World Calibration Centre
for Aerosol Physics

Leibniz Institute for
Tropospheric Research

Leibniz-Institut für Troposphärenforschung Permoserstraße 15 04318 Leipzig

CPC Model: ENVI-CPC 100

CPC Serial Number: 17722

Customer: Palas GmbH

Description: Calibration of a Condensation Particle Counter (CPC, Model ENVI-CPC 100)

Date of Calibration: September 20, 2022

Summary of Intercomparison:

The candidate reached 100% efficiency at 40 nm. The Dp_{50} is at 7.1 nm. For the linearity check the CPC performance was 99% compared to the reference electrometer.

Certificate / Reference: WCCAP

Date of issue: September 23, 2022

Reviewed by: WCCAP

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Date of arrival of instrument in calibration lab:	*September 19, 2022*
Instrument:	*Condensation Particle Counter*
Model and serial number of instrument:	*ENVI-CPC 100 SN 17722*
Result of physical inspection:	*no damages*
Result of functional test:	*functional test successful, no problems*
Internal parameters of instrument	*nominal flow rate 0.9 l/min*
Model and identification number of aerosol electrometer:	*TSI Electrometer Model 3068, SN 70838596*
Electrometer calibration certificate:	*April 20-26, 2022, calibrated at PTB Braunschweig*
Corrections of electrometer, for instance, differing flow rate:	*Within tolerance range (+/-2%); reference: 4.0 l/min, measured: 4.063 l/min*
Software for recording:	*LabView 2010; National Instruments; Program „LabCount.vi“*
Date of calibration:	*September 20, 2022*
Lab temperature and pressure:	*22.0°C, 1005 mbar*
Measured aerosol flow rate of CPC:	*0.895 l/min*
Uncertainty in measured flow rate:	*3%*
Flowmeter used:	*Gilian Gilibrator 3; SN 21181001005, 2021*
Particles and gases used for calibration:	*silver particles and nitrogen*
Method of particle generation:	*tube furnace generator*
Zero measurement of instrument:	*0 particles/cm³ in 5 minutes*

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	Unit	Status
Model	-	ENVI-CPC 100
SN	-	17722
Firmware	-	100534
Date	-	September 2022
last service date	-	-
TSI Software Version	-	-
Saturator Temperature	°C	35
Condenser Temperature	°C	16.4
Optics Temperature	°C	47
Cabinet Temperature	°C	-
Ambient Pressure	kPa	989
Vaccuum Pressure	kPa	-
Inlet Pressure	kPa	-
Critical Orifice Pressure	kPa	-
Aerosol Nozzle Pressure	kPa	-
Laser Current	mA	-
Liquid Level	-	Full
Aerosol Flow	l/min	0.895
Zero	avg 5 min	0

		BNC (pulse output)		USB (direct output)		
Diameter	**EL 3068B (#/cm³)**	**Concentration (#/cm³)**	**Efficiency (µ)**	**Concentration (#/cm³)**	**Efficiency (µ)**	**USB-C / BNC**
40	1839			1856	1.01	
30	1589			1585	1.00	
20	1606			1568	0.98	
14	1856			1737	0.94	
11	1636			1478	0.90	
10	1676			1465	0.87	
9	1472			1231	0.84	
8	1355			1041	0.77	
7	1338			543	0.41	
6	2092			13	0.01	
5	1301			0	0.00	

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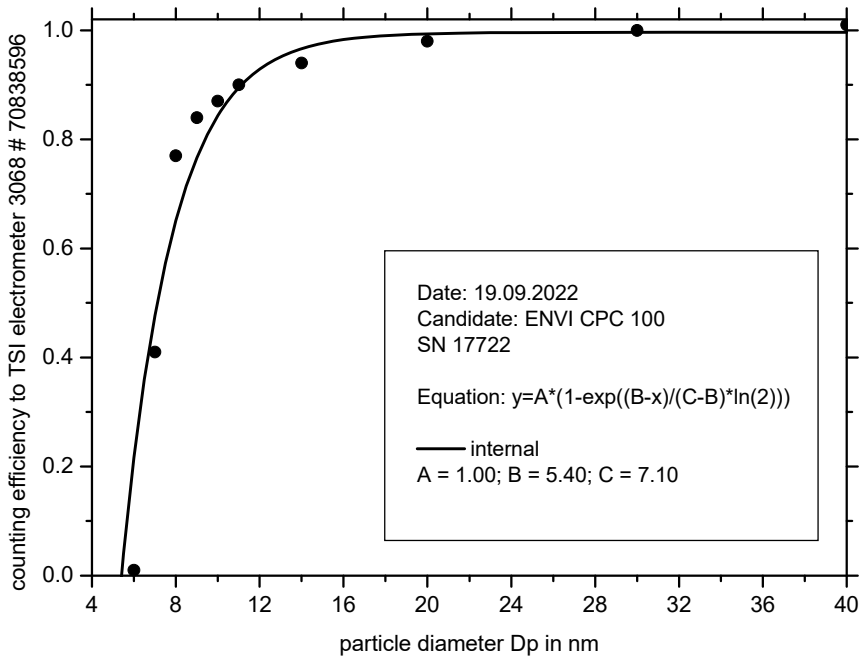

Fig. 1: Counting efficiency for ENVI-CPC 100 SN 17722 against aerosol electrometer 3068 SN 70838596; silver particles between 5 nm and 40 nm were used for calibration; the calculated Dp_{50} is 7.10 nm.

	BNC (pulse output)		USB (direct output)		
EL 3068B (#/cm³)	Concentration (#/cm³)	Efficiency (µ)	Concentration (#/cm³)	Efficiency (µ)	USB-C / BNC
2181			2136	0.98	
4065			3970	0.98	
8528			8501	1.00	
12936			12930	1.00	
19594			19166	0.98	
30533			30458	1.00	
40594			40851	1.01	
49415			48881	0.99	
61394			60692	0.99	

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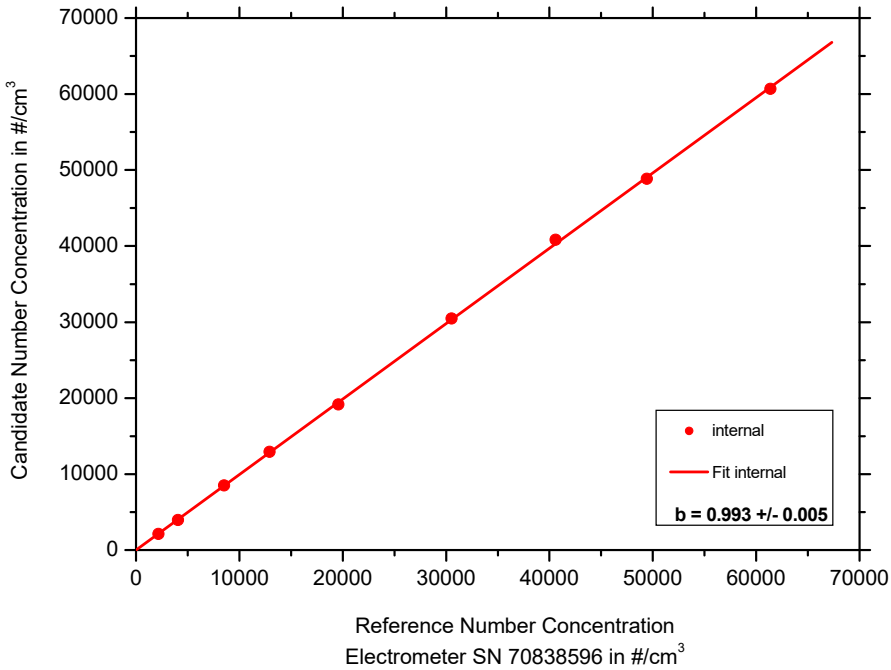

Fig. 2: Linearity for ENVI-CPC 100 SN 17722 against aerosol electrometer 3068 SN 70838596; silver particles with a diameter of 30 nm were used for number concentrations between 2000 particles per cm³ and 60000 particles per cm³.

Date of issue: *September 23, 2022*

Reference: TSI electrometer, model 3068, SN *70838596*

Reviewed: WCCAP

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