



Certificate of Calibration

Certificate Number: 35061

Sound Level Meter Larson Davis Model 820

Client: Environmental Measurements
Unit 12, Tallaght Business Centre
Whitestown Business Park
Co.Dublin 24, Ireland

Instrument Make: Larson Davis
Instrument Model: 812
Serial Number: 0808

Microphone Make: Larson Davis
Microphone Model: 377A02
Serial Number: 100143

Preamplifier Make: Larson Davis
Preamplifier Model: PRM828
Serial Number: 2639

Calibrator Make: None Supplied
Calibrator Model:
Calibrator Serial Number:
Calibrator Adaptor:
Calibrator Certification Ref:

Extension Cable: not supplied

This is to certify that the above instrument was calibrated according to MTS Calibration Ltd. Measurement Procedures and was found to comply as summarised below. The measurements were carried out using the Test Equipment listed below, all of whose calibrations are traceable to UK National Standards. The management controls of MTS Calibration Ltd. are registered in its current Quality Manual, and are designed to be in compliance with BS EN ISO/IEC 17025: 2005. Copies of the relevant certificates, test procedures and test results, together with the traceability of test equipment are filed with MTS Calibration Ltd. and extracts are available on request.

This instrument was tested in accordance with the recommendations of BS 7580: Part 1 1997 (not all tests were performed) with the following results:


| | <i>Manufacturer's Specification</i> | <i>BS EN 60651 Type 1</i> |
|----------------------------------------------|-------------------------------------|-------------------------------------------------------|
| Self-Generated Noise: | Complies | no specification – measured 19.07dB(A) |
| Dynamic Linearity – electrical response: | Complies | Complies between 26.47 and 130.87 dB(A) |
| Frequency Weighting A - electrical response: | Complies | Complies |
| Frequency Weighting A - acoustic response: | Complies | Complies |
| Frequency Weighting C - electrical response: | Complies | Complies |
| Crest Factor: | Complies | Complies |
| Burst (RMS accuracy): | Complies | Complies |
| Time Weightings F, S, I (Detector): | Complies | Complies |
| Microphone Response: | Complies | Complies (assessed as overall acoustic specification) |

Calibrated at 114.17 dB re 20µPa, 250 Hz – calibration offset = 9.7 dB
No modifications were needed in order to achieve this specification
Polarisation Voltage 0 V

Test Equipment:

| Equipment | Manufacturer | Model | Serial No. | Traceability Ref. | Cal. Due |
|------------------------------|-----------------|--------|------------|-------------------|--------------|
| Acoustic Calibrator 250Hz | Larson Davis | CAL250 | 4483 | TE 116 | October 2021 |
| Real-Time Frequency Analyser | Larson Davis | 2900 | 0492 | TE 108 | July 2021 |
| Signal Generator | Hewlett Packard | 33120A | US36016577 | TE 111 | August 2021 |
| Digital Multimeter | Hewlett Packard | 34401A | 3146A63804 | TE 105 | August 2021 |

Date of Receipt: 5th October 2020
Date of Calibration: 6th October 2020
Date of Certificate: 6th October 2020

Authorised Signatory 

Tony Sherris
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MTS Calibration Ltd

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10. Peak C sound level

| Numbers of cycles in test signal | Frequency of test signal | The deviation of indication | Expanded uncertainty | Acceptable limits |
|----------------------------------|--------------------------|-----------------------------|----------------------|-------------------|
| | Hz | dB | dB | dB |
| One | 8000 | -0.3 | 0.2 | ±2.4 |
| Positive half-cycle | 500 | -0.1 | | ±1.4 |
| Negative half-cycle | 500 | -0.1 | | |

11. Overload indication

Frequency weighting A

| The difference between the levels of the positive and negative one-half-cycles input signals that first cause the displays of overload indication | Expanded uncertainty | Maximum value of the difference |
|---------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------------------------|
| dB | dB | dB |
| 0.0 | 0.3 | 1.8 |

8. Level linearity including the level range control

| Level range | HIGH | LOW |
|----------------------------------------------------------------------------------------------------------------------------|----------------|-------|
| Indication for the reference sound pressure level [dB] | 113.9 | 113.9 |
| The deviation of indication [dB] | 0.0 | 0.0 |
| Anticipated level that is 5 dB less than the upper limit specified in the instruction manual for level range at 1 kHz [dB] | 132.0 | 115.0 |
| Indication [dB] | 131.9 | 114.9 |
| The deviation of indication [dB] | -0.1 | -0.1 |
| Expanded uncertainty [dB] | 0.2 | |
| Acceptable limits[dB] | ±1.1 | |

9. Toneburst response

| Measurement quantity | Time weighting | Toneburst duration | The indications in response to toneburst relative to steady sound level | Reference toneburst response relative to steady sound level | Deviation of measured toneburst response from reference toneburst | Expanded uncertainty | Acceptable limits |
|---------------------------|----------------|--------------------|-------------------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------------|----------------------|-------------------|
| | | | ms | dB | dB | | |
| Time-weighted sound level | Fast | 200 | -1.0 | -1.0 | 0.0 | 0.2 | ±0.8 |
| | | 2 | -18.0 | -18.0 | 0.0 | | -1.8; +1.3 |
| | | 0.25 | -27.1 | -27.0 | -0.1 | | -3.3; +1.3 |
| Time-weighted sound level | Slow | 200 | -7.4 | -7.4 | 0.0 | | ±0.8 |
| | | 2 | -27.0 | -27.0 | 0.0 | | -1.8; +1.3 |
| | | 200 | -7.0 | -7.0 | 0.0 | | ±0.8 |
| Sound exposure level | - | 2 | -27.0 | -27.0 | 0.0 | | -1.8; +1.3 |
| | | 0.25 | -36.1 | -36.0 | -0.1 | | -3.3; +1.3 |

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Level range: LOW

| Expected sound level | Indication | Level linearity error | Expanded uncertainty | Acceptable limits |
|----------------------|------------|-----------------------|----------------------|-------------------|
| dB | dB | dB | dB | dB |
| 120.0 | 119.9 | -0.1 | 0.2 | ±1.1 |
| 119.0 | 118.9 | -0.1 | | |
| 118.0 | 117.9 | -0.1 | | |
| 117.0 | 116.9 | -0.1 | | |
| 116.0 | 115.9 | -0.1 | | |
| 115.0 | 114.9 | -0.1 | | |
| 114.0 | 114.0 | 0.0 | | |
| 109.0 | 109.0 | 0.0 | | |
| 104.0 | 104.0 | 0.0 | | |
| 99.0 | 99.0 | 0.0 | | |
| 94.0 | 93.9 | -0.1 | | |
| 89.0 | 88.9 | -0.1 | | |
| 84.0 | 83.9 | -0.1 | | |
| 79.0 | 78.9 | -0.1 | | |
| 74.0 | 73.9 | -0.1 | | |
| 69.0 | 68.9 | -0.1 | | |
| 64.0 | 63.9 | -0.1 | | |
| 59.0 | 58.9 | -0.1 | | |
| 54.0 | 53.9 | -0.1 | | |
| 49.0 | 48.9 | -0.1 | | |
| 44.0 | 43.9 | -0.1 | | |
| 39.0 | 38.9 | -0.1 | | |
| 34.0 | 33.9 | -0.1 | 0.3 | |
| 29.0 | 29.0 | -0.1 | | |
| 28.0 | 28.0 | 0.0 | | |
| 27.0 | 27.0 | 0.0 | | |
| 26.0 | 26.0 | 0.0 | | |
| 25.0 | 25.0 | 0.0 | | |

7. Level linearity

Reference level range: HIGH

| Expected sound level | Indication | Level linearity error | Expanded uncertainty | Acceptable limits |
|----------------------|------------|-----------------------|----------------------|-------------------|
| dB | dB | dB | dB | dB |
| 136.0 | 136.0 | -0.1 | 0.2 | ±1.1 |
| 135.0 | 135.0 | -0.1 | | |
| 134.0 | 133.9 | -0.1 | | |
| 133.0 | 132.9 | -0.1 | | |
| 132.0 | 131.9 | -0.1 | | |
| 131.0 | 130.9 | -0.1 | | |
| 130.0 | 129.9 | -0.1 | | |
| 129.0 | 128.9 | -0.1 | | |
| 124.0 | 123.9 | -0.1 | | |
| 119.0 | 118.9 | -0.1 | | |
| 114.0 | 114.0 | 0.0 | | |
| 109.0 | 109.0 | 0.0 | | |
| 104.0 | 104.0 | 0.0 | | |
| 99.0 | 99.0 | 0.0 | | |
| 94.0 | 93.9 | -0.1 | | |
| 89.0 | 88.9 | -0.1 | | |
| 84.0 | 83.9 | -0.1 | | |
| 79.0 | 78.9 | -0.1 | | |
| 74.0 | 73.9 | -0.1 | | |
| 69.0 | 68.9 | -0.1 | | |
| 64.0 | 63.9 | -0.1 | | |
| 59.0 | 58.9 | -0.1 | | |
| 54.0 | 53.9 | -0.1 | | |
| 49.0 | 48.9 | -0.1 | | |
| 44.0 | 44.0 | 0.0 | | |
| 43.0 | 43.0 | 0.0 | | |
| 42.0 | 42.0 | 0.0 | | |
| 41.0 | 41.0 | 0.0 | | |
| 40.0 | 40.0 | 0.0 | | |

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5. Electrical signal tests of frequency weightings

| Frequency | Design-goal frequency weighting | | | The deviation of frequency weighting | | | Expanded uncertainty | Acceptable limits |
|-----------|---------------------------------|------|-----|--------------------------------------|------|-----|----------------------|-------------------|
| | A | C | Z | A | C | Z | | |
| Hz | dB | dB | dB | dB | dB | dB | dB | dB |
| 63 | -26,2 | -0,8 | 0,0 | 0.1 | 0.0 | 0.0 | 0,3 | ±1,5 |
| 125 | -16,1 | -0,2 | 0,0 | 0.0 | 0.0 | 0.0 | 0,3 | ±1,5 |
| 250 | -8,6 | 0,0 | 0,0 | 0.0 | 0.0 | 0.0 | 0,3 | ±1,4 |
| 500 | -3,2 | 0,0 | 0,0 | 0.0 | 0.0 | 0.0 | 0,3 | ±1,4 |
| 1000 | 0,0 | 0,0 | 0,0 | 0.0 | 0.0 | 0.0 | 0,3 | ±1,1 |
| 2000 | 1,2 | -0,2 | 0,0 | 0.0 | 0.0 | 0.0 | 0,3 | ±1,6 |
| 4000 | 1,0 | -0,8 | 0,0 | 0.0 | 0.0 | 0.0 | 0,3 | ±1,6 |
| 8000 | -1,1 | -3,0 | 0,0 | 0.1 | 0.1 | 0.0 | 0,4 | -3,1; +2,1 |
| 16000 | -6,6 | -8,5 | 0,0 | -0.2 | -0.2 | 0.0 | 0,6 | -17,0; +3,5 |

6. Frequency and time weightings at 1 kHz

| Frequency weighting | Sound level | | | | Time-averaged sound level |
|---------------------------------------------------------------------------------------------------------|--------------|-------|-------|-------|---------------------------|
| | A | A | C | Z | A |
| Time weighting | Fast | Slow | Fast | Fast | - |
| Indication [dB] | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 |
| The deviation of indication from the indication of A-weighted sound level with Fast time weighting [dB] | | 0.0 | 0.0 | 0.0 | 0.0 |
| Expanded uncertainty [dB] | | 0.1 | | | |
| Acceptable limits [dB] | | ±0.3 | ±0.4 | ±0.4 | ±0.3 |

CALIBRATION RESULTS

Calibration results are as follows:

1. Indication at the calibration check frequency

The sound level meter was calibrated in compliance with the instruction manual. During this process, the indication of this SLM was adjusted to the sound pressure level of the sound level calibrator type SV 30A, No 44775, from SVANTEK. The sound pressure level was corrected by the free-field factor.

Deviation of the acoustic pressure measurement of the A-weighted sound level using the sound calibrator type SV 30A, No 44775, from SVANTEK, was made according to the standard reference conditions: for static pressure 1003 hPa, for temperature 24 °C and for relative humidity 60 %, results:

| |
|---------------------|
| 0.0 ± 0.2 dB |
|---------------------|

The deviation was determined as a difference between the measured sound level and the sound level corrected by the free-field factor appropriate to mentioned sound calibrator.

2. Self-generated noise with microphone installed

| | |
|---------------------------------------------------------------------------------|------|
| Frequency weighting | A |
| The highest level of self-generated noise stated in the instruction manual [dB] | 15.0 |
| Indication [dB] | 8.2 |

3. Self-generated noise with microphone replaced by the electrical input signal device

| | | | |
|------------------------------------------------------------------------------------------|------|------|------|
| Frequency weighting | A | C | Z |
| The highest expected level of self-generated noise stated in the instruction manual [dB] | 12.0 | 12.0 | 17.0 |
| Level of self-generated noise [dB] | 6.7 | 6.7 | 11.4 |

4. Acoustical signal tests of a frequency weighting C

| Frequency | Relative frequency-weighted free-field response | Design-goal frequency weighting | The deviation of frequency weighting | Expanded uncertainty | Acceptable limits |
|-----------|-------------------------------------------------|---------------------------------|--------------------------------------|----------------------|-------------------|
| Hz | dB | dB | dB | dB | dB |
| 125.0 | -0.11 | -0,2 | 0.1 | 0.3 | ±1.5 |
| 1000.0 | 0.01 | 0,0 | 0.0 | 0.3 | ±1.1 |
| 4000.0 | -0.63 | -0,8 | 0.2 | 0.4 | ±1.6 |
| 8000.0 | -2.15 | -3,0 | 0.9 | 0.4 | -3.1; +2.5 |

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CALIBRATION METHOD Method described in instruction IN-02 "Calibration of the sound level meter", issue number 11 date 27.01.2016, written on the basis of international standard EN IEC 61672-3:2013 Electroacoustics. Part 3: Periodic tests.

CALIBRATION RESULTS **The sound level meter submitted for testing has successfully completed the Class 1 periodic tests of IEC 61672-3:2013 (BS EN 61672-3:2013), for the environmental conditions under which the tests were performed.**

The results are presented on pages 3 to 8 of this certificate (including measurement uncertainty).

CONFORMITY WITH REQUIREMENTS On the basis of the calibration results, it has been found that, the sound level meter meets metrological requirements specified in the standard IEC 61672-1:2013 Electroacoustics – Sound level meters. Part 1: Specifications, for class 1.

UNCERTAINTY OF MEASUREMENTS Uncertainty of measurement has been evaluated in compliance with EA-4/02:2013. The expanded uncertainty assigned corresponds to a coverage probability of 95 % and the coverage factor $k = 2$.

NOTES

1. *The information appearing on this certificate has been compiled specifically for this instrument. This calibration certificate is produced with traceable and advanced equipment which permit comprehensive quality assurance verification of all data supplied herein.*
2. *The instrument was running firmware version 1.30.3*
3. *The measurements in this document are traceable to GUM (Central Office of Measures), Poland*
4. *This calibration certificate shall not be reproduced except in full, without written permission from Svantek UK Ltd.*

REFERENCE EQUIPMENT

| Description | Manufacturer | Model | Serial Number | Last Calibrated |
|----------------------------|--------------|---------|---------------|-----------------|
| Signal Generator | Svantek | SV401 | 124 | 11.09.19 |
| Sound & Vibration Analyser | Svantek | SV912AE | 15940 | 09.09.19 |
| Thermo-Barometer | LAB-EL | LB-706B | 912 | 13.09.19 |
| Acoustical Calibrator | Svantek | SV30A | 44775 | 09.09.19 |



CALIBRATION CERTIFICATE

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OBJECT OF CALIBRATION

Manufacturer: **SVANTEK**
Model: **SV977A**
Serial No.: 46010
Description: Sound Level Meter

SENSOR

| | | |
|---------------|--------------|----------------|
| Manufacturer: | ACO | Svantek |
| Model: | 7052E | SV12L |
| Serial No.: | 72365 | 77929 |
| Description: | Microphone | Preamplifier |

APPLICANT

Galetech Energy Services
Tullyco, Cootehill, Co Cavan, Republic of Ireland

ENVIRONMENTAL CONDITIONS

| | | |
|--------------|---------------|-----|
| Temperature: | 23.9 – 24.8 | °C |
| Humidity: | 40 – 45 | % |
| Pressure: | 100.5 – 100.5 | kPa |

DATE OF CALIBRATION

24-08-2020

APPROVED BY

B. Hunt



AcSoft Calibration | Bedford Technology Park
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CALIBRATION CERTIFICATE

Date of issue: 24-08-2020

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OBJECT OF CALIBRATION

Manufacturer: **SVANTEK**
Model: **SV977**
Serial No.: 46436
Description: Sound Level Meter

SENSOR

Manufacturer: **ACO** **Svantek**
Model: **7052E** **SV12L**
Serial No.: 63961 58574
Description: Microphone Preamplifier

APPLICANT

Galetech Energy Services
Tullyco, Cootehill, Co Cavan, Republic of Ireland

ENVIRONMENTAL CONDITIONS

Temperature: 23.9 – 24.8 °C
Humidity: 42 – 46 %
Pressure: 100.5 – 100.5 kPa

DATE OF CALIBRATION 24-08-2020

APPROVED BY B. Hunt

AcSoft
sound & vibration

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Thurleigh | Bedford | MK44 2YA

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CALIBRATION METHOD Method described in instruction IN-02 "Calibration of the sound level meter", issue number 11 date 27.01.2016, written on the basis of international standard EN IEC 61672-3:2013 Electroacoustics. Part 3: Periodic tests.

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The results are presented on pages 3 to 8 of this certificate (including measurement uncertainty).

CONFORMITY WITH REQUIREMENTS On the basis of the calibration results, it has been found that, the sound level meter meets metrological requirements specified in the standard IEC 61672-1:2013 Electroacoustics – Sound level meters. Part 1: Specifications, for class 1.

UNCERTAINTY OF MEASUREMENTS Uncertainty of measurement has been evaluated in compliance with EA-4/02:2013. The expanded uncertainty assigned corresponds to a coverage probability of 95 % and the coverage factor $k = 2$.

NOTES

- The information appearing on this certificate has been compiled specifically for this instrument. This calibration certificate is produced with traceable and advanced equipment which permit comprehensive quality assurance verification of all data supplied herein.*
- The instrument was running firmware version 1.33.3*
- The measurements in this document are traceable to GUM (Central Office of Measures), Poland*
- This calibration certificate shall not be reproduced except in full, without written permission from Svantek UK Ltd.*

REFERENCE EQUIPMENT

| Description | Manufacturer | Model | Serial Number | Last Calibrated |
|----------------------------|--------------|---------|---------------|-----------------|
| Signal Generator | Svantek | SV401 | 124 | 11.09.19 |
| Sound & Vibration Analyser | Svantek | SV912AE | 15940 | 09.09.19 |
| Thermo-Barometer | LAB-EL | LB-706B | 912 | 13.09.19 |
| Acoustical Calibrator | Svantek | SV30A | 44775 | 09.09.19 |

CALIBRATION RESULTS

Calibration results are as follows:

1. Indication at the calibration check frequency

The sound level meter was calibrated in compliance with the instruction manual. During this process, the indication of this SLM was adjusted to the sound pressure level of the sound level calibrator type SV 30A, No 44775, from SVANTEK. The sound pressure level was corrected by the free-field factor.

Deviation of the acoustic pressure measurement of the A-weighted sound level using the sound calibrator type SV 30A, No 44775, from SVANTEK, was made according to the standard reference conditions: for static pressure 1003 hPa, for temperature 24 °C and for relative humidity 60 %, results:

| |
|---------------------|
| 0.0 ± 0.2 dB |
|---------------------|

The deviation was determined as a difference between the measured sound level and the sound level corrected by the free-field factor appropriate to mentioned sound calibrator.

2. Self-generated noise with microphone installed

| | |
|---------------------------------------------------------------------------------|------|
| Frequency weighting | A |
| The highest level of self-generated noise stated in the instruction manual [dB] | 15.0 |
| Indication [dB] | 8.5 |

3. Self-generated noise with microphone replaced by the electrical input signal device

| | | | |
|------------------------------------------------------------------------------------------|------|------|------|
| Frequency weighting | A | C | Z |
| The highest expected level of self-generated noise stated in the instruction manual [dB] | 12.0 | 12.0 | 17.0 |
| Level of self-generated noise [dB] | 7.6 | 7.6 | 12.1 |

4. Acoustical signal tests of a frequency weighting C

| Frequency | Relative frequency-weighted free-field response | Design-goal frequency weighting | The deviation of frequency weighting | Expanded uncertainty | Acceptable limits |
|-----------|-------------------------------------------------|---------------------------------|--------------------------------------|----------------------|-------------------|
| Hz | dB | dB | dB | dB | dB |
| 125.0 | -0.12 | -0,2 | 0.1 | 0.3 | ±1.5 |
| 1000.0 | 0.00 | 0,0 | 0.0 | 0.3 | ±1.1 |
| 4000.0 | -0.35 | -0,8 | 0.4 | 0.4 | ±1.6 |
| 8000.0 | -1.41 | -3,0 | 1.6 | 0.4 | -3.1; +2.5 |

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5. Electrical signal tests of frequency weightings

| Frequency | Design-goal frequency weighting | | | The deviation of frequency weighting | | | Expanded uncertainty | Acceptable limits |
|-----------|---------------------------------|------|-----|--------------------------------------|------|-----|----------------------|-------------------|
| | A | C | Z | A | C | Z | | |
| Hz | dB | dB | dB | dB | dB | dB | dB | dB |
| 63 | -26,2 | -0,8 | 0,0 | 0,1 | 0,0 | 0,0 | 0,3 | ±1,5 |
| 125 | -16,1 | -0,2 | 0,0 | 0,0 | 0,0 | 0,0 | 0,3 | ±1,5 |
| 250 | -8,6 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,3 | ±1,4 |
| 500 | -3,2 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,3 | ±1,4 |
| 1000 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,3 | ±1,1 |
| 2000 | 1,2 | -0,2 | 0,0 | 0,0 | 0,0 | 0,0 | 0,3 | ±1,6 |
| 4000 | 1,0 | -0,8 | 0,0 | 0,1 | 0,1 | 0,0 | 0,3 | ±1,6 |
| 8000 | -1,1 | -3,0 | 0,0 | 0,1 | 0,1 | 0,0 | 0,4 | -3,1; +2,1 |
| 16000 | -6,6 | -8,5 | 0,0 | -0,2 | -0,2 | 0,0 | 0,6 | -17,0; +3,5 |

6. Frequency and time weightings at 1 kHz

| Frequency weighting | Sound level | | | | Time-averaged sound level |
|---------------------------------------------------------------------------------------------------------|-----------------|-------|-------|-------|---------------------------|
| | A | A | C | Z | A |
| Time weighting | Fast | Slow | Fast | Fast | - |
| Indication [dB] | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 |
| The deviation of indication from the indication of A-weighted sound level with Fast time weighting [dB] | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Expanded uncertainty [dB] | 0.1 | 0.1 | | | |
| Acceptable limits [dB] | ±0.3 | ±0.3 | ±0.4 | ±0.4 | ±0.3 |

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7. Level linearity

Reference level range: HIGH

| Expected sound level | Indication | Level linearity error | Expanded uncertainty | Acceptable limits |
|----------------------|------------|-----------------------|----------------------|-------------------|
| dB | dB | dB | dB | dB |
| 136.0 | 136.0 | 0.0 | 0.2 | ±1.1 |
| 135.0 | 135.0 | 0.0 | | |
| 134.0 | 134.0 | 0.0 | | |
| 133.0 | 133.0 | 0.0 | | |
| 132.0 | 132.0 | 0.0 | | |
| 131.0 | 131.0 | 0.0 | | |
| 130.0 | 130.0 | 0.0 | | |
| 129.0 | 129.0 | 0.0 | | |
| 124.0 | 124.0 | 0.0 | | |
| 119.0 | 119.0 | 0.0 | | |
| 114.0 | 114.0 | 0.0 | | |
| 109.0 | 109.0 | 0.0 | | |
| 104.0 | 104.0 | 0.0 | | |
| 99.0 | 99.0 | 0.0 | | |
| 94.0 | 94.0 | 0.0 | | |
| 89.0 | 89.0 | 0.0 | | |
| 84.0 | 84.0 | 0.0 | | |
| 79.0 | 79.0 | 0.0 | | |
| 74.0 | 74.0 | 0.0 | | |
| 69.0 | 69.0 | 0.0 | | |
| 64.0 | 64.0 | 0.0 | | |
| 59.0 | 59.0 | 0.0 | | |
| 54.0 | 54.0 | 0.0 | | |
| 49.0 | 49.0 | 0.0 | | |
| 44.0 | 44.0 | 0.0 | | |
| 43.0 | 43.0 | 0.0 | | |
| 42.0 | 42.0 | 0.0 | | |
| 41.0 | 41.0 | 0.0 | | |
| 40.0 | 40.0 | 0.0 | | |

Level range: LOW

| Expected sound level | Indication | Level linearity error | Expanded uncertainty | Acceptable limits |
|----------------------|------------|-----------------------|----------------------|-------------------|
| dB | dB | dB | dB | dB |
| 120.0 | 120.0 | 0.0 | 0.2 | ±1.1 |
| 119.0 | 119.0 | 0.0 | | |
| 118.0 | 118.0 | 0.0 | | |
| 117.0 | 117.0 | 0.0 | | |
| 116.0 | 116.0 | 0.0 | | |
| 115.0 | 115.0 | 0.0 | | |
| 114.0 | 114.0 | 0.0 | | |
| 109.0 | 109.0 | 0.0 | | |
| 104.0 | 104.0 | 0.0 | | |
| 99.0 | 99.0 | 0.0 | | |
| 94.0 | 94.0 | 0.0 | | |
| 89.0 | 89.0 | 0.0 | | |
| 84.0 | 84.0 | 0.0 | | |
| 79.0 | 79.0 | 0.0 | | |
| 74.0 | 74.0 | 0.0 | | |
| 69.0 | 69.0 | 0.0 | | |
| 64.0 | 64.0 | 0.0 | | |
| 59.0 | 59.0 | 0.0 | | |
| 54.0 | 54.0 | 0.0 | | |
| 49.0 | 49.0 | 0.0 | | |
| 44.0 | 43.9 | -0.1 | | |
| 39.0 | 39.0 | 0.0 | | |
| 34.0 | 34.0 | 0.0 | 0.3 | |
| 29.0 | 29.0 | 0.0 | | |
| 28.0 | 28.0 | 0.0 | | |
| 27.0 | 27.0 | 0.0 | | |
| 26.0 | 26.0 | 0.0 | | |
| 25.0 | 25.0 | 0.0 | | |

8. Level linearity including the level range control

| Level range | HIGH | LOW |
|----------------------------------------------------------------------------------------------------------------------------|----------------|-------|
| Indication for the reference sound pressure level [dB] | 114.0 | 114.0 |
| The deviation of indication [dB] | 0.0 | 0.0 |
| Anticipated level that is 5 dB less than the upper limit specified in the instruction manual for level range at 1 kHz [dB] | 132.0 | 115.0 |
| Indication [dB] | 132.0 | 115.0 |
| The deviation of indication [dB] | 0.0 | 0.0 |
| Expanded uncertainty [dB] | 0.2 | |
| Acceptable limits[dB] | ±1.1 | |

9. Toneburst response

| Measurement quantity | Time weighting | Toneburst duration | The indications in response to toneburst relative to steady sound level | Reference toneburst response relative to steady sound level | Deviation of measured toneburst response from reference toneburst | Expanded uncertainty | Acceptable limits |
|---------------------------|----------------|--------------------|-------------------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------------|----------------------|-------------------|
| | | | ms | dB | dB | | dB |
| Time-weighted sound level | Fast | 200 | -1.0 | -1.0 | 0.0 | 0.2 | ±0.8 |
| | | 2 | -18.0 | -18.0 | 0.0 | | -1.8; +1.3 |
| | | 0.25 | -27.1 | -27.0 | -0.1 | | -3.3; +1.3 |
| Time-weighted sound level | Slow | 200 | -7.4 | -7.4 | 0.0 | | ±0.8 |
| | | 2 | -27.0 | -27.0 | 0.0 | | -1.8; +1.3 |
| Sound exposure level | - | 200 | -7.0 | -7.0 | 0.0 | | ±0.8 |
| | | 2 | -27.0 | -27.0 | 0.0 | | -1.8; +1.3 |
| | | 0.25 | -36.1 | -36.0 | -0.1 | | -3.3; +1.3 |

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10. Peak C sound level

| Numbers of cycles in test signal | Frequency of test signal | The deviation of indication | Expanded uncertainty | Acceptable limits |
|----------------------------------|--------------------------|-----------------------------|----------------------|-------------------|
| | Hz | dB | dB | dB |
| One | 8000 | -0.4 | 0.2 | ±2.4 |
| Positive half-cycle | 500 | -0.1 | | ±1.4 |
| Negative half-cycle | 500 | -0.1 | | |

11. Overload indication

Frequency weighting A

| The difference between the levels of the positive and negative one-half-cycles input signals that first cause the displays of overload indication | Expanded uncertainty | Maximum value of the difference |
|---------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------------------------|
| dB | dB | dB |
| 0.0 | 0.3 | 1.8 |



CALIBRATION CERTIFICATE

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OBJECT OF CALIBRATION

Manufacturer: **SVANTEK**
Model: **SV977C**
Serial No.: 92648
Description: Sound Level Meter

SENSOR

| | | |
|---------------|--------------|----------------|
| Manufacturer: | MTG | Svantek |
| Model: | MK255 | SV12L |
| Serial No.: | 18924 | 18955 |
| Description: | Microphone | Preamplifier |

APPLICANT

Galetech Energy Services
Tullyco, Cootehill, Co Cavan, Republic of Ireland

ENVIRONMENTAL CONDITIONS

| | | |
|--------------|--------------|-----|
| Temperature: | 21.1 – 23.1 | °C |
| Humidity: | 39 – 47 | % |
| Pressure: | 99.9 – 100.0 | kPa |

DATE OF CALIBRATION

13-10-2020

APPROVED BY

B. Hunt

AcSoft
sound & vibration

AcSoft Calibration | Bedford Technology Park
Thurleigh | Bedford | MK44 2YA

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www.acsoft.co.uk

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CALIBRATION METHOD Method described in instruction IN-02 "Calibration of the sound level meter", issue number 11 date 27.01.2016, written on the basis of international standard EN IEC 61672-3:2013 Electroacoustics. Part 3: Periodic tests.

CALIBRATION RESULTS **The sound level meter submitted for testing has successfully completed the Class 1 periodic tests of IEC 61672-3:2013 (BS EN 61672-3:2013), for the environmental conditions under which the tests were performed.**

The results are presented on pages 3 to 8 of this certificate (including measurement uncertainty).

CONFORMITY WITH REQUIREMENTS On the basis of the calibration results, it has been found that, the sound level meter meets metrological requirements specified in the standard IEC 61672-1:2013 Electroacoustics – Sound level meters. Part 1: Specifications, for class 1.

UNCERTAINTY OF MEASUREMENTS Uncertainty of measurement has been evaluated in compliance with EA-4/02:2013. The expanded uncertainty assigned corresponds to a coverage probability of 95 % and the coverage factor $k = 2$.

NOTES

- 1. The information appearing on this certificate has been compiled specifically for this instrument. This calibration certificate is produced with traceable and advanced equipment which permit comprehensive quality assurance verification of all data supplied herein.*
- 2. The instrument was running firmware version 1.41.3*
- 3. The measurements in this document are traceable to GUM (Central Office of Measures), Poland*
- 4. This calibration certificate shall not be reproduced except in full, without written permission from Svantek UK Ltd.*

REFERENCE EQUIPMENT

| Description | Manufacturer | Model | Serial Number | Last Calibrated |
|----------------------------|--------------|---------|---------------|-----------------|
| Signal Generator | Svantek | SV401 | 124 | 14.09.20 |
| Sound & Vibration Analyser | Svantek | SV912AE | 15940 | 15.09.20 |
| Thermo-Barometer | LAB-EL | LB-706B | 912 | 15.09.20 |
| Acoustical Calibrator | Svantek | SV30A | 44775 | 15.09.20 |

CALIBRATION RESULTS

Calibration results are as follows:

1. Indication at the calibration check frequency

The sound level meter was calibrated in compliance with the instruction manual. During this process, the indication of this SLM was adjusted to the sound pressure level of the sound level calibrator type SV 30A, No 44775, from SVANTEK. The sound pressure level was corrected by the free-field factor.

Deviation of the acoustic pressure measurement of the A-weighted sound level using the sound calibrator type SV 30A, No 44775, from SVANTEK, was made according to the standard reference conditions: for static pressure 1003 hPa, for temperature 24 °C and for relative humidity 60 %, results:

0.0 ± 0.2 dB

The deviation was determined as a difference between the measured sound level and the sound level corrected by the free-field factor appropriate to mentioned sound calibrator.

2. Self-generated noise with microphone installed

| | |
|---------------------------------------------------------------------------------|------|
| Frequency weighting | A |
| The highest level of self-generated noise stated in the instruction manual [dB] | 15.0 |
| Indication [dB] | 6.8 |

3. Self-generated noise with microphone replaced by the electrical input signal device

| | | | |
|------------------------------------------------------------------------------------------|------|------|------|
| Frequency weighting | A | C | Z |
| The highest expected level of self-generated noise stated in the instruction manual [dB] | 12.0 | 12.0 | 17.0 |
| Level of self-generated noise [dB] | 6.6 | 6.6 | 8.4 |

4. Acoustical signal tests of a frequency weighting C

| Frequency | Relative frequency-weighted free-field response | Design-goal frequency weighting | The deviation of frequency weighting | Expanded uncertainty | Acceptable limits |
|-----------|-------------------------------------------------|---------------------------------|--------------------------------------|----------------------|-------------------|
| Hz | dB | dB | dB | dB | dB |
| 125.0 | -0.01 | -0,2 | 0.2 | 0.3 | ±1.5 |
| 1000.0 | 0.01 | 0,0 | 0.0 | 0.3 | ±1.1 |
| 4000.0 | -0.95 | -0,8 | -0.2 | 0.4 | ±1.6 |
| 8000.0 | -2.88 | -3,0 | 0.1 | 0.4 | -3.1; +2.5 |

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5. Electrical signal tests of frequency weightings

| Frequency | Design-goal frequency weighting | | | The deviation of frequency weighting | | | Expanded uncertainty | Acceptable limits |
|-----------|---------------------------------|------|-----|--------------------------------------|------|-----|----------------------|-------------------|
| | A | C | Z | A | C | Z | | |
| Hz | dB | dB | dB | dB | dB | dB | dB | dB |
| 63 | -26,2 | -0,8 | 0,0 | 0.1 | 0.0 | 0.0 | 0,3 | ±1,5 |
| 125 | -16,1 | -0,2 | 0,0 | 0.0 | 0.0 | 0.0 | 0,3 | ±1,5 |
| 250 | -8,6 | 0,0 | 0,0 | 0.0 | 0.0 | 0.0 | 0,3 | ±1,4 |
| 500 | -3,2 | 0,0 | 0,0 | 0.0 | 0.0 | 0.0 | 0,3 | ±1,4 |
| 1000 | 0,0 | 0,0 | 0,0 | 0.0 | 0.0 | 0.0 | 0,3 | ±1,1 |
| 2000 | 1,2 | -0,2 | 0,0 | 0.0 | 0.0 | 0.0 | 0,3 | ±1,6 |
| 4000 | 1,0 | -0,8 | 0,0 | 0.0 | 0.0 | 0.0 | 0,3 | ±1,6 |
| 8000 | -1,1 | -3,0 | 0,0 | 0.1 | 0.1 | 0.0 | 0,4 | -3,1; +2,1 |
| 16000 | -6,6 | -8,5 | 0,0 | -0.2 | -0.2 | 0.0 | 0,6 | -17,0; +3,5 |

6. Frequency and time weightings at 1 kHz

| Frequency weighting | Sound level | | | | Time-averaged sound level |
|---------------------------------------------------------------------------------------------------------|-----------------|-------|-------|-------|---------------------------|
| | A | A | C | Z | A |
| Time weighting | Fast | Slow | Fast | Fast | - |
| Indication [dB] | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 |
| The deviation of indication from the indication of A-weighted sound level with Fast time weighting [dB] | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Expanded uncertainty [dB] | 0.1 | 0.1 | | | |
| Acceptable limits[dB] | ±0.3 | ±0.3 | ±0.4 | ±0.4 | ±0.3 |

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7. Level linearity

Reference level range: HIGH

| Expected sound level | Indication | Level linearity error | Expanded uncertainty | Acceptable limits |
|----------------------|------------|-----------------------|----------------------|-------------------|
| dB | dB | dB | dB | dB |
| 136.0 | 136.0 | 0.0 | 0.2 | ±1.1 |
| 135.0 | 135.0 | 0.0 | | |
| 134.0 | 134.0 | 0.0 | | |
| 133.0 | 133.0 | 0.0 | | |
| 132.0 | 132.0 | 0.0 | | |
| 131.0 | 131.0 | 0.0 | | |
| 130.0 | 130.0 | 0.0 | | |
| 129.0 | 129.0 | 0.0 | | |
| 124.0 | 124.0 | 0.0 | | |
| 119.0 | 119.0 | 0.0 | | |
| 114.0 | 114.0 | 0.0 | | |
| 109.0 | 109.0 | 0.0 | | |
| 104.0 | 104.0 | 0.0 | | |
| 99.0 | 99.0 | 0.0 | | |
| 94.0 | 94.0 | 0.0 | | |
| 89.0 | 89.0 | 0.0 | | |
| 84.0 | 84.0 | 0.0 | | |
| 79.0 | 79.0 | 0.0 | | |
| 74.0 | 73.9 | -0.1 | | |
| 69.0 | 68.9 | -0.1 | | |
| 64.0 | 63.9 | -0.1 | | |
| 59.0 | 58.9 | -0.1 | | |
| 54.0 | 53.9 | -0.1 | | |
| 49.0 | 49.0 | 0.0 | | |
| 44.0 | 44.0 | 0.0 | | |
| 43.0 | 43.0 | 0.0 | | |
| 42.0 | 42.0 | 0.0 | | |
| 41.0 | 41.0 | 0.0 | | |
| 40.0 | 40.0 | 0.0 | | |

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Level range: LOW

| Expected sound level | Indication | Level linearity error | Expanded uncertainty | Acceptable limits |
|----------------------|------------|-----------------------|----------------------|-------------------|
| dB | dB | dB | dB | dB |
| 120.0 | 120.0 | 0.0 | 0.2 | ±1.1 |
| 119.0 | 119.0 | 0.0 | | |
| 118.0 | 118.0 | 0.0 | | |
| 117.0 | 117.0 | 0.0 | | |
| 116.0 | 116.0 | 0.0 | | |
| 115.0 | 115.0 | 0.0 | | |
| 114.0 | 114.0 | 0.0 | | |
| 109.0 | 109.0 | 0.0 | | |
| 104.0 | 104.0 | 0.0 | | |
| 99.0 | 99.0 | 0.0 | | |
| 94.0 | 94.0 | 0.0 | | |
| 89.0 | 89.0 | 0.0 | | |
| 84.0 | 84.0 | 0.0 | | |
| 79.0 | 79.0 | 0.0 | | |
| 74.0 | 73.9 | -0.1 | | |
| 69.0 | 68.9 | -0.1 | | |
| 64.0 | 63.9 | -0.1 | | |
| 59.0 | 58.9 | -0.1 | | |
| 54.0 | 53.9 | -0.1 | | |
| 49.0 | 48.9 | -0.1 | | |
| 44.0 | 43.9 | -0.1 | | |
| 39.0 | 38.9 | -0.1 | | |
| 34.0 | 33.9 | -0.1 | 0.3 | |
| 29.0 | 29.0 | 0.0 | | |
| 28.0 | 28.0 | 0.0 | | |
| 27.0 | 27.0 | 0.0 | | |
| 26.0 | 26.0 | 0.0 | | |
| 25.0 | 25.0 | 0.0 | | |

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8. Level linearity including the level range control

| Level range | HIGH | LOW |
|----------------------------------------------------------------------------------------------------------------------------|----------------|-------|
| Indication for the reference sound pressure level [dB] | 114.0 | 114.0 |
| The deviation of indication [dB] | 0.0 | 0.0 |
| Anticipated level that is 5 dB less than the upper limit specified in the instruction manual for level range at 1 kHz [dB] | 132.0 | 115.0 |
| Indication [dB] | 132.0 | 114.9 |
| The deviation of indication [dB] | 0.0 | -0.1 |
| Expanded uncertainty [dB] | 0.2 | |
| Acceptable limits[dB] | ±1.1 | |

9. Toneburst response

| Measurement quantity | Time weighting | Toneburst duration | The indications in response to toneburst relative to steady sound level | Reference toneburst response relative to steady sound level | Deviation of measured toneburst response from reference toneburst | Expanded uncertainty | Acceptable limits |
|---------------------------|----------------|--------------------|-------------------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------------|----------------------|-------------------|
| | | | ms | dB | dB | | dB |
| Time-weighted sound level | Fast | 200 | -1.0 | -1.0 | 0.0 | 0.2 | ±0.8 |
| | | 2 | -18.0 | -18.0 | 0.0 | | -1.8; +1.3 |
| | | 0.25 | -27.1 | -27.0 | -0.1 | | -3.3; +1.3 |
| Time-weighted sound level | Slow | 200 | -7.4 | -7.4 | 0.0 | | ±0.8 |
| | | 2 | -27.0 | -27.0 | 0.0 | | -1.8; +1.3 |
| Sound exposure level | - | 200 | -7.0 | -7.0 | 0.0 | | ±0.8 |
| | | 2 | -27.0 | -27.0 | 0.0 | | -1.8; +1.3 |
| | | 0.25 | -36.1 | -36.0 | -0.1 | | -3.3; +1.3 |

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10. Peak C sound level

| Numbers of cycles in test signal | Frequency of test signal | The deviation of indication | Expanded uncertainty | Acceptable limits |
|----------------------------------|--------------------------|-----------------------------|----------------------|-------------------|
| | Hz | dB | dB | dB |
| One | 8000 | -0.5 | 0.2 | ±2.4 |
| Positive half-cycle | 500 | -0.1 | | ±1.4 |
| Negative half-cycle | 500 | -0.1 | | |

11. Overload indication

Frequency weighting A

| The difference between the levels of the positive and negative one-half-cycles input signals that first cause the displays of overload indication | Expanded uncertainty | Maximum value of the difference |
|---------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------------------------|
| dB | dB | dB |
| 0.0 | 0.3 | 1.8 |