Technical Documentation

Outdoor Microphone Type 4952 for Hand-held Analyzer Types 2250, 2250-L and 2270

Supplement to Instruction Manual BE 1712

Brüel & Kjær

English BE 1746 – 18

Outdoor Microphone Type 4952 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

March 2012

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

Table of Contents

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 relevent when Hand-held Analyzer Type 2250, 2250 L or 2270 is configured with Outdoor Microphone Type 4952.

The combination of Outdoor Microphone Type 4952 and the hand-held analyzer is intended for outdoor use where a weatherproof microphone solution is needed.

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.

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 Outdoor Microphone Type 4952. The other hardware components can be found in Instruction Manual BE 1712, section 1.2.4.

NOTE:

- Outdoor Microphone Type 4952 includes the Microphone Preamplifier Type ZC-0034
- Outdoor Microphone Type 4952 is specified for two reference directions. In the user-interface they are selected as two different microphones and are called: 4952 0° (Top) and 4952 90° (Side)
  - *4952 0° (Top)*'s reference direction is defined as the inward direction toward the Microphone Reference Point on the microphones rotational axis, coming from the opposite direction of the electrical output
  - *4952 90° (Side)*'s reference direction is defined as the inward direction toward the Microphone Reference Point perpendicular to the microphones rotational axis
- Outdoor Microphone Type 4952 has a built-in Windscreen and is therefore not specified without the Windscreen
- Outdoor Microphone Type 4952 cannot be mounted directly onto the analyzer. It is always connected to the analyzer using an extension cable
- Outdoor Microphone Type 4952 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 Outdoor Microphone Type 4952

Quantity*	Brüel & Kjær Type/Part Number	Description
1 or 2	Type 4952	Outdoor Microphone
1 or 2	WA-0302-A	Electrical Substitute for Microphone Type 4952 cartridge, 12 pF
1 or 2	AO-0645-D-100	Microphone Extension Cable, Screened, 7-pin to 10-pin LEMO, 10 m

*. 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.

2.2 Mounting and Placing the Microphone

Outdoor Microphone Type 4952 must be connected to the analyzer with Microphone Cable AO-0645-D-100. The microphone cannot be mounted directly onto the analyzer.

When two microphones are needed for Type 2270, the Dual 10-pole Adaptor JP-1041 and two microphone cables can be used.

Outdoor Microphone Type 4952 is designed to operate mounted vertically, with the bird spike pointing upwards. The microphone should not be mounted outdoors with other orientations.

The base of Outdoor Microphone Type 4952 has an inner thread that fits onto the thread of a standard 1″ diameter water pipe (ISO 228-1 G1). The transducer part and the upper part of the microphone are mounted on the base with bayonet fittings. The microphone can be mounted on a tripod with Tripod Adaptor UA-1707. The adaptor fits into the thread of the base.

The cable must be fed through the base.

Fix the base to the mast or tripod before you mount the transducer part on the base. In this way you avoid twisting the cable.

Connect the cable to the transducer part and insert the pins of the bayonet fitting of the transducer part into the cutouts in the the bayonet fitting of the base, then turn it clockwise until it locks.

The upper part is mounted onto the transducer part in a similar manner.

The position of the Microphone Reference Point is marked with a groove in the windscreen, i.e., the microphone height should be measured from the ground to the groove.

The microphone must be placed away from shielding, reflecting, or absorbing objects. In a diffuse sound field, absorbing objects will reduce the measured sound levels. In a free sound field, reflecting objects can change the measured sound levels. Typically, the sound level 0.5 m from a plain reflecting wall is 3 dB higher than if there was no wall.

The operator of the system may be personally shielding, absorbing, and reflecting, and the operator can also be an additional noise source.

The optimum position for the microphone is best found by trying different positions and observing the resulting sound levels.

2.7 Measuring at Low Static Pressure

The frequency response of the microphone depends on the static pressure. Using a sound level calibrator to adjust the sensitivity of a sound level meter at the calibration check frequency provides no information on the influence of static pressure on frequency response. Conformance to the specified standards ensures that the system measures within the standard's tolerances, in the range from 85 kPa to 108 kPa. Data for the frequency response as a function of static pressure for the microphone can be found in the Microphone Handbook BA 5105. Type 4952 is not covered by the Microphone Handbook, but in this respect, it performs like Microphone Type 4188.

At the calibration check frequency, both the microphones and the recommended Brüel & Kjær Sound Calibrator Type 4231 are rather insensitive to variations in the static pressure – for Sound Calibrator Type 4231, below 0.001 dB/kPa.

Chapter 3

Conformance Testing

3.1 Introduction

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

3.2 Mounting for Acoustical Tests

For acoustical tests, it is important that the test rig for mounting the microphone is designed to minimise the influence of reflections to a level that is comparatively smaller than the test parameter's maximum Expanded Uncertainties of Measurement. This has to be demonstrated with a good, known laboratory microphone.

For Acoustical tests, Outdoor Microphone Type 4952 should be mounted on a standard 1″ water pipe, see section 2.2. The pipe must be of sufficient length, so as to avoid influence of reflections from the mounting of the tube in the test rig. The microphone must be connected to the analyzer with Microphone Cable AO-0645-D-100.

3.4 Mounting for Mechanical Vibration Tests

Only Outdoor Microphone Type 4952 contributes significantly to the sensitivity to mechanical vibrations and the microphone cannot be mounted directly onto the analyzer. Therefore, only the microphone needs to be tested.

The basis of Outdoor Microphone Type 4952 has an inner thread that fits on the thread of normal 1″ opening diameter water pipes (ISO 228–1 G1). This thread or Tripod Adaptor UA-1707 can be used for mounting the microphone on the shaker.

If, however, you want to test the analyzer, then use the Tripod Mounting Thread situated centrally on the underside of the analyzer.

3.5 Electrical Substitute for Microphones

To obtain a BNC type electrical input, replace the microphone cartridge with a **WA-0302-A, 12 pF**, fitted with a 10−32 UNF to BNC adaptor, UA-0245.

NOTE: In order to prevent moisture from entering the microphone cartridge-preamplifier assembly, the thread is sealed with grease. If the combination is disassembled, care should be taken that the grease remains in the thread. If regreasing is found to be necessary before assembly, use grease with Brüel & Kjær part number WA-0268.

This Electrical Substitute for Microphones has a nominal attenuation of **0.70 dB**.

The electrical input obtained in this way has a maximum input level of ±10.85 V_{Peak} and no damage will occur for signals up to ±20 V_{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):
   a) Set *Input*, *Transd. Used* to the microphone that you intend to substitute
   b) Set *Input*, *Input* to *Top Socket*
2) Calibrate the analyzer by typing in the nominal sensitivity as the *Sensitivity* on the **Calibration** display. For Outdoor Microphone **Type 4952**, the nominal sensitivity is the microphone's Open Circuit Sensitivity (**31.62 mV/Pa**), attenuated by the Microphone Preamplifier ZC-0034's nominal attenuation (**0.30 dB**), which equates to **30.55 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 **33.2 mV**. This is due to the attenuation of the Electrical Substitute for Microphones (nominally **0.70 dB**).

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

Outdoor Microphone Type 4952 which includes Microphone Preamplifier ZC-0034:

Type: Prepolarized Outdoor Microphone

Nominal Open Circuit Sensitivity: 31.6 mV/Pa, (corresponding to –30 dB re 1 V/Pa) ± 2.0 dB

Cartridge Capacitance: 12 pF (at 250 Hz)

Nominal Preamplifier Attenuation: 0.3 dB

Extension Cables between Microphone and the Analyzer: Up to 100 m without degradation of the specifications. **NOTE:** EMC is only tested with a 10 m cable (AO-0645-D-100)

Microphone Reference Point: The point on the microphone's axis, in the centre of the cavity, in front of the microphone grid. The position of the Microphone Reference Point is marked with a groove on the windscreen

Reference Direction: Two different reference directions are defined for Type 4952:

- *4952 0° (Top)*: This reference direction is defined as the inward direction toward the Microphone Reference Point on the microphones rotational axis, coming from the opposite direction of the electrical output
- *4952 90° (Side)*: This reference direction is defined as the inward direction toward the Microphone Reference Point perpendicular to the microphones rotational axis

4.6 Frequency Responses

4.6.2 Typical Low-frequency Responses

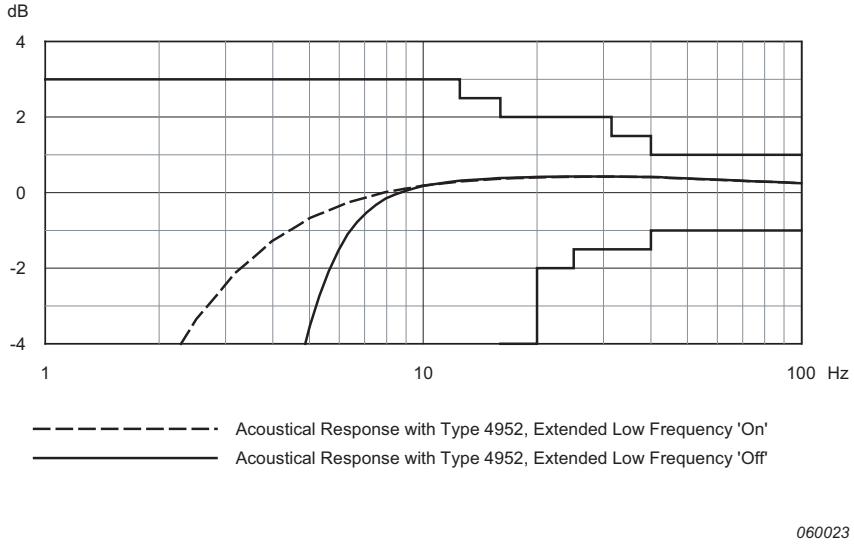
The typical Low-frequency Responses for Z-frequency weighting are given in Fig.4.2. **For the rear 'Input' socket Electrical Responses refer to section 4.6.2 in the Instruction Manual.** The Acoustical Responses include Outdoor Microphone Type 4952 (which again includes Microphone Preamplifier ZC-0034).

The Low-frequency Responses depends on the state of the *Extended Low Frequency* parameter on the **Setup** display, under *Input*.

The Low-frequency Responses are not influenced by the microphone accessories described in section 1.2.4 of the Instruction Manual.

The Low-frequency Responses for introduction of the electrical signal through the recommended means to substitute the microphone with an electrical input facility (see section 3.5) differs from the electrical responses in Fig.4.2 **in the Instruction Manual**, because it also includes Microphone Preamplifier ZC-0034.

Fig.4.2 *Typical low-frequency responses*



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.4.6a and Fig.4.6b, Table A.4a and Table A.4b. The tables also provides the 'Expanded Uncertainties of Measurement' required by IEC 61672–1, see the start of section 4.6 **in the Instruction Manual**.

Fig.4.3 *Outdoor Microphone Type 4952 is not specified without windscreen*

Fig.4.4 *Outdoor Microphone Type 4952 cannot be mounted directly on the analyzer*

Fig.4.5 *Outdoor Microphone Type 4952 cannot be mounted directly on the analyzer*

Fig. 4.6a *4952 0° (Top), Free-field reference direction frequency response for Outdoor Microphone Type 4952 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.4a*

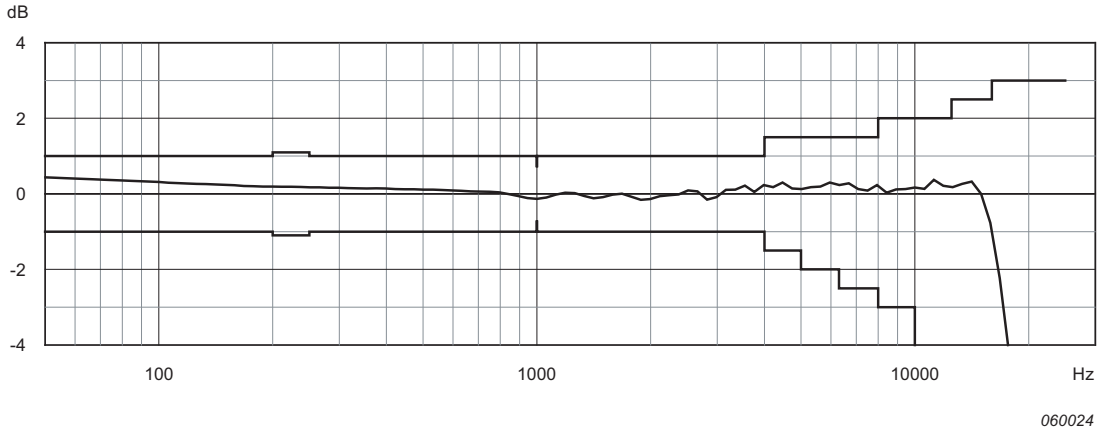


Fig. 4.6b *4952 90° (Side), Free-field reference direction frequency response for Outdoor Microphone Type 4952 and the analyzer's electrical response, with the Microphone Preamplifier connected to a microphone extension cable. Corresponds to the "Acoustical Response" column in Table A.4b*

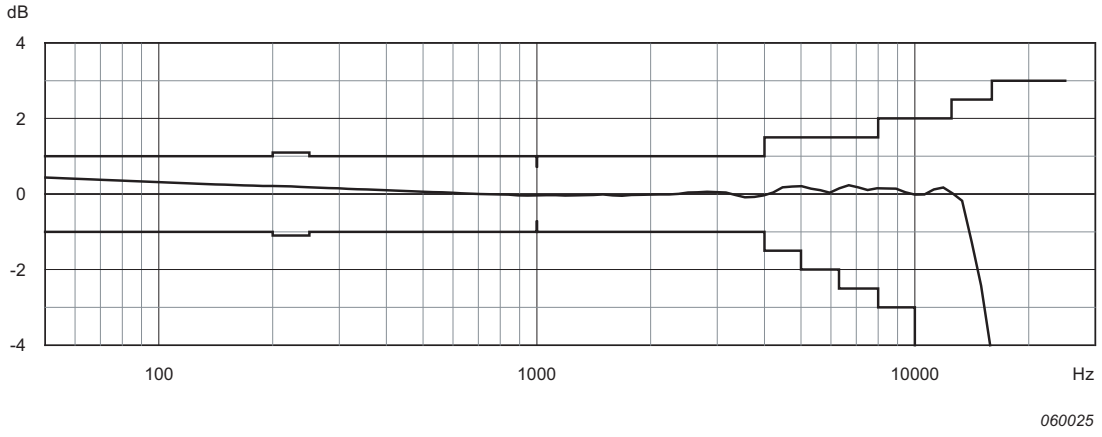


Fig. 4.7 *Outdoor Microphone Type 4952 cannot be mounted directly on the analyzer*

Fig. 4.8 *Outdoor Microphone Type 4952 is not specified together with Outdoor Microphone Kit UA-1404*

4.6.6 Diffuse-field Frequency Responses

The diffuse-field frequency response (also called random-incidence frequency response) with Z-frequency-weighting is provided in Fig. 4.10 and Table A.8.

Fig. 4.9 *Outdoor Microphone Type 4952 is not specified without windscreen*

Fig. 4.10 *Both reference directions, Diffuse-field frequency response for Outdoor Microphone Type 4952 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.8*

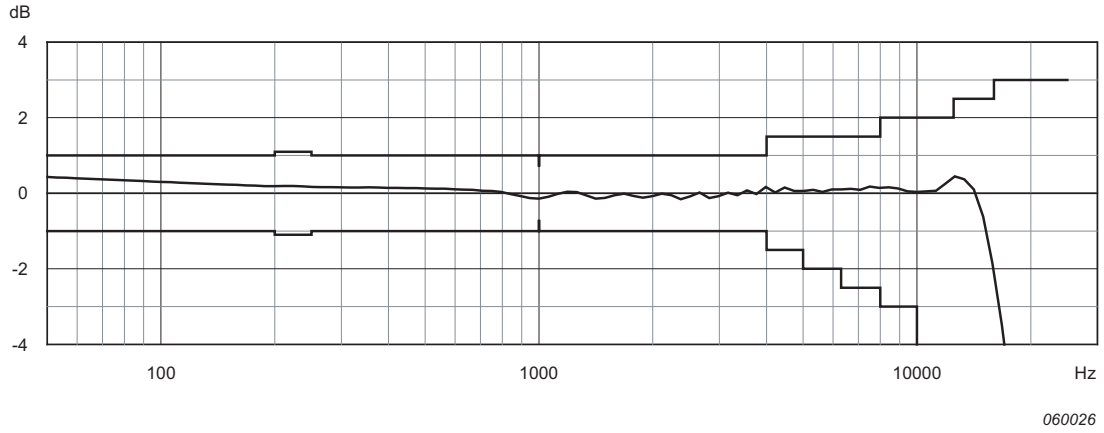


Fig. 4.11 *Outdoor Microphone Type 4952 is not specified together with Outdoor Microphone Kit UA-1404*

4.7 Directional Responses

This section gives directional responses for plane progressive sinusoidal sound waves normalised to the response in the reference direction. The directional responses are given as tables in Appendix A.

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 ±30° 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 *Outdoor Microphone Type 4952 is not specified without windscreen*

Fig. 4.13 *Outdoor Microphone Type 4952 is not specified without windscreen*

Fig. 4.14 *Outdoor Microphone Type 4952 cannot be mounted directly on the analyzer*

Fig. 4.15 *Outdoor Microphone Type 4952 cannot be mounted directly on the analyzer*

Fig. 4.16 *Outdoor Microphone Type 4952 can not be mounted directly on the analyzer*

Fig. 4.17 *Directional response for Outdoor Microphone Type 4952 with the Microphone Preamplifier connected to a microphone extension cable. Corresponds to Table A.31 to Table A.33. The sound incidence angles are for 4952 0° (Top)'s reference direction. For 4952 90° (Side), subtract 90° from the angles in the plots to get the sound incidence angle*

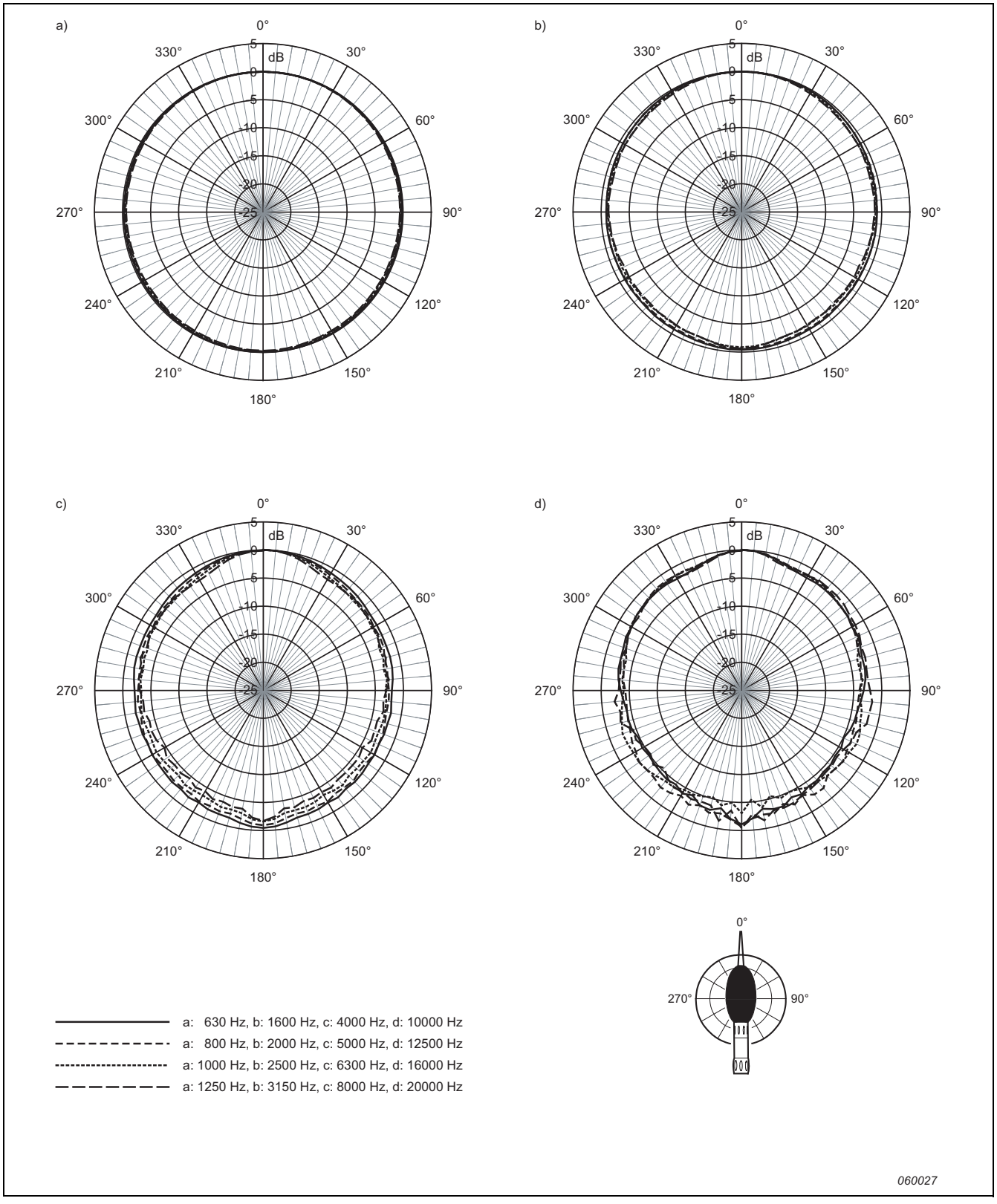


Fig. 4.18a *4952 0° (Top), sensitivity variations for Outdoor Microphone Type 4952 with the Microphone Preamplifier connected to a microphone extension cable, at sound incidence angles within ±θ° from the reference direction. Corresponds to Table A.34a*

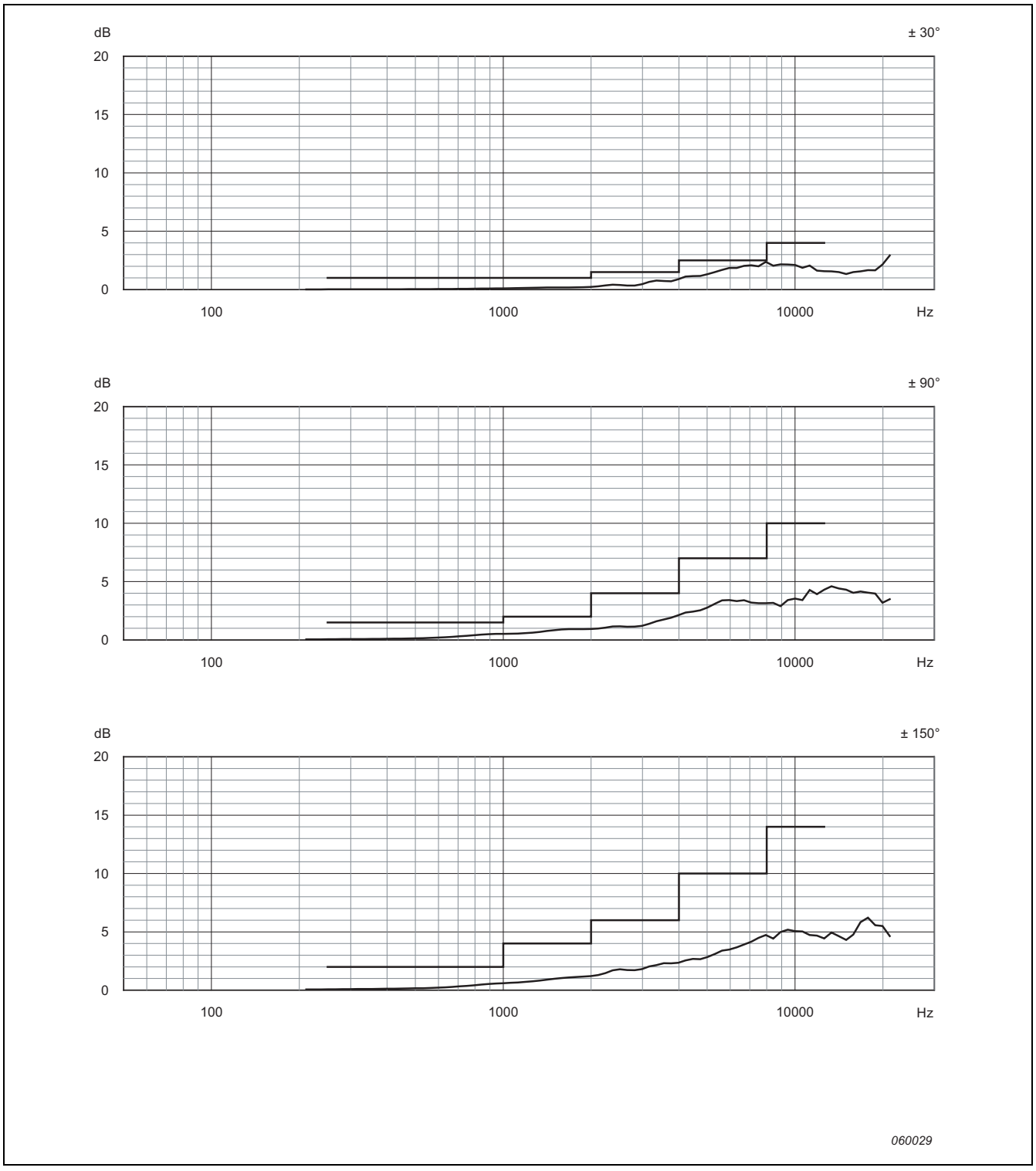


Fig.4.18b *4952 90° (Side), sensitivity variations for Outdoor Microphone Type 4952 with the Microphone Preamplifier connected to a microphone extension cable, at sound incidence angles within ±θ° from the reference direction. Corresponds to Table A.34b*

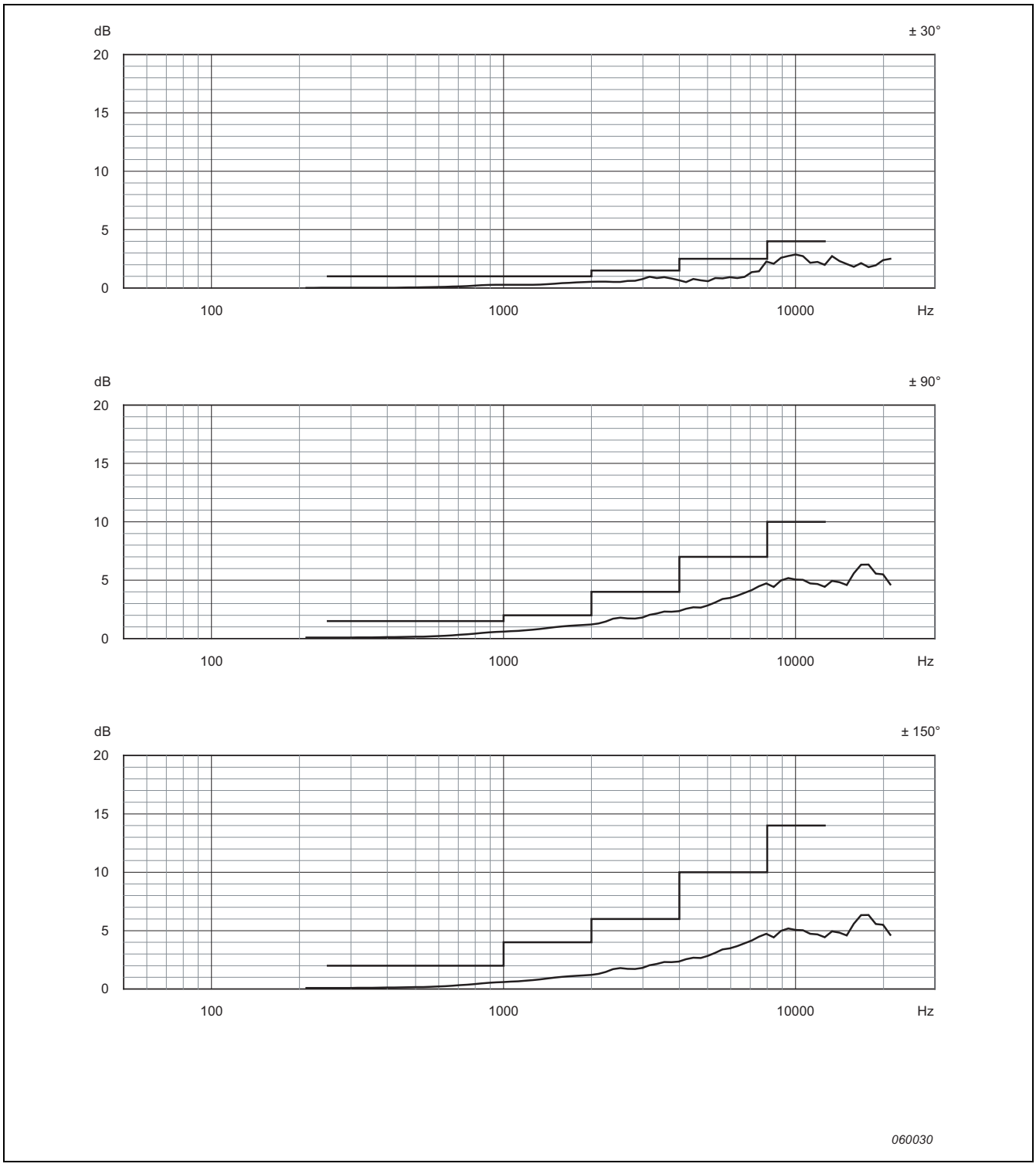


Fig. 4.19 *Outdoor Microphone Type 4952 cannot be mounted directly on the analyzer*

Fig. 4.20 *Outdoor Microphone Type 4952 cannot be mounted directly on the analyzer*

Fig. 4.21 *Outdoor Microphone Type 4952 cannot be mounted directly on the analyzer*

Fig. 4.22 *Outdoor Microphone Type 4952 is not specified together with Outdoor Microphone Kit UA-1404*

Fig. 4.23 *Outdoor Microphone Type 4952 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 4.1
Maximum broadband self-generated noise

Maximum Noise	Frequency Weighting				
	A-weighting (dB)	B-weighting (dB)	C-weighting (dB)	Z-weighting* (dB)	Z-weighting* Extended Low Frequency (dB)
Single-range					
Microphone	15.0	13.9	14.0	15.4	15.4
Electrical	19.9	18.8	20.1	25.9	34.5
Total	21.1	20.0	21.1	26.3	34.6
High Range					
Microphone	15.0	13.9	14.0	15.4	15.4
Electrical	38.2	36.6	36.6	42.5	43.0
Total	38.2	36.6	36.6	42.5	43.0
Low Range					
Microphone	15.0	13.9	14.0	15.4	15.4
Electrical	19.9	18.8	20.1	25.9	34.5
Total	21.1	20.0	21.1	26.3	34.6

*. minimum 120 seconds L_{Zeq}

4.8.2 Typical Broadband Self-generated Noise

Table 4.2
Typical broadband self-generated noise

Typical Noise	Frequency Weighting				
	A-weighting (dB)	B-weighting (dB)	C-weighting (dB)	Z-weighting* (dB)	Z-weighting* Extended Low Frequency (dB)
Single-range					
Microphone	14.0	12.9	13.0	14.4	14.4
Electrical	18.7	17.5	18.7	24.8	30.4
Total	20.0	18.8	19.7	25.2	30.5
High Range					
Microphone	14.0	12.9	13.0	14.4	14.4
Electrical	34.7	33.1	33.1	39.0	39.4
Total	34.7	33.1	33.1	39.0	39.4
Low Range					
Microphone	14.0	12.9	13.0	14.4	14.4
Electrical	18.7	17.5	18.7	24.8	30.4
Total	20.0	18.8	19.7	25.2	30.5

*. minimum 120 seconds L_{Zeq}

4.8.3 Typical Self-generated Noise Spectra

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

Fig. 4.24 *Typical self-generated noise, 1/1 octave band, Single-range*

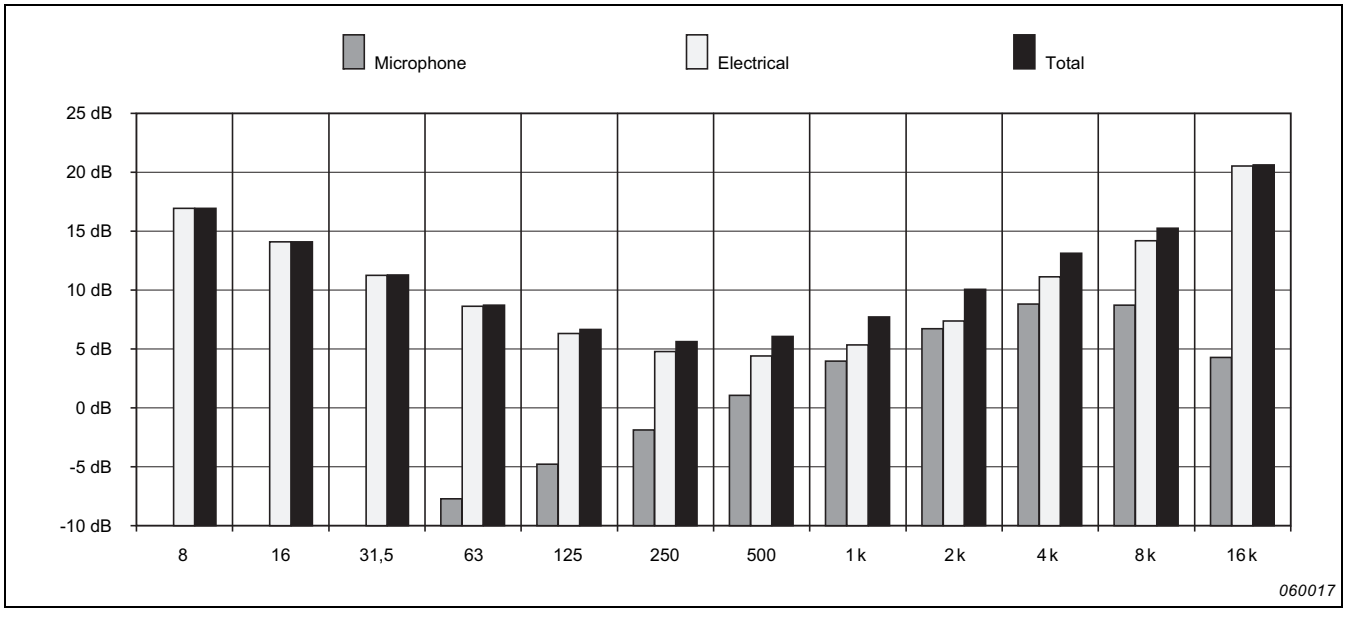


Fig. 4.25 *Typical self-generated noise, 1/1-octave band, High Range*

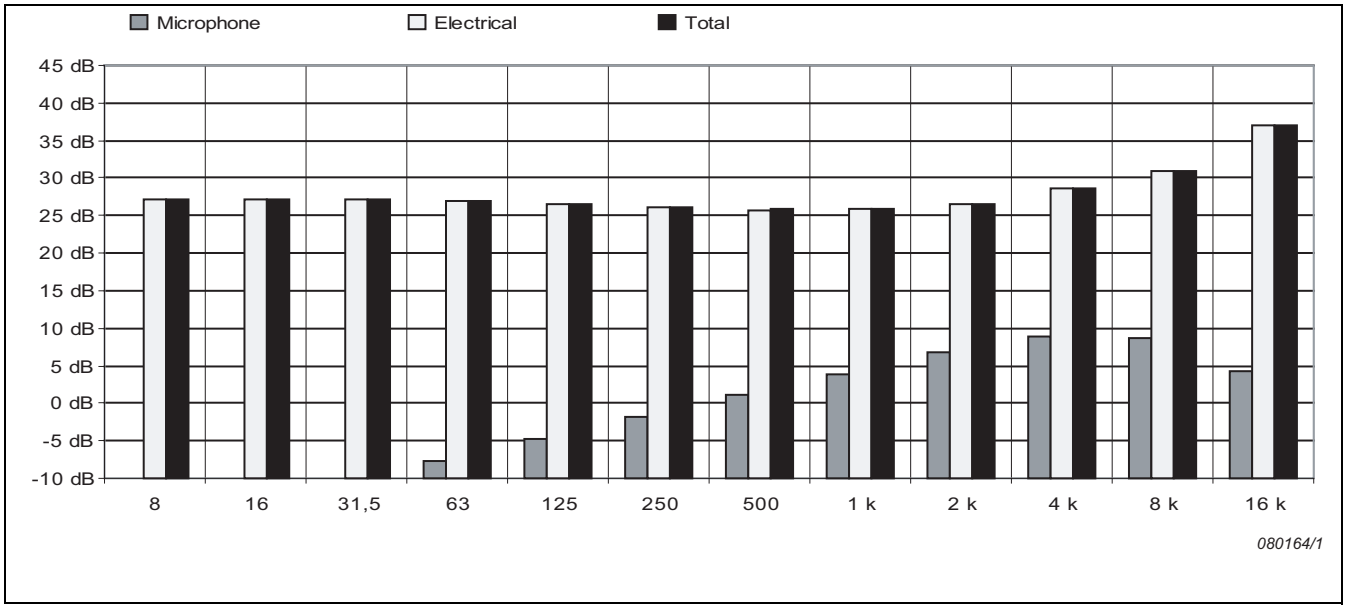


Fig. 4.26 *Typical self-generated noise, 1/1 octave band, Low Range*

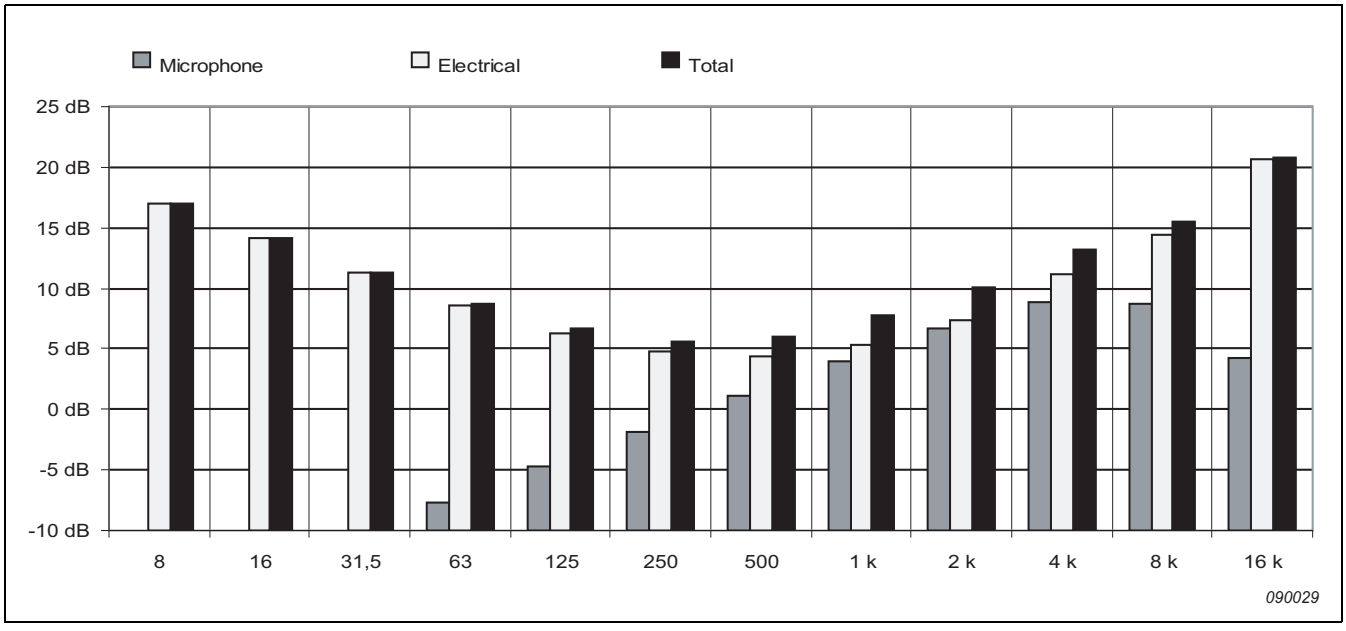


Fig. 4.27 *Typical self-generated noise, 1/3 octave band, Single-range*

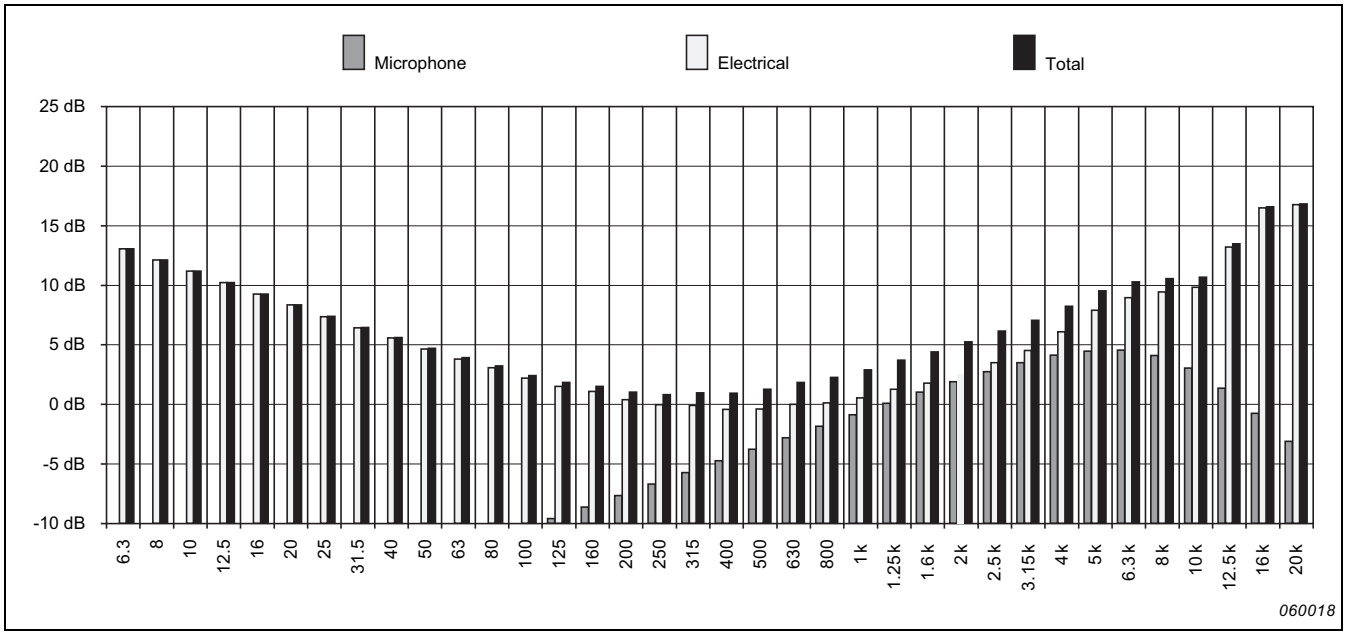


Fig. 4.28 *Typical self-generated noise, 1/3 octave band, High range*

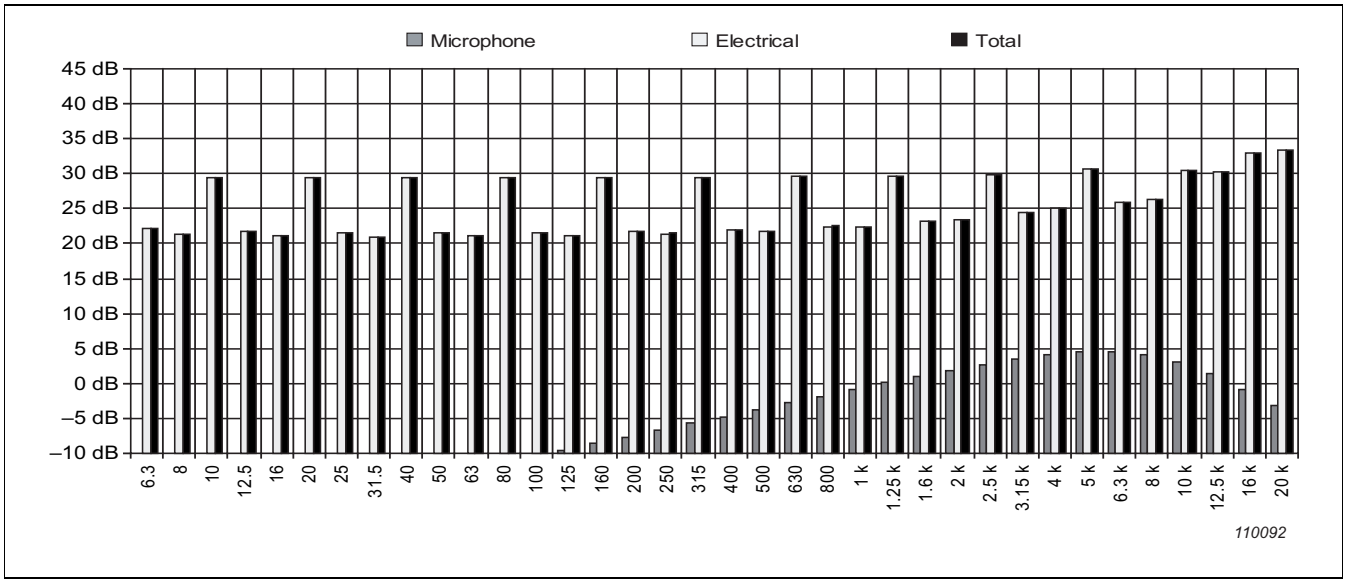
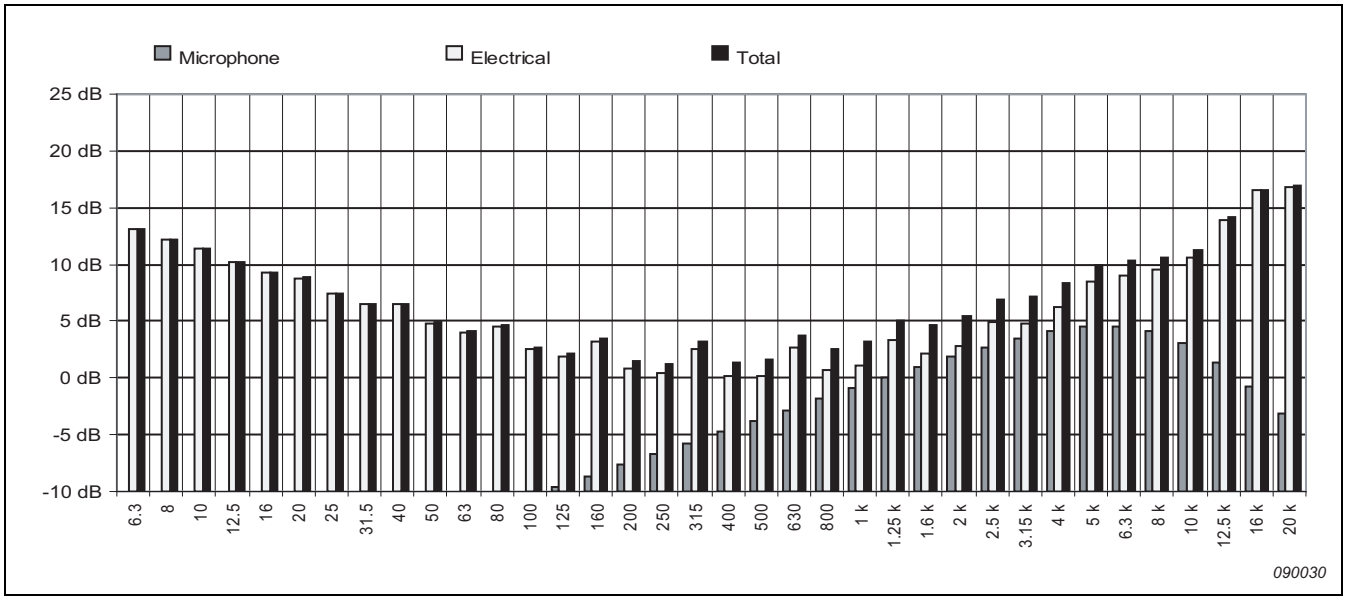


Fig. 4.29 *Typical self-generated noise, 1/3 octave band, Low Range*



4.8.4 Crosstalk

This only applies to Type 2270.

Crosstalk between the two channels is measured with Dual 10-pole Adaptor JP-1041 connected to the top socket, two 10 m Microphone Extension Cables AO-0645-D-100 and two Microphone Preamplifiers ZC-0034 with Electrical Substitute for Microphones as described in section 3.5. The one short-circuited and the other connected to the generator: 5 Hz – 10 kHz ≤ 110 dB, 10 kHz – 20 kHz ≤ 100 dB.

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: 157 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 4.3
Total range

Frequency Weighting				
A-weighting (dB)	**B-weighting (dB)**	**C-weighting (dB)**	**Z-weighting (dB)**	**Z-weighting Extended Low Frequency (dB)**
140.5 – 31.1	140.5 – 30.0	140.5 – 31.3	140.5 – 37.1	140.5 – 45.7

NOTE: For Sound Exposure Levels, the stated ranges are valid if 10*lg(Δ*t*) is added to the limits. Δ*t* 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 4.4
Primary Indicator Range

Range	**Upper Limit (dB)**	**Lower Limit**				
		A-weighting (dB)	**B-weighting (dB)**	**C-weighting (dB)**	**Z-weighting (dB)**	**Z-weighting Extended Low Frequency (dB)**
Single	122.8	29.8	28.7	30.0	35.8	44.4
High	122.8	48.1	46.5	46.5	52.4	52.9
Low	95.8	29.8	28.7	30.0	35.8	44.4

4.9.4 Indicator Range

Indicator Range according to the International Standard IEC 60804:

Table 4.5
Indicator Range

Range	**Upper Limit (dB)**	**Lower Limit**				
		A-weighting (dB)	**B-weighting (dB)**	**C-weighting (dB)**	**Z-weighting (dB)**	**Z-weighting Extended Low Frequency (dB)**
Single	139.8	29.8	28.7	30.0	35.8	44.4
High	139.8	48.1	46.5	46.5	52.4	52.9
Low	112.8	29.8	28.7	30.0	35.8	44.4

NOTE: For Sound Exposure Levels, the stated ranges are valid if 10*lg(Δ*t*) is added to the limits. Δ*t* 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 4.6
Linearity Range

Range	Upper Limit (dB)	Lower Limit				
		A-weighting (dB)	B-weighting (dB)	C-weighting (dB)	Z-weighting (dB)	Z-weighting Extended Low Frequency (dB)
Single	141.1	27.7	26.6	27.9	33.7	42.3
High	141.1	46.0	44.4	44.4	50.3	50.8
Low	114.1	27.7	26.6	27.9	33.7	42.3

NOTE: For Sound Exposure Levels, the stated ranges are valid if 10*lg(Δt) 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 4.7
Pulse Range

Range	Upper Limit (dB)	Lower Limit				
		A-weighting (dB)	B-weighting (dB)	C-weighting (dB)	Z-weighting (dB)	Z-weighting Extended Low Frequency (dB)
Single	144.1	27.7	26.6	27.9	33.7	42.3
High	144.1	46.0	44.4	44.4	50.3	50.8
Low	117.1	27.7	26.6	27.9	33.7	42.3

NOTE: For Sound Exposure Levels, the stated ranges are valid if 10*lg(Δt) 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 4.8
Linear Operating Range

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	101.6	140.5	141.1	138.7	136.4	31.1
B-weighting	123.9	140.5	139.4	136.9	134.6	30.0
C-weighting	138.0	140.5	139.3	136.8	134.5	31.3
Z-weighting	141.0	140.5	140.2	139.8	140.7	37.1
Z-weighting Extended Low Frequency	141.0	140.5	140.2	139.8	140.7	45.7

Table 4.8
Linear Operating Range (Contd.)

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)
High Range						
A-weighting	101.6	140.5	141.1	138.7	136.4	49.4
B-weighting	123.9	140.5	139.4	136.9	134.6	47.8
C-weighting	138.0	140.5	139.3	136.8	134.5	47.8
Z-weighting	141.0	140.5	140.2	139.8	140.7	53.7
Z-weighting Extended Low Frequency	141.0	140.5	140.2	139.8	140.7	54.2
Low Range						
A-weighting	74.6	113.5	114.1	111.7	109.4	31.1
B-weighting	96.9	113.5	112.4	109.9	107.6	30.0
C-weighting	111.0	113.5	112.3	109.8	107.5	31.3
Z-weighting	114.0	113.5	113.2	112.8	113.7	37.1
Z-weighting Extended Low Frequency	114.0	113.5	113.2	112.8	113.7	45.7

NOTE: For Sound Exposure Levels, the stated ranges are valid if 10*lg(Δt) 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 4.9
Peak C Range

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	141.0	143.5	142.3	139.8	137.5	48.1
High	141.0	143.5	142.3	139.8	137.5	64.6
Low	114.0	116.5	115.3	112.8	110.5	48.1

4.11 Spectrum Analysis

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 4.11
Linear Operating Range

Range	Upper Limit (dB)	Lower Limit 1/1-octave (dB)	Lower Limit 1/3-octave (dB)
Single	141.0	33.4	29.5
High	141.0	52.2	48.5
Low	114.0	33.4	29.5

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)
141.0 – 33.4	141.0 – 29.5

4.12 Influence from the Operating Environment

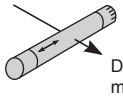
4.12.4 Vibration

Vibration Sensitivity (20 – 1000 Hz) for 1 ms^{-2}: A weighted max. 88 dB, Z-weighted max. 91 dB.

4.12.5 Immunity to Power Magnetic Fields

Maximum sensitivity to power line (50/60 Hz) magnetic field strength of 80 A/m: is specified as the rise in the self-generated noise coming from the magnetic field. The self-generated noise is stated in section 4.8.

Table 4.15
Magnetic Fields

Configuration	Most Sensitive Direction	Rise in Self-generated Noise				
		A-weighted (dB)	B-weighted (dB)	C-weighted (dB)	Z-weighted (dB)	1/3-octave 50 Hz Band (dB)
The Analyzer and Outdoor Microphone Type 4952	Magnetic field perpendicular to the display surface	Not detectable	< 8	< 16	< 12	< 31
Outdoor Microphone Type 4952 alone	 Direction of magnetic field *020148/2* Note orientation	Not detectable	< 7	< 15	< 11	< 30

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 *Outdoor Microphone Type 4952 is not specified without windscreen*

Table A.3 *Outdoor Microphone Type 4952 cannot be mounted directly on the analyzer*

Table A.4a *4952 0° (Top), Free-field reference direction frequency response for Outdoor Microphone Type 4952 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	Electrical Response	Acoustical Response	Expanded Uncertainty
Hz	Hz	dB	dB	dB	dB
63	63.0957	0.39	0.00	0.39	0.16
80	79.4328	0.35	0.00	0.35	0.16
100	100	0.31	0.00	0.31	0.16
125	125.893	0.27	−0.01	0.26	0.16
160	158.489	0.24	−0.01	0.23	0.16
200	199.526	0.21	−0.02	0.19	0.16
250	251.189	0.21	−0.04	0.17	0.16
315	316.228	0.21	−0.06	0.15	0.16
400	398.107	0.23	−0.09	0.14	0.16
500	501.187	0.26	−0.15	0.11	0.17
630	630.957	0.30	−0.22	0.08	0.17
800	794.328	0.37	−0.33	0.04	0.17
1000	1000	0.35	−0.48	−0.13	0.17
1060	1059.25	0.43	−0.52	−0.09	0.17
1120	1122.02	0.54	−0.56	−0.02	0.17
1180	1188.5	0.64	−0.61	0.03	0.17
1250	1258.93	0.67	−0.65	0.02	0.17
1320	1333.52	0.65	−0.70	−0.05	0.17
1400	1412.54	0.62	−0.74	−0.12	0.17
1500	1496.24	0.69	−0.78	−0.09	0.17
1600	1584.89	0.80	−0.82	−0.02	0.17
1700	1678.8	0.86	−0.86	0.00	0.17
1800	1778.28	0.81	−0.89	−0.08	0.17
1900	1883.65	0.76	−0.92	−0.16	0.17
2000	1995.26	0.81	−0.95	−0.14	0.22
2120	2113.49	0.91	−0.97	−0.06	0.22
2240	2238.72	0.94	−0.98	−0.04	0.22
2360	2371.37	0.96	−0.98	−0.02	0.22
2500	2511.89	1.07	−0.98	0.09	0.22
2650	2660.73	1.04	−0.98	0.06	0.22
2800	2818.38	0.82	−0.97	−0.15	0.11

Nominal Frequency	Exact Frequency (6 digits)	Microphone Free–field Response	Electrical Response	Acoustical Response	Expanded Uncertainty
Hz	Hz	dB	dB	dB	dB
3000	2985.38	0.87	–0.95	–0.08	0.23
3150	3162.28	1.04	–0.93	0.11	0.23
3350	3349.65	1.02	–0.91	0.11	0.23
3550	3548.13	1.11	–0.89	0.22	0.24
3750	3758.37	0.92	–0.87	0.05	0.24
4000	3981.07	1.08	–0.85	0.23	0.24
4250	4216.97	1.01	–0.83	0.18	0.24
4500	4466.84	1.12	–0.82	0.30	0.24
4750	4731.51	0.95	–0.81	0.14	0.24
5000	5011.87	0.94	–0.81	0.13	0.25
5300	5308.84	0.99	–0.81	0.18	0.29
5600	5623.41	1.02	–0.83	0.19	0.29
6000	5956.62	1.15	–0.85	0.30	0.30
6300	6309.57	1.13	–0.89	0.24	0.30
6700	6683.44	1.22	–0.94	0.28	0.30
7100	7079.46	1.14	–1.01	0.13	0.30
7500	7498.94	1.17	–1.09	0.08	0.30
8000	7943.28	1.43	–1.19	0.24	0.31
8500	8413.95	1.34	–1.31	0.03	0.31
9000	8912.51	1.55	–1.44	0.11	0.32
9500	9440.61	1.70	–1.57	0.13	0.33
10000	10000	1.86	–1.69	0.17	0.34
10600	10592.5	1.86	–1.73	0.13	0.35
11200	11220.2	1.98	–1.61	0.37	0.36
11800	11885	1.39	–1.18	0.21	0.38
12500	12589.3	0.46	–0.28	0.18	0.38
13200	13335.2	–0.85	1.11	0.26	0.40
14000	14125.4	–2.46	2.78	0.32	0.41
15000	14962.4	–4.31	4.31	0.00	0.46
16000	15848.9	–6.13	5.36	–0.77	0.48
17000	16788	–8.11	5.88	–2.23	0.50
18000	17782.8	–10.30	6.00	–4.30	0.52
19000	18836.5	–12.71	5.93	–6.78	0.54
20000	19952.6	–15.53	5.78	–9.75	0.57
21200	21134.9	–19.46	5.64	–13.82	0.57
22400	22387.2	–23.75	5.50	–18.25	0.57

Table A.4b *4952 90° (Side), Free-field reference direction frequency response for Outdoor Microphone Type 4952 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	Electrical Response	Acoustical Response	Expanded Uncertainty
Hz	Hz	dB	dB	dB	dB
63	63.0957	0.39	0.00	0.39	0.16
80	79.4328	0.35	0.00	0.35	0.16
100	100	0.31	0.00	0.31	0.16
125	125.893	0.27	0.00	0.27	0.16
160	158.489	0.24	0.00	0.24	0.16
200	199.526	0.21	0.00	0.21	0.16
250	251.189	0.18	0.00	0.18	0.16
315	316.228	0.14	0.00	0.14	0.16
400	398.107	0.10	0.00	0.10	0.16
500	501.187	0.06	0.00	0.06	0.17
630	630.957	0.02	0.00	0.02	0.17
800	794.328	–0.01	0.00	–0.01	0.17
1000	1000	–0.03	0.00	–0.03	0.17
1060	1059.25	–0.03	0.00	–0.03	0.17
1120	1122.02	–0.03	0.00	–0.03	0.17

Nominal Frequency	Exact Frequency (6 digits)	Microphone Free–field Response	Electrical Response	Acoustical Response	Expanded Uncertainty
Hz	Hz	dB	dB	dB	dB
1180	1188.5	–0.04	0.00	–0.04	0.17
1250	1258.93	–0.04	0.00	–0.04	0.17
1320	1333.52	–0.03	0.00	–0.03	0.17
1400	1412.54	–0.03	0.00	–0.03	0.17
1500	1496.24	–0.02	0.01	–0.01	0.17
1600	1584.89	–0.04	0.01	–0.03	0.17
1700	1678.8	–0.06	0.01	–0.05	0.17
1800	1778.28	–0.05	0.02	–0.03	0.17
1900	1883.65	–0.05	0.03	–0.02	0.17
2000	1995.26	–0.06	0.04	–0.02	0.22
2120	2113.49	–0.06	0.05	–0.01	0.22
2240	2238.72	–0.07	0.06	–0.01	0.22
2360	2371.37	–0.09	0.09	0.00	0.22
2500	2511.89	–0.08	0.12	0.04	0.22
2650	2660.73	–0.11	0.15	0.04	0.22
2800	2818.38	–0.15	0.21	0.06	0.11
3000	2985.38	–0.22	0.27	0.05	0.23
3150	3162.28	–0.32	0.36	0.04	0.23
3350	3349.65	–0.49	0.47	–0.02	0.23
3550	3548.13	–0.71	0.62	–0.09	0.24
3750	3758.37	–0.88	0.80	–0.08	0.24
4000	3981.07	–1.05	1.01	–0.04	0.24
4250	4216.97	–1.22	1.26	0.04	0.24
4500	4466.84	–1.34	1.52	0.18	0.24
4750	4731.51	–1.58	1.78	0.20	0.24
5000	5011.87	–1.80	2.01	0.21	0.25
5300	5308.84	–2.03	2.17	0.14	0.29
5600	5623.41	–2.17	2.27	0.10	0.29
6000	5956.62	–2.24	2.28	0.04	0.30
6300	6309.57	–2.09	2.24	0.15	0.30
6700	6683.44	–1.92	2.15	0.23	0.30
7100	7079.46	–1.85	2.03	0.18	0.30
7500	7498.94	–1.79	1.90	0.11	0.30
8000	7943.28	–1.62	1.77	0.15	0.31
8500	8413.95	–1.49	1.64	0.15	0.31
9000	8912.51	–1.40	1.54	0.14	0.32
9500	9440.61	–1.44	1.48	0.04	0.33
10000	10000	–1.53	1.51	–0.02	0.34
10600	10592.5	–1.70	1.69	–0.01	0.35
11200	11220.2	–1.99	2.11	0.12	0.36
11800	11885	–2.67	2.84	0.17	0.38
12500	12589.3	–3.83	3.84	0.01	0.38
13200	13335.2	–5.06	4.88	–0.18	0.40
14000	14125.4	–6.92	5.65	–1.27	0.41
15000	14962.4	–8.41	5.99	–2.42	0.46
16000	15848.9	–10.02	5.99	–4.03	0.48
17000	16788	–11.65	5.83	–5.82	0.50
18000	17782.8	–13.50	5.62	–7.88	0.52
19000	18836.5	–15.50	5.41	–10.09	0.54
20000	19952.6	–17.93	5.23	–12.70	0.57
21200	21134.9	–21.76	5.09	–16.67	0.57
22400	22387.2	–25.97	4.97	–21.00	0.57

Table A.5 *Outdoor Microphone Type 4952 cannot be mounted directly on the analyzer*

Table A.6 *Outdoor Microphone Type 4952 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 *Outdoor Microphone Type 4952 is not specified without windscreen*

Table A.8 *Both reference directions, Diffuse-field frequency response for Outdoor Microphone Type 4952 and the analyzer's electrical response, with the Microphone Preamplifier connected to a microphone extension cable*

Nominal Frequency	Exact Frequency (6 digits)	Microphone Diffuse-field Response	Electrical Response	Acoustical Response	Expanded Uncertainty
Hz	Hz	dB	dB	dB	dB
63	63.0957	0.39	0.00	0.39	0.07
80	79.4328	0.34	0.00	0.34	0.07
100	100	0.30	0.00	0.30	0.07
125	125.893	0.26	0.00	0.26	0.07
160	158.489	0.22	0.00	0.22	0.07
200	199.526	0.19	0.00	0.19	0.07
250	251.189	0.18	−0.01	0.17	0.07
315	316.228	0.16	−0.01	0.15	0.08
400	398.107	0.16	−0.02	0.14	0.08
500	501.187	0.15	−0.03	0.12	0.11
630	630.957	0.14	−0.04	0.10	0.11
800	794.328	0.09	−0.06	0.03	0.11
1000	1000	−0.05	−0.09	−0.14	0.11
1060	1059.25	0.00	−0.09	−0.09	0.13
1120	1122.02	0.08	−0.10	−0.02	0.13
1180	1188.5	0.15	−0.11	0.04	0.13
1250	1258.93	0.14	−0.11	0.03	0.13
1320	1333.52	0.06	−0.12	−0.06	0.14
1400	1412.54	−0.01	−0.13	−0.14	0.14
1500	1496.24	0.01	−0.13	−0.12	0.14
1600	1584.89	0.08	−0.13	−0.05	0.16
1700	1678.8	0.12	−0.13	−0.01	0.18
1800	1778.28	0.06	−0.13	−0.07	0.18
1900	1883.65	0.00	−0.12	−0.12	0.18
2000	1995.26	0.03	−0.11	−0.08	0.18
2120	2113.49	0.08	−0.09	−0.01	0.18
2240	2238.72	0.01	−0.06	−0.05	0.19
2360	2371.37	−0.14	−0.02	−0.16	0.19
2500	2511.89	−0.10	0.02	−0.08	0.19
2650	2660.73	−0.06	0.08	0.02	0.19
2800	2818.38	−0.27	0.14	−0.13	0.20
3000	2985.38	−0.30	0.22	−0.08	0.20
3150	3162.28	−0.30	0.31	0.01	0.20
3350	3349.65	−0.47	0.42	−0.05	0.20
3550	3548.13	−0.45	0.53	0.08	0.21
3750	3758.37	−0.67	0.65	−0.02	0.21
4000	3981.07	−0.61	0.78	0.17	0.21
4250	4216.97	−0.90	0.92	0.02	0.21
4500	4466.84	−0.91	1.06	0.15	0.22
4750	4731.51	−1.13	1.19	0.06	0.30
5000	5011.87	−1.26	1.32	0.06	0.39
5300	5308.84	−1.36	1.45	0.09	0.48
5600	5623.41	−1.52	1.56	0.04	0.53
6000	5956.62	−1.56	1.66	0.10	0.53
6300	6309.57	−1.63	1.73	0.10	0.53
6700	6683.44	−1.66	1.78	0.12	0.53
7100	7079.46	−1.72	1.81	0.09	0.53
7500	7498.94	−1.62	1.80	0.18	0.53
8000	7943.28	−1.62	1.76	0.14	0.53
8500	8413.95	−1.51	1.67	0.16	0.55
9000	8912.51	−1.42	1.55	0.13	0.56

Nominal Frequency	Exact Frequency (6 digits)	Microphone Diffuse-field Response	Electrical Response	Acoustical Response	Expanded Uncertainty
Hz	Hz	dB	dB	dB	dB
9500	9440.61	–1.34	1.39	0.05	0.57
10000	10000	–1.21	1.24	0.03	0.59
10600	10592.5	–1.11	1.16	0.05	0.87
11200	11220.2	–1.22	1.29	0.07	0.88
11800	11885	–1.56	1.81	0.25	0.89
12500	12589.3	–2.33	2.78	0.45	0.91
13200	13335.2	–3.69	4.06	0.37	0.92
14000	14125.4	–5.23	5.33	0.10	0.94
15000	14962.4	–6.99	6.37	–0.62	0.95
16000	15848.9	–8.94	7.08	–1.86	0.97
17000	16788	–11.00	7.52	–3.48	0.98
18000	17782.8	–13.26	7.77	–5.49	0.99
19000	18836.5	–15.48	7.90	–7.58	1.01
20000	19952.6	–18.18	7.96	–10.22	1.02
21200	21134.9	–21.98	7.97	–14.01	1.03
22400	22387.2	–27.35	7.95	–19.40	1.04

Table A.9 *Outdoor Microphone Type 4952 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 reference direction 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.4a	Configuration as in Table A.4b
Hz	Hz	dB	dB
63	63.0957	0.39	0.39
80	79.4328	0.35	0.35
100	100	0.31	0.31
125	125.893	0.27	0.27
160	158.489	0.24	0.24
200	199.526	0.21	0.21
250	251.189	0.20	0.17
315	316.228	0.20	0.13
400	398.107	0.21	0.08
500	501.187	0.23	0.03
630	630.957	0.26	–0.02
800	794.328	0.31	–0.07
1000	1000	0.26	–0.12
1060	1059.25	0.34	–0.12
1120	1122.02	0.44	–0.13
1180	1188.5	0.53	–0.15
1250	1258.93	0.56	–0.15
1320	1333.52	0.53	–0.15
1400	1412.54	0.49	–0.16
1500	1496.24	0.56	–0.15
1600	1584.89	0.67	–0.17
1700	1678.8	0.73	–0.19
1800	1778.28	0.68	–0.18

Nominal Frequency Hz	Exact Frequency (6 digits) Hz	Configuration as in Table A.4a dB	Configuration as in Table A.4b dB
1900	1883.65	0.64	–0.17
2000	1995.26	0.70	–0.17
2120	2113.49	0.82	–0.15
2240	2238.72	0.88	–0.13
2360	2371.37	0.94	–0.11
2500	2511.89	1.09	–0.06
2650	2660.73	1.12	–0.03
2800	2818.38	0.96	–0.01
3000	2985.38	1.09	0.00
3150	3162.28	1.35	–0.01
3350	3349.65	1.44	–0.07
3550	3548.13	1.64	–0.18
3750	3758.37	1.57	–0.23
4000	3981.07	1.86	–0.27
4250	4216.97	1.93	–0.30
4500	4466.84	2.18	–0.28
4750	4731.51	2.14	–0.39
5000	5011.87	2.26	–0.48
5300	5308.84	2.44	–0.58
5600	5623.41	2.58	–0.61
6000	5956.62	2.81	–0.58
6300	6309.57	2.86	–0.36
6700	6683.44	3.00	–0.14
7100	7079.46	2.95	–0.04
7500	7498.94	2.97	0.01
8000	7943.28	3.19	0.14
8500	8413.95	3.01	0.18
9000	8912.51	3.10	0.15
9500	9440.61	3.09	–0.05
10000	10000	3.10	–0.29
10600	10592.5	3.02	–0.54
11200	11220.2	3.27	–0.70
11800	11885	3.20	–0.86
12500	12589.3	3.24	–1.05
13200	13335.2	3.21	–1.00
14000	14125.4	2.87	–1.59
15000	14962.4	2.06	–2.04
16000	15848.9	0.95	–2.94
17000	16788	–0.59	–4.13
18000	17782.8	–2.53	–5.73
19000	18836.5	–4.81	–7.60
20000	19952.6	–7.57	–9.97
21200	21134.9	–11.49	–13.79
22400	22387.2	–15.80	–18.02

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 *Outdoor Microphone Type 4952 is not specified without windscreen*

Table A.12 *Outdoor Microphone Type 4952 is not specified without windscreen*

Table A.13 *Outdoor Microphone Type 4952 is not specified without windscreen*

Table A.14 *Outdoor Microphone Type 4952 is not specified without windscreen*

Table A.15 *Outdoor Microphone Type 4952 cannot be mounted directly on the analyzer*

Table A.16 *Outdoor Microphone Type 4952 cannot be mounted directly on the analyzer*

Table A.17 *Outdoor Microphone Type 4952 cannot be mounted directly on the analyzer*

Table A.18 *Outdoor Microphone Type 4952 cannot be mounted directly on the analyzer*

Table A.19 *Outdoor Microphone Type 4952 cannot be mounted directly on the analyzer*

Table A.20 *Outdoor Microphone Type 4952 cannot be mounted directly on the analyzer*

Table A.21 *Outdoor Microphone Type 4952 cannot be mounted directly on the analyzer*

Table A.22 *Outdoor Microphone Type 4952 cannot be mounted directly on the analyzer*

Table A.23 *Outdoor Microphone Type 4952 cannot be mounted directly on the analyzer*

Table A.24 *Outdoor Microphone Type 4952 cannot be mounted directly on the analyzer*

Table A.25 *Outdoor Microphone Type 4952 cannot be mounted directly on the analyzer*

Table A.26 *Outdoor Microphone Type 4952 cannot be mounted directly on the analyzer*

Table A.27 *Outdoor Microphone Type 4952 cannot be mounted directly on the analyzer*

Table A.28 *Windscreen is an integral part of Outdoor Microphone Type 4952*

Table A.29 *Windscreen is an integral part of Outdoor Microphone Type 4952*

Table A.30 *Windscreen is an integral part of Outdoor Microphone Type 4952*

Table A.31 *Directional response for Outdoor Microphone Type 4952 with the Microphone Preamplifier connected to a microphone extension cable. The sound incidence angles are for 4952 0° (Top)'s reference direction. For 4952 90° (Side) subtract 90° degrees from the angles in the table to get the sound incidence angle. 500 Hz – 3550 Hz, in dB*

	Frequency											
Angle	**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	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.02
5°	−0.01	0.00	0.00	−0.01	−0.01	0.00	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01
10°	−0.01	−0.01	−0.01	−0.02	−0.02	−0.02	−0.03	−0.04	−0.04	−0.04	−0.07	−0.07
15°	−0.01	−0.01	−0.02	−0.03	−0.04	−0.04	−0.06	−0.09	−0.09	−0.09	−0.18	−0.17
20°	−0.02	−0.02	−0.03	−0.05	−0.07	−0.08	−0.11	−0.16	−0.17	−0.16	−0.32	−0.31
25°	−0.02	−0.04	−0.05	−0.08	−0.11	−0.12	−0.17	−0.25	−0.27	−0.24	−0.48	−0.49
30°	−0.03	−0.05	−0.07	−0.10	−0.15	−0.18	−0.23	−0.35	−0.39	−0.33	−0.64	−0.70
35°	−0.04	−0.06	−0.10	−0.13	−0.20	−0.24	−0.29	−0.45	−0.51	−0.43	−0.77	−0.94
40°	−0.04	−0.07	−0.12	−0.17	−0.25	−0.31	−0.35	−0.54	−0.66	−0.54	−0.88	−1.18
45°	−0.05	−0.09	−0.15	−0.21	−0.30	−0.39	−0.40	−0.61	−0.82	−0.62	−0.97	−1.34
50°	−0.07	−0.10	−0.17	−0.25	−0.35	−0.46	−0.47	−0.66	−0.98	−0.71	−1.04	−1.40
55°	−0.08	−0.12	−0.20	−0.29	−0.41	−0.54	−0.53	−0.69	−1.06	−0.83	−1.05	−1.43
60°	−0.09	−0.14	−0.22	−0.32	−0.46	−0.60	−0.60	−0.73	−1.07	−0.97	−1.05	−1.45
65°	−0.11	−0.17	−0.25	−0.34	−0.51	−0.68	−0.65	−0.79	−1.04	−1.05	−1.14	−1.39
70°	−0.12	−0.19	−0.29	−0.37	−0.55	−0.75	−0.70	−0.84	−1.02	−1.04	−1.27	−1.37
75°	−0.13	−0.21	−0.33	−0.39	−0.57	−0.82	−0.73	−0.88	−1.06	−0.98	−1.37	−1.48
80°	−0.13	−0.22	−0.37	−0.43	−0.58	−0.87	−0.79	−0.89	−1.13	−0.96	−1.35	−1.64
85°	−0.13	−0.23	−0.39	−0.47	−0.60	−0.89	−0.87	−0.94	−1.16	−1.04	−1.26	−1.74
90°	−0.13	−0.23	−0.41	−0.52	−0.62	−0.89	−0.93	−1.05	−1.15	−1.13	−1.30	−1.68
95°	−0.14	−0.23	−0.41	−0.55	−0.66	−0.89	−0.97	−1.13	−1.28	−1.14	−1.47	−1.64
100°	−0.14	−0.24	−0.42	−0.57	−0.70	−0.91	−0.97	−1.19	−1.39	−1.26	−1.50	−1.87
105°	−0.15	−0.24	−0.42	−0.58	−0.72	−0.96	−0.95	−1.16	−1.55	−1.37	−1.66	−1.91
110°	−0.14	−0.24	−0.42	−0.57	−0.74	−0.99	−1.00	−1.16	−1.50	−1.56	−1.74	−2.07
115°	−0.13	−0.23	−0.42	−0.59	−0.72	−1.02	−1.04	−1.20	−1.53	−1.47	−2.01	−2.06
120°	−0.13	−0.21	−0.39	−0.60	−0.74	−1.00	−1.14	−1.28	−1.54	−1.58	−1.81	−2.30
125°	−0.14	−0.22	−0.36	−0.56	−0.76	−1.00	−1.12	−1.37	−1.65	−1.57	−1.93	−2.04
130°	−0.15	−0.23	−0.36	−0.51	−0.73	−1.04	−1.12	−1.32	−1.72	−1.71	−1.90	−2.09
135°	−0.14	−0.22	−0.36	−0.49	−0.67	−1.02	−1.20	−1.38	−1.64	−1.63	−2.01	−2.11
140°	−0.13	−0.21	−0.36	−0.50	−0.63	−0.94	−1.19	−1.46	−1.77	−1.61	−1.78	−2.00
145°	−0.11	−0.19	−0.34	−0.50	−0.63	−0.89	−1.11	−1.37	−1.78	−1.70	−1.90	−1.89
150°	−0.10	−0.16	−0.30	−0.48	−0.63	−0.88	−1.07	−1.29	−1.64	−1.55	−1.77	−1.97
155°	−0.08	−0.14	−0.25	−0.44	−0.59	−0.85	−1.07	−1.29	−1.63	−1.49	−1.59	−1.67
160°	−0.06	−0.11	−0.20	−0.38	−0.53	−0.77	−1.00	−1.23	−1.59	−1.49	−1.63	−1.67
165°	−0.05	−0.08	−0.16	−0.32	−0.46	−0.65	−0.85	−1.06	−1.40	−1.28	−1.45	−1.55
170°	−0.04	−0.07	−0.13	−0.27	−0.39	−0.55	−0.70	−0.88	−1.16	−0.99	−1.08	−1.14
175°	−0.03	−0.06	−0.11	−0.23	−0.35	−0.49	−0.60	−0.75	−0.99	−0.77	−0.80	−0.79
180°	−0.03	−0.05	−0.10	−0.22	−0.33	−0.46	−0.57	−0.70	−0.93	−0.70	−0.70	−0.66
185°	−0.04	−0.06	−0.10	−0.23	−0.35	−0.48	−0.60	−0.74	−0.98	−0.76	−0.78	−0.77
190°	−0.04	−0.07	−0.12	−0.26	−0.39	−0.54	−0.69	−0.86	−1.14	−0.97	−1.04	−1.09
195°	−0.05	−0.08	−0.15	−0.31	−0.45	−0.64	−0.84	−1.04	−1.38	−1.25	−1.39	−1.50
200°	−0.07	−0.10	−0.19	−0.37	−0.52	−0.75	−0.98	−1.21	−1.58	−1.46	−1.60	−1.66
205°	−0.08	−0.13	−0.23	−0.43	−0.59	−0.83	−1.06	−1.29	−1.63	−1.48	−1.57	−1.64
210°	−0.10	−0.15	−0.28	−0.48	−0.63	−0.86	−1.07	−1.28	−1.63	−1.51	−1.71	−1.93
215°	−0.12	−0.18	−0.31	−0.50	−0.63	−0.87	−1.09	−1.33	−1.75	−1.67	−1.90	−1.93
220°	−0.13	−0.20	−0.33	−0.50	−0.63	−0.91	−1.18	−1.43	−1.77	−1.62	−1.78	−1.96
225°	−0.15	−0.21	−0.34	−0.49	−0.66	−0.99	−1.20	−1.37	−1.64	−1.61	−1.98	−2.12
230°	−0.15	−0.21	−0.33	−0.51	−0.73	−1.02	−1.12	−1.30	−1.70	−1.70	−1.89	−2.06
235°	−0.15	−0.21	−0.33	−0.56	−0.76	−0.98	−1.12	−1.35	−1.65	−1.54	−1.90	−2.09
240°	−0.14	−0.20	−0.35	−0.59	−0.74	−0.97	−1.13	−1.27	−1.51	−1.56	−1.82	−2.24
245°	−0.14	−0.22	−0.39	−0.59	−0.72	−0.99	−1.04	−1.17	−1.53	−1.45	−1.97	−2.05
250°	−0.15	−0.23	−0.39	−0.57	−0.73	−0.96	−0.99	−1.14	−1.47	−1.53	−1.71	−2.08
255°	−0.15	−0.23	−0.38	−0.57	−0.72	−0.92	−0.95	−1.14	−1.52	−1.34	−1.64	−1.91
260°	−0.15	−0.22	−0.38	−0.57	−0.70	−0.88	−0.96	−1.17	−1.37	−1.24	−1.49	−1.85
265°	−0.14	−0.22	−0.38	−0.55	−0.66	−0.86	−0.96	−1.11	−1.26	−1.13	−1.44	−1.63
270°	−0.13	−0.21	−0.37	−0.52	−0.62	−0.86	−0.93	−1.03	−1.15	−1.11	−1.28	−1.64
275°	−0.13	−0.21	−0.36	−0.47	−0.60	−0.86	−0.87	−0.92	−1.14	−1.02	−1.23	−1.69
280°	−0.13	−0.20	−0.33	−0.43	−0.58	−0.84	−0.80	−0.88	−1.11	−0.95	−1.30	−1.62
285°	−0.13	−0.19	−0.30	−0.39	−0.57	−0.79	−0.74	−0.86	−1.05	−0.97	−1.33	−1.46
290°	−0.12	−0.17	−0.26	−0.36	−0.55	−0.73	−0.70	−0.82	−1.01	−1.02	−1.25	−1.34
295°	−0.11	−0.15	−0.22	−0.34	−0.51	−0.65	−0.66	−0.77	−1.02	−1.04	−1.12	−1.37
300°	−0.09	−0.13	−0.19	−0.32	−0.46	−0.58	−0.60	−0.72	−1.05	−0.97	−1.03	−1.42
305°	−0.08	−0.11	−0.17	−0.28	−0.40	−0.52	−0.54	−0.68	−1.05	−0.83	−1.04	−1.41
310°	−0.06	−0.09	−0.14	−0.24	−0.35	−0.45	−0.47	−0.65	−0.97	−0.71	−1.03	−1.39
315°	−0.05	−0.07	−0.12	−0.20	−0.29	−0.37	−0.41	−0.61	−0.82	−0.63	−0.96	−1.35
320°	−0.04	−0.06	−0.10	−0.17	−0.24	−0.30	−0.35	−0.54	−0.66	−0.54	−0.87	−1.19
325°	−0.03	−0.05	−0.08	−0.13	−0.20	−0.23	−0.29	−0.45	−0.51	−0.44	−0.77	−0.96
330°	−0.02	−0.03	−0.05	−0.10	−0.15	−0.17	−0.23	−0.34	−0.39	−0.33	−0.64	−0.72
335°	−0.01	−0.02	−0.04	−0.07	−0.10	−0.11	−0.17	−0.25	−0.27	−0.24	−0.49	−0.51
340°	−0.01	−0.01	−0.02	−0.04	−0.07	−0.07	−0.11	−0.16	−0.18	−0.16	−0.33	−0.33
345°	0.00	0.00	−0.01	−0.02	−0.03	−0.04	−0.06	−0.10	−0.10	−0.10	−0.19	−0.19
350°	0.00	0.00	0.00	−0.01	−0.01	−0.02	−0.03	−0.04	−0.04	−0.05	−0.09	−0.09
355°	0.01	0.00	0.00	0.00	0.00	−0.01	−0.01	−0.02	−0.02	−0.02	−0.04	−0.04

Table A.32 *Directional response for Outdoor Microphone Type 4952 with the Microphone Preamplifier connected to a microphone extension cable. The sound incidence angles are for 4952 0° (Top)'s reference direction. For 4952 90° (Side) subtract 90° degrees from the angles in the table to get the sound incidence angle. 4000 Hz – 10600 Hz, in dB*

	Frequency											
Angle	**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	0.03	0.03	0.04	0.04	0.05	0.06	0.06	0.06	0.07	0.07	0.07
5°	–0.01	–0.01	–0.01	–0.02	–0.02	–0.03	–0.03	–0.04	–0.04	–0.04	–0.04	–0.03
10°	–0.10	–0.11	–0.14	–0.19	–0.21	–0.23	–0.32	–0.32	–0.35	–0.39	–0.39	–0.36
15°	–0.24	–0.28	–0.36	–0.47	–0.52	–0.58	–0.77	–0.75	–0.84	–0.89	–0.90	–0.85
20°	–0.42	–0.51	–0.63	–0.83	–0.91	–1.01	–1.35	–1.22	–1.37	–1.41	–1.41	–1.31
25°	–0.64	–0.79	–0.94	–1.23	–1.34	–1.48	–1.89	–1.61	–1.78	–1.76	–1.74	–1.57
30°	–0.85	–1.09	–1.23	–1.58	–1.72	–1.91	–2.16	–1.84	–1.96	–1.93	–1.86	–1.63
35°	–1.02	–1.37	–1.47	–1.85	–1.96	–2.11	–2.20	–2.05	–1.93	–1.89	–1.72	–1.52
40°	–1.15	–1.61	–1.69	–2.08	–2.15	–2.06	–2.21	–2.04	–1.77	–1.78	–1.72	–1.61
45°	–1.28	–1.83	–1.91	–2.24	–2.38	–2.21	–2.03	–1.91	–2.05	–1.84	–1.80	–1.56
50°	–1.49	–1.90	–1.94	–2.13	–2.29	–2.32	–2.27	–2.00	–1.94	–1.80	–1.83	–1.89
55°	–1.68	–1.78	–1.99	–2.22	–2.38	–2.17	–2.33	–1.85	–2.03	–2.24	–1.97	–1.90
60°	–1.69	–1.88	–2.31	–2.61	–2.70	–2.78	–2.38	–2.38	–1.98	–1.98	–2.34	–2.14
65°	–1.71	–2.17	–2.17	–2.44	–2.40	–2.36	–2.59	–2.04	–2.44	–2.16	–2.11	–2.49
70°	–1.72	–2.19	–2.23	–2.88	–3.08	–3.06	–2.77	–2.41	–2.01	–2.47	–2.51	–2.44
75°	–1.65	–2.27	–2.65	–2.82	–2.87	–2.48	–2.41	–2.50	–2.42	–2.14	–2.77	–2.88
80°	–1.70	–2.29	–2.63	–2.95	–3.25	–3.15	–3.03	–2.12	–2.72	–2.61	–2.72	–3.21
85°	–1.88	–2.26	–2.75	–3.26	–2.89	–2.78	–2.55	–2.78	–2.43	–3.17	–2.90	–3.34
90°	–2.10	–2.39	–2.64	–3.05	–3.25	–2.93	–3.10	–2.94	–2.81	–3.07	–3.28	–3.31
95°	–2.13	–2.59	–2.58	–2.90	–3.02	–3.10	–3.55	–2.88	–3.57	–3.12	–3.70	–3.39
100°	–1.92	–2.65	–2.75	–2.79	–2.99	–3.23	–3.28	–3.45	–3.43	–3.75	–4.08	–3.76
105°	–2.13	–2.32	–2.61	–2.94	–2.99	–3.35	–4.01	–3.77	–3.62	–4.19	–4.19	–4.36
110°	–2.13	–2.34	–2.33	–2.79	–3.22	–3.25	–3.92	–3.54	–4.57	–4.64	–4.44	–4.46
115°	–2.32	–2.26	–2.36	–2.58	–3.16	–3.72	–3.78	–4.04	–4.44	–4.35	–4.98	–4.88
120°	–2.16	–2.55	–2.20	–2.73	–2.89	–3.52	–4.64	–4.13	–4.53	–4.73	–4.52	–4.39
125°	–2.22	–2.44	–2.55	–2.72	–3.21	–3.50	–4.23	–4.16	–4.78	–4.80	–4.71	–4.46
130°	–2.06	–2.23	–2.67	–2.83	–3.33	–3.45	–4.28	–4.22	–4.16	–4.51	–4.35	–4.51
135°	–1.99	–2.32	–2.28	–2.97	–3.47	–3.83	–4.29	–4.19	–4.37	–4.53	–4.44	–3.59
140°	–2.15	–2.20	–2.49	–2.98	–3.02	–3.95	–4.32	–4.32	–4.92	–4.64	–4.12	–3.66
145°	–1.77	–2.14	–2.64	–2.96	–3.23	–3.94	–3.92	–3.96	–4.51	–4.79	–4.19	–3.80
150°	–1.97	–2.10	–2.11	–2.76	–3.54	–3.99	–4.14	–4.17	–4.68	–4.34	–3.67	–2.94
155°	–1.72	–2.17	–2.38	–2.81	–3.14	–3.37	–3.90	–4.18	–4.45	–4.45	–4.03	–3.62
160°	–1.63	–1.95	–2.14	–2.52	–2.93	–3.48	–4.04	–3.94	–3.86	–3.49	–3.09	–2.76
165°	–1.60	–2.04	–2.32	–2.69	–2.95	–3.17	–3.48	–3.41	–3.58	–3.29	–3.14	–2.70
170°	–1.14	–1.59	–1.92	–2.41	–2.88	–3.16	–3.70	–3.74	–3.88	–3.76	–3.60	–3.36
175°	–0.70	–1.05	–1.26	–1.66	–2.05	–2.10	–2.42	–2.46	–2.46	–2.34	–2.17	–1.95
180°	–0.53	–0.84	–1.00	–1.35	–1.67	–1.62	–1.79	–1.76	–1.66	–1.45	–1.18	–0.84
185°	–0.66	–1.00	–1.21	–1.59	–1.97	–2.01	–2.29	–2.34	–2.37	–2.28	–2.08	–1.80
190°	–1.07	–1.50	–1.82	–2.31	–2.81	–3.09	–3.62	–3.77	–4.03	–3.95	–3.72	–3.42
195°	–1.54	–1.99	–2.29	–2.73	–3.05	–3.26	–3.55	–3.54	–3.68	–3.31	–3.00	–2.47
200°	–1.62	–1.94	–2.12	–2.52	–2.92	–3.38	–3.93	–4.01	–4.05	–3.68	–3.23	–2.93
205°	–1.65	–2.10	–2.35	–2.89	–3.28	–3.33	–3.67	–4.03	–4.56	–4.81	–4.41	–3.82
210°	–1.97	–2.17	–2.15	–2.68	–3.43	–4.11	–4.29	–4.19	–4.64	–4.43	–3.83	–3.14
215°	–1.77	–2.07	–2.56	–3.07	–3.31	–3.93	–3.94	–3.80	–4.37	–5.11	–4.58	–3.72
220°	–2.11	–2.22	–2.45	–3.07	–3.15	–3.74	–4.56	–4.33	–4.81	–4.81	–4.29	–3.80
225°	–1.96	–2.29	–2.38	–2.81	–3.63	–3.84	–4.22	–4.07	–4.59	–4.70	–4.50	–3.67
230°	–2.12	–2.18	–2.60	–2.88	–3.50	–3.37	–4.39	–4.18	–4.07	–4.58	–4.66	–4.26
235°	–2.15	–2.44	–2.50	–2.81	–3.25	–3.60	–4.01	–4.36	–4.66	–4.77	–4.83	–4.63
240°	–2.16	–2.54	–2.18	–2.78	–3.01	–3.53	–4.67	–4.05	–4.68	–4.54	–4.56	–4.64
245°	–2.32	–2.25	–2.37	–2.63	–3.21	–3.85	–4.00	–4.01	–4.30	–4.50	–4.81	–4.96
250°	–2.12	–2.35	–2.36	–2.80	–3.30	–3.43	–3.83	–3.74	–4.43	–4.76	–4.27	–4.54
255°	–2.12	–2.33	–2.59	–3.02	–3.04	–3.30	–4.00	–3.82	–3.70	–4.17	–4.18	–4.36
260°	–1.92	–2.62	–2.81	–2.78	–2.95	–3.30	–3.46	–3.34	–3.66	–3.61	–4.24	–3.77
265°	–2.07	–2.62	–2.56	–2.97	–3.13	–3.16	–3.52	–2.95	–3.65	–3.09	–3.90	–3.34
270°	–2.06	–2.40	–2.71	–3.07	–3.27	–2.89	–3.00	–3.12	–2.70	–3.22	–3.47	–3.28
275°	–1.88	–2.23	–2.75	–3.36	–3.04	–2.95	–2.67	–2.71	–2.44	–3.35	–2.98	–3.33
280°	–1.66	–2.28	–2.67	–3.01	–3.28	–3.14	–3.06	–2.04	–2.83	–2.68	–2.71	–3.24
285°	–1.62	–2.23	–2.67	–2.89	–3.01	–2.59	–2.32	–2.58	–2.46	–2.11	–2.73	–3.04
290°	–1.69	–2.19	–2.25	–2.91	–3.14	–3.14	–2.90	–2.47	–1.97	–2.44	–2.60	–2.65
295°	–1.67	–2.16	–2.20	–2.51	–2.50	–2.41	–2.62	–2.05	–2.44	–2.25	–2.26	–2.66
300°	–1.68	–1.88	–2.33	–2.65	–2.73	–2.84	–2.42	–2.43	–2.05	–2.05	–2.40	–2.22
305°	–1.68	–1.78	–2.04	–2.30	–2.46	–2.23	–2.37	–1.91	–2.05	–2.24	–2.01	–1.97
310°	–1.50	–1.90	–1.98	–2.18	–2.35	–2.37	–2.32	–2.02	–1.96	–1.85	–1.90	–1.95
315°	–1.29	–1.85	–1.95	–2.29	–2.45	–2.28	–2.10	–1.95	–2.10	–1.86	–1.84	–1.61
320°	–1.17	–1.65	–1.74	–2.15	–2.24	–2.16	–2.31	–2.11	–1.85	–1.85	–1.79	–1.67
325°	–1.04	–1.41	–1.53	–1.93	–2.05	–2.23	–2.33	–2.17	–2.02	–1.99	–1.83	–1.61
330°	–0.87	–1.13	–1.29	–1.66	–1.81	–2.03	–2.32	–1.99	–2.10	–2.08	–2.03	–1.78
335°	–0.66	–0.83	–1.00	–1.30	–1.43	–1.60	–2.05	–1.77	–1.95	–1.95	–1.97	–1.80
340°	–0.46	–0.55	–0.69	–0.90	–0.99	–1.12	–1.50	–1.38	–1.54	–1.60	–1.64	–1.56
345°	–0.27	–0.32	–0.40	–0.53	–0.59	–0.67	–0.90	–0.88	–0.98	–1.06	–1.09	–1.06
350°	–0.13	–0.15	–0.19	–0.25	–0.28	–0.32	–0.42	–0.43	–0.47	–0.53	–0.55	–0.54
355°	–0.05	–0.06	–0.08	–0.10	–0.11	–0.13	–0.17	–0.17	–0.18	–0.21	–0.22	–0.21

Table A.33 *Directional response for Outdoor Microphone Type 4952 with the Microphone Preamplifier connected to a microphone extension cable. The sound incidence angles are for 4952 0° (Top)'s reference direction. For 4952 90° (Side) subtract 90° degrees from the angels in the table to get the sound incidence angle. 11200 Hz – 20000 Hz, in dB*

	Frequency										
Angle	11200 Hz	11800 Hz	**12500 Hz**	13200 Hz	14000 Hz	15000 Hz	**16000 Hz**	17000 Hz	18000 Hz	19000 Hz	**20000 Hz**
0°	0.07	0.06	0.05	0.05	0.04	0.03	0.04	0.02	0.02	0.02	0.01
5°	–0.06	–0.06	–0.04	–0.06	–0.07	–0.04	–0.04	–0.05	–0.05	–0.05	–0.07
10°	–0.47	–0.44	–0.34	–0.41	–0.44	–0.33	–0.40	–0.39	–0.44	–0.45	–0.52
15°	–1.07	–0.93	–0.78	–0.91	–0.94	–0.77	–0.93	–0.96	–1.08	–1.10	–1.27
20°	–1.59	–1.30	–1.19	–1.31	–1.28	–1.15	–1.31	–1.40	–1.53	–1.51	–1.63
25°	–1.79	–1.40	–1.36	–1.38	–1.31	–1.24	–1.35	–1.45	–1.53	–1.56	–1.72
30°	–1.75	–1.45	–1.29	–1.21	–1.33	–1.29	–1.38	–1.54	–1.64	–1.51	–1.40
35°	–1.62	–1.46	–1.27	–1.34	–1.38	–1.33	–1.55	–1.53	–1.52	–1.25	–1.03
40°	–1.73	–1.43	–1.30	–1.38	–1.49	–1.48	–1.58	–1.58	–1.43	–1.15	–1.11
45°	–1.72	–1.51	–1.58	–1.69	–1.82	–1.62	–1.76	–1.70	–1.40	–1.06	–1.09
50°	–2.20	–2.07	–1.90	–2.00	–1.80	–1.78	–1.93	–1.68	–1.57	–1.10	–1.20
55°	–2.25	–2.06	–1.95	–1.88	–2.06	–2.05	–1.92	–1.67	–1.70	–1.39	–1.55
60°	–2.48	–2.21	–2.18	–2.16	–2.27	–2.14	–2.06	–1.93	–1.98	–2.01	–1.64
65°	–2.77	–2.79	–2.55	–2.50	–2.49	–2.31	–2.26	–2.50	–2.65	–2.52	–1.84
70°	–3.22	–3.07	–3.03	–2.70	–2.67	–2.68	–2.88	–3.08	–3.41	–2.60	–2.32
75°	–3.20	–3.42	–3.09	–2.98	–2.87	–3.07	–3.70	–3.77	–3.69	–3.07	–2.22
80°	–3.44	–3.16	–3.50	–3.36	–3.25	–3.19	–3.67	–4.06	–3.78	–3.47	–2.45
85°	–3.67	–3.41	–3.59	–4.05	–3.93	–3.44	–3.36	–3.34	–3.64	–2.68	–2.47
90°	–4.20	–3.62	–4.02	–4.45	–4.32	–4.19	–3.88	–3.64	–3.26	–2.63	–2.14
95°	–4.51	–4.03	–4.16	–4.80	–4.59	–3.97	–3.72	–3.22	–2.71	–2.17	–1.66
100°	–4.57	–4.02	–4.07	–4.89	–4.05	–3.47	–3.31	–2.72	–2.50	–2.12	–1.92
105°	–4.65	–3.94	–3.89	–4.28	–3.36	–3.52	–3.17	–2.70	–2.42	–1.76	–1.97
110°	–4.39	–4.44	–3.88	–3.73	–2.93	–3.24	–2.59	–2.63	–2.66	–2.72	–3.27
115°	–4.29	–4.29	–3.53	–3.45	–3.24	–2.75	–2.44	–2.63	–2.73	–3.22	–3.37
120°	–4.57	–4.33	–3.41	–3.07	–3.06	–2.46	–2.94	–2.76	–3.68	–3.71	–4.03
125°	–4.21	–3.65	–3.00	–3.14	–3.14	–2.42	–2.96	–3.22	–4.29	–4.40	–4.36
130°	–4.42	–3.33	–3.30	–2.64	–2.69	–2.70	–3.28	–4.22	–4.55	–5.20	–4.07
135°	–3.58	–2.96	–3.44	–2.86	–3.02	–3.43	–3.51	–4.41	–4.59	–5.36	–4.14
140°	–3.52	–3.53	–2.33	–2.33	–3.02	–3.40	–3.90	–4.96	–5.61	–5.32	–3.82
145°	–4.22	–3.22	–2.40	–2.87	–3.55	–3.96	–3.95	–4.97	–5.57	–4.54	–3.63
150°	–2.90	–3.30	–3.46	–3.45	–3.86	–3.91	–4.73	–5.81	–6.19	–4.73	–3.44
155°	–3.67	–2.81	–2.62	–2.93	–3.30	–3.91	–5.08	–6.30	–6.32	–4.94	–2.97
160°	–2.70	–2.85	–3.48	–4.19	–4.79	–4.44	–4.59	–5.56	–5.44	–4.73	–2.82
165°	–2.43	–2.06	–2.41	–3.02	–3.21	–3.75	–5.55	–6.22	–5.81	–4.78	–2.94
170°	–3.31	–2.59	–2.59	–3.33	–3.68	–3.46	–3.88	–4.00	–3.57	–2.56	–1.54
175°	–2.03	–1.75	–2.16	–2.77	–3.34	–4.25	–5.47	–5.91	–5.40	–4.43	–2.92
180°	–0.73	–0.37	–0.73	–1.06	–1.29	–1.94	–3.15	–3.47	–2.73	–1.59	–0.43
185°	–1.84	–1.55	–1.95	–2.49	–2.95	–3.76	–4.96	–5.40	–4.70	–3.69	–3.54
190°	–3.41	–2.79	–2.80	–3.59	–3.90	–3.75	–4.23	–4.31	–3.63	–2.54	–1.46
195°	–2.17	–1.95	–2.47	–3.15	–3.29	–3.63	–5.31	–6.25	–5.70	–5.00	–3.82
200°	–2.88	–2.81	–3.24	–3.90	–4.59	–4.56	–4.94	–5.81	–5.13	–4.43	–3.95
205°	–3.59	–2.58	–2.59	–3.26	–3.60	–3.75	–4.54	–5.85	–6.24	–5.30	–3.68
210°	–2.92	–3.10	–3.36	–3.46	–3.83	–4.06	–4.58	–5.63	–6.03	–5.10	–4.05
215°	–3.78	–3.44	–2.76	–2.80	–3.38	–3.82	–3.95	–4.72	–5.39	–4.68	–3.96
220°	–3.68	–3.19	–2.49	–2.36	–2.73	–3.19	–3.91	–4.54	–5.74	–5.54	–4.51
225°	–3.56	–3.02	–2.99	–3.13	–2.76	–3.17	–3.47	–4.05	–4.81	–5.04	–5.49
230°	–4.54	–3.39	–2.98	–2.82	–2.54	–2.46	–3.00	–4.12	–4.56	–5.37	–4.46
235°	–4.16	–3.64	–2.72	–3.19	–2.95	–2.44	–2.70	–3.33	–3.91	–5.18	–5.19
240°	–4.38	–4.34	–3.24	–3.07	–2.78	–2.42	–2.77	–2.57	–3.65	–3.94	–5.01
245°	–4.30	–4.46	–3.44	–3.32	–3.06	–2.60	–2.57	–2.34	–2.74	–3.59	–4.22
250°	–4.32	–4.61	–3.91	–3.68	–2.99	–2.93	–2.43	–2.52	–2.41	–2.98	–4.47
255°	–4.56	–4.19	–4.06	–4.20	–3.52	–3.46	–2.92	–2.54	–2.41	–2.04	–2.67
260°	–4.41	–4.18	–4.24	–4.77	–4.20	–3.67	–3.32	–2.70	–2.51	–2.58	–3.07
265°	–4.37	–4.18	–4.38	–4.72	–4.58	–4.06	–3.66	–3.07	–2.53	–2.16	–2.29
270°	–4.17	–3.87	–4.26	–4.56	–4.36	–4.27	–4.00	–3.70	–3.42	–3.09	–3.10
275°	–3.76	–3.70	–3.83	–4.15	–4.05	–3.61	–3.65	–3.65	–3.81	–2.93	–3.18
280°	–3.65	–3.47	–3.69	–3.48	–3.30	–3.23	–3.67	–4.13	–3.92	–3.95	–3.09
285°	–3.47	–3.74	–3.26	–3.01	–2.80	–2.92	–3.72	–3.96	–4.03	–3.47	–2.70
290°	–3.51	–3.34	–3.16	–2.70	–2.51	–2.56	–3.09	–3.43	–3.63	–2.91	–3.12
295°	–2.93	–2.93	–2.67	–2.50	–2.36	–2.23	–2.47	–2.67	–3.01	–2.85	–2.60
300°	–2.54	–2.30	–2.28	–2.23	–2.17	–2.09	–2.16	–2.06	–2.22	–2.61	–2.26
305°	–2.30	–2.12	–2.02	–1.93	–2.05	–2.01	–1.97	–1.76	–1.82	–2.00	–2.47
310°	–2.25	–2.10	–1.91	–2.00	–1.78	–1.73	–1.92	–1.73	–1.69	–1.55	–2.10
315°	–1.76	–1.55	–1.58	–1.66	–1.78	–1.57	–1.70	–1.69	–1.44	–1.39	–1.83
320°	–1.77	–1.45	–1.32	–1.36	–1.43	–1.42	–1.54	–1.53	–1.44	–1.39	–1.77
325°	–1.68	–1.49	–1.26	–1.31	–1.32	–1.27	–1.52	–1.46	–1.48	–1.36	–1.54
330°	–1.87	–1.55	–1.35	–1.21	–1.29	–1.24	–1.35	–1.50	–1.65	–1.62	–1.77
335°	–1.98	–1.57	–1.53	–1.48	–1.37	–1.26	–1.36	–1.42	–1.50	–1.63	–2.13
340°	–1.84	–1.52	–1.44	–1.52	–1.45	–1.31	–1.46	–1.50	–1.58	–1.59	–1.88
345°	–1.30	–1.14	–1.03	–1.14	–1.17	–1.00	–1.18	–1.16	–1.27	–1.27	–1.43
350°	–0.65	–0.61	–0.54	–0.60	–0.63	–0.52	–0.62	–0.58	–0.64	–0.65	–0.72
355°	–0.25	–0.24	–0.21	–0.23	–0.24	–0.19	–0.23	–0.20	–0.22	–0.21	–0.24

Table A.34a *4952 0° (Top), sensitivity variations for Outdoor Microphone Type 4952 with the Microphone Preamplifier connected to a microphone extension cable, at sound incidence angles within ±θ° from the reference direction*

Nominal Frequency	Exact Frequency	Max Variation ± 30° dB	Max Variation ± 90° dB	Max Variation ± 150° dB
500 Hz	501.187 Hz	0.04	0.14	0.16
630 Hz	630.957 Hz	0.05	0.23	0.25
800 Hz	794.328 Hz	0.07	0.41	0.42
1000 Hz	1000 Hz	0.11	0.52	0.60
1250 Hz	1258.93 Hz	0.15	0.62	0.76
1600 Hz	1584.89 Hz	0.18	0.90	1.05
2000 Hz	1995.26 Hz	0.23	0.94	1.20
2240 Hz	2238.72 Hz	0.35	1.06	1.46
2500 Hz	2511.89 Hz	0.40	1.17	1.79
2800 Hz	2818.38 Hz	0.34	1.14	1.72
3150 Hz	3162.28 Hz	0.66	1.38	2.03
3550 Hz	3548.13 Hz	0.74	1.76	2.31
4000 Hz	3981.07 Hz	0.89	2.13	2.35
4500 Hz	4466.84 Hz	1.16	2.42	2.68
5000 Hz	5011.87 Hz	1.32	2.78	2.84
5600 Hz	5623.41 Hz	1.70	3.40	3.40
6300 Hz	6309.57 Hz	1.85	3.33	3.68
7100 Hz	7079.46 Hz	2.08	3.20	4.16
8000 Hz	7943.28 Hz	2.38	3.16	4.73
8500 Hz	8413.95 Hz	2.05	3.18	4.42
9000 Hz	8912.51 Hz	2.16	2.90	4.98
9500 Hz	9440.61 Hz	2.15	3.42	5.18
10000 Hz	10000 Hz	2.10	3.54	5.05
10600 Hz	10592.5 Hz	1.87	3.41	5.03
11200 Hz	11220.2 Hz	2.05	4.28	4.72
11800 Hz	11885.0 Hz	1.63	3.93	4.67
12500 Hz	12589.3 Hz	1.57	4.31	4.43
13200 Hz	13335.2 Hz	1.56	4.61	4.94
14000 Hz	14125.4 Hz	1.50	4.40	4.63
15000 Hz	14962.4 Hz	1.34	4.30	4.30
16000 Hz	15848.9 Hz	1.50	4.04	4.77
17000 Hz	16788.0 Hz	1.56	4.15	5.83
18000 Hz	17782.8 Hz	1.67	4.05	6.22
19000 Hz	18836.5 Hz	1.66	3.98	5.57
20000 Hz	19952.6 Hz	2.14	3.19	5.51

Table A.34b *4952 90° (Side), sensitivity variations for Outdoor Microphone Type 4952 with the Microphone Preamplifier connected to a microphone extension cable, at sound incidence angles within ±θ° from the reference direction*

Nominal Frequency	Exact Frequency	Max Variation ± 30° dB	Max Variation ± 90° dB	Max Variation ± 150° dB
500 Hz	501.187 Hz	0.05	0.16	0.16
630 Hz	630.957 Hz	0.10	0.25	0.25
800 Hz	794.328 Hz	0.20	0.42	0.42
1000 Hz	1000 Hz	0.28	0.60	0.60
1250 Hz	1258.93 Hz	0.28	0.76	0.76
1600 Hz	1584.89 Hz	0.42	1.05	1.05
2000 Hz	1995.26 Hz	0.54	1.20	1.20
2240 Hz	2238.72 Hz	0.54	1.46	1.46
2500 Hz	2511.89 Hz	0.52	1.79	1.79
2800 Hz	2818.38 Hz	0.62	1.72	1.72
3150 Hz	3162.28 Hz	0.97	2.03	2.03
3550 Hz	3548.13 Hz	0.92	2.31	2.31
4000 Hz	3981.07 Hz	0.67	2.35	2.35
4500 Hz	4466.84 Hz	0.77	2.68	2.68
5000 Hz	5011.87 Hz	0.58	2.84	2.84
5600 Hz	5623.41 Hz	0.82	3.40	3.40
6300 Hz	6309.57 Hz	0.85	3.68	3.68
7100 Hz	7079.46 Hz	1.36	4.16	4.16
8000 Hz	7943.28 Hz	2.26	4.73	4.73
8500 Hz	8413.95 Hz	2.09	4.42	4.42
9000 Hz	8912.51 Hz	2.59	4.98	4.98
9500 Hz	9440.61 Hz	2.75	5.18	5.18
10000 Hz	10000 Hz	2.87	5.05	5.05
10600 Hz	10592.5 Hz	2.74	5.03	5.03
11200 Hz	11220.2 Hz	2.16	4.72	4.72
11800 Hz	11885.0 Hz	2.23	4.67	4.67
12500 Hz	12589.3 Hz	1.99	4.43	4.43
13200 Hz	13335.2 Hz	2.73	4.94	4.94
14000 Hz	14125.4 Hz	2.32	4.83	4.83
15000 Hz	14962.4 Hz	2.05	4.59	4.59
16000 Hz	15848.9 Hz	1.82	5.59	5.59
17000 Hz	16788.0 Hz	2.13	6.33	6.33
18000 Hz	17782.8 Hz	1.80	6.34	6.34
19000 Hz	18836.5 Hz	1.94	5.57	5.57
20000 Hz	19952.6 Hz	2.40	5.51	5.51

Table A.35 *Outdoor Microphone Type 4952 cannot be mounted directly on the analyzer*

Table A.36 *Outdoor Microphone Type 4952 cannot be mounted directly on the analyzer*

Table A.37 *Outdoor Microphone Type 4952 cannot be mounted directly on the analyzer*

Table A.38 *Outdoor Microphone Type 4952 cannot be mounted directly on the analyzer*

Table A.39 *Outdoor Microphone Type 4952 cannot be mounted directly on the analyzer*

Table A.40 *Outdoor Microphone Type 4952 cannot be mounted directly on the analyzer*

Table A.41 *Outdoor Microphone Type 4952 cannot be mounted directly on the analyzer*

Table A.42 *Outdoor Microphone Type 4952 is not specified together with Outdoor Microphone Kit UA-1404*

Table A.43 *Outdoor Microphone Type 4952 is not specified together with Outdoor Microphone Kit UA-1404*

Table A.44 *Outdoor Microphone Type 4952 is not specified together with Outdoor Microphone Kit UA-1404*

Table A.45 *Outdoor Microphone Type 4952 is not specified together with Outdoor Microphone Kit UA-1404*

Table A.46 *Outdoor Microphone Type 4952 is not specified together with Outdoor Microphone Kit UA-1404*

Table A.47 *Outdoor Microphone Type 4952 is not specified together with Outdoor Microphone Kit UA-1404*

Table A.48 *Outdoor Microphone Type 4952 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, 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 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 4952 0° (Top)	Expanded Uncertainty	Correction Data For 4952 90° (Side)	Expanded Uncertainty
Hz	dB	dB	dB	dB
31.5	−0.11	0.35	−0.11	0.35
63	−0.04	0.11	−0.04	0.11
125	−0.03	0.10	−0.03	0.10
250	0.03	0.05	−0.01	0.05
500	0.20	0.10	0.01	0.10
1000	0.41	0.10	0.03	0.10
2000	1.09	0.13	0.20	0.13
4000	2.24	0.13	0.08	0.22
8000	5.02	0.25	2.02	0.28
12500	7.47	0.30	3.18	0.36
16000	2.96	0.35	−0.84	0.58

Table A.50 *No data are given for Acoustical Test with Electrostatic Actuator UA-0033*

Index

HEADQUARTERS: Brüel & Kjær Sound & Vibration Measurement A/S · DK-2850 Nærum · Denmark
Telephone: +45 7741 2000 · Fax: +45 4580 1405 · www.bksv.com · info@bksv.com

Local representatives and service organisations worldwide