

Technical Documentation

Microphone Type 4193
for Hand-held Analyzer
Types 2250, 2250-L and 2270

Supplement to Instruction Manual BE 1712

Microphone Type 4193 for Hand-held Analyzer Types 2250, 2250-L and 2270

Type 2250, from Hardware Version 1.1
Type 2250-L, from Hardware Version 2.0
Type 2270, from Hardware Version 3.0

Supplement to Instruction Manual BE 1712

Safety Considerations

This apparatus has been designed and tested in accordance with IEC 61010–1 and EN 61010–1 *Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use*. This manual contains information and warnings which must be followed to ensure safe operation and to retain the apparatus in safe condition. Special note should be made of the following:

Safety Symbols



The apparatus will be marked with this symbol when it is important that you refer to the associated warning statements given in the manual.



Protective Earth Terminal



Hazardous Voltage

Explosion Hazard

The equipment is not designed to be used in potentially explosive environments. It should not be operated in the presence of flammable liquids or gases.

Warnings

- Switch off all power to equipment before connecting or disconnecting their digital interface. Failure to do so could damage the equipment.
- Whenever it is likely that the correct function or operating safety of the apparatus has been impaired, it must be made inoperative and be secured against unintended operation.
- Any adjustment, maintenance and repair of the open apparatus under voltage must be avoided as far as possible and, if unavoidable, must be carried out only by trained service personnel.



- Do not dispose of electronic equipment or batteries as unsorted municipal waste
- It is your responsibility to contribute to a clean and healthy environment by using the appropriate local return and collection systems
- Hazardous substances in electronic equipment or batteries may have detrimental effects on the environment and human health
- The symbol shown to the left indicates that separate collection systems must be used for any discarded equipment or batteries marked with that symbol
- Waste electrical and electronic equipment or batteries may be returned to your local Brüel & Kjær representative or to Brüel & Kjær Headquarters for disposal

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Chapter 1

Introduction

1.1 About This Supplement

This document is a supplement, to Instruction Manual for Hand-held Analyzer Types 2250, 2250-L and 2270 BE 1712. It provides the information relevant when Hand-held Analyzer Type 2250, 2250-L or 2270 is configured with Low-frequency Pressure-field ½" Condenser Microphone Type 4193.

The combination of Low-frequency Pressure-field ½" Condenser Microphone Type 4193 and the hand-held analyzer is intended for low frequencies. This combination makes it possible to measure down to 0.4 Hz (–1 dB).

This document also contains the specifications for the frequency analyzer applications when *Low Frequency* is set to *Very Low* and for G-weighting.

The numbering of chapters, sections, figures and tables in this supplement corresponds to Instruction Manual BE 1712. This supplement only contains content that is different from the instruction manual and is specific to this microphone configuration. The other chapters, sections, figures and tables should be read in Instruction Manual BE 1712.

Also see section 1.1 of the Instruction Manual BE 1712.

1.2 System Overview

1.2.4 Hardware Setup

This section provides an overview of the additional hardware components used when the analyzers are configured with one of two microphone configurations based on Microphone Type 4193. The other hardware components can be found in Instruction Manual BE 1712, section 1.2.4.

The microphone configurations are:

- Type 4193 without Adaptor UC-0211 and with *Low Frequency* set to *Normal* or *Extended*
- Type 4193 with Adaptor UC-0211 and with *Low Frequency* set to *Very Low*

NOTE:

- Even though Microphone Type 4193 is a pressure-field microphone, it is only specified for free field and diffuse field in combination with the hand-held analyzer
- Microphone Type 4193 is not specified together with Outdoor Microphone Kit UA-1404

Table 1.1

Additional hardware components needed for conformance testing of the analyzers configured with Type 4193

Quantity*	Brüel & Kjær Type/Part Number	Description
1 or 2	Type 4193	Low-frequency Pressure-field ½" Condenser Microphone Type 4193
1 or 2	UC-0211	Low-frequency Adaptor (delivered with Type 4193)
1 or 2	WA-0302-C	Electrical Substitute for Microphone Type 4193, 18 pF

*. Quantity depends on which analyzer is to be tested.

Chapter 2

Information Required by the Standards

2.1 Introduction

This chapter contains detailed information required by the standards to be described in the Instruction Manual.

No additional information is required in Chapter 2 when using Microphone Type 4193 together with the analyzer.

Chapter 3

Conformance Testing

3.1 Introduction

This chapter contains the information needed to conduct conformance testing according to the specified standards.

3.5 Electrical Substitute for Microphones

3.1.1 Without Low-frequency Adaptor UC-0211

NOTE: Low-frequency Adaptor UC-0211 **should not** be mounted on the preamplifier.

To obtain a BNC-type electrical input, replace the microphone with a **WA-0302-C, 18 pF**, fitted with a 10–32 UNF to BNC adaptor, UA-0245.

This Electrical Substitute for Microphones has (together with the preamplifier) a nominal attenuation of **0.55 dB**.

The electrical input obtained in this way has a maximum input level of at least $\pm 15.07 V_{\text{Peak}}$ and no damage will occur for signals up to $\pm 20 V_{\text{Peak}}$.

All electrical inputs can be short-circuited when needed for test.

To calibrate the analyzer for the electrical conformances test with a calibration that corresponds to the calibration you would get if the analyzer were fitted with a microphone with the nominal Open Circuit Sensitivity, do the following:

- 1) On the **Setup** display (*Full* tab):
 - Set *Input, Transd. Used* to the microphone that you intend to substitute
 - Set *Input, Input to Top Socket*
- 2) Calibrate the analyzer by typing in the nominal sensitivity as the *Sensitivity* on the **Calibration** display. For Microphone **Type 4193**, the nominal sensitivity is the microphone's Open Circuit Sensitivity (**12.50 mV/Pa**), attenuated by the Microphone Preamplifier ZC-0032's nominal attenuation (**0.20 dB**), which equates to **12.22 mV/Pa**. Do not press the **Start Calibration** button.
- 3) Connect an electrical sinusoidal signal with a frequency of 1 kHz to the Electrical Substitute for Microphones and adjust the amplitude of this signal until LZP (or LCF) displays 94.00 dB in the **Calibration** display. This electrical amplitude is the 94.00 dB reference for the electrical tests. The amplitude will typically be **13.1 mV**. This is due to the attenuation of the Electrical Substitute for Microphones together with the preamplifier (nominally **0.55 dB**).

3.1.2 With Low-frequency Adaptor UC-0211

NOTE: Low-frequency Adaptor UC-0211 **should** be mounted on the preamplifier.

To obtain a BNC-type electrical input, replace the microphone with a **WA-0302-C, 18 pF**, fitted with a 10–32 UNF to BNC adaptor, UA-0245.

This Electrical Substitute for Microphones has (together with the preamplifier and Low-frequency Adaptor UC-0211) a nominal attenuation of **16.42 dB**.

The electrical input obtained in this way has a maximum input level without overload of typically $\pm 0.72 V_{\text{Peak}}$ and no damage will occur for signals up to $\pm 50 V_{\text{Peak}}$.

All electrical inputs can be short-circuited when needed for test.

To calibrate the analyzer for the electrical conformance test with a calibration that corresponds to the calibration you would get if the analyzer were fitted with a microphone with the nominal Open Circuit Sensitivity, do the following:

- 1) On the **Setup** display (*Full* tab):
 - Set *Input, Transd. Used* to the microphone that you intend to substitute
 - Set *Input, Input to Top Socket*
- 2) Calibrate the analyzer by typing in the nominal sensitivity as the *Sensitivity* on the **Calibration** display. For Microphone **Type 4193**, the nominal sensitivity is the microphone's Open Circuit Sensitivity (**12.50 mV/Pa**), attenuated by the Microphone Preamplifier ZC-0032's nominal attenuation with UA-0211 mounted (**16.36 dB**), which equates to **1.90 mV/Pa**. Do not press the **Start Calibration** button.
- 3) Connect an electrical sinusoidal signal with a frequency of 1 kHz to the Electrical Substitute for Microphones and adjust the amplitude of this signal until LZF (or LCF) displays 94.00 dB in the **Calibration** display. This electrical amplitude is the 94.00 dB reference for the electrical tests. The amplitude will typically be **1.92 mV**. This is due to the attenuation of the Electrical Substitute for Microphones together with the preamplifier and UC-0211 (nominally **16.42 dB**).

3.6 Testing 1/1-octave-band and 1/3-octave-band Filters

For tests where *Low Frequency* is set to *Normal* or *Extended* follow the procedure in the Instruction Manual BE 1712 Section 3.6.

For tests where *Low Frequency* is set to *Very Low* use the following procedure:

NOTE: These measurements require Frequency Analysis Software and Low Frequency Option to be enabled.

Low-frequency Adaptor UC-0211 must be mounted on preamplifier ZC-0032 and electrical input must be introduced through the Electrical Substitute for Microphones WA-0302-C mounted on UC-0211.

All tests according to IEC 61260 must be conducted with **Setup** screen:

- *Transd. Used* parameter set to *4193+UC-0211* and *Low Frequency* set to *Very Low*
- *Frequency Settings* parameter *Spectrum* set to *Z*

Chapter 4

Specifications

4.1 Specifications

Specifications are given for the configuration detailed in Chapter 1.

Unless specifically noted, specifications are given as typical data under Reference Environmental Conditions, and with the system calibrated to the nominal microphone open circuit sensitivity.

NOTE: The specifications given here for the Z-weighting, as defined in IEC 61672-1, are also valid for the Lin response, as defined in IEC 60651.

4.5 Microphone

Microphone Type 4193 and Microphone Preamplifier ZC-0032:

Type: Low-frequency Pressure-field ½" Condenser Microphone

Polarization voltage: 200 V

Nominal Open Circuit Sensitivity: 12.5 mV/Pa, (corresponding to -38 dB re 1 V/Pa) ± 1.5 dB

Capacitance: 18 pF (at 250 Hz)

Nominal Preamplifier Attenuation: 0.2 dB without UC-0211, 16.4 dB with UC-0211

Extension Cables between Microphone Preamplifier ZC-0032 and the analyzer: Up to 100 m without degradation of the specifications. **NOTE:** EMC is only tested with a 10 m cable (AO-0441-D-100)

Microphone Reference Point: The centre of the front surface of the microphone protection grid

Reference Direction of Sound Incidence: See the small drawings in the lower right corner of the directional response graphs in section 4.7 Directional Responses

4.6 Frequency Responses

4.6.2 Typical Low-frequency Responses

The typical Low-frequency Responses for Z frequency weighting are given in Fig.4.2a and Fig.4.2b. The Electrical Responses are for the rear 'Input' socket. The Acoustical Responses include Microphone Type 4193 and Microphone Preamplifier ZC-0032.

Low-frequency Responses depend on the state of the *Low Frequency* parameter on the **Setup** display, under *Frequency Settings*.

Low-frequency Responses are not influenced by the windscreen.

Low-frequency Responses **are** influenced by frequency response compensation.

The Low-frequency Responses for introduction of the electrical signal through the recommended means to substitute the microphone with an electrical input facility (section 3.5 Electrical Substitute for Microphones) differs from the electrical responses in Fig.4.2a because it also includes Microphone Preamplifier ZC-0032.

Fig.4.2a Typical low-frequency responses without UC-0211

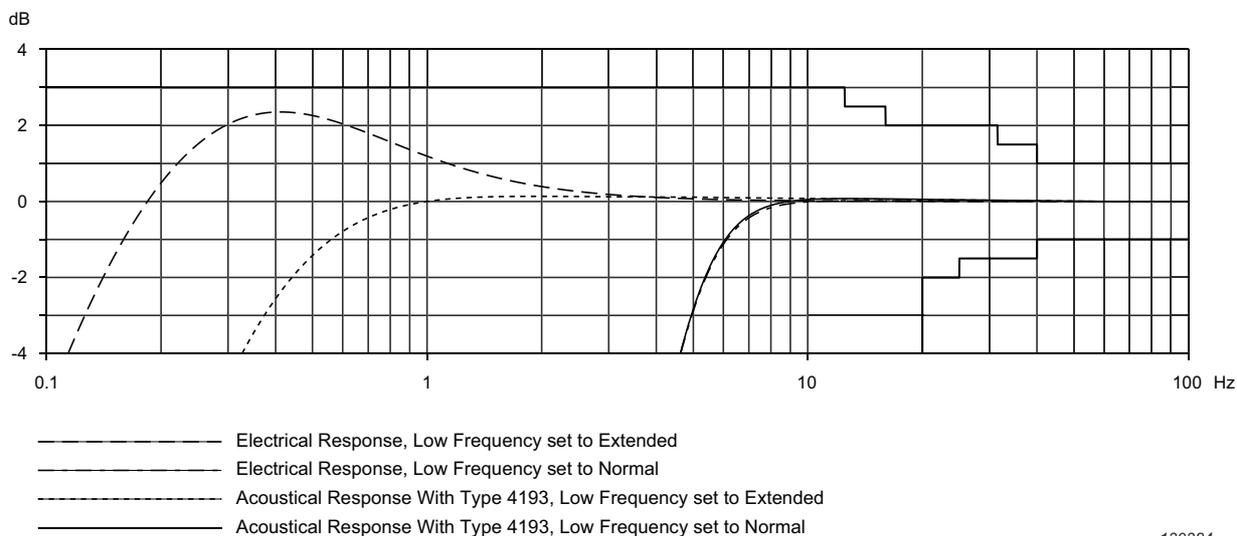
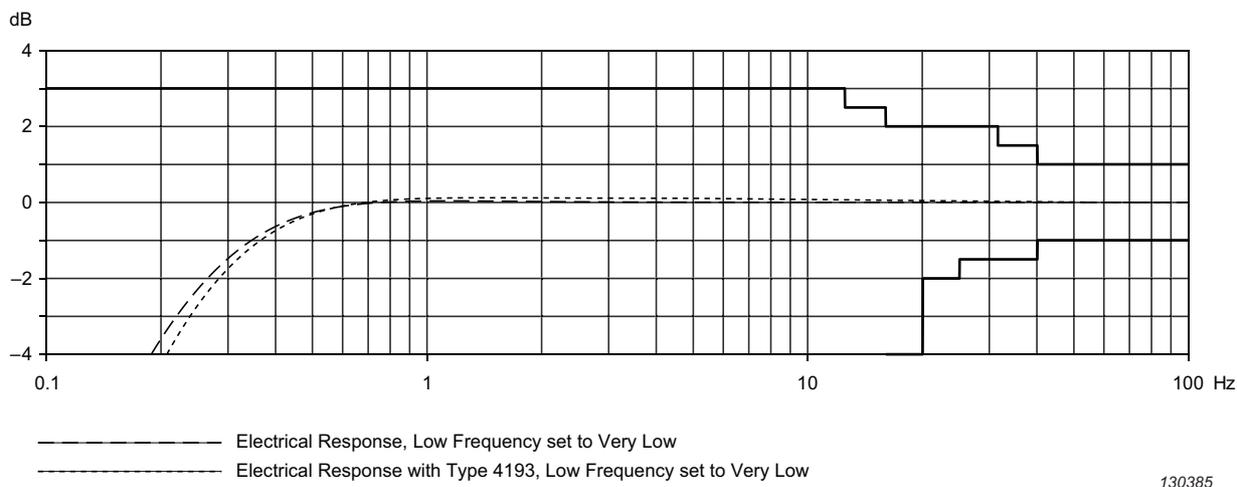


Fig.4.2b Typical low-frequency responses with UC-0211



4.6.3 Flat Frequency Range According to IEC 61260

The frequency ranges of nominally flat frequency responses for the rear 'Input' socket are:

- *Low Frequency set to Normal*: ± 0.15 dB, 8.5 Hz to 22 kHz
- *Low Frequency set to Extended*: ± 0.15 dB, 3.5 Hz to 22 kHz
- *Low Frequency set to Very Low*: ± 0.15 dB, 0.6 Hz to 22 kHz

4.6.5 Free-field Frequency Responses

The free-field frequency responses for plane progressive sinusoidal sound waves incident from the reference direction with Z frequency weighting are provided in Fig.4.3 to Fig.4.7 and Table A.2 to Table A.5. The tables also provides the 'Expanded Uncertainties of Measurement' required by IEC 61672-1, see the start of section 4.6 in **Instruction Manual BE 1712**.

Fig. 4.3 Free-field 0° frequency response for Microphone Type 4193, Microphone Preamplifier ZC-0032 and the analyzer's electrical response, with the Microphone Preamplifier connected to a microphone extension cable. Corresponds to the "Acoustical Response" column in Table A.2

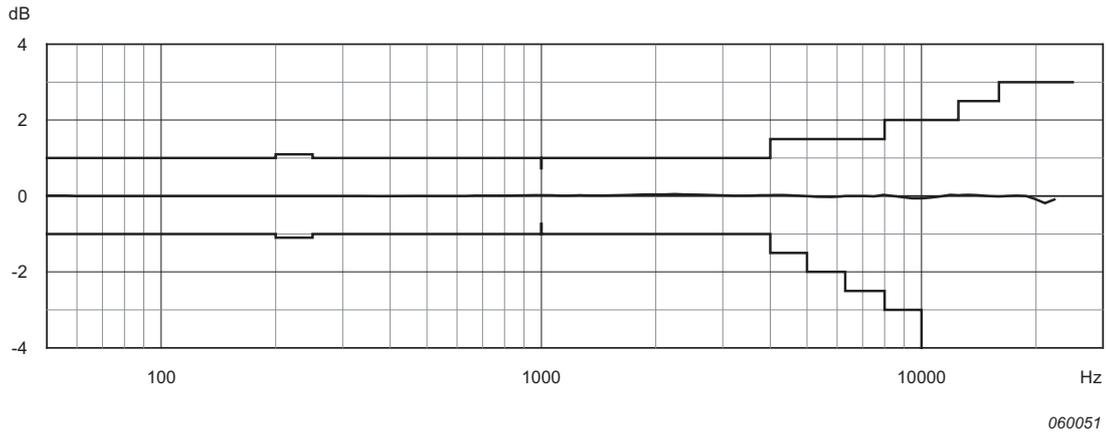


Fig. 4.4 Influence of the analyzer body on free-field 0° response, corresponds to the "Body Influence" column in Table A.3

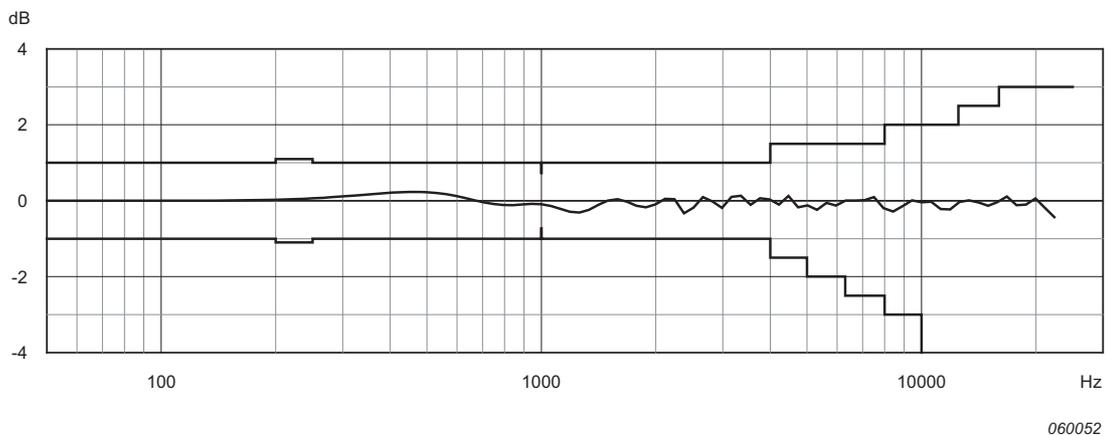


Fig. 4.5 Free-field 0° frequency response for Microphone Type 4193, Microphone Preamplifier ZC-0032 and the analyzer with the Microphone Preamplifier mounted directly on the analyzer. Corresponds to the "Acoustical Response" column in Table A.3

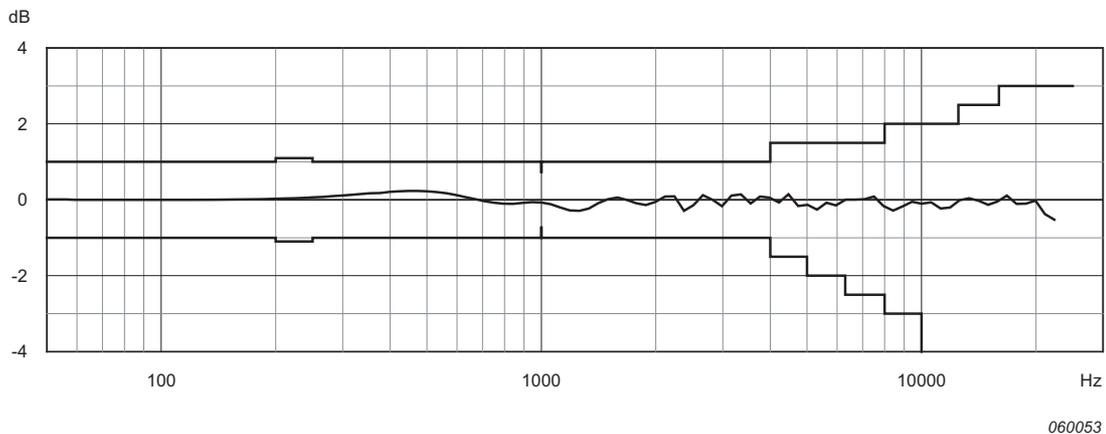
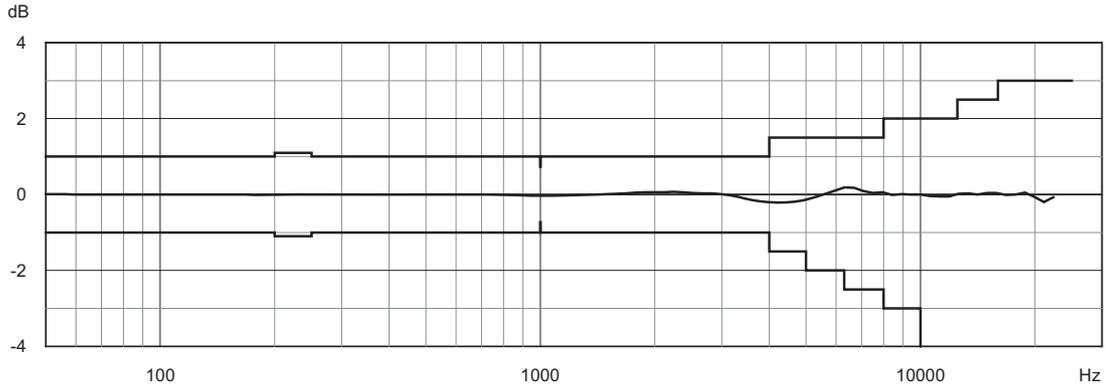
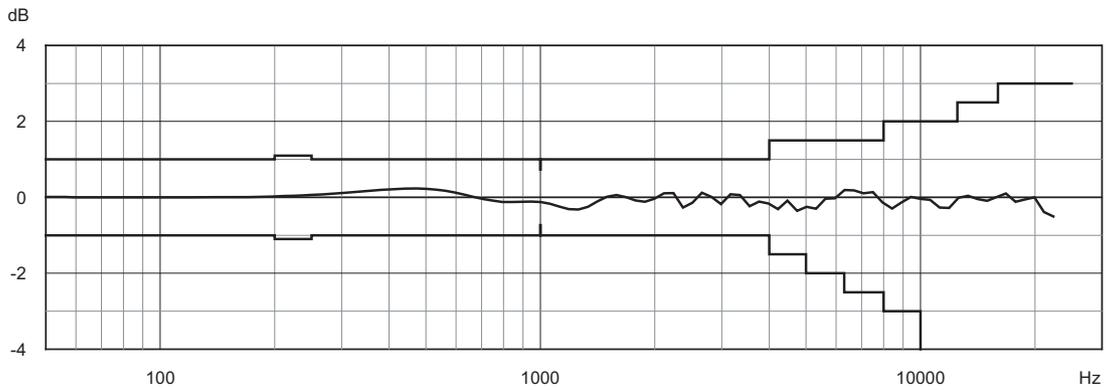


Fig. 4.6 Free-field 0° frequency response for Windscreen UA-1650, Microphone Type 4193, Microphone Preamplifier ZC-0032 and the analyzer's electrical response, with the Microphone Preamplifier connected to a microphone extension cable. Corresponds to the "Acoustical Response" column in Table A.4



060054

Fig. 4.7 Free-field 0° frequency response for Windscreen UA-1650, Microphone Type 4193, Microphone Preamplifier ZC-0032 and the analyzer with the Microphone Preamplifier mounted directly on the analyzer. Corresponds to the "Acoustical Response" column in Table A.5



060055

Fig. 4.8 Microphone Type 4193 is not specified together with Outdoor Microphone Kit UA-1404

4.6.6 Diffuse-field Frequency Responses

The diffuse-field frequency responses (also called random-incidence frequency responses) with Z frequency weighting are provided in Fig. 4.9 and Fig. 4.10, and Table A.7 and Table A.8.

The diffuse-field body influence of the analyzer is so small that the diffuse-field frequency responses are the same with and without the Microphone Preamplifier connected to the microphone extension cable.

Fig. 4.9 Diffuse-field frequency response for Microphone Type 4193, Microphone Preamplifier ZC-0032 and the analyzer with or without the Microphone Preamplifier connected to a microphone extension cable. Corresponds to the “Acoustical Response” column in Table A.7

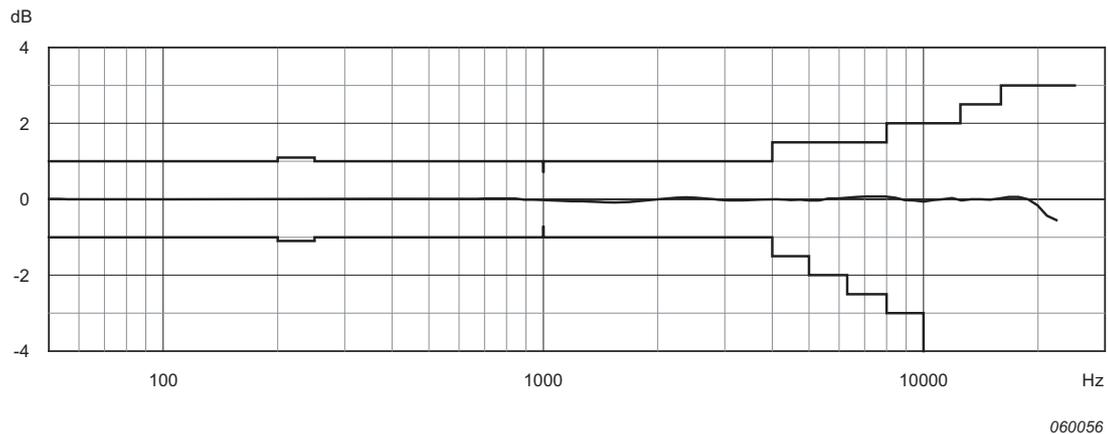


Fig. 4.10 Diffuse-field frequency response for Windscreen UA-1650, Microphone Type 4193, Microphone Preamplifier ZC-0032 and the analyzer with or without the Microphone Preamplifier connected to a microphone extension cable. Corresponds to the “Acoustical Response” column in Table A.8

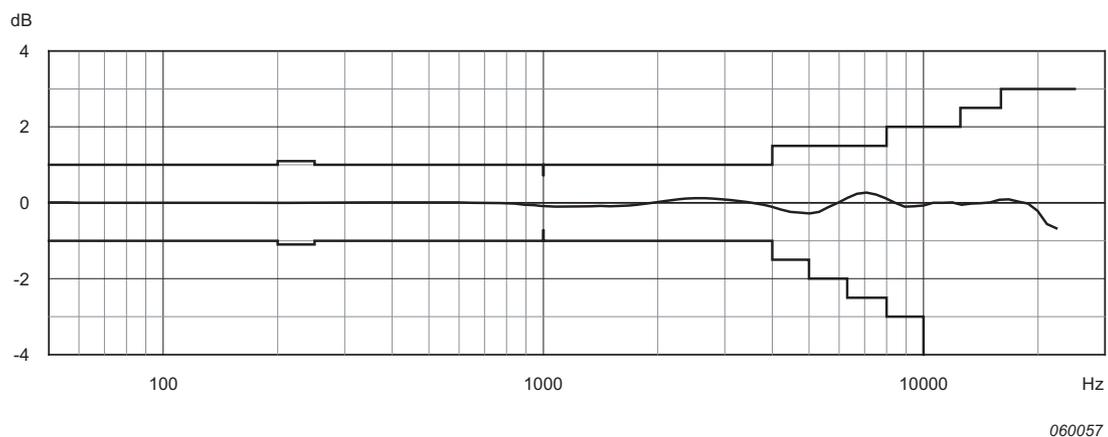


Fig. 4.11 Microphone Type 4193 is not specified together with Outdoor Microphone Kit UA-1404

4.7 Directional Responses

This section gives directional responses for plane progressive sinusoidal sound waves normalised to the response in the reference direction. Both influence of body and accessories, and the resulting directional responses are given as tables in Appendix A. Only the resulting directional responses are given here as graphs.

The sensitivity variation graphs show the absolute maximum difference between the sensitivities at any two sound incidence angles within the specified interval of angles. For example, at each frequency the value for $\pm 30^\circ$ is the difference between the highest and the lowest sensitivity found in a circular cone with an opening angle of 60° , the top at the Microphone Reference Point and with the reference direction of incidence as the axis. Because the angle interval defines a three-dimensional geometric shape there is only one set of graphs with sensitivity variations, also where the directional response is shown for two planes. The graphs show the maximum variation for the two measurement planes combined. The sensitivity variations are also given as tables in Appendix A.

Limit curves are drawn on the sensitivity variation graphs in the following sections. These curves represent the IEC 61672-1 limits, reduced by the 'Maximum Expanded Uncertainties of Measurement' from Appendix A of IEC 61672-1. The 'Maximum Expanded Uncertainties of Measurement' used here are the maximum uncertainties that a test organisation may have on its measurements when it performs conformance tests according to IEC 61672.

Fig. 4.12 Directional response for Microphone Type 4193 and Microphone Preamplifier ZC-0032 with the microphone preamplifier connected to a microphone extension cable. Corresponds to Table A.11 to Table A.13

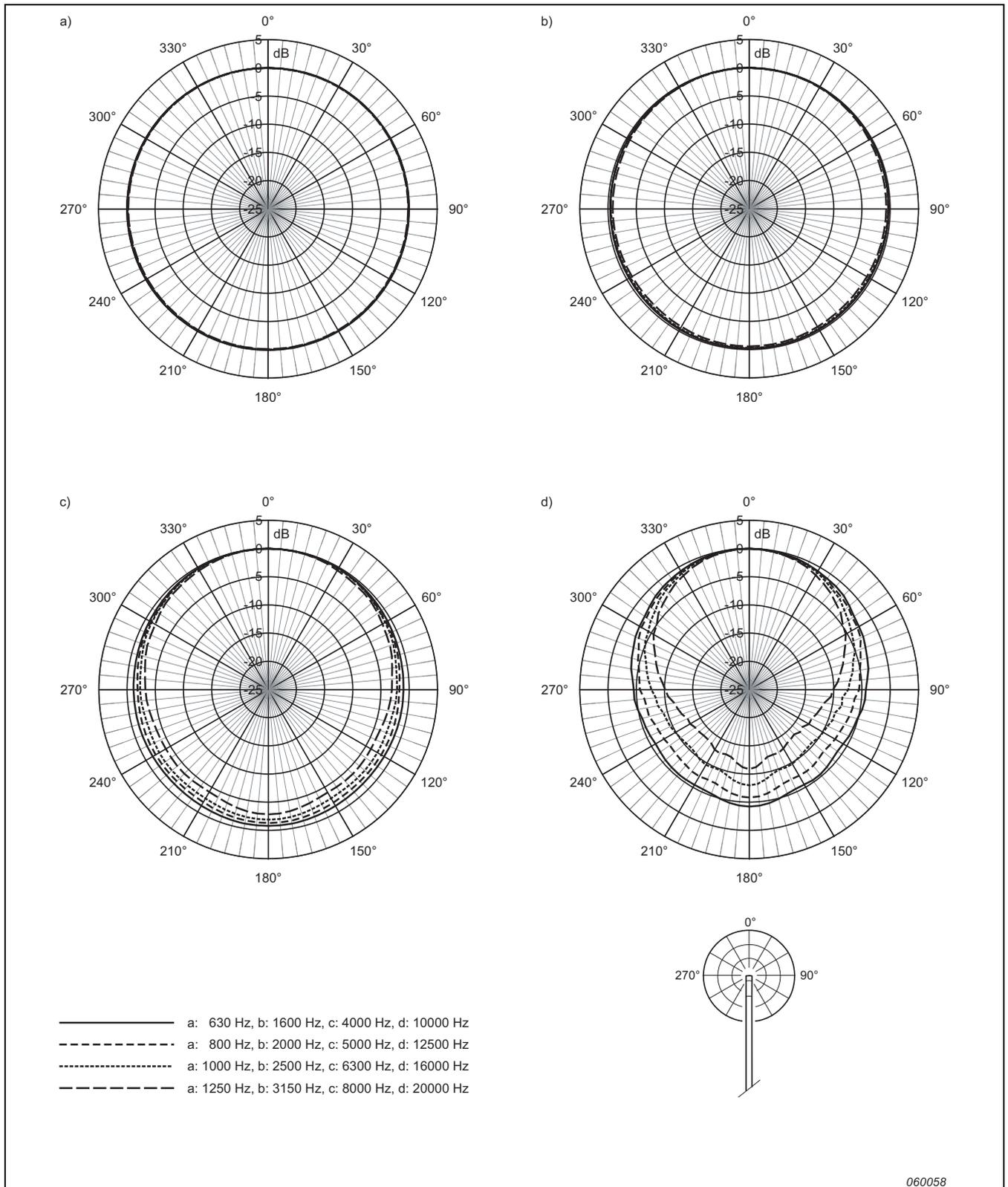


Fig. 4.13 Sensitivity variations for Microphone Type 4193 and Microphone Preamplifier ZC-0032 with the Microphone Preamplifier connected to a microphone extension cable, at sound incidence angles within $\pm\theta^\circ$ from the reference direction. Corresponds to Table A.14

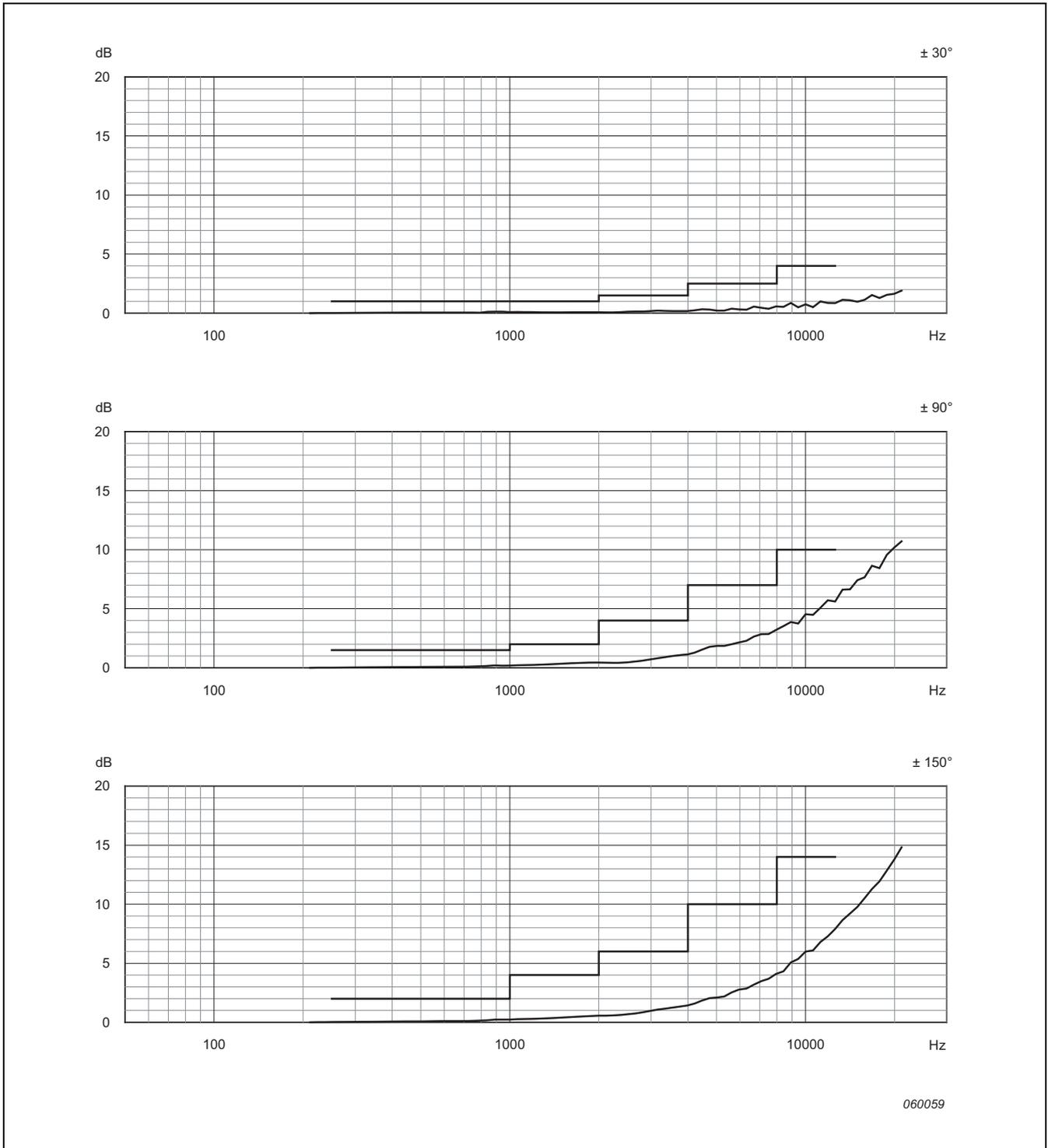


Fig. 4.14 Directional response for Microphone Type 4193, Microphone Preamplifier ZC-0032 and the analyzer with the Microphone Preamplifier mounted directly on the analyzer, measured in a plane parallel to the display and along the microphone axis. Corresponds to Table A.21 to Table A.23

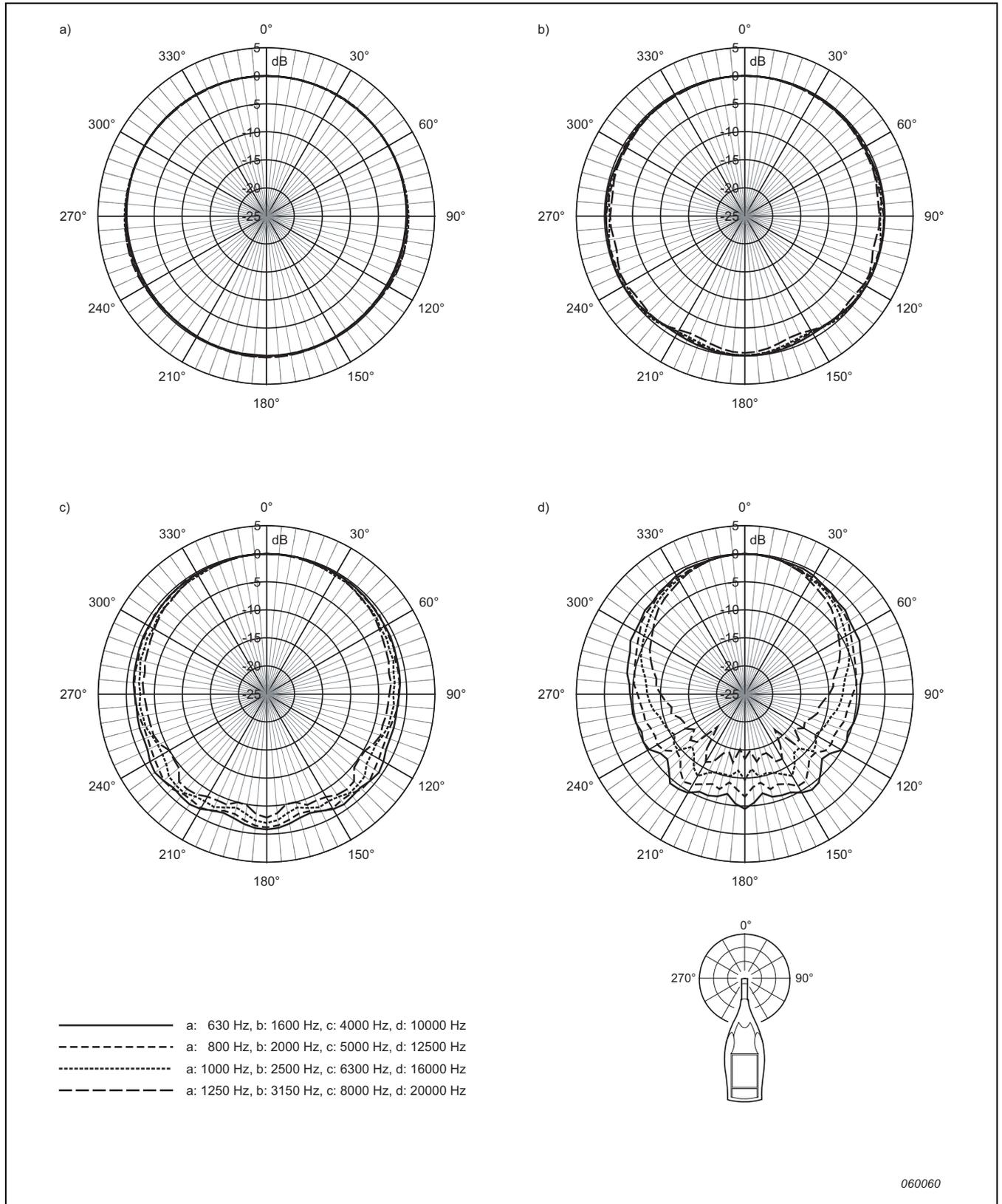


Fig. 4.15 Directional response for Microphone Type 4193, Microphone Preamplifier ZC-0032 and the analyzer with the Microphone Preamplifier mounted directly on the analyzer, measured in a plane perpendicular to the display and along the microphone axis. Corresponds to Table A.24 to Table A.26

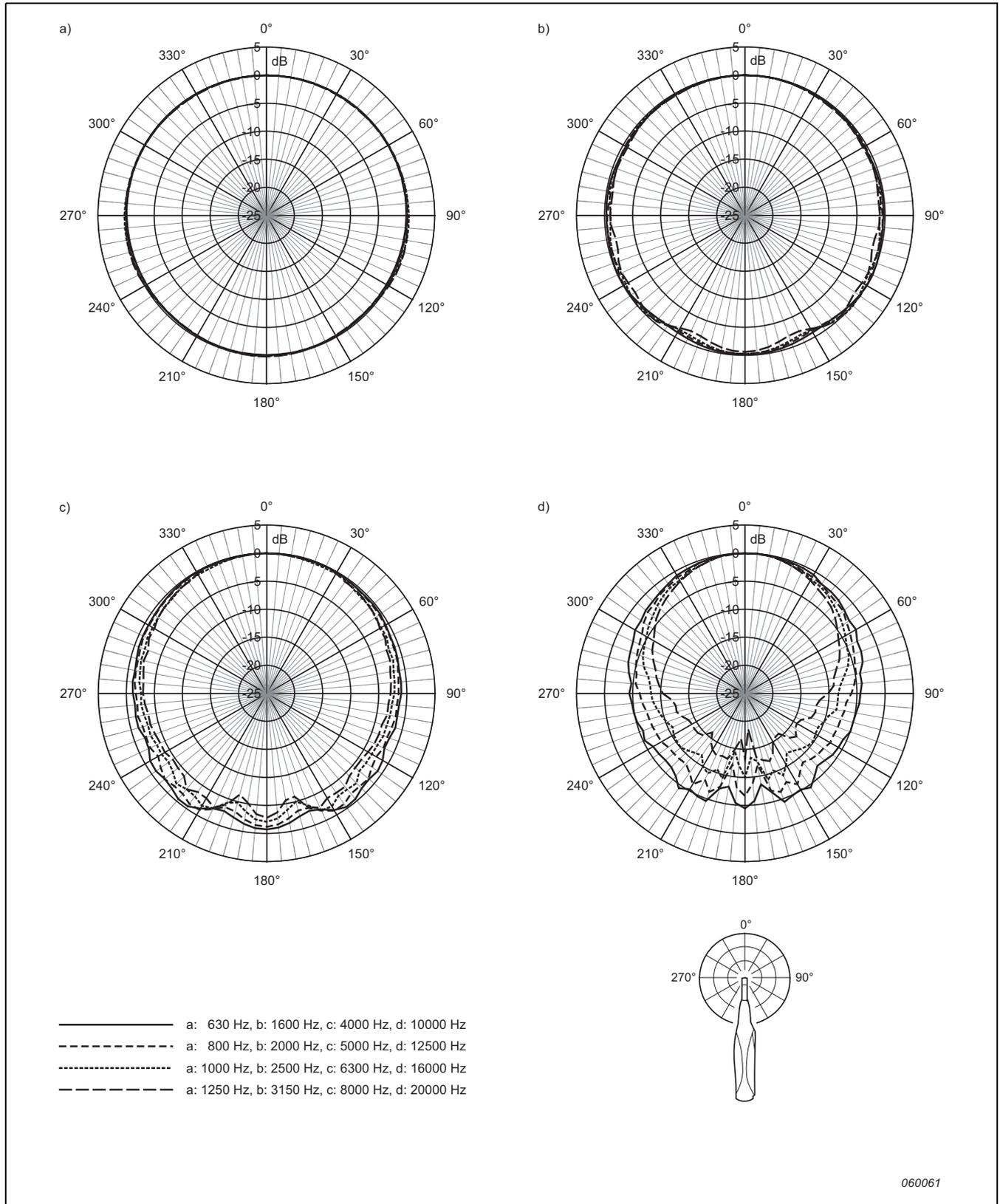


Fig. 4.16 Sensitivity variations of Microphone Type 4193, Microphone Preamplifier ZC-0032 and the analyzer with the Microphone Preamplifier mounted directly on the analyzer, at sound incidence angles within $\pm\theta^\circ$ from the reference direction. Corresponds to Table A.27

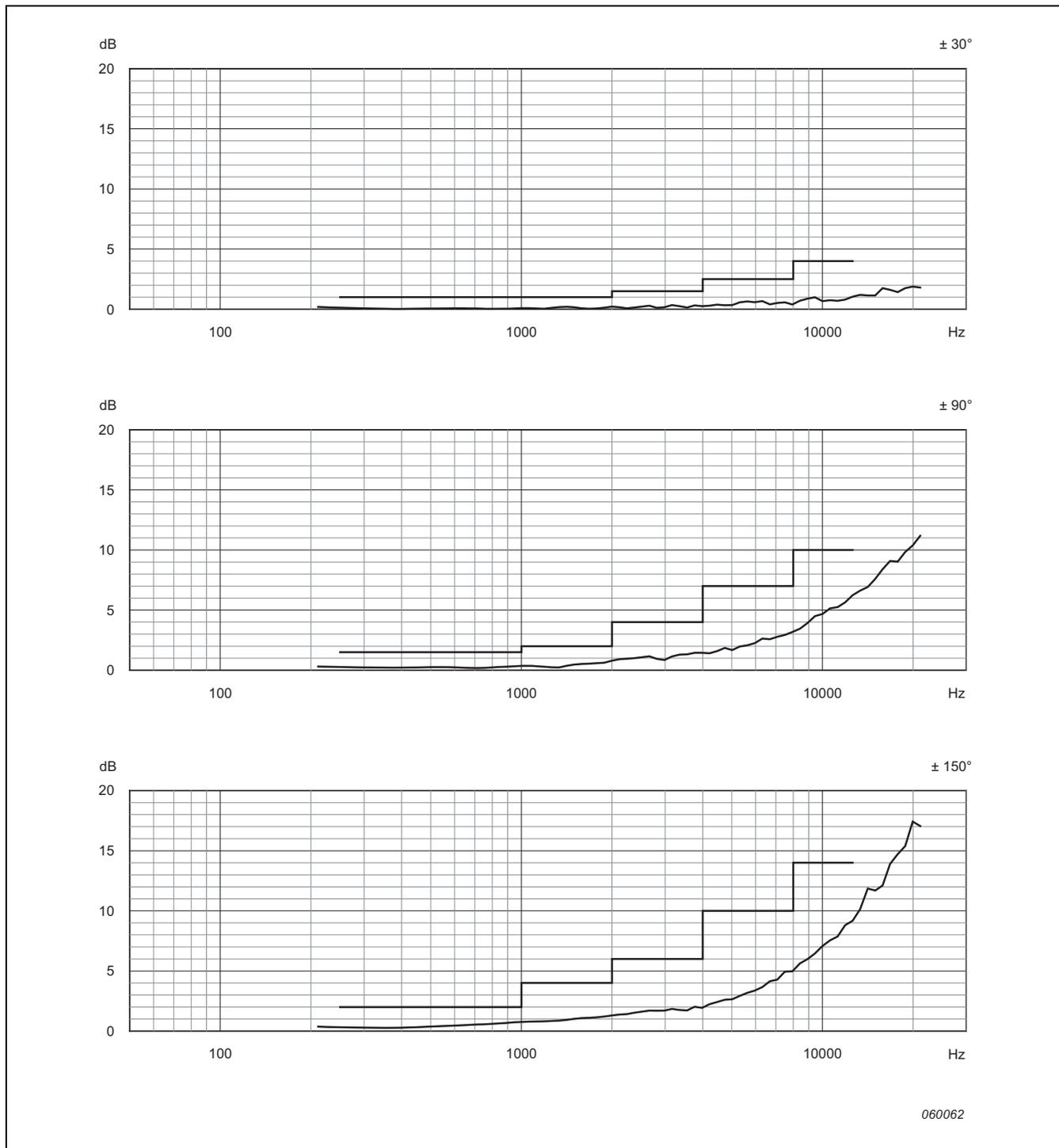


Fig. 4.17 Directional response for Windscreen UA-1650, Microphone Type 4193 and Microphone Preamplifier ZC-0032 with the Microphone Preamplifier connected to a microphone extension cable. Corresponds to Table A.31 to Table A.33

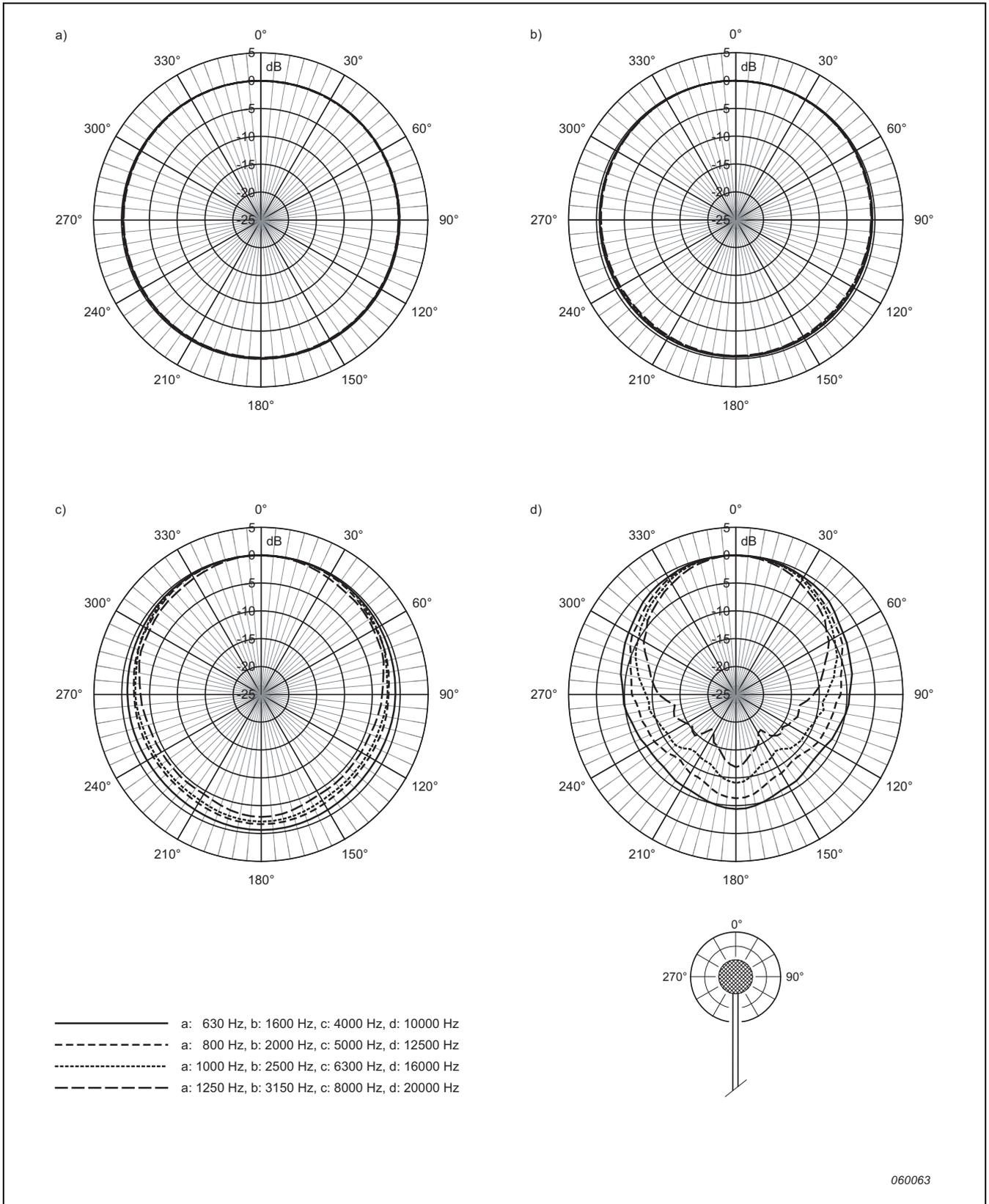


Fig. 4.18 Sensitivity variations for Windscreen UA-1650, Microphone Type 4193 and Microphone Preamplifier ZC-0032 with the Microphone Preamplifier connected to a microphone extension cable, at sound incidence angles within $\pm\theta^\circ$ from the reference direction. Corresponds to Table A.34

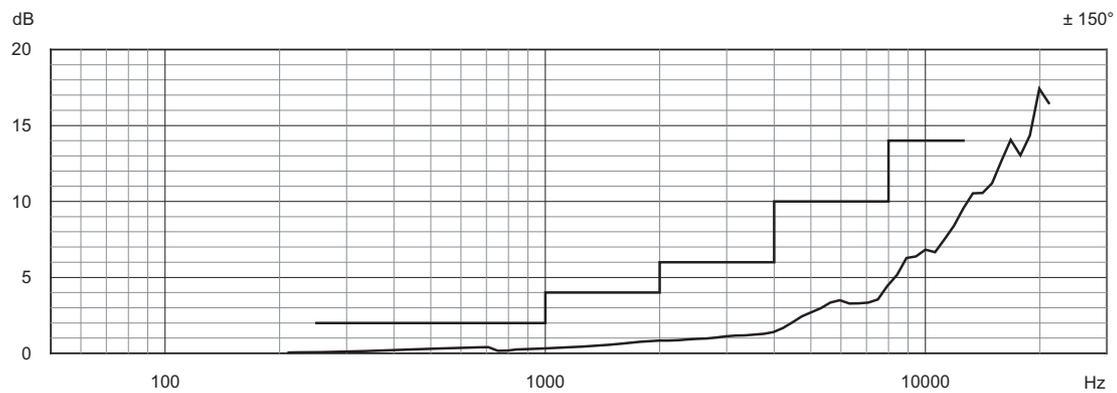
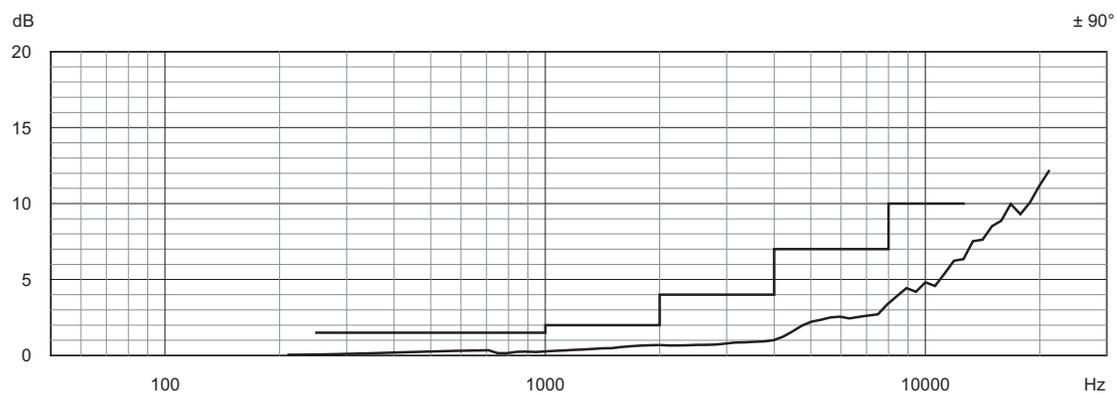
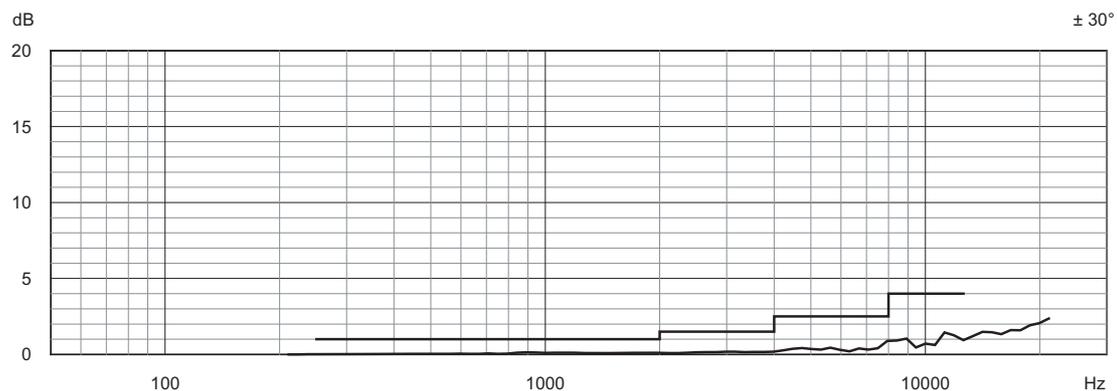


Fig. 4.19 Directional response for Windscreen UA-1650, Microphone Type 4193, Microphone Preamplifier ZC-0032 and the analyzer with the Microphone Preamplifier mounted directly on the analyzer, measured in a plane parallel to the display and along the microphone axis. Corresponds to Table A.35 to Table A.37

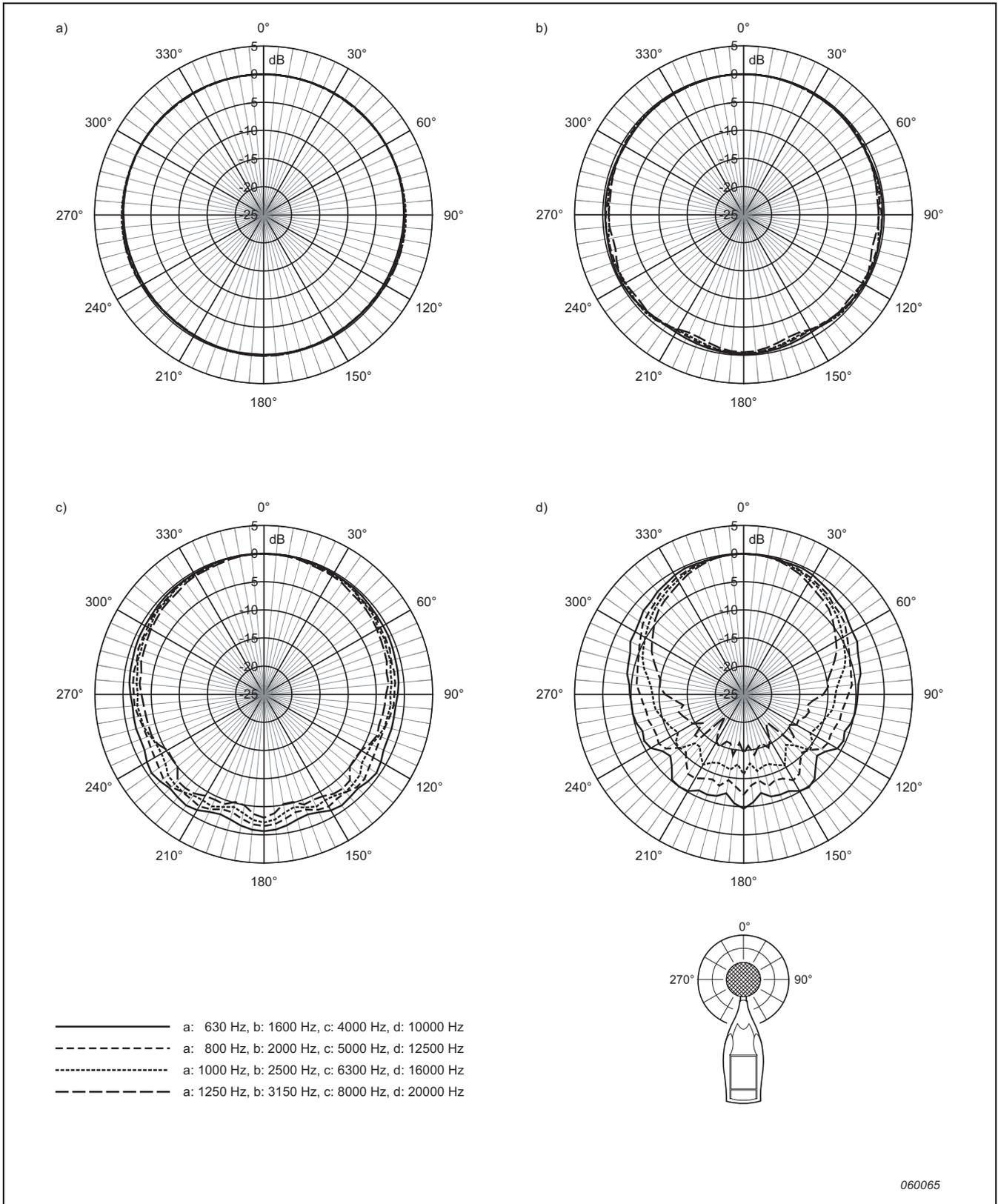


Fig. 4.20 Directional response for Windscreen UA-1650, Microphone Type 4193, Microphone Preamplifier ZC-0032 and the analyzer with the Microphone Preamplifier mounted directly on the analyzer, measured in a plane perpendicular to the display and along the microphone axis. Corresponds to Table A.38 to Table A.40

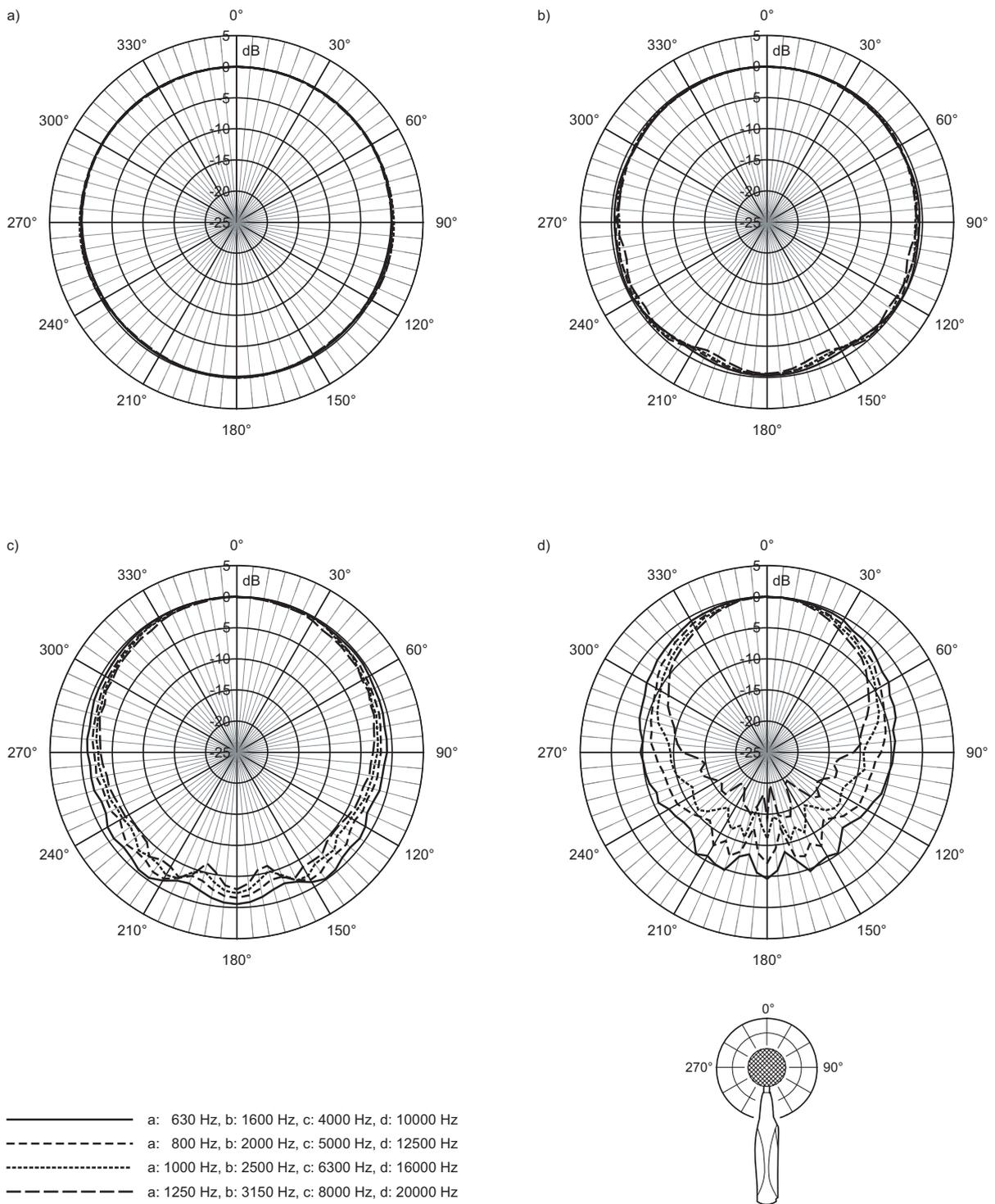


Fig. 4.21 Sensitivity variations of Windscreen UA-1650, Microphone Type 4193, Microphone Preamplifier ZC-0032 and the analyzer with the Microphone Preamplifier mounted directly on the analyzer, at sound incidence angles within $\pm\theta^\circ$ from the reference direction. Corresponds to Table A.41

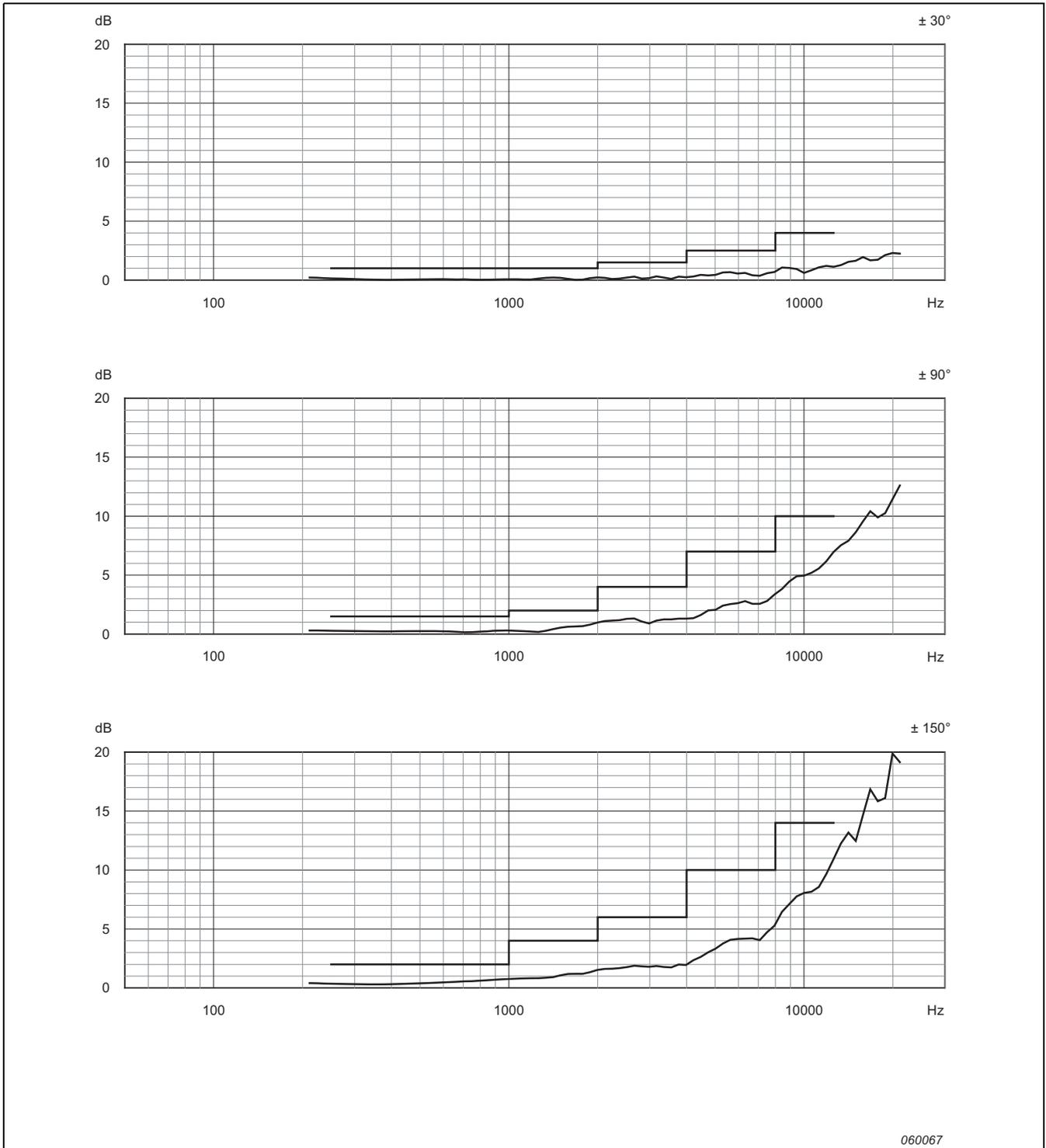


Fig. 4.22 Microphone Type 4193 is not specified together with Outdoor Microphone Kit UA-1404

Fig. 4.23 Microphone Type 4193 is not specified together with Outdoor Microphone Kit UA-1404

4.8 Self-generated Noise

Self-generated noise is given for nominal microphone Open Circuit Sensitivity. *Sound Field Correction* set to *Free-field* and no microphone accessories selected.

4.8.1 Maximum Broadband Self-generated Noise

Table 4.1a

Maximum broadband self-generated noise without UC-0211

Maximum Noise	Frequency Weighting				
	A-weighting (dB)	B-weighting (dB)	C-weighting (dB)	Z-weighting* Normal (dB)	Z-weighting* Extended (dB)
Single-range					
Microphone	17.6	16.4	16.4	18.4	18.4
Electrical	23.3	22.8	24.4	28.7	50.6
Total	24.3	23.7	25.0	29.1	50.6
High Range					
Microphone	17.6	16.4	16.4	18.4	18.4
Electrical	41.5	40.4	40.5	42.5	51.1
Total	41.5	40.4	40.5	42.5	51.1
Low Range					
Microphone	17.6	16.4	16.4	18.4	18.4
Electrical	23.3	22.8	24.4	28.7	50.6
Total	24.3	23.7	25.0	29.1	50.6

*. minimum 120 seconds L_{Zeq}

Table 4.1b

Maximum broadband self-generated noise with UC-0211

Maximum Noise	Frequency Weighting			
	A-weighting (dB)	B-weighting (dB)	C-weighting (dB)	Z-weighting* Very Low (dB)
Single-range				
Microphone	17.6	16.4	16.4	18.4
Electrical	38.7	37.7	37.9	58.0
Total	38.7	37.7	37.9	58.0
High Range				
Microphone	17.6	16.4	16.4	18.4
Electrical	57.7	56.5	56.6	61.2
Total	57.7	56.5	56.6	61.2
Low Range				
Microphone	17.6	16.4	16.4	18.4
Electrical	38.7	37.7	37.9	58.0
Total	38.7	37.7	37.9	58.0

*. minimum 120 seconds L_{Zeq}

4.8.2 Typical Broadband Self-generated Noise

Table 4.2a

Typical broadband self-generated noise without UC-0211

Typical Noise	Frequency Weighting				
	A-weighting (dB)	B-weighting (dB)	C-weighting (dB)	Z-weighting* Normal (dB)	Z-weighting* Extended (dB)
Single-range					
Microphone	16.6	15.4	15.4	17.4	17.4
Electrical	22.1	21.5	23.0	27.6	38.4
Total	23.2	22.5	23.7	28.0	38.4
High Range					
Microphone	16.6	15.4	15.4	17.4	17.4
Electrical	38.0	36.9	37.0	39.1	42.2
Total	38.0	36.9	37.0	39.1	42.2
Low Range					
Microphone	16.6	15.4	15.4	17.4	17.4
Electrical	22.1	21.5	23.0	27.6	38.4
Total	23.2	22.5	23.7	28.0	38.4

*. minimum 120 seconds L_{Zeq}

Table 4.2b

Typical broadband self-generated noise with UC-0211

Typical Noise	Frequency Weighting			
	A-weighting (dB)	B-weighting (dB)	C-weighting (dB)	Z-weighting* Very Low (dB)
Single-range				
Microphone	16.6	15.4	15.4	17.4
Electrical	37.8	36.7	36.9	43.7
Total	37.8	36.7	36.9	43.7
High Range				
Microphone	16.6	15.4	15.4	17.4
Electrical	54.2	53.0	53.1	56.2
Total	54.2	53.0	53.1	56.2
Low Range				
Microphone	16.6	15.4	15.4	17.4
Electrical	37.8	36.7	36.9	43.7
Total	37.8	36.7	36.9	43.7

*. minimum 120 seconds L_{Zeq}

4.8.3 Typical Self-generated Noise Spectra

Typical spectra for self-generated noise are shown in Fig.4.24a to Fig.4.29b.

Fig.4.24a Typical self-generated noise, 1/1-octave band, Single-range, without UC-0211

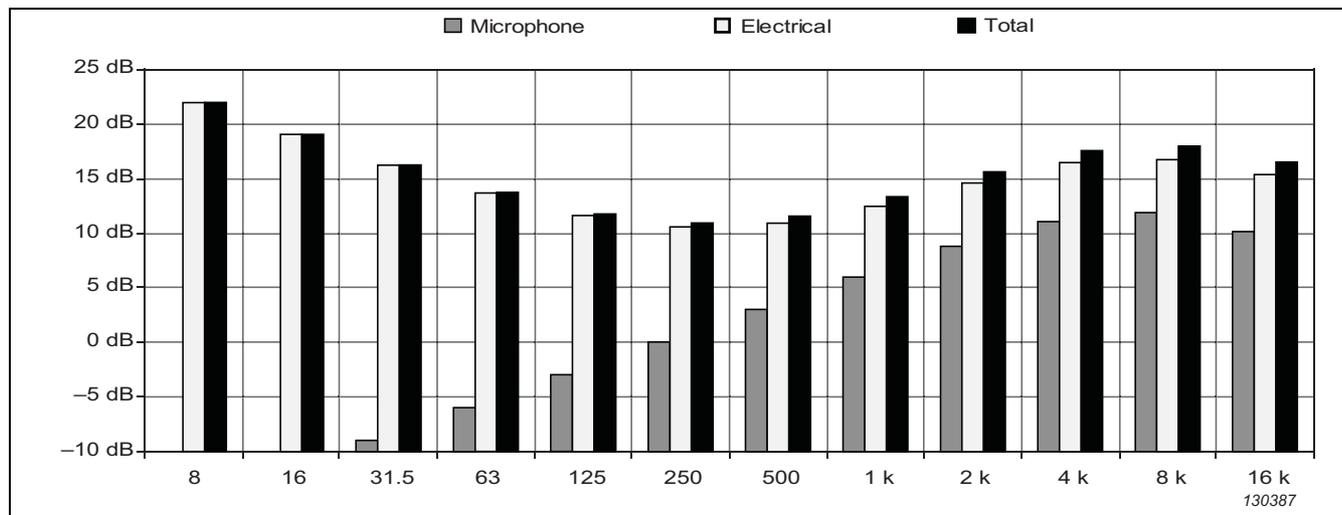


Fig.4.24b Typical self-generated noise, 1/1-octave band, Single-range, with UC-0211

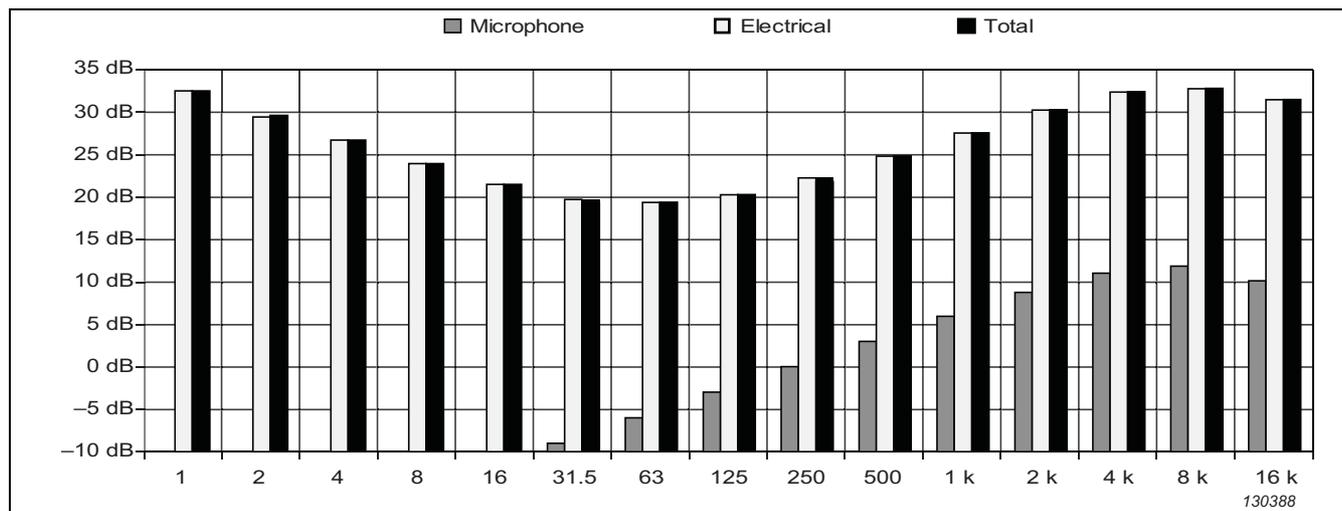


Fig. 4.25a Typical self-generated noise, 1/1-octave band, High Range, without UC-0211

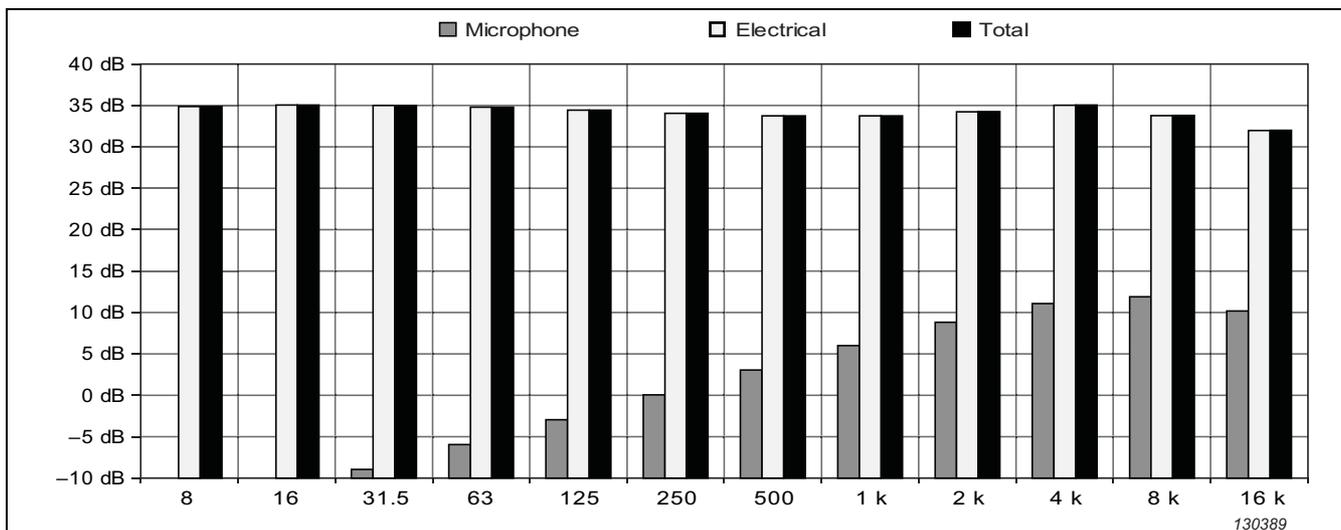


Fig. 4.25b Typical self-generated noise, 1/1-octave band, High Range, with UC-0211

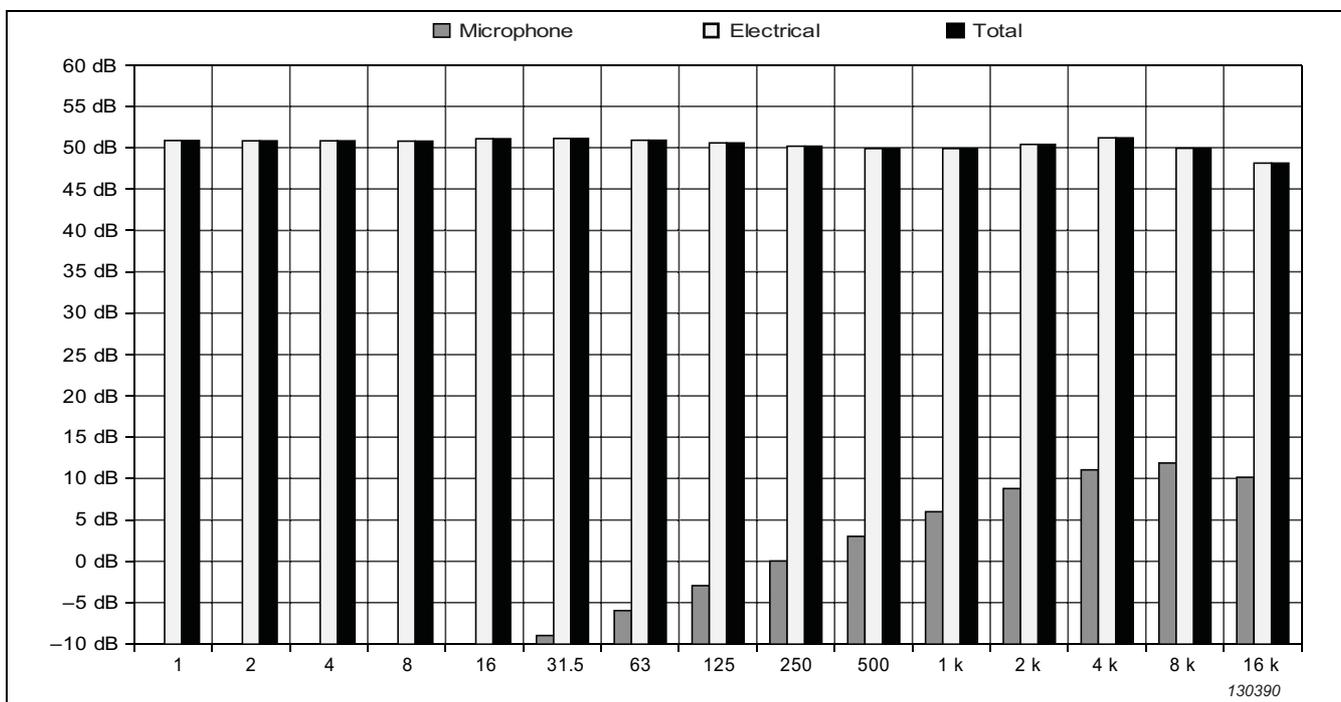


Fig. 4.26a Typical self-generated noise, 1/1-octave band, Low Range, without UC-0211

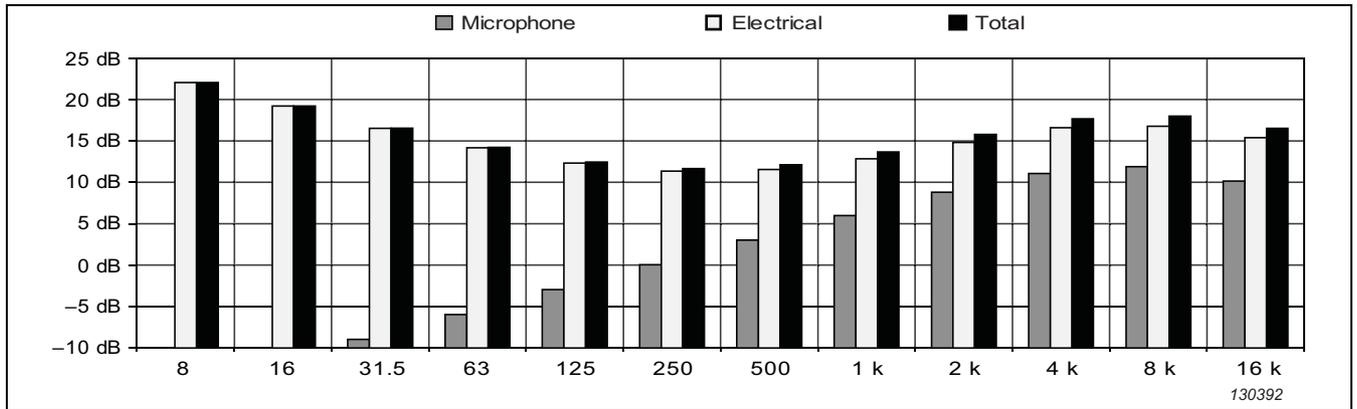


Fig. 4.26b Typical self-generated noise, 1/1-octave band, Low Range, with UC-0211

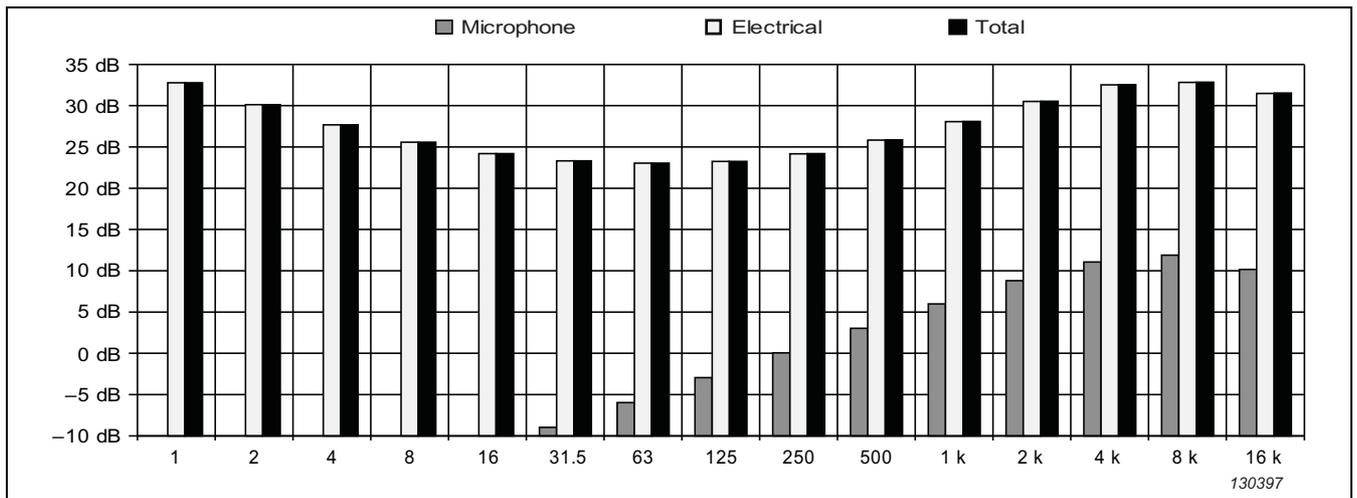


Fig. 4.27a Typical self-generated noise, 1/3-octave band, Single-range, without UC-0211

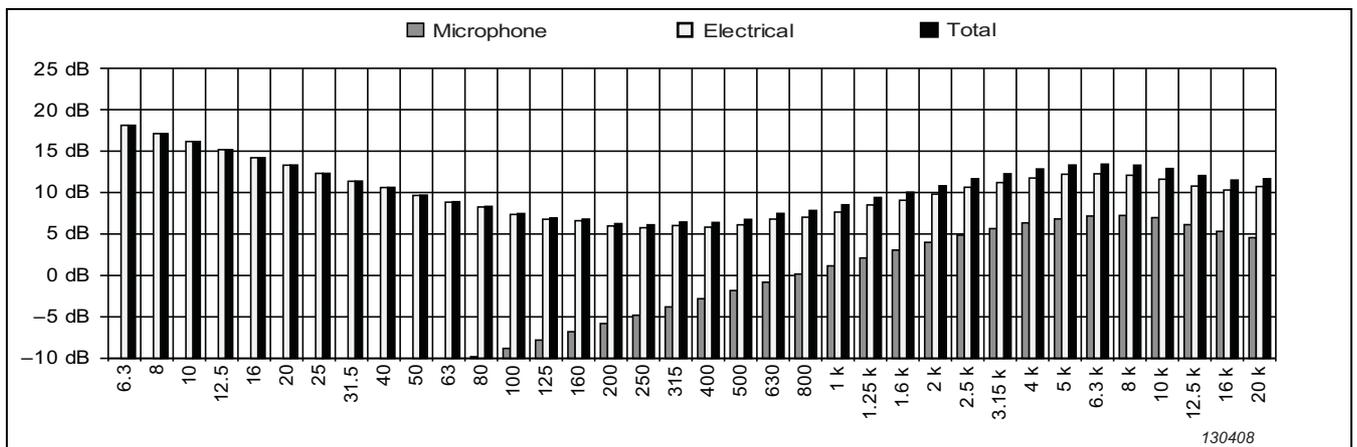


Fig. 4.27b Typical self-generated noise, 1/3-octave band, Single-range, with UC-0211

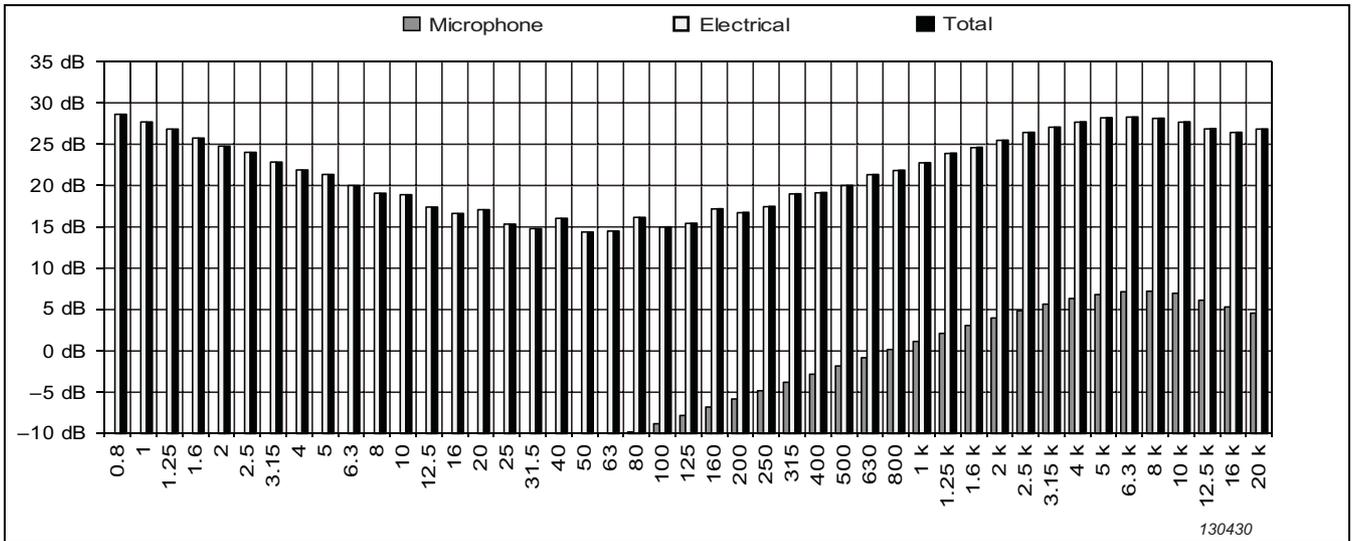


Fig. 4.28a Typical self-generated noise, 1/3-octave band, High Range, without UC-0211

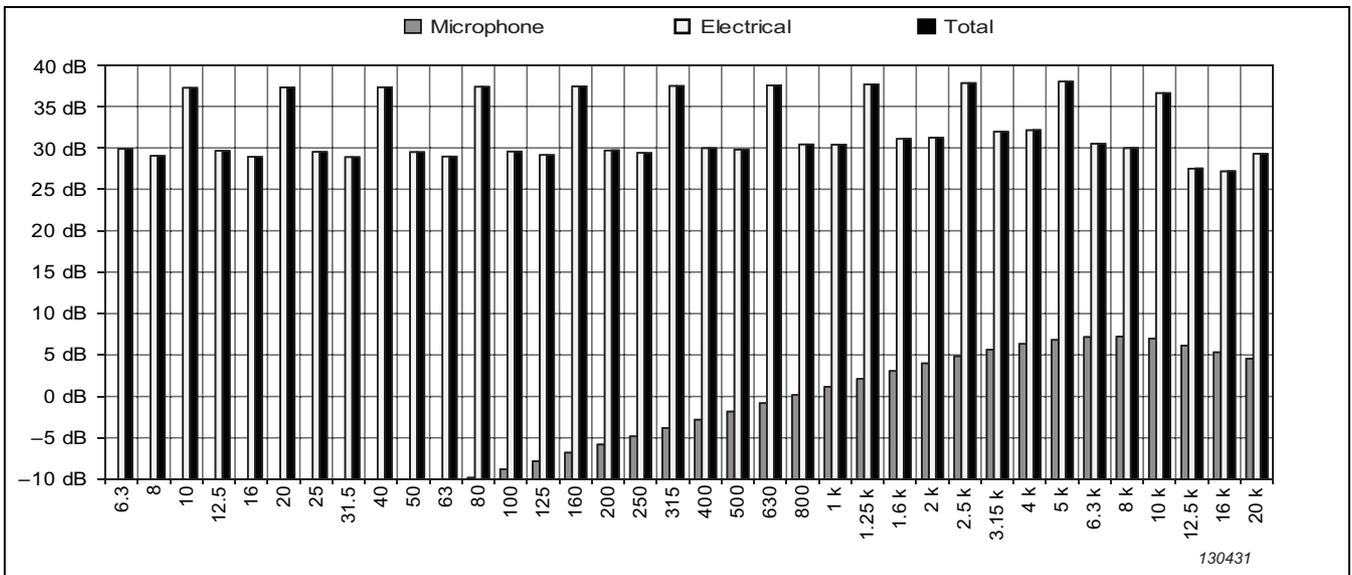


Fig. 4.28b Typical self-generated noise, 1/3-octave band, High Range, with UC-0211

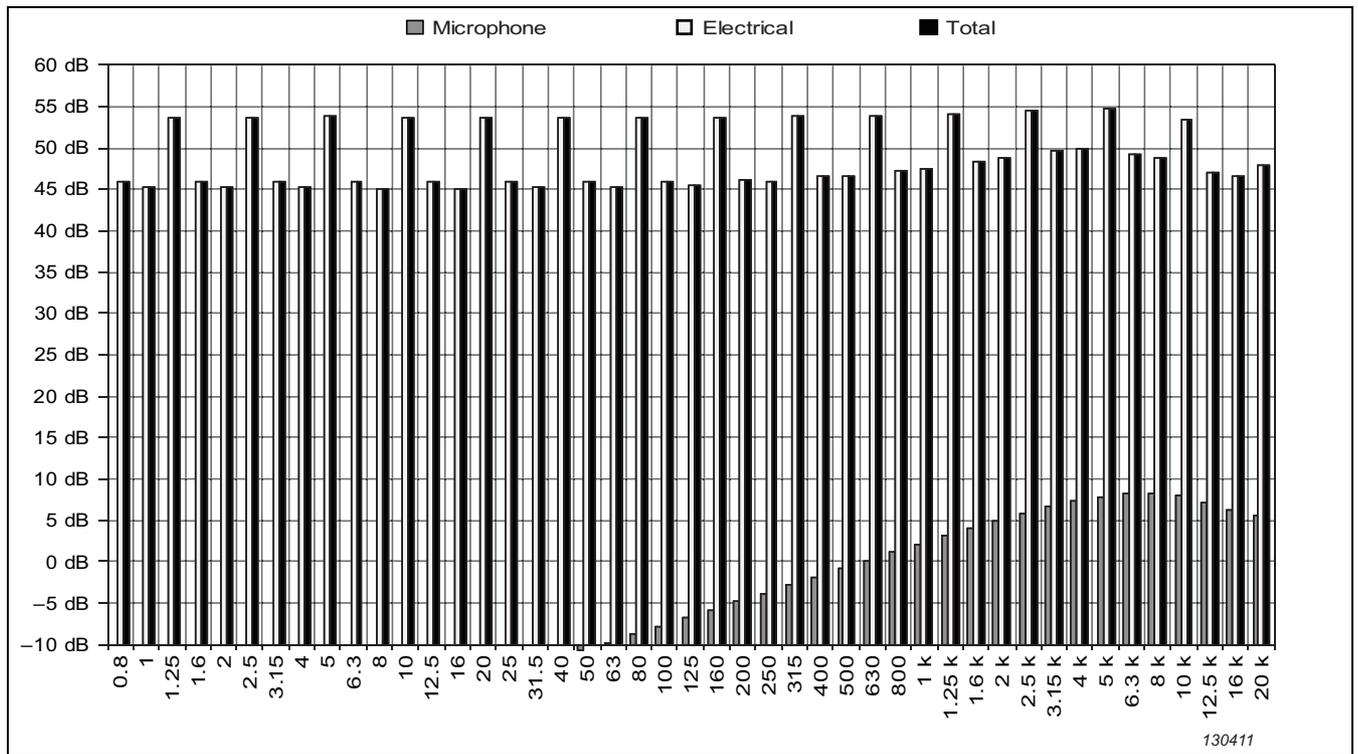


Fig. 4.29a Typical self-generated noise, 1/3-octave band, Low Range, without UC-0211

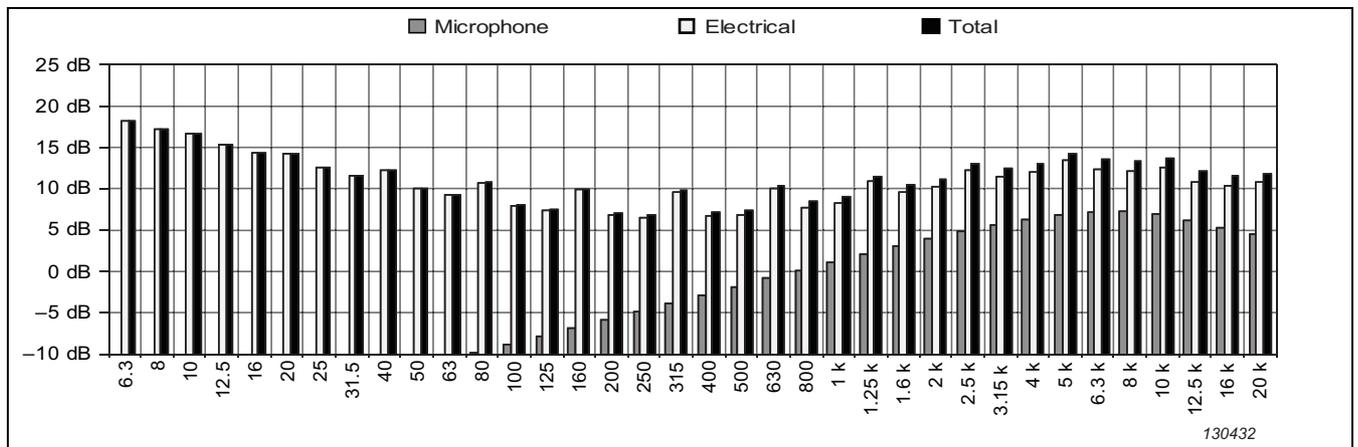
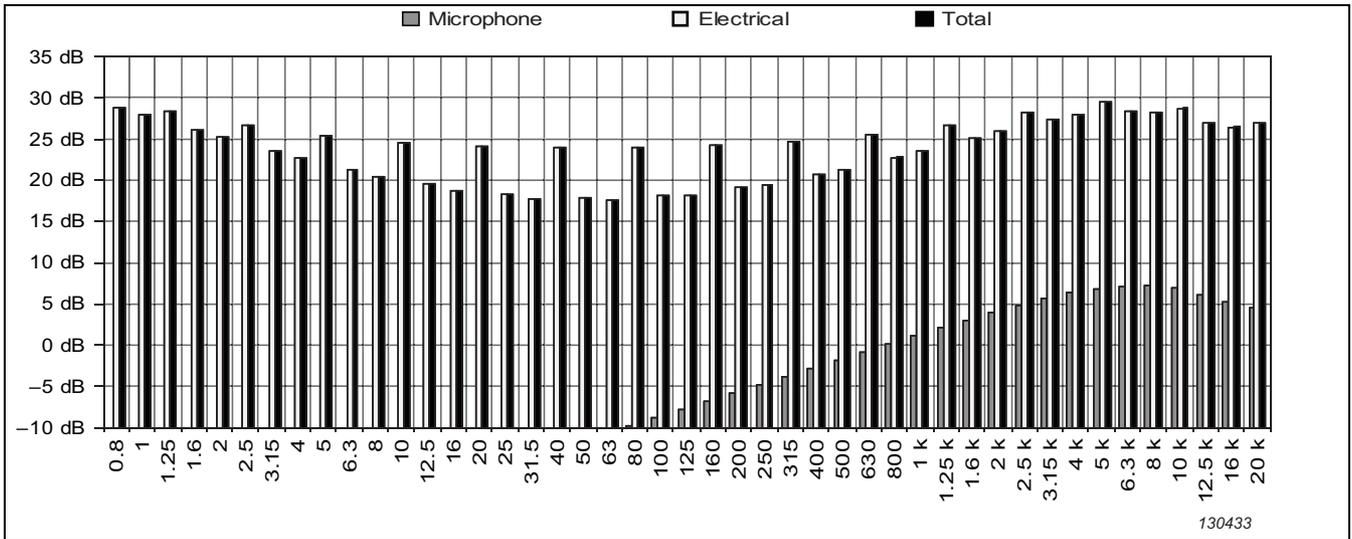


Fig. 4.29b Typical self-generated noise, 1/3-octave band, Low Range, with UC-0211



4.9 Measuring Ranges

The Upper Limit in the following sections is based on the guaranteed worst-case limit for the analyzer and the nominal Open Circuit Sensitivity of the microphone. The Overload Limit can, due to tolerances in the analyzer, be up to 1.5 dB higher than the worst-case limit, but tolerances specified in the International Standards are maintained as long as no Overload is indicated.

The Lower Limit in the following sections is based on the guaranteed worst-case limit for the analyzer and the nominal Open Circuit Sensitivity of the microphone, under Reference Environmental Conditions, *Sound Field Correction* set to *Free-field* and no microphone accessories selected.

4.9.1 Maximum Sound Level

The maximum Sound Level that the Sound Level Meter can accommodate without causing damage to the Sound Level Meter: 171 dB Peak.

4.9.2 Total Range

Total Range is defined as the difference between the Upper Limit on the least sensitive level range, and the lowest sound pressure level measurable on the most sensitive level range, which can be measured at 1 kHz within the most conservative tolerance limits, specified in the International Standards IEC 61672-1, IEC 60651 and IEC 60804:

Table 4.3a
Total range without UC-0211

Frequency Weighting				
A-weighting (dB)	B-weighting (dB)	C-weighting (dB)	Z-weighting Normal (dB)	Z-weighting Extended (dB)
151.7 – 34.5	151.7 – 34.0	151.7 – 35.6	151.7 – 39.9	151.7 – 61.8

Table 4.3b
Total range with
UC-0211

Frequency Weighting			
A-weighting (dB)	B-weighting (dB)	C-weighting (dB)	Z-weighting Very Low (dB)
142.1 – 49.9	142.1 – 48.9	142.1 – 49.1	142.1 – 69.2

NOTE: For Sound Exposure Levels, the stated ranges are valid if $10 \cdot \lg(\Delta t)$ is added to the limits, Δt being the averaging time interval, indicated as *Elapsed Time*, expressed in seconds.

4.9.3 Primary Indicator Range

Primary Indicator Range according to the International Standard IEC 60651:

Table 4.4a
Primary Indicator
Range without
UC-0211

Range	Upper Limit (dB)	Lower Limit				
		A-weighting (dB)	B-weighting (dB)	C-weighting (dB)	Z-weighting Normal (dB)	Z-weighting Extended (dB)
Single	131.5	33.2	32.7	34.3	38.6	60.5
High	131.5	51.4	50.3	50.4	52.4	61.0
Low	101.5	33.2	32.7	34.3	38.6	60.5

Table 4.4b
Primary Indicator
Range with
UC-0211

Range	Upper Limit (dB)	Lower Limit			
		A-weighting (dB)	B-weighting (dB)	C-weighting (dB)	Z-weighting Very Low (dB)
Single	121.9	48.6	47.6	47.8	67.9
High	121.9	67.6	66.4	66.5	71.1
Low	117.9	48.6	47.6	47.8	67.9

4.9.4 Indicator Range

Indicator Range according to the International Standard IEC 60804:

Table 4.5a
Indicator Range
without UC-0211

Range	Upper Limit (dB)	Lower Limit				
		A-weighting (dB)	B-weighting (dB)	C-weighting (dB)	Z-weighting Normal (dB)	Z-weighting Extended Low Frequency (dB)
Single	148.5	33.2	32.7	34.3	38.6	60.5
High	148.5	51.4	50.3	50.4	52.4	61.0
Low	118.5	33.2	32.7	34.3	38.6	60.5

Table 4.5b
Indicator Range
with UC-0211

Range	Upper Limit (dB)	Lower Limit			
		A-weighting (dB)	B-weighting (dB)	C-weighting (dB)	Z-weighting Normal (dB)
Single	138.9	48.6	47.6	47.8	67.9
High	138.9	67.6	66.4	66.5	71.1
Low	134.9	48.6	47.6	47.8	67.9

NOTE: For Sound Exposure Levels, the stated ranges are valid if $10 \cdot \lg(\Delta t)$ is added to the limits, Δt being the averaging time interval, indicated as *Elapsed Time*, expressed in seconds.

4.9.5 Linearity Range

Linearity Range according to the International Standard IEC 60804 is the difference between the Upper and Lower Limit in the following table:

Table 4.6a
Linearity Range
without UC-0211

Range	Upper Limit (dB)	Lower Limit				
		A-weighting (dB)	B-weighting (dB)	C-weighting (dB)	Z-weighting Normal (dB)	Z-weighting Extended (dB)
Single	151.7	31.1	30.6	32.2	36.5	58.4
High	151.7	49.3	48.2	48.3	50.3	58.9
Low	121.7	31.1	30.6	32.2	36.5	58.4

Table 4.6b
Linearity Range
with UC-0211

Range	Upper Limit (dB)	Lower Limit			
		A-weighting (dB)	B-weighting (dB)	C-weighting (dB)	Z-weighting Very Low (dB)
Single	142.1	46.5	45.5	45.7	65.8
High	142.1	65.5	64.3	64.4	69.0
Low	138.1	46.5	45.5	45.7	65.8

NOTE: For Sound Exposure Levels, the stated ranges are valid if $10 \cdot \lg(\Delta t)$ is added to the limits, Δt being the averaging time interval, indicated as *Elapsed Time*, expressed in seconds.

4.9.6 Pulse Range

Pulse Range according to the International Standard IEC 60804 is the difference between the Upper and Lower Limit in the following table:

Table 4.7a
Pulse Range

Range	Upper Limit (dB)	Lower Limit				
		A-weighting (dB)	B-weighting (dB)	C-weighting (dB)	Z-weighting Normal (dB)	Z-weighting Extended (dB)
Single	154.7	31.1	30.6	32.2	36.5	58.4
High	154.7	49.3	48.2	48.3	50.3	58.9
Low	124.7	31.1	30.6	32.2	36.5	58.4

Table 4.7b
Pulse Range

Range	Upper Limit (dB)	Lower Limit			
		A-weighting (dB)	B-weighting (dB)	C-weighting (dB)	Z-weighting Very Low (dB)
Single	145.1	46.5	45.5	45.7	65.8
High	145.1	65.5	64.3	64.4	69.0
Low	141.1	46.5	45.5	45.7	65.8

NOTE: For Sound Exposure Levels, the stated ranges are valid if $10 \cdot \lg(\Delta t)$ is added to the limits. Δt being the averaging time interval, indicated as *Elapsed Time*, expressed in seconds.

4.9.7 Linear Operating Range

The starting point for all the Linear Operating Range tests is 94.0 dB.

Linear Operating Range according to the International Standard IEC 61672-1:

Table 4.8a
 Linear Operating
 Range without
 UC-0211

Frequency- Weighting	Upper Limit					Lower Limit
	31.5 Hz (dB)	1 kHz (dB)	4 kHz (dB)	8 kHz (dB)	12.5 kHz (dB)	All (dB)
Single-range						
A-weighting	112.6	151.7	151.7	147.4	140.9	34.5
B-weighting	134.9	151.7	150.0	145.6	139.1	34.0
C-weighting	149.0	151.7	149.9	145.5	139.0	35.6
Z-weighting Normal	152.0	151.7	150.7	148.5	145.2	39.9
Z-weighting Extended	152.0	151.7	150.7	148.5	145.2	61.8
High Range						
A-weighting	112.6	151.7	151.7	147.4	140.9	52.7
B-weighting	134.9	151.7	150.0	145.6	139.1	51.6
C-weighting	149.0	151.7	149.9	145.5	139.0	51.7
Z-weighting Normal	152.0	151.7	150.7	148.5	145.2	53.7
Z-weighting Extended	152.0	151.7	150.7	148.5	145.2	62.3
Low Range						
A-weighting	82.6	121.7	121.7	117.4	110.9	34.5
B-weighting	104.9	121.7	120.0	115.6	109.1	34.0
C-weighting	119.0	121.7	119.9	115.5	109.0	35.6
Z-weighting Normal	122.0	121.7	120.7	118.5	115.2	39.9
Z-weighting Extended	122.0	121.7	120.7	118.5	115.2	61.8

Table 4.8b
Linear Operating
Range with
UC-0211

Frequency- Weighting	Upper Limit					Lower Limit
	31.5 Hz (dB)	1 kHz (dB)	4 kHz (dB)	8 kHz (dB)	12.5 kHz (dB)	All (dB)
Single-range						
A-weighting	103.0	142.1	142.1	137.8	131.3	49.9
B-weighting	125.3	142.1	140.4	136.0	129.5	48.9
C-weighting	139.4	142.1	140.3	135.9	129.4	49.1
Z-weighting Very Low	142.4	142.1	141.1	138.9	135.6	69.2
High Range						
A-weighting	103.0	142.1	142.1	137.8	131.3	68.9
B-weighting	125.3	142.1	140.4	136.0	129.5	67.7
C-weighting	139.4	142.1	140.3	135.9	129.4	67.8
Z-weighting Very Low	142.4	142.1	141.1	138.9	135.6	72.4
Low Range						
A-weighting	99.0	138.1	138.1	133.8	127.3	49.9
B-weighting	121.3	138.1	136.4	132.0	125.5	48.9
C-weighting	135.4	138.1	136.3	131.9	125.4	49.1
Z-weighting Very Low	138.4	138.1	137.1	134.9	131.6	69.2

NOTE: For Sound Exposure Levels, the stated ranges are valid if $10 \cdot \lg(\Delta t)$ is added to the limits, Δt being the averaging time interval, indicated as *Elapsed Time*, expressed in seconds.

4.9.8 Peak C Range

Peak C Range according to the International Standard IEC 61672-1 is:

Table 4.9a
Peak C Range
without UC-0211

Range	Upper Limit					Lower Limit
	31.5 Hz (dB)	1 kHz (dB)	4 kHz (dB)	8 kHz (dB)	12.5 kHz (dB)	All (dB)
Single	152.0	154.7	152.9	148.5	142.0	52.4
High	152.0	154.7	152.9	148.5	142.0	68.5
Low	122.0	124.7	122.9	118.5	112.0	52.4

Table 4.9b
Peak C Range with
UC-0211
Table 4.9b

Range	Upper Limit					Lower Limit
	31.5 Hz (dB) <i>Table 4.9b</i>	1 kHz (dB)	4 kHz (dB)	8 kHz (dB)	12.5 kHz (dB)	All (dB)
Single	142.4	145.1	143.3	138.9	132.4	65.9
High	142.4	145.1	143.3	138.9	132.4	84.6
Low	138.4	141.1	139.3	134.9	128.4	65.9

4.11 Spectrum Analysis

4.11.1 1/1- octave Band Centre Frequencies

See Instruction Manual BE 1712. Additional filters when *Low Frequency* is set to *Very Low*:

Nominal: 1 Hz, 2 Hz, 4 Hz

Exact (5 digits): 0.97656 Hz, 1.9531 Hz, 3.9063 Hz

Real-time Frequency Range: 1 Hz to 16 kHz centre frequencies.

4.11.2 1/3-octave Band Centre Frequencies

See Instruction Manual BE 1712. Additional filters when *Low Frequency* is set to *Very Low*:

Nominal: 0.8 Hz, 1 Hz, 1.25 Hz, 1.6 Hz, 2 Hz, 2.5 Hz, 3.15 Hz, 4 Hz, 5 Hz

Exact (5 digits): 0.77510 Hz, 0.97656 Hz, 1.2304 Hz, 1.5502 Hz, 1.9531 Hz, 2.4608 Hz, 3.1004 Hz, 3.9063 Hz, 4.9216 Hz

Real-time Frequency Range: 0.8 Hz to 20 kHz centre frequencies.

4.11.3 Linear Operating Range

Linear Operating Range according to the International Standard IEC 61260. for electrical input, for all filters in the filter banks:

Table 4.11a
Linear Operating
Range without
UC-0211

Range	Upper Limit (dB)	Lower Limit 1/1-octave (dB)	Lower Limit 1/3-octave (dB)
Single	152.0	34.7	30.8
High	152.0	49.0	50.3
Low	122.0	34.8	30.9

Table 4.11b
Linear Operating
Range with
UC-0211

Range	Upper Limit (dB)	Lower Limit 1/1-octave (dB)	Lower Limit 1/3-octave (dB)
Single	142.4	45.8	41.9
High	142.4	65.2	66.4
Low	138.4	46.0	42.0

Below the Lower Limit, the Level Linearity Error is less than or equal to the error found in Fig.2.1 with L_{inh} set to the Lower Limit – 11.5 dB.

4.11.4 Measurement Range

Measurement Range according to the International Standard IEC 61260 is the difference between the Upper Limit of the Linear Operating Range on the least sensitive level range and the Lower Limit of the Linear Operating Range on the most sensitive level range.

Table 4.12
Measurement Range

	1/1-octave (dB)	1/3-octave (dB)
Without UC-0211	152.0 – 34.8	152.0 – 30.9
With UC-0211	142.4 – 46.0	142.4 – 42.0

4.11.5 Octave Band Time Constants

At low centre frequencies, the B*T product for time weightings becomes too small to give statistically reliable measurements. To overcome this, the Fast time constant (125 ms) and the Slow time constant (1000 ms) are replaced by progressively longer time constants with decreasing centre frequencies (and corresponding bandwidths). See Table 4.13 and Table 4.14.

Table 4.13
Octave band Fast Time Constants

1/1-octave Centre Frequency (Hz)	1/3-octave Centre Frequency (Hz)	Time Constant (ms)	Averaging Time (ms)
≥ 63	≥ 100	125 (Fast)	250 (Fast)
31.5	80, 63, 50	250	500
16	40, 31.5, 25	500	1000
8	20, 16, 12.5	1000	2000
4	10, 8, 6.3	2000	4000
2	5, 4, 3.15	4000	8000
1	2.5, 2, 1.6	8000	16000
-	1.25, 1, 0.8	16000	32000

Table 4.14
Octave band Slow Time Constants

1/1-octave Centre Frequency (Hz)	1/3-octave Centre Frequency (Hz)	Time Constant (ms)	Averaging Time (ms)
≥ 8	≥ 12.5	1000 (Slow)	2000 (Slow)
4	10, 8, 6.3	2000	4000
2	5, 4, 3.15	4000	8000
1	2.5, 2, 1.6	8000	16000
-	1.25, 1, 0.8	16000	32000

For a white Gaussian signal and for 1/1-octave centre frequencies from 1 Hz to 63 Hz, these time constants give a maximum relative standard deviation of approximately 1.5 dB. For 1/3-octave centre frequencies from 0.8 Hz to 160 Hz, these time constants give a maximum relative standard deviation of approximately 2 dB.

4.12 Influence from the Operating Environment

4.12.4 Vibration

Vibration Sensitivity (20 – 1000 Hz) for 1 ms^{-2} : A-weighted max. 76 dB, Z-weighted max. 86 dB without UC-0211, A-weighted max 93 dB, Z-weighted max 103 dB with UC-0211.

Appendix A

Tables

A.2 Free-field Frequency Responses

Frequency responses with Z frequency weighting. Measured with plane progressive sinusoidal sound waves incident from the reference direction and the instrument's *Sound Field Correction* parameter set to *Free-field*, see section 4.6.5.

Table A.2 Free-field 0° frequency response for Microphone Type 4193, Microphone Preamplifier ZC-0032 and the analyzer's electrical response with the Microphone Preamplifier connected to a microphone extension cable

Nominal Frequency Hz	Exact Frequency (6 digits) Hz	Microphone Actuator Response dB	Microphone Free-field Correction dB	Microphone Free-field Response dB	Electrical Response dB	Acoustical Response dB	Expanded Uncertainty dB
63	63.0957	0.00	0.00	0.00	0.00	0.00	0.05
80	79.4328	0.00	0.00	0.00	0.00	0.00	0.05
100	100	0.00	0.00	0.00	0.00	0.00	0.05
125	125.893	0.00	0.00	0.00	0.00	0.00	0.05
160	158.489	0.00	0.00	0.00	0.00	0.00	0.05
200	199.526	0.00	0.00	0.00	0.00	0.00	0.05
250	251.189	0.00	0.00	0.00	0.00	0.00	0.05
315	316.228	0.00	0.01	0.00	0.00	0.00	0.06
400	398.107	-0.01	0.01	0.00	-0.01	-0.01	0.06
500	501.187	-0.01	0.02	0.01	-0.02	-0.01	0.07
630	630.957	-0.01	0.04	0.03	-0.03	0.00	0.07
800	794.328	-0.01	0.06	0.05	-0.04	0.01	0.07
1000	1000	-0.01	0.10	0.08	-0.07	0.01	0.07
1060	1059.25	-0.01	0.10	0.09	-0.08	0.01	0.07
1120	1122.02	-0.01	0.11	0.10	-0.09	0.01	0.07
1180	1188.5	-0.01	0.12	0.11	-0.10	0.01	0.08
1250	1258.93	-0.01	0.14	0.12	-0.11	0.01	0.08
1320	1333.52	-0.01	0.15	0.13	-0.12	0.01	0.08
1400	1412.54	-0.01	0.16	0.15	-0.14	0.01	0.08
1500	1496.24	-0.01	0.18	0.17	-0.15	0.02	0.08
1600	1584.89	-0.01	0.20	0.19	-0.17	0.02	0.08
1700	1678.8	-0.01	0.22	0.21	-0.19	0.02	0.08
1800	1778.28	0.00	0.25	0.25	-0.21	0.04	0.09
1900	1883.65	0.00	0.28	0.28	-0.24	0.04	0.09
2000	1995.26	0.00	0.31	0.31	-0.27	0.04	0.09
2120	2113.49	0.00	0.35	0.34	-0.30	0.04	0.09
2240	2238.72	0.00	0.39	0.39	-0.34	0.05	0.09
2360	2371.37	0.00	0.42	0.42	-0.38	0.04	0.10
2500	2511.89	0.01	0.46	0.46	-0.42	0.04	0.10
2650	2660.73	0.01	0.49	0.50	-0.47	0.03	0.10
2800	2818.38	0.01	0.54	0.55	-0.53	0.02	0.11
3000	2985.38	0.02	0.59	0.61	-0.59	0.02	0.11
3150	3162.28	0.02	0.65	0.68	-0.66	0.02	0.12
3350	3349.65	0.03	0.72	0.75	-0.74	0.01	0.12
3550	3548.13	0.03	0.81	0.84	-0.83	0.01	0.13

Nominal Frequency	Exact Frequency (6 digits)	Microphone Actuator Response	Microphone Free-field Correction	Microphone Free-field Response	Electrical Response	Acoustical Response	Expanded Uncertainty
Hz	Hz	dB	dB	dB	dB	dB	dB
3750	3758.37	0.04	0.90	0.94	-0.92	0.02	0.13
4000	3981.07	0.05	1.00	1.05	-1.03	0.02	0.14
4250	4216.97	0.06	1.11	1.17	-1.15	0.02	0.14
4500	4466.84	0.07	1.22	1.29	-1.28	0.01	0.14
4750	4731.51	0.08	1.35	1.43	-1.42	0.01	0.14
5000	5011.87	0.09	1.48	1.57	-1.58	-0.01	0.15
5300	5308.84	0.11	1.63	1.73	-1.75	-0.02	0.15
5600	5623.41	0.12	1.80	1.92	-1.94	-0.02	0.15
6000	5956.62	0.14	2.00	2.14	-2.16	-0.02	0.16
6300	6309.57	0.16	2.23	2.39	-2.39	0.00	0.16
6700	6683.44	0.19	2.45	2.64	-2.64	0.00	0.17
7100	7079.46	0.21	2.69	2.91	-2.91	0.00	0.17
7500	7498.94	0.24	2.96	3.20	-3.21	-0.01	0.17
8000	7943.28	0.27	3.28	3.55	-3.52	0.03	0.18
8500	8413.95	0.29	3.57	3.86	-3.87	-0.01	0.19
9000	8912.51	0.30	3.90	4.20	-4.23	-0.03	0.20
9500	9440.61	0.29	4.27	4.56	-4.62	-0.06	0.22
10000	10000	0.26	4.71	4.97	-5.03	-0.06	0.23
10600	10592.5	0.23	5.19	5.42	-5.46	-0.04	0.24
11200	11220.2	0.17	5.72	5.89	-5.90	-0.01	0.26
11800	11885	0.11	6.27	6.38	-6.35	0.03	0.28
12500	12589.3	0.05	6.76	6.81	-6.79	0.02	0.29
13200	13335.2	-0.01	7.26	7.25	-7.22	0.03	0.31
14000	14125.4	-0.08	7.71	7.63	-7.62	0.01	0.33
15000	14962.4	-0.17	8.15	7.98	-7.98	0.00	0.35
16000	15848.9	-0.28	8.55	8.27	-8.28	-0.01	0.38
17000	16788	-0.42	8.94	8.52	-8.53	-0.01	0.40
18000	17782.8	-0.60	9.32	8.71	-8.71	0.00	0.43
19000	18836.5	-0.85	9.68	8.82	-8.82	0.00	0.45
20000	19952.6	-1.16	9.97	8.81	-8.89	-0.08	0.48
21200	21134.9	-1.53	10.27	8.74	-8.93	-0.19	0.49
22400	22387.2	-1.72	10.59	8.87	-8.97	-0.10	0.49

Table A.3 Free-field 0° frequency response for Microphone Type 4193, Microphone Preamplifier ZC-0032 and the analyzer with the Microphone Preamplifier mounted directly on the analyzer

Nominal Frequency	Exact Frequency (6 digits)	Acoustical Response (From Table A.2)	Expanded Uncertainty	Body Influence	Expanded Uncertainty	Acoustical Response	Expanded Uncertainty
Hz	Hz	dB	dB	dB	dB	dB	dB
63	63.0957	0.00	0.05	0.00	0.10	0.00	0.11
80	79.4328	0.00	0.05	0.00	0.10	0.00	0.11
100	100	0.00	0.05	0.00	0.10	0.00	0.11
125	125.893	0.00	0.05	0.00	0.10	0.00	0.11
160	158.489	0.00	0.05	0.01	0.10	0.01	0.11
200	199.526	0.00	0.05	0.03	0.10	0.03	0.11
250	251.189	0.00	0.05	0.06	0.10	0.07	0.11
315	316.228	0.00	0.06	0.13	0.10	0.13	0.12
400	398.107	-0.01	0.06	0.21	0.10	0.20	0.12
500	501.187	-0.01	0.07	0.22	0.10	0.22	0.12
630	630.957	0.00	0.07	0.07	0.10	0.07	0.12
800	794.328	0.01	0.07	-0.11	0.10	-0.10	0.12
1000	1000	0.01	0.07	-0.09	0.10	-0.08	0.12
1060	1059.25	0.01	0.07	-0.14	0.10	-0.12	0.12
1120	1122.02	0.01	0.07	-0.21	0.10	-0.21	0.12
1180	1188.5	0.01	0.08	-0.29	0.10	-0.28	0.13
1250	1258.93	0.01	0.08	-0.31	0.10	-0.29	0.13
1320	1333.52	0.01	0.08	-0.24	0.10	-0.22	0.13
1400	1412.54	0.01	0.08	-0.11	0.10	-0.10	0.13
1500	1496.24	0.02	0.08	0.00	0.10	0.02	0.13
1600	1584.89	0.02	0.08	0.04	0.10	0.06	0.13
1700	1678.8	0.02	0.08	-0.02	0.10	0.00	0.13
1800	1778.28	0.04	0.09	-0.13	0.10	-0.09	0.13
1900	1883.65	0.04	0.09	-0.18	0.10	-0.14	0.13
2000	1995.26	0.04	0.09	-0.10	0.10	-0.06	0.13
2120	2113.49	0.04	0.09	0.05	0.10	0.09	0.13
2240	2238.72	0.05	0.09	0.04	0.15	0.09	0.13
2360	2371.37	0.04	0.10	-0.33	0.15	-0.29	0.18
2500	2511.89	0.04	0.10	-0.18	0.15	-0.14	0.18
2650	2660.73	0.03	0.10	0.09	0.15	0.12	0.18
2800	2818.38	0.02	0.11	-0.02	0.15	0.00	0.19
3000	2985.38	0.02	0.11	-0.19	0.15	-0.17	0.19
3150	3162.28	0.02	0.12	0.10	0.15	0.12	0.19
3350	3349.65	0.01	0.12	0.13	0.15	0.14	0.19
3550	3548.13	0.01	0.13	-0.10	0.15	-0.10	0.19
3750	3758.37	0.02	0.13	0.07	0.15	0.09	0.20
4000	3981.07	0.02	0.14	0.04	0.15	0.06	0.20
4250	4216.97	0.02	0.14	-0.10	0.15	-0.08	0.21
4500	4466.84	0.01	0.14	0.13	0.15	0.14	0.21
4750	4731.51	0.01	0.14	-0.17	0.15	-0.16	0.21
5000	5011.87	-0.01	0.15	-0.12	0.15	-0.13	0.21
5300	5308.84	-0.02	0.15	-0.24	0.15	-0.25	0.21
5600	5623.41	-0.02	0.15	-0.06	0.15	-0.07	0.21
6000	5956.62	-0.02	0.16	-0.13	0.15	-0.15	0.21
6300	6309.57	0.00	0.16	0.01	0.15	0.00	0.22
6700	6683.44	0.00	0.17	0.00	0.15	0.00	0.22
7100	7079.46	0.00	0.17	0.01	0.15	0.01	0.23
7500	7498.94	-0.01	0.17	0.10	0.20	0.09	0.23
8000	7943.28	0.03	0.18	-0.19	0.20	-0.16	0.26
8500	8413.95	-0.01	0.19	-0.29	0.20	-0.29	0.27
9000	8912.51	-0.03	0.20	-0.14	0.20	-0.17	0.28
9500	9440.61	-0.06	0.22	0.01	0.20	-0.05	0.28
10000	10000	-0.06	0.23	-0.04	0.20	-0.10	0.30
10600	10592.5	-0.04	0.24	-0.02	0.20	-0.07	0.30
11200	11220.2	-0.01	0.26	-0.22	0.20	-0.23	0.33

Nominal Frequency	Exact Frequency (6 digits)	Acoustical Response (From Table A.2)	Expanded Uncertainty	Body Influence	Expanded Uncertainty	Acoustical Response	Expanded Uncertainty
Hz	Hz	dB	dB	dB	dB	dB	dB
11800	11885	0.03	0.28	-0.23	0.20	-0.20	0.34
12500	12589.3	0.02	0.29	-0.03	0.20	-0.01	0.35
13200	13335.2	0.03	0.31	0.01	0.20	0.04	0.37
14000	14125.4	0.01	0.33	-0.04	0.20	-0.03	0.39
15000	14962.4	0.00	0.35	-0.13	0.20	-0.13	0.39
16000	15848.9	-0.01	0.38	-0.04	0.20	-0.04	0.40
17000	16788	-0.01	0.40	0.11	0.20	0.11	0.43
18000	17782.8	0.00	0.43	-0.12	0.20	-0.11	0.45
19000	18836.5	0.00	0.45	-0.10	0.20	-0.10	0.47
20000	19952.6	-0.08	0.48	0.06	0.20	-0.02	0.49
21200	21134.9	-0.19	0.49	-0.19	0.20	-0.37	0.52
22400	22387.2	-0.10	0.49	-0.43	0.20	-0.53	0.53

Table A.4 Free-field 0° frequency response for Windscreen UA-1650, Microphone Type 4193, Microphone Preamplifier ZC-0032 and the analyzer's electrical response, with the Microphone Preamplifier connected to a microphone extension cable

Nominal Frequency	Exact Frequency (6 digits)	Microphone Free-field Response (From Table A.2)	Expanded Uncertainty	Influence of Windscreen	Expanded Uncertainty	Electrical Response	Acoustical Response	Expanded Uncertainty
Hz	Hz	dB	dB	dB	dB	dB	dB	dB
63	63.0957	0.00	0.05	0.00	0.15	0.00	0.00	0.16
80	79.4328	0.00	0.05	0.00	0.15	0.00	0.00	0.16
100	100	0.00	0.05	0.00	0.15	0.00	0.00	0.16
125	125.893	0.00	0.05	0.00	0.15	0.00	0.00	0.16
160	158.489	0.00	0.05	0.00	0.15	0.00	0.00	0.16
200	199.526	0.00	0.05	0.00	0.15	-0.01	-0.01	0.16
250	251.189	0.00	0.05	0.02	0.15	-0.02	0.00	0.16
315	316.228	0.00	0.06	0.03	0.15	-0.03	0.00	0.16
400	398.107	0.00	0.06	0.05	0.15	-0.05	0.00	0.16
500	501.187	0.01	0.07	0.08	0.15	-0.08	0.01	0.17
630	630.957	0.03	0.07	0.11	0.15	-0.12	0.02	0.17
800	794.328	0.05	0.07	0.14	0.15	-0.20	-0.01	0.17
1000	1000	0.08	0.07	0.19	0.15	-0.30	-0.03	0.17
1060	1059.25	0.09	0.07	0.22	0.15	-0.34	-0.03	0.17
1120	1122.02	0.10	0.07	0.25	0.15	-0.37	-0.02	0.17
1180	1188.5	0.11	0.08	0.29	0.15	-0.42	-0.02	0.17
1250	1258.93	0.12	0.08	0.32	0.15	-0.46	-0.02	0.17
1320	1333.52	0.13	0.08	0.37	0.15	-0.51	-0.01	0.17
1400	1412.54	0.15	0.08	0.41	0.15	-0.56	0.00	0.17
1500	1496.24	0.17	0.08	0.46	0.15	-0.61	0.02	0.17
1600	1584.89	0.19	0.08	0.51	0.15	-0.67	0.03	0.17
1700	1678.8	0.21	0.08	0.55	0.15	-0.73	0.03	0.17
1800	1778.28	0.25	0.09	0.59	0.15	-0.79	0.05	0.17
1900	1883.65	0.28	0.09	0.64	0.15	-0.85	0.07	0.17
2000	1995.26	0.31	0.09	0.67	0.20	-0.92	0.06	0.22
2120	2113.49	0.34	0.09	0.70	0.20	-0.98	0.06	0.22
2240	2238.72	0.39	0.09	0.71	0.20	-1.03	0.07	0.22
2360	2371.37	0.42	0.10	0.72	0.20	-1.09	0.05	0.22
2500	2511.89	0.46	0.10	0.72	0.20	-1.13	0.05	0.22
2650	2660.73	0.50	0.10	0.70	0.20	-1.17	0.03	0.22
2800	2818.38	0.55	0.11	0.68	0.20	-1.21	0.02	0.11
3000	2985.38	0.61	0.11	0.63	0.20	-1.23	0.01	0.23
3150	3162.28	0.68	0.12	0.55	0.20	-1.25	-0.02	0.23
3350	3349.65	0.75	0.12	0.44	0.20	-1.26	-0.07	0.23
3550	3548.13	0.84	0.13	0.30	0.20	-1.27	-0.13	0.24
3750	3758.37	0.94	0.13	0.16	0.20	-1.28	-0.18	0.24
4000	3981.07	1.05	0.14	0.04	0.20	-1.30	-0.21	0.24
4250	4216.97	1.17	0.14	-0.05	0.20	-1.33	-0.21	0.24
4500	4466.84	1.29	0.14	-0.13	0.20	-1.37	-0.21	0.24

Nominal Frequency	Exact Frequency (6 digits)	Microphone Free-field Response (From Table A.2)	Expanded Uncertainty	Influence of Windscreen	Expanded Uncertainty	Electrical Response	Acoustical Response	Expanded Uncertainty
Hz	Hz	dB	dB	dB	dB	dB	dB	dB
4750	4731.51	1.43	0.14	-0.18	0.20	-1.43	-0.18	0.24
5000	5011.87	1.57	0.15	-0.19	0.20	-1.51	-0.13	0.25
5300	5308.84	1.73	0.15	-0.17	0.25	-1.62	-0.06	0.29
5600	5623.41	1.92	0.15	-0.16	0.25	-1.75	0.01	0.29
6000	5956.62	2.14	0.16	-0.13	0.25	-1.90	0.11	0.30
6300	6309.57	2.39	0.16	-0.11	0.25	-2.09	0.19	0.30
6700	6683.44	2.64	0.17	-0.16	0.25	-2.30	0.18	0.30
7100	7079.46	2.91	0.17	-0.28	0.25	-2.53	0.10	0.30
7500	7498.94	3.20	0.17	-0.36	0.25	-2.80	0.04	0.30
8000	7943.28	3.55	0.18	-0.41	0.25	-3.09	0.05	0.31
8500	8413.95	3.86	0.19	-0.47	0.25	-3.40	-0.01	0.31
9000	8912.51	4.20	0.20	-0.45	0.25	-3.74	0.01	0.32
9500	9440.61	4.56	0.22	-0.47	0.25	-4.09	0.00	0.33
10000	10000	4.97	0.23	-0.52	0.25	-4.46	-0.01	0.34
10600	10592.5	5.42	0.24	-0.63	0.25	-4.83	-0.04	0.35
11200	11220.2	5.89	0.26	-0.74	0.25	-5.20	-0.05	0.36
11800	11885	6.38	0.28	-0.86	0.25	-5.57	-0.05	0.38
12500	12589.3	6.81	0.29	-0.88	0.25	-5.91	0.02	0.38
13200	13335.2	7.25	0.31	-1.00	0.25	-6.23	0.02	0.40
14000	14125.4	7.63	0.33	-1.13	0.25	-6.51	-0.01	0.41
15000	14962.4	7.98	0.35	-1.21	0.30	-6.73	0.04	0.46
16000	15848.9	8.27	0.38	-1.33	0.30	-6.91	0.03	0.48
17000	16788	8.52	0.40	-1.50	0.30	-7.03	-0.01	0.50
18000	17782.8	8.71	0.43	-1.61	0.30	-7.11	-0.01	0.52
19000	18836.5	8.82	0.45	-1.64	0.30	-7.14	0.04	0.54
20000	19952.6	8.81	0.48	-1.73	0.30	-7.14	-0.06	0.57
21200	21134.9	8.74	0.49	-1.81	0.30	-7.14	-0.21	0.57
22400	22387.2	8.87	0.49	-1.79	0.30	-7.15	-0.07	0.57

Table A.5 Free-field 0° frequency response for Windscreen UA-1650, Microphone Type 4193, Microphone Preamplifier ZC-0032 and the analyzer with the Microphone Preamplifier mounted directly on the analyzer

Nominal Frequency	Exact Frequency (6 digits)	Acoustical Response (From Table A.4)	Expanded Uncertainty	Body Influence	Expanded Uncertainty	Acoustical Response	Expanded Uncertainty
Hz	Hz	dB	dB	dB	dB	dB	dB
63	63.0957	0.00	0.16	0.00	0.10	0.00	0.19
80	79.4328	0.00	0.16	0.00	0.10	0.00	0.19
100	100	0.00	0.16	0.00	0.10	0.00	0.19
125	125.893	0.00	0.16	0.00	0.10	0.00	0.19
160	158.489	0.00	0.16	0.01	0.10	0.01	0.19
200	199.526	-0.01	0.16	0.03	0.10	0.02	0.19
250	251.189	0.00	0.16	0.06	0.10	0.07	0.19
315	316.228	0.00	0.16	0.13	0.10	0.13	0.19
400	398.107	0.00	0.16	0.21	0.10	0.21	0.19
500	501.187	0.01	0.17	0.22	0.10	0.24	0.19
630	630.957	0.02	0.17	0.07	0.10	0.09	0.19
800	794.328	-0.01	0.17	-0.11	0.10	-0.12	0.19
1000	1000	-0.03	0.17	-0.09	0.10	-0.12	0.19
1060	1059.25	-0.03	0.17	-0.14	0.10	-0.16	0.19
1120	1122.02	-0.02	0.17	-0.21	0.10	-0.24	0.19
1180	1188.5	-0.02	0.17	-0.29	0.10	-0.31	0.20
1250	1258.93	-0.02	0.17	-0.31	0.10	-0.32	0.20
1320	1333.52	-0.01	0.17	-0.24	0.10	-0.24	0.20
1400	1412.54	0.00	0.17	-0.11	0.10	-0.11	0.20
1500	1496.24	0.02	0.17	0.00	0.10	0.02	0.20
1600	1584.89	0.03	0.17	0.04	0.10	0.07	0.20
1700	1678.8	0.03	0.17	-0.02	0.10	0.01	0.20
1800	1778.28	0.05	0.17	-0.13	0.10	-0.08	0.20

Nominal Frequency	Exact Frequency (6 digits)	Acoustical Response (From Table A.4)	Expanded Uncertainty	Body Influence	Expanded Uncertainty	Acoustical Response	Expanded Uncertainty
Hz	Hz	dB	dB	dB	dB	dB	dB
1900	1883.65	0.07	0.17	-0.18	0.10	-0.11	0.20
2000	1995.26	0.06	0.22	-0.10	0.10	-0.04	0.24
2120	2113.49	0.06	0.22	0.05	0.10	0.11	0.24
2240	2238.72	0.07	0.22	0.04	0.15	0.11	0.27
2360	2371.37	0.05	0.22	-0.33	0.15	-0.28	0.27
2500	2511.89	0.05	0.22	-0.18	0.15	-0.13	0.27
2650	2660.73	0.03	0.22	0.09	0.15	0.12	0.27
2800	2818.38	0.02	0.11	-0.02	0.15	0.00	0.19
3000	2985.38	0.01	0.23	-0.19	0.15	-0.18	0.27
3150	3162.28	-0.02	0.23	0.10	0.15	0.08	0.28
3350	3349.65	-0.07	0.23	0.13	0.15	0.06	0.28
3550	3548.13	-0.13	0.24	-0.10	0.15	-0.24	0.28
3750	3758.37	-0.18	0.24	0.07	0.15	-0.11	0.28
4000	3981.07	-0.21	0.24	0.04	0.15	-0.17	0.29
4250	4216.97	-0.21	0.24	-0.10	0.15	-0.31	0.29
4500	4466.84	-0.21	0.24	0.13	0.15	-0.08	0.29
4750	4731.51	-0.18	0.24	-0.17	0.15	-0.35	0.29
5000	5011.87	-0.13	0.25	-0.12	0.15	-0.25	0.29
5300	5308.84	-0.06	0.29	-0.24	0.15	-0.29	0.33
5600	5623.41	0.01	0.29	-0.06	0.15	-0.04	0.33
6000	5956.62	0.11	0.30	-0.13	0.15	-0.02	0.33
6300	6309.57	0.19	0.30	0.01	0.15	0.19	0.33
6700	6683.44	0.18	0.30	0.00	0.15	0.18	0.34
7100	7079.46	0.10	0.30	0.01	0.15	0.11	0.34
7500	7498.94	0.04	0.30	0.10	0.20	0.14	0.36
8000	7943.28	0.05	0.31	-0.19	0.20	-0.14	0.37
8500	8413.95	-0.01	0.31	-0.29	0.20	-0.29	0.37
9000	8912.51	0.01	0.32	-0.14	0.20	-0.13	0.38
9500	9440.61	0.00	0.33	0.01	0.20	0.01	0.39
10000	10000	-0.01	0.34	-0.04	0.20	-0.05	0.39
10600	10592.5	-0.04	0.35	-0.02	0.20	-0.07	0.40
11200	11220.2	-0.05	0.36	-0.22	0.20	-0.27	0.41
11800	11885	-0.05	0.38	-0.23	0.20	-0.28	0.43
12500	12589.3	0.02	0.38	-0.03	0.20	-0.01	0.43
13200	13335.2	0.02	0.40	0.01	0.20	0.03	0.45
14000	14125.4	-0.01	0.41	-0.04	0.20	-0.05	0.46
15000	14962.4	0.04	0.46	-0.13	0.20	-0.09	0.50
16000	15848.9	0.03	0.48	-0.04	0.20	0.00	0.52
17000	16788	-0.01	0.50	0.11	0.20	0.11	0.54
18000	17782.8	-0.01	0.52	-0.12	0.20	-0.12	0.56
19000	18836.5	0.04	0.54	-0.10	0.20	-0.06	0.58
20000	19952.6	-0.06	0.57	0.06	0.20	0.00	0.60
21200	21134.9	-0.21	0.57	-0.19	0.20	-0.39	0.61
22400	22387.2	-0.07	0.57	-0.43	0.20	-0.50	0.61

Table A.6 Microphone Type 4193 is not specified together with Outdoor Microphone Kit UA-1404

A.3 Diffuse-field Frequency Responses

Diffuse-field frequency responses with Z frequency weighting. Measured with sounds at random incidence and the instrument's *Sound Field Correction* parameter set to *Diffuse-field*, see section 4.6.6.

Table A.7 Diffuse-field frequency response for Microphone Type 4193, Microphone Preamplifier ZC-0032 and the analyzer with or without the Microphone Preamplifier connected to a microphone extension cable

Nominal Frequency Hz	Exact Frequency (6 digits) Hz	Microphone Actuator Response dB	Microphone Diffuse-field Correction dB	Microphone Diffuse-field Response dB	Electrical Response dB	Acoustical Response dB	Expanded Uncertainty dB
63	63.0957	0.00	0.00	0.00	0.00	0.00	0.05
80	79.4328	0.00	0.00	0.00	0.00	0.00	0.05
100	100	0.00	0.00	0.00	0.00	0.00	0.05
125	125.893	0.00	0.00	0.00	0.00	0.00	0.05
160	158.489	0.00	0.00	0.00	0.00	0.00	0.05
200	199.526	0.00	0.00	0.00	0.00	0.00	0.05
250	251.189	0.00	0.01	0.00	0.00	0.00	0.05
315	316.228	0.00	0.01	0.00	0.00	0.00	0.06
400	398.107	-0.01	0.01	0.01	0.00	0.01	0.06
500	501.187	-0.01	0.02	0.01	0.00	0.01	0.10
630	630.957	-0.01	0.02	0.01	0.00	0.01	0.10
800	794.328	-0.01	0.03	0.02	0.00	0.02	0.10
1000	1000	-0.01	-0.01	-0.02	0.00	-0.02	0.10
1060	1059.25	-0.01	-0.02	-0.03	0.00	-0.03	0.10
1120	1122.02	-0.01	-0.03	-0.05	0.00	-0.05	0.10
1180	1188.5	-0.01	-0.04	-0.05	0.00	-0.05	0.10
1250	1258.93	-0.01	-0.04	-0.05	0.00	-0.05	0.10
1320	1333.52	-0.01	-0.05	-0.06	0.00	-0.06	0.10
1400	1412.54	-0.01	-0.06	-0.07	0.00	-0.07	0.10
1500	1496.24	-0.01	-0.07	-0.08	0.00	-0.08	0.10
1600	1584.89	-0.01	-0.07	-0.08	0.00	-0.08	0.10
1700	1678.8	-0.01	-0.07	-0.07	0.00	-0.07	0.10
1800	1778.28	0.00	-0.05	-0.05	0.00	-0.05	0.10
1900	1883.65	0.00	-0.03	-0.03	0.00	-0.03	0.10
2000	1995.26	0.00	0.00	0.00	0.00	0.00	0.10
2120	2113.49	0.00	0.03	0.02	0.00	0.02	0.10
2240	2238.72	0.00	0.05	0.05	-0.01	0.04	0.11
2360	2371.37	0.00	0.05	0.06	-0.01	0.05	0.11
2500	2511.89	0.01	0.05	0.05	-0.01	0.04	0.12
2650	2660.73	0.01	0.03	0.04	-0.02	0.02	0.12
2800	2818.38	0.01	0.01	0.02	-0.02	0.00	0.13
3000	2985.38	0.02	-0.01	0.01	-0.03	-0.02	0.13
3150	3162.28	0.02	-0.02	0.00	-0.04	-0.04	0.13
3350	3349.65	0.03	-0.01	0.01	-0.05	-0.04	0.14
3550	3548.13	0.03	0.01	0.04	-0.06	-0.02	0.14
3750	3758.37	0.04	0.03	0.07	-0.07	0.00	0.15
4000	3981.07	0.05	0.04	0.09	-0.09	0.00	0.15
4250	4216.97	0.06	0.05	0.10	-0.11	-0.01	0.15
4500	4466.84	0.07	0.05	0.12	-0.14	-0.02	0.16
4750	4731.51	0.08	0.09	0.17	-0.18	-0.01	0.16
5000	5011.87	0.09	0.09	0.18	-0.22	-0.04	0.16
5300	5308.84	0.11	0.13	0.23	-0.26	-0.03	0.17
5600	5623.41	0.12	0.21	0.34	-0.32	0.02	0.17
6000	5956.62	0.14	0.27	0.41	-0.39	0.02	0.17
6300	6309.57	0.16	0.34	0.50	-0.46	0.04	0.18
6700	6683.44	0.19	0.43	0.62	-0.55	0.07	0.18
7100	7079.46	0.21	0.52	0.73	-0.66	0.07	0.18
7500	7498.94	0.24	0.61	0.85	-0.77	0.08	0.19
8000	7943.28	0.27	0.70	0.97	-0.91	0.06	0.19
8500	8413.95	0.29	0.81	1.10	-1.05	0.05	0.22
9000	8912.51	0.30	0.90	1.20	-1.22	-0.02	0.25
9500	9440.61	0.29	1.08	1.37	-1.40	-0.03	0.28
10000	10000	0.26	1.27	1.53	-1.59	-0.06	0.31
10600	10592.5	0.23	1.55	1.78	-1.79	-0.01	0.34
11200	11220.2	0.17	1.83	2.00	-2.00	0.00	0.37

Nominal Frequency	Exact Frequency (6 digits)	Microphone Actuator Response	Microphone Diffuse-field Correction	Microphone Diffuse-field Response	Electrical Response	Acoustical Response	Expanded Uncertainty
Hz	Hz	dB	dB	dB	dB	dB	dB
11800	11885	0.11	2.12	2.22	-2.20	0.02	0.40
12500	12589.3	0.05	2.30	2.35	-2.38	-0.03	0.43
13200	13335.2	-0.01	2.54	2.53	-2.54	-0.01	0.46
14000	14125.4	-0.08	2.73	2.65	-2.65	0.00	0.49
15000	14962.4	-0.17	2.86	2.70	-2.71	-0.01	0.52
16000	15848.9	-0.28	3.01	2.73	-2.71	0.02	0.55
17000	16788	-0.42	3.12	2.70	-2.64	0.06	0.57
18000	17782.8	-0.60	3.18	2.58	-2.52	0.06	0.59
19000	18836.5	-0.85	3.21	2.36	-2.36	0.00	0.61
20000	19952.6	-1.16	3.18	2.03	-2.19	-0.16	0.63
21200	21134.9	-1.53	3.14	1.61	-2.03	-0.42	0.65
22400	22387.2	-1.72	3.11	1.39	-1.94	-0.55	0.67

Table A.8 Diffuse-field frequency response for Windscreen UA-1650, Microphone Type 4193, Microphone Preamplifier ZC-0032 and the analyzer with or without the Microphone Preamplifier connected to a microphone extension cable

Nominal Frequency	Exact Frequency (6 digits)	Microphone Diffuse-field Response (From Table A.7)	Expanded Uncertainty	Influence of Windscreen	Expanded Uncertainty	Electrical Response	Acoustical Response	Expanded Uncertainty
Hz	Hz	dB	dB	dB	dB	dB	dB	dB
63	63.0957	0.00	0.05	0.00	0.05	0.00	0.00	0.07
80	79.4328	0.00	0.05	0.00	0.05	0.00	0.00	0.07
100	100	0.00	0.05	0.00	0.05	0.00	0.00	0.07
125	125.893	0.00	0.05	0.00	0.05	0.00	0.00	0.07
160	158.489	0.00	0.05	0.00	0.05	0.00	0.00	0.07
200	199.526	0.00	0.05	0.00	0.05	-0.01	-0.01	0.07
250	251.189	0.00	0.05	0.01	0.05	-0.01	0.00	0.07
315	316.228	0.00	0.06	0.02	0.05	-0.02	0.00	0.08
400	398.107	0.01	0.06	0.04	0.05	-0.03	0.02	0.08
500	501.187	0.01	0.10	0.06	0.05	-0.05	0.02	0.11
630	630.957	0.01	0.10	0.09	0.05	-0.09	0.01	0.11
800	794.328	0.02	0.10	0.11	0.05	-0.14	-0.01	0.11
1000	1000	-0.02	0.10	0.15	0.05	-0.21	-0.08	0.11
1060	1059.25	-0.03	0.10	0.18	0.08	-0.23	-0.08	0.13
1120	1122.02	-0.05	0.10	0.20	0.08	-0.26	-0.11	0.13
1180	1188.5	-0.05	0.10	0.24	0.08	-0.28	-0.09	0.13
1250	1258.93	-0.05	0.10	0.28	0.08	-0.31	-0.08	0.13
1320	1333.52	-0.06	0.10	0.32	0.10	-0.34	-0.08	0.14
1400	1412.54	-0.07	0.10	0.36	0.10	-0.37	-0.08	0.14
1500	1496.24	-0.08	0.10	0.40	0.10	-0.41	-0.09	0.14
1600	1584.89	-0.08	0.10	0.44	0.12	-0.44	-0.08	0.16
1700	1678.8	-0.07	0.10	0.48	0.15	-0.47	-0.06	0.18
1800	1778.28	-0.05	0.10	0.52	0.15	-0.51	-0.04	0.18
1900	1883.65	-0.03	0.10	0.55	0.15	-0.54	-0.02	0.18
2000	1995.26	0.00	0.10	0.58	0.15	-0.57	0.01	0.18
2120	2113.49	0.02	0.10	0.62	0.15	-0.59	0.05	0.18
2240	2238.72	0.05	0.11	0.64	0.15	-0.60	0.09	0.19
2360	2371.37	0.06	0.11	0.66	0.15	-0.61	0.11	0.19
2500	2511.89	0.05	0.12	0.68	0.15	-0.61	0.12	0.19
2650	2660.73	0.04	0.12	0.68	0.15	-0.60	0.12	0.19
2800	2818.38	0.02	0.13	0.66	0.15	-0.57	0.11	0.20
3000	2985.38	0.01	0.13	0.61	0.15	-0.54	0.08	0.20
3150	3162.28	0.00	0.13	0.54	0.15	-0.49	0.05	0.20
3350	3349.65	0.01	0.14	0.45	0.15	-0.43	0.03	0.20
3550	3548.13	0.04	0.14	0.32	0.15	-0.36	0.00	0.21
3750	3758.37	0.07	0.15	0.18	0.15	-0.29	-0.04	0.21
4000	3981.07	0.09	0.15	0.02	0.15	-0.22	-0.11	0.21
4250	4216.97	0.10	0.15	-0.13	0.15	-0.16	-0.19	0.21
4500	4466.84	0.12	0.16	-0.27	0.15	-0.09	-0.24	0.22

Nominal Frequency	Exact Frequency (6 digits)	Microphone Diffuse-field Response (From Table A.7)	Expanded Uncertainty	Influence of Windscreen	Expanded Uncertainty	Electrical Response	Acoustical Response	Expanded Uncertainty
Hz	Hz	dB	dB	dB	dB	dB	dB	dB
4750	4731.51	0.17	0.16	-0.39	0.25	-0.04	-0.26	0.30
5000	5011.87	0.18	0.16	-0.46	0.35	0.00	-0.28	0.39
5300	5308.84	0.23	0.17	-0.49	0.45	0.02	-0.24	0.48
5600	5623.41	0.34	0.17	-0.48	0.50	0.04	-0.10	0.53
6000	5956.62	0.41	0.17	-0.43	0.50	0.03	0.01	0.53
6300	6309.57	0.50	0.18	-0.38	0.50	0.00	0.12	0.53
6700	6683.44	0.62	0.18	-0.34	0.50	-0.04	0.24	0.53
7100	7079.46	0.73	0.18	-0.36	0.50	-0.10	0.27	0.53
7500	7498.94	0.85	0.19	-0.45	0.50	-0.18	0.22	0.53
8000	7943.28	0.97	0.19	-0.58	0.50	-0.27	0.12	0.53
8500	8413.95	1.10	0.22	-0.71	0.50	-0.38	0.01	0.55
9000	8912.51	1.20	0.25	-0.79	0.50	-0.51	-0.10	0.56
9500	9440.61	1.37	0.28	-0.82	0.50	-0.64	-0.09	0.57
10000	10000	1.53	0.31	-0.82	0.50	-0.78	-0.07	0.59
10600	10592.5	1.78	0.34	-0.87	0.80	-0.91	0.00	0.87
11200	11220.2	2.00	0.37	-0.96	0.80	-1.04	0.00	0.88
11800	11885	2.22	0.40	-1.07	0.80	-1.14	0.01	0.89
12500	12589.3	2.35	0.43	-1.19	0.80	-1.22	-0.06	0.91
13200	13335.2	2.53	0.46	-1.31	0.80	-1.25	-0.03	0.92
14000	14125.4	2.65	0.49	-1.43	0.80	-1.23	-0.01	0.94
15000	14962.4	2.70	0.52	-1.53	0.80	-1.16	0.01	0.95
16000	15848.9	2.73	0.55	-1.63	0.80	-1.03	0.07	0.97
17000	16788	2.70	0.57	-1.77	0.80	-0.85	0.08	0.98
18000	17782.8	2.58	0.59	-1.92	0.80	-0.63	0.03	0.99
19000	18836.5	2.36	0.61	-1.98	0.80	-0.40	-0.02	1.01
20000	19952.6	2.03	0.63	-2.07	0.80	-0.17	-0.21	1.02
21200	21134.9	1.61	0.65	-2.18	0.80	0.01	-0.56	1.03
22400	22387.2	1.39	0.67	-2.19	0.80	0.12	-0.68	1.04

Table A.9 Microphone Type 4193 is not specified together with Outdoor Microphone Kit UA-1404

A.4 Free-field Frequency Responses for Diffuse-field Calibrated Instruments

Free-field frequency response in the reference direction for diffuse-field calibrated instruments according to IEC 60651 and IEC 60804. Measured with plane progressive sinusoidal sound waves incident from the reference direction and the instrument's *Sound Field Correction* parameter set to *Diffuse-field*.

Table A.10 Free-field 0° frequency response with the *Sound Field Correction* parameter set to *Diffuse-field* for the configurations for which there are specified normal Free-field responses

Nominal Frequency	Exact Frequency (6 digits)	Configuration as in Table A.2	Configuration as in Table A.3	Configuration as in Table A.4	Configuration as in Table A.5
Hz	Hz	dB	dB	dB	dB
63	63.0957	0.00	0.00	0.00	0.00
80	79.4328	0.00	0.00	0.00	0.00
100	100	0.00	0.00	0.00	0.00
125	125.893	0.00	0.00	0.00	0.00
160	158.489	0.00	0.01	0.00	0.01
200	199.526	0.00	0.03	-0.01	0.02
250	251.189	0.00	0.07	0.01	0.08
315	316.228	0.00	0.13	0.01	0.14
400	398.107	0.00	0.21	0.02	0.23
500	501.187	0.01	0.24	0.04	0.27
630	630.957	0.03	0.10	0.05	0.12

Nominal Frequency Hz	Exact Frequency (6 digits) Hz	Configuration as in Table A.2 dB	Configuration as in Table A.3 dB	Configuration as in Table A.4 dB	Configuration as in Table A.5 dB
800	794.328	0.05	-0.06	0.05	-0.06
1000	1000	0.08	-0.01	0.06	-0.03
1060	1059.25	0.09	-0.04	0.08	-0.05
1120	1122.02	0.10	-0.12	0.09	-0.13
1180	1188.5	0.11	-0.18	0.12	-0.17
1250	1258.93	0.12	-0.18	0.13	-0.17
1320	1333.52	0.13	-0.10	0.16	-0.07
1400	1412.54	0.15	0.04	0.19	0.08
1500	1496.24	0.17	0.17	0.22	0.22
1600	1584.89	0.19	0.23	0.26	0.30
1700	1678.8	0.21	0.19	0.29	0.27
1800	1778.28	0.25	0.12	0.33	0.20
1900	1883.65	0.28	0.10	0.38	0.20
2000	1995.26	0.31	0.21	0.41	0.31
2120	2113.49	0.34	0.39	0.45	0.50
2240	2238.72	0.38	0.42	0.50	0.54
2360	2371.37	0.41	0.08	0.53	0.20
2500	2511.89	0.45	0.27	0.57	0.39
2650	2660.73	0.48	0.57	0.60	0.69
2800	2818.38	0.53	0.51	0.66	0.64
3000	2985.38	0.58	0.39	0.70	0.51
3150	3162.28	0.64	0.74	0.74	0.84
3350	3349.65	0.70	0.83	0.76	0.89
3550	3548.13	0.78	0.67	0.78	0.67
3750	3758.37	0.87	0.94	0.81	0.88
4000	3981.07	0.96	1.00	0.87	0.91
4250	4216.97	1.06	0.96	0.96	0.86
4500	4466.84	1.15	1.28	1.07	1.20
4750	4731.51	1.25	1.08	1.21	1.04
5000	5011.87	1.35	1.23	1.38	1.26
5300	5308.84	1.47	1.24	1.58	1.35
5600	5623.41	1.60	1.55	1.80	1.75
6000	5956.62	1.75	1.62	2.04	1.91
6300	6309.57	1.93	1.93	2.28	2.28
6700	6683.44	2.09	2.09	2.44	2.44
7100	7079.46	2.25	2.26	2.53	2.54
7500	7498.94	2.43	2.53	2.66	2.76
8000	7943.28	2.64	2.45	2.87	2.68
8500	8413.95	2.81	2.53	3.01	2.73
9000	8912.51	2.98	2.84	3.24	3.10
9500	9440.61	3.16	3.17	3.45	3.46
10000	10000	3.38	3.34	3.67	3.63
10600	10592.5	3.63	3.60	3.88	3.85
11200	11220.2	3.89	3.67	4.11	3.89
11800	11885	4.18	3.95	4.38	4.15
12500	12589.3	4.43	4.40	4.71	4.68
13200	13335.2	4.71	4.72	5.00	5.01
14000	14125.4	4.98	4.94	5.27	5.23
15000	14962.4	5.27	5.14	5.61	5.48
16000	15848.9	5.56	5.53	5.91	5.88
17000	16788	5.88	6.00	6.17	6.29
18000	17782.8	6.19	6.08	6.47	6.36
19000	18836.5	6.46	6.36	6.78	6.68
20000	19952.6	6.62	6.68	6.91	6.97
21200	21134.9	6.71	6.53	6.94	6.76
22400	22387.2	6.93	6.50	7.20	6.77

A.5 Directional Responses

Directional responses for plane progressive sinusoidal sound waves normalised to the response in the reference direction, including sensitivity variations.

Table A.11 Directional response for Microphone Type 4193 and Microphone Preamplifier ZC-0032 with the Microphone Preamplifier connected to a microphone extension cable, 500 Hz – 3550 Hz, in dB

Angle	Frequency											
	500 Hz	630 Hz	800 Hz	1000 Hz	1250 Hz	1600 Hz	2000 Hz	2240 Hz	2500 Hz	2800 Hz	3150 Hz	3550 Hz
0°	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5°	0.01	0.01	0.01	-0.04	-0.02	-0.03	-0.02	-0.03	0.00	-0.03	-0.05	-0.03
10°	0.02	0.02	0.01	-0.04	-0.03	-0.04	-0.02	-0.03	-0.02	-0.03	-0.05	-0.05
15°	0.02	0.03	0.02	-0.03	-0.03	-0.04	-0.04	-0.03	-0.04	-0.05	-0.07	-0.07
20°	0.03	0.03	0.03	-0.03	-0.03	-0.05	-0.04	-0.03	-0.05	-0.07	-0.09	-0.10
25°	0.04	0.04	0.04	-0.02	-0.03	-0.05	-0.04	-0.04	-0.06	-0.09	-0.12	-0.13
30°	0.05	0.05	0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.10	-0.13	-0.16	-0.18
35°	0.04	0.04	0.04	-0.05	-0.04	-0.09	-0.06	-0.07	-0.12	-0.17	-0.19	-0.23
40°	0.04	0.04	0.03	-0.03	-0.06	-0.09	-0.06	-0.08	-0.15	-0.21	-0.23	-0.29
45°	0.04	0.03	0.02	-0.04	-0.08	-0.10	-0.08	-0.09	-0.17	-0.27	-0.30	-0.35
50°	0.03	0.03	0.02	-0.05	-0.08	-0.14	-0.09	-0.10	-0.20	-0.32	-0.37	-0.42
55°	0.03	0.02	0.01	-0.06	-0.11	-0.16	-0.12	-0.12	-0.21	-0.35	-0.42	-0.49
60°	0.02	0.02	0.00	-0.07	-0.11	-0.19	-0.16	-0.13	-0.23	-0.40	-0.50	-0.56
65°	0.01	0.01	-0.01	-0.07	-0.13	-0.20	-0.19	-0.16	-0.25	-0.42	-0.56	-0.65
70°	0.01	0.00	-0.02	-0.09	-0.15	-0.23	-0.22	-0.20	-0.27	-0.45	-0.62	-0.71
75°	0.00	-0.01	-0.03	-0.11	-0.17	-0.26	-0.26	-0.24	-0.29	-0.46	-0.67	-0.78
80°	-0.01	-0.02	-0.04	-0.12	-0.18	-0.29	-0.30	-0.27	-0.33	-0.49	-0.69	-0.84
85°	-0.02	-0.03	-0.05	-0.13	-0.19	-0.31	-0.33	-0.32	-0.37	-0.51	-0.72	-0.89
90°	-0.02	-0.04	-0.07	-0.13	-0.20	-0.33	-0.37	-0.36	-0.42	-0.55	-0.75	-0.93
95°	-0.03	-0.04	-0.07	-0.14	-0.22	-0.35	-0.41	-0.41	-0.46	-0.60	-0.78	-0.96
100°	-0.03	-0.04	-0.07	-0.14	-0.23	-0.36	-0.43	-0.44	-0.50	-0.64	-0.82	-1.00
105°	-0.03	-0.05	-0.07	-0.14	-0.24	-0.38	-0.45	-0.47	-0.54	-0.68	-0.85	-1.03
110°	-0.03	-0.05	-0.08	-0.15	-0.24	-0.38	-0.48	-0.50	-0.58	-0.72	-0.90	-1.08
115°	-0.03	-0.05	-0.08	-0.16	-0.24	-0.39	-0.49	-0.52	-0.60	-0.76	-0.95	-1.12
120°	-0.03	-0.05	-0.08	-0.16	-0.24	-0.39	-0.49	-0.53	-0.62	-0.79	-0.98	-1.15
125°	-0.03	-0.05	-0.08	-0.15	-0.24	-0.39	-0.48	-0.53	-0.63	-0.80	-1.00	-1.19
130°	-0.03	-0.04	-0.07	-0.15	-0.24	-0.38	-0.48	-0.53	-0.62	-0.79	-1.00	-1.21
135°	-0.02	-0.04	-0.07	-0.15	-0.22	-0.37	-0.46	-0.51	-0.60	-0.78	-1.00	-1.21
140°	-0.02	-0.04	-0.06	-0.14	-0.22	-0.35	-0.44	-0.48	-0.58	-0.75	-0.97	-1.19
145°	-0.02	-0.03	-0.06	-0.14	-0.22	-0.34	-0.42	-0.45	-0.55	-0.71	-0.92	-1.13
150°	-0.01	-0.03	-0.05	-0.14	-0.21	-0.32	-0.40	-0.43	-0.50	-0.66	-0.86	-1.07
155°	-0.01	-0.02	-0.05	-0.12	-0.20	-0.30	-0.37	-0.39	-0.46	-0.61	-0.80	-0.99
160°	-0.01	-0.02	-0.04	-0.12	-0.19	-0.29	-0.35	-0.37	-0.43	-0.56	-0.73	-0.92
165°	-0.01	-0.02	-0.04	-0.12	-0.18	-0.28	-0.33	-0.34	-0.40	-0.52	-0.69	-0.85
170°	-0.01	-0.02	-0.04	-0.13	-0.17	-0.27	-0.31	-0.32	-0.38	-0.49	-0.65	-0.80
175°	0.00	-0.02	-0.04	-0.12	-0.18	-0.27	-0.31	-0.31	-0.36	-0.48	-0.64	-0.79
180°	0.00	-0.01	-0.03	-0.10	-0.18	-0.27	-0.31	-0.30	-0.36	-0.47	-0.63	-0.78
185°	0.00	-0.02	-0.04	-0.12	-0.18	-0.27	-0.31	-0.31	-0.37	-0.48	-0.64	-0.79
190°	-0.01	-0.02	-0.04	-0.13	-0.19	-0.28	-0.32	-0.32	-0.38	-0.50	-0.66	-0.82
195°	-0.01	-0.02	-0.04	-0.13	-0.20	-0.28	-0.33	-0.35	-0.40	-0.53	-0.71	-0.88
200°	-0.01	-0.02	-0.04	-0.13	-0.22	-0.30	-0.36	-0.38	-0.44	-0.58	-0.76	-0.94
205°	-0.01	-0.02	-0.05	-0.14	-0.22	-0.32	-0.38	-0.41	-0.48	-0.63	-0.82	-1.02
210°	-0.01	-0.03	-0.05	-0.15	-0.23	-0.34	-0.41	-0.44	-0.52	-0.68	-0.89	-1.08
215°	-0.02	-0.03	-0.06	-0.15	-0.24	-0.36	-0.45	-0.48	-0.57	-0.73	-0.95	-1.17
220°	-0.02	-0.04	-0.06	-0.17	-0.25	-0.38	-0.47	-0.52	-0.60	-0.77	-1.00	-1.22
225°	-0.02	-0.04	-0.07	-0.16	-0.27	-0.39	-0.49	-0.54	-0.64	-0.81	-1.03	-1.24
230°	-0.03	-0.04	-0.07	-0.17	-0.27	-0.41	-0.51	-0.56	-0.66	-0.83	-1.04	-1.24
235°	-0.03	-0.05	-0.08	-0.18	-0.28	-0.42	-0.52	-0.57	-0.66	-0.83	-1.04	-1.23
240°	-0.03	-0.05	-0.08	-0.18	-0.28	-0.42	-0.52	-0.57	-0.65	-0.81	-1.00	-1.20
245°	-0.03	-0.05	-0.08	-0.18	-0.29	-0.42	-0.52	-0.56	-0.64	-0.80	-0.97	-1.15
250°	-0.03	-0.05	-0.08	-0.19	-0.29	-0.41	-0.51	-0.54	-0.61	-0.75	-0.94	-1.12
255°	-0.03	-0.05	-0.07	-0.17	-0.27	-0.40	-0.50	-0.52	-0.58	-0.70	-0.89	-1.08
260°	-0.03	-0.04	-0.07	-0.18	-0.27	-0.39	-0.47	-0.49	-0.54	-0.67	-0.85	-1.04
265°	-0.03	-0.04	-0.07	-0.16	-0.25	-0.37	-0.45	-0.45	-0.49	-0.62	-0.82	-1.02
270°	-0.02	-0.04	-0.07	-0.14	-0.24	-0.37	-0.41	-0.41	-0.45	-0.58	-0.79	-0.99
275°	-0.02	-0.03	-0.05	-0.13	-0.22	-0.35	-0.37	-0.37	-0.40	-0.55	-0.76	-0.95
280°	-0.01	-0.02	-0.04	-0.13	-0.22	-0.33	-0.34	-0.32	-0.36	-0.53	-0.74	-0.90
285°	0.00	-0.01	-0.03	-0.11	-0.20	-0.29	-0.30	-0.27	-0.33	-0.51	-0.71	-0.84
290°	0.01	0.00	-0.02	-0.10	-0.17	-0.27	-0.26	-0.24	-0.30	-0.49	-0.67	-0.77
295°	0.01	0.01	-0.01	-0.10	-0.15	-0.24	-0.22	-0.20	-0.28	-0.47	-0.61	-0.70
300°	0.02	0.02	0.00	-0.09	-0.14	-0.22	-0.18	-0.17	-0.25	-0.44	-0.53	-0.62
305°	0.03	0.02	0.01	-0.06	-0.12	-0.18	-0.14	-0.15	-0.23	-0.39	-0.47	-0.55
310°	0.03	0.03	0.02	-0.07	-0.10	-0.15	-0.11	-0.13	-0.22	-0.34	-0.40	-0.47
315°	0.04	0.03	0.02	-0.06	-0.07	-0.13	-0.10	-0.11	-0.18	-0.28	-0.34	-0.38
320°	0.04	0.04	0.03	-0.04	-0.07	-0.10	-0.07	-0.08	-0.16	-0.23	-0.27	-0.31
325°	0.04	0.04	0.04	-0.01	-0.06	-0.07	-0.04	-0.06	-0.13	-0.19	-0.20	-0.23
330°	0.05	0.05	0.04	0.03	-0.03	-0.07	-0.02	-0.05	-0.09	-0.12	-0.18	-0.17
335°	0.04	0.04	0.04	0.02	-0.02	-0.03	-0.01	-0.02	-0.07	-0.08	-0.12	-0.11
340°	0.03	0.03	0.03	0.01	-0.01	-0.02	-0.01	-0.01	-0.03	-0.05	-0.06	-0.07
345°	0.02	0.03	0.02	0.03	0.02	-0.01	0.02	0.01	0.00	-0.01	-0.03	-0.05
350°	0.02	0.02	0.01	0.02	0.01	0.00	0.01	0.01	0.01	0.00	-0.01	0.00
355°	0.01	0.01	0.01	0.04	0.02	0.01	0.04	0.02	0.03	0.02	0.04	0.01

Table A.12 Directional response for Microphone Type 4193 and Microphone Preamplifier ZC-0032 with the Microphone Preamplifier connected to a microphone extension cable, 4000 Hz – 10600 Hz, in dB

Angle	Frequency											
	4000 Hz	4500 Hz	5000 Hz	5600 Hz	6300 Hz	7100 Hz	8000 Hz	8500 Hz	9000 Hz	9500 Hz	10000 Hz	10600 Hz
0°	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5°	-0.02	-0.02	-0.02	-0.05	-0.02	-0.02	-0.03	-0.05	-0.02	-0.05	-0.04	-0.04
10°	-0.03	-0.05	-0.03	-0.05	-0.07	-0.05	-0.06	-0.10	-0.08	-0.09	-0.08	-0.10
15°	-0.05	-0.10	-0.04	-0.09	-0.10	-0.09	-0.13	-0.18	-0.18	-0.15	-0.17	-0.20
20°	-0.08	-0.15	-0.09	-0.19	-0.16	-0.13	-0.22	-0.29	-0.34	-0.21	-0.30	-0.30
25°	-0.11	-0.21	-0.12	-0.27	-0.20	-0.23	-0.37	-0.39	-0.57	-0.30	-0.51	-0.39
30°	-0.16	-0.29	-0.20	-0.37	-0.27	-0.37	-0.56	-0.53	-0.81	-0.43	-0.74	-0.49
35°	-0.22	-0.37	-0.26	-0.48	-0.34	-0.56	-0.72	-0.69	-1.04	-0.66	-0.95	-0.66
40°	-0.28	-0.46	-0.39	-0.58	-0.43	-0.79	-0.85	-0.94	-1.20	-1.02	-1.14	-0.96
45°	-0.36	-0.54	-0.55	-0.65	-0.58	-1.01	-0.94	-1.22	-1.38	-1.40	-1.41	-1.32
50°	-0.46	-0.61	-0.70	-0.77	-0.78	-1.15	-1.08	-1.43	-1.68	-1.62	-1.88	-1.60
55°	-0.55	-0.71	-0.84	-0.91	-0.96	-1.26	-1.35	-1.55	-2.06	-1.76	-2.36	-1.93
60°	-0.65	-0.81	-0.95	-1.12	-1.12	-1.39	-1.69	-1.73	-2.36	-2.06	-2.58	-2.48
65°	-0.76	-0.94	-1.02	-1.33	-1.25	-1.63	-1.94	-2.05	-2.54	-2.44	-2.76	-2.94
70°	-0.83	-1.09	-1.12	-1.50	-1.45	-1.87	-2.09	-2.31	-2.86	-2.70	-3.11	-3.18
75°	-0.91	-1.22	-1.29	-1.57	-1.74	-2.03	-2.36	-2.41	-3.20	-3.00	-3.39	-3.59
80°	-0.97	-1.35	-1.47	-1.62	-2.03	-2.19	-2.75	-2.63	-3.31	-3.41	-3.60	-3.96
85°	-1.02	-1.41	-1.68	-1.76	-2.17	-2.46	-3.02	-3.06	-3.44	-3.59	-4.05	-4.05
90°	-1.07	-1.46	-1.80	-1.97	-2.21	-2.73	-3.13	-3.44	-3.86	-3.64	-4.38	-4.37
95°	-1.10	-1.48	-1.83	-2.20	-2.33	-2.90	-3.29	-3.60	-4.33	-3.98	-4.45	-4.80
100°	-1.15	-1.51	-1.84	-2.34	-2.53	-3.04	-3.49	-3.70	-4.57	-4.48	-4.73	-4.97
105°	-1.20	-1.55	-1.83	-2.35	-2.69	-3.20	-3.73	-3.85	-4.62	-4.76	-5.18	-5.26
110°	-1.24	-1.59	-1.86	-2.36	-2.75	-3.31	-3.96	-4.09	-4.75	-4.85	-5.38	-5.58
115°	-1.28	-1.64	-1.90	-2.34	-2.73	-3.32	-4.06	-4.29	-4.99	-5.09	-5.52	-5.67
120°	-1.32	-1.67	-1.91	-2.34	-2.71	-3.30	-4.02	-4.29	-5.07	-5.33	-5.82	-5.86
125°	-1.35	-1.72	-1.96	-2.39	-2.70	-3.31	-3.96	-4.23	-4.97	-5.29	-5.97	-6.04
130°	-1.37	-1.76	-2.00	-2.43	-2.72	-3.31	-3.92	-4.17	-4.86	-5.09	-5.82	-6.00
135°	-1.39	-1.79	-2.04	-2.48	-2.77	-3.30	-3.88	-4.13	-4.79	-4.95	-5.59	-5.88
140°	-1.37	-1.78	-2.04	-2.53	-2.83	-3.33	-3.88	-4.12	-4.78	-4.90	-5.44	-5.74
145°	-1.31	-1.73	-2.02	-2.53	-2.85	-3.40	-3.94	-4.15	-4.86	-4.94	-5.44	-5.69
150°	-1.24	-1.65	-1.91	-2.44	-2.78	-3.37	-3.97	-4.17	-4.93	-5.02	-5.57	-5.79
155°	-1.14	-1.54	-1.79	-2.30	-2.64	-3.25	-3.86	-4.07	-4.85	-4.98	-5.59	-5.83
160°	-1.05	-1.43	-1.66	-2.15	-2.45	-3.04	-3.63	-3.83	-4.59	-4.74	-5.36	-5.61
165°	-0.97	-1.33	-1.53	-1.99	-2.25	-2.82	-3.37	-3.55	-4.25	-4.39	-4.97	-5.21
170°	-0.91	-1.25	-1.43	-1.86	-2.10	-2.62	-3.13	-3.29	-3.96	-4.07	-4.60	-4.83
175°	-0.87	-1.21	-1.39	-1.78	-2.00	-2.49	-2.97	-3.12	-3.77	-3.86	-4.36	-4.57
180°	-0.86	-1.19	-1.36	-1.77	-1.98	-2.46	-2.92	-3.07	-3.72	-3.80	-4.29	-4.48
185°	-0.88	-1.20	-1.40	-1.79	-2.00	-2.49	-2.97	-3.14	-3.80	-3.89	-4.39	-4.58
190°	-0.92	-1.26	-1.47	-1.87	-2.10	-2.62	-3.12	-3.31	-4.01	-4.14	-4.64	-4.83
195°	-0.99	-1.35	-1.57	-2.01	-2.24	-2.80	-3.36	-3.59	-4.34	-4.48	-5.00	-5.20
200°	-1.08	-1.46	-1.71	-2.15	-2.42	-3.03	-3.66	-3.92	-4.70	-4.84	-5.36	-5.57
205°	-1.17	-1.57	-1.85	-2.31	-2.60	-3.25	-3.93	-4.20	-4.97	-5.04	-5.55	-5.78
210°	-1.26	-1.69	-1.97	-2.43	-2.74	-3.40	-4.08	-4.31	-5.04	-5.03	-5.55	-5.80
215°	-1.34	-1.77	-2.06	-2.50	-2.80	-3.45	-4.10	-4.25	-4.96	-4.93	-5.49	-5.73
220°	-1.40	-1.82	-2.08	-2.51	-2.81	-3.41	-4.01	-4.14	-4.89	-4.92	-5.50	-5.69
225°	-1.42	-1.82	-2.07	-2.47	-2.76	-3.34	-3.95	-4.12	-4.92	-4.96	-5.53	-5.77
230°	-1.41	-1.79	-2.02	-2.43	-2.72	-3.30	-3.96	-4.18	-4.96	-4.98	-5.59	-5.95
235°	-1.38	-1.75	-1.98	-2.39	-2.68	-3.30	-4.00	-4.23	-4.95	-5.05	-5.74	-6.09
240°	-1.34	-1.71	-1.94	-2.34	-2.68	-3.33	-4.02	-4.25	-4.98	-5.16	-5.80	-5.99
245°	-1.30	-1.67	-1.92	-2.33	-2.72	-3.38	-4.00	-4.25	-5.00	-5.06	-5.62	-5.81
250°	-1.27	-1.63	-1.90	-2.35	-2.75	-3.36	-3.95	-4.19	-4.86	-4.84	-5.48	-5.70
255°	-1.23	-1.61	-1.89	-2.38	-2.72	-3.25	-3.82	-3.99	-4.64	-4.75	-5.34	-5.42
260°	-1.20	-1.58	-1.88	-2.34	-2.57	-3.12	-3.60	-3.75	-4.55	-4.58	-4.91	-5.06
265°	-1.16	-1.55	-1.88	-2.21	-2.38	-3.01	-3.35	-3.65	-4.38	-4.08	-4.56	-4.85
270°	-1.13	-1.52	-1.83	-2.00	-2.28	-2.82	-3.21	-3.53	-4.37	-3.70	-4.52	-4.49
275°	-1.07	-1.47	-1.71	-1.80	-2.20	-2.53	-3.08	-3.14	-4.31	-3.72	-4.26	-4.11
280°	-1.02	-1.40	-1.52	-1.67	-2.08	-2.27	-2.82	-2.68	-4.35	-3.63	-4.35	-3.99
285°	-0.95	-1.30	-1.32	-1.63	-1.82	-2.09	-2.44	-2.49	-4.32	-3.18	-4.35	-3.65
290°	-0.89	-1.16	-1.16	-1.54	-1.52	-1.94	-2.17	-2.43	-4.30	-2.82	-3.15	-3.20
295°	-0.80	-1.02	-1.05	-1.37	-1.29	-1.73	-2.05	-2.20	-4.26	-2.53	-2.76	-2.94
300°	-0.71	-0.88	-0.97	-1.13	-1.16	-1.48	-1.87	-1.85	-4.38	-2.12	-2.53	-2.55
305°	-0.59	-0.75	-0.87	-0.92	-1.01	-1.32	-1.53	-1.59	-4.40	-1.77	-2.35	-2.02
310°	-0.49	-0.66	-0.72	-0.76	-0.83	-1.21	-1.21	-1.42	-4.42	-1.60	-1.96	-1.65
315°	-0.39	-0.57	-0.56	-0.66	-0.65	-1.08	-1.01	-1.22	-4.42	-1.42	-1.52	-1.37
320°	-0.32	-0.48	-0.40	-0.56	-0.49	-0.87	-0.88	-0.94	-4.42	-1.10	-1.20	-1.01
325°	-0.23	-0.39	-0.27	-0.48	-0.37	-0.65	-0.75	-0.68	-4.42	-0.74	-0.97	-0.69
330°	-0.18	-0.31	-0.17	-0.38	-0.28	-0.43	-0.57	-0.50	-4.42	-0.48	-0.73	-0.51
335°	-0.12	-0.20	-0.10	-0.27	-0.21	-0.26	-0.41	-0.36	-4.42	-0.30	-0.47	-0.41
340°	-0.07	-0.13	-0.07	-0.15	-0.13	-0.13	-0.26	-0.24	-4.42	-0.19	-0.27	-0.31
345°	-0.03	-0.06	-0.02	-0.07	-0.08	-0.05	-0.13	-0.14	-4.42	-0.09	-0.12	-0.20
350°	-0.02	-0.01	0.01	-0.01	-0.03	-0.01	-0.05	-0.06	-4.42	-0.04	-0.03	-0.09
355°	0.00	0.02	0.02	0.00	0.01	0.03	0.00	0.00	-4.42	0.03	0.01	-0.01

Table A.13 Directional response for Microphone Type 4193 and Microphone Preamplifier ZC-0032 with the Microphone Preamplifier connected to a microphone extension cable, 11200 Hz – 20000 Hz, in dB

Angle	Frequency										
	11200 Hz	11800 Hz	12500 Hz	13200 Hz	14000 Hz	15000 Hz	16000 Hz	17000 Hz	18000 Hz	19000 Hz	20000 Hz
0°	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5°	-0.04	-0.04	-0.05	-0.04	-0.04	-0.04	-0.07	-0.05	-0.04	-0.04	-0.06
10°	-0.09	-0.11	-0.14	-0.07	-0.11	-0.13	-0.18	-0.15	-0.13	-0.14	-0.21
15°	-0.19	-0.25	-0.27	-0.17	-0.29	-0.30	-0.34	-0.33	-0.27	-0.30	-0.41
20°	-0.35	-0.44	-0.41	-0.34	-0.54	-0.51	-0.52	-0.59	-0.45	-0.54	-0.65
25°	-0.59	-0.66	-0.57	-0.64	-0.83	-0.72	-0.69	-0.93	-0.72	-0.90	-1.01
30°	-0.93	-0.86	-0.78	-1.06	-1.09	-0.92	-1.00	-1.42	-1.18	-1.43	-1.54
35°	-1.26	-1.05	-1.15	-1.44	-1.35	-1.28	-1.52	-1.89	-1.73	-1.88	-2.07
40°	-1.45	-1.39	-1.60	-1.65	-1.84	-1.79	-1.98	-2.16	-2.16	-2.35	-2.61
45°	-1.59	-1.87	-1.89	-2.03	-2.46	-2.13	-2.34	-2.64	-2.82	-3.23	-3.34
50°	-1.94	-2.19	-2.20	-2.67	-2.72	-2.66	-3.06	-3.30	-3.33	-3.88	-3.86
55°	-2.42	-2.37	-2.71	-3.08	-3.12	-3.46	-3.60	-3.65	-4.02	-4.52	-4.82
60°	-2.73	-2.94	-2.90	-3.54	-3.82	-3.82	-4.16	-4.51	-4.81	-5.03	-5.30
65°	-3.10	-3.55	-3.24	-4.12	-4.07	-4.62	-4.67	-5.11	-5.45	-5.86	-6.26
70°	-3.60	-3.87	-4.09	-4.33	-4.71	-5.05	-5.08	-5.98	-6.10	-6.42	-7.15
75°	-3.84	-4.36	-4.56	-5.03	-5.18	-5.31	-6.01	-6.40	-6.62	-7.63	-7.85
80°	-4.30	-4.54	-5.14	-5.45	-5.97	-5.86	-6.40	-7.07	-7.45	-8.08	-8.66
85°	-4.91	-4.93	-5.33	-5.98	-6.32	-6.75	-7.10	-7.27	-8.30	-8.65	-9.28
90°	-4.94	-5.72	-5.56	-6.47	-6.61	-7.43	-7.50	-8.59	-8.23	-9.51	-10.17
95°	-5.15	-5.76	-6.30	-6.72	-7.31	-7.34	-8.48	-8.65	-9.71	-9.85	-10.50
100°	-5.60	-5.94	-6.44	-7.20	-7.63	-8.19	-8.37	-9.50	-9.76	-10.91	-11.52
105°	-5.83	-6.36	-6.69	-7.46	-7.86	-8.48	-9.29	-9.57	-10.39	-11.14	-11.97
110°	-6.16	-6.62	-7.02	-7.71	-8.31	-8.64	-9.29	-10.35	-10.84	-11.53	-12.34
115°	-6.39	-6.86	-7.32	-7.99	-8.45	-9.16	-9.73	-10.23	-10.99	-12.06	-12.85
120°	-6.57	-7.05	-7.47	-8.33	-8.83	-9.22	-9.90	-10.84	-11.30	-12.06	-12.82
125°	-6.72	-7.28	-7.72	-8.39	-9.00	-9.70	-10.09	-10.85	-11.57	-12.61	-13.51
130°	-6.68	-7.25	-7.91	-8.64	-9.08	-9.68	-10.51	-11.14	-11.78	-12.62	-13.30
135°	-6.57	-7.06	-7.67	-8.54	-9.19	-9.72	-10.45	-11.28	-11.87	-12.82	-13.77
140°	-6.45	-6.94	-7.43	-8.21	-8.91	-9.63	-10.32	-11.06	-11.93	-12.77	-13.57
145°	-6.32	-6.87	-7.34	-8.03	-8.58	-9.27	-10.10	-10.72	-11.46	-12.56	-13.40
150°	-6.37	-6.91	-7.39	-8.05	-8.50	-9.04	-9.79	-10.54	-11.13	-12.04	-12.97
155°	-6.43	-6.95	-7.48	-8.20	-8.68	-9.14	-9.79	-10.58	-11.14	-11.83	-12.69
160°	-6.24	-6.76	-7.33	-8.12	-8.72	-9.23	-9.88	-10.63	-11.32	-12.07	-12.76
165°	-5.85	-6.35	-6.88	-7.65	-8.29	-8.86	-9.50	-10.25	-11.05	-11.95	-12.68
170°	-5.45	-5.91	-6.36	-7.08	-7.68	-8.23	-8.81	-9.51	-10.31	-11.21	-11.99
175°	-5.17	-5.60	-5.99	-6.68	-7.22	-7.74	-8.26	-8.91	-9.64	-10.51	-11.23
180°	-5.07	-5.49	-5.89	-6.55	-7.06	-7.56	-8.05	-8.68	-9.38	-10.22	-10.93
185°	-5.18	-5.61	-6.02	-6.70	-7.24	-7.73	-8.23	-8.90	-9.63	-10.49	-11.21
190°	-5.46	-5.92	-6.38	-7.13	-7.69	-8.17	-8.71	-9.49	-10.31	-11.16	-11.88
195°	-5.86	-6.38	-6.92	-7.70	-8.23	-8.75	-9.37	-10.26	-10.99	-11.84	-12.65
200°	-6.27	-6.81	-7.37	-8.09	-8.58	-9.12	-9.84	-10.62	-11.14	-11.97	-12.83
205°	-6.47	-6.98	-7.45	-8.06	-8.55	-9.14	-9.77	-10.36	-10.94	-11.87	-12.57
210°	-6.44	-6.88	-7.27	-7.93	-8.51	-9.10	-9.61	-10.34	-11.12	-11.98	-12.73
215°	-6.32	-6.80	-7.29	-8.07	-8.64	-9.16	-9.82	-10.76	-11.39	-12.33	-13.32
220°	-6.32	-6.94	-7.52	-8.28	-8.76	-9.40	-10.24	-11.00	-11.75	-12.84	-13.54
225°	-6.52	-7.17	-7.64	-8.38	-9.05	-9.78	-10.42	-11.26	-11.90	-12.70	-13.53
230°	-6.74	-7.23	-7.74	-8.62	-9.21	-9.68	-10.31	-11.08	-11.66	-12.70	-13.40
235°	-6.78	-7.20	-7.80	-8.43	-8.86	-9.52	-10.11	-10.95	-11.67	-12.42	-13.30
240°	-6.67	-7.05	-7.54	-8.20	-8.85	-9.39	-9.90	-10.69	-11.18	-12.20	-12.90
245°	-6.49	-6.85	-7.39	-8.18	-8.52	-8.96	-9.55	-10.35	-11.12	-11.94	-12.93
250°	-6.26	-6.72	-7.17	-7.66	-8.16	-8.72	-9.41	-10.25	-10.79	-11.76	-12.28
255°	-5.94	-6.38	-6.64	-7.48	-8.02	-8.43	-9.22	-9.80	-10.41	-11.04	-11.87
260°	-5.63	-5.94	-6.57	-7.27	-7.56	-8.23	-8.55	-9.42	-9.75	-10.93	-11.49
265°	-5.26	-5.87	-6.33	-6.70	-7.41	-7.46	-8.37	-8.80	-9.72	-9.97	-10.59
270°	-5.07	-5.72	-5.61	-6.61	-6.65	-7.32	-7.66	-8.65	-8.44	-9.57	-10.12
275°	-4.97	-5.00	-5.43	-5.99	-6.31	-6.86	-7.10	-7.47	-8.34	-8.64	-9.49
280°	-4.38	-4.58	-5.15	-5.43	-6.08	-5.93	-6.54	-7.10	-7.53	-8.27	-8.63
285°	-3.89	-4.34	-4.58	-5.13	-5.26	-5.43	-6.05	-6.51	-6.77	-7.63	-7.93
290°	-3.64	-3.89	-4.17	-4.41	-4.78	-5.08	-5.25	-6.08	-6.08	-6.63	-7.27
295°	-3.17	-3.62	-3.38	-4.13	-4.17	-4.72	-4.66	-5.22	-5.64	-5.95	-6.34
300°	-2.81	-3.07	-2.91	-3.67	-3.85	-3.89	-4.33	-4.65	-4.85	-5.17	-5.40
305°	-2.53	-2.41	-2.77	-3.11	-3.27	-3.52	-3.68	-3.81	-4.26	-4.65	-4.96
310°	-2.03	-2.17	-2.31	-2.72	-2.74	-2.83	-3.24	-3.35	-3.39	-3.97	-3.99
315°	-1.61	-1.93	-1.89	-2.14	-2.52	-2.20	-2.47	-2.86	-2.95	-3.37	-3.42
320°	-1.45	-1.47	-1.62	-1.68	-1.98	-1.84	-2.02	-2.21	-2.32	-2.51	-2.77
325°	-1.29	-1.07	-1.24	-1.43	-1.41	-1.40	-1.65	-1.92	-1.79	-1.95	-2.11
330°	-0.98	-0.84	-0.85	-1.12	-1.09	-0.97	-1.13	-1.54	-1.29	-1.54	-1.64
335°	-0.64	-0.66	-0.58	-0.72	-0.85	-0.71	-0.74	-1.02	-0.79	-1.01	-1.12
340°	-0.36	-0.47	-0.41	-0.38	-0.59	-0.51	-0.52	-0.62	-0.49	-0.57	-0.69
345°	-0.17	-0.27	-0.25	-0.17	-0.32	-0.31	-0.33	-0.35	-0.28	-0.32	-0.41
350°	-0.06	-0.12	-0.12	-0.06	-0.13	-0.14	-0.16	-0.16	-0.15	-0.14	-0.19
355°	0.01	-0.02	-0.03	0.01	-0.02	-0.01	-0.02	-0.03	-0.04	-0.03	-0.03

Table A.14 Sensitivity variations for Microphone Type 4193 and Microphone Preamplifier ZC-0032 with the Microphone Preamplifier connected to a microphone extension cable, at sound incidence angles within $\pm\theta^\circ$ from the reference direction

Nominal Frequency	Exact Frequency	Max Variation $\pm 30^\circ$ dB	Max Variation $\pm 90^\circ$ dB	Max Variation $\pm 150^\circ$ dB
500 Hz	501.187 Hz	0.05	0.07	0.08
630 Hz	630.957 Hz	0.05	0.09	0.10
800 Hz	794.328 Hz	0.04	0.11	0.12
1000 Hz	1000 Hz	0.09	0.19	0.23
1250 Hz	1258.93 Hz	0.07	0.27	0.31
1600 Hz	1584.89 Hz	0.08	0.38	0.43
2000 Hz	1995.26 Hz	0.08	0.45	0.56
2240 Hz	2238.72 Hz	0.07	0.42	0.59
2500 Hz	2511.89 Hz	0.13	0.48	0.69
2800 Hz	2818.38 Hz	0.14	0.60	0.85
3150 Hz	3162.28 Hz	0.22	0.83	1.08
3550 Hz	3548.13 Hz	0.18	1.00	1.25
4000 Hz	3981.07 Hz	0.18	1.13	1.42
4500 Hz	4466.84 Hz	0.33	1.54	1.84
5000 Hz	5011.87 Hz	0.21	1.85	2.10
5600 Hz	5623.41 Hz	0.38	2.00	2.53
6300 Hz	6309.57 Hz	0.29	2.29	2.86
7100 Hz	7079.46 Hz	0.46	2.85	3.48
8000 Hz	7943.28 Hz	0.57	3.21	4.10
8500 Hz	8413.95 Hz	0.53	3.53	4.32
9000 Hz	8912.51 Hz	0.86	3.87	5.07
9500 Hz	9440.61 Hz	0.50	3.75	5.36
10000 Hz	10000 Hz	0.75	4.53	5.98
10600 Hz	10592.5 Hz	0.51	4.49	6.09
11200 Hz	11220.2 Hz	0.99	5.08	6.79
11800 Hz	11885.0 Hz	0.86	5.72	7.28
12500 Hz	12589.3 Hz	0.85	5.61	7.91
13200 Hz	13335.2 Hz	1.13	6.62	8.65
14000 Hz	14125.4 Hz	1.09	6.65	9.21
15000 Hz	14962.4 Hz	0.97	7.43	9.78
16000 Hz	15848.9 Hz	1.13	7.66	10.51
17000 Hz	16788.0 Hz	1.54	8.65	11.28
18000 Hz	17782.8 Hz	1.29	8.44	11.93
19000 Hz	18836.5 Hz	1.54	9.57	12.84
20000 Hz	19952.6 Hz	1.64	10.17	13.77

Table A.15 Influence of the analyzer's body on the directional response, measured in a plane parallel to the display and along the microphone's axis, 500 Hz – 3550 Hz, in dB

Angle	Frequency											
	500 Hz	630 Hz	800 Hz	1000 Hz	1250 Hz	1600 Hz	2000 Hz	2240 Hz	2500 Hz	2800 Hz	3150 Hz	3550 Hz
0°	-0.01	-0.02	-0.01	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	-0.01	-0.01
5°	-0.01	-0.03	-0.01	0.04	0.02	0.03	0.02	0.01	-0.02	0.02	0.04	0.01
10°	-0.02	-0.04	-0.02	0.05	0.02	0.04	-0.01	0.02	-0.02	0.03	0.01	0.03
15°	-0.03	-0.04	-0.02	0.05	-0.01	0.04	-0.01	0.03	-0.03	0.05	-0.02	0.04
20°	-0.04	-0.06	-0.04	0.06	-0.02	0.04	-0.05	0.04	-0.06	0.08	-0.06	0.06
25°	-0.03	-0.06	-0.05	0.08	-0.04	0.03	-0.10	0.05	-0.09	0.07	-0.11	0.08
30°	-0.04	-0.05	-0.06	0.12	-0.04	-0.01	-0.13	0.03	-0.06	0.06	-0.13	0.10
35°	-0.02	-0.03	-0.06	0.13	-0.04	-0.02	-0.15	0.00	-0.01	0.02	-0.13	0.08
40°	-0.03	-0.01	-0.05	0.12	-0.01	-0.11	-0.16	-0.08	0.06	-0.05	-0.10	0.05
45°	-0.03	0.01	-0.03	0.13	0.06	-0.21	-0.11	-0.18	0.10	-0.08	-0.05	0.02
50°	-0.04	0.02	0.00	0.12	0.11	-0.27	-0.06	-0.23	0.09	-0.06	-0.07	0.02
55°	-0.03	0.05	0.04	0.11	0.17	-0.31	-0.03	-0.21	-0.06	0.03	-0.16	0.05
60°	-0.06	0.04	0.08	0.14	0.20	-0.29	-0.05	-0.12	-0.21	0.09	-0.19	0.04
65°	-0.06	0.05	0.12	0.16	0.22	-0.21	-0.18	-0.04	-0.27	0.00	-0.14	0.01
70°	-0.09	0.03	0.16	0.20	0.23	-0.08	-0.35	-0.06	-0.15	-0.21	-0.08	-0.03
75°	-0.09	0.02	0.18	0.27	0.22	0.03	-0.43	-0.23	-0.02	-0.31	-0.17	-0.01
80°	-0.11	0.00	0.21	0.33	0.22	0.13	-0.36	-0.44	-0.06	-0.20	-0.39	-0.02
85°	-0.12	-0.02	0.20	0.39	0.25	0.14	-0.15	-0.47	-0.28	-0.09	-0.41	-0.21
90°	-0.15	-0.05	0.19	0.44	0.31	0.12	0.08	-0.27	-0.47	-0.22	-0.25	-0.38
95°	-0.17	-0.10	0.15	0.47	0.41	0.10	0.22	0.06	-0.33	-0.47	-0.26	-0.27
100°	-0.21	-0.15	0.09	0.45	0.49	0.12	0.21	0.26	0.07	-0.43	-0.50	-0.18
105°	-0.23	-0.21	0.01	0.41	0.56	0.20	0.15	0.27	0.39	0.02	-0.53	-0.35
110°	-0.25	-0.24	-0.07	0.33	0.57	0.29	0.13	0.15	0.40	0.44	-0.05	-0.31
115°	-0.26	-0.27	-0.15	0.23	0.51	0.36	0.22	0.10	0.22	0.48	0.44	0.21
120°	-0.24	-0.27	-0.22	0.11	0.40	0.34	0.37	0.22	0.13	0.23	0.44	0.68
125°	-0.27	-0.31	-0.28	-0.01	0.25	0.20	0.44	0.40	0.26	0.10	0.11	0.58
130°	-0.25	-0.29	-0.30	-0.10	0.09	-0.01	0.34	0.45	0.46	0.25	0.01	0.17
135°	-0.25	-0.29	-0.31	-0.15	-0.04	-0.25	0.07	0.27	0.46	0.42	0.24	0.15
140°	-0.26	-0.28	-0.29	-0.17	-0.09	-0.43	-0.28	-0.10	0.17	0.30	0.34	0.42
145°	-0.24	-0.26	-0.27	-0.13	-0.09	-0.50	-0.57	-0.50	-0.30	-0.16	0.01	0.33
150°	-0.21	-0.23	-0.22	-0.09	-0.03	-0.47	-0.68	-0.73	-0.71	-0.69	-0.62	-0.24
155°	-0.20	-0.19	-0.18	-0.04	0.04	-0.35	-0.63	-0.74	-0.83	-0.97	-1.12	-0.92
160°	-0.20	-0.18	-0.13	0.02	0.14	-0.19	-0.44	-0.54	-0.67	-0.86	-1.16	-1.15
165°	-0.18	-0.15	-0.09	0.09	0.22	-0.05	-0.23	-0.28	-0.37	-0.53	-0.82	-0.86
170°	-0.17	-0.14	-0.06	0.15	0.28	0.07	-0.06	-0.05	-0.09	-0.19	-0.40	-0.39
175°	-0.16	-0.12	-0.05	0.16	0.33	0.15	0.07	0.10	0.10	0.05	-0.10	-0.01
180°	-0.15	-0.12	-0.04	0.16	0.35	0.17	0.12	0.15	0.18	0.14	0.02	0.13
185°	-0.19	-0.19	-0.04	0.20	0.33	0.15	0.09	0.12	0.13	0.07	-0.07	0.02
190°	-0.16	-0.13	-0.06	0.16	0.30	0.08	-0.01	-0.02	-0.04	-0.14	-0.34	-0.31
195°	-0.16	-0.14	-0.09	0.12	0.24	-0.04	-0.18	-0.22	-0.31	-0.46	-0.72	-0.78
200°	-0.18	-0.16	-0.13	0.06	0.16	-0.17	-0.37	-0.46	-0.59	-0.78	-1.08	-1.12
205°	-0.19	-0.18	-0.17	0.00	0.06	-0.31	-0.55	-0.66	-0.76	-0.90	-1.11	-0.96
210°	-0.22	-0.22	-0.21	-0.05	-0.02	-0.42	-0.61	-0.68	-0.67	-0.67	-0.66	-0.31
215°	-0.22	-0.25	-0.25	-0.11	-0.08	-0.45	-0.51	-0.46	-0.29	-0.18	-0.04	0.32
220°	-0.24	-0.27	-0.28	-0.11	-0.09	-0.37	-0.24	-0.07	0.16	0.28	0.36	0.47
225°	-0.26	-0.30	-0.29	-0.11	-0.02	-0.19	0.09	0.30	0.48	0.45	0.31	0.23
230°	-0.26	-0.30	-0.29	-0.06	0.09	0.06	0.37	0.50	0.50	0.31	0.09	0.19
235°	-0.26	-0.30	-0.25	0.03	0.25	0.28	0.48	0.46	0.30	0.15	0.14	0.57
240°	-0.26	-0.27	-0.19	0.13	0.42	0.42	0.41	0.28	0.13	0.24	0.41	0.73
245°	-0.26	-0.26	-0.12	0.25	0.55	0.44	0.25	0.15	0.21	0.47	0.45	0.32
250°	-0.22	-0.21	-0.04	0.36	0.61	0.37	0.14	0.17	0.39	0.47	0.03	-0.26
255°	-0.23	-0.18	0.04	0.43	0.61	0.25	0.14	0.28	0.41	0.09	-0.47	-0.33
260°	-0.21	-0.13	0.11	0.48	0.56	0.15	0.21	0.30	0.14	-0.37	-0.48	-0.15
265°	-0.15	-0.06	0.17	0.47	0.47	0.11	0.23	0.13	-0.26	-0.46	-0.23	-0.18
270°	-0.16	-0.04	0.21	0.44	0.38	0.14	0.13	-0.17	-0.45	-0.20	-0.20	-0.31
275°	-0.11	0.00	0.22	0.39	0.31	0.15	-0.07	-0.41	-0.30	-0.04	-0.36	-0.18
280°	-0.09	0.02	0.22	0.34	0.27	0.14	-0.28	-0.41	-0.04	-0.14	-0.35	0.04
285°	-0.07	0.06	0.19	0.26	0.27	0.06	-0.38	-0.23	0.03	-0.27	-0.13	0.05
290°	-0.06	0.07	0.16	0.22	0.25	-0.05	-0.32	-0.05	-0.10	-0.18	0.00	-0.01
295°	-0.06	0.06	0.13	0.19	0.25	-0.17	-0.17	0.00	-0.22	0.03	-0.07	0.02
300°	-0.03	0.09	0.08	0.15	0.23	-0.25	-0.06	-0.08	-0.18	0.15	-0.16	0.09
305°	-0.03	0.07	0.05	0.12	0.19	-0.28	-0.01	-0.17	-0.01	0.08	-0.12	0.11
310°	-0.01	0.06	0.01	0.14	0.14	-0.26	-0.05	-0.20	0.14	-0.03	-0.05	0.05
315°	0.04	0.08	-0.03	0.14	0.05	-0.17	-0.10	-0.14	0.16	-0.09	0.00	0.02
320°	-0.01	0.02	-0.05	0.13	0.01	-0.10	-0.16	-0.05	0.11	-0.04	-0.04	0.07
325°	-0.01	-0.01	-0.05	0.10	-0.03	-0.03	-0.18	0.03	0.01	0.03	-0.11	0.11
330°	-0.01	0.00	-0.05	0.05	-0.07	0.01	-0.18	0.08	-0.06	0.06	-0.12	0.13
335°	-0.02	-0.03	-0.04	0.03	-0.06	0.01	-0.13	0.08	-0.08	0.08	-0.13	0.10
340°	-0.02	-0.04	-0.01	0.04	-0.05	0.02	-0.08	0.07	-0.10	0.07	-0.11	0.06
345°	-0.01	-0.02	-0.02	-0.02	-0.05	0.01	-0.07	0.03	-0.08	0.03	-0.07	0.04
350°	-0.01	0.00	-0.01	0.00	-0.03	0.00	-0.03	0.02	-0.05	0.01	-0.03	0.00
355°	-0.01	0.01	0.00	-0.05	-0.03	-0.01	-0.04	0.00	-0.04	-0.01	-0.04	-0.01

Table A.16 Influence of the analyzer's body on the directional response, measured in a plane parallel to the display and along the microphone's axis, 4000 Hz – 10600 Hz, in dB

Angle	Frequency											
	4000 Hz	4500 Hz	5000 Hz	5600 Hz	6300 Hz	7100 Hz	8000 Hz	8500 Hz	9000 Hz	9500 Hz	10000 Hz	10600 Hz
0°	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5°	0.01	0.01	-0.01	0.03	0.03	0.00	0.01	0.03	-0.02	0.00	-0.02	0.01
10°	0.02	0.01	-0.05	-0.02	0.07	0.00	-0.01	0.00	-0.09	-0.10	-0.11	0.03
15°	0.02	-0.01	-0.15	-0.11	0.05	0.02	-0.04	-0.04	-0.14	-0.24	-0.16	0.07
20°	0.01	-0.05	-0.20	-0.22	-0.05	0.07	-0.10	-0.06	-0.06	-0.32	-0.06	0.13
25°	-0.03	-0.10	-0.20	-0.32	-0.28	0.10	-0.01	-0.01	0.15	-0.33	0.18	0.14
30°	-0.07	-0.08	-0.03	-0.20	-0.38	0.03	0.21	0.06	0.20	-0.51	0.16	-0.18
35°	-0.07	0.00	0.14	0.00	-0.27	0.02	0.24	0.01	0.09	-0.52	-0.08	-0.41
40°	-0.02	0.03	0.10	-0.12	-0.28	0.22	0.02	0.13	0.19	-0.13	-0.12	-0.16
45°	0.00	-0.06	0.00	-0.40	-0.56	0.11	-0.03	0.34	0.20	-0.23	-0.30	-0.40
50°	-0.05	-0.11	0.21	-0.15	-0.29	-0.13	-0.09	0.16	0.30	-0.12	0.20	-0.44
55°	-0.11	0.02	0.35	0.01	-0.19	-0.08	-0.09	0.12	0.48	-0.26	0.12	-0.26
60°	-0.04	0.02	0.09	-0.16	-0.49	-0.41	-0.13	-0.02	0.37	-0.03	0.14	-0.21
65°	0.05	-0.12	0.08	0.24	-0.18	0.02	-0.22	-0.03	0.37	-0.27	0.29	0.03
70°	-0.02	-0.01	0.20	0.07	-0.33	-0.29	-0.30	-0.25	0.28	-0.13	0.00	0.17
75°	-0.10	0.13	-0.03	-0.06	0.09	0.09	-0.16	-0.33	0.01	-0.25	-0.03	-0.04
80°	-0.08	0.09	0.25	-0.01	-0.05	-0.19	-0.16	-0.22	-0.02	-0.49	-0.08	-0.25
85°	-0.12	0.02	0.38	-0.30	0.04	0.22	0.25	-0.19	0.15	-0.52	-0.29	-0.30
90°	-0.32	0.00	0.29	0.26	-0.24	-0.02	-0.03	0.28	0.03	-0.35	-0.14	-0.39
95°	-0.54	-0.28	0.31	0.00	0.05	0.12	-0.03	0.09	0.50	-0.33	-0.15	0.00
100°	-0.51	-0.55	-0.06	0.29	-0.03	0.15	0.08	-0.12	0.53	-0.13	0.01	-0.44
105°	-0.40	-0.56	-0.42	-0.24	0.08	0.29	0.08	0.08	0.30	-0.21	0.22	-0.42
110°	-0.44	-0.44	-0.47	-0.56	-0.35	0.22	0.54	0.44	0.56	0.10	-0.11	-0.04
115°	-0.29	-0.37	-0.35	-0.65	-0.88	-0.52	0.05	0.20	0.75	0.49	0.53	0.30
120°	0.30	-0.05	-0.05	-0.60	-0.78	-0.96	-0.82	-0.33	0.04	-0.13	0.71	0.42
125°	0.71	0.59	0.37	0.18	-0.59	-0.74	-0.92	-1.37	-0.92	-0.94	-0.58	-0.85
130°	0.42	0.81	0.96	0.54	0.49	0.11	-0.74	-0.62	-0.61	-1.26	-1.25	-1.49
135°	-0.06	0.34	0.94	1.03	0.67	1.01	0.85	0.29	0.13	-0.66	-0.27	-0.58
140°	0.06	-0.02	0.25	0.66	0.84	0.96	1.04	1.35	1.63	1.05	0.95	0.34
145°	0.28	0.22	0.15	-0.08	0.16	0.69	0.82	0.79	1.24	0.94	1.25	1.38
150°	-0.09	0.16	0.37	0.15	-0.23	-0.07	0.12	0.26	0.72	0.45	0.83	0.44
155°	-0.91	-0.60	-0.15	0.00	-0.12	0.01	-0.25	-0.38	-0.14	-0.64	-0.09	0.04
160°	-1.41	-1.36	-1.14	-1.00	-0.96	-0.58	-0.37	-0.42	-0.08	-0.57	-0.45	-0.65
165°	-1.21	-1.33	-1.42	-1.68	-1.85	-1.80	-1.70	-1.61	-1.30	-1.54	-1.09	-1.22
170°	-0.66	-0.75	-0.82	-1.16	-1.40	-1.57	-1.97	-2.11	-2.07	-2.60	-2.46	-2.75
175°	-0.21	-0.20	-0.14	-0.36	-0.48	-0.47	-0.74	-0.85	-0.71	-1.27	-1.27	-1.54
180°	-0.04	0.02	0.12	-0.01	-0.06	0.06	-0.08	-0.13	0.12	-0.35	-0.26	-0.45
185°	-0.17	-0.16	-0.08	-0.27	-0.39	-0.36	-0.56	-0.67	-0.50	-1.02	-1.02	-1.29
190°	-0.61	-0.67	-0.70	-1.02	-1.27	-1.41	-1.74	-1.91	-1.84	-2.38	-2.33	-2.67
195°	-1.15	-1.28	-1.33	-1.61	-1.83	-1.81	-1.71	-1.61	-1.26	-1.51	-1.13	-1.33
200°	-1.40	-1.39	-1.16	-1.11	-1.08	-0.70	-0.42	-0.33	0.05	-0.45	-0.43	-0.69
205°	-0.95	-0.69	-0.20	-0.08	-0.19	-0.02	-0.19	-0.28	-0.04	-0.62	-0.27	-0.08
210°	-0.14	0.13	0.40	0.15	-0.22	-0.08	0.17	0.34	0.72	0.40	0.85	0.44
215°	0.32	0.30	0.23	-0.10	0.06	0.63	0.92	0.81	1.20	0.76	1.13	1.32
220°	0.17	0.04	0.25	0.56	0.78	0.98	1.08	1.26	1.76	1.20	1.22	0.50
225°	0.00	0.29	0.95	0.99	0.69	1.04	1.06	0.56	0.44	-0.47	-0.32	-0.49
230°	0.40	0.81	1.01	0.55	0.50	0.22	-0.59	-0.62	-0.46	-1.25	-1.38	-1.55
235°	0.73	0.66	0.43	0.22	-0.48	-0.72	-0.78	-1.28	-0.98	-1.34	-0.87	-0.94
240°	0.35	0.04	0.03	-0.48	-0.86	-0.84	-0.94	-0.51	-0.10	-0.36	0.53	0.53
245°	-0.27	-0.30	-0.24	-0.71	-0.88	-0.55	0.04	0.05	0.70	0.45	0.63	0.46
250°	-0.41	-0.35	-0.45	-0.55	-0.49	0.23	0.39	0.51	0.74	0.08	0.05	0.08
255°	-0.32	-0.49	-0.40	-0.31	0.08	0.26	0.24	0.18	0.33	-0.30	0.40	-0.21
260°	-0.41	-0.55	-0.07	0.26	-0.01	0.30	0.12	-0.09	0.44	-0.02	0.18	-0.35
265°	-0.53	-0.23	0.35	0.00	0.13	0.15	-0.05	0.13	0.56	-0.18	-0.19	0.06
270°	-0.30	0.03	0.31	0.24	-0.19	0.09	0.11	0.35	0.09	-0.38	-0.01	-0.33
275°	-0.08	0.06	0.38	-0.24	0.04	0.22	0.26	-0.13	0.08	-0.45	-0.09	-0.31
280°	-0.04	0.12	0.28	-0.01	-0.02	-0.08	-0.11	-0.23	-0.04	-0.25	0.05	-0.29
285°	-0.07	0.18	0.01	0.00	0.14	0.06	-0.08	-0.30	0.12	-0.08	-0.02	0.00
290°	0.04	0.04	0.22	0.06	-0.24	-0.24	-0.27	-0.16	0.38	-0.10	-0.05	0.21
295°	0.08	-0.05	0.13	0.29	-0.17	0.09	-0.11	0.06	0.37	-0.30	0.27	-0.05
300°	-0.02	0.09	0.14	-0.13	-0.51	-0.32	0.05	0.06	0.37	0.01	0.04	-0.22
305°	-0.08	0.07	0.34	0.03	-0.23	-0.03	0.00	0.14	0.49	-0.31	0.08	-0.18
310°	-0.02	-0.06	0.22	-0.13	-0.25	-0.09	0.06	0.08	0.31	-0.14	0.20	-0.41
315°	0.02	0.00	0.02	-0.43	-0.53	0.12	0.00	0.32	0.22	-0.25	-0.25	-0.38
320°	0.00	0.07	0.10	-0.19	-0.24	0.27	0.03	0.15	0.19	-0.11	-0.07	-0.15
325°	-0.07	0.03	0.14	-0.01	-0.23	0.08	0.25	-0.02	0.11	-0.46	-0.11	-0.38
330°	-0.06	-0.05	-0.04	-0.21	-0.36	0.07	0.23	0.00	0.24	-0.50	0.12	-0.20
335°	-0.03	-0.11	-0.21	-0.36	-0.28	0.13	0.03	-0.07	0.17	-0.35	0.15	0.14
340°	0.01	-0.08	-0.21	-0.30	-0.07	0.07	-0.08	-0.14	0.00	-0.34	-0.10	0.16
345°	0.01	-0.05	-0.14	-0.15	0.04	-0.02	-0.05	-0.11	-0.10	-0.30	-0.22	0.08
350°	0.02	-0.03	-0.08	-0.06	0.03	-0.05	-0.01	-0.06	-0.08	-0.17	-0.16	0.01
355°	0.00	-0.03	-0.03	-0.01	0.00	-0.06	-0.01	-0.03	-0.03	-0.09	-0.07	-0.02

Table A.17 Influence of the analyzer's body on the directional response, measured in a plane parallel to the display and along the microphone's axis, 11200 Hz – 20000 Hz, in dB

Angle	Frequency										
	11200 Hz	11800 Hz	12500 Hz	13200 Hz	14000 Hz	15000 Hz	16000 Hz	17000 Hz	18000 Hz	19000 Hz	20000 Hz
0°	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	0.00	-0.01	0.00	0.00
5°	0.01	0.01	0.02	0.01	0.02	0.00	0.05	0.00	-0.01	0.00	0.03
10°	-0.01	0.03	0.01	-0.04	0.04	-0.02	0.09	-0.08	0.01	0.00	0.08
15°	-0.02	0.11	0.02	-0.09	0.06	0.06	-0.02	-0.10	0.02	-0.06	0.07
20°	0.00	0.16	-0.04	-0.03	0.13	0.13	-0.22	-0.08	-0.04	-0.17	-0.09
25°	0.15	0.18	-0.25	-0.07	0.33	0.01	-0.21	-0.17	-0.03	-0.08	-0.12
30°	0.34	0.26	-0.21	-0.03	0.05	0.08	-0.37	-0.05	0.02	0.02	-0.23
35°	0.37	-0.03	-0.17	0.03	0.08	0.03	-0.03	-0.20	0.00	0.16	-0.24
40°	0.43	0.35	0.09	-0.22	-0.04	0.14	0.02	-0.27	-0.19	0.06	-0.13
45°	-0.06	0.31	-0.16	-0.19	0.15	-0.06	-0.10	-0.17	-0.22	0.25	0.05
50°	0.02	0.26	0.03	0.17	-0.09	-0.17	0.06	0.02	-0.21	0.11	-0.23
55°	0.13	0.16	0.20	0.21	-0.02	0.08	-0.05	-0.22	-0.07	0.13	-0.10
60°	-0.14	0.06	-0.39	0.15	0.20	0.04	-0.06	-0.13	0.07	0.06	-0.35
65°	-0.05	0.05	-0.63	0.03	-0.05	0.41	-0.11	-0.24	-0.03	0.07	0.02
70°	0.27	0.14	-0.25	-0.39	-0.07	0.35	-0.13	0.09	-0.07	-0.27	0.06
75°	0.30	0.43	-0.08	-0.14	-0.22	-0.17	0.13	-0.05	-0.06	0.21	-0.17
80°	0.16	0.47	0.23	-0.07	0.07	-0.22	-0.40	-0.21	0.10	0.14	-0.32
85°	0.02	0.24	0.29	0.12	0.06	0.19	-0.21	-0.75	0.19	0.09	0.10
90°	-0.24	0.37	-0.23	0.41	0.05	0.53	-0.08	0.22	-0.41	0.11	0.19
95°	-0.36	0.00	0.05	-0.17	0.25	0.11	0.57	-0.21	0.22	-0.23	-0.44
100°	0.36	-0.21	-0.13	-0.04	-0.07	0.07	-0.03	0.22	0.17	0.48	-0.10
105°	0.13	0.04	0.07	-0.08	-0.17	0.05	0.10	-0.47	0.29	0.27	0.34
110°	0.17	-0.10	-0.15	0.06	0.17	0.19	-0.21	-0.15	-0.10	-0.18	-0.12
115°	0.20	0.44	-0.15	-0.30	-0.24	0.33	-0.19	-0.16	0.04	0.11	-0.39
120°	0.68	1.16	0.24	0.53	0.32	0.00	-0.61	-0.12	-0.45	0.07	-0.05
125°	0.43	0.83	0.25	1.16	1.19	1.28	0.56	0.15	-0.12	-0.31	-0.74
130°	-1.18	-1.54	-0.79	0.32	0.00	0.80	1.39	1.29	1.62	0.97	0.89
135°	-1.03	-1.36	-1.10	-1.60	-2.65	-1.48	-0.90	-0.82	0.26	0.76	1.52
140°	0.59	0.62	-0.05	-0.85	-1.01	-0.22	-1.05	-2.83	-2.76	-2.61	-3.15
145°	1.81	1.81	1.25	1.29	1.38	1.45	0.58	-0.37	0.16	0.56	-0.67
150°	0.65	1.04	1.30	1.63	1.73	1.75	1.63	1.63	2.03	1.90	1.28
155°	0.30	0.40	0.12	0.15	0.18	0.37	0.52	0.89	1.27	1.17	0.90
160°	-0.31	-0.33	-0.56	-0.46	-0.31	-0.14	-0.23	-0.29	-0.38	-0.65	-1.07
165°	-0.80	-0.48	-0.58	-0.35	-0.35	-0.36	-0.94	-1.28	-1.03	-0.97	-1.10
170°	-2.62	-2.52	-2.63	-2.25	-1.80	-1.37	-1.22	-1.19	-0.68	-0.49	-0.81
175°	-1.49	-1.83	-2.38	-2.60	-2.78	-2.91	-3.36	-3.56	-3.39	-3.23	-3.57
180°	-0.24	-0.44	-0.84	-0.93	-1.06	-1.15	-1.70	-1.97	-1.92	-2.08	-2.53
185°	-1.23	-1.53	-2.01	-2.22	-2.42	-2.60	-3.10	-3.36	-3.25	-3.30	-3.93
190°	-2.58	-2.51	-2.66	-2.38	-1.99	-1.63	-1.48	-1.36	-0.74	-0.53	-0.76
195°	-0.89	-0.47	-0.57	-0.28	-0.31	-0.33	-0.89	-1.26	-1.18	-1.33	-1.59
200°	-0.34	-0.36	-0.60	-0.60	-0.61	-0.33	-0.31	-0.24	-0.26	-0.38	-0.95
205°	0.34	0.46	0.16	0.11	0.09	0.28	0.22	0.23	0.70	1.06	0.87
210°	0.60	0.79	0.88	1.33	1.65	1.81	1.46	1.37	1.93	2.05	1.70
215°	1.81	1.85	1.34	1.41	1.51	1.60	0.74	-0.07	0.10	0.51	0.14
220°	0.59	0.75	0.39	-0.43	-1.02	-0.41	-0.67	-2.37	-2.85	-2.45	-3.86
225°	-0.88	-1.16	-1.11	-1.45	-2.55	-1.90	-1.34	-1.32	-0.03	0.39	0.59
230°	-1.12	-1.55	-1.42	-0.02	0.11	0.55	0.86	0.93	1.63	1.21	1.11
235°	0.30	0.67	0.32	1.00	1.13	1.14	0.55	0.20	0.27	-0.62	-0.70
240°	0.78	1.05	0.54	0.42	0.44	0.17	-0.65	-0.45	-0.62	0.12	0.14
245°	0.40	0.30	0.07	-0.13	-0.18	0.06	-0.34	0.04	0.17	0.02	-0.13
250°	0.29	-0.13	0.01	-0.08	0.09	0.24	-0.16	-0.18	-0.25	-0.12	-0.35
255°	0.19	0.07	0.03	-0.11	-0.03	-0.04	-0.10	-0.44	0.16	0.19	0.47
260°	0.23	-0.13	-0.07	-0.09	-0.33	0.00	0.07	0.09	0.07	0.52	-0.26
265°	-0.46	0.12	0.03	-0.21	0.21	0.08	0.38	-0.21	0.19	-0.17	-0.18
270°	-0.17	0.40	-0.28	0.46	0.03	0.36	0.06	0.17	-0.33	0.02	0.10
275°	0.05	0.24	0.27	0.10	-0.03	0.24	-0.27	-0.61	0.18	0.09	0.36
280°	0.23	0.43	0.13	-0.14	0.14	-0.29	-0.38	-0.27	0.08	0.35	-0.35
285°	0.35	0.32	-0.15	-0.06	-0.24	-0.19	0.00	-0.05	0.02	0.10	-0.06
290°	0.24	0.08	-0.20	-0.33	-0.12	0.28	-0.02	0.14	-0.18	-0.02	0.14
295°	-0.07	0.10	-0.50	0.04	-0.07	0.42	-0.13	-0.25	0.17	0.12	0.03
300°	-0.11	0.19	-0.39	0.28	0.16	0.05	0.05	-0.04	0.05	0.17	-0.32
305°	0.19	0.17	0.22	0.24	0.05	0.06	-0.06	-0.08	0.12	0.23	-0.04
310°	0.01	0.17	0.08	0.19	-0.11	-0.05	0.14	0.04	-0.21	0.15	-0.13
315°	-0.05	0.37	-0.14	-0.11	0.18	-0.05	-0.04	0.03	-0.19	0.36	0.11
320°	0.38	0.42	0.12	-0.20	0.09	0.13	-0.01	-0.27	-0.14	0.15	0.01
325°	0.41	-0.01	-0.13	-0.03	0.09	0.15	0.01	-0.21	0.04	0.17	-0.20
330°	0.38	0.21	-0.14	0.03	0.04	0.07	-0.27	0.03	0.07	0.09	-0.12
335°	0.20	0.18	-0.29	-0.02	0.32	-0.01	-0.22	-0.12	-0.02	0.00	-0.03
340°	-0.02	0.18	-0.05	0.00	0.19	0.09	-0.24	-0.07	-0.01	-0.17	-0.07
345°	-0.03	0.13	-0.02	-0.08	0.09	0.06	-0.06	-0.08	0.02	-0.07	0.05
350°	-0.04	0.03	-0.04	-0.07	0.05	-0.03	0.08	-0.08	0.02	-0.01	0.06
355°	-0.04	-0.01	-0.02	-0.04	0.00	-0.03	0.01	-0.03	0.00	-0.02	-0.01

Table A.18 Influence of the analyzer's body on the directional response, measured in a plane perpendicular to the display and along the microphone's axis, 500 Hz – 3550 Hz, in dB

Angle	Frequency											
	500 Hz	630 Hz	800 Hz	1000 Hz	1250 Hz	1600 Hz	2000 Hz	2240 Hz	2500 Hz	2800 Hz	3150 Hz	3550 Hz
0°	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01
5°	-0.02	-0.01	-0.01	0.04	0.01	0.02	0.01	0.01	-0.01	0.00	0.04	0.00
10°	-0.02	-0.02	-0.02	0.04	0.00	0.04	-0.01	0.03	-0.01	0.00	0.03	0.00
15°	-0.01	-0.03	-0.04	0.05	-0.01	0.03	-0.01	0.03	-0.03	0.03	0.01	0.00
20°	-0.03	-0.03	-0.05	0.05	-0.04	0.03	-0.05	0.05	-0.05	0.05	-0.03	0.02
25°	-0.03	-0.04	-0.05	0.06	-0.04	0.02	-0.09	0.07	-0.09	0.05	-0.11	0.07
30°	-0.03	-0.04	-0.06	0.10	-0.04	-0.01	-0.14	0.05	-0.08	0.05	-0.18	0.15
35°	-0.02	-0.02	-0.07	0.12	-0.05	-0.03	-0.17	0.03	-0.05	0.03	-0.22	0.22
40°	-0.02	-0.01	-0.05	0.09	-0.02	-0.12	-0.20	-0.03	0.01	-0.03	-0.21	0.21
45°	-0.01	0.03	-0.03	0.10	0.02	-0.22	-0.16	-0.12	0.08	-0.06	-0.14	0.09
50°	-0.02	0.03	0.00	0.08	0.06	-0.28	-0.12	-0.19	0.07	-0.04	-0.14	-0.04
55°	-0.02	0.07	0.04	0.08	0.11	-0.34	-0.10	-0.18	-0.06	0.05	-0.22	-0.05
60°	-0.04	0.05	0.09	0.10	0.12	-0.33	-0.13	-0.13	-0.22	0.13	-0.24	0.02
65°	-0.07	0.04	0.14	0.12	0.13	-0.27	-0.24	-0.07	-0.28	0.05	-0.15	-0.01
70°	-0.07	0.04	0.19	0.18	0.13	-0.16	-0.40	-0.11	-0.18	-0.15	-0.02	-0.13
75°	-0.10	0.02	0.22	0.27	0.11	-0.06	-0.50	-0.28	-0.07	-0.27	-0.08	-0.03
80°	-0.11	0.00	0.24	0.35	0.12	0.00	-0.47	-0.49	-0.13	-0.17	-0.32	0.11
85°	-0.12	-0.02	0.23	0.43	0.18	0.00	-0.32	-0.55	-0.38	-0.10	-0.36	-0.04
90°	-0.15	-0.06	0.20	0.48	0.28	-0.03	-0.13	-0.40	-0.59	-0.29	-0.20	-0.26
95°	-0.18	-0.11	0.15	0.51	0.42	-0.03	-0.03	-0.14	-0.49	-0.59	-0.30	-0.13
100°	-0.22	-0.16	0.07	0.49	0.54	0.04	-0.04	0.00	-0.15	-0.55	-0.70	-0.08
105°	-0.23	-0.21	-0.02	0.43	0.61	0.20	-0.06	-0.02	0.06	-0.13	-0.76	-0.52
110°	-0.25	-0.25	-0.11	0.33	0.61	0.36	0.03	-0.06	0.01	0.15	-0.24	-0.63
115°	-0.27	-0.28	-0.19	0.20	0.53	0.46	0.23	0.07	-0.09	0.06	0.15	-0.01
120°	-0.27	-0.30	-0.25	0.05	0.37	0.44	0.44	0.34	0.08	-0.07	0.03	0.36
125°	-0.27	-0.31	-0.31	-0.09	0.18	0.27	0.50	0.58	0.45	0.18	-0.12	0.18
130°	-0.27	-0.31	-0.33	-0.18	-0.01	0.00	0.36	0.59	0.71	0.62	0.21	0.16
135°	-0.27	-0.31	-0.33	-0.24	-0.16	-0.29	0.01	0.31	0.61	0.79	0.68	0.66
140°	-0.26	-0.30	-0.32	-0.25	-0.22	-0.52	-0.41	-0.17	0.15	0.48	0.70	1.02
145°	-0.24	-0.26	-0.28	-0.21	-0.21	-0.62	-0.74	-0.66	-0.49	-0.22	0.10	0.68
150°	-0.22	-0.24	-0.23	-0.14	-0.14	-0.60	-0.87	-0.92	-0.97	-0.93	-0.82	-0.27
155°	-0.21	-0.21	-0.18	-0.09	-0.05	-0.47	-0.80	-0.91	-1.08	-1.22	-1.45	-1.23
160°	-0.19	-0.18	-0.14	-0.01	0.06	-0.30	-0.60	-0.69	-0.86	-1.04	-1.45	-1.47
165°	-0.17	-0.16	-0.10	0.07	0.15	-0.15	-0.38	-0.40	-0.51	-0.64	-1.01	-1.04
170°	-0.16	-0.15	-0.06	0.13	0.21	-0.02	-0.20	-0.16	-0.20	-0.25	-0.52	-0.47
175°	-0.17	-0.15	-0.05	0.15	0.27	0.06	-0.07	0.00	0.00	0.01	-0.19	-0.04
180°	-0.18	-0.15	-0.05	0.15	0.29	0.09	-0.02	0.05	0.09	0.11	-0.05	0.12
185°	-0.17	-0.14	-0.05	0.16	0.28	0.06	-0.05	0.02	0.04	0.05	-0.13	0.03
190°	-0.17	-0.16	-0.07	0.14	0.25	-0.01	-0.15	-0.11	-0.14	-0.17	-0.41	-0.31
195°	-0.17	-0.16	-0.09	0.10	0.18	-0.14	-0.33	-0.32	-0.43	-0.53	-0.85	-0.85
200°	-0.19	-0.19	-0.13	0.04	0.11	-0.29	-0.53	-0.58	-0.77	-0.93	-1.32	-1.35
205°	-0.20	-0.21	-0.17	-0.04	0.00	-0.46	-0.73	-0.82	-1.02	-1.17	-1.45	-1.30
210°	-0.22	-0.24	-0.22	-0.11	-0.10	-0.60	-0.83	-0.89	-1.01	-0.97	-0.94	-0.49
215°	-0.25	-0.28	-0.26	-0.17	-0.17	-0.65	-0.73	-0.68	-0.60	-0.35	-0.06	0.51
220°	-0.26	-0.30	-0.30	-0.19	-0.18	-0.57	-0.44	-0.25	0.00	0.34	0.61	0.96
225°	-0.28	-0.32	-0.31	-0.21	-0.13	-0.36	-0.05	0.22	0.51	0.72	0.69	0.70
230°	-0.27	-0.31	-0.32	-0.16	-0.02	-0.07	0.30	0.52	0.68	0.63	0.30	0.21
235°	-0.27	-0.30	-0.29	-0.06	0.15	0.21	0.47	0.55	0.49	0.27	-0.05	0.20
240°	-0.28	-0.30	-0.24	0.06	0.32	0.39	0.43	0.37	0.17	0.03	0.05	0.47
245°	-0.26	-0.27	-0.18	0.19	0.47	0.44	0.26	0.16	0.03	0.14	0.22	0.18
250°	-0.24	-0.23	-0.10	0.33	0.55	0.36	0.09	0.07	0.10	0.22	-0.09	-0.51
255°	-0.24	-0.20	-0.02	0.42	0.55	0.23	0.03	0.12	0.13	-0.06	-0.68	-0.58
260°	-0.20	-0.14	0.07	0.49	0.51	0.10	0.06	0.12	-0.09	-0.50	-0.74	-0.10
265°	-0.18	-0.10	0.14	0.48	0.41	0.04	0.07	-0.05	-0.45	-0.63	-0.32	-0.02
270°	-0.15	-0.05	0.20	0.45	0.31	0.06	-0.05	-0.33	-0.62	-0.32	-0.15	-0.20
275°	-0.12	-0.01	0.22	0.38	0.23	0.09	-0.25	-0.53	-0.44	-0.05	-0.31	-0.08
280°	-0.09	0.03	0.22	0.31	0.20	0.09	-0.43	-0.51	-0.14	-0.10	-0.31	0.14
285°	-0.07	0.04	0.20	0.22	0.20	0.01	-0.48	-0.32	-0.04	-0.21	-0.11	0.02
290°	-0.06	0.06	0.17	0.17	0.19	-0.10	-0.40	-0.12	-0.14	-0.12	-0.01	-0.12
295°	-0.05	0.07	0.13	0.12	0.20	-0.23	-0.25	-0.05	-0.24	0.06	-0.15	0.03
300°	-0.03	0.06	0.08	0.10	0.19	-0.30	-0.13	-0.11	-0.18	0.13	-0.27	0.16
305°	-0.02	0.07	0.04	0.07	0.16	-0.32	-0.09	-0.18	-0.02	0.02	-0.19	0.14
310°	0.00	0.06	0.00	0.10	0.10	-0.28	-0.13	-0.19	0.12	-0.11	-0.04	0.04
315°	0.00	0.04	-0.04	0.12	0.02	-0.19	-0.17	-0.12	0.11	-0.14	0.02	-0.01
320°	0.00	0.03	-0.07	0.11	-0.02	-0.10	-0.22	-0.03	0.04	-0.06	-0.04	0.03
325°	0.00	0.00	-0.07	0.08	-0.05	-0.04	-0.21	0.05	-0.05	0.05	-0.11	0.05
330°	-0.01	-0.01	-0.06	0.04	-0.08	0.02	-0.19	0.09	-0.11	0.09	-0.12	0.04
335°	0.00	-0.02	-0.05	0.04	-0.07	0.01	-0.13	0.07	-0.12	0.10	-0.13	0.02
340°	0.00	-0.01	-0.03	0.03	-0.07	0.02	-0.08	0.06	-0.11	0.09	-0.12	0.01
345°	0.01	0.01	-0.02	-0.01	-0.06	0.02	-0.07	0.02	-0.09	0.05	-0.08	0.02
350°	0.01	0.00	-0.01	-0.01	-0.03	0.01	-0.03	0.01	-0.05	0.02	-0.04	0.00
355°	0.01	0.02	0.00	-0.04	-0.04	-0.01	-0.04	-0.01	-0.04	0.00	-0.05	0.00

Table A.19 Influence of the analyzer's body on the directional response, measured in a plane perpendicular to the display and along the microphone's axis, 4000 Hz – 10600 Hz, in dB

Angle	Frequency												
	4000 Hz	4500 Hz	5000 Hz	5600 Hz	6300 Hz	7100 Hz	8000 Hz	8500 Hz	9000 Hz	9500 Hz	10000 Hz	10600 Hz	
0°	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
5°	0.02	0.01	0.00	-0.01	-0.02	0.02	-0.01	0.00	0.04	0.03	0.02	0.02	0.06
10°	0.04	0.02	-0.01	-0.08	-0.05	0.07	-0.04	0.02	0.12	-0.01	0.02	0.02	0.15
15°	0.07	0.03	-0.02	-0.15	-0.13	0.11	-0.04	0.10	0.21	-0.15	0.03	0.03	0.20
20°	0.09	0.03	0.03	-0.12	-0.20	0.08	0.07	0.19	0.18	-0.42	0.05	0.09	0.09
25°	0.08	0.02	0.08	-0.04	-0.18	-0.03	0.29	0.08	-0.02	-0.53	0.16	-0.11	-0.11
30°	0.04	0.04	0.14	0.09	-0.04	-0.04	0.27	-0.09	-0.02	-0.30	0.18	-0.16	-0.16
35°	0.00	0.08	0.12	0.09	-0.07	0.18	0.03	0.15	0.21	-0.36	-0.27	-0.22	-0.22
40°	-0.03	0.13	0.07	-0.12	-0.43	0.20	0.17	0.30	-0.04	-0.53	-0.12	-0.06	-0.06
45°	0.03	0.14	0.08	-0.14	-0.45	0.01	0.10	0.07	0.21	-0.25	-0.05	-0.37	-0.37
50°	0.17	0.06	0.21	0.09	-0.17	0.20	-0.02	0.33	0.14	-0.37	-0.04	-0.19	-0.19
55°	0.20	-0.02	0.29	-0.06	-0.45	-0.15	0.17	0.02	0.23	-0.16	0.01	-0.36	-0.36
60°	0.08	0.05	0.23	-0.10	-0.37	-0.19	-0.07	0.21	0.36	-0.62	0.40	-0.09	-0.09
65°	0.00	0.18	0.18	0.22	-0.17	0.03	0.21	-0.16	0.31	-0.18	-0.22	0.24	0.24
70°	0.05	0.08	0.15	0.11	-0.47	-0.20	-0.22	0.12	-0.06	-0.29	0.12	-0.16	-0.16
75°	0.02	-0.02	0.27	0.06	0.03	0.12	0.08	-0.35	0.30	-0.78	0.09	0.13	0.13
80°	-0.11	0.12	0.21	0.05	-0.04	-0.29	0.07	-0.22	-0.16	-0.26	-0.62	0.18	0.18
85°	0.02	0.02	0.20	-0.07	0.02	0.21	0.22	0.07	-0.22	-0.52	-0.08	-0.58	-0.58
90°	0.03	-0.05	0.28	-0.05	-0.08	0.11	0.19	0.02	0.27	-0.84	-0.07	-0.26	-0.26
95°	-0.27	0.05	0.09	0.02	-0.31	0.20	0.01	0.28	0.17	-0.46	-0.14	-0.15	-0.15
100°	-0.26	-0.24	0.17	0.05	-0.17	0.07	0.29	0.02	0.46	-0.13	-0.20	0.03	0.03
105°	-0.12	-0.32	-0.08	-0.06	-0.22	0.03	-0.01	0.14	0.45	-0.11	0.10	-0.01	-0.01
110°	-0.53	-0.20	-0.33	-0.21	-0.17	0.14	0.20	-0.19	0.06	-0.25	0.32	-0.05	-0.05
115°	-0.64	-0.62	-0.18	-0.49	-0.53	-0.13	0.20	0.30	0.15	-0.47	-0.16	-0.01	-0.01
120°	0.14	-0.55	-0.58	-0.45	-0.70	-0.39	-0.16	-0.24	0.09	0.05	0.03	-0.36	-0.36
125°	0.43	0.33	-0.20	-0.77	-0.71	-0.50	-0.49	-0.54	-0.37	-0.79	-0.01	-0.14	-0.14
130°	0.11	0.39	0.62	0.08	-0.78	-0.39	-0.54	-0.79	-0.95	-1.22	-0.64	-0.55	-0.55
135°	0.28	0.12	0.42	0.59	0.36	0.00	-0.31	-0.49	-0.49	-1.28	-1.19	-1.11	-1.11
140°	0.91	0.63	0.36	0.15	0.12	0.79	0.56	0.25	0.08	-0.50	-0.31	-0.71	-0.71
145°	1.01	1.11	1.05	0.67	0.09	0.16	0.52	0.47	0.78	0.43	0.87	0.67	0.67
150°	0.21	0.63	1.03	1.18	0.98	0.87	0.49	0.18	0.12	-0.35	0.33	0.55	0.55
155°	-1.06	-0.71	-0.17	0.31	0.62	1.21	1.30	1.10	1.17	0.48	0.63	0.48	0.48
160°	-1.73	-1.81	-1.66	-1.57	-1.37	-0.53	0.20	0.31	0.78	0.53	0.90	1.00	1.00
165°	-1.38	-1.65	-1.87	-2.33	-2.80	-2.82	-2.61	-2.63	-2.32	-2.43	-1.89	-1.76	-1.76
170°	-0.68	-0.86	-1.00	-1.41	-1.85	-2.13	-2.56	-2.97	-3.23	-3.88	-3.97	-4.73	-4.73
175°	-0.16	-0.21	-0.20	-0.43	-0.66	-0.61	-0.75	-0.99	-1.00	-1.53	-1.44	-1.74	-1.74
180°	0.06	0.05	0.10	-0.03	-0.16	0.03	0.05	-0.10	0.02	-0.41	-0.24	-0.34	-0.34
185°	-0.06	-0.11	-0.08	-0.27	-0.46	-0.36	-0.44	-0.65	-0.61	-1.11	-1.04	-1.21	-1.21
190°	-0.51	-0.64	-0.75	-1.12	-1.49	-1.71	-2.14	-2.52	-2.71	-3.45	-3.52	-4.02	-4.02
195°	-1.16	-1.42	-1.64	-2.10	-2.63	-2.94	-3.01	-3.10	-2.84	-3.12	-2.48	-2.47	-2.47
200°	-1.64	-1.79	-1.75	-1.79	-1.85	-1.12	-0.27	-0.03	0.49	0.30	0.75	0.79	0.79
205°	-1.23	-0.97	-0.42	-0.03	0.16	1.02	1.31	1.23	1.30	0.64	0.74	0.56	0.56
210°	-0.06	0.39	0.90	1.02	0.83	1.04	0.63	0.26	0.12	-0.42	0.22	0.28	0.28
215°	0.86	1.05	1.08	0.61	0.16	0.04	0.51	0.58	1.08	0.75	1.07	1.06	1.06
220°	0.92	0.69	0.41	0.07	0.05	0.90	1.25	0.91	0.59	-0.48	-0.28	-0.57	-0.57
225°	0.35	0.15	0.37	0.60	0.52	0.60	-0.21	-0.74	-0.49	-1.06	-0.90	-1.05	-1.05
230°	0.12	0.44	0.76	0.31	-0.45	-0.72	-0.39	-0.59	-0.82	-1.46	-0.91	-0.65	-0.65
235°	0.49	0.56	0.05	-0.72	-0.97	-0.31	-0.55	-0.71	-0.35	-1.01	-0.53	-0.34	-0.34
240°	0.34	-0.31	-0.70	-0.51	-0.66	-0.62	-0.02	-0.18	-0.28	-0.50	-0.28	-0.31	-0.31
245°	-0.48	-0.74	-0.15	-0.55	-0.66	0.07	-0.06	-0.11	-0.04	-0.50	0.37	0.06	0.06
250°	-0.63	-0.17	-0.24	-0.35	-0.23	-0.09	0.12	0.07	0.50	-0.44	-0.18	0.14	0.14
255°	-0.11	-0.21	-0.24	-0.05	-0.37	0.07	0.28	0.09	-0.09	-0.19	0.23	0.23	0.23
260°	-0.11	-0.34	0.23	-0.11	-0.25	0.21	0.03	-0.02	0.31	-0.04	0.00	-0.30	-0.30
265°	-0.29	0.09	0.03	-0.09	-0.15	-0.01	0.15	0.17	0.37	-0.64	-0.22	0.02	0.02
270°	-0.01	-0.02	0.16	0.04	-0.34	0.26	0.25	0.10	-0.01	-0.76	0.14	-0.61	-0.61
275°	0.08	-0.11	0.34	-0.15	-0.01	0.14	0.16	0.01	-0.22	-0.52	-0.42	-0.09	-0.09
280°	-0.14	0.19	0.21	-0.19	0.01	-0.11	0.14	-0.18	-0.35	-0.34	-0.26	0.01	0.01
285°	-0.03	0.20	0.06	0.18	-0.02	-0.01	0.14	-0.50	0.27	-0.66	-0.01	-0.06	-0.06
290°	0.16	0.06	0.10	0.06	-0.35	-0.05	-0.36	0.10	-0.12	-0.33	-0.12	-0.20	-0.20
295°	0.14	0.03	0.27	0.13	-0.25	0.00	0.23	-0.20	0.25	-0.39	-0.24	0.13	0.13
300°	0.06	0.04	0.21	-0.05	-0.33	-0.25	0.01	0.15	0.10	-0.41	0.13	-0.14	-0.14
305°	0.04	0.12	0.18	-0.13	-0.37	0.00	0.16	-0.07	0.28	-0.48	-0.04	-0.45	-0.45
310°	0.06	0.16	0.17	-0.01	-0.35	0.18	0.06	0.20	-0.02	-0.42	0.04	-0.26	-0.26
315°	0.08	0.09	0.14	-0.13	-0.48	-0.08	0.04	-0.03	0.23	-0.40	-0.23	-0.39	-0.39
320°	0.13	0.02	0.07	-0.19	-0.34	0.27	0.15	0.13	-0.06	-0.38	-0.26	-0.16	-0.16
325°	0.17	0.02	0.06	-0.10	-0.18	0.23	0.01	0.10	0.12	-0.50	-0.18	-0.31	-0.31
330°	0.16	0.06	0.08	-0.04	-0.27	-0.07	0.21	-0.19	0.14	-0.50	0.06	-0.10	-0.10
335°	0.10	0.06	0.07	-0.05	-0.31	-0.07	0.29	-0.08	-0.01	-0.50	-0.06	-0.14	-0.14
340°	0.05	0.06	0.05	-0.05	-0.22	0.01	0.11	0.08	-0.03	-0.29	-0.09	0.13	0.13
345°	0.00	0.04	0.02	-0.02	-0.08	0.03	-0.04	0.10	-0.03	-0.15	-0.07	0.24	0.24
350°	0.00	0.01	-0.01	-0.01	-0.01	0.00	-0.07	0.07	-0.02	-0.07	-0.07	0.11	0.11
355°	-0.01	-0.01	-0.01	0.02	0.00	-0.03	-0.02	0.02	-0.01	-0.05	-0.05	0.00	0.00

Table A.20 Influence of the analyzer's body on the directional response, measured in a plane perpendicular to the display and along the microphone's axis, 11200 Hz – 20000 Hz, in dB

Angle	Frequency										
	11200 Hz	11800 Hz	12500 Hz	13200 Hz	14000 Hz	15000 Hz	16000 Hz	17000 Hz	18000 Hz	19000 Hz	20000 Hz
0°	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
5°	0.02	0.03	0.06	0.02	0.01	-0.03	0.05	0.00	-0.02	0.02	0.05
10°	0.02	0.07	0.09	-0.01	0.05	-0.06	0.10	-0.06	0.03	0.06	0.10
15°	0.02	0.17	0.08	-0.05	0.13	0.02	-0.04	-0.01	0.05	-0.08	0.03
20°	-0.01	0.21	0.00	-0.06	0.11	0.10	-0.25	0.06	-0.12	-0.22	-0.09
25°	0.05	0.06	-0.24	0.00	0.22	-0.17	-0.22	-0.09	-0.04	-0.18	-0.20
30°	0.38	0.07	-0.24	0.01	0.08	0.01	-0.53	0.07	0.00	-0.08	-0.18
35°	0.26	-0.02	-0.12	0.04	0.03	-0.16	-0.18	-0.14	0.12	-0.04	-0.25
40°	0.23	0.18	-0.14	-0.26	-0.01	0.08	-0.12	-0.35	-0.04	-0.03	-0.17
45°	-0.02	0.15	-0.12	-0.08	0.25	-0.09	-0.34	-0.25	-0.12	0.24	0.07
50°	0.05	0.23	0.04	0.16	-0.04	-0.31	-0.12	0.02	-0.22	0.11	-0.18
55°	-0.13	-0.21	-0.20	0.00	-0.17	0.02	-0.16	-0.26	-0.11	-0.01	-0.13
60°	-0.03	-0.18	-0.50	-0.12	0.18	-0.11	-0.21	-0.17	0.04	-0.10	-0.48
65°	-0.01	0.18	-0.68	0.03	-0.10	0.41	-0.35	-0.34	-0.02	0.02	-0.12
70°	0.22	0.09	-0.24	-0.40	0.07	0.28	-0.25	-0.10	-0.08	-0.28	0.05
75°	-0.14	0.31	-0.16	-0.08	-0.22	-0.21	-0.01	-0.14	-0.24	0.10	-0.33
80°	0.19	-0.12	0.21	-0.04	0.12	-0.50	-0.64	-0.26	0.00	-0.08	-0.27
85°	0.45	-0.01	-0.12	0.19	0.09	-0.23	-0.85	-1.14	0.24	0.02	0.12
90°	-0.11	0.23	-0.51	0.33	-0.13	0.14	-0.88	-0.13	-0.58	0.02	-0.03
95°	-0.20	0.08	-0.60	-0.23	0.15	-0.25	0.04	-0.18	0.39	-0.56	-1.14
100°	-0.12	-0.16	-0.59	-0.19	-0.46	0.05	-0.09	0.28	-0.16	-0.03	-0.68
105°	-0.01	0.11	-0.65	-0.26	-0.30	0.02	-0.29	-0.64	0.18	-0.04	-0.08
110°	0.14	0.17	-0.39	-0.03	-0.22	-0.20	-0.81	-0.39	-0.19	-0.15	-0.08
115°	0.41	0.25	-0.24	0.23	-0.08	0.09	-0.95	-0.50	-0.17	0.02	-1.10
120°	0.13	0.24	0.01	0.61	0.05	-0.08	-0.61	0.19	-0.19	-0.52	-1.53
125°	0.22	0.12	-0.24	0.24	0.02	0.58	-0.10	-0.05	0.29	-0.52	-0.59
130°	-0.38	-0.48	-0.18	0.11	-0.34	0.17	0.03	-0.03	0.82	-0.34	0.23
135°	-0.79	-0.74	-0.79	-1.15	-0.90	-0.17	-0.57	-0.66	0.31	-0.14	-0.07
140°	-0.53	-0.85	-1.55	-1.69	-0.87	-0.32	-1.36	-2.21	-0.49	-0.59	-2.09
145°	0.44	0.02	-0.59	-0.33	-0.31	-0.65	-1.99	-2.14	-0.57	-0.54	-2.19
150°	0.93	1.09	1.08	1.06	0.52	-0.20	-0.55	0.18	0.69	-0.61	-2.12
155°	0.29	0.06	-0.14	0.41	0.90	1.01	0.86	1.35	1.12	-0.30	-0.56
160°	1.28	1.14	0.98	1.06	0.65	-0.09	-0.56	0.02	0.52	-0.02	0.59
165°	-1.04	-0.54	-0.17	0.57	0.83	0.71	0.40	0.76	0.89	-0.11	-0.03
170°	-5.13	-5.35	-5.75	-5.27	-4.77	-4.43	-3.96	-3.01	-2.14	-2.33	-1.50
175°	-2.01	-2.43	-3.01	-3.31	-3.79	-4.64	-5.24	-5.55	-5.89	-7.11	-7.38
180°	-0.36	-0.56	-0.84	-0.91	-1.13	-1.61	-1.99	-1.92	-1.90	-2.78	-2.39
185°	-1.36	-1.68	-2.11	-2.34	-2.71	-3.45	-3.99	-4.14	-4.32	-5.53	-5.73
190°	-4.51	-5.01	-5.76	-5.74	-5.97	-6.03	-5.87	-4.82	-3.91	-3.97	-3.09
195°	-1.84	-1.34	-0.89	-0.07	0.19	0.18	0.04	0.62	0.83	-0.42	-0.31
200°	1.14	1.13	1.01	1.04	0.67	-0.09	-0.77	-0.45	-0.36	-0.97	-0.33
205°	0.37	-0.06	-0.64	-0.26	0.13	0.49	0.47	1.04	1.36	0.09	-0.30
210°	0.77	0.90	0.94	1.28	1.20	0.47	-0.40	0.11	1.26	0.55	-0.71
215°	0.88	0.30	-0.47	-0.08	0.21	-0.05	-1.75	-2.45	-0.96	-0.13	-1.13
220°	-0.36	-0.47	-1.14	-1.71	-1.33	-0.36	-0.92	-2.78	-1.31	0.17	-2.42
225°	-0.92	-0.66	-0.86	-1.22	-1.42	-0.36	-0.22	-1.42	-0.66	0.04	-0.95
230°	-0.32	-0.73	-0.68	0.10	-0.66	-0.56	0.29	-0.21	0.54	0.03	-0.67
235°	0.24	-0.30	-0.50	0.56	0.17	-0.19	-0.06	-0.75	0.71	-0.76	-0.70
240°	0.45	0.51	-0.25	0.18	-0.09	-0.16	-0.39	-0.75	-0.10	-0.76	-1.18
245°	-0.06	0.13	-0.32	0.42	-0.06	-0.20	-1.23	-0.58	0.31	-0.21	-0.95
250°	0.12	0.23	-0.33	-0.20	-0.47	0.37	-0.73	-1.05	-0.31	-0.06	-0.78
255°	-0.16	-0.09	-0.71	-0.06	-0.30	-0.13	-0.37	-0.92	-0.41	0.15	-0.49
260°	-0.05	-0.09	-0.56	-0.66	-0.49	0.07	-0.53	-0.18	-0.59	0.01	-0.98
265°	-0.11	-0.33	-0.27	-0.67	-0.31	-0.15	-0.16	-0.36	0.22	-0.43	-1.35
270°	0.20	0.08	-0.61	0.00	-0.27	-0.27	-0.59	-0.43	-0.58	-0.25	-0.25
275°	0.22	-0.26	-0.02	-0.23	-0.13	-0.23	-0.94	-1.29	-0.30	-0.41	-0.18
280°	0.00	0.06	-0.22	-0.20	-0.09	-0.64	-0.94	-0.58	-0.19	0.18	-0.35
285°	-0.02	0.03	-0.29	-0.28	-0.43	-0.59	-0.25	-0.30	-0.22	0.00	-0.56
290°	0.13	-0.03	-0.38	-0.62	-0.34	-0.06	-0.37	-0.17	-0.39	-0.36	-0.34
295°	-0.08	0.08	-0.84	-0.35	-0.33	0.27	-0.52	-0.57	-0.18	-0.25	-0.41
300°	-0.18	-0.29	-0.89	-0.20	0.08	-0.17	-0.40	-0.35	-0.21	-0.30	-0.81
305°	-0.13	-0.35	-0.22	0.03	-0.03	-0.12	-0.33	-0.45	-0.19	-0.08	-0.37
310°	-0.02	0.13	-0.07	0.11	-0.16	-0.34	-0.30	-0.21	-0.33	0.01	-0.35
315°	-0.20	-0.07	-0.38	-0.27	0.05	-0.44	-0.40	-0.18	-0.17	0.11	-0.20
320°	0.12	0.24	-0.06	-0.27	-0.01	-0.10	-0.31	-0.59	-0.22	-0.06	-0.25
325°	0.17	-0.21	-0.25	-0.09	-0.13	-0.21	-0.20	-0.19	-0.05	-0.06	-0.38
330°	0.42	0.11	-0.18	-0.06	-0.05	-0.17	-0.61	-0.06	-0.12	-0.21	-0.23
335°	-0.05	-0.12	-0.35	-0.16	0.12	-0.17	-0.28	-0.14	-0.10	-0.20	-0.26
340°	0.00	0.13	0.01	-0.02	0.02	-0.06	-0.39	-0.06	-0.13	-0.28	-0.18
345°	0.11	0.17	0.01	-0.07	0.04	-0.05	-0.19	-0.09	-0.12	-0.21	-0.10
350°	0.04	0.04	-0.09	-0.09	0.06	-0.06	0.07	-0.15	0.05	-0.06	0.05
355°	-0.02	-0.02	-0.07	-0.06	0.02	-0.03	0.04	-0.06	0.04	-0.01	0.01

Table A.21 Directional response for Microphone Type 4193, Microphone Preamplifier ZC-0032 and the analyzer with the Microphone Preamplifier mounted directly on the analyzer, measured in a plane parallel to the display and along the microphone's axis, 500 Hz – 3550 Hz, in dB

Angle	Frequency											
	500 Hz	630 Hz	800 Hz	1000 Hz	1250 Hz	1600 Hz	2000 Hz	2240 Hz	2500 Hz	2800 Hz	3150 Hz	3550 Hz
0°	-0.01	-0.02	-0.01	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	-0.01	-0.01
5°	0.00	-0.02	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.02	-0.01	-0.01	-0.01
10°	0.00	-0.02	0.00	0.01	-0.01	0.00	-0.02	-0.01	-0.03	0.00	-0.04	-0.02
15°	0.00	-0.02	0.00	0.02	-0.03	0.00	-0.05	0.01	-0.07	0.00	-0.09	-0.03
20°	-0.01	-0.02	-0.01	0.03	-0.05	-0.01	-0.09	0.01	-0.11	0.00	-0.15	-0.04
25°	0.01	-0.01	-0.02	0.06	-0.07	-0.03	-0.14	0.01	-0.15	-0.02	-0.23	-0.05
30°	0.01	0.00	-0.02	0.08	-0.09	-0.06	-0.18	-0.01	-0.16	-0.06	-0.29	-0.08
35°	0.02	0.01	-0.02	0.08	-0.09	-0.12	-0.21	-0.07	-0.13	-0.15	-0.32	-0.15
40°	0.01	0.03	-0.02	0.09	-0.06	-0.20	-0.22	-0.16	-0.08	-0.26	-0.33	-0.24
45°	0.01	0.04	-0.01	0.09	-0.02	-0.31	-0.19	-0.27	-0.06	-0.35	-0.36	-0.33
50°	-0.01	0.05	0.01	0.07	0.02	-0.41	-0.15	-0.33	-0.11	-0.37	-0.44	-0.40
55°	0.00	0.07	0.05	0.06	0.07	-0.47	-0.14	-0.33	-0.26	-0.32	-0.58	-0.45
60°	-0.04	0.05	0.08	0.07	0.09	-0.47	-0.21	-0.26	-0.44	-0.31	-0.69	-0.52
65°	-0.05	0.06	0.11	0.09	0.09	-0.41	-0.37	-0.20	-0.51	-0.43	-0.71	-0.63
70°	-0.08	0.03	0.14	0.11	0.08	-0.31	-0.57	-0.26	-0.42	-0.66	-0.69	-0.74
75°	-0.09	0.01	0.15	0.16	0.06	-0.23	-0.69	-0.47	-0.32	-0.77	-0.83	-0.79
80°	-0.12	-0.02	0.16	0.22	0.04	-0.16	-0.66	-0.72	-0.39	-0.68	-1.08	-0.86
85°	-0.14	-0.05	0.15	0.26	0.06	-0.16	-0.48	-0.80	-0.65	-0.60	-1.13	-1.10
90°	-0.17	-0.09	0.13	0.31	0.11	-0.21	-0.28	-0.63	-0.89	-0.77	-1.00	-1.31
95°	-0.19	-0.14	0.08	0.33	0.19	-0.25	-0.19	-0.35	-0.79	-1.07	-1.04	-1.23
100°	-0.23	-0.20	0.02	0.31	0.27	-0.25	-0.22	-0.18	-0.43	-1.07	-1.32	-1.19
105°	-0.26	-0.25	-0.06	0.26	0.33	-0.18	-0.31	-0.21	-0.16	-0.66	-1.38	-1.39
110°	-0.28	-0.29	-0.15	0.18	0.33	-0.09	-0.35	-0.35	-0.18	-0.28	-0.95	-1.40
115°	-0.29	-0.32	-0.23	0.07	0.27	-0.03	-0.27	-0.42	-0.38	-0.28	-0.51	-0.90
120°	-0.28	-0.33	-0.30	-0.05	0.15	-0.05	-0.12	-0.31	-0.49	-0.55	-0.54	-0.47
125°	-0.30	-0.35	-0.35	-0.16	0.01	-0.18	-0.05	-0.13	-0.37	-0.70	-0.88	-0.61
130°	-0.28	-0.33	-0.37	-0.25	-0.15	-0.39	-0.14	-0.07	-0.16	-0.54	-0.99	-1.03
135°	-0.28	-0.33	-0.38	-0.30	-0.26	-0.61	-0.39	-0.23	-0.14	-0.36	-0.76	-1.06
140°	-0.28	-0.32	-0.35	-0.31	-0.32	-0.78	-0.72	-0.58	-0.41	-0.45	-0.63	-0.77
145°	-0.25	-0.29	-0.32	-0.27	-0.31	-0.84	-0.99	-0.95	-0.85	-0.87	-0.91	-0.80
150°	-0.23	-0.26	-0.27	-0.23	-0.25	-0.79	-1.08	-1.16	-1.21	-1.35	-1.48	-1.31
155°	-0.21	-0.22	-0.23	-0.16	-0.16	-0.65	-0.99	-1.13	-1.29	-1.58	-1.92	-1.91
160°	-0.20	-0.20	-0.18	-0.09	-0.05	-0.49	-0.79	-0.90	-1.09	-1.43	-1.89	-2.07
165°	-0.18	-0.17	-0.13	-0.03	0.04	-0.32	-0.56	-0.62	-0.77	-1.06	-1.51	-1.71
170°	-0.18	-0.15	-0.10	0.02	0.11	-0.20	-0.37	-0.38	-0.46	-0.68	-1.06	-1.19
175°	-0.16	-0.14	-0.09	0.05	0.15	-0.12	-0.24	-0.21	-0.26	-0.43	-0.74	-0.80
180°	-0.16	-0.14	-0.08	0.06	0.17	-0.10	-0.19	-0.15	-0.18	-0.33	-0.61	-0.65
185°	-0.19	-0.20	-0.07	0.08	0.15	-0.12	-0.22	-0.20	-0.24	-0.41	-0.70	-0.77
190°	-0.17	-0.15	-0.10	0.03	0.11	-0.20	-0.33	-0.34	-0.42	-0.64	-1.00	-1.13
195°	-0.17	-0.16	-0.14	-0.01	0.04	-0.32	-0.51	-0.57	-0.71	-0.99	-1.43	-1.66
200°	-0.19	-0.19	-0.18	-0.07	-0.05	-0.48	-0.73	-0.84	-1.03	-1.35	-1.84	-2.06
205°	-0.20	-0.21	-0.22	-0.14	-0.15	-0.63	-0.93	-1.07	-1.24	-1.53	-1.93	-1.97
210°	-0.23	-0.25	-0.26	-0.20	-0.25	-0.76	-1.03	-1.12	-1.19	-1.35	-1.55	-1.39
215°	-0.24	-0.28	-0.31	-0.25	-0.32	-0.81	-0.95	-0.94	-0.86	-0.90	-0.99	-0.84
220°	-0.26	-0.30	-0.34	-0.28	-0.34	-0.74	-0.71	-0.59	-0.44	-0.49	-0.65	-0.74
225°	-0.28	-0.34	-0.36	-0.27	-0.29	-0.58	-0.40	-0.24	-0.16	-0.36	-0.71	-1.01
230°	-0.29	-0.34	-0.36	-0.23	-0.18	-0.35	-0.14	-0.06	-0.16	-0.52	-0.95	-1.05
235°	-0.30	-0.35	-0.33	-0.15	-0.03	-0.14	-0.04	-0.11	-0.36	-0.69	-0.90	-0.66
240°	-0.29	-0.33	-0.27	-0.04	0.13	0.00	-0.11	-0.29	-0.52	-0.58	-0.59	-0.47
245°	-0.29	-0.31	-0.20	0.07	0.26	0.02	-0.27	-0.42	-0.43	-0.32	-0.52	-0.84
250°	-0.25	-0.26	-0.12	0.17	0.33	-0.04	-0.37	-0.37	-0.22	-0.28	-0.90	-1.38
255°	-0.26	-0.23	-0.04	0.26	0.34	-0.15	-0.35	-0.24	-0.17	-0.61	-1.35	-1.41
260°	-0.24	-0.17	0.04	0.30	0.29	-0.24	-0.26	-0.19	-0.40	-1.04	-1.33	-1.19
265°	-0.18	-0.10	0.10	0.32	0.22	-0.27	-0.21	-0.32	-0.76	-1.08	-1.05	-1.20
270°	-0.18	-0.08	0.14	0.30	0.14	-0.23	-0.28	-0.58	-0.90	-0.78	-0.99	-1.30
275°	-0.13	-0.03	0.17	0.26	0.08	-0.20	-0.45	-0.77	-0.70	-0.59	-1.12	-1.13
280°	-0.10	0.00	0.17	0.21	0.05	-0.19	-0.62	-0.73	-0.40	-0.67	-1.09	-0.86
285°	-0.07	0.05	0.15	0.16	0.07	-0.23	-0.68	-0.50	-0.30	-0.77	-0.84	-0.79
290°	-0.05	0.07	0.14	0.12	0.07	-0.32	-0.58	-0.29	-0.40	-0.67	-0.67	-0.78
295°	-0.04	0.07	0.12	0.09	0.09	-0.41	-0.39	-0.21	-0.49	-0.43	-0.68	-0.68
300°	-0.01	0.11	0.08	0.06	0.09	-0.47	-0.23	-0.25	-0.43	-0.29	-0.70	-0.53
305°	0.00	0.10	0.06	0.06	0.07	-0.47	-0.16	-0.32	-0.25	-0.31	-0.60	-0.44
310°	0.02	0.09	0.02	0.07	0.03	-0.41	-0.16	-0.32	-0.08	-0.38	-0.45	-0.42
315°	0.07	0.11	-0.01	0.08	-0.02	-0.30	-0.20	-0.25	-0.02	-0.37	-0.34	-0.36
320°	0.03	0.06	-0.02	0.09	-0.06	-0.20	-0.23	-0.13	-0.05	-0.27	-0.31	-0.24
325°	0.04	0.04	-0.01	0.09	-0.08	-0.11	-0.22	-0.03	-0.12	-0.16	-0.31	-0.12
330°	0.04	0.05	-0.01	0.08	-0.10	-0.05	-0.19	0.03	-0.16	-0.06	-0.30	-0.04
335°	0.02	0.02	-0.01	0.05	-0.08	-0.02	-0.14	0.06	-0.15	0.00	-0.24	-0.02
340°	0.01	-0.01	0.01	0.05	-0.06	-0.01	-0.09	0.05	-0.13	0.02	-0.17	-0.01
345°	0.01	0.01	0.01	0.02	-0.03	0.00	-0.05	0.04	-0.08	0.02	-0.10	-0.01
350°	0.01	0.02	0.00	0.02	-0.02	0.00	-0.02	0.03	-0.04	0.02	-0.04	0.00
355°	0.00	0.01	0.00	0.00	-0.01	0.00	0.00	0.01	-0.01	0.00	0.00	0.00

Table A.22 Directional response for Microphone Type 4193, Microphone Preamplifier ZC-0032 and the analyzer with the Microphone Preamplifier mounted directly on the analyzer, measured in a plane parallel to the display and along the microphone's axis, 4000 Hz – 10600 Hz, in dB

Angle	Frequency											
	4000 Hz	4500 Hz	5000 Hz	5600 Hz	6300 Hz	7100 Hz	8000 Hz	8500 Hz	9000 Hz	9500 Hz	10000 Hz	10600 Hz
0°	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5°	-0.01	-0.02	-0.03	-0.02	0.00	-0.01	-0.02	-0.02	-0.04	-0.05	-0.05	-0.03
10°	-0.01	-0.04	-0.09	-0.07	0.01	-0.06	-0.07	-0.09	-0.16	-0.20	-0.19	-0.08
15°	-0.03	-0.11	-0.18	-0.20	-0.04	-0.07	-0.17	-0.22	-0.33	-0.39	-0.33	-0.13
20°	-0.07	-0.20	-0.29	-0.40	-0.21	-0.07	-0.32	-0.34	-0.41	-0.53	-0.36	-0.16
25°	-0.14	-0.30	-0.33	-0.58	-0.48	-0.13	-0.39	-0.40	-0.42	-0.64	-0.33	-0.25
30°	-0.23	-0.37	-0.23	-0.57	-0.66	-0.34	-0.35	-0.47	-0.61	-0.94	-0.58	-0.67
35°	-0.29	-0.37	-0.13	-0.49	-0.61	-0.54	-0.49	-0.68	-0.95	-1.18	-1.03	-1.06
40°	-0.31	-0.43	-0.30	-0.70	-0.72	-0.58	-0.83	-0.81	-1.01	-1.14	-1.25	-1.12
45°	-0.36	-0.60	-0.56	-1.05	-1.13	-0.90	-0.98	-0.88	-1.18	-1.62	-1.71	-1.72
50°	-0.51	-0.72	-0.49	-0.91	-1.06	-1.28	-1.17	-1.27	-1.38	-1.74	-1.67	-2.04
55°	-0.66	-0.69	-0.49	-0.91	-1.16	-1.34	-1.44	-1.42	-1.58	-2.03	-2.24	-2.19
60°	-0.69	-0.79	-0.87	-1.27	-1.61	-1.80	-1.83	-1.75	-1.99	-2.09	-2.45	-2.70
65°	-0.71	-1.06	-0.93	-1.09	-1.43	-1.61	-2.16	-2.08	-2.17	-2.71	-2.47	-2.92
70°	-0.85	-1.10	-0.92	-1.43	-1.78	-2.16	-2.39	-2.56	-2.58	-2.83	-3.11	-3.00
75°	-1.01	-1.09	-1.31	-1.63	-1.66	-1.94	-2.52	-2.75	-3.18	-3.25	-3.41	-3.63
80°	-1.05	-1.26	-1.22	-1.63	-2.08	-2.38	-2.91	-2.85	-3.33	-3.90	-3.68	-4.21
85°	-1.15	-1.39	-1.30	-2.06	-2.14	-2.24	-2.77	-3.25	-3.29	-4.11	-4.34	-4.35
90°	-1.39	-1.46	-1.51	-1.71	-2.45	-2.76	-3.16	-3.15	-3.82	-3.99	-4.51	-4.76
95°	-1.65	-1.76	-1.52	-2.20	-2.28	-2.78	-3.33	-3.51	-3.83	-4.32	-4.60	-4.80
100°	-1.66	-2.06	-1.90	-2.05	-2.56	-2.89	-3.41	-3.82	-4.04	-4.62	-4.72	-5.41
105°	-1.60	-2.11	-2.26	-2.58	-2.61	-2.90	-3.65	-3.77	-4.32	-4.97	-4.96	-5.68
110°	-1.68	-2.03	-2.34	-2.92	-3.10	-3.09	-3.43	-3.65	-4.19	-4.75	-5.49	-5.62
115°	-1.57	-2.01	-2.24	-3.00	-3.61	-3.83	-4.01	-4.09	-4.23	-4.59	-4.98	-5.38
120°	-1.01	-1.72	-1.96	-2.94	-3.49	-4.26	-4.83	-4.62	-5.03	-5.47	-5.11	-5.44
125°	-0.64	-1.13	-1.58	-2.21	-3.29	-4.05	-4.88	-5.60	-5.89	-6.23	-6.55	-6.88
130°	-0.96	-0.95	-1.04	-1.89	-2.24	-3.19	-4.66	-4.80	-5.47	-6.35	-7.07	-7.48
135°	-1.45	-1.44	-1.09	-1.45	-2.10	-2.30	-3.03	-3.84	-4.66	-5.60	-5.86	-6.47
140°	-1.30	-1.80	-1.80	-1.88	-1.98	-2.37	-2.85	-2.76	-3.15	-3.84	-4.49	-5.39
145°	-1.03	-1.51	-1.86	-2.60	-2.69	-2.70	-3.12	-3.37	-3.62	-4.01	-4.19	-4.31
150°	-1.33	-1.49	-1.54	-2.29	-3.01	-3.45	-3.85	-3.91	-4.21	-4.57	-4.74	-5.36
155°	-2.05	-2.14	-1.94	-2.29	-2.76	-3.24	-4.11	-4.45	-5.00	-5.62	-5.68	-5.79
160°	-2.47	-2.79	-2.80	-3.16	-3.41	-3.62	-3.99	-4.25	-4.68	-5.30	-5.81	-6.26
165°	-2.18	-2.66	-2.96	-3.66	-4.09	-4.61	-5.07	-5.15	-5.55	-5.93	-6.06	-6.43
170°	-1.57	-2.00	-2.26	-3.02	-3.50	-4.19	-5.11	-5.40	-6.03	-6.67	-7.06	-7.58
175°	-1.08	-1.41	-1.53	-2.15	-2.47	-2.96	-3.71	-3.97	-4.48	-5.13	-5.63	-6.11
180°	-0.90	-1.18	-1.25	-1.78	-2.04	-2.40	-3.00	-3.20	-3.60	-4.14	-4.55	-4.92
185°	-1.05	-1.37	-1.48	-2.07	-2.39	-2.84	-3.53	-3.80	-4.29	-4.91	-5.41	-5.87
190°	-1.52	-1.93	-2.17	-2.89	-3.37	-4.02	-4.86	-5.22	-5.85	-6.51	-6.97	-7.50
195°	-2.14	-2.63	-2.90	-3.62	-4.07	-4.60	-5.07	-5.20	-5.60	-5.99	-6.13	-6.53
200°	-2.47	-2.85	-2.86	-3.26	-3.50	-3.72	-4.08	-4.25	-4.64	-5.29	-5.78	-6.26
205°	-2.12	-2.26	-2.05	-2.39	-2.80	-3.27	-4.12	-4.47	-5.01	-5.66	-5.82	-5.86
210°	-1.40	-1.56	-1.57	-2.28	-2.96	-3.48	-3.91	-3.97	-4.32	-4.62	-4.70	-5.36
215°	-1.02	-1.47	-1.83	-2.60	-2.74	-2.82	-3.18	-3.44	-3.76	-4.17	-4.36	-4.41
220°	-1.23	-1.78	-1.83	-1.95	-2.03	-2.44	-2.93	-2.88	-3.13	-3.72	-4.27	-5.20
225°	-1.42	-1.53	-1.12	-1.48	-2.07	-2.30	-2.89	-3.56	-4.48	-5.43	-5.85	-6.26
230°	-1.00	-0.98	-1.02	-1.88	-2.22	-3.08	-4.55	-4.80	-5.42	-6.24	-6.97	-7.50
235°	-0.65	-1.09	-1.55	-2.17	-3.16	-4.02	-4.78	-5.51	-5.93	-6.39	-6.62	-7.03
240°	-0.99	-1.67	-1.91	-2.82	-3.55	-4.17	-4.96	-4.76	-5.08	-5.52	-5.28	-5.45
245°	-1.58	-1.97	-2.17	-3.03	-3.60	-3.93	-3.95	-4.20	-4.30	-4.61	-4.99	-5.35
250°	-1.68	-1.98	-2.35	-2.90	-3.25	-3.14	-3.55	-3.67	-4.12	-4.76	-5.43	-5.62
255°	-1.55	-2.09	-2.29	-2.69	-2.64	-2.99	-3.58	-3.80	-4.31	-5.05	-4.94	-5.62
260°	-1.61	-2.13	-1.95	-2.07	-2.58	-2.82	-3.48	-3.85	-4.11	-4.60	-4.73	-5.41
265°	-1.69	-1.78	-1.53	-2.20	-2.25	-2.86	-3.41	-3.52	-3.81	-4.26	-4.76	-4.79
270°	-1.43	-1.49	-1.52	-1.76	-2.47	-2.73	-3.10	-3.18	-3.78	-4.09	-4.53	-4.82
275°	-1.16	-1.41	-1.33	-2.04	-2.16	-2.31	-2.82	-3.28	-3.33	-4.17	-4.34	-4.41
280°	-1.07	-1.28	-1.24	-1.68	-2.10	-2.35	-2.94	-2.91	-3.39	-3.88	-3.70	-4.28
285°	-1.02	-1.12	-1.32	-1.62	-1.67	-2.02	-2.52	-2.79	-3.20	-3.27	-3.47	-3.66
290°	-0.85	-1.12	-0.94	-1.47	-1.77	-2.18	-2.44	-2.59	-2.62	-2.92	-3.21	-3.00
295°	-0.72	-1.06	-0.92	-1.08	-1.46	-1.64	-2.16	-2.14	-2.25	-2.82	-2.49	-2.99
300°	-0.73	-0.79	-0.83	-1.27	-1.67	-1.80	-1.83	-1.78	-2.00	-2.12	-2.49	-2.77
305°	-0.67	-0.68	-0.53	-0.89	-1.24	-1.35	-1.53	-1.44	-1.60	-2.08	-2.28	-2.20
310°	-0.51	-0.71	-0.50	-0.90	-1.08	-1.29	-1.16	-1.34	-1.41	-1.74	-1.76	-2.06
315°	-0.37	-0.57	-0.54	-1.09	-1.17	-0.96	-1.01	-0.90	-1.20	-1.67	-1.76	-1.74
320°	-0.32	-0.40	-0.30	-0.75	-0.73	-0.60	-0.85	-0.80	-1.05	-1.21	-1.27	-1.16
325°	-0.30	-0.36	-0.14	-0.48	-0.59	-0.57	-0.50	-0.71	-0.97	-1.19	-1.08	-1.08
330°	-0.24	-0.36	-0.21	-0.59	-0.64	-0.36	-0.35	-0.50	-0.62	-0.97	-0.61	-0.71
335°	-0.15	-0.31	-0.31	-0.63	-0.48	-0.13	-0.38	-0.43	-0.44	-0.66	-0.33	-0.27
340°	-0.06	-0.21	-0.27	-0.45	-0.21	-0.06	-0.33	-0.39	-0.39	-0.53	-0.37	-0.15
345°	-0.02	-0.11	-0.16	-0.22	-0.04	-0.07	-0.18	-0.25	-0.31	-0.39	-0.34	-0.11
350°	0.00	-0.04	-0.06	-0.07	0.01	-0.06	-0.06	-0.11	-0.17	-0.21	-0.20	-0.07
355°	0.00	-0.01	-0.01	-0.01	0.01	-0.03	-0.01	-0.03	-0.05	-0.06	-0.06	-0.02

Table A.23 Directional response for Microphone Type 4193, Microphone Preamplifier ZC-0032 and the analyzer with the Microphone Preamplifier mounted directly on the analyzer, measured in a plane parallel to the display and along the microphone's axis, 11200 Hz – 20000 Hz, in dB

Angle	Frequency										
	11200 Hz	11800 Hz	12500 Hz	13200 Hz	14000 Hz	15000 Hz	16000 Hz	17000 Hz	18000 Hz	19000 Hz	20000 Hz
0°	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	0.00	-0.01	0.00	0.00
5°	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.06	-0.04	-0.04	-0.03
10°	-0.10	-0.08	-0.13	-0.12	-0.08	-0.15	-0.09	-0.23	-0.13	-0.14	-0.13
15°	-0.21	-0.14	-0.26	-0.26	-0.23	-0.24	-0.36	-0.43	-0.25	-0.36	-0.34
20°	-0.35	-0.27	-0.45	-0.38	-0.41	-0.39	-0.74	-0.67	-0.48	-0.71	-0.74
25°	-0.44	-0.47	-0.82	-0.70	-0.50	-0.70	-0.91	-1.10	-0.75	-0.98	-1.13
30°	-0.59	-0.60	-0.99	-1.09	-1.04	-0.84	-1.37	-1.47	-1.17	-1.41	-1.77
35°	-0.89	-1.08	-1.33	-1.41	-1.26	-1.25	-1.56	-2.09	-1.72	-1.72	-2.31
40°	-1.02	-1.04	-1.51	-1.87	-1.87	-1.64	-1.96	-2.43	-2.40	-2.29	-2.74
45°	-1.64	-1.56	-2.05	-2.22	-2.32	-2.18	-2.43	-2.81	-3.05	-2.98	-3.29
50°	-1.92	-1.93	-2.17	-2.50	-2.82	-2.83	-3.00	-3.28	-3.54	-3.77	-4.09
55°	-2.29	-2.21	-2.51	-2.87	-3.15	-3.38	-3.64	-3.88	-4.09	-4.39	-4.92
60°	-2.87	-2.88	-3.29	-3.39	-3.62	-3.78	-4.23	-4.64	-4.74	-4.97	-5.65
65°	-3.15	-3.50	-3.86	-4.10	-4.12	-4.21	-4.78	-5.35	-5.48	-5.79	-6.24
70°	-3.33	-3.74	-4.33	-4.72	-4.79	-4.70	-5.21	-5.89	-6.18	-6.69	-7.08
75°	-3.54	-3.93	-4.64	-5.17	-5.40	-5.48	-5.87	-6.45	-6.69	-7.43	-8.02
80°	-4.14	-4.07	-4.91	-5.52	-5.90	-6.08	-6.80	-7.27	-7.35	-7.94	-8.98
85°	-4.90	-4.69	-5.04	-5.85	-6.26	-6.56	-7.31	-8.02	-8.10	-8.56	-9.19
90°	-5.18	-5.35	-5.79	-6.06	-6.56	-6.90	-7.57	-8.37	-8.64	-9.39	-9.98
95°	-5.52	-5.75	-6.25	-6.89	-7.06	-7.23	-7.91	-8.86	-9.49	-10.08	-10.94
100°	-5.24	-6.15	-6.57	-7.24	-7.70	-8.12	-8.40	-9.28	-9.59	-10.43	-11.62
105°	-5.70	-6.31	-6.63	-7.54	-8.03	-8.43	-9.18	-10.04	-10.10	-10.86	-11.63
110°	-5.98	-6.72	-7.17	-7.65	-8.15	-8.45	-9.50	-10.50	-10.95	-11.72	-12.47
115°	-6.19	-6.42	-7.48	-8.29	-8.69	-8.83	-9.92	-10.39	-10.95	-11.94	-13.24
120°	-5.89	-5.89	-7.23	-7.80	-8.51	-9.22	-10.51	-10.96	-11.76	-11.99	-12.87
125°	-6.29	-6.45	-7.46	-7.23	-7.81	-8.42	-9.52	-10.70	-11.69	-12.92	-14.25
130°	-7.85	-8.80	-8.69	-8.33	-9.08	-8.88	-9.12	-9.85	-10.16	-11.65	-12.41
135°	-7.61	-8.42	-8.77	-10.14	-11.84	-11.20	-11.35	-12.10	-11.61	-12.06	-12.25
140°	-5.86	-6.32	-7.47	-9.06	-9.92	-9.85	-11.37	-13.89	-14.70	-15.38	-16.73
145°	-4.51	-5.06	-6.09	-6.74	-7.21	-7.82	-9.52	-11.09	-11.30	-12.01	-14.07
150°	-5.72	-5.87	-6.09	-6.41	-6.77	-7.29	-8.17	-8.91	-9.10	-10.13	-11.70
155°	-6.12	-6.55	-7.36	-8.05	-8.50	-8.77	-9.26	-9.69	-9.87	-10.65	-11.79
160°	-6.55	-7.10	-7.89	-8.58	-9.03	-9.36	-10.10	-10.93	-11.70	-12.72	-13.83
165°	-6.66	-6.82	-7.46	-8.00	-8.64	-9.22	-10.44	-11.53	-12.09	-12.92	-13.78
170°	-8.07	-8.42	-8.99	-9.34	-9.48	-9.60	-10.02	-10.70	-10.99	-11.70	-12.80
175°	-6.66	-7.43	-8.38	-9.27	-10.00	-10.65	-11.61	-12.47	-13.03	-13.73	-14.80
180°	-5.31	-5.93	-6.73	-7.47	-8.12	-8.71	-9.74	-10.65	-11.30	-12.30	-13.46
185°	-6.41	-7.14	-8.03	-8.92	-9.66	-10.33	-11.33	-12.26	-12.88	-13.79	-15.14
190°	-8.04	-8.43	-9.04	-9.51	-9.67	-9.79	-10.19	-10.85	-11.05	-11.69	-12.64
195°	-6.76	-6.85	-7.48	-7.98	-8.55	-9.08	-10.26	-11.52	-12.17	-13.17	-14.24
200°	-6.60	-7.17	-7.98	-8.69	-9.19	-9.45	-10.15	-10.86	-11.39	-12.35	-13.78
205°	-6.13	-6.52	-7.29	-7.94	-8.46	-8.86	-9.55	-10.13	-10.25	-10.81	-11.71
210°	-5.84	-6.09	-6.40	-6.60	-6.87	-7.29	-8.15	-8.97	-9.19	-9.93	-11.03
215°	-4.51	-4.95	-5.95	-6.66	-7.13	-7.56	-9.08	-10.83	-11.29	-11.82	-13.18
220°	-5.73	-6.19	-7.13	-8.71	-9.78	-9.81	-10.91	-13.37	-14.60	-15.30	-17.40
225°	-7.41	-8.33	-8.75	-9.84	-11.61	-11.68	-11.76	-12.58	-11.94	-12.31	-12.94
230°	-7.86	-8.78	-9.16	-8.64	-9.10	-9.13	-9.45	-10.15	-10.02	-11.49	-12.28
235°	-6.48	-6.53	-7.48	-7.43	-7.73	-8.38	-9.57	-10.75	-11.40	-13.04	-14.00
240°	-5.89	-6.00	-7.00	-7.77	-8.41	-9.22	-10.55	-11.14	-11.81	-12.08	-12.75
245°	-6.10	-6.55	-7.33	-8.32	-8.70	-8.90	-9.89	-10.31	-10.94	-11.91	-13.06
250°	-5.97	-6.85	-7.15	-7.73	-8.06	-8.48	-9.58	-10.43	-11.04	-11.88	-12.63
255°	-5.76	-6.31	-6.61	-7.58	-8.05	-8.47	-9.31	-10.24	-10.25	-10.86	-11.40
260°	-5.40	-6.07	-6.64	-7.36	-7.89	-8.23	-8.48	-9.33	-9.68	-10.41	-11.74
265°	-5.71	-5.75	-6.30	-6.92	-7.20	-7.38	-7.99	-9.00	-9.53	-10.14	-10.77
270°	-5.25	-5.31	-5.90	-6.15	-6.61	-6.96	-7.60	-8.47	-8.77	-9.55	-10.01
275°	-4.93	-4.76	-5.17	-5.89	-6.35	-6.62	-7.37	-8.07	-8.15	-8.56	-9.13
280°	-4.16	-4.15	-5.02	-5.57	-5.94	-6.22	-6.93	-7.37	-7.44	-7.92	-8.99
285°	-3.54	-4.02	-4.73	-5.19	-5.50	-5.62	-6.04	-6.56	-6.74	-7.53	-7.99
290°	-3.40	-3.80	-4.37	-4.74	-4.90	-4.81	-5.28	-5.93	-6.25	-6.65	-7.13
295°	-3.24	-3.52	-3.88	-4.10	-4.24	-4.29	-4.79	-5.47	-5.47	-5.83	-6.31
300°	-2.92	-2.88	-3.30	-3.40	-3.68	-3.84	-4.28	-4.69	-4.80	-5.00	-5.72
305°	-2.34	-2.24	-2.55	-2.87	-3.22	-3.46	-3.74	-3.90	-4.14	-4.42	-5.00
310°	-2.02	-1.99	-2.24	-2.53	-2.85	-2.89	-3.10	-3.32	-3.61	-3.81	-4.12
315°	-1.66	-1.56	-2.03	-2.25	-2.33	-2.25	-2.50	-2.83	-3.14	-3.01	-3.31
320°	-1.07	-1.05	-1.49	-1.89	-1.89	-1.72	-2.02	-2.49	-2.45	-2.35	-2.76
325°	-0.88	-1.09	-1.38	-1.46	-1.32	-1.26	-1.64	-2.13	-1.75	-1.78	-2.31
330°	-0.60	-0.63	-0.99	-1.09	-1.05	-0.89	-1.40	-1.51	-1.22	-1.46	-1.76
335°	-0.43	-0.48	-0.87	-0.74	-0.53	-0.72	-0.95	-1.14	-0.81	-1.01	-1.15
340°	-0.38	-0.28	-0.45	-0.38	-0.40	-0.42	-0.75	-0.69	-0.50	-0.74	-0.76
345°	-0.20	-0.13	-0.27	-0.25	-0.24	-0.25	-0.39	-0.44	-0.26	-0.39	-0.36
350°	-0.09	-0.08	-0.15	-0.13	-0.08	-0.16	-0.08	-0.24	-0.13	-0.16	-0.13
355°	-0.03	-0.03	-0.05	-0.03	-0.02	-0.04	-0.01	-0.06	-0.04	-0.06	-0.04

Table A.24 Directional response for Microphone Type 4193, Microphone Preamplifier ZC-0032 and the analyzer with the Microphone Preamplifier mounted directly on the analyzer, measured in a plane perpendicular to the display and along the microphone's axis, 500 Hz – 3550 Hz, in dB

Angle	Frequency											
	500 Hz	630 Hz	800 Hz	1000 Hz	1250 Hz	1600 Hz	2000 Hz	2240 Hz	2500 Hz	2800 Hz	3150 Hz	3550 Hz
0°	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01
5°	-0.01	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.02	-0.01	-0.02	-0.01	-0.03
10°	-0.01	0.00	0.00	0.00	-0.03	-0.01	-0.02	0.00	-0.03	-0.02	-0.02	-0.04
15°	0.01	0.00	-0.01	0.02	-0.03	-0.01	-0.05	0.00	-0.07	-0.02	-0.06	-0.07
20°	0.01	0.00	-0.02	0.02	-0.07	-0.02	-0.08	0.02	-0.10	-0.03	-0.13	-0.08
25°	0.01	0.00	-0.02	0.04	-0.08	-0.03	-0.13	0.02	-0.15	-0.04	-0.22	-0.06
30°	0.02	0.01	-0.01	0.06	-0.09	-0.07	-0.18	0.01	-0.18	-0.07	-0.33	-0.03
35°	0.03	0.02	-0.03	0.07	-0.09	-0.12	-0.23	-0.03	-0.17	-0.13	-0.41	-0.01
40°	0.02	0.03	-0.02	0.06	-0.08	-0.21	-0.25	-0.11	-0.13	-0.24	-0.44	-0.08
45°	0.03	0.06	-0.01	0.06	-0.05	-0.32	-0.25	-0.21	-0.09	-0.33	-0.45	-0.25
50°	0.01	0.06	0.02	0.04	-0.02	-0.42	-0.22	-0.29	-0.13	-0.35	-0.51	-0.46
55°	0.01	0.09	0.05	0.02	0.00	-0.50	-0.22	-0.30	-0.27	-0.30	-0.64	-0.54
60°	-0.02	0.07	0.09	0.03	0.01	-0.52	-0.28	-0.26	-0.45	-0.26	-0.75	-0.53
65°	-0.05	0.05	0.13	0.05	0.00	-0.47	-0.43	-0.23	-0.52	-0.37	-0.71	-0.65
70°	-0.07	0.04	0.17	0.09	-0.02	-0.39	-0.62	-0.31	-0.45	-0.60	-0.63	-0.83
75°	-0.10	0.01	0.19	0.16	-0.05	-0.32	-0.76	-0.51	-0.37	-0.73	-0.74	-0.81
80°	-0.12	-0.02	0.19	0.23	-0.05	-0.28	-0.77	-0.76	-0.46	-0.65	-1.01	-0.73
85°	-0.13	-0.05	0.17	0.30	-0.01	-0.31	-0.65	-0.88	-0.76	-0.61	-1.09	-0.93
90°	-0.18	-0.10	0.14	0.35	0.08	-0.36	-0.50	-0.76	-1.01	-0.84	-0.95	-1.19
95°	-0.21	-0.15	0.08	0.37	0.20	-0.38	-0.43	-0.55	-0.95	-1.18	-1.08	-1.09
100°	-0.25	-0.21	0.00	0.35	0.31	-0.33	-0.47	-0.45	-0.66	-1.18	-1.53	-1.08
105°	-0.26	-0.26	-0.09	0.29	0.37	-0.18	-0.51	-0.49	-0.48	-0.81	-1.62	-1.56
110°	-0.28	-0.30	-0.18	0.18	0.37	-0.02	-0.45	-0.55	-0.57	-0.57	-1.14	-1.71
115°	-0.30	-0.33	-0.26	0.04	0.28	0.07	-0.25	-0.45	-0.69	-0.70	-0.79	-1.13
120°	-0.31	-0.36	-0.33	-0.11	0.13	0.05	-0.05	-0.19	-0.54	-0.85	-0.94	-0.79
125°	-0.30	-0.36	-0.38	-0.25	-0.06	-0.12	0.02	0.05	-0.17	-0.62	-1.11	-1.01
130°	-0.30	-0.36	-0.40	-0.34	-0.25	-0.37	-0.12	0.06	0.08	-0.18	-0.79	-1.05
135°	-0.29	-0.35	-0.40	-0.39	-0.39	-0.66	-0.45	-0.20	0.00	0.01	-0.32	-0.54
140°	-0.28	-0.33	-0.38	-0.38	-0.45	-0.88	-0.85	-0.65	-0.44	-0.27	-0.27	-0.17
145°	-0.25	-0.29	-0.34	-0.35	-0.43	-0.96	-1.16	-1.11	-1.03	-0.93	-0.82	-0.45
150°	-0.24	-0.27	-0.28	-0.28	-0.35	-0.91	-1.27	-1.35	-1.47	-1.59	-1.67	-1.34
155°	-0.22	-0.23	-0.23	-0.21	-0.25	-0.77	-1.17	-1.30	-1.54	-1.83	-2.25	-2.22
160°	-0.20	-0.21	-0.18	-0.13	-0.14	-0.59	-0.95	-1.05	-1.28	-1.61	-2.18	-2.39
165°	-0.18	-0.18	-0.14	-0.05	-0.04	-0.42	-0.71	-0.74	-0.91	-1.16	-1.70	-1.89
170°	-0.17	-0.17	-0.10	0.00	0.04	-0.29	-0.50	-0.48	-0.58	-0.74	-1.18	-1.27
175°	-0.18	-0.16	-0.09	0.03	0.09	-0.21	-0.37	-0.32	-0.36	-0.47	-0.82	-0.83
180°	-0.18	-0.17	-0.08	0.05	0.11	-0.18	-0.33	-0.25	-0.27	-0.36	-0.69	-0.66
185°	-0.17	-0.16	-0.08	0.04	0.10	-0.21	-0.36	-0.29	-0.33	-0.43	-0.77	-0.76
190°	-0.18	-0.17	-0.11	0.01	0.05	-0.29	-0.48	-0.44	-0.52	-0.67	-1.07	-1.14
195°	-0.18	-0.18	-0.13	-0.03	-0.02	-0.43	-0.66	-0.67	-0.83	-1.06	-1.56	-1.73
200°	-0.20	-0.21	-0.17	-0.10	-0.11	-0.59	-0.89	-0.96	-1.20	-1.51	-2.07	-2.29
205°	-0.21	-0.23	-0.22	-0.17	-0.22	-0.78	-1.11	-1.23	-1.50	-1.79	-2.27	-2.31
210°	-0.24	-0.27	-0.27	-0.25	-0.33	-0.94	-1.24	-1.33	-1.53	-1.65	-1.83	-1.57
215°	-0.26	-0.31	-0.32	-0.32	-0.41	-1.01	-1.18	-1.16	-1.17	-1.08	-1.01	-0.66
220°	-0.28	-0.34	-0.36	-0.36	-0.44	-0.95	-0.91	-0.77	-0.60	-0.43	-0.40	-0.26
225°	-0.31	-0.36	-0.38	-0.37	-0.40	-0.75	-0.54	-0.32	-0.13	-0.09	-0.33	-0.53
230°	-0.30	-0.36	-0.39	-0.32	-0.29	-0.48	-0.21	-0.04	0.02	-0.20	-0.74	-1.03
235°	-0.30	-0.35	-0.37	-0.24	-0.13	-0.21	-0.05	-0.02	-0.17	-0.56	-1.09	-1.03
240°	-0.31	-0.35	-0.32	-0.12	0.04	-0.03	-0.09	-0.20	-0.48	-0.78	-0.95	-0.73
245°	-0.29	-0.32	-0.26	0.01	0.18	0.02	-0.26	-0.41	-0.61	-0.66	-0.75	-0.97
250°	-0.27	-0.27	-0.18	0.15	0.26	-0.05	-0.43	-0.47	-0.52	-0.53	-1.03	-1.63
255°	-0.26	-0.24	-0.09	0.25	0.28	-0.18	-0.46	-0.40	-0.45	-0.76	-1.56	-1.66
260°	-0.23	-0.18	-0.01	0.31	0.24	-0.29	-0.41	-0.37	-0.63	-1.17	-1.59	-1.14
265°	-0.21	-0.14	0.07	0.32	0.16	-0.34	-0.38	-0.49	-0.94	-1.25	-1.13	-1.04
270°	-0.18	-0.09	0.13	0.31	0.07	-0.31	-0.46	-0.73	-1.07	-0.90	-0.94	-1.19
275°	-0.14	-0.04	0.16	0.25	0.00	-0.25	-0.62	-0.90	-0.83	-0.61	-1.07	-1.02
280°	-0.10	0.01	0.17	0.19	-0.02	-0.24	-0.76	-0.83	-0.50	-0.62	-1.06	-0.76
285°	-0.07	0.03	0.17	0.11	-0.01	-0.28	-0.78	-0.59	-0.37	-0.72	-0.82	-0.82
290°	-0.06	0.06	0.15	0.06	0.02	-0.37	-0.66	-0.36	-0.44	-0.61	-0.68	-0.89
295°	-0.04	0.07	0.12	0.02	0.04	-0.46	-0.47	-0.26	-0.52	-0.40	-0.76	-0.67
300°	-0.01	0.08	0.08	0.01	0.05	-0.52	-0.31	-0.28	-0.43	-0.31	-0.81	-0.46
305°	0.01	0.09	0.05	0.01	0.04	-0.51	-0.24	-0.33	-0.25	-0.37	-0.66	-0.41
310°	0.03	0.09	0.01	0.03	0.00	-0.43	-0.24	-0.32	-0.10	-0.45	-0.44	-0.43
315°	0.04	0.08	-0.02	0.07	-0.05	-0.32	-0.28	-0.22	-0.07	-0.43	-0.32	-0.39
320°	0.04	0.06	-0.04	0.07	-0.09	-0.20	-0.29	-0.11	-0.12	-0.29	-0.31	-0.28
325°	0.04	0.05	-0.03	0.07	-0.10	-0.11	-0.26	-0.01	-0.18	-0.14	-0.31	-0.18
330°	0.04	0.04	-0.02	0.07	-0.11	-0.05	-0.21	0.04	-0.21	-0.03	-0.30	-0.12
335°	0.04	0.03	-0.01	0.05	-0.10	-0.02	-0.14	0.05	-0.19	0.02	-0.25	-0.10
340°	0.03	0.02	-0.01	0.04	-0.07	0.00	-0.09	0.05	-0.14	0.04	-0.17	-0.06
345°	0.04	0.03	0.00	0.02	-0.04	0.00	-0.05	0.03	-0.09	0.03	-0.11	-0.03
350°	0.02	0.02	0.00	0.01	-0.02	0.01	-0.02	0.02	-0.04	0.02	-0.05	-0.01
355°	0.02	0.03	0.01	0.00	-0.01	0.00	0.00	0.01	-0.01	0.02	-0.01	0.01

Table A.25 Directional response for Microphone Type 4193, Microphone Preamplifier ZC-0032 and the analyzer with the Microphone Preamplifier mounted directly on the analyzer, measured in a plane perpendicular to the display and along the microphone's axis, 4000 Hz – 10600 Hz, in dB

Angle	Frequency											
	4000 Hz	4500 Hz	5000 Hz	5600 Hz	6300 Hz	7100 Hz	8000 Hz	8500 Hz	9000 Hz	9500 Hz	10000 Hz	10600 Hz
0°	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
5°	0.00	-0.02	-0.02	-0.06	-0.05	0.00	-0.04	-0.05	0.01	-0.02	-0.02	0.02
10°	0.02	-0.03	-0.04	-0.13	-0.11	0.02	-0.10	-0.08	0.05	-0.11	-0.06	0.05
15°	0.02	-0.07	-0.05	-0.23	-0.23	0.02	-0.17	-0.08	0.03	-0.30	-0.14	0.00
20°	0.01	-0.12	-0.06	-0.31	-0.35	-0.06	-0.15	-0.10	-0.16	-0.63	-0.26	-0.21
25°	-0.03	-0.19	-0.05	-0.31	-0.38	-0.26	-0.08	-0.31	-0.59	-0.83	-0.35	-0.51
30°	-0.12	-0.25	-0.05	-0.28	-0.31	-0.41	-0.29	-0.62	-0.83	-0.73	-0.56	-0.65
35°	-0.23	-0.29	-0.14	-0.39	-0.41	-0.38	-0.70	-0.54	-0.83	-1.02	-1.22	-0.88
40°	-0.32	-0.33	-0.32	-0.70	-0.86	-0.59	-0.67	-0.64	-1.25	-1.55	-1.26	-1.02
45°	-0.33	-0.40	-0.47	-0.79	-1.03	-1.00	-0.84	-1.16	-1.17	-1.65	-1.46	-1.69
50°	-0.28	-0.55	-0.49	-0.67	-0.94	-0.95	-1.10	-1.10	-1.54	-1.99	-1.92	-1.79
55°	-0.35	-0.73	-0.55	-0.97	-1.41	-1.41	-1.18	-1.53	-1.83	-1.92	-2.35	-2.29
60°	-0.57	-0.76	-0.72	-1.22	-1.50	-1.58	-1.77	-1.52	-2.00	-2.68	-2.18	-2.57
65°	-0.76	-0.76	-0.84	-1.11	-1.43	-1.60	-1.74	-2.21	-2.24	-2.62	-2.98	-2.71
70°	-0.78	-1.01	-0.96	-1.39	-1.92	-2.07	-2.31	-2.20	-2.92	-2.99	-2.99	-3.34
75°	-0.89	-1.24	-1.01	-1.51	-1.72	-1.91	-2.28	-2.76	-2.90	-3.77	-3.30	-3.46
80°	-1.08	-1.23	-1.26	-1.57	-2.07	-2.48	-2.68	-2.85	-3.48	-3.67	-4.22	-3.78
85°	-1.00	-1.39	-1.47	-1.82	-2.15	-2.25	-2.81	-2.98	-3.66	-4.11	-4.12	-4.63
90°	-1.03	-1.51	-1.52	-2.02	-2.29	-2.62	-2.95	-3.41	-3.59	-4.48	-4.45	-4.63
95°	-1.37	-1.43	-1.74	-2.18	-2.65	-2.70	-3.29	-3.32	-4.17	-4.45	-4.59	-4.95
100°	-1.41	-1.75	-1.67	-2.28	-2.70	-2.97	-3.20	-3.67	-4.10	-4.62	-4.93	-4.93
105°	-1.32	-1.87	-1.91	-2.41	-2.91	-3.17	-3.74	-3.71	-4.17	-4.87	-5.09	-5.27
110°	-1.77	-1.78	-2.19	-2.57	-2.92	-3.17	-3.76	-4.28	-4.70	-5.09	-5.06	-5.63
115°	-1.91	-2.26	-2.08	-2.84	-3.26	-3.45	-3.86	-3.99	-4.84	-5.56	-5.68	-5.68
120°	-1.18	-2.22	-2.49	-2.79	-3.40	-3.70	-4.17	-4.53	-4.97	-5.28	-5.78	-6.22
125°	-0.92	-1.39	-2.16	-3.15	-3.41	-3.81	-4.45	-4.77	-5.34	-6.07	-5.97	-6.18
130°	-1.26	-1.37	-1.38	-2.35	-3.50	-3.69	-4.45	-4.96	-5.81	-6.31	-6.46	-6.55
135°	-1.10	-1.67	-1.62	-1.89	-2.41	-3.31	-4.19	-4.62	-5.28	-6.23	-6.78	-7.00
140°	-0.46	-1.15	-1.68	-2.38	-2.71	-2.55	-3.32	-3.87	-4.70	-5.39	-5.74	-6.45
145°	-0.30	-0.62	-0.97	-1.86	-2.76	-3.23	-3.42	-3.68	-4.09	-4.52	-4.57	-5.02
150°	-1.03	-1.01	-0.89	-1.25	-1.80	-2.50	-3.48	-3.99	-4.81	-5.37	-5.24	-5.24
155°	-2.20	-2.25	-1.96	-1.99	-2.02	-2.04	-2.56	-2.96	-3.69	-4.50	-4.97	-5.35
160°	-2.79	-3.24	-3.33	-3.72	-3.82	-3.57	-3.42	-3.53	-3.81	-4.21	-4.46	-4.61
165°	-2.36	-2.99	-3.40	-4.32	-5.05	-5.63	-5.98	-6.17	-6.57	-6.82	-6.86	-6.97
170°	-1.59	-2.11	-2.44	-3.27	-3.95	-4.75	-5.69	-6.26	-7.18	-7.95	-8.58	-9.56
175°	-1.03	-1.42	-1.60	-2.22	-2.66	-3.10	-3.72	-4.11	-4.77	-5.38	-5.80	-6.31
180°	-0.80	-1.14	-1.26	-1.79	-2.14	-2.42	-2.87	-3.17	-3.70	-4.21	-4.52	-4.82
185°	-0.94	-1.31	-1.48	-2.06	-2.46	-2.85	-3.42	-3.78	-4.41	-5.00	-5.43	-5.79
190°	-1.42	-1.91	-2.22	-2.99	-3.60	-4.33	-5.26	-5.82	-6.72	-7.58	-8.16	-8.86
195°	-2.16	-2.77	-3.22	-4.11	-4.88	-5.73	-6.37	-6.68	-7.17	-7.60	-7.48	-7.67
200°	-2.72	-3.25	-3.46	-3.94	-4.27	-4.15	-3.93	-3.95	-4.21	-4.54	-4.61	-4.78
205°	-2.40	-2.54	-2.27	-2.34	-2.44	-2.23	-2.62	-2.97	-3.67	-4.40	-4.81	-5.21
210°	-1.32	-1.29	-1.07	-1.42	-1.91	-2.35	-3.46	-4.05	-4.92	-5.44	-5.33	-5.51
215°	-0.48	-0.72	-0.98	-1.89	-2.64	-3.41	-3.58	-3.67	-3.88	-4.18	-4.42	-4.67
220°	-0.47	-1.13	-1.67	-2.43	-2.76	-2.51	-2.76	-3.23	-4.31	-5.40	-5.78	-6.26
225°	-1.07	-1.67	-1.70	-1.87	-2.24	-2.74	-4.17	-4.86	-5.41	-6.02	-6.43	-6.82
230°	-1.29	-1.35	-1.26	-2.13	-3.17	-4.03	-4.35	-4.77	-5.78	-6.44	-6.50	-6.60
235°	-0.89	-1.19	-1.93	-3.11	-3.65	-3.60	-4.55	-4.95	-5.31	-6.06	-6.27	-6.43
240°	-1.01	-2.02	-2.64	-2.86	-3.34	-3.95	-4.04	-4.43	-5.26	-5.66	-6.08	-6.30
245°	-1.79	-2.41	-2.07	-2.88	-3.38	-3.31	-4.06	-4.36	-5.04	-5.57	-5.25	-5.74
250°	-1.89	-1.80	-2.14	-2.70	-2.98	-3.46	-3.83	-4.12	-4.35	-5.28	-5.66	-5.57
255°	-1.34	-1.81	-2.12	-2.43	-3.09	-3.18	-3.53	-3.89	-4.72	-4.94	-5.12	-5.19
260°	-1.31	-1.91	-1.66	-2.45	-2.82	-2.91	-3.57	-3.77	-4.23	-4.63	-4.91	-5.36
265°	-1.45	-1.46	-1.85	-2.30	-2.53	-3.02	-3.20	-3.48	-4.00	-4.72	-4.79	-4.83
270°	-1.14	-1.53	-1.67	-1.96	-2.62	-2.56	-2.95	-3.43	-3.88	-4.47	-4.38	-5.10
275°	-1.00	-1.58	-1.37	-1.95	-2.21	-2.40	-2.93	-3.14	-3.63	-4.24	-4.67	-4.19
280°	-1.16	-1.21	-1.31	-1.86	-2.08	-2.38	-2.68	-2.87	-3.70	-3.97	-4.01	-3.98
285°	-0.99	-1.09	-1.26	-1.45	-1.84	-2.10	-2.30	-2.99	-3.05	-3.85	-3.46	-3.71
290°	-0.73	-1.10	-1.06	-1.47	-1.87	-1.99	-2.53	-2.34	-3.12	-3.15	-3.27	-3.40
295°	-0.67	-0.99	-0.78	-1.24	-1.53	-1.73	-1.82	-2.40	-2.37	-2.92	-3.00	-2.82
300°	-0.65	-0.83	-0.76	-1.18	-1.49	-1.73	-1.86	-1.70	-2.28	-2.54	-2.39	-2.69
305°	-0.55	-0.62	-0.69	-1.05	-1.38	-1.32	-1.37	-1.66	-1.82	-2.24	-2.39	-2.46
310°	-0.43	-0.50	-0.55	-0.77	-1.18	-1.02	-1.15	-1.22	-1.73	-2.02	-1.93	-1.90
315°	-0.31	-0.49	-0.41	-0.79	-1.13	-1.16	-0.97	-1.25	-1.19	-1.82	-1.74	-1.76
320°	-0.18	-0.46	-0.33	-0.75	-0.83	-0.61	-0.73	-0.81	-1.30	-1.48	-1.47	-1.17
325°	-0.07	-0.38	-0.21	-0.58	-0.54	-0.42	-0.74	-0.59	-0.95	-1.24	-1.15	-1.00
330°	-0.02	-0.25	-0.09	-0.42	-0.55	-0.50	-0.37	-0.68	-0.73	-0.98	-0.67	-0.61
335°	-0.02	-0.14	-0.03	-0.32	-0.51	-0.33	-0.12	-0.44	-0.62	-0.80	-0.54	-0.55
340°	-0.02	-0.07	-0.02	-0.20	-0.35	-0.12	-0.14	-0.16	-0.42	-0.47	-0.35	-0.18
345°	-0.03	-0.02	0.00	-0.09	-0.16	-0.02	-0.17	-0.04	-0.24	-0.24	-0.19	0.04
350°	-0.02	0.00	0.01	-0.02	-0.04	0.00	-0.12	0.01	-0.11	-0.11	-0.11	0.02
355°	-0.01	0.01	0.01	0.02	0.00	0.00	-0.03	0.02	-0.03	-0.03	-0.03	-0.01

Table A.26 Directional response for Microphone Type 4193, Microphone Preamplifier ZC-0032 and the analyzer with the Microphone Preamplifier mounted directly on the analyzer, measured in a plane perpendicular to the display and along the microphone's axis, 11200 Hz – 20000 Hz, in dB

Angle	Frequency										
	11200 Hz	11800 Hz	12500 Hz	13200 Hz	14000 Hz	15000 Hz	16000 Hz	17000 Hz	18000 Hz	19000 Hz	20000 Hz
0°	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
5°	-0.02	-0.01	0.01	-0.02	-0.03	-0.07	-0.02	-0.06	-0.06	-0.01	-0.02
10°	-0.07	-0.04	-0.05	-0.08	-0.06	-0.20	-0.09	-0.21	-0.10	-0.09	-0.11
15°	-0.17	-0.08	-0.19	-0.22	-0.16	-0.28	-0.39	-0.34	-0.21	-0.39	-0.38
20°	-0.36	-0.23	-0.42	-0.40	-0.43	-0.41	-0.77	-0.53	-0.56	-0.76	-0.75
25°	-0.54	-0.60	-0.81	-0.63	-0.61	-0.88	-0.91	-1.02	-0.76	-1.09	-1.21
30°	-0.55	-0.79	-1.02	-1.06	-1.01	-0.91	-1.52	-1.34	-1.19	-1.51	-1.72
35°	-1.00	-1.08	-1.27	-1.40	-1.31	-1.44	-1.70	-2.03	-1.60	-1.93	-2.32
40°	-1.22	-1.21	-1.74	-1.91	-1.85	-1.71	-2.10	-2.51	-2.25	-2.37	-2.78
45°	-1.61	-1.72	-2.01	-2.10	-2.21	-2.22	-2.68	-2.88	-2.94	-3.00	-3.27
50°	-1.89	-1.96	-2.17	-2.51	-2.76	-2.96	-3.17	-3.28	-3.54	-3.76	-4.05
55°	-2.55	-2.59	-2.91	-3.08	-3.29	-3.44	-3.76	-3.91	-4.13	-4.53	-4.95
60°	-2.76	-3.11	-3.41	-3.67	-3.64	-3.93	-4.38	-4.68	-4.77	-5.14	-5.78
65°	-3.11	-3.37	-3.92	-4.09	-4.17	-4.21	-5.02	-5.45	-5.47	-5.84	-6.38
70°	-3.39	-3.79	-4.33	-4.73	-4.64	-4.78	-5.33	-6.08	-6.19	-6.70	-7.10
75°	-3.98	-4.05	-4.72	-5.12	-5.40	-5.52	-6.02	-6.54	-6.86	-7.54	-8.18
80°	-4.11	-4.66	-4.94	-5.49	-5.86	-6.36	-7.04	-7.33	-7.45	-8.16	-8.93
85°	-4.46	-4.94	-5.45	-5.79	-6.23	-6.98	-7.94	-8.42	-8.05	-8.63	-9.16
90°	-5.05	-5.50	-6.06	-6.14	-6.74	-7.29	-8.38	-8.72	-8.80	-9.49	-10.20
95°	-5.35	-5.67	-6.90	-6.94	-7.16	-7.59	-8.44	-8.83	-9.32	-10.41	-11.65
100°	-5.72	-6.11	-7.03	-7.39	-8.08	-8.14	-8.46	-9.22	-9.92	-10.95	-12.19
105°	-5.84	-6.25	-7.34	-7.72	-8.16	-8.46	-9.58	-10.21	-10.22	-11.17	-12.04
110°	-6.01	-6.45	-7.42	-7.74	-8.53	-8.84	-10.10	-10.74	-11.03	-11.69	-12.43
115°	-5.98	-6.61	-7.56	-7.76	-8.54	-9.07	-10.68	-10.73	-11.17	-12.04	-13.94
120°	-6.44	-6.80	-7.46	-7.72	-8.78	-9.30	-10.52	-10.65	-11.49	-12.58	-14.35
125°	-6.51	-7.17	-7.96	-8.15	-8.99	-9.12	-10.18	-10.90	-11.28	-13.13	-14.10
130°	-7.05	-7.74	-8.09	-8.53	-9.42	-9.51	-10.48	-11.17	-10.96	-12.96	-13.07
135°	-7.36	-7.80	-8.46	-9.70	-10.09	-9.89	-11.03	-11.94	-11.57	-12.97	-13.84
140°	-6.98	-7.79	-8.98	-9.89	-9.78	-9.95	-11.68	-13.26	-12.43	-13.37	-15.67
145°	-5.88	-6.85	-7.94	-8.35	-8.89	-9.92	-12.09	-12.86	-12.03	-13.10	-15.59
150°	-5.43	-5.82	-6.32	-6.98	-7.99	-9.24	-10.34	-10.36	-10.44	-12.65	-15.09
155°	-6.13	-6.89	-7.62	-7.79	-7.79	-8.13	-8.92	-9.23	-10.02	-12.13	-13.26
160°	-4.96	-5.62	-6.35	-7.06	-8.07	-9.32	-10.44	-10.62	-10.80	-12.08	-12.18
165°	-6.89	-6.89	-7.05	-7.08	-7.46	-8.15	-9.09	-9.49	-10.17	-12.07	-12.71
170°	-10.58	-11.26	-12.11	-12.35	-12.45	-12.66	-12.77	-12.52	-12.45	-13.54	-13.49
175°	-7.18	-8.03	-9.00	-9.99	-11.02	-12.38	-13.50	-14.46	-15.53	-17.62	-18.61
180°	-5.43	-6.05	-6.73	-7.45	-8.19	-9.17	-10.04	-10.60	-11.28	-12.99	-13.32
185°	-6.53	-7.28	-8.13	-9.05	-9.95	-11.18	-12.22	-13.03	-13.95	-16.02	-16.94
190°	-9.97	-10.93	-12.15	-12.87	-13.65	-14.20	-14.58	-14.31	-14.22	-15.13	-14.98
195°	-7.70	-7.72	-7.81	-7.77	-8.05	-8.56	-9.34	-9.64	-10.16	-12.26	-12.96
200°	-5.12	-5.68	-6.36	-7.06	-7.91	-9.21	-10.60	-11.06	-11.50	-12.94	-13.16
205°	-6.10	-7.03	-8.08	-8.32	-8.42	-8.66	-9.30	-9.32	-9.59	-11.79	-12.88
210°	-5.67	-5.97	-6.33	-6.65	-7.31	-8.64	-10.01	-10.23	-9.86	-11.43	-13.44
215°	-5.44	-6.49	-7.76	-8.16	-8.43	-9.21	-11.57	-13.21	-12.35	-12.46	-14.45
220°	-6.69	-7.41	-8.66	-9.99	-10.08	-9.76	-11.15	-13.78	-13.07	-12.67	-15.96
225°	-7.44	-7.83	-8.50	-9.61	-10.47	-10.13	-10.64	-12.69	-12.56	-12.66	-14.48
230°	-7.06	-7.97	-8.42	-8.52	-9.86	-10.24	-10.02	-11.29	-11.11	-12.67	-14.07
235°	-6.54	-7.50	-8.31	-8.77	-8.69	-9.71	-10.18	-11.71	-10.96	-13.18	-14.00
240°	-6.22	-6.54	-7.79	-8.02	-8.94	-9.54	-10.29	-11.44	-11.28	-12.95	-14.08
245°	-6.55	-6.72	-7.71	-7.76	-8.57	-9.16	-10.78	-10.93	-10.81	-12.14	-13.88
250°	-6.14	-6.48	-7.50	-7.85	-8.63	-8.35	-10.14	-11.30	-11.10	-11.82	-13.07
255°	-6.11	-6.47	-7.34	-7.54	-8.32	-8.56	-9.59	-10.72	-10.82	-10.89	-12.36
260°	-5.68	-6.03	-7.12	-7.93	-8.06	-8.16	-9.09	-9.60	-10.34	-10.92	-12.47
265°	-5.37	-6.20	-6.60	-7.38	-7.72	-7.60	-8.53	-9.16	-9.50	-10.40	-11.94
270°	-4.87	-5.64	-6.22	-6.61	-6.92	-7.60	-8.25	-9.08	-9.02	-9.82	-10.36
275°	-4.75	-5.26	-5.46	-6.22	-6.44	-7.08	-8.04	-8.76	-8.63	-9.06	-9.66
280°	-4.39	-4.52	-5.37	-5.63	-6.18	-6.57	-7.48	-7.68	-7.71	-8.09	-8.98
285°	-3.91	-4.31	-4.87	-5.41	-5.69	-6.02	-6.30	-6.80	-6.99	-7.63	-8.49
290°	-3.51	-3.92	-4.55	-5.03	-5.12	-5.14	-5.63	-6.24	-6.46	-6.99	-7.60
295°	-3.25	-3.54	-4.22	-4.49	-4.50	-4.45	-5.18	-5.79	-5.82	-6.19	-6.75
300°	-3.00	-3.36	-3.80	-3.87	-3.77	-4.06	-4.73	-5.00	-5.07	-5.48	-6.20
305°	-2.66	-2.77	-2.99	-3.08	-3.30	-3.65	-4.01	-4.27	-4.45	-4.73	-5.33
310°	-2.04	-2.04	-2.38	-2.61	-2.90	-3.17	-3.54	-3.56	-3.72	-3.95	-4.34
315°	-1.81	-2.00	-2.27	-2.41	-2.47	-2.64	-2.87	-3.04	-3.11	-3.26	-3.63
320°	-1.32	-1.23	-1.67	-1.95	-1.99	-1.94	-2.33	-2.80	-2.54	-2.57	-3.02
325°	-1.12	-1.29	-1.49	-1.53	-1.55	-1.61	-1.86	-2.11	-1.84	-2.01	-2.49
330°	-0.56	-0.74	-1.03	-1.19	-1.14	-1.14	-1.74	-1.60	-1.41	-1.75	-1.87
335°	-0.69	-0.78	-0.93	-0.88	-0.73	-0.88	-1.02	-1.15	-0.89	-1.20	-1.38
340°	-0.36	-0.33	-0.40	-0.40	-0.56	-0.58	-0.91	-0.68	-0.62	-0.86	-0.86
345°	-0.06	-0.09	-0.24	-0.25	-0.28	-0.36	-0.52	-0.44	-0.40	-0.54	-0.51
350°	-0.01	-0.08	-0.21	-0.15	-0.07	-0.20	-0.08	-0.31	-0.10	-0.20	-0.13
355°	-0.01	-0.04	-0.10	-0.05	0.00	-0.05	0.02	-0.09	0.00	-0.04	-0.02

Table A.27 Sensitivity variations of Microphone Type 4193, Microphone Preamplifier ZC-0032 and the analyzer with the Microphone Preamplifier mounted directly on the analyzer, at sound incidence angles within $\pm\theta^\circ$ from the reference direction

Nominal Frequency	Exact Frequency	Max Variation $\pm 30^\circ$ dB	Max Variation $\pm 90^\circ$ dB	Max Variation $\pm 150^\circ$ dB
500 Hz	501.187 Hz	0.05	0.25	0.38
630 Hz	630.957 Hz	0.07	0.21	0.48
800 Hz	794.328 Hz	0.04	0.23	0.59
1000 Hz	1000 Hz	0.08	0.35	0.75
1250 Hz	1258.93 Hz	0.11	0.25	0.82
1600 Hz	1584.89 Hz	0.07	0.52	1.08
2000 Hz	1995.26 Hz	0.21	0.79	1.29
2240 Hz	2238.72 Hz	0.08	0.96	1.41
2500 Hz	2511.89 Hz	0.22	1.08	1.61
2800 Hz	2818.38 Hz	0.11	0.93	1.69
3150 Hz	3162.28 Hz	0.34	1.14	1.84
3550 Hz	3548.13 Hz	0.13	1.32	1.72
4000 Hz	3981.07 Hz	0.26	1.45	1.93
4500 Hz	4466.84 Hz	0.38	1.59	2.42
5000 Hz	5011.87 Hz	0.34	1.68	2.65
5600 Hz	5623.41 Hz	0.65	2.07	3.17
6300 Hz	6309.57 Hz	0.67	2.63	3.66
7100 Hz	7079.46 Hz	0.52	2.78	4.28
8000 Hz	7943.28 Hz	0.40	3.17	4.97
8500 Hz	8413.95 Hz	0.71	3.45	5.62
9000 Hz	8912.51 Hz	0.88	3.93	5.98
9500 Hz	9440.61 Hz	0.99	4.49	6.45
10000 Hz	10000 Hz	0.68	4.68	7.08
10600 Hz	10592.5 Hz	0.75	5.15	7.55
11200 Hz	11220.2 Hz	0.69	5.25	7.86
11800 Hz	11885.0 Hz	0.80	5.64	8.80
12500 Hz	12589.3 Hz	1.04	6.23	9.17
13200 Hz	13335.2 Hz	1.19	6.62	10.15
14000 Hz	14125.4 Hz	1.15	6.93	11.85
15000 Hz	14962.4 Hz	1.14	7.60	11.69
16000 Hz	15848.9 Hz	1.75	8.40	12.11
17000 Hz	16788.0 Hz	1.61	9.08	13.89
18000 Hz	17782.8 Hz	1.42	9.03	14.71
19000 Hz	18836.5 Hz	1.75	9.83	15.39
20000 Hz	19952.6 Hz	1.88	10.38	17.42

Table A.28 Influence of Windscreen UA-1650 on directional response, with or without the Microphone Preamplifier ZC-0032 connected to a microphone extension cable, 500 Hz – 3550 Hz, in dB

Angle	Frequency											
	500 Hz	630 Hz	800 Hz	1000 Hz	1250 Hz	1600 Hz	2000 Hz	2240 Hz	2500 Hz	2800 Hz	3150 Hz	3550 Hz
0°	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
5°	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01
10°	-0.01	0.00	0.00	-0.01	-0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.00
15°	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	0.00	-0.01	0.01	0.00
20°	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	0.00	0.00	0.02	0.01
25°	-0.01	-0.01	0.00	-0.01	-0.01	-0.02	-0.01	-0.02	0.00	0.00	0.03	0.03
30°	-0.01	-0.01	0.00	-0.01	-0.02	-0.02	-0.02	-0.02	-0.01	0.00	0.04	0.04
35°	-0.01	-0.02	-0.01	-0.01	-0.03	-0.03	-0.03	-0.03	-0.02	0.01	0.05	0.06
40°	0.00	-0.01	-0.01	-0.02	-0.04	-0.04	-0.05	-0.03	-0.03	0.02	0.06	0.07
45°	-0.01	-0.02	-0.02	-0.02	-0.05	-0.05	-0.07	-0.04	-0.04	0.02	0.06	0.09
50°	0.00	-0.01	-0.02	-0.02	-0.06	-0.06	-0.08	-0.06	-0.05	0.01	0.07	0.11
55°	-0.01	-0.01	-0.02	-0.03	-0.07	-0.08	-0.10	-0.08	-0.06	-0.01	0.07	0.12
60°	-0.01	-0.01	-0.03	-0.04	-0.07	-0.10	-0.11	-0.11	-0.07	-0.01	0.07	0.14
65°	-0.01	-0.01	-0.03	-0.05	-0.08	-0.12	-0.12	-0.13	-0.10	-0.02	0.07	0.15
70°	-0.01	-0.01	-0.03	-0.05	-0.09	-0.13	-0.14	-0.14	-0.13	-0.04	0.06	0.15
75°	-0.02	-0.02	-0.04	-0.06	-0.09	-0.15	-0.16	-0.15	-0.15	-0.06	0.06	0.15
80°	-0.02	-0.02	-0.04	-0.06	-0.10	-0.16	-0.19	-0.17	-0.16	-0.09	0.04	0.14
85°	-0.03	-0.03	-0.04	-0.07	-0.11	-0.17	-0.22	-0.19	-0.18	-0.10	0.01	0.14
90°	-0.02	-0.02	-0.05	-0.07	-0.12	-0.18	-0.23	-0.22	-0.20	-0.11	-0.01	0.12
95°	-0.02	-0.03	-0.05	-0.07	-0.13	-0.18	-0.24	-0.24	-0.23	-0.14	-0.02	0.09
100°	-0.02	-0.03	-0.05	-0.07	-0.12	-0.19	-0.25	-0.25	-0.24	-0.17	-0.04	0.08
105°	-0.02	-0.02	-0.06	-0.07	-0.12	-0.19	-0.26	-0.26	-0.25	-0.19	-0.08	0.06
110°	-0.03	-0.03	-0.05	-0.08	-0.12	-0.19	-0.26	-0.27	-0.25	-0.19	-0.09	0.02
115°	-0.03	-0.04	-0.05	-0.07	-0.12	-0.19	-0.26	-0.27	-0.26	-0.18	-0.08	0.00
120°	-0.04	-0.04	-0.05	-0.07	-0.12	-0.19	-0.26	-0.26	-0.26	-0.18	-0.07	0.03
125°	-0.03	-0.03	-0.05	-0.07	-0.12	-0.18	-0.25	-0.25	-0.26	-0.18	-0.07	0.04
130°	-0.03	-0.04	-0.05	-0.07	-0.13	-0.18	-0.25	-0.24	-0.24	-0.17	-0.06	0.04
135°	-0.03	-0.04	-0.05	-0.07	-0.12	-0.17	-0.24	-0.23	-0.23	-0.15	-0.04	0.06
140°	-0.03	-0.04	-0.05	-0.07	-0.12	-0.16	-0.24	-0.22	-0.22	-0.13	-0.03	0.08
145°	-0.03	-0.04	-0.06	-0.08	-0.13	-0.15	-0.24	-0.22	-0.21	-0.12	-0.01	0.11
150°	-0.03	-0.04	-0.06	-0.08	-0.12	-0.15	-0.24	-0.22	-0.20	-0.12	0.00	0.12
155°	-0.03	-0.04	-0.06	-0.07	-0.13	-0.15	-0.23	-0.22	-0.20	-0.11	0.01	0.13
160°	-0.03	-0.04	-0.06	-0.07	-0.13	-0.15	-0.23	-0.21	-0.19	-0.11	0.02	0.13
165°	-0.03	-0.04	-0.06	-0.07	-0.13	-0.15	-0.23	-0.21	-0.19	-0.10	0.02	0.14
170°	-0.03	-0.04	-0.06	-0.07	-0.13	-0.15	-0.22	-0.21	-0.19	-0.10	0.03	0.15
175°	-0.04	-0.04	-0.06	-0.07	-0.13	-0.16	-0.22	-0.21	-0.19	-0.10	0.03	0.15
180°	-0.05	-0.05	-0.05	-0.07	-0.13	-0.16	-0.22	-0.21	-0.19	-0.10	0.03	0.15
185°	-0.03	-0.03	-0.06	-0.07	-0.12	-0.16	-0.23	-0.21	-0.19	-0.10	0.03	0.15
190°	-0.04	-0.05	-0.06	-0.07	-0.13	-0.16	-0.23	-0.22	-0.20	-0.11	0.02	0.14
195°	-0.03	-0.04	-0.06	-0.07	-0.13	-0.16	-0.23	-0.22	-0.20	-0.11	0.02	0.13
200°	-0.03	-0.04	-0.06	-0.07	-0.13	-0.16	-0.24	-0.22	-0.21	-0.12	0.01	0.13
205°	-0.03	-0.04	-0.06	-0.07	-0.13	-0.16	-0.24	-0.23	-0.21	-0.12	0.00	0.12
210°	-0.03	-0.04	-0.06	-0.07	-0.13	-0.16	-0.24	-0.23	-0.22	-0.12	0.00	0.11
215°	-0.03	-0.04	-0.06	-0.08	-0.13	-0.16	-0.25	-0.23	-0.22	-0.13	-0.01	0.10
220°	-0.04	-0.05	-0.06	-0.08	-0.13	-0.17	-0.25	-0.23	-0.22	-0.14	-0.03	0.08
225°	-0.04	-0.04	-0.06	-0.08	-0.13	-0.18	-0.25	-0.24	-0.23	-0.15	-0.05	0.05
230°	-0.03	-0.04	-0.06	-0.08	-0.13	-0.18	-0.25	-0.25	-0.24	-0.17	-0.07	0.04
235°	-0.03	-0.04	-0.06	-0.08	-0.13	-0.19	-0.26	-0.26	-0.26	-0.19	-0.07	0.04
240°	-0.03	-0.04	-0.06	-0.08	-0.12	-0.20	-0.26	-0.27	-0.26	-0.19	-0.07	0.03
245°	-0.03	-0.04	-0.06	-0.08	-0.13	-0.20	-0.27	-0.27	-0.26	-0.18	-0.08	0.00
250°	-0.03	-0.04	-0.05	-0.08	-0.13	-0.20	-0.26	-0.27	-0.26	-0.19	-0.09	0.01
255°	-0.03	-0.04	-0.06	-0.08	-0.13	-0.20	-0.26	-0.26	-0.25	-0.19	-0.08	0.06
260°	-0.02	-0.03	-0.05	-0.07	-0.13	-0.19	-0.25	-0.25	-0.25	-0.18	-0.04	0.08
265°	-0.03	-0.04	-0.05	-0.07	-0.13	-0.18	-0.24	-0.24	-0.23	-0.14	-0.01	0.09
270°	-0.02	-0.03	-0.05	-0.07	-0.12	-0.17	-0.23	-0.22	-0.21	-0.11	0.00	0.11
275°	-0.04	-0.04	-0.04	-0.07	-0.12	-0.16	-0.21	-0.20	-0.18	-0.10	0.01	0.15
280°	-0.02	-0.02	-0.04	-0.07	-0.10	-0.15	-0.19	-0.17	-0.16	-0.08	0.04	0.15
285°	-0.02	-0.03	-0.04	-0.06	-0.10	-0.14	-0.16	-0.15	-0.14	-0.05	0.06	0.15
290°	-0.02	-0.02	-0.04	-0.05	-0.09	-0.13	-0.14	-0.13	-0.12	-0.03	0.07	0.16
295°	-0.01	-0.01	-0.03	-0.05	-0.08	-0.11	-0.12	-0.12	-0.09	-0.01	0.07	0.16
300°	-0.02	-0.03	-0.03	-0.04	-0.07	-0.09	-0.11	-0.10	-0.06	0.00	0.08	0.15
305°	-0.01	-0.02	-0.03	-0.03	-0.06	-0.08	-0.09	-0.07	-0.05	0.01	0.08	0.14
310°	-0.01	-0.02	-0.02	-0.03	-0.05	-0.06	-0.08	-0.05	-0.04	0.02	0.08	0.12
315°	-0.02	-0.03	-0.02	-0.02	-0.04	-0.05	-0.06	-0.03	-0.03	0.03	0.07	0.11
320°	0.00	-0.01	-0.01	-0.02	-0.03	-0.03	-0.04	-0.02	-0.02	0.02	0.07	0.08
325°	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02	0.00	0.02	0.07	0.07
330°	-0.01	-0.01	0.00	-0.01	-0.01	-0.02	-0.01	-0.01	0.01	0.02	0.06	0.06
335°	0.00	-0.01	0.00	0.00	-0.01	-0.01	0.00	-0.01	0.01	0.02	0.05	0.05
340°	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.03	0.04
345°	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.02	0.03	0.03
350°	-0.01	-0.01	0.00	0.00	0.01	0.00	0.01	0.01	0.01	0.02	0.02	0.02
355°	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.02	0.02

Table A.29 Influence of Windscreen UA-1650 on directional response, with or without the Microphone Preamplifier ZC-0032 connected to a microphone extension cable, 4000 Hz – 10600 Hz, in dB

Angle	Frequency											
	4000 Hz	4500 Hz	5000 Hz	5600 Hz	6300 Hz	7100 Hz	8000 Hz	8500 Hz	9000 Hz	9500 Hz	10000 Hz	10600 Hz
0°	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01	-0.01	-0.01
5°	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01	0.00	0.00	-0.02
10°	-0.01	-0.01	-0.02	-0.01	0.01	0.00	-0.06	-0.04	-0.02	0.02	0.00	-0.05
15°	-0.01	-0.02	-0.03	-0.01	0.03	0.02	-0.11	-0.10	-0.03	0.06	0.01	-0.08
20°	0.00	-0.03	-0.06	-0.02	0.06	0.05	-0.20	-0.18	-0.05	0.08	0.03	-0.10
25°	0.00	-0.04	-0.09	-0.03	0.09	0.10	-0.27	-0.26	-0.08	0.10	0.05	-0.11
30°	0.01	-0.05	-0.13	-0.06	0.10	0.14	-0.31	-0.36	-0.17	0.06	0.07	-0.11
35°	0.02	-0.06	-0.16	-0.08	0.12	0.19	-0.34	-0.50	-0.28	0.03	0.12	-0.07
40°	0.03	-0.07	-0.19	-0.11	0.15	0.28	-0.37	-0.56	-0.38	-0.04	0.08	-0.05
45°	0.04	-0.07	-0.24	-0.18	0.14	0.34	-0.32	-0.62	-0.54	-0.17	0.06	0.03
50°	0.06	-0.08	-0.28	-0.24	0.11	0.35	-0.25	-0.65	-0.59	-0.30	-0.03	0.00
55°	0.09	-0.07	-0.30	-0.27	0.10	0.43	-0.14	-0.58	-0.67	-0.40	-0.11	-0.01
60°	0.11	-0.06	-0.31	-0.34	0.02	0.42	-0.04	-0.51	-0.64	-0.47	-0.25	-0.08
65°	0.12	-0.05	-0.33	-0.40	0.00	0.41	0.05	-0.40	-0.61	-0.48	-0.30	-0.20
70°	0.14	-0.03	-0.33	-0.40	-0.04	0.35	0.11	-0.34	-0.51	-0.47	-0.32	-0.23
75°	0.15	-0.01	-0.32	-0.43	-0.10	0.29	0.10	-0.28	-0.48	-0.40	-0.32	-0.22
80°	0.15	-0.01	-0.32	-0.44	-0.10	0.24	0.01	-0.28	-0.46	-0.39	-0.25	-0.19
85°	0.14	-0.01	-0.33	-0.45	-0.12	0.23	-0.02	-0.35	-0.46	-0.40	-0.24	-0.13
90°	0.14	-0.02	-0.35	-0.47	-0.12	0.22	-0.17	-0.36	-0.51	-0.39	-0.24	-0.08
95°	0.12	-0.04	-0.38	-0.50	-0.15	0.26	-0.15	-0.42	-0.53	-0.42	-0.25	-0.08
100°	0.07	-0.08	-0.42	-0.55	-0.16	0.28	-0.22	-0.46	-0.54	-0.45	-0.27	-0.11
105°	0.05	-0.13	-0.47	-0.60	-0.20	0.32	-0.21	-0.46	-0.60	-0.49	-0.31	-0.18
110°	0.03	-0.17	-0.55	-0.68	-0.23	0.33	-0.22	-0.52	-0.63	-0.57	-0.42	-0.23
115°	-0.01	-0.20	-0.62	-0.77	-0.33	0.32	-0.22	-0.57	-0.76	-0.69	-0.49	-0.31
120°	-0.01	-0.25	-0.65	-0.84	-0.42	0.25	-0.26	-0.66	-0.86	-0.83	-0.67	-0.33
125°	0.02	-0.23	-0.68	-0.89	-0.47	0.16	-0.37	-0.82	-1.06	-1.03	-0.76	-0.42
130°	0.03	-0.20	-0.64	-0.88	-0.52	0.10	-0.43	-0.95	-1.27	-1.25	-0.96	-0.62
135°	0.05	-0.18	-0.60	-0.79	-0.45	0.09	-0.40	-0.94	-1.31	-1.31	-1.08	-0.76
140°	0.08	-0.15	-0.57	-0.77	-0.40	0.12	-0.35	-0.85	-1.12	-1.13	-0.93	-0.75
145°	0.10	-0.11	-0.52	-0.71	-0.36	0.13	-0.32	-0.79	-0.99	-0.86	-0.64	-0.52
150°	0.13	-0.07	-0.46	-0.65	-0.30	0.17	-0.28	-0.73	-0.92	-0.75	-0.47	-0.38
155°	0.15	-0.05	-0.43	-0.60	-0.25	0.20	-0.23	-0.63	-0.76	-0.59	-0.38	-0.31
160°	0.16	-0.03	-0.41	-0.57	-0.21	0.22	-0.19	-0.53	-0.63	-0.45	-0.24	-0.26
165°	0.16	-0.02	-0.39	-0.55	-0.20	0.25	-0.14	-0.48	-0.55	-0.35	-0.17	-0.20
170°	0.17	0.00	-0.38	-0.53	-0.21	0.27	-0.11	-0.44	-0.48	-0.29	-0.17	-0.17
175°	0.18	0.01	-0.36	-0.52	-0.21	0.27	-0.10	-0.41	-0.45	-0.27	-0.15	-0.19
180°	0.18	0.01	-0.37	-0.53	-0.22	0.27	-0.11	-0.41	-0.45	-0.29	-0.16	-0.21
185°	0.17	0.00	-0.37	-0.54	-0.23	0.26	-0.13	-0.44	-0.48	-0.32	-0.19	-0.23
190°	0.16	-0.01	-0.39	-0.56	-0.24	0.25	-0.15	-0.48	-0.52	-0.34	-0.21	-0.21
195°	0.15	-0.03	-0.41	-0.58	-0.23	0.25	-0.15	-0.50	-0.57	-0.37	-0.20	-0.21
200°	0.14	-0.04	-0.43	-0.59	-0.23	0.24	-0.18	-0.55	-0.66	-0.48	-0.27	-0.28
205°	0.13	-0.05	-0.45	-0.61	-0.27	0.20	-0.24	-0.64	-0.77	-0.60	-0.37	-0.30
210°	0.12	-0.08	-0.48	-0.66	-0.32	0.19	-0.29	-0.73	-0.92	-0.75	-0.47	-0.37
215°	0.10	-0.12	-0.53	-0.73	-0.37	0.16	-0.32	-0.79	-1.01	-0.88	-0.63	-0.49
220°	0.07	-0.15	-0.58	-0.79	-0.40	0.13	-0.35	-0.85	-1.14	-1.15	-0.93	-0.72
225°	0.04	-0.18	-0.61	-0.81	-0.46	0.10	-0.39	-0.95	-1.34	-1.34	-1.10	-0.74
230°	0.03	-0.20	-0.65	-0.89	-0.52	0.10	-0.43	-0.96	-1.30	-1.30	-1.01	-0.64
235°	0.03	-0.24	-0.70	-0.91	-0.48	0.14	-0.36	-0.85	-1.13	-1.09	-0.81	-0.43
240°	-0.01	-0.26	-0.67	-0.87	-0.44	0.24	-0.28	-0.68	-0.91	-0.89	-0.70	-0.33
245°	-0.02	-0.20	-0.63	-0.81	-0.35	0.30	-0.21	-0.57	-0.78	-0.72	-0.50	-0.30
250°	0.03	-0.18	-0.57	-0.71	-0.27	0.30	-0.20	-0.51	-0.66	-0.61	-0.45	-0.23
255°	0.06	-0.15	-0.49	-0.62	-0.22	0.30	-0.19	-0.47	-0.62	-0.52	-0.33	-0.18
260°	0.07	-0.08	-0.43	-0.57	-0.18	0.27	-0.20	-0.46	-0.56	-0.49	-0.29	-0.10
265°	0.11	-0.05	-0.39	-0.52	-0.16	0.27	-0.15	-0.43	-0.55	-0.45	-0.26	-0.06
270°	0.14	-0.03	-0.36	-0.48	-0.13	0.23	-0.14	-0.36	-0.54	-0.42	-0.26	-0.07
275°	0.14	-0.01	-0.34	-0.46	-0.12	0.25	-0.01	-0.35	-0.48	-0.42	-0.26	-0.12
280°	0.15	-0.01	-0.32	-0.44	-0.10	0.26	0.04	-0.29	-0.48	-0.42	-0.27	-0.19
285°	0.16	-0.01	-0.32	-0.43	-0.09	0.32	0.11	-0.29	-0.50	-0.43	-0.33	-0.21
290°	0.15	-0.02	-0.33	-0.40	-0.03	0.36	0.12	-0.35	-0.53	-0.49	-0.33	-0.21
295°	0.14	-0.03	-0.33	-0.39	0.02	0.43	0.05	-0.40	-0.63	-0.50	-0.30	-0.19
300°	0.12	-0.05	-0.31	-0.33	0.05	0.43	-0.01	-0.52	-0.66	-0.49	-0.25	-0.07
305°	0.10	-0.06	-0.29	-0.26	0.12	0.45	-0.14	-0.59	-0.69	-0.41	-0.11	0.00
310°	0.08	-0.07	-0.26	-0.23	0.13	0.39	-0.24	-0.65	-0.61	-0.30	-0.03	0.00
315°	0.06	-0.06	-0.22	-0.17	0.16	0.37	-0.31	-0.63	-0.54	-0.17	0.06	0.03
320°	0.05	-0.05	-0.17	-0.10	0.17	0.29	-0.37	-0.56	-0.38	-0.04	0.08	-0.05
325°	0.03	-0.04	-0.14	-0.06	0.14	0.20	-0.34	-0.49	-0.27	0.04	0.13	-0.07
330°	0.02	-0.03	-0.11	-0.03	0.12	0.16	-0.30	-0.35	-0.16	0.07	0.08	-0.10
335°	0.02	-0.02	-0.07	-0.01	0.11	0.12	-0.26	-0.24	-0.07	0.11	0.06	-0.09
340°	0.02	0.00	-0.04	0.01	0.09	0.07	-0.18	-0.16	-0.03	0.11	0.05	-0.08
345°	0.01	0.01	-0.01	0.01	0.06	0.04	-0.09	-0.08	-0.01	0.08	0.03	-0.06
350°	0.01	0.01	0.01	0.02	0.04	0.02	-0.03	-0.03	0.01	0.05	0.02	-0.03
355°	0.01	0.01	0.01	0.02	0.03	0.02	0.00	0.00	0.02	0.03	0.02	0.00

Table A.30 Influence of Windscreen UA-1650 on directional response, with or without the Microphone Preamplifier ZC-0032 connected to a microphone extension cable, 11200 Hz – 20000 Hz, in dB

Angle	Frequency										
	11200 Hz	11800 Hz	12500 Hz	13200 Hz	14000 Hz	15000 Hz	16000 Hz	17000 Hz	18000 Hz	19000 Hz	20000 Hz
0°	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02
5°	-0.03	-0.02	0.00	-0.01	-0.03	-0.01	0.00	-0.01	-0.02	-0.01	-0.03
10°	-0.08	-0.05	0.00	-0.03	-0.09	-0.02	0.01	-0.02	-0.04	-0.02	-0.08
15°	-0.16	-0.11	0.01	-0.05	-0.17	-0.09	0.04	-0.03	-0.11	-0.05	-0.15
20°	-0.25	-0.18	0.00	-0.09	-0.26	-0.20	0.04	-0.06	-0.20	-0.12	-0.22
25°	-0.35	-0.25	-0.01	-0.08	-0.36	-0.30	-0.07	-0.02	-0.27	-0.25	-0.31
30°	-0.46	-0.39	-0.09	-0.07	-0.38	-0.46	-0.16	-0.04	-0.28	-0.33	-0.37
35°	-0.49	-0.50	-0.18	-0.09	-0.40	-0.51	-0.33	-0.06	-0.21	-0.36	-0.40
40°	-0.52	-0.63	-0.30	-0.11	-0.33	-0.54	-0.40	-0.17	-0.08	-0.25	-0.37
45°	-0.46	-0.65	-0.41	-0.18	-0.31	-0.49	-0.40	-0.29	-0.02	-0.09	-0.30
50°	-0.43	-0.68	-0.53	-0.29	-0.29	-0.40	-0.38	-0.40	-0.16	-0.04	-0.29
55°	-0.36	-0.64	-0.57	-0.39	-0.32	-0.41	-0.39	-0.47	-0.39	-0.19	-0.36
60°	-0.38	-0.61	-0.58	-0.52	-0.43	-0.47	-0.46	-0.52	-0.58	-0.41	-0.44
65°	-0.45	-0.66	-0.63	-0.62	-0.55	-0.56	-0.53	-0.54	-0.65	-0.50	-0.53
70°	-0.51	-0.71	-0.70	-0.73	-0.66	-0.60	-0.56	-0.58	-0.63	-0.54	-0.81
75°	-0.51	-0.74	-0.73	-0.79	-0.80	-0.65	-0.59	-0.66	-0.71	-0.66	-0.90
80°	-0.45	-0.69	-0.73	-0.78	-0.90	-0.82	-0.74	-0.82	-0.80	-0.79	-0.85
85°	-0.37	-0.58	-0.70	-0.78	-0.94	-1.02	-1.01	-1.04	-0.80	-0.66	-0.77
90°	-0.32	-0.51	-0.64	-0.81	-0.95	-1.08	-1.14	-1.13	-0.83	-0.54	-0.91
95°	-0.29	-0.54	-0.68	-0.90	-0.91	-1.00	-0.93	-0.94	-0.81	-0.84	-1.70
100°	-0.33	-0.57	-0.75	-1.07	-0.94	-0.81	-0.65	-0.66	-0.86	-1.27	-1.98
105°	-0.36	-0.57	-0.74	-1.03	-1.05	-0.87	-0.57	-0.61	-0.88	-1.35	-1.35
110°	-0.39	-0.54	-0.61	-0.89	-1.09	-0.91	-0.80	-0.99	-0.99	-1.05	-0.90
115°	-0.42	-0.49	-0.51	-0.74	-1.10	-0.94	-0.86	-1.05	-1.12	-1.27	-1.01
120°	-0.40	-0.44	-0.50	-0.79	-1.10	-0.84	-0.82	-0.88	-1.32	-1.22	-1.30
125°	-0.48	-0.55	-0.64	-0.90	-1.04	-0.71	-0.58	-0.76	-1.30	-1.14	-1.29
130°	-0.70	-0.76	-0.96	-1.32	-1.09	-0.55	-0.48	-0.79	-0.94	-0.87	-0.95
135°	-0.92	-1.18	-1.61	-1.97	-1.32	-0.81	-0.82	-1.58	-0.59	-0.52	-0.82
140°	-0.99	-1.42	-1.93	-2.12	-1.62	-1.54	-1.96	-2.68	-1.05	-0.71	-1.78
145°	-0.86	-1.33	-1.70	-1.71	-1.58	-1.79	-2.53	-2.83	-1.56	-1.77	-3.84
150°	-0.80	-1.21	-1.29	-1.12	-1.14	-1.61	-2.29	-2.00	-1.49	-2.18	-4.05
155°	-0.74	-1.17	-1.15	-0.84	-0.84	-1.54	-1.89	-1.21	-0.94	-2.22	-2.77
160°	-0.71	-1.02	-0.88	-0.57	-0.77	-1.49	-1.73	-0.86	-0.77	-2.32	-1.91
165°	-0.67	-0.89	-0.66	-0.40	-0.68	-1.44	-1.37	-0.53	-0.64	-2.22	-1.47
170°	-0.58	-0.79	-0.47	-0.23	-0.59	-1.32	-1.16	-0.33	-0.57	-2.09	-1.28
175°	-0.57	-0.74	-0.47	-0.21	-0.58	-1.19	-1.07	-0.25	-0.43	-1.93	-1.08
180°	-0.60	-0.75	-0.48	-0.25	-0.60	-1.21	-1.08	-0.30	-0.43	-1.95	-1.03
185°	-0.62	-0.80	-0.54	-0.29	-0.64	-1.28	-1.22	-0.39	-0.49	-2.08	-1.24
190°	-0.61	-0.83	-0.51	-0.24	-0.60	-1.36	-1.25	-0.37	-0.56	-2.18	-1.38
195°	-0.67	-0.92	-0.70	-0.43	-0.70	-1.50	-1.54	-0.64	-0.62	-2.39	-1.76
200°	-0.73	-1.05	-0.95	-0.59	-0.74	-1.52	-1.88	-0.90	-0.69	-2.49	-2.34
205°	-0.73	-1.21	-1.24	-0.88	-0.83	-1.57	-2.09	-1.29	-0.79	-2.26	-3.02
210°	-0.80	-1.26	-1.40	-1.15	-1.08	-1.56	-2.44	-2.15	-1.37	-2.11	-4.31
215°	-0.82	-1.36	-1.80	-1.80	-1.54	-1.74	-2.59	-3.04	-1.46	-1.56	-4.08
220°	-0.96	-1.42	-2.02	-2.24	-1.68	-1.46	-1.99	-3.04	-1.21	-0.72	-2.45
225°	-0.89	-1.22	-1.73	-2.11	-1.49	-0.77	-0.94	-1.76	-0.53	-0.53	-1.05
230°	-0.68	-0.84	-1.08	-1.40	-1.11	-0.54	-0.56	-0.85	-0.82	-0.94	-1.40
235°	-0.47	-0.57	-0.71	-0.96	-1.03	-0.71	-0.71	-0.85	-1.14	-0.98	-2.13
240°	-0.39	-0.46	-0.56	-0.87	-1.08	-0.81	-0.99	-1.11	-1.14	-0.86	-1.81
245°	-0.41	-0.52	-0.59	-0.81	-1.06	-0.85	-1.00	-1.36	-1.03	-0.95	-1.15
250°	-0.37	-0.57	-0.70	-0.97	-1.05	-0.80	-0.82	-1.30	-1.04	-0.75	-0.95
255°	-0.33	-0.59	-0.82	-1.15	-1.07	-0.76	-0.55	-0.81	-0.97	-1.25	-1.60
260°	-0.29	-0.57	-0.83	-1.19	-0.98	-0.73	-0.65	-0.77	-0.88	-1.16	-2.36
265°	-0.26	-0.53	-0.76	-1.02	-0.95	-0.95	-0.95	-1.06	-0.83	-0.71	-1.96
270°	-0.29	-0.51	-0.71	-0.90	-0.97	-1.02	-1.19	-1.32	-0.86	-0.41	-1.04
275°	-0.35	-0.59	-0.75	-0.86	-0.94	-0.95	-1.07	-1.21	-0.89	-0.59	-0.90
280°	-0.43	-0.70	-0.78	-0.86	-0.90	-0.77	-0.77	-0.93	-0.86	-0.76	-1.00
285°	-0.50	-0.74	-0.80	-0.87	-0.80	-0.63	-0.61	-0.73	-0.71	-0.60	-1.07
290°	-0.50	-0.72	-0.77	-0.80	-0.66	-0.59	-0.60	-0.65	-0.61	-0.54	-0.92
295°	-0.44	-0.67	-0.70	-0.66	-0.53	-0.55	-0.57	-0.60	-0.65	-0.53	-0.66
300°	-0.37	-0.63	-0.62	-0.52	-0.39	-0.46	-0.50	-0.56	-0.60	-0.46	-0.49
305°	-0.37	-0.66	-0.59	-0.38	-0.29	-0.41	-0.43	-0.51	-0.42	-0.22	-0.40
310°	-0.44	-0.70	-0.54	-0.28	-0.27	-0.42	-0.42	-0.44	-0.17	-0.06	-0.32
315°	-0.48	-0.66	-0.41	-0.17	-0.32	-0.52	-0.45	-0.34	-0.03	-0.12	-0.36
320°	-0.52	-0.63	-0.29	-0.10	-0.35	-0.57	-0.45	-0.20	-0.08	-0.29	-0.42
325°	-0.48	-0.49	-0.17	-0.09	-0.40	-0.53	-0.37	-0.08	-0.22	-0.40	-0.44
330°	-0.45	-0.37	-0.07	-0.07	-0.39	-0.48	-0.19	-0.05	-0.29	-0.36	-0.40
335°	-0.34	-0.23	0.01	-0.07	-0.35	-0.32	-0.08	-0.01	-0.28	-0.27	-0.33
340°	-0.23	-0.15	0.02	-0.07	-0.25	-0.21	0.04	-0.03	-0.20	-0.13	-0.23
345°	-0.14	-0.08	0.03	-0.03	-0.17	-0.10	0.05	-0.02	-0.11	-0.05	-0.14
350°	-0.06	-0.03	0.03	-0.01	-0.09	-0.02	0.02	-0.01	-0.03	-0.02	-0.06
355°	-0.01	0.00	0.02	0.01	-0.01	0.01	0.02	0.01	0.00	0.00	0.00

Table A.31 Directional response for Windscreen UA-1650, Microphone Type 4193 and Microphone Preamplifier ZC-0032, with the Microphone Preamplifier connected to a microphone extension cable, 500 Hz – 3550 Hz, in dB

Angle	Frequency											
	500 Hz	630 Hz	800 Hz	1000 Hz	1250 Hz	1600 Hz	2000 Hz	2240 Hz	2500 Hz	2800 Hz	3150 Hz	3550 Hz
0°	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
5°	0.01	0.02	0.01	-0.04	-0.02	-0.03	-0.03	-0.03	-0.01	-0.03	-0.06	-0.03
10°	0.01	0.01	0.01	-0.05	-0.04	-0.05	-0.02	-0.04	-0.02	-0.03	-0.05	-0.05
15°	0.02	0.03	0.02	-0.04	-0.03	-0.05	-0.04	-0.03	-0.04	-0.06	-0.06	-0.06
20°	0.03	0.03	0.03	-0.04	-0.03	-0.07	-0.05	-0.04	-0.05	-0.08	-0.08	-0.08
25°	0.03	0.03	0.04	-0.03	-0.05	-0.07	-0.05	-0.06	-0.06	-0.09	-0.09	-0.10
30°	0.04	0.04	0.04	-0.05	-0.07	-0.08	-0.07	-0.06	-0.10	-0.12	-0.12	-0.14
35°	0.03	0.03	0.03	-0.06	-0.07	-0.12	-0.09	-0.09	-0.14	-0.16	-0.14	-0.17
40°	0.04	0.03	0.02	-0.05	-0.09	-0.13	-0.10	-0.11	-0.17	-0.20	-0.18	-0.22
45°	0.03	0.02	0.00	-0.06	-0.12	-0.15	-0.15	-0.13	-0.21	-0.25	-0.24	-0.25
50°	0.03	0.02	0.00	-0.07	-0.14	-0.21	-0.18	-0.16	-0.25	-0.31	-0.30	-0.31
55°	0.02	0.01	-0.02	-0.09	-0.17	-0.24	-0.22	-0.20	-0.27	-0.36	-0.34	-0.37
60°	0.01	0.01	-0.03	-0.11	-0.19	-0.29	-0.27	-0.24	-0.30	-0.41	-0.43	-0.42
65°	0.01	-0.01	-0.04	-0.12	-0.21	-0.32	-0.31	-0.29	-0.34	-0.45	-0.50	-0.49
70°	0.00	-0.02	-0.05	-0.14	-0.24	-0.37	-0.36	-0.34	-0.40	-0.49	-0.56	-0.55
75°	-0.02	-0.03	-0.07	-0.17	-0.26	-0.40	-0.43	-0.39	-0.44	-0.52	-0.61	-0.63
80°	-0.03	-0.04	-0.08	-0.18	-0.28	-0.45	-0.49	-0.44	-0.49	-0.57	-0.66	-0.69
85°	-0.04	-0.06	-0.10	-0.20	-0.30	-0.47	-0.54	-0.52	-0.55	-0.61	-0.71	-0.75
90°	-0.04	-0.06	-0.11	-0.19	-0.32	-0.51	-0.60	-0.58	-0.62	-0.66	-0.76	-0.81
95°	-0.05	-0.07	-0.12	-0.21	-0.34	-0.53	-0.65	-0.65	-0.69	-0.73	-0.80	-0.88
100°	-0.05	-0.07	-0.12	-0.22	-0.35	-0.55	-0.68	-0.69	-0.75	-0.81	-0.86	-0.92
105°	-0.05	-0.07	-0.13	-0.22	-0.36	-0.57	-0.71	-0.73	-0.79	-0.87	-0.93	-0.97
110°	-0.06	-0.08	-0.13	-0.23	-0.36	-0.58	-0.74	-0.76	-0.83	-0.91	-0.99	-1.07
115°	-0.06	-0.09	-0.13	-0.24	-0.37	-0.58	-0.75	-0.78	-0.86	-0.94	-1.03	-1.11
120°	-0.07	-0.09	-0.13	-0.23	-0.36	-0.58	-0.75	-0.79	-0.88	-0.97	-1.05	-1.12
125°	-0.06	-0.08	-0.13	-0.23	-0.37	-0.57	-0.73	-0.78	-0.88	-0.98	-1.07	-1.15
130°	-0.05	-0.08	-0.13	-0.22	-0.36	-0.55	-0.72	-0.77	-0.87	-0.96	-1.06	-1.16
135°	-0.05	-0.08	-0.12	-0.22	-0.35	-0.53	-0.71	-0.74	-0.83	-0.92	-1.04	-1.15
140°	-0.05	-0.07	-0.11	-0.21	-0.35	-0.51	-0.68	-0.71	-0.80	-0.89	-0.99	-1.10
145°	-0.04	-0.07	-0.11	-0.22	-0.34	-0.49	-0.66	-0.68	-0.76	-0.83	-0.93	-1.03
150°	-0.04	-0.06	-0.11	-0.21	-0.34	-0.47	-0.63	-0.65	-0.70	-0.77	-0.86	-0.95
155°	-0.04	-0.06	-0.10	-0.19	-0.33	-0.45	-0.60	-0.61	-0.66	-0.72	-0.79	-0.86
160°	-0.04	-0.06	-0.10	-0.19	-0.32	-0.45	-0.58	-0.58	-0.62	-0.67	-0.72	-0.79
165°	-0.04	-0.06	-0.10	-0.19	-0.31	-0.43	-0.56	-0.55	-0.59	-0.62	-0.67	-0.71
170°	-0.04	-0.06	-0.10	-0.19	-0.30	-0.43	-0.53	-0.53	-0.56	-0.59	-0.63	-0.65
175°	-0.04	-0.06	-0.09	-0.19	-0.30	-0.43	-0.53	-0.52	-0.55	-0.58	-0.61	-0.64
180°	-0.05	-0.07	-0.09	-0.17	-0.31	-0.43	-0.53	-0.51	-0.55	-0.57	-0.60	-0.62
185°	-0.03	-0.04	-0.09	-0.19	-0.30	-0.43	-0.54	-0.52	-0.56	-0.58	-0.61	-0.64
190°	-0.04	-0.06	-0.10	-0.20	-0.32	-0.44	-0.55	-0.54	-0.57	-0.60	-0.64	-0.68
195°	-0.04	-0.06	-0.10	-0.20	-0.33	-0.44	-0.57	-0.57	-0.61	-0.64	-0.69	-0.74
200°	-0.04	-0.06	-0.10	-0.20	-0.35	-0.46	-0.60	-0.60	-0.64	-0.69	-0.75	-0.81
205°	-0.05	-0.07	-0.10	-0.21	-0.35	-0.48	-0.63	-0.63	-0.70	-0.75	-0.82	-0.89
210°	-0.04	-0.07	-0.11	-0.22	-0.36	-0.50	-0.66	-0.67	-0.74	-0.80	-0.90	-0.97
215°	-0.05	-0.07	-0.11	-0.22	-0.37	-0.52	-0.69	-0.72	-0.79	-0.86	-0.96	-1.07
220°	-0.06	-0.08	-0.12	-0.25	-0.38	-0.55	-0.72	-0.75	-0.82	-0.91	-1.03	-1.14
225°	-0.06	-0.08	-0.12	-0.24	-0.39	-0.57	-0.74	-0.78	-0.86	-0.96	-1.08	-1.19
230°	-0.06	-0.09	-0.13	-0.24	-0.40	-0.59	-0.76	-0.81	-0.90	-1.00	-1.11	-1.20
235°	-0.06	-0.09	-0.14	-0.26	-0.40	-0.61	-0.78	-0.83	-0.92	-1.02	-1.11	-1.19
240°	-0.07	-0.09	-0.14	-0.25	-0.41	-0.62	-0.78	-0.83	-0.91	-1.00	-1.08	-1.17
245°	-0.07	-0.09	-0.14	-0.26	-0.42	-0.62	-0.79	-0.83	-0.90	-0.98	-1.05	-1.15
250°	-0.06	-0.08	-0.13	-0.26	-0.42	-0.61	-0.78	-0.81	-0.87	-0.94	-1.03	-1.11
255°	-0.06	-0.08	-0.13	-0.25	-0.40	-0.60	-0.75	-0.78	-0.83	-0.90	-0.97	-1.02
260°	-0.04	-0.07	-0.12	-0.25	-0.40	-0.58	-0.72	-0.74	-0.79	-0.85	-0.89	-0.96
265°	-0.05	-0.08	-0.12	-0.22	-0.38	-0.55	-0.69	-0.69	-0.73	-0.76	-0.83	-0.93
270°	-0.05	-0.07	-0.11	-0.21	-0.37	-0.54	-0.64	-0.63	-0.66	-0.69	-0.80	-0.88
275°	-0.05	-0.07	-0.10	-0.19	-0.34	-0.51	-0.59	-0.56	-0.57	-0.65	-0.75	-0.80
280°	-0.03	-0.05	-0.09	-0.19	-0.32	-0.48	-0.53	-0.49	-0.52	-0.60	-0.70	-0.75
285°	-0.02	-0.04	-0.07	-0.17	-0.30	-0.44	-0.46	-0.42	-0.47	-0.56	-0.65	-0.68
290°	-0.01	-0.02	-0.06	-0.15	-0.26	-0.40	-0.40	-0.37	-0.42	-0.52	-0.60	-0.61
295°	0.01	-0.01	-0.04	-0.15	-0.23	-0.35	-0.34	-0.32	-0.36	-0.48	-0.53	-0.54
300°	0.01	-0.01	-0.03	-0.13	-0.21	-0.31	-0.28	-0.27	-0.32	-0.44	-0.45	-0.46
305°	0.02	0.00	-0.02	-0.09	-0.18	-0.26	-0.23	-0.22	-0.28	-0.38	-0.39	-0.41
310°	0.03	0.01	-0.01	-0.10	-0.16	-0.21	-0.19	-0.18	-0.26	-0.32	-0.32	-0.34
315°	0.01	0.01	0.00	-0.08	-0.12	-0.18	-0.16	-0.14	-0.21	-0.26	-0.27	-0.27
320°	0.04	0.03	0.02	-0.06	-0.10	-0.13	-0.11	-0.11	-0.18	-0.21	-0.20	-0.23
325°	0.04	0.03	0.03	-0.02	-0.08	-0.10	-0.07	-0.08	-0.14	-0.17	-0.13	-0.16
330°	0.04	0.04	0.04	0.02	-0.04	-0.09	-0.03	-0.06	-0.09	-0.10	-0.12	-0.11
335°	0.04	0.03	0.03	0.02	-0.03	-0.04	-0.01	-0.02	-0.06	-0.06	-0.07	-0.06
340°	0.03	0.03	0.03	0.00	-0.01	-0.03	0.00	-0.01	-0.01	-0.03	-0.02	-0.03
345°	0.03	0.03	0.02	0.03	0.02	-0.01	0.02	0.02	0.01	0.00	0.00	-0.02
350°	0.01	0.01	0.02	0.02	0.02	0.00	0.02	0.02	0.03	0.02	0.01	0.02
355°	0.01	0.01	0.01	0.05	0.03	0.02	0.05	0.03	0.04	0.03	0.05	0.02

Table A.32 Directional response for Windscreen UA-1650, Microphone Type 4193 and Microphone Preamplifier ZC-0032, with the Microphone Preamplifier connected to a microphone extension cable, 4000 Hz – 10600 Hz, in dB

Angle	Frequency											
	4000 Hz	4500 Hz	5000 Hz	5600 Hz	6300 Hz	7100 Hz	8000 Hz	8500 Hz	9000 Hz	9500 Hz	10000 Hz	10600 Hz
0°	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01	-0.01	-0.01
5°	-0.03	-0.04	-0.03	-0.06	-0.03	-0.03	-0.05	-0.07	-0.03	-0.05	-0.04	-0.06
10°	-0.03	-0.07	-0.05	-0.06	-0.06	-0.06	-0.12	-0.14	-0.09	-0.07	-0.08	-0.15
15°	-0.06	-0.11	-0.07	-0.10	-0.06	-0.07	-0.24	-0.28	-0.21	-0.09	-0.16	-0.28
20°	-0.08	-0.18	-0.15	-0.21	-0.10	-0.09	-0.42	-0.47	-0.39	-0.13	-0.28	-0.40
25°	-0.11	-0.24	-0.21	-0.30	-0.12	-0.13	-0.64	-0.64	-0.65	-0.21	-0.46	-0.50
30°	-0.15	-0.34	-0.32	-0.42	-0.17	-0.22	-0.87	-0.89	-0.98	-0.37	-0.67	-0.60
35°	-0.21	-0.43	-0.42	-0.56	-0.22	-0.37	-1.06	-1.19	-1.32	-0.62	-0.83	-0.73
40°	-0.26	-0.52	-0.59	-0.69	-0.28	-0.52	-1.22	-1.50	-1.58	-1.06	-1.06	-1.01
45°	-0.32	-0.61	-0.79	-0.83	-0.43	-0.66	-1.26	-1.84	-1.92	-1.56	-1.35	-1.28
50°	-0.40	-0.69	-0.98	-1.01	-0.66	-0.80	-1.33	-2.08	-2.27	-1.92	-1.91	-1.61
55°	-0.46	-0.78	-1.14	-1.18	-0.86	-0.83	-1.50	-2.13	-2.74	-2.16	-2.47	-1.94
60°	-0.54	-0.87	-1.27	-1.46	-1.10	-0.97	-1.73	-2.24	-2.99	-2.53	-2.84	-2.57
65°	-0.63	-0.98	-1.35	-1.73	-1.26	-1.22	-1.89	-2.44	-3.15	-2.92	-3.06	-3.14
70°	-0.69	-1.12	-1.44	-1.90	-1.49	-1.53	-1.98	-2.65	-3.37	-3.17	-3.43	-3.41
75°	-0.75	-1.23	-1.61	-2.01	-1.84	-1.74	-2.25	-2.70	-3.68	-3.40	-3.71	-3.81
80°	-0.82	-1.36	-1.79	-2.05	-2.13	-1.95	-2.74	-2.92	-3.77	-3.80	-3.85	-4.15
85°	-0.88	-1.42	-2.01	-2.21	-2.29	-2.23	-3.05	-3.41	-3.90	-3.99	-4.28	-4.18
90°	-0.93	-1.48	-2.15	-2.44	-2.33	-2.51	-3.30	-3.80	-4.37	-4.04	-4.61	-4.45
95°	-0.99	-1.52	-2.21	-2.70	-2.48	-2.63	-3.45	-4.02	-4.87	-4.41	-4.70	-4.89
100°	-1.08	-1.59	-2.26	-2.89	-2.69	-2.76	-3.71	-4.16	-5.11	-4.94	-5.00	-5.08
105°	-1.15	-1.68	-2.30	-2.95	-2.88	-2.88	-3.94	-4.31	-5.22	-5.24	-5.49	-5.44
110°	-1.20	-1.76	-2.41	-3.04	-2.98	-2.99	-4.18	-4.61	-5.38	-5.42	-5.79	-5.81
115°	-1.29	-1.84	-2.51	-3.12	-3.05	-3.00	-4.28	-4.87	-5.75	-5.78	-6.00	-5.98
120°	-1.33	-1.91	-2.57	-3.18	-3.13	-3.05	-4.27	-4.96	-5.93	-6.17	-6.49	-6.19
125°	-1.33	-1.95	-2.64	-3.27	-3.18	-3.15	-4.33	-5.05	-6.03	-6.32	-6.73	-6.46
130°	-1.34	-1.95	-2.64	-3.31	-3.24	-3.21	-4.35	-5.12	-6.13	-6.33	-6.78	-6.62
135°	-1.34	-1.97	-2.64	-3.27	-3.22	-3.21	-4.28	-5.07	-6.10	-6.25	-6.67	-6.64
140°	-1.29	-1.93	-2.61	-3.30	-3.22	-3.21	-4.23	-4.96	-5.91	-6.03	-6.37	-6.49
145°	-1.21	-1.84	-2.53	-3.23	-3.21	-3.26	-4.27	-4.95	-5.86	-5.80	-6.08	-6.21
150°	-1.11	-1.72	-2.38	-3.08	-3.08	-3.20	-4.25	-4.90	-5.86	-5.76	-6.04	-6.17
155°	-1.00	-1.59	-2.22	-2.90	-2.88	-3.05	-4.09	-4.70	-5.61	-5.57	-5.97	-6.15
160°	-0.90	-1.46	-2.07	-2.72	-2.66	-2.81	-3.82	-4.36	-5.22	-5.19	-5.60	-5.87
165°	-0.81	-1.35	-1.93	-2.53	-2.45	-2.57	-3.51	-4.02	-4.80	-4.74	-5.14	-5.41
170°	-0.74	-1.25	-1.81	-2.39	-2.31	-2.35	-3.25	-3.73	-4.44	-4.36	-4.77	-4.99
175°	-0.70	-1.20	-1.75	-2.30	-2.21	-2.22	-3.08	-3.53	-4.22	-4.13	-4.51	-4.76
180°	-0.68	-1.18	-1.73	-2.30	-2.20	-2.19	-3.03	-3.48	-4.17	-4.09	-4.45	-4.69
185°	-0.71	-1.20	-1.77	-2.33	-2.23	-2.23	-3.11	-3.58	-4.28	-4.21	-4.58	-4.82
190°	-0.75	-1.27	-1.85	-2.43	-2.34	-2.37	-3.27	-3.79	-4.53	-4.48	-4.85	-5.04
195°	-0.84	-1.37	-1.98	-2.59	-2.48	-2.54	-3.51	-4.08	-4.90	-4.86	-5.20	-5.41
200°	-0.94	-1.50	-2.13	-2.74	-2.65	-2.79	-3.84	-4.47	-5.35	-5.31	-5.63	-5.85
205°	-1.04	-1.63	-2.30	-2.92	-2.87	-3.05	-4.16	-4.83	-5.74	-5.64	-5.92	-6.08
210°	-1.15	-1.77	-2.45	-3.09	-3.06	-3.20	-4.37	-5.04	-5.96	-5.78	-6.02	-6.16
215°	-1.24	-1.89	-2.59	-3.23	-3.17	-3.29	-4.42	-5.04	-5.97	-5.81	-6.12	-6.22
220°	-1.33	-1.97	-2.66	-3.30	-3.21	-3.28	-4.36	-4.99	-6.04	-6.06	-6.43	-6.42
225°	-1.39	-2.00	-2.68	-3.28	-3.22	-3.24	-4.34	-5.07	-6.26	-6.30	-6.63	-6.51
230°	-1.37	-1.99	-2.68	-3.32	-3.24	-3.20	-4.39	-5.14	-6.25	-6.28	-6.60	-6.59
235°	-1.35	-1.99	-2.68	-3.30	-3.16	-3.15	-4.35	-5.09	-6.08	-6.14	-6.55	-6.52
240°	-1.35	-1.97	-2.61	-3.21	-3.12	-3.09	-4.30	-4.93	-5.89	-6.05	-6.50	-6.32
245°	-1.32	-1.87	-2.55	-3.13	-3.07	-3.09	-4.21	-4.82	-5.79	-5.78	-6.12	-6.11
250°	-1.24	-1.81	-2.47	-3.06	-3.02	-3.06	-4.15	-4.70	-5.51	-5.45	-5.93	-5.94
255°	-1.17	-1.75	-2.38	-3.00	-2.94	-2.95	-4.00	-4.46	-5.26	-5.27	-5.67	-5.59
260°	-1.13	-1.66	-2.32	-2.90	-2.75	-2.85	-3.80	-4.21	-5.11	-5.07	-5.20	-5.16
265°	-1.05	-1.60	-2.27	-2.73	-2.54	-2.74	-3.50	-4.08	-4.93	-4.53	-4.83	-4.91
270°	-0.99	-1.55	-2.19	-2.48	-2.41	-2.58	-3.35	-3.89	-4.42	-4.12	-4.78	-4.56
275°	-0.93	-1.47	-2.05	-2.26	-2.33	-2.28	-3.09	-3.50	-3.89	-4.14	-4.51	-4.22
280°	-0.87	-1.41	-1.84	-2.11	-2.18	-2.00	-2.79	-2.98	-3.82	-4.06	-4.02	-4.18
285°	-0.79	-1.31	-1.64	-2.06	-1.91	-1.77	-2.33	-2.78	-3.82	-3.62	-3.78	-3.86
290°	-0.73	-1.18	-1.48	-1.93	-1.56	-1.58	-2.05	-2.78	-3.53	-3.31	-3.48	-3.42
295°	-0.66	-1.05	-1.38	-1.75	-1.27	-1.31	-2.00	-2.60	-3.25	-3.02	-3.05	-3.13
300°	-0.59	-0.92	-1.28	-1.47	-1.10	-1.05	-1.88	-2.37	-3.03	-2.61	-2.78	-2.62
305°	-0.49	-0.81	-1.16	-1.18	-0.89	-0.87	-1.67	-2.18	-2.79	-2.18	-2.46	-2.01
310°	-0.41	-0.72	-0.98	-0.99	-0.70	-0.82	-1.46	-2.07	-2.32	-1.91	-1.99	-1.65
315°	-0.33	-0.63	-0.77	-0.83	-0.49	-0.72	-1.32	-1.85	-1.97	-1.58	-1.45	-1.34
320°	-0.27	-0.53	-0.57	-0.66	-0.32	-0.59	-1.25	-1.50	-1.62	-1.15	-1.12	-1.06
325°	-0.20	-0.44	-0.41	-0.54	-0.23	-0.45	-1.09	-1.17	-1.34	-0.70	-0.84	-0.76
330°	-0.16	-0.34	-0.28	-0.41	-0.16	-0.27	-0.87	-0.85	-1.02	-0.41	-0.65	-0.61
335°	-0.10	-0.22	-0.17	-0.28	-0.10	-0.14	-0.67	-0.60	-0.68	-0.19	-0.41	-0.50
340°	-0.06	-0.13	-0.10	-0.15	-0.05	-0.06	-0.44	-0.40	-0.42	-0.08	-0.22	-0.39
345°	-0.01	-0.05	-0.03	-0.05	-0.02	-0.01	-0.22	-0.23	-0.22	-0.01	-0.09	-0.26
350°	-0.01	0.00	0.02	0.01	0.02	0.01	-0.08	-0.09	-0.08	0.01	-0.01	-0.12
355°	0.01	0.03	0.03	0.02	0.03	0.05	0.00	0.01	0.00	0.05	0.04	0.00

Table A.33 Directional response for Windscreen UA-1650, Microphone Type 4193 and Microphone Preamplifier ZC-0032 with the Microphone Preamplifier connected to a microphone extension cable, 11200 Hz – 20000 Hz, in dB

Angle	Frequency										
	11200 Hz	11800 Hz	12500 Hz	13200 Hz	14000 Hz	15000 Hz	16000 Hz	17000 Hz	18000 Hz	19000 Hz	20000 Hz
0°	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02
5°	-0.06	-0.06	-0.06	-0.05	-0.07	-0.05	-0.07	-0.07	-0.05	-0.04	-0.09
10°	-0.17	-0.16	-0.14	-0.11	-0.21	-0.16	-0.17	-0.17	-0.17	-0.17	-0.29
15°	-0.35	-0.36	-0.26	-0.22	-0.46	-0.40	-0.30	-0.36	-0.38	-0.36	-0.56
20°	-0.60	-0.61	-0.41	-0.43	-0.80	-0.72	-0.48	-0.65	-0.64	-0.66	-0.88
25°	-0.94	-0.90	-0.58	-0.72	-1.19	-1.01	-0.76	-0.95	-0.99	-1.15	-1.32
30°	-1.39	-1.25	-0.86	-1.14	-1.46	-1.38	-1.15	-1.46	-1.47	-1.76	-1.91
35°	-1.75	-1.55	-1.34	-1.53	-1.74	-1.79	-1.85	-1.95	-1.94	-2.24	-2.47
40°	-1.97	-2.03	-1.90	-1.76	-2.17	-2.33	-2.38	-2.33	-2.29	-2.60	-2.98
45°	-2.05	-2.53	-2.30	-2.21	-2.77	-2.62	-2.73	-2.93	-2.84	-3.33	-3.64
50°	-2.36	-2.87	-2.73	-2.96	-3.01	-3.06	-3.44	-3.70	-3.48	-3.92	-4.15
55°	-2.78	-3.01	-3.28	-3.47	-3.45	-3.87	-3.99	-4.12	-4.41	-4.71	-5.18
60°	-3.12	-3.54	-3.49	-4.06	-4.25	-4.29	-4.62	-5.03	-5.38	-5.44	-5.73
65°	-3.55	-4.21	-3.87	-4.75	-4.62	-5.18	-5.20	-5.65	-6.10	-6.36	-6.79
70°	-4.12	-4.58	-4.78	-5.06	-5.37	-5.65	-5.64	-6.56	-6.73	-6.96	-7.95
75°	-4.35	-5.09	-5.29	-5.82	-5.98	-5.95	-6.60	-7.05	-7.33	-8.29	-8.75
80°	-4.75	-5.22	-5.88	-6.23	-6.87	-6.69	-7.14	-7.88	-8.25	-8.87	-9.51
85°	-5.28	-5.51	-6.03	-6.76	-7.26	-7.76	-8.11	-8.31	-9.10	-9.31	-10.05
90°	-5.25	-6.23	-6.20	-7.28	-7.56	-8.50	-8.64	-9.72	-9.05	-10.05	-11.08
95°	-5.45	-6.29	-6.98	-7.62	-8.22	-8.34	-9.41	-9.59	-10.52	-10.70	-12.20
100°	-5.92	-6.51	-7.20	-8.27	-8.57	-8.99	-9.02	-10.16	-10.62	-12.18	-13.49
105°	-6.19	-6.92	-7.43	-8.49	-8.91	-9.34	-9.85	-10.18	-11.28	-12.48	-13.32
110°	-6.55	-7.16	-7.63	-8.60	-9.40	-9.55	-10.09	-11.34	-11.84	-12.58	-13.24
115°	-6.80	-7.35	-7.83	-8.73	-9.56	-10.10	-10.59	-11.28	-12.11	-13.33	-13.86
120°	-6.97	-7.49	-7.97	-9.12	-9.93	-10.05	-10.72	-11.72	-12.62	-13.28	-14.12
125°	-7.21	-7.83	-8.36	-9.29	-10.04	-10.41	-10.67	-11.61	-12.87	-13.75	-14.81
130°	-7.37	-8.01	-8.87	-9.96	-10.17	-10.24	-10.99	-11.94	-12.72	-13.49	-14.25
135°	-7.49	-8.24	-9.28	-10.51	-10.51	-10.52	-11.28	-12.86	-12.46	-13.34	-14.59
140°	-7.44	-8.36	-9.36	-10.33	-10.53	-11.18	-12.28	-13.74	-12.98	-13.48	-15.36
145°	-7.18	-8.21	-9.05	-9.74	-10.16	-11.06	-12.63	-13.55	-13.02	-14.33	-17.24
150°	-7.17	-8.12	-8.69	-9.16	-9.64	-10.65	-12.09	-12.55	-12.63	-14.22	-17.02
155°	-7.16	-8.12	-8.64	-9.04	-9.52	-10.68	-11.67	-11.79	-12.08	-14.05	-15.46
160°	-6.96	-7.78	-8.21	-8.69	-9.49	-10.71	-11.61	-11.49	-12.09	-14.38	-14.67
165°	-6.52	-7.24	-7.54	-8.05	-8.96	-10.30	-10.87	-10.78	-11.70	-14.18	-14.15
170°	-6.03	-6.70	-6.83	-7.31	-8.27	-9.55	-9.96	-9.83	-10.88	-13.30	-13.27
175°	-5.74	-6.34	-6.46	-6.89	-7.80	-8.93	-9.33	-9.16	-10.07	-12.44	-12.31
180°	-5.67	-6.24	-6.37	-6.79	-7.66	-8.77	-9.13	-8.98	-9.82	-12.17	-11.96
185°	-5.80	-6.41	-6.56	-6.99	-7.88	-9.02	-9.45	-9.29	-10.12	-12.57	-12.45
190°	-6.07	-6.75	-6.89	-7.37	-8.28	-9.53	-9.96	-9.87	-10.87	-13.34	-13.26
195°	-6.54	-7.30	-7.62	-8.13	-8.93	-10.25	-10.91	-10.91	-11.61	-14.22	-14.41
200°	-7.00	-7.86	-8.32	-8.68	-9.32	-10.64	-11.72	-11.52	-11.83	-14.46	-15.17
205°	-7.20	-8.19	-8.69	-8.94	-9.38	-10.72	-11.86	-11.64	-11.74	-14.14	-15.59
210°	-7.24	-8.14	-8.67	-9.08	-9.59	-10.67	-12.05	-12.49	-12.49	-14.09	-17.04
215°	-7.14	-8.15	-9.10	-9.88	-10.19	-10.89	-12.41	-13.80	-12.85	-13.89	-17.40
220°	-7.28	-8.36	-9.54	-10.51	-10.44	-10.86	-12.23	-14.04	-12.96	-13.57	-15.99
225°	-7.41	-8.39	-9.37	-10.50	-10.55	-10.55	-11.36	-13.02	-12.43	-13.23	-14.58
230°	-7.42	-8.07	-8.82	-10.01	-10.32	-10.22	-10.87	-11.93	-12.47	-13.64	-14.79
235°	-7.25	-7.77	-8.52	-9.39	-9.89	-10.24	-10.82	-11.81	-12.81	-13.40	-15.43
240°	-7.06	-7.52	-8.10	-9.07	-9.93	-10.20	-10.89	-11.80	-12.32	-13.06	-14.71
245°	-6.90	-7.38	-7.99	-9.00	-9.57	-9.81	-10.55	-11.70	-12.15	-12.89	-14.08
250°	-6.63	-7.29	-7.87	-8.63	-9.21	-9.52	-10.24	-11.55	-11.83	-12.51	-13.23
255°	-6.27	-6.96	-7.46	-8.62	-9.09	-9.19	-9.76	-10.61	-11.38	-12.29	-13.48
260°	-5.92	-6.50	-7.39	-8.46	-8.54	-8.96	-9.20	-10.18	-10.63	-12.09	-13.85
265°	-5.52	-6.40	-7.09	-7.73	-8.36	-8.41	-9.32	-9.85	-10.55	-10.68	-12.55
270°	-5.37	-6.23	-6.32	-7.51	-7.62	-8.34	-8.86	-9.96	-9.29	-9.98	-11.15
275°	-5.32	-5.59	-6.18	-6.85	-7.26	-7.81	-8.17	-8.67	-9.23	-9.24	-10.39
280°	-4.81	-5.28	-5.94	-6.29	-6.99	-6.70	-7.32	-8.03	-8.39	-9.02	-9.63
285°	-4.39	-5.08	-5.38	-6.00	-6.06	-6.06	-6.65	-7.24	-7.48	-8.23	-9.00
290°	-4.14	-4.61	-4.94	-5.21	-5.44	-5.68	-5.85	-6.72	-6.69	-7.17	-8.19
295°	-3.61	-4.29	-4.08	-4.79	-4.70	-5.26	-5.23	-5.82	-6.29	-6.47	-7.00
300°	-3.19	-3.70	-3.54	-4.20	-4.24	-4.35	-4.83	-5.22	-5.46	-5.63	-5.89
305°	-2.90	-3.08	-3.36	-3.50	-3.56	-3.93	-4.12	-4.32	-4.68	-4.87	-5.36
310°	-2.46	-2.87	-2.85	-3.00	-3.01	-3.25	-3.66	-3.79	-3.56	-4.03	-4.31
315°	-2.09	-2.60	-2.30	-2.31	-2.84	-2.72	-2.91	-3.20	-2.97	-3.49	-3.78
320°	-1.97	-2.11	-1.91	-1.78	-2.33	-2.41	-2.47	-2.42	-2.40	-2.80	-3.20
325°	-1.77	-1.56	-1.41	-1.52	-1.82	-1.94	-2.02	-2.00	-2.01	-2.35	-2.55
330°	-1.44	-1.22	-0.92	-1.19	-1.47	-1.45	-1.32	-1.58	-1.58	-1.90	-2.04
335°	-0.98	-0.89	-0.57	-0.79	-1.20	-1.03	-0.82	-1.03	-1.07	-1.27	-1.45
340°	-0.59	-0.61	-0.38	-0.45	-0.84	-0.73	-0.47	-0.65	-0.69	-0.70	-0.91
345°	-0.31	-0.35	-0.21	-0.21	-0.49	-0.41	-0.28	-0.37	-0.39	-0.38	-0.55
350°	-0.12	-0.15	-0.09	-0.08	-0.22	-0.16	-0.13	-0.16	-0.18	-0.16	-0.24
355°	0.00	-0.01	-0.01	0.02	-0.03	-0.01	0.00	-0.02	-0.04	-0.03	-0.03

Table A.34 Sensitivity variations for Windscreen UA-1650, Microphone Type 4193 and Microphone Preamplifier ZC-0032, with the Microphone Preamplifier connected to a microphone extension cable, at sound incidence angles within $\pm\theta^\circ$ from the reference direction

Nominal Frequency	Exact Frequency	Max Variation $\pm 30^\circ$ dB	Max Variation $\pm 90^\circ$ dB	Max Variation $\pm 150^\circ$ dB
500 Hz	501.187 Hz	0.03	0.26	0.30
630 Hz	630.957 Hz	0.04	0.32	0.37
800 Hz	794.328 Hz	0.05	0.16	0.18
1000 Hz	1000 Hz	0.10	0.26	0.31
1250 Hz	1258.93 Hz	0.10	0.40	0.45
1600 Hz	1584.89 Hz	0.10	0.56	0.64
2000 Hz	1995.26 Hz	0.12	0.69	0.83
2240 Hz	2238.72 Hz	0.09	0.66	0.87
2500 Hz	2511.89 Hz	0.14	0.70	0.96
2800 Hz	2818.38 Hz	0.15	0.72	1.05
3150 Hz	3162.28 Hz	0.17	0.85	1.16
3550 Hz	3548.13 Hz	0.16	0.90	1.23
4000 Hz	3981.07 Hz	0.17	1.00	1.40
4500 Hz	4466.84 Hz	0.37	1.58	2.03
5000 Hz	5011.87 Hz	0.35	2.23	2.71
5600 Hz	5623.41 Hz	0.44	2.50	3.34
6300 Hz	6309.57 Hz	0.21	2.44	3.27
7100 Hz	7079.46 Hz	0.32	2.63	3.34
8000 Hz	7943.28 Hz	0.89	3.36	4.43
8500 Hz	8413.95 Hz	0.91	3.91	5.16
9000 Hz	8912.51 Hz	1.04	4.44	6.28
9500 Hz	9440.61 Hz	0.46	4.20	6.38
10000 Hz	10000 Hz	0.71	4.81	6.82
10600 Hz	10592.5 Hz	0.63	4.57	6.66
11200 Hz	11220.2 Hz	1.45	5.38	7.51
11800 Hz	11885.0 Hz	1.26	6.24	8.40
12500 Hz	12589.3 Hz	0.94	6.34	9.56
13200 Hz	13335.2 Hz	1.21	7.53	10.53
14000 Hz	14125.4 Hz	1.49	7.63	10.56
15000 Hz	14962.4 Hz	1.46	8.52	11.19
16000 Hz	15848.9 Hz	1.33	8.87	12.64
17000 Hz	16788.0 Hz	1.60	9.98	14.06
18000 Hz	17782.8 Hz	1.59	9.31	13.03
19000 Hz	18836.5 Hz	1.92	10.06	14.35
20000 Hz	19952.6 Hz	2.06	11.17	17.42

Table A.35 Directional response for Windscreen UA-1650, Microphone Type 4193, Microphone Preamplifier ZC-0032 and the analyzer with the Microphone Preamplifier mounted directly on the analyzer, measured in a plane parallel to the display and along the microphone's axis, 500 Hz – 3550 Hz, in dB

Angle	Frequency											
	500 Hz	630 Hz	800 Hz	1000 Hz	1250 Hz	1600 Hz	2000 Hz	2240 Hz	2500 Hz	2800 Hz	3150 Hz	3550 Hz
0°	-0.01	-0.02	-0.01	-0.01	0.00	0.00	-0.01	-0.02	-0.01	-0.02	-0.02	-0.02
5°	0.00	-0.02	0.00	0.00	0.00	0.00	-0.01	-0.02	-0.02	-0.01	-0.02	-0.02
10°	-0.01	-0.02	-0.01	0.00	-0.02	-0.01	-0.03	-0.01	-0.04	-0.01	-0.04	-0.02
15°	-0.01	-0.02	-0.01	0.01	-0.04	-0.01	-0.05	0.00	-0.07	0.00	-0.08	-0.03
20°	-0.01	-0.02	-0.01	0.03	-0.06	-0.03	-0.10	0.00	-0.11	0.00	-0.14	-0.02
25°	0.00	-0.02	-0.02	0.05	-0.09	-0.05	-0.15	-0.01	-0.15	-0.02	-0.20	-0.02
30°	0.00	-0.01	-0.02	0.07	-0.11	-0.08	-0.21	-0.03	-0.17	-0.06	-0.25	-0.04
35°	0.01	0.00	-0.03	0.06	-0.11	-0.15	-0.25	-0.09	-0.15	-0.14	-0.27	-0.09
40°	0.01	0.02	-0.03	0.07	-0.10	-0.24	-0.27	-0.19	-0.11	-0.24	-0.27	-0.17
45°	0.00	0.03	-0.03	0.06	-0.07	-0.36	-0.26	-0.31	-0.10	-0.33	-0.30	-0.24
50°	-0.01	0.04	-0.01	0.05	-0.04	-0.48	-0.24	-0.39	-0.16	-0.37	-0.37	-0.29
55°	-0.01	0.06	0.02	0.03	0.00	-0.55	-0.24	-0.41	-0.32	-0.33	-0.50	-0.32
60°	-0.04	0.04	0.06	0.02	0.02	-0.57	-0.32	-0.36	-0.52	-0.32	-0.62	-0.39
65°	-0.05	0.04	0.08	0.04	0.01	-0.53	-0.49	-0.33	-0.61	-0.45	-0.64	-0.48
70°	-0.09	0.01	0.11	0.06	-0.01	-0.45	-0.71	-0.40	-0.55	-0.69	-0.64	-0.59
75°	-0.11	-0.01	0.12	0.10	-0.04	-0.37	-0.86	-0.62	-0.47	-0.83	-0.78	-0.65
80°	-0.13	-0.05	0.12	0.15	-0.06	-0.32	-0.85	-0.89	-0.55	-0.77	-1.04	-0.72
85°	-0.17	-0.08	0.11	0.19	-0.05	-0.33	-0.69	-0.99	-0.83	-0.70	-1.12	-0.96
90°	-0.19	-0.11	0.08	0.24	-0.01	-0.38	-0.51	-0.85	-1.09	-0.89	-1.01	-1.20
95°	-0.22	-0.17	0.03	0.26	0.06	-0.43	-0.43	-0.59	-1.02	-1.21	-1.06	-1.15
100°	-0.26	-0.23	-0.03	0.24	0.15	-0.44	-0.47	-0.43	-0.68	-1.24	-1.36	-1.11
105°	-0.28	-0.28	-0.11	0.19	0.20	-0.38	-0.56	-0.47	-0.41	-0.85	-1.46	-1.33
110°	-0.31	-0.32	-0.20	0.11	0.21	-0.28	-0.61	-0.61	-0.43	-0.47	-1.04	-1.38
115°	-0.32	-0.35	-0.28	0.00	0.15	-0.22	-0.53	-0.68	-0.64	-0.47	-0.59	-0.90
120°	-0.31	-0.37	-0.35	-0.12	0.03	-0.24	-0.38	-0.57	-0.76	-0.74	-0.61	-0.44
125°	-0.32	-0.39	-0.41	-0.24	-0.12	-0.37	-0.30	-0.38	-0.62	-0.88	-0.95	-0.57
130°	-0.31	-0.37	-0.43	-0.32	-0.27	-0.56	-0.39	-0.31	-0.41	-0.71	-1.06	-0.99
135°	-0.30	-0.36	-0.43	-0.37	-0.38	-0.78	-0.63	-0.46	-0.37	-0.51	-0.80	-1.00
140°	-0.31	-0.35	-0.41	-0.38	-0.44	-0.94	-0.96	-0.80	-0.62	-0.59	-0.65	-0.69
145°	-0.28	-0.33	-0.38	-0.35	-0.43	-0.99	-1.23	-1.17	-1.06	-0.99	-0.92	-0.69
150°	-0.26	-0.29	-0.33	-0.31	-0.37	-0.94	-1.32	-1.38	-1.41	-1.46	-1.48	-1.19
155°	-0.24	-0.26	-0.28	-0.23	-0.29	-0.80	-1.23	-1.34	-1.49	-1.69	-1.91	-1.78
160°	-0.24	-0.24	-0.23	-0.17	-0.18	-0.64	-1.02	-1.12	-1.29	-1.53	-1.88	-1.93
165°	-0.21	-0.21	-0.19	-0.10	-0.09	-0.48	-0.78	-0.83	-0.96	-1.16	-1.49	-1.57
170°	-0.21	-0.20	-0.16	-0.05	-0.02	-0.36	-0.59	-0.59	-0.65	-0.78	-1.03	-1.04
175°	-0.20	-0.18	-0.14	-0.02	0.03	-0.28	-0.46	-0.42	-0.45	-0.52	-0.71	-0.65
180°	-0.20	-0.19	-0.13	-0.01	0.04	-0.26	-0.41	-0.36	-0.37	-0.43	-0.58	-0.50
185°	-0.22	-0.23	-0.13	0.01	0.02	-0.28	-0.45	-0.41	-0.43	-0.51	-0.68	-0.62
190°	-0.20	-0.19	-0.16	-0.04	-0.02	-0.36	-0.56	-0.56	-0.62	-0.74	-0.97	-0.99
195°	-0.20	-0.20	-0.19	-0.08	-0.09	-0.48	-0.75	-0.79	-0.91	-1.10	-1.42	-1.52
200°	-0.22	-0.23	-0.23	-0.14	-0.18	-0.63	-0.97	-1.07	-1.24	-1.47	-1.83	-1.93
205°	-0.23	-0.25	-0.28	-0.21	-0.28	-0.79	-1.17	-1.30	-1.46	-1.65	-1.93	-1.85
210°	-0.26	-0.29	-0.32	-0.27	-0.38	-0.92	-1.27	-1.35	-1.41	-1.48	-1.56	-1.28
215°	-0.27	-0.32	-0.37	-0.33	-0.45	-0.97	-1.20	-1.18	-1.09	-1.03	-1.00	-0.74
220°	-0.29	-0.35	-0.40	-0.36	-0.47	-0.91	-0.96	-0.83	-0.66	-0.63	-0.68	-0.67
225°	-0.32	-0.38	-0.41	-0.35	-0.41	-0.75	-0.65	-0.48	-0.39	-0.51	-0.76	-0.96
230°	-0.32	-0.38	-0.42	-0.31	-0.31	-0.53	-0.40	-0.31	-0.40	-0.69	-1.02	-1.01
235°	-0.32	-0.38	-0.39	-0.23	-0.15	-0.33	-0.30	-0.36	-0.61	-0.87	-0.97	-0.62
240°	-0.32	-0.37	-0.33	-0.12	0.01	-0.20	-0.37	-0.55	-0.78	-0.77	-0.66	-0.43
245°	-0.33	-0.35	-0.26	0.00	0.13	-0.18	-0.53	-0.69	-0.69	-0.51	-0.60	-0.83
250°	-0.28	-0.29	-0.17	0.10	0.20	-0.24	-0.63	-0.64	-0.48	-0.47	-0.99	-1.36
255°	-0.28	-0.27	-0.09	0.18	0.21	-0.35	-0.61	-0.50	-0.42	-0.81	-1.44	-1.34
260°	-0.25	-0.20	-0.01	0.23	0.16	-0.43	-0.51	-0.44	-0.65	-1.22	-1.37	-1.11
265°	-0.21	-0.14	0.05	0.25	0.09	-0.45	-0.45	-0.56	-0.99	-1.22	-1.06	-1.11
270°	-0.20	-0.11	0.10	0.23	0.02	-0.41	-0.51	-0.80	-1.11	-0.89	-1.00	-1.19
275°	-0.16	-0.06	0.12	0.19	-0.04	-0.36	-0.66	-0.97	-0.87	-0.69	-1.11	-0.98
280°	-0.12	-0.02	0.13	0.15	-0.05	-0.34	-0.81	-0.90	-0.55	-0.75	-1.05	-0.71
285°	-0.09	0.02	0.12	0.10	-0.03	-0.37	-0.84	-0.65	-0.44	-0.83	-0.78	-0.63
290°	-0.07	0.05	0.10	0.08	-0.02	-0.44	-0.72	-0.42	-0.52	-0.70	-0.60	-0.62
295°	-0.05	0.06	0.08	0.04	0.02	-0.51	-0.51	-0.32	-0.58	-0.44	-0.60	-0.52
300°	-0.02	0.08	0.06	0.02	0.02	-0.56	-0.34	-0.34	-0.50	-0.29	-0.61	-0.38
305°	-0.01	0.08	0.03	0.03	0.01	-0.54	-0.25	-0.39	-0.30	-0.30	-0.51	-0.30
310°	0.02	0.08	0.00	0.05	-0.02	-0.47	-0.24	-0.37	-0.13	-0.36	-0.37	-0.29
315°	0.05	0.09	-0.03	0.06	-0.06	-0.35	-0.26	-0.28	-0.05	-0.34	-0.27	-0.26
320°	0.03	0.05	-0.03	0.07	-0.09	-0.23	-0.27	-0.16	-0.07	-0.25	-0.24	-0.16
325°	0.03	0.02	-0.02	0.07	-0.11	-0.13	-0.25	-0.05	-0.12	-0.13	-0.25	-0.05
330°	0.03	0.03	-0.01	0.07	-0.11	-0.07	-0.20	0.02	-0.15	-0.04	-0.24	0.01
335°	0.01	0.01	-0.01	0.05	-0.09	-0.03	-0.14	0.06	-0.14	0.01	-0.20	0.03
340°	0.01	-0.01	0.02	0.04	-0.06	-0.01	-0.09	0.06	-0.11	0.04	-0.13	0.03
345°	0.01	0.01	0.00	0.02	-0.03	0.00	-0.04	0.05	-0.06	0.04	-0.07	0.02
350°	0.00	0.01	0.01	0.01	-0.02	0.00	-0.01	0.04	-0.02	0.03	-0.02	0.02
355°	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.03	0.00	0.02	0.01	0.01

Table A.36 Directional response for Windscreen UA-1650, Microphone Type 4193, Microphone Preamplifier ZC-0032 and the analyzer with the Microphone Preamplifier mounted directly on the analyzer, measured in a plane parallel to the display and along the microphone's axis, 4000 Hz – 10600 Hz, in dB

Angle	Frequency											
	4000 Hz	4500 Hz	5000 Hz	5600 Hz	6300 Hz	7100 Hz	8000 Hz	8500 Hz	9000 Hz	9500 Hz	10000 Hz	10600 Hz
0°	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01	-0.01	-0.02
5°	-0.02	-0.03	-0.04	-0.03	0.00	-0.02	-0.04	-0.04	-0.05	-0.05	-0.05	-0.04
10°	-0.02	-0.06	-0.11	-0.08	0.02	-0.06	-0.12	-0.14	-0.18	-0.17	-0.19	-0.13
15°	-0.03	-0.12	-0.21	-0.21	-0.01	-0.05	-0.29	-0.32	-0.36	-0.33	-0.32	-0.21
20°	-0.07	-0.23	-0.35	-0.42	-0.15	-0.02	-0.52	-0.52	-0.45	-0.45	-0.34	-0.26
25°	-0.14	-0.34	-0.42	-0.62	-0.39	-0.03	-0.65	-0.65	-0.50	-0.54	-0.28	-0.36
30°	-0.22	-0.42	-0.35	-0.62	-0.56	-0.19	-0.65	-0.83	-0.78	-0.88	-0.51	-0.78
35°	-0.27	-0.43	-0.28	-0.56	-0.49	-0.35	-0.83	-1.18	-1.23	-1.15	-0.91	-1.14
40°	-0.28	-0.49	-0.49	-0.81	-0.56	-0.30	-1.20	-1.37	-1.39	-1.19	-1.17	-1.17
45°	-0.32	-0.67	-0.80	-1.23	-0.99	-0.55	-1.30	-1.50	-1.72	-1.79	-1.65	-1.69
50°	-0.45	-0.80	-0.77	-1.15	-0.95	-0.93	-1.42	-1.92	-1.92	-2.04	-1.71	-2.04
55°	-0.57	-0.76	-0.79	-1.17	-1.05	-0.91	-1.59	-2.00	-2.26	-2.42	-2.35	-2.20
60°	-0.58	-0.85	-1.18	-1.61	-1.59	-1.38	-1.86	-2.26	-2.62	-2.56	-2.70	-2.78
65°	-0.59	-1.11	-1.27	-1.48	-1.44	-1.20	-2.11	-2.47	-2.78	-3.19	-2.76	-3.12
70°	-0.71	-1.13	-1.25	-1.83	-1.82	-1.81	-2.28	-2.90	-3.08	-3.30	-3.43	-3.23
75°	-0.86	-1.10	-1.63	-2.06	-1.75	-1.65	-2.42	-3.03	-3.67	-3.65	-3.74	-3.85
80°	-0.90	-1.27	-1.54	-2.06	-2.18	-2.14	-2.90	-3.14	-3.79	-4.29	-3.93	-4.40
85°	-1.01	-1.40	-1.63	-2.51	-2.26	-2.01	-2.80	-3.60	-3.75	-4.50	-4.57	-4.48
90°	-1.25	-1.48	-1.86	-2.18	-2.57	-2.53	-3.33	-3.52	-4.34	-4.38	-4.75	-4.84
95°	-1.53	-1.80	-1.90	-2.70	-2.43	-2.51	-3.48	-3.94	-4.37	-4.74	-4.86	-4.88
100°	-1.59	-2.14	-2.31	-2.59	-2.72	-2.61	-3.63	-4.27	-4.58	-5.07	-4.99	-5.52
105°	-1.54	-2.24	-2.72	-3.18	-2.81	-2.59	-3.86	-4.23	-4.92	-5.45	-5.27	-5.86
110°	-1.65	-2.20	-2.89	-3.60	-3.33	-2.77	-3.64	-4.17	-4.83	-5.32	-5.91	-5.85
115°	-1.58	-2.21	-2.86	-3.77	-3.94	-3.51	-4.23	-4.66	-4.99	-5.28	-5.47	-5.68
120°	-1.03	-1.96	-2.61	-3.78	-3.91	-4.01	-5.09	-5.28	-5.89	-6.30	-5.78	-5.77
125°	-0.62	-1.36	-2.27	-3.10	-3.77	-3.89	-5.25	-6.42	-6.95	-7.26	-7.31	-7.31
130°	-0.93	-1.14	-1.68	-2.76	-2.76	-3.09	-5.09	-5.75	-6.74	-7.59	-8.04	-8.10
135°	-1.40	-1.63	-1.69	-2.24	-2.55	-2.21	-3.43	-4.78	-5.97	-6.91	-6.94	-7.23
140°	-1.23	-1.95	-2.36	-2.65	-2.38	-2.25	-3.20	-3.61	-4.27	-4.98	-5.42	-6.14
145°	-0.93	-1.61	-2.38	-3.31	-3.06	-2.57	-3.44	-4.16	-4.61	-4.86	-4.84	-4.83
150°	-1.20	-1.56	-2.01	-2.93	-3.31	-3.27	-4.13	-4.64	-5.13	-5.31	-5.21	-5.73
155°	-1.91	-2.18	-2.37	-2.89	-3.01	-3.03	-4.34	-5.08	-5.75	-6.21	-6.06	-6.11
160°	-2.31	-2.83	-3.20	-3.73	-3.62	-3.39	-4.18	-4.78	-5.31	-5.75	-6.05	-6.52
165°	-2.02	-2.68	-3.35	-4.21	-4.30	-4.37	-5.21	-5.63	-6.09	-6.28	-6.24	-6.63
170°	-1.40	-2.00	-2.63	-3.54	-3.71	-3.91	-5.22	-5.84	-6.51	-6.96	-7.23	-7.74
175°	-0.91	-1.40	-1.90	-2.67	-2.69	-2.69	-3.81	-4.38	-4.93	-5.40	-5.77	-6.30
180°	-0.72	-1.17	-1.61	-2.31	-2.25	-2.14	-3.11	-3.62	-4.05	-4.43	-4.71	-5.13
185°	-0.88	-1.36	-1.85	-2.60	-2.62	-2.59	-3.66	-4.25	-4.77	-5.22	-5.60	-6.11
190°	-1.36	-1.94	-2.55	-3.45	-3.61	-3.77	-5.01	-5.70	-6.38	-6.85	-7.18	-7.71
195°	-1.99	-2.66	-3.31	-4.20	-4.31	-4.35	-5.22	-5.69	-6.16	-6.37	-6.33	-6.74
200°	-2.34	-2.89	-3.29	-3.85	-3.73	-3.49	-4.26	-4.80	-5.30	-5.76	-6.06	-6.54
205°	-1.99	-2.32	-2.50	-3.00	-3.06	-3.06	-4.36	-5.11	-5.78	-6.26	-6.19	-6.16
210°	-1.28	-1.64	-2.05	-2.94	-3.28	-3.29	-4.20	-4.70	-5.24	-5.38	-5.17	-5.73
215°	-0.92	-1.58	-2.36	-3.33	-3.11	-2.65	-3.50	-4.23	-4.77	-5.05	-5.00	-4.90
220°	-1.16	-1.94	-2.41	-2.74	-2.43	-2.31	-3.28	-3.73	-4.28	-4.87	-5.20	-5.92
225°	-1.38	-1.71	-1.73	-2.29	-2.53	-2.20	-3.29	-4.51	-5.82	-6.78	-6.95	-7.00
230°	-0.97	-1.18	-1.67	-2.77	-2.74	-2.97	-4.98	-5.76	-6.72	-7.54	-7.98	-8.14
235°	-0.62	-1.33	-2.25	-3.08	-3.64	-3.87	-5.14	-6.36	-7.06	-7.48	-7.43	-7.46
240°	-0.99	-1.93	-2.58	-3.69	-3.99	-3.93	-5.24	-5.44	-5.99	-6.41	-5.97	-5.78
245°	-1.59	-2.17	-2.79	-3.84	-3.95	-3.63	-4.16	-4.77	-5.08	-5.33	-5.49	-5.65
250°	-1.65	-2.16	-2.93	-3.61	-3.51	-2.83	-3.75	-4.18	-4.78	-5.37	-5.88	-5.85
255°	-1.50	-2.24	-2.78	-3.31	-2.87	-2.69	-3.77	-4.27	-4.93	-5.57	-5.27	-5.80
260°	-1.54	-2.21	-2.38	-2.64	-2.76	-2.55	-3.68	-4.30	-4.67	-5.09	-5.02	-5.51
265°	-1.58	-1.83	-1.92	-2.72	-2.41	-2.59	-3.56	-3.96	-4.36	-4.71	-5.02	-4.85
270°	-1.29	-1.52	-1.88	-2.24	-2.60	-2.50	-3.24	-3.54	-4.32	-4.51	-4.79	-4.89
275°	-1.01	-1.42	-1.67	-2.50	-2.28	-2.07	-2.83	-3.63	-3.81	-4.59	-4.60	-4.53
280°	-0.91	-1.29	-1.56	-2.12	-2.20	-2.09	-2.90	-3.21	-3.87	-4.30	-3.97	-4.47
285°	-0.86	-1.13	-1.64	-2.06	-1.77	-1.71	-2.41	-3.08	-3.70	-3.70	-3.80	-3.87
290°	-0.70	-1.14	-1.26	-1.87	-1.80	-1.82	-2.32	-2.94	-3.15	-3.41	-3.53	-3.21
295°	-0.59	-1.10	-1.25	-1.47	-1.44	-1.22	-2.11	-2.54	-2.88	-3.32	-2.79	-3.18
300°	-0.61	-0.84	-1.14	-1.60	-1.62	-1.36	-1.84	-2.30	-2.66	-2.60	-2.74	-2.84
305°	-0.57	-0.75	-0.82	-1.15	-1.12	-0.90	-1.68	-2.03	-2.29	-2.49	-2.38	-2.20
310°	-0.43	-0.78	-0.76	-1.12	-0.95	-0.90	-1.40	-1.99	-2.01	-2.04	-1.79	-2.07
315°	-0.31	-0.63	-0.76	-1.26	-1.01	-0.60	-1.33	-1.53	-1.75	-1.84	-1.70	-1.72
320°	-0.27	-0.46	-0.47	-0.84	-0.57	-0.31	-1.22	-1.36	-1.44	-1.25	-1.19	-1.21
325°	-0.27	-0.40	-0.27	-0.54	-0.46	-0.37	-0.84	-1.20	-1.24	-1.15	-0.95	-1.14
330°	-0.22	-0.39	-0.32	-0.62	-0.52	-0.19	-0.65	-0.85	-0.79	-0.91	-0.53	-0.81
335°	-0.13	-0.33	-0.38	-0.64	-0.37	-0.01	-0.63	-0.68	-0.51	-0.54	-0.27	-0.36
340°	-0.05	-0.21	-0.31	-0.44	-0.12	0.01	-0.51	-0.55	-0.42	-0.42	-0.32	-0.23
345°	-0.01	-0.10	-0.17	-0.20	0.02	-0.03	-0.27	-0.34	-0.32	-0.31	-0.31	-0.18
350°	0.01	-0.03	-0.06	-0.05	0.05	-0.03	-0.09	-0.14	-0.16	-0.16	-0.18	-0.10
355°	0.01	0.00	0.00	0.00	0.04	-0.01	-0.01	-0.02	-0.03	-0.03	-0.03	-0.02

Table A.37 Directional response for Windscreen UA-1650, Microphone Type 4193, Microphone Preamplifier ZC-0032 and the analyzer with the Microphone Preamplifier mounted directly on the analyzer, measured in a plane parallel to the display and along the microphone's axis, 11200 Hz – 20000 Hz, in dB

Angle	Frequency										
	11200 Hz	11800 Hz	12500 Hz	13200 Hz	14000 Hz	15000 Hz	16000 Hz	17000 Hz	18000 Hz	19000 Hz	20000 Hz
0°	-0.02	-0.01	-0.02	-0.01	-0.02	-0.01	-0.02	-0.02	-0.02	-0.01	-0.02
5°	-0.05	-0.05	-0.04	-0.04	-0.05	-0.05	-0.02	-0.07	-0.06	-0.05	-0.06
10°	-0.18	-0.13	-0.12	-0.15	-0.17	-0.18	-0.08	-0.25	-0.17	-0.16	-0.21
15°	-0.37	-0.25	-0.25	-0.31	-0.41	-0.33	-0.32	-0.46	-0.36	-0.41	-0.49
20°	-0.60	-0.45	-0.45	-0.46	-0.67	-0.59	-0.70	-0.72	-0.68	-0.83	-0.96
25°	-0.79	-0.72	-0.83	-0.78	-0.86	-1.00	-0.97	-1.12	-1.02	-1.23	-1.44
30°	-1.05	-0.99	-1.08	-1.16	-1.41	-1.30	-1.53	-1.51	-1.45	-1.74	-2.13
35°	-1.37	-1.58	-1.51	-1.50	-1.66	-1.76	-1.88	-2.15	-1.93	-2.08	-2.71
40°	-1.54	-1.68	-1.81	-1.98	-2.21	-2.18	-2.36	-2.60	-2.48	-2.54	-3.11
45°	-2.11	-2.22	-2.45	-2.40	-2.63	-2.67	-2.83	-3.10	-3.06	-3.07	-3.58
50°	-2.35	-2.61	-2.70	-2.79	-3.10	-3.23	-3.38	-3.68	-3.70	-3.81	-4.38
55°	-2.66	-2.85	-3.07	-3.26	-3.47	-3.78	-4.03	-4.34	-4.48	-4.57	-5.28
60°	-3.26	-3.49	-3.87	-3.91	-4.05	-4.25	-4.69	-5.16	-5.31	-5.37	-6.09
65°	-3.60	-4.16	-4.50	-4.72	-4.67	-4.77	-5.30	-5.89	-6.12	-6.30	-6.78
70°	-3.84	-4.44	-5.03	-5.46	-5.45	-5.30	-5.77	-6.47	-6.81	-7.24	-7.89
75°	-4.06	-4.67	-5.37	-5.96	-6.20	-6.13	-6.47	-7.10	-7.39	-8.08	-8.93
80°	-4.59	-4.75	-5.65	-6.30	-6.80	-6.91	-7.54	-8.09	-8.15	-8.73	-9.83
85°	-5.26	-5.27	-5.73	-6.63	-7.20	-7.57	-8.32	-9.06	-8.91	-9.22	-9.96
90°	-5.50	-5.86	-6.43	-6.87	-7.52	-7.98	-8.72	-9.50	-9.47	-9.93	-10.89
95°	-5.81	-6.29	-6.93	-7.79	-7.97	-8.23	-8.83	-9.81	-10.30	-10.93	-12.64
100°	-5.57	-6.72	-7.33	-8.31	-8.64	-8.93	-9.05	-9.95	-10.45	-11.70	-13.59
105°	-6.06	-6.88	-7.37	-8.57	-9.09	-9.30	-9.75	-10.65	-10.99	-12.21	-12.98
110°	-6.38	-7.26	-7.78	-8.54	-9.23	-9.36	-10.30	-11.49	-11.94	-12.77	-13.36
115°	-6.60	-6.91	-7.99	-9.02	-9.80	-9.77	-10.79	-11.44	-12.07	-13.22	-14.25
120°	-6.29	-6.33	-7.73	-8.59	-9.61	-10.06	-11.33	-11.84	-13.07	-13.21	-14.17
125°	-6.78	-7.00	-8.11	-8.13	-8.85	-9.12	-10.10	-11.46	-12.99	-14.06	-15.54
130°	-8.55	-9.56	-9.65	-9.64	-10.18	-9.44	-9.60	-10.64	-11.09	-12.52	-13.36
135°	-8.52	-9.60	-10.38	-12.11	-13.16	-12.00	-12.18	-13.68	-12.20	-12.58	-13.07
140°	-6.85	-7.74	-9.41	-11.18	-11.53	-11.40	-13.32	-16.57	-15.75	-16.09	-18.51
145°	-5.37	-6.40	-7.79	-8.45	-8.78	-9.61	-12.05	-13.92	-12.86	-13.78	-17.91
150°	-6.52	-7.08	-7.39	-7.53	-7.92	-8.90	-10.46	-10.92	-10.60	-12.31	-15.74
155°	-6.86	-7.72	-8.51	-8.89	-9.33	-10.32	-11.15	-10.90	-10.81	-12.88	-14.56
160°	-7.26	-8.11	-8.77	-9.15	-9.80	-10.85	-11.83	-11.79	-12.46	-15.04	-15.74
165°	-7.32	-7.71	-8.12	-8.40	-9.31	-10.66	-11.81	-12.06	-12.73	-15.15	-15.25
170°	-8.65	-9.21	-9.46	-9.56	-10.07	-10.92	-11.18	-11.03	-11.56	-13.79	-14.08
175°	-7.24	-8.17	-8.85	-9.49	-10.58	-11.84	-12.69	-12.72	-13.46	-15.67	-15.88
180°	-5.91	-6.68	-7.21	-7.72	-8.72	-9.92	-10.82	-10.95	-11.73	-14.25	-14.50
185°	-7.03	-7.94	-8.57	-9.21	-10.30	-11.61	-12.55	-12.66	-13.37	-15.86	-16.38
190°	-8.65	-9.26	-9.55	-9.76	-10.27	-11.16	-11.43	-11.22	-11.61	-13.87	-14.02
195°	-7.43	-7.78	-8.19	-8.41	-9.24	-10.58	-11.80	-12.16	-12.79	-15.55	-16.00
200°	-7.33	-8.22	-8.92	-9.28	-9.93	-10.97	-12.03	-11.76	-12.08	-14.84	-16.12
205°	-6.86	-7.73	-8.53	-8.82	-9.29	-10.44	-11.64	-11.42	-11.04	-13.07	-14.73
210°	-6.63	-7.35	-7.80	-7.75	-7.95	-8.85	-10.59	-11.12	-10.56	-12.04	-15.34
215°	-5.34	-6.30	-7.76	-8.46	-8.68	-9.29	-11.67	-13.87	-12.75	-13.38	-17.26
220°	-6.69	-7.61	-9.15	-10.94	-11.46	-11.27	-12.90	-16.41	-15.81	-16.02	-19.85
225°	-8.29	-9.55	-10.48	-11.95	-13.10	-12.45	-12.70	-14.34	-12.46	-12.84	-13.98
230°	-8.54	-9.62	-10.25	-10.04	-10.21	-9.68	-10.01	-11.00	-10.84	-12.43	-13.68
235°	-6.95	-7.10	-8.19	-8.39	-8.76	-9.10	-10.27	-11.60	-12.54	-14.02	-16.14
240°	-6.28	-6.46	-7.55	-8.64	-9.49	-10.03	-11.53	-12.26	-12.94	-12.94	-14.56
245°	-6.50	-7.08	-7.92	-9.13	-9.75	-9.75	-10.89	-11.67	-11.98	-12.86	-14.21
250°	-6.34	-7.42	-7.85	-8.70	-9.12	-9.28	-10.40	-11.73	-12.08	-12.63	-13.58
255°	-6.08	-6.90	-7.43	-8.73	-9.12	-9.23	-9.86	-11.05	-11.23	-12.11	-13.00
260°	-5.69	-6.63	-7.47	-8.55	-8.87	-8.96	-9.13	-10.09	-10.56	-11.58	-14.11
265°	-5.98	-6.28	-7.06	-7.94	-8.15	-8.33	-8.94	-10.06	-10.36	-10.85	-12.73
270°	-5.54	-5.82	-6.60	-7.05	-7.59	-7.98	-8.80	-9.79	-9.62	-9.96	-11.05
275°	-5.27	-5.35	-5.91	-6.75	-7.29	-7.57	-8.44	-9.28	-9.05	-9.15	-10.03
280°	-4.59	-4.85	-5.80	-6.43	-6.85	-6.99	-7.70	-8.30	-8.30	-8.67	-9.98
285°	-4.04	-4.76	-5.53	-6.06	-6.30	-6.25	-6.65	-7.29	-7.45	-8.13	-9.06
290°	-3.90	-4.52	-5.13	-5.54	-5.56	-5.40	-5.87	-6.58	-6.86	-7.19	-8.05
295°	-3.67	-4.19	-4.58	-4.75	-4.77	-4.84	-5.36	-6.07	-6.12	-6.35	-6.97
300°	-3.29	-3.51	-3.93	-3.92	-4.08	-4.30	-4.79	-5.25	-5.41	-5.46	-6.21
305°	-2.71	-2.90	-3.14	-3.25	-3.51	-3.86	-4.18	-4.41	-4.56	-4.64	-5.40
310°	-2.46	-2.70	-2.77	-2.80	-3.12	-3.31	-3.52	-3.75	-3.77	-3.87	-4.44
315°	-2.13	-2.23	-2.44	-2.42	-2.66	-2.77	-2.95	-3.16	-3.16	-3.13	-3.67
320°	-1.59	-1.68	-1.79	-1.98	-2.24	-2.29	-2.47	-2.69	-2.54	-2.65	-3.19
325°	-1.36	-1.57	-1.54	-1.55	-1.72	-1.79	-2.01	-2.21	-1.97	-2.19	-2.75
330°	-1.06	-1.00	-1.06	-1.16	-1.43	-1.38	-1.59	-1.55	-1.51	-1.81	-2.16
335°	-0.77	-0.71	-0.85	-0.81	-0.88	-1.03	-1.04	-1.14	-1.09	-1.27	-1.48
340°	-0.61	-0.43	-0.43	-0.45	-0.66	-0.64	-0.71	-0.73	-0.70	-0.87	-0.98
345°	-0.34	-0.22	-0.23	-0.29	-0.41	-0.34	-0.34	-0.45	-0.37	-0.45	-0.50
350°	-0.15	-0.11	-0.13	-0.14	-0.17	-0.18	-0.05	-0.24	-0.16	-0.17	-0.18
355°	-0.03	-0.02	-0.03	-0.03	-0.03	-0.04	0.01	-0.05	-0.04	-0.05	-0.04

Table A.38 Directional response for Windscreen UA-1650, Microphone Type 4193, Microphone Preampifier ZC-0032 and the analyzer with the Microphone Preampifier mounted directly on the analyzer, measured in a plane perpendicular to the display and along the microphone's axis, 500 Hz – 3550 Hz, in dB

Angle	Frequency											
	500 Hz	630 Hz	800 Hz	1000 Hz	1250 Hz	1600 Hz	2000 Hz	2240 Hz	2500 Hz	2800 Hz	3150 Hz	3550 Hz
0°	0.00	0.00	-0.01	0.00	0.00	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02	-0.02
5°	-0.01	0.01	0.00	0.00	-0.01	-0.01	-0.02	-0.02	-0.02	-0.03	-0.02	-0.03
10°	-0.02	0.00	-0.01	-0.01	-0.03	-0.01	-0.03	-0.01	-0.03	-0.03	-0.02	-0.05
15°	0.01	0.00	-0.02	0.01	-0.04	-0.02	-0.05	0.00	-0.07	-0.03	-0.05	-0.06
20°	0.00	0.00	-0.02	0.02	-0.07	-0.03	-0.09	0.01	-0.11	-0.03	-0.11	-0.06
25°	-0.01	-0.01	-0.02	0.03	-0.09	-0.05	-0.14	0.01	-0.15	-0.04	-0.20	-0.04
30°	0.01	0.00	-0.01	0.05	-0.11	-0.09	-0.21	-0.01	-0.19	-0.07	-0.29	0.01
35°	0.01	0.00	-0.04	0.05	-0.12	-0.15	-0.26	-0.06	-0.18	-0.13	-0.36	0.05
40°	0.02	0.03	-0.03	0.04	-0.12	-0.25	-0.30	-0.14	-0.16	-0.22	-0.39	0.00
45°	0.02	0.04	-0.03	0.04	-0.10	-0.37	-0.31	-0.25	-0.13	-0.31	-0.39	-0.16
50°	0.01	0.04	0.00	0.01	-0.08	-0.49	-0.30	-0.35	-0.18	-0.35	-0.44	-0.35
55°	0.00	0.08	0.02	-0.01	-0.06	-0.58	-0.31	-0.39	-0.33	-0.31	-0.57	-0.42
60°	-0.02	0.06	0.07	-0.02	-0.06	-0.62	-0.39	-0.37	-0.52	-0.28	-0.67	-0.40
65°	-0.06	0.03	0.10	0.00	-0.08	-0.59	-0.55	-0.36	-0.62	-0.39	-0.64	-0.50
70°	-0.08	0.02	0.14	0.04	-0.11	-0.52	-0.76	-0.45	-0.58	-0.64	-0.58	-0.68
75°	-0.11	-0.01	0.15	0.10	-0.15	-0.46	-0.92	-0.66	-0.52	-0.79	-0.69	-0.66
80°	-0.13	-0.04	0.15	0.17	-0.16	-0.44	-0.96	-0.93	-0.62	-0.74	-0.97	-0.59
85°	-0.16	-0.08	0.13	0.23	-0.12	-0.48	-0.87	-1.07	-0.93	-0.71	-1.08	-0.79
90°	-0.19	-0.12	0.09	0.28	-0.03	-0.54	-0.73	-0.98	-1.22	-0.95	-0.96	-1.07
95°	-0.23	-0.18	0.03	0.30	0.07	-0.56	-0.67	-0.79	-1.19	-1.32	-1.10	-1.01
100°	-0.28	-0.24	-0.05	0.27	0.19	-0.51	-0.72	-0.70	-0.90	-1.36	-1.57	-1.00
105°	-0.28	-0.28	-0.15	0.22	0.25	-0.37	-0.77	-0.75	-0.74	-1.00	-1.69	-1.49
110°	-0.31	-0.33	-0.24	0.10	0.25	-0.22	-0.71	-0.82	-0.82	-0.76	-1.23	-1.69
115°	-0.33	-0.37	-0.32	-0.04	0.16	-0.12	-0.52	-0.72	-0.95	-0.88	-0.88	-1.13
120°	-0.34	-0.40	-0.38	-0.19	0.01	-0.14	-0.31	-0.45	-0.80	-1.04	-1.01	-0.76
125°	-0.33	-0.39	-0.44	-0.32	-0.19	-0.30	-0.23	-0.20	-0.43	-0.80	-1.18	-0.97
130°	-0.32	-0.40	-0.46	-0.41	-0.37	-0.55	-0.37	-0.18	-0.16	-0.34	-0.86	-1.00
135°	-0.32	-0.39	-0.45	-0.46	-0.51	-0.82	-0.69	-0.42	-0.22	-0.14	-0.36	-0.49
140°	-0.31	-0.37	-0.43	-0.46	-0.57	-1.04	-1.09	-0.88	-0.65	-0.41	-0.30	-0.08
145°	-0.28	-0.33	-0.39	-0.42	-0.56	-1.12	-1.40	-1.33	-1.24	-1.05	-0.83	-0.35
150°	-0.27	-0.30	-0.34	-0.36	-0.48	-1.07	-1.51	-1.57	-1.67	-1.70	-1.67	-1.22
155°	-0.25	-0.27	-0.29	-0.28	-0.38	-0.93	-1.40	-1.52	-1.73	-1.94	-2.24	-2.09
160°	-0.23	-0.25	-0.24	-0.20	-0.27	-0.75	-1.18	-1.27	-1.48	-1.71	-2.17	-2.25
165°	-0.21	-0.22	-0.20	-0.12	-0.16	-0.58	-0.93	-0.96	-1.10	-1.26	-1.68	-1.76
170°	-0.20	-0.21	-0.16	-0.06	-0.09	-0.44	-0.73	-0.70	-0.76	-0.84	-1.15	-1.12
175°	-0.22	-0.21	-0.14	-0.03	-0.03	-0.36	-0.60	-0.53	-0.55	-0.56	-0.79	-0.68
180°	-0.23	-0.22	-0.13	-0.02	-0.02	-0.34	-0.55	-0.46	-0.46	-0.46	-0.66	-0.51
185°	-0.20	-0.19	-0.14	-0.03	-0.03	-0.37	-0.59	-0.50	-0.52	-0.53	-0.74	-0.61
190°	-0.22	-0.22	-0.17	-0.06	-0.07	-0.45	-0.70	-0.65	-0.71	-0.78	-1.05	-0.99
195°	-0.21	-0.23	-0.19	-0.10	-0.15	-0.58	-0.89	-0.89	-1.03	-1.17	-1.54	-1.60
200°	-0.23	-0.26	-0.23	-0.17	-0.24	-0.75	-1.13	-1.19	-1.41	-1.62	-2.07	-2.16
205°	-0.25	-0.28	-0.28	-0.25	-0.35	-0.94	-1.36	-1.45	-1.72	-1.91	-2.26	-2.19
210°	-0.27	-0.31	-0.33	-0.33	-0.46	-1.10	-1.49	-1.56	-1.74	-1.77	-1.83	-1.46
215°	-0.29	-0.35	-0.38	-0.40	-0.54	-1.17	-1.42	-1.40	-1.39	-1.20	-1.03	-0.56
220°	-0.32	-0.38	-0.42	-0.44	-0.56	-1.11	-1.16	-1.00	-0.82	-0.57	-0.43	-0.18
225°	-0.34	-0.41	-0.44	-0.45	-0.52	-0.93	-0.79	-0.56	-0.36	-0.24	-0.39	-0.49
230°	-0.33	-0.40	-0.45	-0.40	-0.42	-0.66	-0.46	-0.29	-0.22	-0.37	-0.81	-0.99
235°	-0.33	-0.39	-0.43	-0.32	-0.25	-0.40	-0.31	-0.27	-0.42	-0.75	-1.16	-0.98
240°	-0.35	-0.39	-0.38	-0.19	-0.08	-0.23	-0.35	-0.46	-0.74	-0.97	-1.02	-0.70
245°	-0.33	-0.36	-0.31	-0.06	0.05	-0.18	-0.53	-0.67	-0.87	-0.84	-0.83	-0.97
250°	-0.30	-0.31	-0.23	0.07	0.14	-0.25	-0.69	-0.73	-0.77	-0.72	-1.12	-1.61
255°	-0.29	-0.28	-0.15	0.17	0.15	-0.37	-0.72	-0.66	-0.71	-0.95	-1.65	-1.60
260°	-0.24	-0.21	-0.06	0.24	0.10	-0.48	-0.66	-0.62	-0.88	-1.35	-1.63	-1.06
265°	-0.24	-0.18	0.02	0.25	0.02	-0.52	-0.62	-0.73	-1.17	-1.39	-1.14	-0.95
270°	-0.20	-0.12	0.09	0.24	-0.06	-0.48	-0.69	-0.96	-1.28	-1.01	-0.94	-1.07
275°	-0.17	-0.08	0.12	0.19	-0.11	-0.42	-0.83	-1.09	-1.01	-0.70	-1.05	-0.88
280°	-0.12	-0.02	0.13	0.12	-0.13	-0.39	-0.95	-1.00	-0.66	-0.70	-1.02	-0.61
285°	-0.10	0.00	0.13	0.06	-0.10	-0.42	-0.95	-0.74	-0.51	-0.77	-0.76	-0.67
290°	-0.07	0.03	0.11	0.02	-0.07	-0.50	-0.80	-0.49	-0.56	-0.64	-0.61	-0.73
295°	-0.05	0.06	0.09	-0.03	-0.03	-0.57	-0.59	-0.37	-0.61	-0.42	-0.68	-0.51
300°	-0.02	0.06	0.06	-0.03	-0.02	-0.61	-0.42	-0.38	-0.50	-0.31	-0.73	-0.30
305°	0.00	0.07	0.02	-0.02	-0.03	-0.58	-0.33	-0.40	-0.30	-0.36	-0.57	-0.27
310°	0.03	0.08	-0.01	0.01	-0.05	-0.49	-0.32	-0.37	-0.15	-0.43	-0.36	-0.31
315°	0.02	0.05	-0.04	0.05	-0.09	-0.36	-0.34	-0.26	-0.10	-0.40	-0.25	-0.28
320°	0.04	0.06	-0.05	0.05	-0.12	-0.23	-0.33	-0.13	-0.13	-0.26	-0.24	-0.19
325°	0.03	0.03	-0.04	0.06	-0.13	-0.14	-0.28	-0.03	-0.19	-0.12	-0.24	-0.11
330°	0.03	0.03	-0.02	0.06	-0.12	-0.07	-0.22	0.03	-0.20	-0.01	-0.24	-0.07
335°	0.03	0.02	-0.01	0.05	-0.10	-0.03	-0.14	0.05	-0.18	0.04	-0.20	-0.05
340°	0.03	0.02	0.00	0.03	-0.07	-0.01	-0.09	0.05	-0.13	0.06	-0.14	-0.02
345°	0.04	0.03	0.00	0.02	-0.04	0.00	-0.04	0.04	-0.08	0.05	-0.08	0.00
350°	0.01	0.01	0.00	0.01	-0.02	0.01	-0.01	0.03	-0.03	0.04	-0.03	0.02
355°	0.02	0.03	0.01	0.01	0.00	0.01	0.01	0.03	0.00	0.03	0.00	0.03

Table A.39 Directional response for Windscreen UA-1650, Microphone Type 4193, Microphone Preamplifier ZC-0032 and the analyzer with the Microphone Preamplifier mounted directly on the analyzer, measured in a plane perpendicular to the display and along the microphone's axis, 4000 Hz – 10600 Hz, in dB

Angle	Frequency											
	4000 Hz	4500 Hz	5000 Hz	5600 Hz	6300 Hz	7100 Hz	8000 Hz	8500 Hz	9000 Hz	9500 Hz	10000 Hz	10600 Hz
0°	-0.02	-0.02	-0.02	-0.02	-0.03	-0.02	-0.02	-0.03	-0.02	-0.02	-0.02	-0.02
5°	-0.01	-0.03	-0.03	-0.07	-0.05	0.00	-0.06	-0.07	0.00	-0.02	-0.02	0.01
10°	0.01	-0.04	-0.06	-0.14	-0.10	0.02	-0.16	-0.12	0.03	-0.09	-0.06	0.00
15°	0.01	-0.08	-0.08	-0.24	-0.20	0.04	-0.29	-0.18	0.00	-0.24	-0.13	-0.08
20°	0.00	-0.15	-0.12	-0.33	-0.30	-0.01	-0.35	-0.28	-0.21	-0.54	-0.23	-0.31
25°	-0.03	-0.23	-0.14	-0.34	-0.29	-0.16	-0.35	-0.57	-0.67	-0.73	-0.31	-0.62
30°	-0.11	-0.30	-0.18	-0.33	-0.21	-0.27	-0.60	-0.98	-1.00	-0.68	-0.49	-0.76
35°	-0.21	-0.35	-0.30	-0.47	-0.29	-0.19	-1.04	-1.04	-1.11	-0.99	-1.10	-0.95
40°	-0.29	-0.40	-0.52	-0.81	-0.71	-0.32	-1.04	-1.20	-1.63	-1.60	-1.18	-1.06
45°	-0.28	-0.47	-0.71	-0.97	-0.89	-0.65	-1.16	-1.77	-1.71	-1.81	-1.40	-1.66
50°	-0.22	-0.63	-0.77	-0.91	-0.83	-0.60	-1.35	-1.74	-2.13	-2.29	-1.96	-1.79
55°	-0.26	-0.80	-0.85	-1.24	-1.31	-0.98	-1.32	-2.11	-2.51	-2.32	-2.46	-2.30
60°	-0.45	-0.82	-1.04	-1.56	-1.47	-1.16	-1.80	-2.03	-2.64	-3.15	-2.43	-2.65
65°	-0.64	-0.80	-1.17	-1.50	-1.43	-1.19	-1.69	-2.61	-2.84	-3.10	-3.28	-2.91
70°	-0.64	-1.04	-1.29	-1.79	-1.96	-1.73	-2.20	-2.53	-3.43	-3.46	-3.31	-3.57
75°	-0.73	-1.25	-1.34	-1.94	-1.81	-1.61	-2.17	-3.04	-3.38	-4.17	-3.62	-3.68
80°	-0.92	-1.24	-1.58	-2.00	-2.17	-2.24	-2.67	-3.14	-3.93	-4.06	-4.47	-3.98
85°	-0.86	-1.40	-1.80	-2.28	-2.27	-2.02	-2.83	-3.34	-4.12	-4.51	-4.36	-4.76
90°	-0.89	-1.53	-1.87	-2.48	-2.40	-2.39	-3.12	-3.78	-4.10	-4.88	-4.69	-4.72
95°	-1.26	-1.47	-2.12	-2.68	-2.79	-2.44	-3.44	-3.74	-4.70	-4.87	-4.84	-5.03
100°	-1.34	-1.83	-2.09	-2.83	-2.86	-2.69	-3.42	-4.13	-4.65	-5.07	-5.20	-5.05
105°	-1.27	-2.00	-2.38	-3.00	-3.11	-2.85	-3.95	-4.17	-4.77	-5.35	-5.40	-5.44
110°	-1.74	-1.95	-2.74	-3.25	-3.15	-2.84	-3.98	-4.80	-5.33	-5.66	-5.48	-5.87
115°	-1.93	-2.47	-2.70	-3.61	-3.59	-3.13	-4.08	-4.56	-5.60	-6.25	-6.17	-5.99
120°	-1.19	-2.47	-3.14	-3.63	-3.83	-3.45	-4.43	-5.20	-5.84	-6.12	-6.46	-6.55
125°	-0.90	-1.62	-2.84	-4.04	-3.89	-3.65	-4.82	-5.59	-6.41	-7.10	-6.74	-6.60
130°	-1.23	-1.56	-2.02	-3.23	-4.02	-3.59	-4.89	-5.91	-7.08	-7.55	-7.42	-7.17
135°	-1.06	-1.85	-2.22	-2.68	-2.86	-3.21	-4.59	-5.56	-6.59	-7.54	-7.86	-7.76
140°	-0.38	-1.30	-2.25	-3.15	-3.11	-2.43	-3.67	-4.71	-5.83	-6.53	-6.68	-7.20
145°	-0.20	-0.73	-1.49	-2.57	-3.12	-3.10	-3.74	-4.48	-5.08	-5.37	-5.22	-5.54
150°	-0.91	-1.09	-1.35	-1.90	-2.10	-2.33	-3.76	-4.72	-5.73	-6.12	-5.71	-5.62
155°	-2.06	-2.30	-2.39	-2.59	-2.27	-1.84	-2.79	-3.60	-4.44	-5.08	-5.34	-5.67
160°	-2.63	-3.27	-3.73	-4.29	-4.03	-3.34	-3.61	-4.06	-4.45	-4.66	-4.70	-4.87
165°	-2.20	-3.00	-3.79	-4.87	-5.25	-5.38	-6.12	-6.65	-7.11	-7.17	-7.03	-7.17
170°	-1.42	-2.11	-2.82	-3.80	-4.16	-4.48	-5.80	-6.70	-7.67	-8.24	-8.74	-9.73
175°	-0.85	-1.41	-1.96	-2.74	-2.87	-2.83	-3.83	-4.52	-5.21	-5.66	-5.95	-6.50
180°	-0.63	-1.13	-1.62	-2.32	-2.36	-2.16	-2.98	-3.59	-4.15	-4.49	-4.69	-5.03
185°	-0.77	-1.31	-1.85	-2.60	-2.69	-2.59	-3.55	-4.22	-4.88	-5.32	-5.63	-6.02
190°	-1.26	-1.91	-2.61	-3.55	-3.83	-4.08	-5.41	-6.30	-7.24	-7.92	-8.37	-9.06
195°	-2.01	-2.80	-3.62	-4.70	-5.11	-5.48	-6.51	-7.18	-7.74	-7.98	-7.67	-7.88
200°	-2.58	-3.29	-3.88	-4.53	-4.50	-3.91	-4.11	-4.49	-4.86	-5.02	-4.88	-5.06
205°	-2.28	-2.60	-2.72	-2.95	-2.71	-2.03	-2.86	-3.61	-4.44	-5.00	-5.18	-5.51
210°	-1.20	-1.37	-1.55	-2.08	-2.23	-2.16	-3.75	-4.78	-5.84	-6.19	-5.80	-5.88
215°	-0.38	-0.84	-1.51	-2.62	-3.01	-3.24	-3.91	-4.46	-4.89	-5.06	-5.05	-5.16
220°	-0.41	-1.28	-2.25	-3.22	-3.16	-2.38	-3.12	-4.08	-5.45	-6.54	-6.71	-6.98
225°	-1.03	-1.85	-2.31	-2.69	-2.70	-2.64	-4.56	-5.81	-6.75	-7.37	-7.52	-7.56
230°	-1.26	-1.55	-1.92	-3.01	-3.69	-3.92	-4.78	-5.73	-7.07	-7.74	-7.51	-7.24
235°	-0.86	-1.43	-2.63	-4.02	-4.13	-3.46	-4.91	-5.80	-6.44	-7.15	-7.08	-6.86
240°	-1.01	-2.28	-3.31	-3.73	-3.78	-3.71	-4.32	-5.11	-6.17	-6.55	-6.78	-6.62
245°	-1.80	-2.61	-2.70	-3.68	-3.72	-3.01	-4.27	-4.94	-5.83	-6.29	-5.75	-6.04
250°	-1.86	-1.98	-2.71	-3.40	-3.24	-3.15	-4.03	-4.63	-5.01	-5.88	-6.11	-5.80
255°	-1.28	-1.96	-2.61	-3.05	-3.32	-2.88	-3.72	-4.36	-5.34	-5.46	-5.44	-5.36
260°	-1.24	-1.99	-2.09	-3.02	-3.00	-2.64	-3.77	-4.23	-4.79	-5.11	-5.20	-5.46
265°	-1.34	-1.50	-2.24	-2.81	-2.69	-2.76	-3.35	-3.91	-4.55	-5.17	-5.05	-4.89
270°	-1.00	-1.56	-2.03	-2.44	-2.75	-2.33	-3.09	-3.79	-4.43	-4.89	-4.64	-5.17
275°	-0.85	-1.59	-1.71	-2.41	-2.33	-2.15	-2.94	-3.49	-4.11	-4.66	-4.93	-4.31
280°	-1.01	-1.22	-1.64	-2.29	-2.18	-2.11	-2.65	-3.16	-4.18	-4.39	-4.28	-4.16
285°	-0.82	-1.10	-1.58	-1.88	-1.93	-1.78	-2.19	-3.27	-3.55	-4.28	-3.79	-3.92
290°	-0.58	-1.12	-1.39	-1.87	-1.90	-1.63	-2.41	-2.69	-3.65	-3.64	-3.60	-3.61
295°	-0.53	-1.02	-1.11	-1.62	-1.52	-1.31	-1.77	-2.80	-3.00	-3.41	-3.30	-3.01
300°	-0.53	-0.88	-1.07	-1.52	-1.43	-1.30	-1.88	-2.22	-2.93	-3.02	-2.64	-2.77
305°	-0.45	-0.69	-0.98	-1.32	-1.26	-0.87	-1.51	-2.25	-2.51	-2.65	-2.50	-2.46
310°	-0.34	-0.56	-0.81	-1.00	-1.05	-0.63	-1.39	-1.87	-2.34	-2.32	-1.96	-1.91
315°	-0.25	-0.55	-0.63	-0.96	-0.97	-0.80	-1.29	-1.88	-1.73	-1.98	-1.68	-1.73
320°	-0.14	-0.51	-0.50	-0.85	-0.66	-0.32	-1.10	-1.37	-1.68	-1.52	-1.38	-1.21
325°	-0.04	-0.42	-0.35	-0.64	-0.41	-0.22	-1.08	-1.08	-1.22	-1.20	-1.01	-1.07
330°	0.00	-0.28	-0.20	-0.45	-0.43	-0.33	-0.66	-1.04	-0.89	-0.91	-0.59	-0.72
335°	0.00	-0.16	-0.10	-0.33	-0.40	-0.21	-0.38	-0.68	-0.69	-0.69	-0.48	-0.65
340°	-0.01	-0.07	-0.05	-0.19	-0.27	-0.04	-0.32	-0.32	-0.45	-0.37	-0.31	-0.26
345°	-0.01	-0.01	-0.01	-0.08	-0.10	0.02	-0.26	-0.12	-0.24	-0.16	-0.16	-0.02
350°	0.00	0.01	0.01	0.00	0.00	0.02	-0.15	-0.02	-0.11	-0.06	-0.08	-0.01
355°	0.01	0.02	0.02	0.04	0.03	0.02	-0.02	0.03	-0.02	0.00	-0.01	-0.01

Table A.40 Directional response for Windscreen UA-1650, Microphone Type 4193, Microphone Preampifier ZC-0032 and the analyzer with the Microphone Preampifier mounted directly on the analyzer, measured in a plane perpendicular to the display and along the microphone's axis, 11200 Hz – 20000 Hz, in dB

Angle	Frequency										
	11200 Hz	11800 Hz	12500 Hz	13200 Hz	14000 Hz	15000 Hz	16000 Hz	17000 Hz	18000 Hz	19000 Hz	20000 Hz
0°	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.03
5°	-0.05	-0.03	0.01	-0.03	-0.06	-0.07	-0.02	-0.07	-0.07	-0.02	-0.05
10°	-0.15	-0.09	-0.05	-0.12	-0.15	-0.22	-0.07	-0.23	-0.14	-0.11	-0.19
15°	-0.33	-0.19	-0.18	-0.27	-0.33	-0.37	-0.34	-0.37	-0.33	-0.44	-0.53
20°	-0.61	-0.41	-0.42	-0.48	-0.69	-0.62	-0.73	-0.58	-0.76	-0.88	-0.97
25°	-0.90	-0.85	-0.82	-0.71	-0.97	-1.18	-0.98	-1.03	-1.03	-1.34	-1.51
30°	-1.01	-1.18	-1.11	-1.13	-1.38	-1.37	-1.68	-1.38	-1.47	-1.84	-2.09
35°	-1.49	-1.58	-1.46	-1.50	-1.71	-1.95	-2.02	-2.09	-1.82	-2.29	-2.72
40°	-1.74	-1.84	-2.04	-2.01	-2.19	-2.25	-2.50	-2.68	-2.33	-2.62	-3.15
45°	-2.07	-2.37	-2.42	-2.28	-2.52	-2.71	-3.07	-3.18	-2.96	-3.09	-3.57
50°	-2.31	-2.64	-2.69	-2.80	-3.05	-3.37	-3.55	-3.68	-3.70	-3.81	-4.34
55°	-2.91	-3.22	-3.48	-3.47	-3.62	-3.85	-4.15	-4.38	-4.52	-4.72	-5.31
60°	-3.15	-3.72	-3.99	-4.18	-4.07	-4.40	-4.84	-5.19	-5.35	-5.54	-6.21
65°	-3.56	-4.02	-4.55	-4.72	-4.72	-4.77	-5.54	-5.99	-6.12	-6.35	-6.92
70°	-3.90	-4.49	-5.03	-5.46	-5.30	-5.38	-5.89	-6.66	-6.81	-7.24	-7.90
75°	-4.49	-4.78	-5.45	-5.90	-6.20	-6.17	-6.61	-7.19	-7.57	-8.19	-9.08
80°	-4.56	-5.34	-5.67	-6.27	-6.75	-7.18	-7.78	-8.15	-8.25	-8.95	-9.78
85°	-4.83	-5.52	-6.15	-6.57	-7.17	-8.00	-8.95	-9.46	-8.86	-9.29	-9.93
90°	-5.37	-6.00	-6.71	-6.95	-7.69	-8.37	-9.52	-9.86	-9.63	-10.02	-11.11
95°	-5.64	-6.21	-7.58	-7.84	-8.07	-8.59	-9.36	-9.77	-10.13	-11.25	-13.35
100°	-6.05	-6.67	-7.79	-8.46	-9.02	-8.95	-9.10	-9.89	-10.78	-12.21	-14.17
105°	-6.20	-6.81	-8.08	-8.75	-9.21	-9.32	-10.15	-10.82	-11.10	-12.52	-13.40
110°	-6.41	-6.99	-8.03	-8.63	-9.62	-9.75	-10.90	-11.73	-12.03	-12.74	-13.32
115°	-6.40	-7.10	-8.07	-8.50	-9.64	-10.01	-11.54	-11.78	-12.28	-13.31	-14.95
120°	-6.84	-7.25	-7.96	-8.51	-9.87	-10.13	-11.33	-11.54	-12.81	-13.80	-15.65
125°	-6.99	-7.71	-8.60	-9.05	-10.03	-9.83	-10.76	-11.66	-12.58	-14.27	-15.40
130°	-7.75	-8.50	-9.04	-9.84	-10.52	-10.07	-10.96	-11.97	-11.90	-13.83	-14.02
135°	-8.28	-8.98	-10.06	-11.66	-11.41	-10.70	-11.85	-13.52	-12.16	-13.49	-14.66
140°	-7.97	-9.20	-10.91	-12.01	-11.40	-11.49	-13.64	-15.94	-13.48	-14.07	-17.45
145°	-6.73	-8.19	-9.64	-10.06	-10.47	-11.71	-14.62	-15.69	-13.59	-14.87	-19.42
150°	-6.23	-7.03	-7.61	-8.10	-9.13	-10.84	-12.64	-12.37	-11.94	-14.83	-19.14
155°	-6.87	-8.07	-8.78	-8.63	-8.62	-9.68	-10.81	-10.44	-10.97	-14.35	-16.02
160°	-5.68	-6.64	-7.23	-7.63	-8.84	-10.81	-12.17	-11.47	-11.57	-14.40	-14.08
165°	-7.56	-7.78	-7.71	-7.48	-8.14	-9.59	-10.46	-10.02	-10.81	-14.29	-14.18
170°	-11.16	-12.05	-12.58	-12.58	-13.04	-13.98	-13.93	-12.85	-13.02	-15.63	-14.77
175°	-7.75	-8.78	-9.47	-10.20	-11.59	-13.57	-14.57	-14.71	-15.96	-19.55	-19.69
180°	-6.03	-6.80	-7.21	-7.70	-8.79	-10.38	-11.12	-10.90	-11.72	-14.95	-14.35
185°	-7.16	-8.09	-8.67	-9.33	-10.59	-12.46	-13.44	-13.43	-14.44	-18.10	-18.18
190°	-10.58	-11.76	-12.66	-13.11	-14.25	-15.56	-15.82	-14.68	-14.78	-17.31	-16.35
195°	-8.37	-8.64	-8.51	-8.19	-8.75	-10.07	-10.88	-10.29	-10.78	-14.65	-14.72
200°	-5.85	-6.73	-7.30	-7.65	-8.64	-10.73	-12.49	-11.97	-12.19	-15.43	-15.49
205°	-6.82	-8.25	-9.32	-9.20	-9.25	-10.23	-11.39	-10.60	-10.38	-14.05	-15.89
210°	-6.46	-7.24	-7.73	-7.80	-8.39	-10.20	-12.44	-12.38	-11.23	-13.54	-17.75
215°	-6.26	-7.85	-9.57	-9.96	-9.97	-10.95	-14.16	-16.25	-13.81	-14.02	-18.53
220°	-7.65	-8.83	-10.68	-12.23	-11.76	-11.21	-13.14	-16.82	-14.28	-13.40	-18.41
225°	-8.33	-9.05	-10.23	-11.72	-11.97	-10.90	-11.58	-14.44	-13.09	-13.20	-15.53
230°	-7.74	-8.81	-9.50	-9.92	-10.97	-10.78	-10.58	-12.14	-11.93	-13.61	-15.47
235°	-7.01	-8.07	-9.02	-8.83	-9.72	-10.42	-10.89	-12.56	-12.10	-14.16	-16.13
240°	-6.62	-7.00	-8.35	-8.89	-10.02	-10.36	-11.28	-12.55	-12.41	-13.82	-15.88
245°	-6.96	-7.25	-8.30	-8.58	-9.63	-10.01	-11.78	-12.29	-11.84	-13.09	-15.03
250°	-6.51	-7.06	-8.20	-8.83	-9.68	-9.15	-10.96	-12.60	-12.14	-12.57	-14.02
255°	-6.43	-7.06	-8.16	-8.69	-9.38	-9.32	-10.14	-11.53	-11.79	-12.14	-13.97
260°	-5.97	-6.59	-7.95	-9.13	-9.03	-8.89	-9.73	-10.36	-11.22	-12.08	-14.83
265°	-5.63	-6.73	-7.36	-8.40	-8.66	-8.55	-9.48	-10.22	-10.33	-11.11	-13.90
270°	-5.17	-6.14	-6.93	-7.51	-7.89	-8.62	-9.45	-10.39	-9.88	-10.23	-11.40
275°	-5.10	-5.85	-6.20	-7.08	-7.39	-8.03	-9.11	-9.96	-9.53	-9.65	-10.56
280°	-4.81	-5.22	-6.16	-6.49	-7.08	-7.34	-8.25	-8.61	-8.57	-8.85	-9.98
285°	-4.41	-5.05	-5.67	-6.28	-6.49	-6.64	-6.90	-7.53	-7.70	-8.23	-9.56
290°	-4.01	-4.64	-5.31	-5.83	-5.78	-5.74	-6.22	-6.89	-7.07	-7.53	-8.52
295°	-3.69	-4.21	-4.92	-5.14	-5.03	-4.99	-5.75	-6.39	-6.47	-6.72	-7.41
300°	-3.37	-3.99	-4.43	-4.39	-4.17	-4.52	-5.23	-5.56	-5.67	-5.93	-6.70
305°	-3.03	-3.43	-3.58	-3.47	-3.59	-4.05	-4.45	-4.78	-4.87	-4.95	-5.73
310°	-2.48	-2.74	-2.92	-2.89	-3.17	-3.59	-3.95	-4.00	-3.88	-4.01	-4.66
315°	-2.28	-2.67	-2.68	-2.58	-2.79	-3.16	-3.32	-3.38	-3.14	-3.38	-3.99
320°	-1.84	-1.86	-1.96	-2.05	-2.34	-2.51	-2.78	-3.00	-2.62	-2.86	-3.45
325°	-1.61	-1.77	-1.66	-1.61	-1.95	-2.14	-2.23	-2.19	-2.06	-2.41	-2.93
330°	-1.01	-1.11	-1.11	-1.25	-1.52	-1.62	-1.93	-1.65	-1.70	-2.11	-2.27
335°	-1.02	-1.01	-0.92	-0.95	-1.08	-1.20	-1.10	-1.16	-1.17	-1.47	-1.71
340°	-0.59	-0.48	-0.37	-0.47	-0.82	-0.79	-0.86	-0.72	-0.82	-0.99	-1.09
345°	-0.20	-0.17	-0.20	-0.28	-0.45	-0.45	-0.46	-0.46	-0.51	-0.59	-0.65
350°	-0.07	-0.11	-0.18	-0.17	-0.16	-0.22	-0.06	-0.31	-0.13	-0.22	-0.19
355°	-0.02	-0.04	-0.08	-0.05	-0.02	-0.04	0.03	-0.08	0.00	-0.04	-0.02

Table A.41 Sensitivity variations of Windscreen UA-1650, Microphone Type 4193, Microphone Preamplifier ZC-0032 and the analyzer with the Microphone Preamplifier mounted directly on the analyzer, at sound incidence angles within $\pm\theta^\circ$ from the reference direction

Nominal Frequency	Exact Frequency	Max Variation $\pm 30^\circ$ dB	Max Variation $\pm 90^\circ$ dB	Max Variation $\pm 150^\circ$ dB
500 Hz	501.187 Hz	0.05	0.25	0.39
630 Hz	630.957 Hz	0.06	0.21	0.49
800 Hz	794.328 Hz	0.04	0.20	0.61
1000 Hz	1000 Hz	0.08	0.31	0.76
1250 Hz	1258.93 Hz	0.12	0.18	0.82
1600 Hz	1584.89 Hz	0.10	0.63	1.18
2000 Hz	1995.26 Hz	0.23	0.98	1.52
2240 Hz	2238.72 Hz	0.09	1.15	1.63
2500 Hz	2511.89 Hz	0.22	1.30	1.76
2800 Hz	2818.38 Hz	0.13	1.06	1.83
3150 Hz	3162.28 Hz	0.32	1.14	1.86
3550 Hz	3548.13 Hz	0.10	1.24	1.74
4000 Hz	3981.07 Hz	0.25	1.31	1.95
4500 Hz	4466.84 Hz	0.44	1.61	2.63
5000 Hz	5011.87 Hz	0.44	2.06	3.33
5600 Hz	5623.41 Hz	0.68	2.55	4.08
6300 Hz	6309.57 Hz	0.61	2.80	4.18
7100 Hz	7079.46 Hz	0.37	2.57	4.05
8000 Hz	7943.28 Hz	0.69	3.36	5.28
8500 Hz	8413.95 Hz	1.07	3.82	6.45
9000 Hz	8912.51 Hz	1.03	4.46	7.11
9500 Hz	9440.61 Hz	0.94	4.91	7.76
10000 Hz	10000 Hz	0.61	4.95	8.06
10600 Hz	10592.5 Hz	0.83	5.19	8.16
11200 Hz	11220.2 Hz	1.08	5.56	8.57
11800 Hz	11885.0 Hz	1.20	6.17	9.64
12500 Hz	12589.3 Hz	1.13	6.96	10.93
13200 Hz	13335.2 Hz	1.28	7.53	12.25
14000 Hz	14125.4 Hz	1.55	7.91	13.18
15000 Hz	14962.4 Hz	1.64	8.64	12.47
16000 Hz	15848.9 Hz	1.96	9.56	14.66
17000 Hz	16788.0 Hz	1.67	10.42	16.84
18000 Hz	17782.8 Hz	1.72	9.90	15.83
19000 Hz	18836.5 Hz	2.13	10.25	16.10
20000 Hz	19952.6 Hz	2.30	11.43	19.88

Table A.42 Microphone Type 4193 is not specified together with Outdoor Microphone Kit UA-1404

Table A.43 Microphone Type 4193 is not specified together with Outdoor Microphone Kit UA-1404

Table A.44 Microphone Type 4193 is not specified together with Outdoor Microphone Kit UA-1404

Table A.45 Microphone Type 4193 is not specified together with Outdoor Microphone Kit UA-1404

Table A.46 Microphone Type 4193 is not specified together with Outdoor Microphone Kit UA-1404

Table A.47 Microphone Type 4193 is not specified together with Outdoor Microphone Kit UA-1404

Table A.48 Microphone Type 4193 is not specified together with Outdoor Microphone Kit UA-1404

A.6 Periodic Testing of Acoustical Frequency Responses

This section gives the adjustment data that must be applied to sound levels displayed in response to the sound pressure produced by Multifunction Acoustic Calibrator Type 4226, or in response to simulation of sound pressure by Electrostatic Actuator UA-0033, in order to obtain the equivalent sound levels that would be displayed under reference environmental conditions in response to plane progressive sinusoidal sound waves incident from the reference direction. See Table A.49 and Table A.50 to view the data.

Table A.49 *Acoustical test with Multifunction Acoustic Calibrator Type 4226. Adjustment data that must be applied to the readings of the analyzer in order to obtain equivalent sound levels that would be displayed in response to plane progressive sinusoidal sound waves incident from the reference direction*

Nominal Frequency	Correction Data For Preamplifier Connected to an Extension Cable	Expanded Uncertainty	Correction Data For Preamplifier Mounted Directly on the Analyzer	Expanded Uncertainty
	dB	dB	dB	dB
31.5 Hz	0.00	0.30	0.00	0.32
63 Hz	0.00	0.06	0.00	0.12
125 Hz	0.00	0.05	0.00	0.11
250 Hz	0.00	0.05	0.07	0.11
500 Hz	0.02	0.05	0.25	0.11
1000 Hz	0.11	0.05	0.02	0.11
2000 Hz	0.33	0.09	0.23	0.14
4000 Hz	0.98	0.11	1.02	0.19
8000 Hz	3.19	0.22	3.00	0.30
12500 Hz	6.17	0.27	6.14	0.34
16000 Hz	7.57	0.32	7.53	0.38

Table A.50 *Acoustical test with Electrostatic Actuator UA-0033. Adjustment data that must be applied to the readings of the analyzer in order to obtain equivalent sound levels that would be displayed in response to plane progressive sinusoidal sound waves incident from the reference direction*

Nominal Frequency	Exact Frequency	Correction Data For Preamplifier Connected to an Extension Cable	Expanded Uncertainty	Correction Data For Preamplifier Mounted Directly on the Analyzer	Expanded Uncertainty
		dB	dB	dB	dB
31.5 Hz	31.6228 Hz	0.00	0.02	0.00	0.10
63 Hz	63.0957 Hz	0.00	0.02	0.00	0.10
125 Hz	125.893 Hz	0.00	0.02	0.00	0.10
250 Hz	251.189 Hz	0.00	0.02	0.07	0.10
500 Hz	501.187 Hz	0.02	0.02	0.25	0.10
1000 Hz	1000.00 Hz	0.10	0.02	0.01	0.10
2000 Hz	1995.26 Hz	0.31	0.05	0.22	0.11
4000 Hz	3981.07 Hz	1.00	0.08	1.04	0.17
8000 Hz	7943.28 Hz	3.28	0.09	3.09	0.22
12500 Hz	12589.3 Hz	6.76	0.11	6.73	0.23
16000 Hz	15848.9 Hz	8.55	0.12	8.52	0.23

Appendix E

G-weighting

E.1 Introduction

G-weighting is not specified in the Sound Level Meter standard IEC 61672–1 (2002–05), but it states in paragraph 5.4.12:

“If a sound level meter provides one or more optional frequency responses, the instruction manual shall state the design-goal frequency response and the tolerance limits that are maintained around the design goal(s). If an optional frequency response is specified in an International Standard, the design-goal frequency response shall be as specified in that International Standard....”

Concerning Level Linearity, the standard states in paragraph 5.5.7:

“The specifications in 5.5.5 and 5.5.6 apply over the total range for any frequency within the frequency range of the sound level meter and for any frequency weighting or frequency response provided.”

G-weighting covers a substantially different frequency range from that of the Sound Level Meter standard IEC 61672–1; therefore, it is neither possible nor relevant to fulfil the above completely, but in the specification below we have tried to be as loyal to it as possible.

E.2 Frequency Weighting

Both broadband and spectrum measurements can be frequency weighted with G-weighting.

The G-weightings conform to the requirements in ISO 7196:1995 and ANSI S1.42–2001 (R2011).

Table 2.1 states the design goal frequency responses for the frequency weighting and the typical acoustical responses for the two microphone configurations:

- Type 4193 without UC-0211 and *Low Frequency* is set to *Extended*
- Type 4193 with UC-0211 and *Low Frequency* is set to *Very Low*

At these low frequencies there are no significant influences from windscreens and sound fields.

Table E.1
Frequency weighting design goal and typical acoustical responses

Nominal 1/3-octave Frequency (Hz)	Exact Frequency (6 digits) (Hz)	ISO 7196 Relative Response (dB)	ISO 7196 Tolerance Range (informative) (dB)	Type 4193 without UC-0211 Typical Acoustical Responses (dB)	Type 4193 with UC-0211 Typical Acoustical Responses (dB)
0.25	0.251189	-88.01	$-\infty$ to +1	-94.49	-90.68
0.315	0.316228	-80.04	$-\infty$ to +1	-84.29	-81.55
0.4	0.398107	-72.10	$-\infty$ to +1	-74.67	-72.85
0.5	0.501187	-64.26	$-\infty$ to +1	-65.66	-64.55
0.63	0.630957	-56.64	$-\infty$ to +1	-57.29	-56.69
0.8	0.794328	-49.45	$-\infty$ to +1	-49.66	-49.38
1.00	1	-43.01	$-\infty$ to +1	-43.01	-42.90
1.25	1.25893	-37.45	± 1	-37.35	-37.33
1.6	1.58489	-32.64	± 1	-32.51	-32.52
2.0	1.99526	-28.26	± 1	-28.12	-28.14
2.5	2.51189	-24.11	± 1	-23.98	-24.00
3.15	3.16228	-20.04	± 1	-19.92	-19.93
4.0	3.98107	-16.02	± 1	-15.90	-15.91
5.0	5.01187	-12.01	± 1	-11.90	-11.90
6.3	6.30957	-8.00	± 1	-7.90	-8.00
8.0	7.94328	-4.00	± 1	-3.91	-4.00
10.0	10	0.00	± 1	0.08	0.00
12.5	12.5893	3.99	± 1	4.06	3.99
16.0	15.8489	7.74	± 1	7.80	7.74
20.0	19.9526	8.99	± 1	9.04	8.99
25.0	25.1189	3.73	$-\infty$ to +1	3.77	3.73
31.5	31.6228	-4.02	$-\infty$ to +1	-3.99	-4.02
40	39.8107	-12.00	$-\infty$ to +1	-11.98	-12.00
50	50.1187	-20.00	$-\infty$ to +1	-19.99	-20.00
63	63.0957	-28.00	$-\infty$ to +1	-28.00	-28.00
80	79.4328	-36.00	$-\infty$ to +1	-36.00	-36.00
100	100	-44.00	$-\infty$ to +1	-44.00	-44.00
125	125.893	-52.00	$-\infty$ to +1	-52.00	-52.00
160	158.489	-60.00	$-\infty$ to +1	-60.00	-60.00
200	199.526	-68.00	$-\infty$ to +1	-68.00	-68.00
250	251.189	-76.00	$-\infty$ to +1	-76.00	-76.00
315	316.228	-84.00	$-\infty$ to +1	-84.00	-84.00

E.3 G-weighted Self-generated Noise

Self-generated noise is given for nominal microphone Open Circuit Sensitivity, with *Sound Field Correction* set to *Free-field* and no microphone accessories selected.

Table E.2
G-weighted self-generated noise

	Type 4193 without UC-0211		Type 4193 with UC-0211	
	Maximum Noise (dB)	Typical Noise (dB)	Maximum Noise (dB)	Typical Noise (dB)
Single Range				
Microphone	-2.1	-3.1	-2.1	-3.1
Electrical	29.8	27.2	32.9	29.5
Total	29.8	27.2	32.9	29.5
High Range				
Microphone	-2.1	-3.1	-2.1	-3.1
Electrical	30.4	28.4	40.6	38.6
Total	30.4	28.4	40.6	38.6
Low Range				
Microphone	-2.1	-3.1	-2.1	-3.1
Electrical	29.8	27.2	32.9	29.5
Total	29.8	27.2	32.9	29.5

E.4 G-weighted Linear Operating Range

The starting point for all the Linear Operating Range tests is 94.0 dB.

Linear Operating Range according to the International Standard IEC 61672-1, but at the G-weighting reference frequency, 10 Hz:

Table E.3
Linear Operating Range

	Type 4193 without UC-0211		Type 4193 with UC-0211	
	Upper Limit (dB)	Lower Limit (dB)	Upper Limit (dB)	Lower Limit (dB)
Single Range	161.0	41.0	151.4	44.1
High Range	161.0	41.6	151.4	51.8
Low Range	131.0	41.0	147.4	44.1

E.4.1 Exponential Averaging

Fast and Slow are not relevant at the low frequencies that G-weighting covers, therefore, the exponential time constant is 10 s when G-weighting is selected. This corresponds to an averaging time of 20 s.

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