

# 3M™ Sound Detector SD-200 Addendum

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## About this addendum

This addendum presents information for measuring the 3M™ 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.*

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### 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 @ <http://3m.com/SoundDetector> and link to "user manual")

IEC 61672-1 Section (User manual requirements)	Sound Detector SD-200 User Manual and Addendum references	Notes
5.1.4	"SD-200 overview" section (page 1)	
5.1.6	"Microphone" section (page 10)	
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	"Frequency weighting" sections (page A-2 and A-3)	
5.1.12	"Level of Linearity" tables (page A-1)	
5.1.13	"References direction" (page A-5) "Positioning and tripod mount" (page 8) "Level of Linearity" tables (page A-1)	
5.1.14	"Resetting" (page 9)	
5.1.15	"Electrical signal input" (A-1)	
5.1.16	"Maximum input levels" (A-1)	
5.1.17		The SD-200 is a single channel instrument
5.1.18	"Powering on" (page 2)	
5.2.1	"Calibrating" (page 9) "Accessories" (page 12)	
5.2.4, 5.2.5, 5.2.7	"Nominal microphone frequency response, windscreen, diffraction and reflection corrections" (page A-4)	
5.2.8	"Pressure to free field corrections" (page A-4)	
5.4.12		No optional frequency responses
5.5.9, 5.5.10, 5.5.11	"Display range" (page 11) "Linear operating range" (page A-1) and "Level of Linearity" tables (page A-1)	
5.6.1, 5.6.2, 5.6.3	"Self generated noise levels" (page A-1)	
5.6.4, 5.6.5	"Effects of background noise" (A-1)	
5.7.1	"Time Weighting" (page 11)	
5.10.1	"Overload" in Screen indicators table (page 6)	
5.11.1	"Under Range" in Screen indicators table (page 6)	
5.12.1		No peak C levels
5.14		No thresholds used for integrating-averaging
5.15.2, 5.15.3, 5.15.4	"Screen indicators" (page 6) "Display" (page 11)	
5.15.5, 5.15.6,	"Display and Integration" (page A-5)	
5.15.7		No digital output
5.16.1		No AC or digital output -
5.17.1, 5.17.2		Not applicable
5.18.1, 5.18.2	"Cable and radio frequency emissions" (page A-5)	
5.19.2		The SD-200 is a single channel instrument
5.20.2, 5.20.3	"Battery voltage range and power supply" (page A-5), page 10	
5.20.4, 5.20.5		No external power supply
6.1.2		Environmental effects not applicable
6.2.2	"Environmental effects" (page 11)	
6.5.2	"Electrostatic discharges" (page A-5)	
6.6.1, 6.6.3, 6.6.4	"AC power and radio frequency" (page A-5)	
6.6.9		Not applicable
7.1		No microphone extension device or cable
7.2	"Directional Windscreen corrections" (page A-5)	
7.3		No optional installed accessories
7.4		No filters used with the SD-200
7.5		No auxiliary devices with the SD-200
<b>9.2.1 General</b>		
a	"Standards" section (page 10)	
b	"SD-200 Overview (page 1) "Operating" (page 3)	
c	"Microphone" (page 10)	
d		No microphone extension device or cable used with the SD-200.
e		The SD-200 is a single channel instrument

**Measuring to IEC 61672-1: Look –up table (Continued)**

IEC 61672-1 Section	Sound Detector SD-200 User Manual and Addendum references	Notes
9.2.2 Design features		
a	"Screen indicators" section (page 6)	
b	"Directional windscreen corrections" (page A-6)	
c	"Frequency weighting" (page A2 – A3)	
d	"Measurements/frequency weighting and time response" (page 11)	
e		The SD-200 is a single range SLM, not applicable.
f		The SD-200 is a single range SLM, not applicable.
g	"Screen indicators" (page 6 and A5)	
h	"Level of linearity" (page A-1)	
i	"Frequency weighting" (page A-2, A-3)	
j		No computer program software used to operate the SD-200
k		Not applicable.
9.2.3 Power supply		
a	"Electrical characteristics" (page 10)	
b	"Screen Indicators" (page 6) "Battery voltage" (page A-5)	
c		No external power
d		No a.c. electrical power supply
9.2.4 Adjustments to indicated levels		
a	"Calibration" (page 12)	
b	"Calibration" (page 12)	
c	"Calibrating" (page 9)	
d	"Corrections" (page A4 – A5)	
9.2.5 Operating the sound level meter		
a	"Directional windscreen corrections" (page A-6)	
b	"Positioning and tripod mount" (page 8)	
c		The SD-200 measures sound level using a single range
d	"Effects of background noise" (page A-1)	
e	"Powering on" (page 2)	
f	"Display and integration" (page A-5)	
g		No pre-set for integration time or time of day setting
h	"Minimum/Maximum integration time" (page A-5)	
i		No hold function on the SD-200
j	"Resetting" (page 9)	
k	"Resetting Overload and Under Range" (page A-5)	
l		No threshold settings used on the SD-200
m		No downloading of data capability on the SD-200
n	"Cable and radio frequency emissions" (page A-5)	
o	"Self generated noise levels" (A-1)	
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

**Measuring to IEC 61672-1: Look –up table (continued)**

IEC 61672-1 Section	Sound Detector SD-200 User Manual and Addendum references	Notes
9.2.7 Influence of variations in environmental conditions		
a		Not intended for operating in environmentally controlled enclosure.
b	" <u>Electrostatic discharges</u> " (page A-5)	
c	" <u>AC Power and radio frequency</u> " (page A-5)	
9.3 Instruction manual shall contain the following testing, as appropriate to a sound level meter		
a	" <u>Section 9.3 a.</u> " (page A-5)	
b	" <u>Section 9.3 b</u> " (page A-5)	
c	" <u>Section 9.3 c.</u> " (page A-5)	
d	" <u>Pressure to free field corrections</u> " (page A-4)	
e	" <u>Level of Linearity</u> " tables (page A-1)	
f	" <u>Level linearity</u> " (page A-1)	
g	" <u>Electrical signal input</u> " (page A-1)	
h	" <u>Self generated noise levels</u> " (page A-1)	
i	" <u>Maximum input level</u> " (page A-1)	
j	" <u>Battery voltage range and power supply</u> " (page A-5)	
k		Not applicable
l	" <u>Environmental effects</u> " (page 11)	
m		Not applicable
n	" <u>Cable and radio frequency emission</u> " (page A-5)	
o	" <u>AC power and radio frequency</u> " (page A-5)	

A-1 | Level of Linearity with A-weighting measurements (sections: 5.5.11 9.2.7e)  
A Weighting Nominal

**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 Linear Operating Range (dB)		LEQ A Weighting Linear Operating Range (dB)	
	31.5	85	130	85
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 Linear Operating Range (dB)		LEQ C Weighting Linear Operating Range (dB)	
	31.5	48	130	48
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.

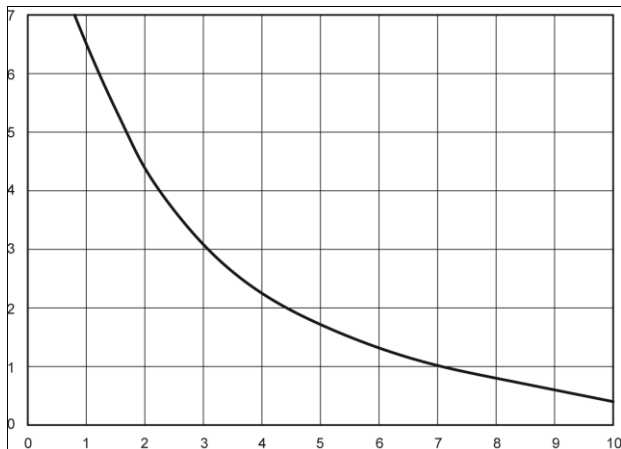
**Self generated noise levels (sections: 5.6.1 5.6.2 5.6.3, 9.3)**

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.



A-2 | Frequency weighting (sections: 5.1.10, 5.4.12)

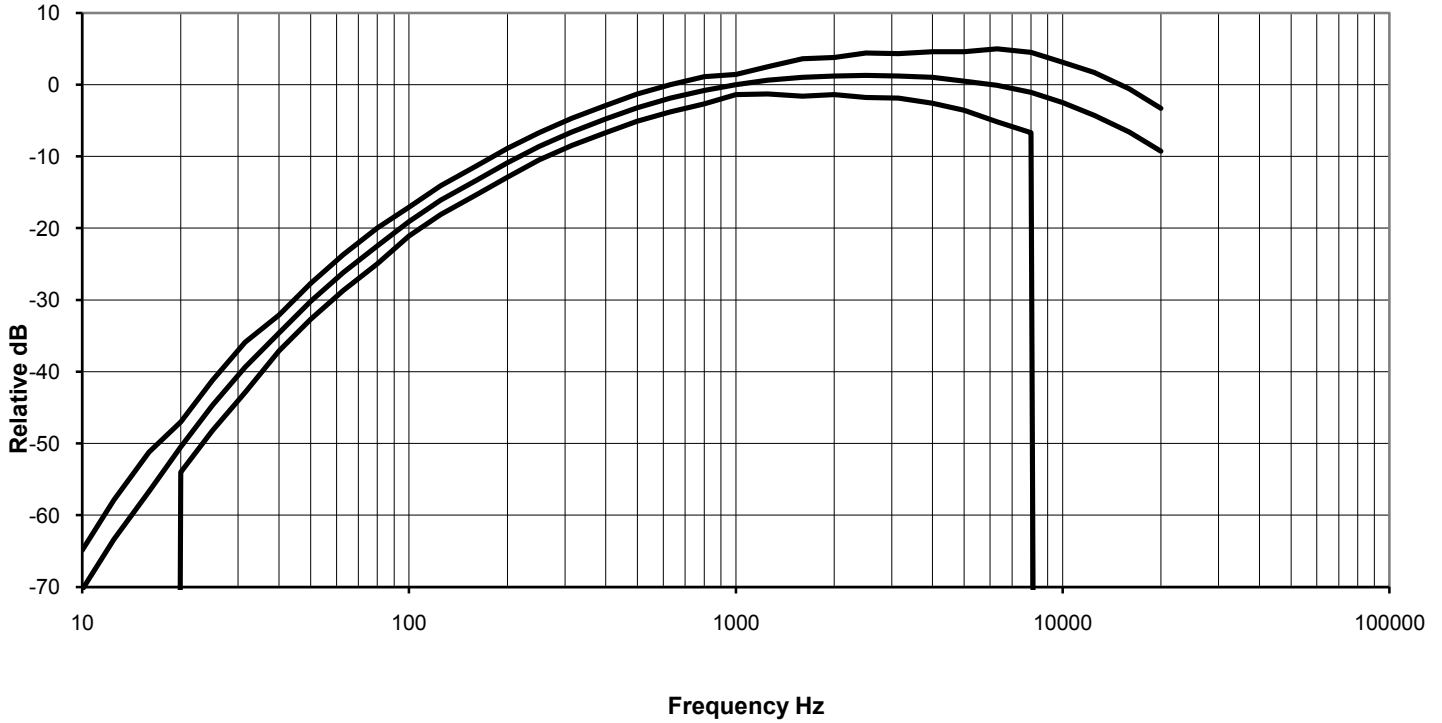
A Weighting Nominal

Chart: Effects of background noise

Frequency weighting (sections: 5.1.10, 5.4.12)

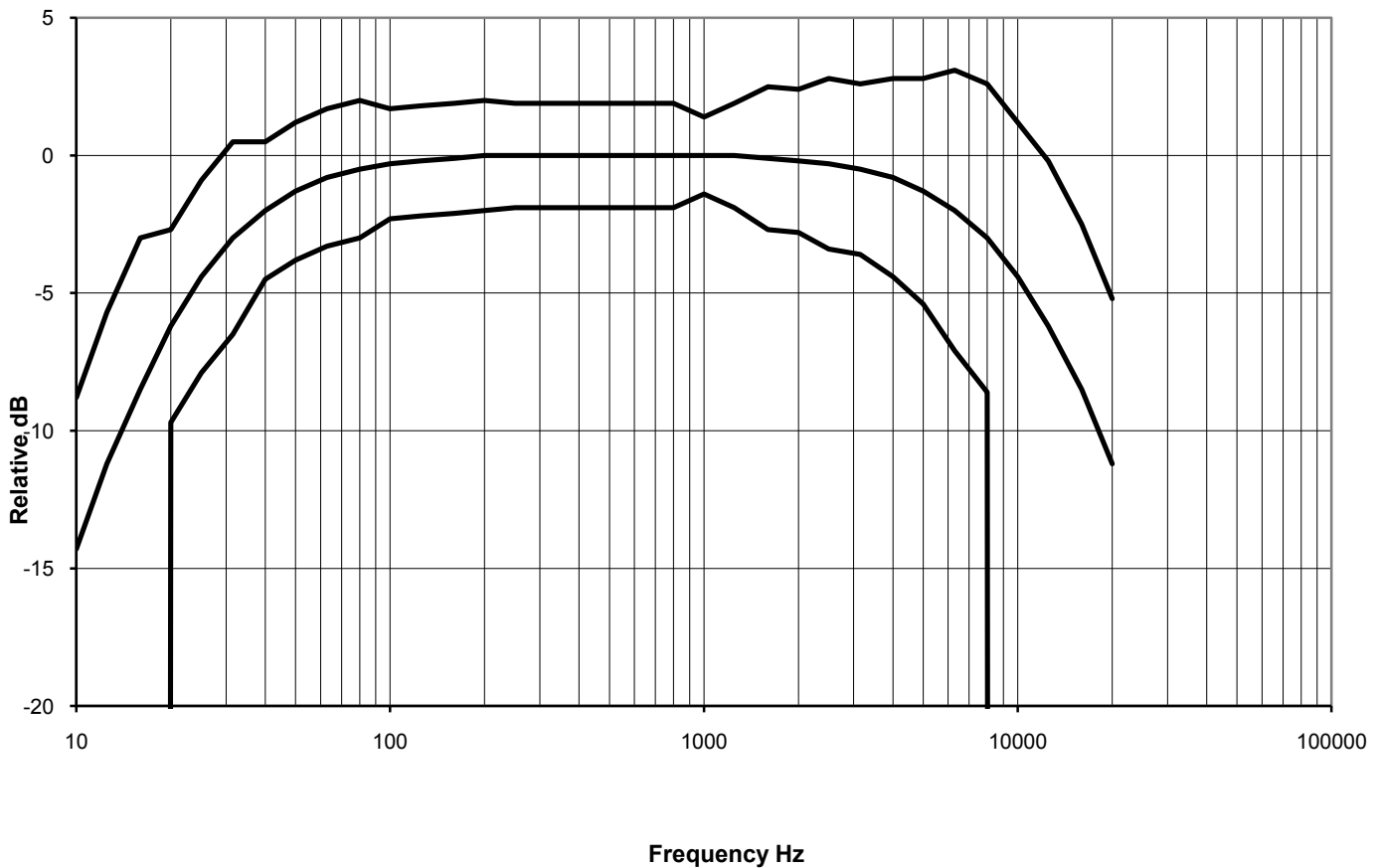
A Weighting Nominal

The graph below is the nominal A weighting frequency response



C Weighting Nominal

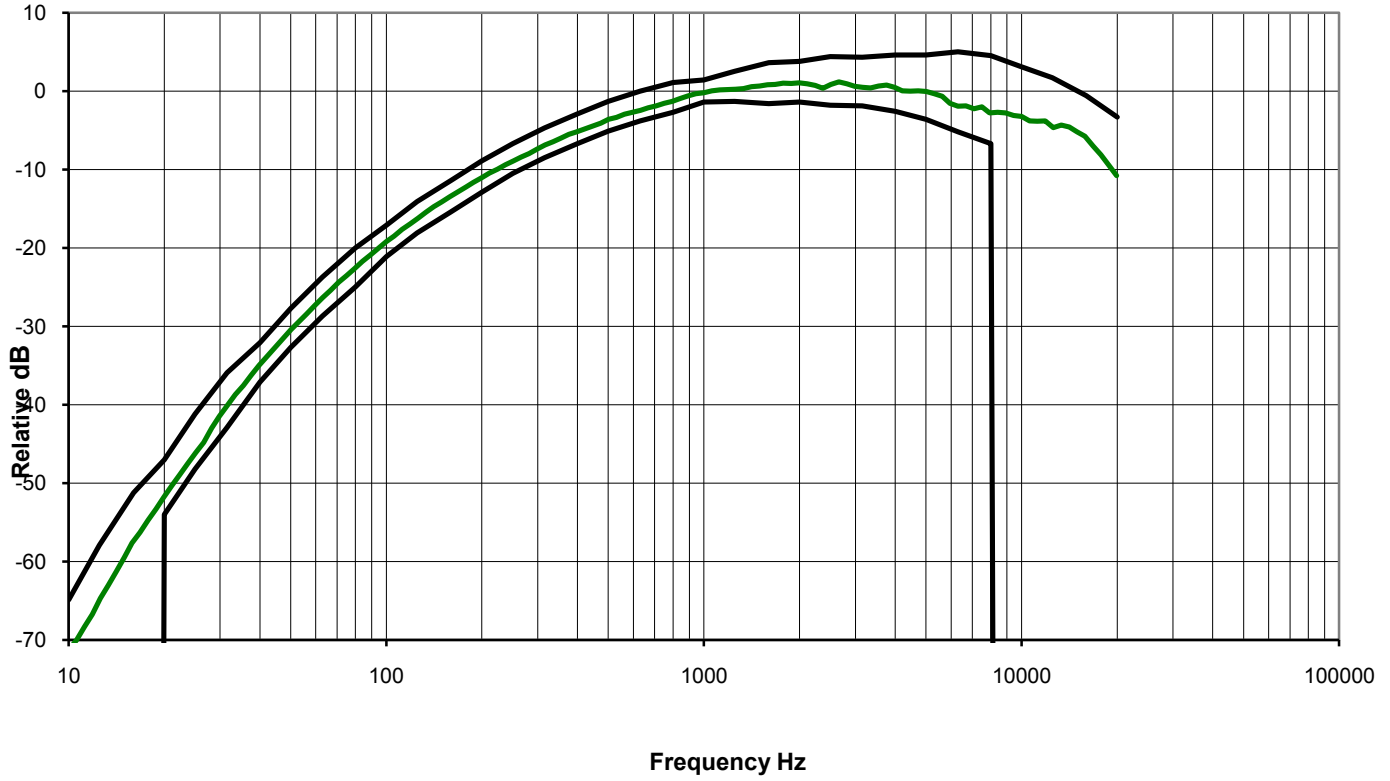
The graph below is the nominal C weighting frequency response



A-3 | Frequency weighting (sections: 5.1.10, 5.4.12)(continued)  
A Weighting Electrical

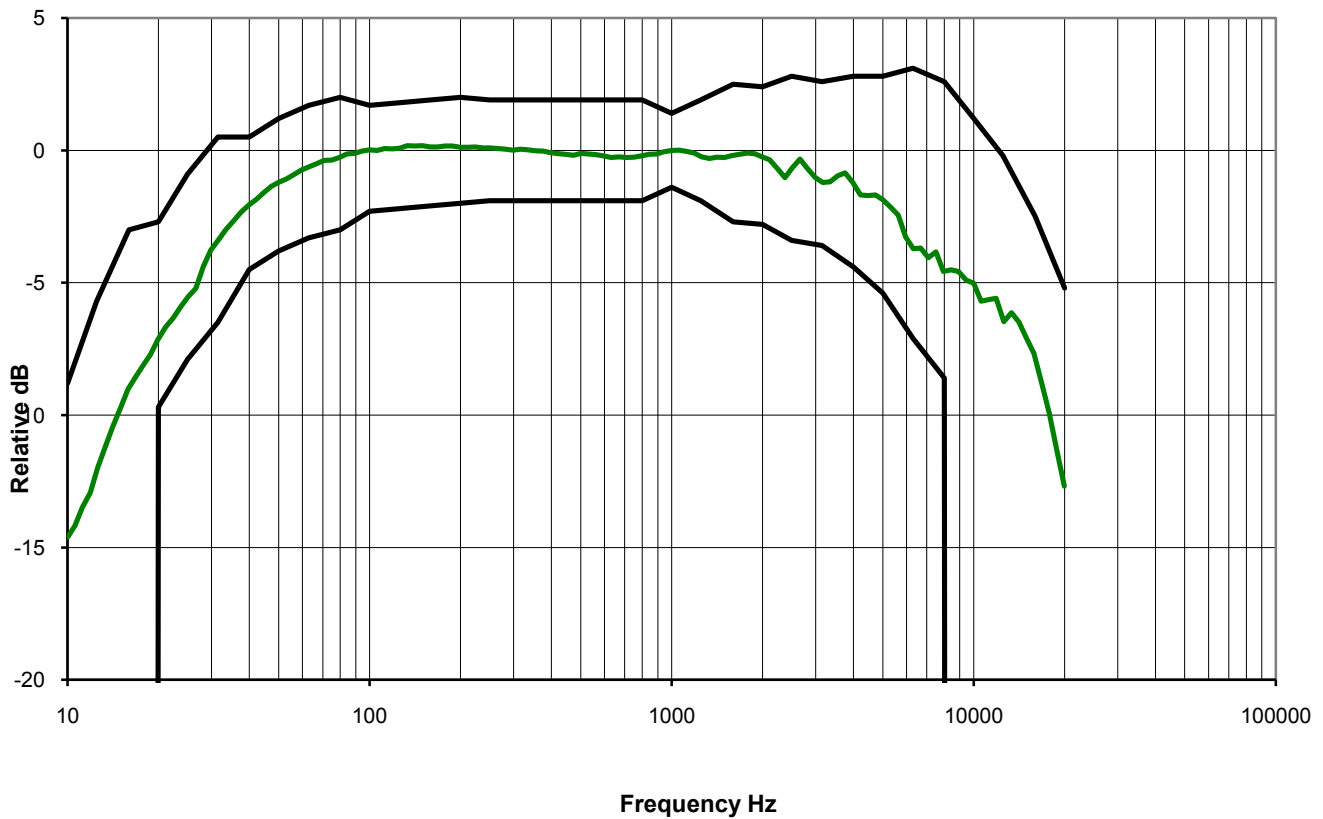
**Frequency weighting (sections: 5.1.10, 5.4.12)(continued)**  
**A Weighting Electrical**

The graph below is the electrical A weighting frequency response



**C Weighting Electrical**

The graph below is the electrical C weighting frequency response.



A-4 | Nominal microphone frequency response, diffraction and reflection corrections (section: 5.2.8)  
 C Weighting Electrical

**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
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 In Hz	0 Degree Incidence Angle	30 Degree Incidence Angle	60 Degree Incidence Angle	90 Degree Incidence Angle	120 Degree Incidence Angle	150 Degree Incidence Angle	180 Degree Incidence Angle	Random Field	Expanded Uncertainty of Measurement 95% Confidence In dB
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.