

## Calibration certificate

Certificate number: LH80269

Revision 3.0.d

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

|                    |               |                           |
|--------------------|---------------|---------------------------|
| <b>Instrument:</b> | Description   | Airborne particle counter |
|                    | Manufacturer  | Lighthouse                |
|                    | Model         | Solair 3100               |
|                    | Serial number | 200704044                 |
|                    | Customer ID   | C109                      |

**Date of calibration:** 08 December 2021

**Due date calibration:** December 2022

**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.

**Readjustments:** The unit is readjusted.

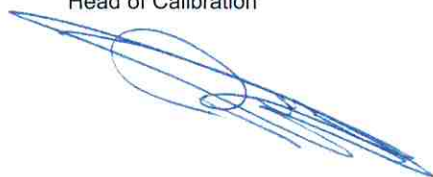
**Compliance, As left:** Pass - The measured values were observed in tolerance at the points tested.

**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. The ILAC-G8:09/2019 Binary statement is used as method for the compliance statement.

**Date of issue:** 10 December 2021

**Authorized by:** M.A.W. van Boxtel  
Head of Calibration



## Appendix

Certificate number: LH80269

**Date of calibration:** 08 December 2021  
**Calibration location:** Lighthouse Benelux Calibration laboratory in Boven-Leeuwen  
**Calibrated by:** K.P.B. de Ruiter  
**Function:** Calibration & Service Engineer

**Environmental conditions:** The ambient temperature was 22,2 °C at a relative humidity of 41,0 %rh.

### Measurement results, As found

| Performance information             |                                                     |                      |                       |             |
|-------------------------------------|-----------------------------------------------------|----------------------|-----------------------|-------------|
| Test                                | Test result                                         | Expanded uncertainty | Criteria              | Pass / Fail |
| ISO21501-4 Flow                     | 28,64 l/min                                         | 1,11 l/min           | 28,30 l/min $\pm 5$ % | Pass        |
| JIS B 9921 Zero count               | 0                                                   | N/A                  | $\leq 1$ in 5 min     | Pass        |
| ISO21501-4 False count rate         | Upper confidence level<br>21 counts per cubic meter | N/A                  | N/A                   | N/A         |
| ISO21501-4 Timer check              | 59,9 seconds                                        | 0,4 s                | $\pm 1$ %             | Pass        |
| ISO21501-4 Size resolution          | 2,9 % used size 0,406 $\mu\text{m}$                 | 2,9 %SR              | $< 15$ %              | Pass        |
| ISO21501-4 Counting efficiency 50%  | 50,4 % used size 0,309 $\mu\text{m}$                | 2,4 %CE              | (50 $\pm 20$ ) %      | Pass        |
| ISO21501-4 Counting efficiency 100% | 98,7 % used size 0,516 $\mu\text{m}$                | 5,1 %CE              | (100 $\pm 10$ ) %     | Pass        |

| Size calibration (criteria $\pm 10$ %) |                   |                 |                   |                      |                         |            |
|----------------------------------------|-------------------|-----------------|-------------------|----------------------|-------------------------|------------|
| Channel                                | Channel size      | Threshold value | Calculated size   | Expanded uncertainty | Calculated sizing error | Compliance |
|                                        | [ $\mu\text{m}$ ] | [mV]            | [ $\mu\text{m}$ ] | [ $\mu\text{m}$ ]    | [%]                     |            |
| 1                                      | 0,30              | 51              | 0,304             | 0,007                | 1,2                     | Pass       |
| 2                                      | 0,50              | 487             | 0,513             | 0,010                | 2,5                     | Pass       |
| 3                                      | 1,00              | 1105            | 0,929             | 0,018                | -7,1                    | Pass       |
| 4                                      | 3,00              | 3246            | 3,045             | 0,072                | 1,5                     | Pass       |
| 5                                      | 5,00              | 3750            | 5,221             | 0,142                | 4,4                     | Pass       |
| 6                                      | 10,00             | 4613            | 9,474             | 0,247                | -5,3                    | Pass       |

### Notes

Counting efficiency: used size 1,000  $\mu\text{m}$ : 97,5 %CE  $\pm$  5,8%CE

### Reference equipment

| Model                     | S/N         | Due to           | Certificate number |
|---------------------------|-------------|------------------|--------------------|
| TSI Mass Flowmeter 4043   | 40431802001 | 25 August 2022   | 71651              |
| Fisher Scientific 0666256 | 200359240   | 16 June 2022     | 1042-11351210      |
| Palas                     | 6752 / 6751 | 16 November 2022 | 235-11195          |
| MCA8000D                  | 1711        | 09 August 2022   | 21-13808-7-4       |

### Particle size standards

| Size                | Description                                     | Due to        | Certificate |
|---------------------|-------------------------------------------------|---------------|-------------|
| 0,30 $\mu\text{m}$  | 3300A & 3300B, Nanosphere Size Standards        | April 2023    | D20015      |
| 0,40 $\mu\text{m}$  | 3400A, Nanosphere Size Standards                | November 2022 | D20016      |
| 0,50 $\mu\text{m}$  | 3500 & 3500A, Nanosphere Size Standards         | April 2022    | D20017      |
| 1,00 $\mu\text{m}$  | 4009A, 4009A & 4009B Microsphere Size Standards | October 2022  | D20020      |
| 3,00 $\mu\text{m}$  | 4D-03 Dry Duke Microshere Size standards        | August 2023   | D20025      |
| 5,00 $\mu\text{m}$  | 4D-05 Dry Duke Microshere Size standards        | December 2022 | D20022      |
| 10,00 $\mu\text{m}$ | 4D-10 Dry Duke Microshere Size standards        | January 2022  | DM20001     |

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### Size calibration (criteria $\pm 10\%$ )

| Channel | Channel size      | Threshold value | Calculated size   | Expanded uncertainty | Calculated sizing error | Compliance |
|---------|-------------------|-----------------|-------------------|----------------------|-------------------------|------------|
|         | [ $\mu\text{m}$ ] | [mV]            | [ $\mu\text{m}$ ] | [ $\mu\text{m}$ ]    | [%]                     |            |
| 1       | 0,30              | 51              | 0,304             | 0,007                | 1,2                     | Pass       |
| 2       | 0,50              | 458             | 0,500             | 0,010                | 0,0                     | Pass       |
| 3       | 1,00              | 1193            | 1,000             | 0,018                | 0,0                     | Pass       |
| 4       | 3,00              | 3222            | 3,002             | 0,070                | 0,1                     | Pass       |
| 5       | 5,00              | 3702            | 5,002             | 0,141                | 0,0                     | Pass       |
| 6       | 10,00             | 4716            | 9,999             | 0,245                | 0,0                     | Pass       |

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