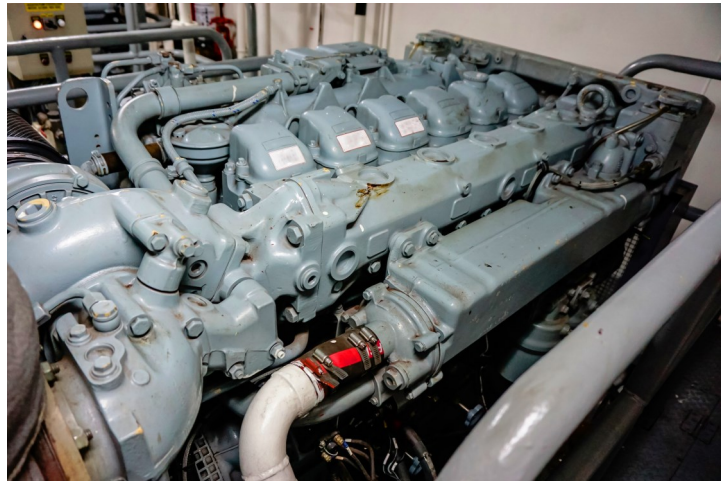




Sample Conditioning Instruments for Engine Emission Measurements



Aerosol dilution and sample conditioning is an essential part of any particle measurement system. Most aerosol particle measurement instruments cannot measure reliably when sample conditions differ from ambient nor when particle concentration is high. A well-designed dilution system not only reduces the concentration of the particles but also brings the sample conditions to a level that is acceptable for a measurement instrument without affecting the sample.

Dekati has nearly 30 years of experience in designing different dilution and sample conditioning systems for engine emission measurements and today our selection of instrumentation includes both complete aerosol dilution and conditioning systems as well as add on components to existing sampling lines. We can provide complete sample conditioning setups both for standardized EURO6+ emission measurements and for direct tailpipe measurements from practically any sample conditions.

The Dekati® Dilution instruments are all designed with slightly different specifications and they can all be combined with different sample conditioning accessories to build a complete sample conditioning system. Dekati® Dilution Instruments for engine exhaust emission measurements include:

- Dekati® eDiluter™
- Dekati® eDiluter™ Pro
- Dekati® Diluter
- Dekati® Double Diluter Setup
- Dekati® High Pressure Diluter DEED-300
- Dekati® Engine Exhaust Diluter DEED

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Sample Conditioning Instruments for Engine Emission Measurements

Reliable and easy-to-use

Dekati® eDiluter™ Setup

Dekati® eDiluter™ is a perfect choice for engine emission measurements when looking for the most easy way to condition the sample. The eDiluter™ dilutes the aerosol sample with a fixed dilution factor and conditions the sample in a controlled manner. The sample at the outlet of the system is at room temperature and pressure, and the high output flow rate allows several measurement instruments to be connected to the outlet of the system.

Dilution factor	1:60 standard, fixed. 1:25-1:225 available upon request
Sample T max	600 °C
Sample P range	900-1200 mbar abs*
Sample (inlet) flow rate	~7 lpm @ DF 60
Diluted sample flow rate	~60 lpm @ DF 60
Diluted sample	Ambient temperature and pressure

* Sample pressure affects DF, 10% accuracy in DF at ±15 mbar sample pressure



Most advanced and flexible

Dekati® eDiluter™ Pro Setup

The Dekati® eDiluter™ Pro has all the benefits of the Dekati® eDiluter™, but additionally it gives more flexibility with adjustable dilution factor and automatic pressure compensation. This compensation takes automatically into account changes in sample conditions and eliminates the effect of sample pressure in the dilution factor.

Dilution factor	1:25-1:225, adjustable
Sample T max	600 °C
Sample P range	900-2200 mbar with pressure compensation
Sample (inlet) flow rate	4-10 lpm depending on DF
Diluted sample flow rate	50-80 lpm depending on DF
Diluted sample	Ambient temperature and pressure



For high pressure conditions

Dekati® High Pressure Diluter DEED-300

The Dekati® High Pressure Diluter is a two-stage dilution device for taking aerosol sample from high sample pressure such as pre-DPF conditions. The DEED-300 is especially designed for high pressure sampling and keeps a constant dilution factor regardless of the sample pressure inside the tailpipe. The DEED-300 can be connected to another dilution system to further increase the dilution factor.

Dilution factor	~1:40, fixed.
Sample T max	600 °C
Sample P range	30-1000 mbar above ventilation pressure
Sample (inlet) flow rate	~2 lpm
Diluted sample flow rate	~45 lpm
Diluted sample	Ambient temperature and pressure



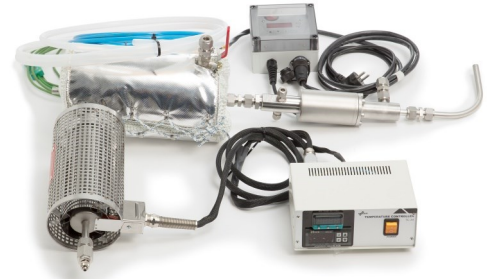
Most widely used

Dekati® Double Diluter Setup

Dekati® Double Diluter Setup is a widely used system in emission measurements. The setup includes two Dekati® Diluters with stainless steel and robust construction. This setup has a fixed dilution factor and the dilution factor can be further increased by adding extra Dekati® Diluters in the setup. The sample at the outlet of the system is at room temperature and pressure, and the high output flow rate allows several measurement instruments to be connected to the outlet of the system at the same time.

Dilution factor	~1:64, fixed
Sample T max	450 °C
Sample P range	~920-1050 mbar abs*
Sample (inlet flow rate)	~6 lpm
Diluted sample flow rate	~45 lpm
Diluted sample	Ambient temperature and pressure

*Sample pressure affects DF



Sample conditioning according to EURO 6

Dekati® Engine Exhaust Diluter DEED-100

The Dekati® Engine Exhaust Diluter DEED-100 is an engine exhaust conditioning system that fulfills all requirements and recommendations set in the EURO 6 legislation for a VPR (Volatile Particle Remover). The DEED-100 unit includes two Dekati® Diluters with an evaporation tube in between, and it is designed to be used for sampling from a CVS tunnel as defined in EURO 6. With additional accessories, the system can also be connected directly into an engine tailpipe.

Dilution factor	1:100 or 1:1000, fixed
Sample T max	60 °C, up to 600 °C with accessories
Sample P range	~920-1050 mbar abs*
Sample (inlet) flow rate	~7 lpm
Diluted sample flow rate	0-60 lpm
Diluted sample	Ambient pressure and temperature

*Sample pressure affects DF



Optional parts for tailpipe sampling and accessories

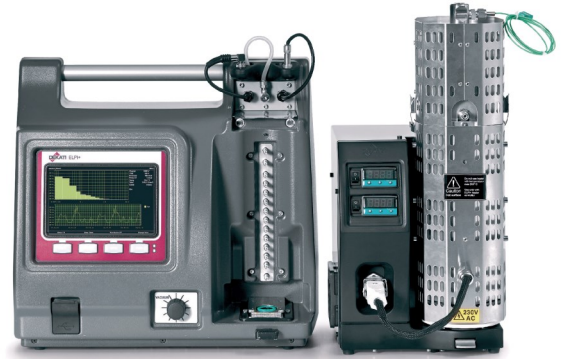
- DEED-150 Post-DPF sampling probe for connection of the DEED-100 directly into an exhaust line
- DEED-300 Dekati® High Pressure Diluter for taking the sample from pre-DPF conditions
- DEED evaporation chamber can be replaced with a catalytic stripper for efficient volatile matter removal



Sample Conditioning Instruments for Engine Emission Measurements

And don't forget High Temperature ELPI®+

High Temperature ELPI®+ allows direct measurement from up to 180 °C without the need to use an additional sample conditioning system. The HT-ELPI®+ can be connected directly to the engine tailpipe with the included heated sampling line to measure real-time particle size distribution in tailpipe conditions.



Dekati® Dilution Systems

	eDiluter™	eDiluter™ Pro	DEED-300	Dekati® Double Diluter setup	DEED-100	HT-ELPI®+
DF	1:60, standard. 1:25-1:225 available upon request.	1:25-1:225	~1:40	~1:64	1:100 or 1:1000	NA
DF adjustment	No	Yes	No	No	No	NA
Max sample T, °C	600	600	600	450	60**	180
Max dilution T, °C	400	400	400	400	Evaporation tube at 300-400 °C	-
Sample P, mbar	900-1200*	Pressure compensation between 900-2200 mbar inlet pressure	30-1000 mbar above ventilation pressure	~920-1050*	~920-1050*	750-1200
Sample flow rate (inlet), lpm	~7 @ DF 60	4-10 depending on DF	~2	~6	~7	10
Diluted sample flow rate (outlet), lpm	~60 @ DF 60	50-80	~45	~45	~60	-
Dilution air (clean and dry air) requirement, bar abs	5 bar, ~100 lpm	5 bar, 120 lpm	4 bar, 60 lpm	3 bar, 80 lpm	4 bar, max 120 lpm	0

* Sample pressure affects DF

** Up to 600 °C with DEED-300 or DEED-150

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Additional components for the sampling line

Heated sampling lines

Heated sampling lines can be used to transport high temperature aerosol sample without a risk of thermophoretic losses and condensation. Dekati provides heated sampling line in two different lengths; 1.5m or 3.0 m. The temperature of the heated sampling line can be controlled directly with the High Temperature ELPI®+ external heater controller unit, Dekati® eDiluter™ systems or with the temperature controller unit DR-1623.



DEED-150 Post-DPF Sampler

The DEED-150 Post-DPF sampler includes a perforated sampling probe and heated sampling line for direct tailpipe connection. The DEED-150 can be connected into any of the Dekati® Dilution systems and heated up to 400 °C. The temperature of the DEED-150 is controlled either with the DEED-100 or Dekati® eDiluter™ systems, or with an external temperature controller DR-1623.

Catalytic Stripper

Dekati® Catalytic Stripper DSC-100 can be used as a part of the sampling line to remove volatile matter from the aerosol sample. The catalytic stripper uses an oxidation catalyst to evaporate semi-volatile compounds in the sample and to oxidize the resulting gas phase compounds. Solid material passes through the stripper to be further detected by a particle measurement instrument. An additional temperature controller such as the DR-1623 is used to control the temperature of the catalytic stripper.



Dekati® Oxidation Flow Reactor DOFR™

Dekati® Oxidation Flow Reactor, DOFR™, is a constant flow oxidation flow reactor for secondary aerosol (SA) formation studies. The formation of secondary aerosols can take several days in the atmosphere and the purpose of the oxidation flow reactor is to speed up these processes. In the Dekati® DOFR™, the formation processes are accelerated by creating highly oxidative conditions for the aerosol sample and the timescale is reduced from days to less than one minute. The flow through the oxidation chamber is kept constant and laminar, resulting in minimal particle losses. All these features make the DOFR an ideal tool for PAM (Potential Aerosol Mass) measurements and SA formation research.



Additional components for the sampling line

Dekati® Diluter

Single heated Dekati® Diluter can be combined with any of the Dekati® Dilution systems to further increase the dilution factor of the system. The Dekati® Diluter comes with a fixed dilution factor or ~1:8 and can be heated up to 400 °C to prevent condensation.



Dekati® Pressurised Air Cleaning and Drying Units

When aerosol from a combustion or other source is diluted, it is important that the dilution air is dry and particle free. Dekati provides two different pressurized air drying and filtration units that remove water and impurities from pressurised air before it is used for dilution. The DI-1010b and DI-1032 units can be used to condition dilution air e.g. for Dekati® eDiluter and Dekati® Diluter. Both units include particle and oil filters to remove impurities from pressurised air. DI-1010b unit uses a molecular sieve and silica gel for drying while DI-1032 has a membrane dryer to dry the air.



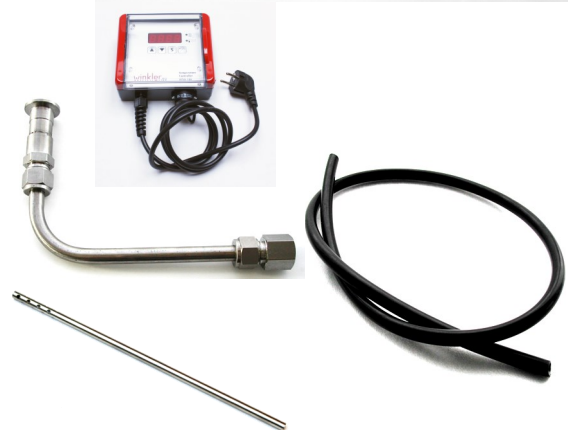
Heaters, Heating Jackets and Temperature Controllers

Heaters and heating jackets are used to control the temperature of parts of the sampling line. Dekati provides heaters and digital temperature controllers for parts in the sampling line, e.g. for the Dekati® Diluter.



Other parts

- Perforated sampling probes with different lengths
- Thermocouples for measuring temperature in different parts of the sampling lines
- Stainless steel and flexible, conductive sampling lines
- Etc. Etc.



Contact us for details and we can recommend the best solution for your measurements!

► Dekati Ltd. is a world leader in designing and manufacturing innovative fine particle measurement solutions. We have 30 years of experience in providing measurement instruments and complete measurement solutions to a wide variety of environments and sample conditions. All Dekati® Products are developed and manufactured in Finland and are available with up to five-year warranty.

ISO 9001

BUREAU VERITAS
Certification



FI008346