High Resolution ELPI®+

- Real-time particle size distribution
- Wide particle size range with one measurement method
- High size resolution
Dekati® High Resolution ELPI®+

Description

The Dekati® High Resolution ELPI®+ (Electrical Low Pressure Impactor, HR-ELPI®+) is an improved version of the widely use ELPI®+ instrument. The High Resolution ELPI®+ combines features of the ELPI®+ with a data inversion algorithm that gives real-time particle number size distribution in up to 500 size classes 6 nm – 10 μm. Other High Resolution ELPI®+ features include wide particle sample concentration range, robust structure and possibility to characterize chemical composition of size classified particles after the real-time measurement.

Operating principle*

The High Resolution ELPI®+ operating principle is the same as ELPI®+ operation with added data inversion software. First, the particles pass through a unipolar corona charger where they are charged up to a known positive charge level. Second, the particles are size classified in a cascade impactor into 14 size classes depending on their aerodynamic size. The classification of particles is based on the inertia of the particles, with larger particles getting collected on the upper impactor stages and smaller particles getting collected on the lower stages.

All the impactor stages are electrically insulated from each other and each impactor stage is connected to an electrometer. The primary particle collection efficiencies and the amount of diffusion and image charge deposition have been determined for each impactor stage allowing determination of impactor Kernel functions.* The data inversion calculation method used in the HR-ELPI®+ is based on these Kernel functions and iterative calculation routines, resulting in an accurate and reliable determination of particle size distribution with high size resolution. The inversion calculation runs in real-time and doesn’t require any adjustments nor optimizations from the user of the instrument.

Measurement Applications

The robust structure of the HR-ELPI®+, and its ability to measure in real-time over a wide size range, make the HR-ELPI®+ the ideal choice for various measurement applications. In combination with Dekati® Sample Conditioning Instruments, Dekati can provide complete HR-ELPI®+ measurement solutions for a very broad range of applications and even demanding measurement conditions.

Typical applications for the HR-ELPI®+ include:

- Combustion process studies and emission measurements
- Outdoor and indoor air quality measurements
- Occupational health studies
- Engine exhaust measurements
- Brake wear measurements
- Blow-by gas measurements
- Nanoparticle measurements

Features and benefits

- Wide particle size range 6 nm - 10 μm with one single instrument
- Real-time particle number size distribution in up to 500 size classes
- Possibility of post-measurement chemical characterization of size classified impactor samples
- Wide operational concentration range
- Can also be used with traditional ELPI®+VI software to get information on particle active surface, mass and natural charge
- Simple and robust construction
- Insensitivity to variations in sample pressure
- Sophisticated calibration made for each manufactured unit
- Integrated flow control and pressure adjustment
- 6 analogue inputs and 3 outputs

Accessories

- Aluminium and polycarbonate impactor collection foils, 25 mm
- Collection substrate spray (DS-515) with a stencil (DS-125)
- Vacuum pumps
- Spare impactors and collection plate sets
- High Temperature ELPI®+ for direct hot aerosol sampling up to 180 °C for use with standard ELPI®+ software
- Dekati® Dilution Systems for conditioning samples from combustion flue gas and automotive exhaust
- Dekati® Dryer (DD-600) for removing water from ambient aerosol
- Sample inlets for air quality measurements

3D printer emissions measured with the HR-ELPI®+
HR-ELPI+ Specifications

- **Particle size range**: 0.006 - 10 μm
- **Number of size classes**: 100 or 500
  - 30 or 150 per decade
- **Sample flow rate**: 10 lpm
- **Sensitivity**:
  - 250 #/cm³ for 10 nm particles
  - 20 #/cm³ for 100 nm particles
  - 1.0 #/cm³ for 1 μm particles
  - 0.1 #/cm³ for 5 μm particles
- **Dimensions**: H407 x W454 x D242 mm
- **Collection plate diameter**: 25 mm
- **Unit weight**: 15 kg without impactor
  - 22 kg with impactor in its place
- **Pump requirements**: 20 m³/h @ 40 mbars
- **Sample temperature**: 10-50 °C
  - Up to 600 °C when combined with Dekati® Sample Conditioning Instruments
- **Sample humidity**: 0-90 % RH Non-condensing
- **Sampling rate**: 1 Hz
- **Power**: 100-250 V, 50-60 Hz, 200 W
- **Computer requirements**: MS-Windows 7™, MS-Windows 8™, MS-Windows 10™
- **Connection to PC**: RS-232 or Ethernet
- **6 analogue inputs**: 0-5 V
- **3 analogue outputs**: 0-10 V

* Suitable pumps available at Dekati Ltd.

Acknowledgements

The ELPI® instrument originated through work carried out at the Aerosol Research Group at the Tampere University of Technology, Tampere, Finland.

Dekati Ltd. is a world leader in designing and manufacturing innovative fine particle measurement solutions. We have over 25 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.

www.dekati.fi