



Dekati Ltd Technical Note

## ELPI+™ IMPROVEMENTS

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### Introduction

ELPI™ (Electrical Low Pressure Impactor, Dekati Ltd.) is used to measure airborne particle size distribution and concentration in real time. ELPI+™ is an improved version of the widely used ELPI™ instrument with new features and improved performance. This paper lists the new features and improvements made in the ELPI+™ instrument compared to the previous ELPI™ models.

### ELPI+™ Features

Previously Dekati has provided four different ELPI™ models: Standard ELPI™ model at either 10 or 30lpm flow rate, and Outdoor Air ELPI™ model at either 10 or 30lpm flow rate. The features of standard and Outdoor Air ELPI™ models have been combined into one in the new ELPI+™ system. In addition, several new features have been added to improve the instrument performance and make it easier to operate. A summary of the ELPI+™ features compared to the old models is presented in table 1 at the end of this document.



ELPI+™

### ELPI+™ improvements: Performance

- Improved size resolution, 14 stages between 6nm - 10µm
- Sample residence time between impactor stages taken into account in the concentration calculation improving the time constant of the whole system
- New impactor design with decreased volume resulting in lower sample residence time and reduction in induction currents
- More durable PEAK™ insulators in the impactor and charger to reduce problems related to handling of Teflon
- 10Hz sampling rate
- Improved electrometer design – improved sensitivity
- Automatic Q/N and Q/M measurement operation

- Improved charger design with lower particle losses
- Sample temperature and pressure measurement
- 6 analogue inputs and 3 outputs in all units (All 0-10V)

### **ELPI+™ improvements: Usability**

- Lighter construction, total weight 22kg
- Simplified impactor construction with fewer parts
- Automatic impactor tightness adjustment
- Impactor-charger construction easily removable from the ELPI+™. Separate carry case available.
- Impactor low pressure adjustment via ELPI+™
- Standalone operation – WVGA display for data presentation and instrument control
- Simplified ELPI+VI software (Optional)
- Data calculation inside ELPI+™ and ELPI+VI
- One measurement range up to 500 000fA
- Automated and faster electrometer calibration function (Zeroing)
- Impactor calibration values installed inside the ELPI+™ and automatically uploaded to ELPI+VI
- Simplified control electronics – easy maintenance/repair
- More durable flush pump filter
- USB port for stored data output
- Ethernet or RS-232 connection to PC
- Pump control via ELPI+™ possible



*ELPI+™ Impactor and Charger Unit*

### **ELPI+™ future developments**

Further development with the ELPI+™ is being made and the following features will soon be available:

- Data inversion
- Heated ELPI+™ setup
- Automatic particle density measurement
- Sintered collection plates

Similar to ELPI™, the ELPI+™ is compatible with all Dekati® sample conditioning instruments.

Table 1. Comparison ELPI™ vs ELPI+™

<b>Feature</b>	<b>ELPI™</b>	<b>ELPI+™</b>
<b>Particle Size range</b>	7nm -10 µm	6nm -10 µm
<b>Number of size classes</b>	12	14, filter stage standard, additional impactor stage at 17nm
<b>Filter stage</b>	Option	Standard
<b>Sample flow rate</b>	10 or 30lpm	10lpm
<b>Unit dimensions</b>	570 x 400x 230	400 x 420 x 220
<b>Unit weight</b>	35kg	22kg
<b>Impactor low pressure</b>	100mbar	40mbar
<b>Pump requirements</b>	7m <sup>3</sup> /h @ 100mbar (10lpm) 21m <sup>3</sup> /h @ 100mbar (30lpm)	16m <sup>3</sup> /h @ 40mbar
<b>Versions</b>	Standard ELPI 10 or 30lpm OELPI 10 or 30lpm	ELPI+ 10lpm
<b>Charger type</b>	Diode corona charger, 1 µA, 5kV. Separate from the impactor.	Diode corona charger, 1 µA, 3.5 kV. Integrated in the uppermost impactor stage.
<b>Impactor insulation</b>	Teflon	PEEK™
<b>Charger insulation</b>	Teflon	PEEK™
<b>Collection foil diameter</b>	25mm	25mm
<b>Filter stage filter</b>	47mm	No additional filter needed
<b>Low pressure control</b>	External valve for pressure adjustment	Integrated valve option for pressure adjustment
<b>Control of the unit</b>	Via ELPIVI	Independent and/or via ELPI+VI
<b>Connection to PC</b>	RS-232	RS-232 or Ethernet
<b>Data Output</b>	Via ELPIVI Floppy disk/USB drive in Outdoor Air ELPI™.	USB port for data saving Analogue outputs, 3pcs Via ELPIVI
<b>Inputs/outputs</b>	Accessory ELPIVOLT for 3 analogue inputs	6 inputs, 3 outputs standard. All 0-10V
<b>Electrometers</b>	12 electrometers operating in four measurement ranges, max 400 pA	7 electrometers boards, 14 channels operating in one measurement range, max 500 pA
<b>Sampling rate</b>	1 Hz	10Hz
<b>Temperature measurements</b>	RH & T sensor available as accessory	Sample temperature measurement standard
<b>Pressure measurements</b>	Impactor low pressure measurement	Impactor low pressure and sample pressure measurement
<b>Charge measurement</b>	Manual	Automatic function for Q/N measurements
<b>Impactor residence time</b>	Not taken into account in the calculation	Taken into account in the calculation
<b>Restart after power failure</b>	OELPI feature	NA
<b>Power requirements</b>	110/ 220-240V, 50-60Hz, 300W	100-250V, 50-60Hz, 200W
<b>Operating temperature</b>	5-40 °C	10-35 °C
<b>Operating humidity</b>	0-90%RH Non condensing	0-90% RH Non condensing
<b>Heated set-up</b>	Available as an accessory	Future option
<b>Possibility for collection of particles</b>	Yes	Yes
<b>Sintered collection plates</b>	Available as an accessory	Future option
<b>ELPI Display</b>	LCD, only current values and instrument status	7" WVGA display with graphic user interface. Data display and instrument controls.

<b>Feature</b>	<b>ELPI™</b>	<b>ELPI+™</b>
<b>Setup values</b>	Inserted in ELPIVI init.bin file before the measurement	Installed inside ELPI+™ unit and automatically uploaded to ELPI+VI
<b>Data calculation</b>	ELPIVI	Inside ELPI+™ and ELPI+VI
<b>Data processing software</b>	ELPIxls	ELPIPlusCalc.xls
<b>Data format</b>	Text file *.dat	Text file *.dat
<b>Inlet</b>	R3/8"	R3/8"
<b>Outlet</b>	R3/8, NW16 flange connection provided	R1/2", R3/8" or NW16 flange

For more information on the ELPI+™, please contact Dekati Ltd. at support@dekati.fi