

Calibration certificate

Certificate number: LH35670

Revision 3.0

Applicant	: CCSTEC GesmbH Triesterstrasse 36 A-2512, Oeynhausen Austria		
Instrument	: Description	:	Airborne particle counter
	: Manufacturer	:	Lighthouse
	: Model	:	Solair 3100E
	: Serial no.	:	180204002
Date of calibration	: 06 March 2019		
Due date calibration	: March 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 Boxtel
 Head of calibration



Appendix

Certificate number: LH35670

Date of calibration : 06 March 2019

Calibrated by : E.J. Koenen
Function : Calibration & Service Engineer

Environmental conditions : The ambient temperature was 23,1°C
at a relative humidity of 30,6%

Measurement results. As found

Performance information			
Test	Test result	Expanded uncertainty	Criteria
ISO21501-4 Flow	28,50l/min	0,83l/min	28,30l/min $\pm 5\%$
JIS B 9921 Zero count	0	N/A	≤ 1 in 5 mins
ISO21501-4 False count rate	Upper confidence level 21 particles/m ³	N/A	N/A
ISO21501-4 Timer check	60,0 seconds	0,40s	$\pm 1\%$
ISO21501-4 Size resolution	9,23% used size 0,40 μ m	2,38%SR	$< 15\%$
ISO21501-4 Counting efficiency 50%	49,2% used size 0,30 μ m	2,56%CE	(50 ± 20)%
ISO21501-4 Counting efficiency 100%	104,0% used size 0,50 μ m	11,89%CE	(100 ± 10)%

Size calibration					
Channel	Channel Size	Threshold voltage	Calculated size	Expanded uncertainty	Calculated Sizing error ($\pm 10\%$)
1	0,30 μ m	40mV	0,302 μ m	0,006 μ m	0,78%
2	0,50 μ m	356mV	0,510 μ m	0,008 μ m	1,95%
3	0,70 μ m	751mV	0,735 μ m	0,010 μ m	5,01%
4	1,00 μ m	866mV	0,941 μ m	0,019 μ m	-5,89%
5	3,00 μ m	2992mV	2,926 μ m	0,057 μ m	-2,47%
6	5,00 μ m	3518mV	5,280 μ m	0,163 μ m	5,60%
7	10,00 μ m	4322mV	10,259 μ m	0,163 μ m	2,59%
8	25,00 μ m	8650mV	24,604 μ m		-1,59%

Notes

25 μ m is not included in the scope of accreditation.

Reference equipment

Model	S/N	Due to	Certificate number
TSI Mass Flowmeter 4043	40431802001	21-Feb-2020	52106
Fluke-175	12170243	14-Jun-2019	1806-06261
MCA8000D	1025	21-Jun-2019	1806-06262
Control company 14-649-11	181416962	6-Jul-2020	1045-9624780
Solair 2010+	100461001	29-May-2019	LH32624

Particle size standards

Size	Description	Due to	Lot#
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
0,70 μ m	3700 & 3700A, Nanosphere Size Standards	1-Jan-2020	179741
1,00 μ m	4009A, 4009A & 4009B Microsphere Size Standards	1-Aug-2020	187477
3,00 μ m	4203 and 4203A, Particle Size Standards	1-Sep-2021	202646
5,00 μ m	4D-05 Dry Duke Microsphere Size standards	1-Aug-2020	188015
10,00 μ m	DC-10, DRI-CAL, Particle Size Standards	1-Apr-2021	196944
25,00 μ m	Calibration standards-LS series	1-Apr-2021	LS443.171

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ISO21501-4 Timer check	60,0 seconds	0,40s	±1%
ISO21501-4 Size resolution	9,23% used size 0,40µm	2,38%SR	< 15%
ISO21501-4 Counting efficiency 50%	49,2% used size 0,30µm	2,56%CE	(50±20)%
ISO21501-4 Counting efficiency 100%	104,0% used size 0,50µm	11,89%CE	(100±10)%

Size calibration					
Channel	Channel Size	Threshold voltage	Calculated size	Expanded uncertainty	Calculated Sizing error (±10%)
1	0,30µm	40mV	0,302µm	0,006µm	0,78%
2	0,50µm	356mV	0,510µm	0,008µm	1,95%
3	0,70µm	751mV	0,735µm	0,010µm	5,01%
4	1,00µm	866mV	0,941µm	0,019µm	-5,89%
5	3,00µm	2992mV	2,926µm	0,057µm	-2,47%
6	5,00µm	3518mV	5,280µm	0,163µm	5,60%
7	10,00µm	4322mV	10,259µm	0,163µm	2,59%
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