

# Dekati® ELPI®+

- Real-time particle size distribution
- Wide particle size range
- Wide range of applications



Excellence in Particle Measurements

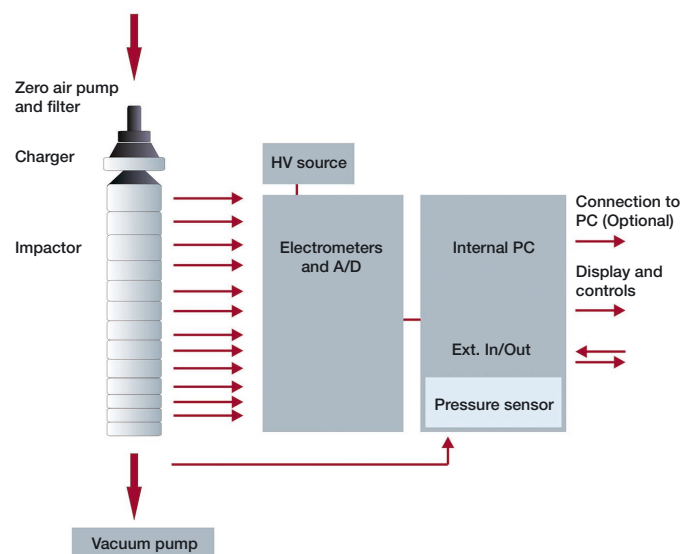




# Dekati® ELPI®+

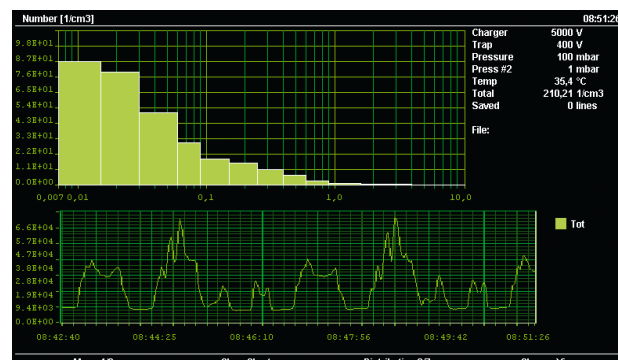
## Description

Dekati's Electrical Low Pressure Impactor, the ELPI®, is a new, improved version of the widely used and well characterized ELPI® system. ELPI®+ enables measurement of real-time particle size distribution and concentration in the size range of 6 nm - 10 µm with 10 Hz sampling rate. 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. The use of impactor technology enables post-measurement chemical analysis of size classified particles. In addition, the ELPI®+ can be used for real-time particle charge distribution and gravimetric impactor measurements. The size resolution of the ELPI®+ can be increased to 100/500 size channels with data inversion available in the High Resolution ELPI®+ software. The ELPI®+ can also be upgraded into the High Temperature ELPI®+ which allows direct sampling of hot aerosol up to 180 °C. All these features enable the use of the ELPI®+ instrument in wide range of particle measurement applications.

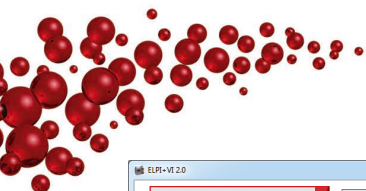


## Operating principle

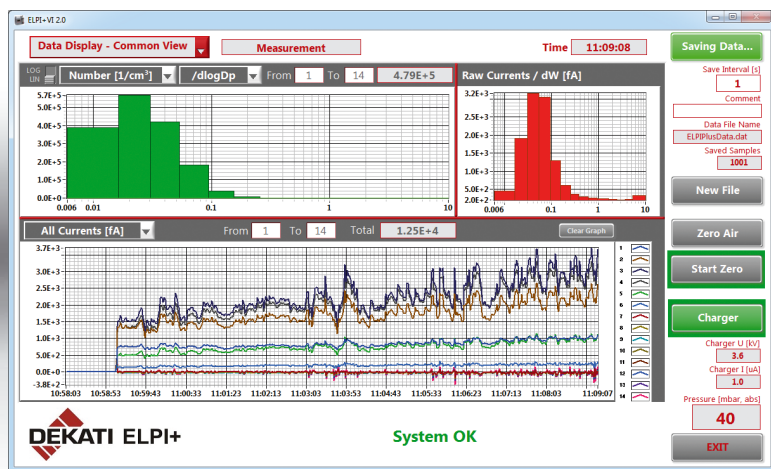
The ELPI®+ operating principle can be divided into three major parts: particle charging, size classification in a cascade impactor and electrical detection with sensitive electrometers. The particles are first charged into a known charge level in the corona charger. After charging, the particles enter a cascade low pressure impactor with 14 electrically insulated collection stages. The particles are collected in the different impactor stages according to their aerodynamic diameter, and the electric charge carried by particles into each impactor stage is measured in real-time by sensitive electrometers. This measured current signal is directly proportional to particle number concentration and size, thus the gives particle number concentration and size distribution in real-time. By switching the charger unit off, the ELPI®+ can be used for particle charge distribution measurements.



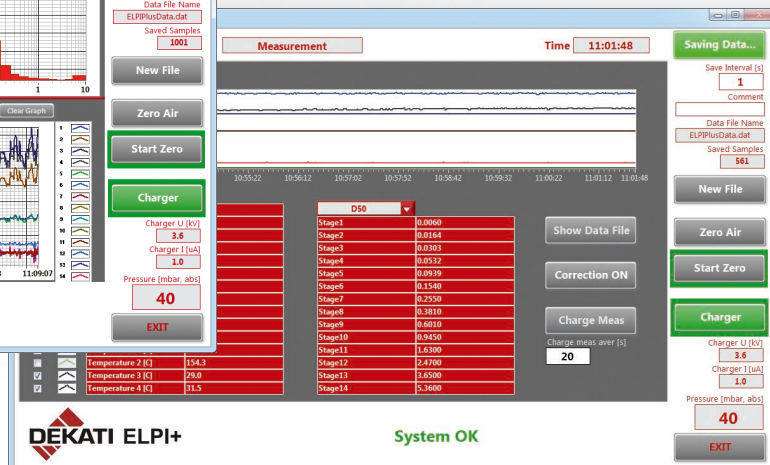
ELPI®+ display shows particle size distribution in real-time.



Excellence in Particle Measurements



ELPI®+VI software can be used for instrument control



## ELPI®+ Applications

The ELPI®+ is suitable for various different types of measurement applications where the requirements for the instrument include wide particle size range and fast response time. Together with Dekati® Sample Conditioning instruments, Dekati is able to provide complete measurement solutions for many different types of applications.

Typical applications for the ELPI®+ include:

- Combustion studies
- Outdoor and indoor air quality measurements
- Occupational health studies
- Engine exhaust measurements
- Brake wear measurements
- Blow-by gas measurements
- Pharmaceutical inhaler studies
- Particle charge distribution measurements
- Filter grade efficiency studies
- Nanoparticle measurements

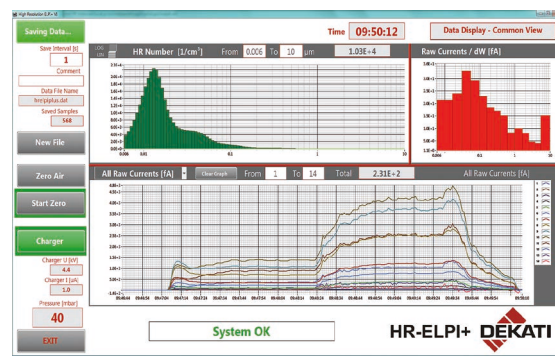
## ELPI®+ Accessories

- 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
- Sintered collection plate sets for high concentration measurements
- High Resolution ELPI®+ software for improved particle size resolution
- High Temperature ELPI®+ for direct hot aerosol sampling
- Dekati® Dilution Systems for conditioning sample from combustion flue gas and automotive exhaust
- Dekati® Dryer (DD-600) for removing water from ambient aerosol
- Sample inlets for air quality measurements

## ELPI®+ Features

Real-time particle size distribution and total concentration measurements

- Wide particle size range; 6 nm-10 µm
- 14 size fractions (up to 500 size fractions with the High Resolution ELPI®+ software)
- Real-time (10 Hz) data on particle number, active surface and mass concentration
- Possibility of post-measurement chemical characterization of size classified impactor samples
- Automated particle charge size distribution measurements
- Wide operational concentration range
- Insensitivity to variations in sample pressure
- Sampling from up to 180 °C with the High Temperature ELPI®+
- Sophisticated calibration made for each manufactured unit
- Integrated flow control and pressure adjustment
- Independent stand-alone operation or control via laptop using ELPI®+VI software
- Large 7" display with graphic user interface



High Resolution ELPI®+ software gives up to 500 size channels.

## ELPI®+ Specifications

Particle size range	0.006 - 10 µm
Number of size classes	14 100/500 with High Resolution ELPI®+
Sample flow rate	10 lpm
ELPI®+ 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 10-180 °C with the High Temperature ELPI®+
Sample humidity	0-90 % RH Non-condensing
Sampling rate	10 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.

Stage	D50% [µm]	Di [µm]	Number min [1/cm³]	Number max [1/cm³]	Mass min [µg/m³]	Mass max [mg/m³]
15	10					
14	5,3	7,3	0,1	1,7E+05	11	3400
13	3,6	4,4	0,1	3,0E+05	4	1300
12	2,5	3,0	0,16	5,2E+05	2,3	730
11	1,6	2,0	0,3	9,7E+05	1,3	400
10	0,94	1,2	0,6	2,0E+06	0,6	195
9	0,60	0,75	1,2	3,9E+06	0,3	85
8	0,38	0,48	2	6,8E+06	0,12	38
7	0,25	0,31	4	1,2E+07	0,06	17
6	0,15	0,19	6	2,0E+07	0,03	7,7
5	0,094	0,12	12	3,7E+07	0,01	3,2
4	0,054	0,071	21	7,0E+07	0,004	1,3
3	0,030	0,040	42	1,4E+08	0,0015	0,47
2	0,016	0,022	90	3,0E+08	0,0005	0,16
1	0,006	0,010	240	7,9E+08	0,0002	0,03

Each ELPI®+ unit is individually calibrated before delivery; the calibration includes detailed determination of the exact sample flow rate and D50% values. The values presented in this table are nominal values.

## Acknowledgements

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



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Dekati Ltd. is specialized in the design and manufacture of innovative fine particle measuring and sampling devices. Since its founding in 1994, Dekati has become the technological market leader in producing fine particle measurement instrumentation for various applications and thousands of customers. ●



ELPI®+ impactor and charger unit.