



LIGHTHOUSE
WORLDWIDE SOLUTIONS BENELUX BV



Calibration certificate

Certificate number: LH34185

Revision 2.12

Applicant

: CCSTEC GesmbH
Triesterstrasse 36
A-2512, Oeynhausen
Austria

Instrument

: Description : Airborne particle counter
: Manufacturer : Lighthouse
: Model : Remote 2014
: Serial no. : 180221001
: Customer ID : C91

Date of calibration

: 21 January 2019

Due date calibration

: January 2020

Calibration location

: Lighthouse Benelux Calibration laboratory
in Boven-Leeuwen

Calibration method

: Calibration has been accomplished as described in ISO21501-4:2018.
All work performed is in accordance with Lighthouse Worldwide
Solutions Benelux, Master Calibration Document: I201 and is recorded
and maintained as such.

Results

: The results of the measurements are shown in the appendix.
No readjustments are made.

Compliance, As left

: For some of the measured values it is not possible to make a statement
of compliance with specification.

Traceability

: The measurements have been executed using standards for which the
traceability to (inter)national standards has been demonstrated towards
the Raad voor Accreditatie.

Uncertainty

: The reported uncertainty is based on a standard uncertainty multiplied
by a coverage factor of $k = 2$, which provides a confidence level of
approximately 95%. The standard uncertainty is determined in
accordance with EA-4/02. The measurement uncertainty is taken into
account for compliance statements according to ILAC-G8:03/2009.

M.A.W. van Boxel
Head of calibration

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issued provided that neither Lighthouse Worldwide
Solutions Benelux BV nor the Raad voor Accreditatie
assumes any liability.



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Appendix

Certificate number: LH34185

Date of calibration : 21 January 2019
Calibrated by : A.C.G. Gerritse
Function : Calibration & Service Engineer
Environmental conditions : The ambient temperature was 20,5°C at a relative humidity of 22,2%

Measurement results, As found

Performance information			
Test	Test result	Expanded uncertainty	Criteria
ISO21501-4 Flow	2,87l/min	0,11l/min	2,83l/min $\pm 5\%$
JIS B 9921 Zero count	0	N/A	≤ 1 in 5 mins
ISO21501-4 False count rate	Upper confidence level 212 particles/m3	N/A	N/A
ISO21501-4 Timer check	59,9 seconds	0,40s	$\pm 1\%$
ISO21501-4 Size resolution	1,92% used size 0,24 μ m	3,36%SR	$< 15\%$
ISO21501-4 Counting efficiency 50%	56,5% used size 0,20 μ m	4,45%CE	(50 ± 20)%
ISO21501-4 Counting efficiency 100%	102,2% used size 0,30 μ m	4,71%CE	(100 ± 10)%

Size calibration					
Channel	Channel Size	Threshold voltage	Calculated size	Expanded uncertainty	Calculated Sizing error ($\pm 10\%$)
1	0,20 μ m	63mV	0,199 μ m	0,005 μ m	-0,40%
2	0,30 μ m	615mV	0,297 μ m	0,006 μ m	-0,98%
3	0,50 μ m	2296mV	0,488 μ m	0,008 μ m	-2,37%
4	1,00 μ m	4212mV	0,940 μ m	0,018 μ m	-5,98%

Notes

Counting efficiency: used size 0,5 μ m: 93,9 %CE $\pm 10,46\%$ CE
Counting efficiency: used size 1,0 μ m: 94,1 %CE $\pm 7,65\%$ CE

Reference equipment

Model	S/N	Due to	Certificate number
TSI Mass Flowmeter 4043	40431138006	28-Sep-2019	49048
MCA8000D	425	22-Mar-2019	1803-08453
Fluke-175	32820245	31-Aug-2019	1808-04131
Control company 14-649-11	181513043	10-Aug-2020	1045-9722549
Palas	6752 / 6751	20-Nov-2019	235-10808

Particle size standards

Size	Description	Due to	Lot#
0,20 μ m	3200 & 3200A Nanosphere size standards	1-Aug-2019	172288
0,25 μ m	3240A, Nanosphere size standards	1-Apr-2021	195737
0,30 μ m	3300A & 3300B, Nanosphere Size Standards	1-Mar-2020	183039
0,50 μ m	3500 & 3500A, Nanosphere Size Standards	1-Jan-2021	193188
1,00 μ m	4009A, 4009A & 4009B Microsphere Size Standards	1-Aug-2020	187477



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Channel	Channel Size	Threshold voltage	Calculated size	Expanded uncertainty	Calculated Sizing error (±10%)
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3	0,50µm	2296mV	0,488µm	0,008µm	-2,37%
4	1,00µm	4212mV	0,940µm	0,018µm	-5,98%

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