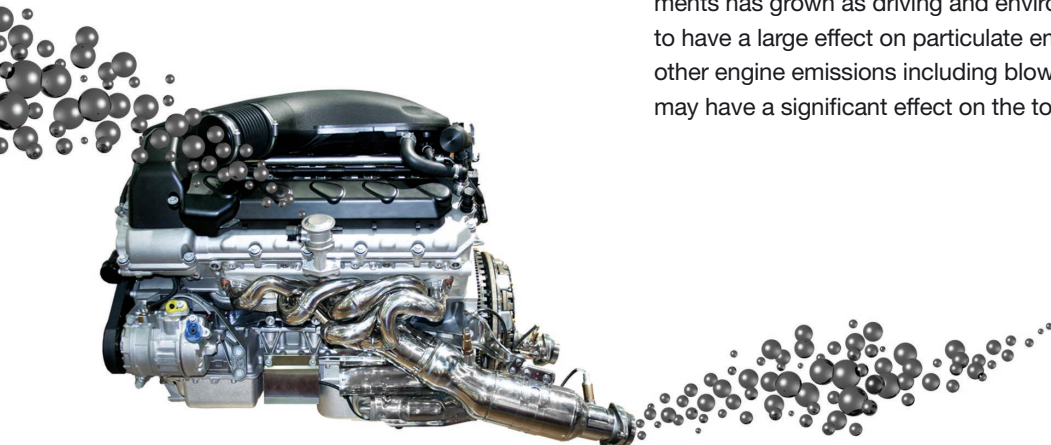




## Engine emissions

Particle emissions from engines vary a lot depending on the type of engine and fuel used. Additional factors including engine load, ECU operation and environmental conditions also have an effect on the emissions. Particle emissions are commonly reduced using different after-treatment devices such as DPFs (Diesel Particulate Filters) and catalysts which are used to also reduce other emissions from engines. Besides on-road and off-road vehicles, interest in characterizing particulate emissions from other types of engines including marine engines and aircraft turbines is continually growing.

Effects of the different factors on emissions are accurately evaluated through real-time particle measurements taken directly from the engine tailpipe, although regulatory measurements are still commonly made using a CVS tunnel. Engine development measurements are typically made on an engine or chassis dynamometer, but recently the need for on-board vehicle measurements has grown as driving and environmental conditions have been found to have a large effect on particulate emissions. Besides tailpipe emissions, other engine emissions including blow-by gas and brake wear emissions may have a significant effect on the total particle emissions from an engine.



## Dekati® Applications

- Emission measurements
- After-treatment device testing and development
- Engine development
- Dynamometer and on-board measurements
- Blow-by gas emission measurements
- Brake wear emission measurements
- On-road and off-road engine measurements
- Marine engines
- Aircraft engines

## Dekati® Solutions

Dekati Ltd. has provided high quality instrumentation for fine particle measurements successfully for over 20 years. Our measurement solutions for vehicle emission measurements include tailpipe, blow-by and brake wear emission measurement setups including both exhaust sample conditioning and particle detection. All our instruments are developed, manufactured and calibrated in Finland with strict quality requirements and provided with a standard two year warranty.

### Dekati® Particle Measurement Solutions for measuring engine emissions:

- Tailpipe and blow-by gas emission measurements
- Brake wear debris measurements
- Dynamometer and on-board measurements
- Real-time measurement of particle concentration and size distribution
- Sample conditioning solutions for pre- and post-DPF conditions
- EURO6+ conform sample conditioning unit

Each and every Dekati® Instrument is thoroughly tested with traceably calibrated flow, pressure, temperature, voltage, current and particle measurement instruments. Additionally, all Dekati® Instruments go through rigorous type-approval tests, including instrument response tests for changes in temperature, pressure and humidity. The robustness of our instruments is guaranteed through misuse tests making sure that the instruments are ready for any environment. These procedures ensure that every instrument shipped operates according to their specifications and the measurement data is reliable and reproducible.



## Dekati® Instruments

- All units original Dekati® design
- Over 20 years of experience in aerosol instrumentation
- All units manufactured and calibrated in Finland
- All units individually calibrated
- Provided with two year warranty
- Robust structure designed for use in field conditions
- Software and data processing spread sheet always included

## Dekati® Services

Dekati provides detailed and accurate calibration and maintenance services for all Dekati® Products. Our instrument services include both on-site maintenance services provided by certified Dekati engineers and factory calibration services performed at a Dekati certified calibration facility. In addition to instrument services, Dekati also provides wide range of learning options and training services that are designed to increase your knowledge on Dekati® Instruments and particle measurements in general.







## Real-Time PM Combined with Standard Gravimetric Filter Measurement

Dekati® eFilter™ is a unique instrument that adds real-time PM detection into a standard gravimetric filter holder. The Dekati® eFilter™ assembly is approximately the same size as a normal PM filter holder and it fits directly into all existing exhaust PM filter sampling systems including CVS tunnels.

In addition to the standard gravimetric filter measurement, the Dekati® eFilter™ gives a real-time signal throughout the filter sampling period which allows monitoring PM accumulation on the filter during different stages of the filter sampling. This real-time signal changes the standard filter holder into a sensitive, dynamic measurement instrument for modern routine emission measurements.

Dekati® eFilter™ assembly is in one compact single unit with automated operation. The real-time detection module is battery operated and it includes a diffusion charger with electrical detection for sensitive real-time measurement.

The real-time PM detection starts automatically when standard filter sampling is started requiring no actions from the operator. A separate pump is used in the real-time detection module to make sure the gravimetric filter sampling is not affected by the real-time measurement.



*Dekati® eFilter™*

## Dekati® eFilter™ Features

- Standard gravimetric filter measurement that meets US EPA requirements
- Compatible with existing gravimetric PM measurement filter holders and sampling systems
- Automated and sensitive real-time PM measurement
- Battery operated with internal pump for real-time PM measurement
- Fully automated operation; gravimetric filter flow automatically starts the real-time measurement
- Plug-and-play and maintenance free instrument
- Replaceable real-time detection module
- Can be used inside a 47 °C cabinet
- Separate docking station with automatic flow calibration
- Data saved to a micro-SD memory card



## Real-Time Particle Size Distribution

### Dekati® ELPI®+ Products

Dekati® ELPI®+ is a real-time particle size distribution measurement instrument suitable for brake-wear emission measurements and tailpipe and blow-by gas emission measurements from different types of engines. The wide particle size range of 6 nm – 10 µm and fast time response of 10 Hz make the ELPI®+ a perfect choice for real-time determination of PM levels from different conditions. The ELPI®+ features include real-time stand-alone operation, wide sample concentration range, wide particle size range and robust structure for operation even in harsh conditions such as blow-by gas emission measurements.

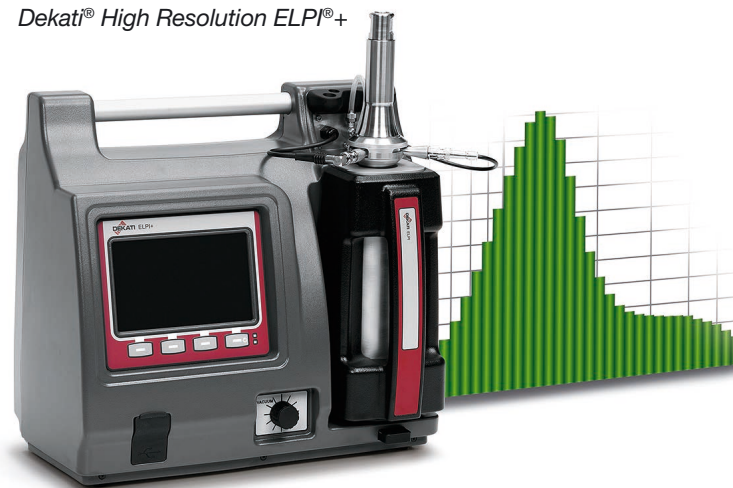
## ELPI®+ Features

- Real-time particle size distribution and concentration 6 nm – 10 µm
- Up to 500 size channels available with High Resolution ELPI®+
- High Temperature ELPI®+ model for direct sampling of high temperature aerosols
- Up to 10 Hz sampling rate for detecting small timescale changes in the sample
- Independent stand-alone operation or control via laptop using ELPI®+VI software
- Analogue inputs and outputs for data integration
- Complete measurement solutions available with Dekati® Sample Conditioning instruments

## ELPI®+ Applications

- On-road, off-road and marine engine tailpipe emissions measurements
- Engine development
- Blow-by gas emission measurements
- Brake wear emission measurements

*Dekati® High Resolution ELPI®+*



## ELPI®+ Setup Options

### Blow-by gas measurements

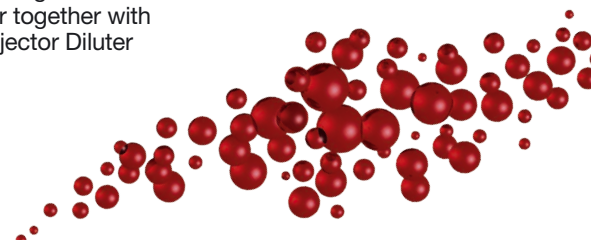
- Direct connection to High Temperature ELPI®+
- High Temperature ELPI®+ with heated Dekati® ejector Diluter
- ELPI®+ or High Resolution ELPI®+ with Dekati® Double Diluter Setup

### Tailpipe emissions

- Post-DPF: direct connection to High Temperature ELPI®+
- Pre-DPF: with Dekati® High Pressure Diluter DEED-300 or Dekati® FPS

### Brake wear emissions

- ELPI®+ or High Resolution ELPI®+ directly or together with Dekati® ejector Diluter







## Dilution and Sample Conditioning

Dekati® Solutions for diluting and conditioning engine exhaust include setups for both CVS and tailpipe sampling. Our engine tailpipe dilution solutions enable measurements both upstream and downstream exhaust after-treatment devices. The Dekati® Sample Conditioning Setups can be connected to any particle measurement instrument including the ELPI®+ and Dekati® eFilter™.

**Dekati® Solutions for conditioning engine exhaust include:**

- EURO6+ conform DEED for CVS and pre- and post-DPF conditions
- Dekati® FPS for CVS and pre- and post-DPF conditions
- Dekati® Double Diluter for CVS and post-DPF conditions
- Dekati® Thermodenuder for removal of volatile matter
- Customized sample conditioning solutions for extreme conditions including temperatures up to 1000 °C

*Dekati® Engine Exhaust Diluter*



## EURO6+ Measurements

The Dekati® Engine Exhaust Diluter DEED is an engine exhaust conditioning system that fulfils all requirements and recommendations set in EURO6+ legislation for a VPR (Volatile Particle Remover). The DEED unit can be used together with any particle concentration or size distribution measurement device since the sample at the outlet of the DEED is in ambient temperature and pressure, and the pressure fluctuations are minimal. Each DEED unit is calibrated for PCRF (Particle Concentration Reduction Factor) and evaporation efficiency as required in the EURO6+ legislation and provided with a calibration certificate.

## DEED Features

- Complete compliance to EURO6+ standard
- Extremely low solid particle losses
- Simple user interface - only two operation switches
  - High/Low dilution factor, either 100 or 1000
  - Heating on/off
- Always constant dilution factor
- Robust, stainless steel Dekati® Diluters as PND1 and PND2 with no moving parts ensure long-term maintenance free operation
- High sample output of 40 lpm allows several instruments to be connected to the DEED outlet
- DEED with DEED-300 for pre-DPF sampling
- DEED with DEED-150 for post-DPF sampling

*Dekati® Fine Particle Sampler*



## Dekati® Fine Particle Sampler for Pre- and Post-DPF

The Dekati® Fine Particle Sampler is a guaranteed solution for diluting and conditioning aerosol and gaseous samples for measurement instruments. This versatile dilution system allows dilution factor adjustment between 1:20 and 1:200 and first stage dilution temperature settings between 0 and 350 °C. Temperatures and pressures in different parts of the dilution probe are measured in real-time enabling second-by-second dilution factor calculation taking changes in raw exhaust sample properties into account. The system can be directly connected to engine tailpipe both before and after exhaust cleaning devices enabling the use of the same setup for both types of measurements.

*Dekati® Double Diluter Setup*



## Dekati® Double Diluter Setup for Post-DPF

The Dekati® Double Diluter setup is a widely used and well characterized dilution system for tailpipe emission measurements. Its all stainless steel construction without any moving parts makes it a robust and reliable choice for any emission measurements. The system consists of two Dekati® Diluters with the first dilution stage heated up to the exhaust temperature. This method effectively reduces risk of condensation and unwanted sample transformations caused by volatile components in the sample. The secondary dilution with cold air reduces the temperature at the outlet of the dilution system to ambient levels. The nominal dilution factor of one Dekati® Diluter is approximately 1:8 giving the complete setup a total dilution factor of 64. Higher dilution factors are also available upon request.

## Dekati® Sample Conditioning Setups for tailpipe sampling

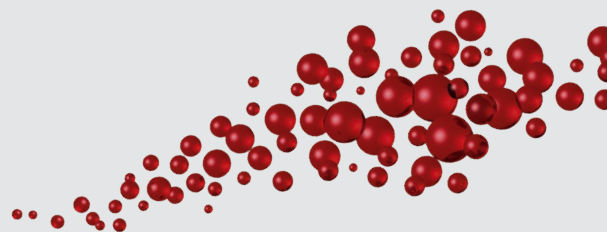
Blow-by gas emission and on-board measurement setups are also available.

	Dekati® DEED	Dekati® FPS	Dekati® Double Diluter
<b>Pre-DPF Connection</b>	With DEED-300	Direct	N/A
<b>Post-DPF Connection</b>	With DEED-150	Direct	Direct
<b>Dilution Factor*</b>	100 or 1000, 4000 or 40 000 with DEED-300	20 – 200, adjustable	64 – 2500, fixed
<b>Dilution Temperature °C**</b>	Adjustable 150 – 350	Adjustable 0 – 350	Adjustable 0 – 350
<b>Sample Temperature °C</b>	0 – 600 with DEED-300, 0 – 400 with DEED-150	0 – 600	0 – 450
<b>Sample Pressure mbar abs</b>	20 – 3000 ABOVE ventilation pressure with DEED-300, 950 – 1050 with DEED-150	750 – 2000	800 – 1200
<b>Outlet Sample Temperature and Pressure</b>	Ambient	Ambient	Ambient

\*All units individually calibrated, values may vary

\*\* First dilution stage





Dekati Ltd. is specialized in the design and manufacture of innovative fine particle measuring and sampling devices. Since its founding in 1993, Dekati has become the technological market leader in producing high-class fine particle measurement instrumentation for various applications and thousands of customers.

For more information, please contact: [sales@dekati.fi](mailto:sales@dekati.fi)

Excellence in Particle Measurements



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