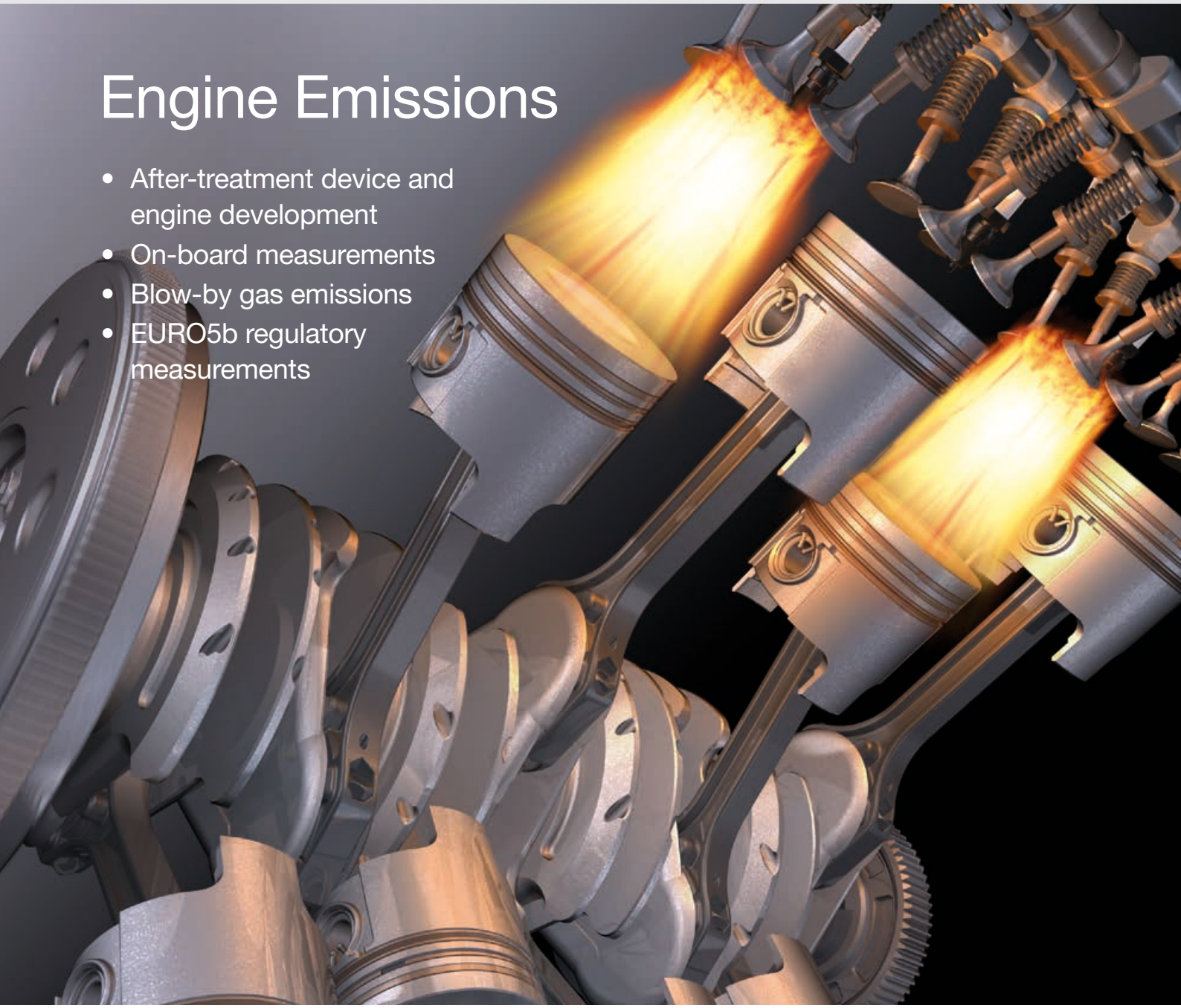
Dekati® Solutions



Engine Emissions

- After-treatment device and engine development
- On-board measurements
- Blow-by gas emissions
- EURO5b regulatory measurements

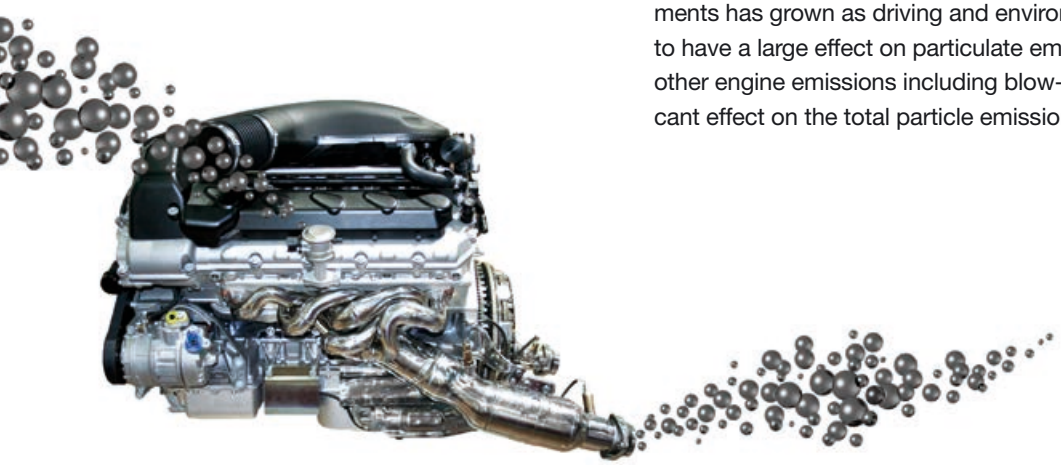
Excellence in Particle Measurements

DEKATI

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 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
- 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 engine emission measurements include both tailpipe and blow-by gas 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
- EURO5b conform sample conditioning unit

Each and every Dekati® Instrument is thoroughly tested with traceably calibrated flow, pressure, temperature, voltage, current and particle measurements. 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

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® Calibration Services

Dekati provides detailed and accurate calibration and maintenance services for all Dekati® Products. Our instrument calibration services include:

- Arrival inspection of the instrument in its arrival condition
- Cleaning and overhauling of the instrument
- Change of seals, filters and other aging parts
- Adjustment of electronics (if any)
- Calibration of the instrument
- Final operation and/or reference test
- Detailed report on the service
- New calibration data sheets

Real-Time Particle Mass Concentration

Dekati® Mass Monitor, DMM, is a real-time measurement instrument for monitoring PM emissions from diesel and gasoline vehicles. It can also be used to measure emissions from marine engines. DMM's wide dynamic concentration range allows measurements from both upstream and downstream of any after-treatment device making it an excellent choice for engine and after-treatment device development. Since the sensitivity of the DMM goes as high as 1 µm/m^3 it is well suited for accurate measurements even in post-DPF conditions. DMM is designed for daily routine measurements thus special attention has been paid to usability issues related to daily operation and service of the instrument.

The DMM can be used either with a tailpipe sample conditioning system or an existing CVS tunnel to provide second-by-second information on vehicle PM mass and number emissions. The instrument's robust structure and insusceptibility to vibration make the DMM an excellent choice also for PEMS measurements.

Dekati® Mass Monitor

DMM Features

- Real-time particle mass and number concentration
- Information on particle size distribution:
  MMD (Mass median diameter) and
  GSD (Geometric standard deviation)
- Sampling frequency 1 Hz
- Measures all particles (PM), not only black carbon
- No cross sensitivity issues
- Outstanding sensitivity down to 1 µg/m^3
- Can be used in both pre- and post-DPF conditions with a well-designed sample conditioning system, e.g. the Dekati® DEED or Dekati® FPS

DMM Applications

- On-road, off-road and marine engine emission measurements
- After-treatment device development
- Engine development
- On-board measurements

Real-Time Particle Size Distribution

Dekati® ELPI+™ is a real-time particle size distribution measurement instrument suitable for both 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.

Dekati® ELPI+™

ELPI+™ Features

- Real-time particle size distribution and concentration 6 nm – 10 µm
- Suitable for tailpipe and blow-by gas emission measurements, and also for brake wear debris measurements
- 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
- High Temperature ELPI+™ model for direct sampling of hot exhaust or blow-by gas
- ELPI+™ together with Dekati® DEED or Dekati® FPS for both pre- and post-DPF conditions

ELPI+™ Setup Options

Blow-by gas measurements

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

Tailpipe emissions

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

ELPI+™ Applications

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

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 aftertreatment devices. The Dekati® Sample Conditioning Setups can be connected to any particle measurement instrument including the ELPI+™ and DMM.

Dekati® Solutions for conditioning engine exhaust include:

- EURO5b/6 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

EURO5b/6 Measurements

The Dekati® Engine Exhaust Diluter DEED is an engine exhaust conditioning system that fulfils all requirements and recommendations set in EURO5b/6 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 EURO5b/6 legislation and provided with a calibration certificate.

DEED Features

- Complete compliance to EURO5b/6 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® Double Diluter Setup

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

*All units individually calibrated, values may vary ** First dilution stage

Dekati® Solutions

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

Excellence in Particle Measurements

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