

Calibration certificate

Certificate number: LH46484

Revision 3.2

Applicant : CCSTEC GesmbH
Triesterstrasse 36
A-2512, Oeynhausen
Austria

Instrument : Description : Airborne particle counter
Manufacturer : Lighthouse
Model : Solair 3100
Serial no. : 171004018
Customer ID : C89

Date of calibration : 14 November 2019

Due date calibration : November 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.

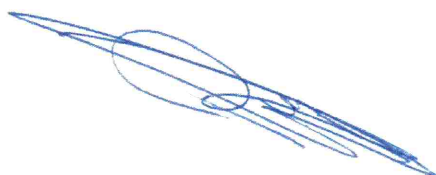
Results : The results of the measurements are shown in the appendix.
The unit is readjusted.

Compliance, As left : All measured values comply with the specification limit(s).

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 expanded uncertainty is based on the standard uncertainty of the measurement multiplied by a coverage factor k, such that the coverage probability corresponds to approximately 95%. The standard uncertainty is determined in accordance with EA-4/02. Compliance statements are given in accordance with ISO21501-4:2018.

M.A.W. van Bortel
Head of calibration



Appendix

Certificate number: LH46484

Date of calibration : 14 November 2019
Calibrated by : A.C.G. Gerritse
Function : Calibration & Service Engineer
Environmental conditions : The ambient temperature was 22,0°C
at a relative humidity of 35,5%

Measurement results, As found

Performance information				
Test	Test result	Expanded uncertainty	Criteria	
ISO21501-4 Flow	28,36l/min	0,49l/min	28,30l/min $\pm 5\%$	Pass
JIS B 9921 Zero count	0	N/A	≤ 1 in 5 mins	Pass
ISO21501-4 False count rate	Upper confidence level 21 particles/m ³	N/A	N/A	N/A
ISO21501-4 Timer check	60,1 seconds	0,40s	$\pm 1\%$	Pass
ISO21501-4 Size resolution	2,09% used size 0,40 μ m	3,49%SR	$< 15\%$	Pass
ISO21501-4 Counting efficiency 50%	58,9% used size 0,30 μ m	2,72%CE	(50 ± 20)%	Pass
ISO21501-4 Counting efficiency 100%	91,4% used size 0,50 μ m	10,18%CE	(100 ± 10)%	Pass

Size calibration						
Channel	Channel Size	Threshold voltage	Calculated size	Expanded uncertainty	Calculated Sizing error ($\pm 10\%$)	
1	0,30 μ m	47mV	0,302 μ m	0,006 μ m	0,56%	Pass
2	0,50 μ m	426mV	0,492 μ m	0,008 μ m	-1,57%	Pass
3	1,00 μ m	1220mV	0,977 μ m	0,018 μ m	-2,28%	Pass
4	3,00 μ m	3142mV	2,900 μ m	0,062 μ m	-3,35%	Pass
5	5,00 μ m	3696mV	4,875 μ m	0,137 μ m	-2,50%	Pass
6	10,00 μ m	4582mV	9,579 μ m	0,212 μ m	-4,21%	Pass

Notes

Counting efficiency: used size 1,0 μ m: 83,7 %CE $\pm$ 6,73%CE

Reference equipment

Model	S/N	Due to	Certificate number
Defender 510	120068	15-Jan-2020	51152
MCA8000D	999	26-Mar-2020	1903-02648
Fluke-175	12170245	1-Aug-2020	1906-10758
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#
0,30 μ m	3300A & 3300B, Nanosphere Size Standards	1-Apr-2021	196947
0,40 μ m	3400A, Nanosphere Size Standards	1-Apr-2021	197091
0,50 μ m	3500 & 3500A, Nanosphere Size Standards	1-Apr-2022	210349
1,00 μ m	4009A, 4009A & 4009B Microsphere Size Standards	1-Aug-2021	200992
3,00 μ m	4D-03 Dry Duke Microsphere Size standards	1-Jul-2021	199811
5,00 μ m	4D-05 Dry Duke Microsphere Size standards	1-Aug-2020	188015
10,00 μ m	4D-10 Dry Duke Microsphere Size standards	1-Jan-2022	206793

Appendix

Certificate number: LH46484

Date of calibration : 14 November 2019
Calibrated by : A.C.G. Gerritse
Function : Calibration & Service Engineer
Environmental conditions : The ambient temperature was 22,0°C
 at a relative humidity of 35,5%

Measurement results. As left

Performance information					
Test	Test result		Expanded uncertainty	Criteria	
ISO21501-4 Flow	28,36l/min		±0,49l/min	28,30l/min ±5%	Pass
JIS B 9921 Zero count	0		N/A	≤1 in 5 mins	Pass
ISO21501-4 False count rate	Upper confidence level 21 particles/m3		N/A	N/A	N/A
ISO21501-4 Timer check	60,1 seconds		0,40s	±1%	Pass
ISO21501-4 Size resolution	2,09%	used size 0,40µm	3,49%SR	< 15%	Pass
ISO21501-4 Counting efficiency 50%	64,5%	used size 0,30µm	2,98%CE	(50±20)%	Pass
ISO21501-4 Counting efficiency 100%	97,4%	used size 0,50µm	10,85%CE	(100±10)%	Pass

Size calibration						
Channel	Channel Size	Threshold voltage	Calculated size	Expanded uncertainty	Calculated Sizing error (±10%)	
1	0,30µm	47mV	0,302µm	0,006µm	0,56%	Pass
2	0,50µm	426mV	0,492µm	0,008µm	-1,57%	Pass
3	1,00µm	1220mV	0,977µm	0,018µm	-2,28%	Pass
4	3,00µm	3142mV	2,900µm	0,062µm	-3,35%	Pass
5	5,00µm	3696mV	4,875µm	0,137µm	-2,50%	Pass
6	10,00µm	4582mV	9,579µm	0,212µm	-4,21%	Pass

Notes

Counting efficiency: used size 1,0 µm: 93,8 %CE ± 7,53%CE

Reference equipment

Model	S/N	Due to	Certificate number
Defender 510	120068	15-Jan-2020	51152
MCA8000D	999	26-Mar-2020	1903-02648
Fluke-175	12170245	1-Aug-2020	1906-10758
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#
0,30µm	3300A & 3300B, Nanosphere Size Standards	1-Apr-2021	196947
0,40µm	3400A, Nanosphere Size Standards	1-Apr-2021	197091
0,50µm	3500 & 3500A, Nanosphere Size Standards	1-Apr-2022	210349
1,00µm	4009A, 4009A & 4009B Microsphere Size Standards	1-Aug-2021	200992
3,00µm	4D-03 Dry Duke Microsphere Size standards	1-Jul-2021	199811
5,00µm	4D-05 Dry Duke Microsphere Size standards	1-Aug-2020	188015
10,00µm	4D-10 Dry Duke Microsphere Size standards	1-Jan-2022	206793