

# SOUND DETECTOR

## MODEL SD-200

ADDENDUM



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## About this Addendum

This addendum presents information for measuring the Sound Detector SD-200 sound level meter to the IEC61672-1.

- The SD-200 computes time-weighted averages over the run-time and is an integrating averaging sound level meter.

## Measuring to IEC 61672-1: Look –up table

The following references sections and tables in the user manual in which specific sections of IEC61672-1 standard are identified by page number (s). In some instances, the information is not applicable, as noted below in the Notes section.

\* Note: the data within this document will link to the specific section and is designated as pages “A1 – A6). The user manual references are listed as pages 1-11 and do not hyperlink. Please reference the SD-200 user manual at [www.tsi.com](http://www.tsi.com).

| IEC 61672-1<br>Section<br>(User manual<br>requirements) | Sound Detector SD-200 User Manual and<br>Addendum References                                                                                                | Notes                                        |
|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| 5.1.4                                                   | “SD-200 overview” section user manual                                                                                                                       |                                              |
| 5.1.6                                                   | “Microphone” section user manual                                                                                                                            |                                              |
| 5.1.7                                                   |                                                                                                                                                             | Microphone mounting is not applicable.       |
| 5.1.8                                                   |                                                                                                                                                             | Computer software is not used with SD-200.   |
| 5.1.10, 5.4.12                                          | <a href="#">“Frequency weighting”</a> sections (page A-7 and A-9)                                                                                           |                                              |
| 5.1.12                                                  | <a href="#">“Level of Linearity”</a> tables (page A-5)                                                                                                      |                                              |
| 5.1.13                                                  | <a href="#">“References direction”</a> (page A-5)<br>“Positioning and tripod mount” (user manual)<br><a href="#">“Level of Linearity”</a> tables (page A-5) |                                              |
| 5.1.14                                                  | “Resetting” (user manual)                                                                                                                                   |                                              |
| 5.1.15                                                  | <a href="#">“Electrical signal input”</a> (A-5)                                                                                                             |                                              |
| 5.1.16                                                  | <a href="#">“Maximum input levels”</a> (A-5)                                                                                                                |                                              |
| 5.1.17                                                  |                                                                                                                                                             | The SD-200 is a single channel instrument    |
| 5.1.18                                                  | “Powering on” (user manual)                                                                                                                                 |                                              |
| 5.2.1                                                   | “Calibrating” (user manual)<br>“Accessories” (user manual)                                                                                                  |                                              |
| 5.2.4, 5.2.5, 5.2.7                                     | <a href="#">“Nominal microphone frequency response , windscreen, diffraction and reflection corrections”</a> (page A-11)                                    |                                              |
| 5.2.8                                                   | <a href="#">“Pressure to free field corrections”</a> (page A-11)                                                                                            |                                              |
| 5.4.12                                                  |                                                                                                                                                             | No optional frequency responses              |
| 5.5.9, 5.5.10,<br>5.5.11                                | “Display range” (user manual)<br><a href="#">“Linear operating range”</a> (page A-6) and<br><a href="#">“Level of Linearity”</a> tables (page A-5)          |                                              |
| 5.6.1, 5.6.2, 5.6.3                                     | <a href="#">“Self generated noise levels”</a> (page A-6)                                                                                                    |                                              |
| 5.6.4, 5.6.5                                            | <a href="#">“Effects of background noise”</a> (A-6)                                                                                                         |                                              |
| 5.7.1                                                   | “Time Weighting” (user manual)                                                                                                                              |                                              |
| 5.10.1                                                  | “Overload” in Screen indicators table (user manual)                                                                                                         |                                              |
| 5.11.1                                                  | “Under Range” in Screen indicators table (user manual)                                                                                                      |                                              |
| 5.12.1                                                  |                                                                                                                                                             | No peak C levels                             |
| 5.14                                                    |                                                                                                                                                             | No thresholds used for integrating-averaging |
| 5.15.2, 5.15.3,<br>5.15.4                               | “Screen indicators” (user manual)<br>“Display” (user manual)                                                                                                |                                              |
| 5.15.5, 5.15.6,                                         | <a href="#">“Display and Integration”</a> (page A-12)                                                                                                       |                                              |
| 5.15.7                                                  |                                                                                                                                                             | No digital output                            |

| IEC 61672-1<br>Section<br>(User manual<br>requirements) | Sound Detector SD-200 User Manual and<br>Addendum References                         | Notes                                                            |
|---------------------------------------------------------|--------------------------------------------------------------------------------------|------------------------------------------------------------------|
| 5.16.1                                                  |                                                                                      | No AC or digital output -                                        |
| 5.17.1, 5.17.2                                          |                                                                                      | Not applicable                                                   |
| 5.18.1, 5.18.2                                          | <a href="#">“Cable and radio frequency emissions”</a> (page A-13)                    |                                                                  |
| 5.19.2                                                  |                                                                                      | The SD-200 is a single channel instrument                        |
| 5.20.2, 5.20.3                                          | <a href="#">“Battery voltage range and power supply”</a> (page A-13),<br>user manual |                                                                  |
| 5.20.4, 5.20.5                                          |                                                                                      | No external power supply                                         |
| 6.1.2                                                   |                                                                                      | Environmental effects not applicable                             |
| 6.2.2                                                   | “Environmental effects” (user manual)                                                |                                                                  |
| 6.5.2                                                   | <a href="#">“Electrostatic discharges”</a> (page A-13)                               |                                                                  |
| 6.6.1, 6.6.3, 6.6.4                                     | <a href="#">“AC power and radio frequency”</a> (page A-13)                           |                                                                  |
| 6.6.9                                                   |                                                                                      | Not applicable                                                   |
| 7.1                                                     |                                                                                      | No microphone extension device or cable                          |
| 7.2                                                     | <a href="#">“Directional Windscreen corrections”</a> (page A-13)                     |                                                                  |
| 7.3                                                     |                                                                                      | No optional installed accessories                                |
| 7.4                                                     |                                                                                      | No filters used with the SD-200                                  |
| 7.5                                                     |                                                                                      | No auxiliary devices with the SD-200                             |
| 9.2.1 General                                           |                                                                                      |                                                                  |
| a                                                       | “Standards” section (user manual)                                                    |                                                                  |
| b                                                       | “SD-200 Overview (user manual)<br>“Operating” (user manual)                          |                                                                  |
| c                                                       | “Microphone” (user manual)                                                           |                                                                  |
| d                                                       |                                                                                      | No microphone extension device or cable used<br>with the SD-200. |
| e                                                       |                                                                                      | The SD-200 is a single channel instrument                        |
| 9.2.2 Design features                                   |                                                                                      |                                                                  |
| a                                                       | “Screen indicators” section (user manual)                                            |                                                                  |
| b                                                       | <a href="#">“Directional windscreen corrections”</a> (page A-13)                     |                                                                  |
| c                                                       | <a href="#">“Frequency weighting”</a> (page A-7 – A-9))                              |                                                                  |
| d                                                       | “Measurements/frequency weighting and time response”<br>(user manual)                |                                                                  |
| e                                                       |                                                                                      | The SD-200 is a single range SLM, not<br>applicable.             |
| f                                                       |                                                                                      | The SD-200 is a single range SLM, not<br>applicable.             |
| g                                                       | “Screen indicators” (user manual and A-13)                                           |                                                                  |
| h                                                       | <a href="#">“Level of linearity”</a> (page A-5)                                      |                                                                  |
| i                                                       | <a href="#">“Frequency weighting”</a> (page A-7, A-9)                                |                                                                  |
| j                                                       |                                                                                      | No computer program software used to operate<br>the SD-200       |
| k                                                       |                                                                                      | Not applicable.                                                  |

| IEC 61672-1<br>Section<br>(User manual<br>requirements)                                           | Sound Detector SD-200 User Manual and<br>Addendum References                         | Notes                                                               |
|---------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| 9.2.3 Power supply                                                                                |                                                                                      |                                                                     |
| a                                                                                                 | “Electrical characteristics” (user manual)                                           |                                                                     |
| b                                                                                                 | “Screen Indicators” (user manual)<br>“ <a href="#">Battery voltage</a> ” (page A-13) |                                                                     |
| c                                                                                                 |                                                                                      | No external power                                                   |
| d                                                                                                 |                                                                                      | No A.C. electrical power supply                                     |
| 9.2.4 Adjustments to indicated levels                                                             |                                                                                      |                                                                     |
| a                                                                                                 | “Calibration” (user manual)                                                          |                                                                     |
| b                                                                                                 | “Calibration” (user manual)                                                          |                                                                     |
| c                                                                                                 | “Calibrating” (user manual)                                                          |                                                                     |
| d                                                                                                 | “ <a href="#">Corrections</a> ” (page A-11)                                          |                                                                     |
| 9.2.5 Operating the sound level meter                                                             |                                                                                      |                                                                     |
| a                                                                                                 | “ <a href="#">Directional windscreen corrections</a> ” (page A-13)                   |                                                                     |
| b                                                                                                 | “Positioning and tripod mount” (user manual)                                         |                                                                     |
| c                                                                                                 |                                                                                      | The SD-200 measures sound level using a single range                |
| d                                                                                                 | “ <a href="#">Effects of background noise</a> ” (page A-6)                           |                                                                     |
| e                                                                                                 | “Powering on” (user manual)                                                          |                                                                     |
| f                                                                                                 | “ <a href="#">Display and integration</a> ” (page A-12)                              |                                                                     |
| g                                                                                                 |                                                                                      | No pre-set for integration time or time of day setting              |
| h                                                                                                 | “ <a href="#">Minimum/Maximum integration time</a> ” (page A-13)                     |                                                                     |
| i                                                                                                 |                                                                                      | No hold function on the SD-200                                      |
| j                                                                                                 | “Resetting” (user manual)                                                            |                                                                     |
| k                                                                                                 | “ <a href="#">Resetting Overload and Under Range</a> ” (page A-12)                   |                                                                     |
| l                                                                                                 |                                                                                      | No threshold settings used on the SD-200                            |
| m                                                                                                 |                                                                                      | No downloading of data capability on the SD-200                     |
| n                                                                                                 | “ <a href="#">Cable and radio frequency emissions</a> ” (page A-13)                  |                                                                     |
| o                                                                                                 | “ <a href="#">Self generated noise levels</a> ” (A-6)                                |                                                                     |
| p                                                                                                 |                                                                                      | No AC or digital output used with the SD-200.                       |
| 9.2.6 Accessories                                                                                 |                                                                                      |                                                                     |
| a                                                                                                 |                                                                                      | No optional installed accessories                                   |
| b                                                                                                 |                                                                                      | No microphone extension device or cable                             |
| c                                                                                                 |                                                                                      | No bandpass filters used                                            |
| d                                                                                                 |                                                                                      | No auxiliary devices used                                           |
| 9.2.7 Influence of variations in environmental conditions                                         |                                                                                      |                                                                     |
| a                                                                                                 |                                                                                      | Not intended for operating in environmentally controlled enclosure. |
| b                                                                                                 | “ <a href="#">Electrostatic discharges</a> ” (page A-13)                             |                                                                     |
| c                                                                                                 | “ <a href="#">AC Power and radio frequency</a> ” (page A-13)                         |                                                                     |
| 9.3 Instruction manual shall contain the following testing, as appropriate to a sound level meter |                                                                                      |                                                                     |
| a                                                                                                 | “ <a href="#">Section 9.3 a.</a> ” (page A-14)                                       |                                                                     |

| IEC 61672-1<br>Section<br>(User manual<br>requirements) | Sound Detector SD-200 User Manual and<br>Addendum References         | Notes          |
|---------------------------------------------------------|----------------------------------------------------------------------|----------------|
| b                                                       | <a href="#">“Section 9.3 b”</a> (page A-14)                          |                |
| c                                                       | <a href="#">“Section 9.3 c.”</a> (page A-14)                         |                |
| d                                                       | <a href="#">“Pressure to free field corrections”</a> (page A-11)     |                |
| e                                                       | <a href="#">“Level of Linearity”</a> tables (page A-5)               |                |
| f                                                       | <a href="#">“Level linearity”</a> (page A-6)                         |                |
| g                                                       | <a href="#">“Electrical signal input”</a> (page A-5)                 |                |
| h                                                       | <a href="#">“Self generated noise levels”</a> (page A-6)             |                |
| i                                                       | <a href="#">“Maximum input level”</a> (page A-5)                     |                |
| j                                                       | <a href="#">“Battery voltage range and power supply”</a> (page A-13) |                |
| k                                                       |                                                                      | Not applicable |
| l                                                       | <a href="#">“Environmental effects”</a> (user manual)                |                |
| m                                                       |                                                                      | Not applicable |
| n                                                       | <a href="#">“Cable and radio frequency emission”</a> (page A-13)     |                |
| o                                                       | <a href="#">“AC power and radio frequency”</a> (page A-13)           |                |

## Level of Linearity with A-weighting measurements (sections: 5.5.11 9.2.7e)

Note: Reference level 114 dB with calibration point of  $63V_{MB} = 114 \text{ dB @ } 1 \text{ kHz}$

| Frequency | SPL A Weighting             |     | LEQ A Weighting             |     |
|-----------|-----------------------------|-----|-----------------------------|-----|
|           | Linear Operating Range (dB) |     | Linear Operating Range (dB) |     |
| 31.5      | 85                          | 130 | 85                          | 130 |
| 1000      | 45                          | 130 | 45                          | 130 |
| 4000      | 45                          | 130 | 45                          | 130 |
| 8000      | 45                          | 130 | 45                          | 130 |

## Level of Linearity with C-weighting measurements (sections: 5.5.11 9.2.7e)

Note: Reference level 114 dB with calibration point of  $63V_{MB} = 114 \text{ dB @ } 1 \text{ kHz}$

| Frequency | SPL C Weighting             |     | LEQ C Weighting             |     |
|-----------|-----------------------------|-----|-----------------------------|-----|
|           | Linear Operating Range (dB) |     | Linear Operating Range (dB) |     |
| 31.5      | 48                          | 130 | 48                          | 130 |
| 1000      | 45                          | 130 | 45                          | 130 |
| 4000      | 46                          | 130 | 45                          | 130 |
| 8000      | 48                          | 130 | 48                          | 130 |

## Electrical signal input (sections: 5.1.15, 9.3)

The microphone is not removable; therefore, no electrical input is provided. If an electrical input is needed for pattern approval testing, please contact the factory for information.

## Maximum input level (sections: 5.1.16, 9.3i)

The maximum input level is 150 dB.

## Linear operating range (sections: 5.5.10, 9.3f)

The starting level for measuring level linearity is 114 dB at all frequencies.

## Self generated noise levels (sections: 5.6.1 5.6.2 5.6.3, 9.3)

Level of self-generated noise in decibels (dB)

| A Weighting | C Weighting |
|-------------|-------------|
| 43          | 41          |

## Effects of background noise (sections: 5.6.4, 5.6.5, 9.2.5d)

Background noise can cause considerable error in measurement when its intensity is close to that of a particular sound source of interest. When it is not possible to eliminate or reduce the background noise, use the curve shown in Figure 4 to correct for the effect of the background noise on the measurement. For example, if the background noise is 45 dB and the sound of interest measures 51 dB, the difference between measurement and background noise is 6 dB. From Figure 4, for a 6 dB difference, 1.3 dB should be subtracted from the measurement. The correct measurement is therefore 51 dB- 1.3 dB= 49.7 dB.

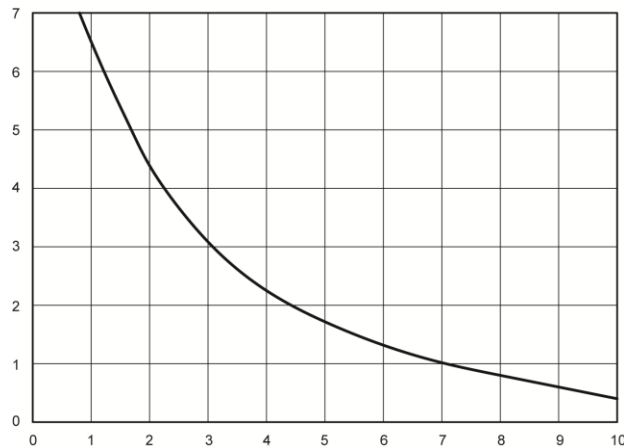
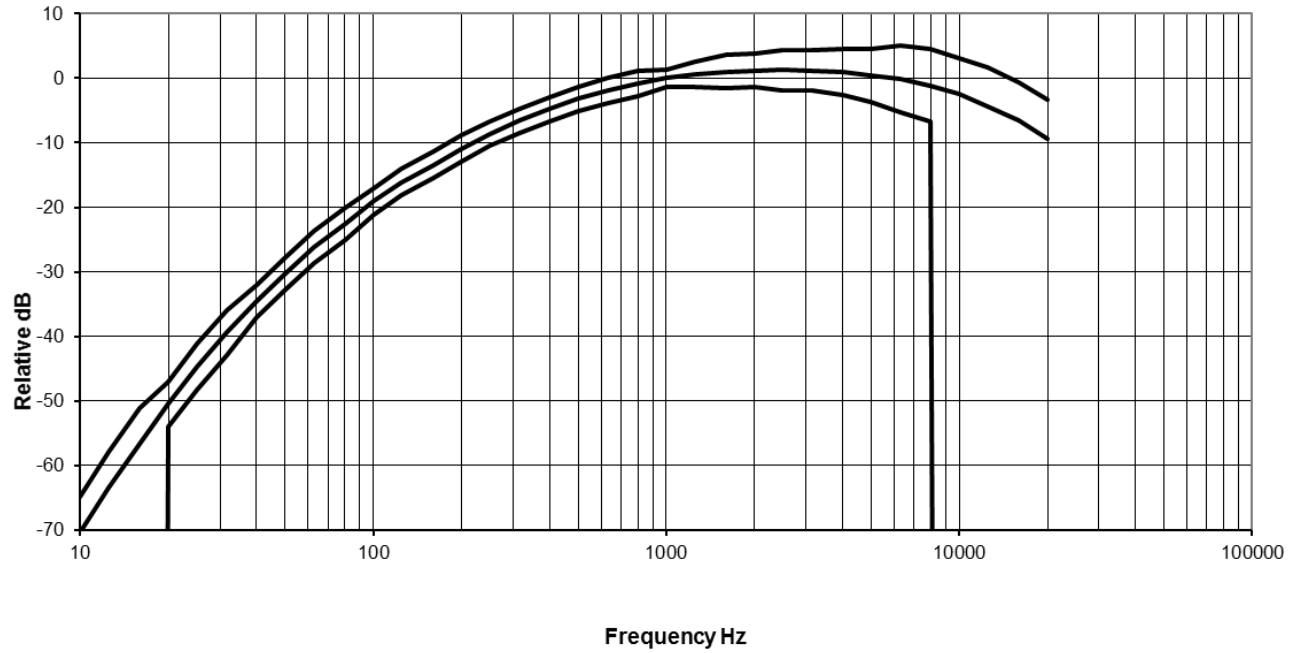


Chart: Effects of background noise

## Frequency weighting (sections: 5.1.10, 5.4.12)

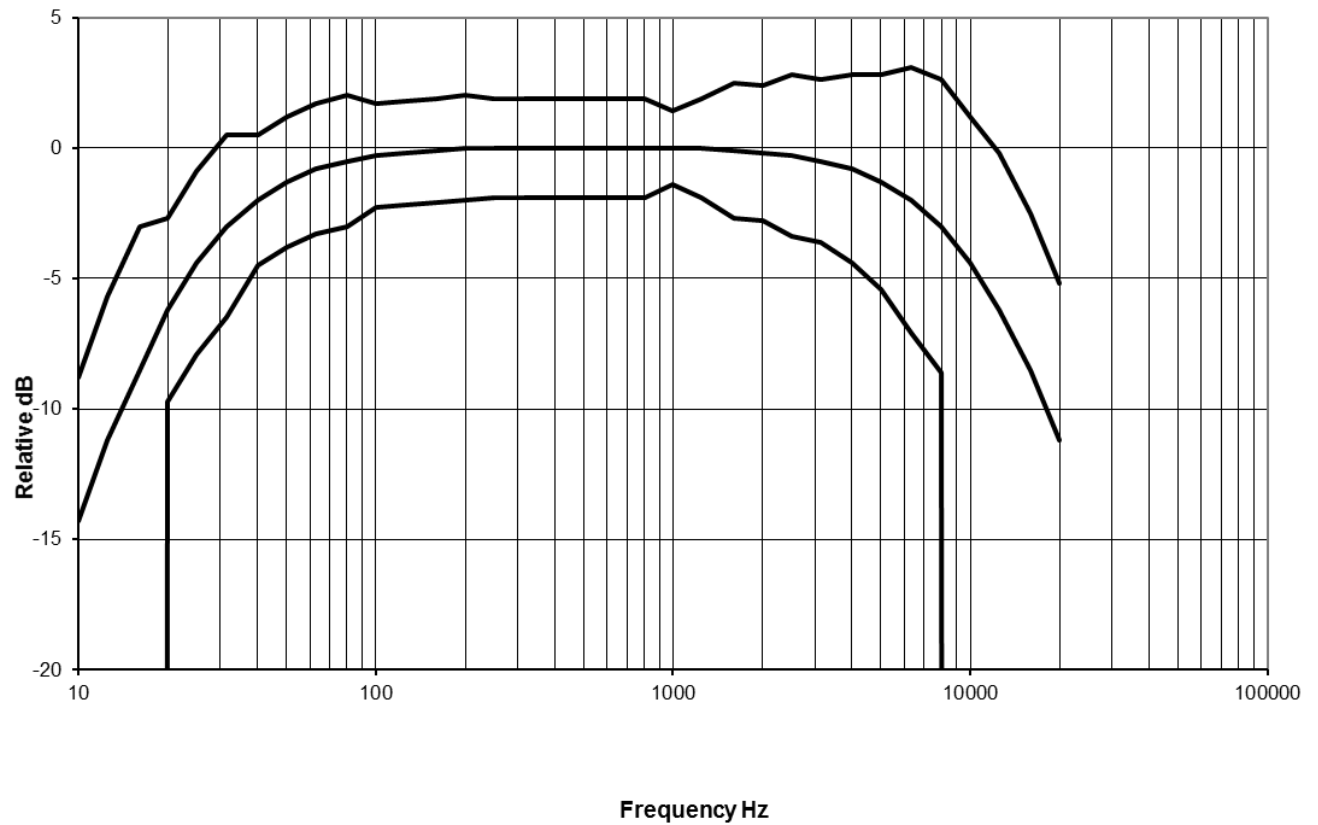
### A Weighting Nominal

The graph below is the nominal A weighting frequency response



## C Weighting Nominal

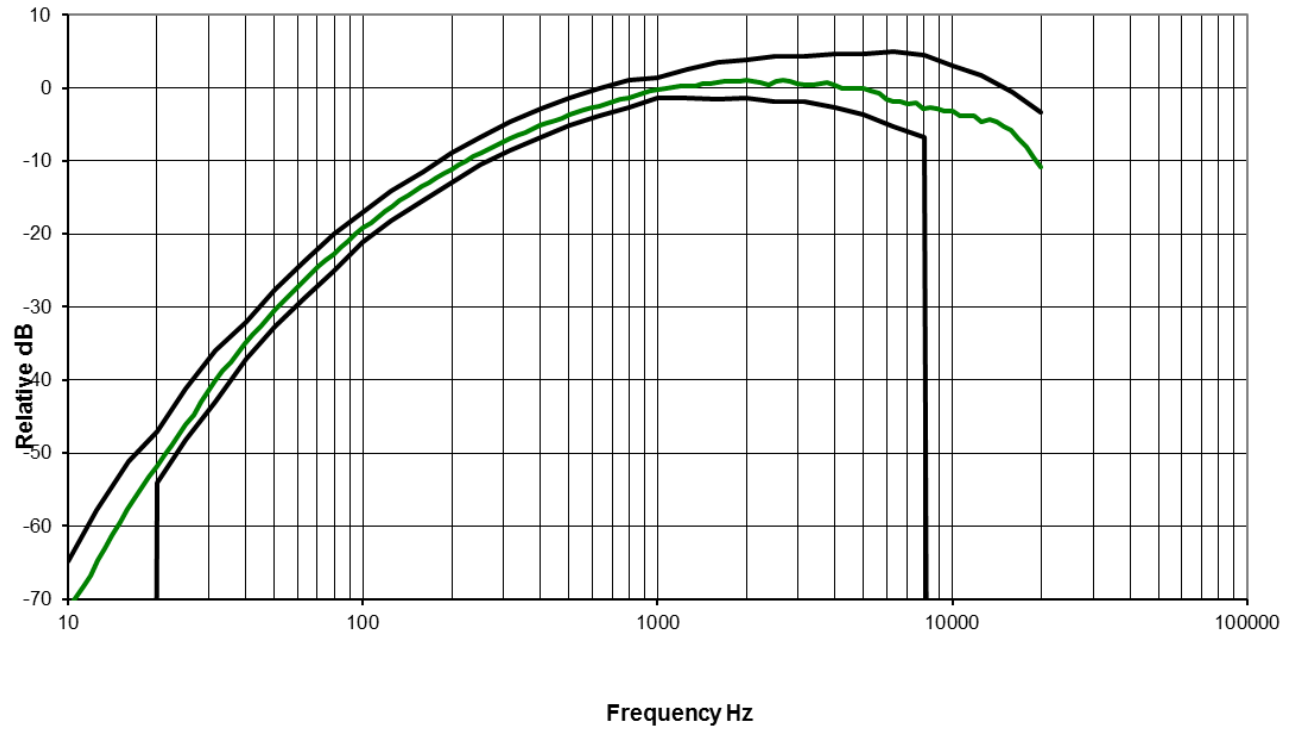
The graph below is the nominal C weighting frequency response



## Frequency weighting (sections: 5.1.10, 5.4.12) (continued)

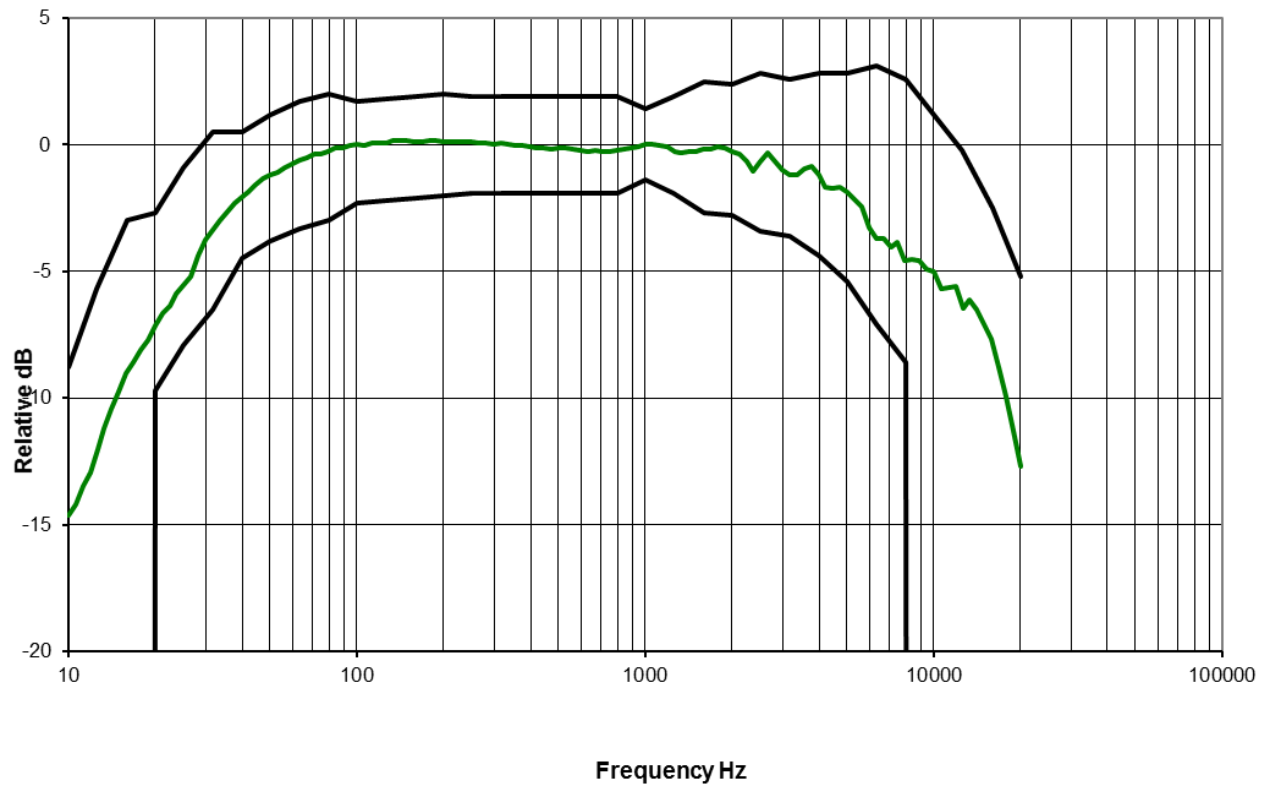
### A Weighting Electrical

The graph below is the electrical A weighting frequency response



## C Weighting Electrical

The graph below is the \electrical C weighting frequency response.



## Nominal microphone frequency response, diffraction and reflection corrections (section: 5.2.8)

Note: Add correction to electrical frequency response.

| Range 1/3 Octave Frequency Hz | Nominal Microphone Response, Diffraction, Reflection and Windscreen corrections in dB |
|-------------------------------|---------------------------------------------------------------------------------------|
| 63                            | 0.1                                                                                   |
| 80                            | 0.0                                                                                   |
| 100                           | 0.1                                                                                   |
| 125                           | 0.1                                                                                   |
| 160                           | 0.0                                                                                   |
| 200                           | 0.0                                                                                   |
| 250                           | -0.1                                                                                  |
| 315                           | -0.2                                                                                  |
| 400                           | -0.3                                                                                  |
| 500                           | -0.3                                                                                  |
| 630                           | -0.5                                                                                  |
| 800                           | -0.4                                                                                  |
| 1000                          | -0.2                                                                                  |
| 1250                          | -0.3                                                                                  |
| 1600                          | -0.2                                                                                  |
| 2000                          | -0.1                                                                                  |
| 2500                          | -0.4                                                                                  |
| 3150                          | -0.7                                                                                  |
| 4000                          | -0.4                                                                                  |
| 5000                          | -0.6                                                                                  |
| 6300                          | -1.6                                                                                  |
| 8000                          | -1.5                                                                                  |

## Pressure to free field corrections (sections: 5.2.8, 9.2.7d)

Note: add to pressure response to get 0° incidence free-field response. B&K 4226 calibrator may be used to determine the pressure field response.

| Frequency in Hz | SD-200 pressure field to free field corrections in dB | Expanded uncertainty of measurement 95% confidence in dB |
|-----------------|-------------------------------------------------------|----------------------------------------------------------|
| 63              | 0.0                                                   | 0.32                                                     |
| 80              | 0.0                                                   | 0.26                                                     |
| 100             | 0.0                                                   | 0.26                                                     |
| 125             | 0.0                                                   | 0.19                                                     |
| 160             | 0.0                                                   | 0.19                                                     |
| 200             | -0.1                                                  | 0.13                                                     |
| 250             | -0.3                                                  | 0.12                                                     |
| 315             | -0.3                                                  | 0.12                                                     |
| 400             | -0.3                                                  | 0.12                                                     |
| 500             | -0.3                                                  | 0.11                                                     |
| 630             | -0.3                                                  | 0.11                                                     |

| Frequency in Hz | SD-200 pressure field to free field corrections in dB | Expanded uncertainty of measurement 95% confidence in dB |
|-----------------|-------------------------------------------------------|----------------------------------------------------------|
| 800             | -0.3                                                  | 0.11                                                     |
| 1000            | 0.0                                                   | 0.13                                                     |
| 1250            | -0.1                                                  | 0.14                                                     |
| 1600            | 0.1                                                   | 0.14                                                     |
| 2000            | 0.3                                                   | 0.14                                                     |
| 2500            | 0.1                                                   | 0.12                                                     |
| 3150            | 0.0                                                   | 0.12                                                     |
| 4000            | 0.5                                                   | 0.12                                                     |
| 5000            | 1.3                                                   | 0.18                                                     |
| 6300            | 1.5                                                   | 0.18                                                     |
| 8000            | 2.9                                                   | 0.18                                                     |

### Pressure to random incidence corrections (section 5.2.7)

Note: added to the pressure response to calculate random incidence response.

| Frequency in Hz | SD-200 pressure field to random incidence corrections |
|-----------------|-------------------------------------------------------|
| 63              | 0.4                                                   |
| 80              | 0.3                                                   |
| 100             | 0.2                                                   |
| 125             | 0.3                                                   |
| 160             | 0.3                                                   |
| 200             | 0.4                                                   |
| 250             | 0.3                                                   |
| 315             | 0.2                                                   |
| 400             | 0.2                                                   |
| 500             | 0.1                                                   |
| 630             | 0.2                                                   |
| 800             | -0.1                                                  |
| 1000            | 0.0                                                   |
| 1250            | 0.1                                                   |
| 1600            | 0.1                                                   |
| 2000            | 0.3                                                   |
| 2500            | 0.3                                                   |
| 3150            | 0.0                                                   |
| 4000            | 0.3                                                   |
| 5000            | 0.8                                                   |
| 6300            | 0.5                                                   |
| 8000            | 1.2                                                   |

### Display and Integration (sections: 5.15.5, 5.15.6, 5.15.7, 9.2.5f)

The display update rate is 1 second. The display is updated every second during integration.

### Resetting Overload and Under Range (section 9.2.5 k)

To reset the OL and UR indicators, power the instrument off and then power back on. Press the run key. This will reset the measurement data and the indicators. The time to reset is immediate.

## Minimum/Maximum integration time (sections: 5.17.1, 5.17.2)

The Minimum/Maximum integration time for measurement time-average levels.

| Measurement type | Time average levels |
|------------------|---------------------|
| Minimum          | 1 second            |
| Maximum          | 20 hours            |

## Reference direction (section 9.2.5a)

The reference direction is at 0° and/or the random incidence direction is at 70° angle.

## Cable and radio frequency emission (sections: 5.18.1, 5.18.2, 9.3n)

The charging cable is a shielded 1 meter long USB cable.

## Battery voltage range and power supply (sections: 5.20.2, 5.20.3, 9.3j)

The charging circuit stops charging when the battery voltage reaches its maximum of 4.2 Volts DC. The unit shuts down when the minimum battery voltage of 3.2 volts DC is reached.

## Electrostatic discharges (section 6.5.2, 9.2.7 b)

Exposure to electrostatic discharges shall not change operating state, change of configuration or corruption or loss of stored data.

## AC power and radio frequency (sections: 6.6.1, 6.6.3, 6.6.4, 9.2.7c, 9.3o)

No effect was observed in any orientation or configuration of the SD-200 within a 60 Hz 80 A/m magnetic field. During radio frequency immunity testing a 3 meter USB cable was connected between the SD-200 and a computer USB port. The SD-200 was set to display SPL.

## Directional windscreen corrections (sections: 7.2, 9.2.2b, 9.3d)

Note: in dB re:20 uPA

| Frequency (Hz) | Incidence Angle |      |      |     |      |      |      | Random Field | Expanded Measurement 95% Confidence (dB) |
|----------------|-----------------|------|------|-----|------|------|------|--------------|------------------------------------------|
|                | 0°              | 30°  | 60°  | 90° | 120° | 150° | 180° |              |                                          |
| 1000           | 0.1             | 0.1  | 0.1  | 0.1 | 0.2  | 0.1  | 0.0  | 0.0          | 0.13                                     |
| 1250           | 0.1             | 0.1  | 0.1  | 0.1 | 0.1  | 0.1  | 0.0  | 0.0          | 0.14                                     |
| 1600           | 0.0             | 0.0  | 0.1  | 0.1 | 0.1  | 0.1  | 0.1  | -0.1         | 0.14                                     |
| 2000           | 0.1             | 0.1  | 0.1  | 0.2 | 0.1  | 0.2  | 0.1  | -0.1         | 0.14                                     |
| 2500           | 0.1             | 0.1  | 0.3  | 0.1 | 0.2  | 0.3  | 0.1  | 0.0          | 0.12                                     |
| 3150           | 0.1             | 0.1  | 0.1  | 0.2 | 0.2  | 0.2  | 0.1  | -0.1         | 0.12                                     |
| 4000           | 0.0             | 0.0  | 0.1  | 0.1 | 0.1  | 0.1  | 0.1  | -0.1         | 0.12                                     |
| 5000           | -0.1            | -0.1 | 0.0  | 0.1 | 0.0  | 0.0  | 0.1  | -0.2         | 0.18                                     |
| 6300           | -0.1            | -0.2 | -0.1 | 0.0 | 0.0  | 0.0  | 0.0  | -0.2         | 0.18                                     |
| 8000           | -0.2            | -0.2 | -0.1 | 0.0 | -0.1 | 0.2  | 0.1  | -0.3         | 0.18                                     |

## **Sound level meter type (section: 9.2.1 a)**

Class 2 Sound Level Meter. Group X. Model SD-200.

### **Section 9.3**

#### **General Information**

- a. The reference sound pressure level is 114 dB.
- b. The one range is the reference range.
- c. The microphone reference point is the center of the microphone face.

This product complies with the requirements of IEC61672-1 with the exception of clause 9.1c - "An instruction manual shall be provided as a printed document in one or more parts". A printed copy of the instruction manual is available on request.



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