

Calibration certificate

Certificate number: LH54094

Revision 3.2

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

Instrument : Description : Airborne particle counter
Manufacturer : Lighthouse
Model : Solair 3100E
Serial no. : 190504038
Customer ID : C96

Date of calibration : 04 June 2020

Due date calibration : June 2021

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.

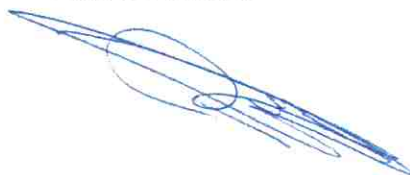
Results : The results of the measurements are shown in the appendix.
The unit is readjusted.

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 Boxtel
Head of calibration



Appendix

Certificate number: LH54094

Date of calibration : 04 June 2020
Calibrated by : S. van Eldijk
Function : Calibration & Service Engineer
Environmental conditions : The ambient temperature was 20,3°C
at a relative humidity of 37,6%

Measurement results. As found

Performance information					
Test	Test result		Expanded uncertainty	Criteria	
ISO21501-4 Flow	29,31l/min		0,85l/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/m3		N/A	N/A	N/A
ISO21501-4 Timer check	60,0 seconds		0,40s	$\pm 1\%$	Pass
ISO21501-4 Size resolution	5,26%	used size 0,40 μ m	2,60%SR	$< 15\%$	Pass
ISO21501-4 Counting efficiency 50%	61,8%	used size 0,30 μ m	3,73%CE	(50 ± 20)%	Pass
ISO21501-4 Counting efficiency 100%	105,7%	used size 0,50 μ m	6,03%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	48mV	0,301 μ m	0,006 μ m	0,29%	Pass
2	0,50 μ m	473mV	0,514 μ m	0,008 μ m	2,70%	Pass
3	1,00 μ m	1082mV	0,922 μ m	0,018 μ m	-7,80%	Pass
4	3,00 μ m	3330mV	3,281 μ m	0,083 μ m	9,35%	Pass
5	5,00 μ m	3743mV	5,143 μ m	0,154 μ m	2,87%	Pass
6	10,00 μ m	4551mV	10,300 μ m	0,225 μ m	3,00%	Pass

Notes

Counting efficiency: used size 1,0 μ m: 97,3 %CE $\pm$ 5,55 %CE

Reference equipment

Model	S/N	Due to	Certificate number
TSI Mass Flowmeter 4043	40431350007	25-Mar-2021	60682
MCA8000D	1110	14-Nov-2020	19-13808-2-1
Fluke-175	32820180	7-Oct-2020	19-13808-1-3
Control company 14-649-11	181513060	10-Aug-2020	1045-9722566
Palas	6752 / 6751	26-Nov-2020	235-10928

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-Apr-2022	211354
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-Dec-2022	220284
10,00 μ m	4D-10 Dry Duke Microsphere Size standards	1-Jan-2022	206793

Appendix

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Date of calibration : 04 June 2020
Calibrated by : S. van Eldijk
Function : Calibration & Service Engineer
Environmental conditions : The ambient temperature was 20,3°C at a relative humidity of 37,6%

Measurement results, As left

Performance information					
Test	Test result		Expanded uncertainty	Criteria	
ISO21501-4 Flow	29,31l/min		±0,85l/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	60,0 seconds		0,40s	±1%	Pass
ISO21501-4 Size resolution	5,26%	used size 0,40µm	2,60%SR	< 15%	Pass
ISO21501-4 Counting efficiency 50%	55,6%	used size 0,30µm	3,36%CE	(50±20)%	Pass
ISO21501-4 Counting efficiency 100%	104,6%	used size 0,50µm	5,96%CE	(100±10)%	Pass

Size calibration						
Channel	Channel Size	Threshold voltage	Calculated size	Expanded uncertainty	Calculated Sizing error (±10%)	
1	0,30µm	51mV	0,303µm	0,006µm	1,00%	Pass
2	0,50µm	446mV	0,500µm	0,008µm	0,09%	Pass
3	1,00µm	1180mV	1,000µm	0,018µm	-0,04%	Pass
4	3,00µm	3217mV	2,977µm	0,069µm	-0,78%	Pass
5	5,00µm	3714mV	5,001µm	0,152µm	0,01%	Pass
6	10,00µm	4504mV	10,002µm	0,222µm	0,02%	Pass

Notes

Counting efficiency: used size 1,0 µm: 97,7 %CE ± 6,03%CE

Reference equipment

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10,00µm	4D-10 Dry Duke Microsphere Size standards	1-Jan-2022	206793