Dekati® High Temperature ELPI®+

- Real-time particle size distribution
- Wide particle size range
- High temperature aerosol measurements

Excellence in Particle Measurements

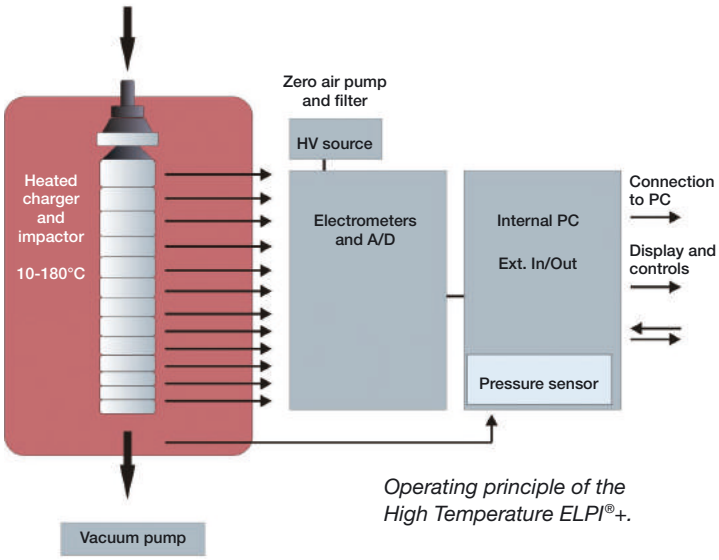
DEKATI

Dekati® High Temperature ELPI®+

Description

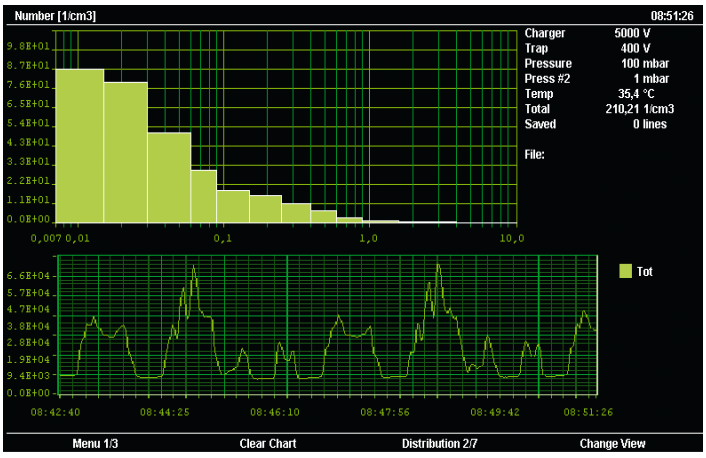
The Dekati® High Temperature ELPI®+ (HT-ELPI®+) is a new version of the Dekati® ELPI®+ that enables real-time measurement of particle size distribution from 6 nm up to 10 µm with 10 Hz sampling rate. The High Temperature ELPI®+ allows direct measurement of up to 180 °C aerosol sample without the need to cool the sample, which makes the HT-ELPI®+ a one of a kind tool to characterize high temperature aerosols. Additionally, the HT-ELPI®+ has all the benefits of the Dekati® ELPI®+ system including real-time standalone 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 the size classified particles. In addition, the HT-ELPI®+ can be used for real-time particle charge distribution and gravimetric measurements. All these features make the HT-ELPI®+ an ideal choice for characterization of high temperature aerosols.

The operating principle of the High Temperature ELPI®+ is the same as that of the ELPI®+ unit.
In the High Temperature ELPI®+, the impactor and charger unit is separated from the ELPI®+main unit and placed inside a heating element. The heating element can be heated up to 180 °C allowing direct sampling of hot aerosol without the risk of condensation or sample transformations. The impactor support and heater controller are all integrated into one easy-to-use unit which also allows control of an additional heater such as heated sampling that is also provided with unit.



Operating principle of the High Temperature ELPI®+.

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



HT-ELPI®+ Applications

High Temperature ELPI®+ is a unique instrument capable of measuring properties of high temperature aerosol without a dilution or a sample conditioning unit. This enables accurate measurements without the risk of sample transformations and even when sample particle concentrations are very low.

Typical applications for the HT-ELPI®+ include:

- Emission measurements
- Combustion process studies
- Stationary source emission cleaning device development and optimization
- Engine emission after-treatment device development
- On-board engine emission measurements
- Blow-by gas emission measurements
- Particle transformation studies and general particle research

HT-ELPI®+ Accessories

- Aluminium (max 300 °C) and polycarbonate (max 140 °C) impactor collection foils, 25 mm
- High temperature collection foil grease for >100 °C applications
- Vacuum pumps
- Spare impactors and collection plate sets
- Different length heated stainless steel sampling lines for sample transfer
- Dekati® Sample Conditioning Systems for specific applications

HT-ELPI®+ Features

High temperature real-time particle size distribution and total concentration measurements

- Wide particle size range; 6 nm - 10 µm
- 14 size fractions
- Temperature range 10-180 °C allowing direct measurement of high temperature aerosols
- 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 particle concentration range
- Impactor and charger units heated and temperature controlled with an integrated digital control unit
- 1.5 m heated sampling line provided with the unit and temperature controlled with the secondary integrated digital control unit
- Can be connected directly to high temperature aerosol source
- Improved sensitivity as no dilution systems are needed
- Insensitive to variations in sample pressure
- Sophisticated calibration made for each manufactured unit
- Impactor calibration values provided for 20, 60, 120 and 180 °C
- Integrated flow control and pressure adjustment
- Completely reversible to a standard ELPI®+ system for low temperature applications
- Independent stand-alone operation or control via laptop using ELPI®+VI software
- Large 7” display with graphic user interface
- 6 analog inputs, 3 outputs

HT-ELPI®+ heating unit disassembled

ENG

High Temperature ELPI®+ Specifications

Particle size range	0.006 - 10 µm
Number of size classes	14
Sample flow rate	10 lpm
ELPI®+ dimensions	ELPI®+ unit: H407 x W454 x D242 mm External heating unit: H350 x W240 x D240 mm without impactor
Collection plate diameter	25 mm
Unit weight	ELPI®+: 15 kg without impactor 22 kg with impactor in its place Heating unit: 8.6 kg without impactor 16.3 kg with impactor and heater
Pump requirements *	20 m³/h @ 40 mbars
Operating temperature	10-35 °C
Sample temperature	10-180 °C
Pre-set calibration temperatures	20, 60, 120 and 180 °C
Operating humidity	0-90% RH Non-condensing
Sampling rate	10 Hz
Power	100-250 V, 50-60 Hz, 200 W for ELPI®+ Impactor heater: 500 W for 110/230 V 1.5 m heated sampling line: 500 W for 110/230 V Alternative external heater to the provided heated sampling line: Max 500 W for 110 V Max 1000 W for 230 V
Computer requirements	MS-Windows 7™, MS-Windows 8™
Connection to PC	RS-232 or Ethernet

* Suitable pumps available at Dekati Ltd.

Heating unit of the High Temperature ELPI®+

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+04	11	3400
13	3,6	4,4	0,1	3,0E+04	4	1300
12	2,5	3,0	0,16	5,2E+04	2,3	730
11	1,6	2,0	0,3	9,7E+04	1,3	400
10	0,94	1,2	0,6	2,0E+05	0,6	195
9	0,60	0,75	1,2	3,9E+05	0,3	85
8	0,38	0,48	2	6,8E+05	0,12	38
7	0,25	0,31	4	1,2E+06	0,06	17
6	0,15	0,19	6	2,0E+06	0,03	7,7
5	0,094	0,12	12	3,7E+06	0,01	3,2
4	0,054	0,071	21	7,0E+06	0,004	1,3
3	0,030	0,040	42	1,4E+07	0,0015	0,47
2	0,016	0,022	90	3,0E+07	0,0005	0,16
1	0,006	0,010	240	7,9E+07	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 at 20 °C.

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.

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