

CONSOLIDATED VERSION



**Electroacoustics – Instruments for the measurement of sound intensity –
Electromagnetic and electrostatic compatibility requirements and test
procedures**





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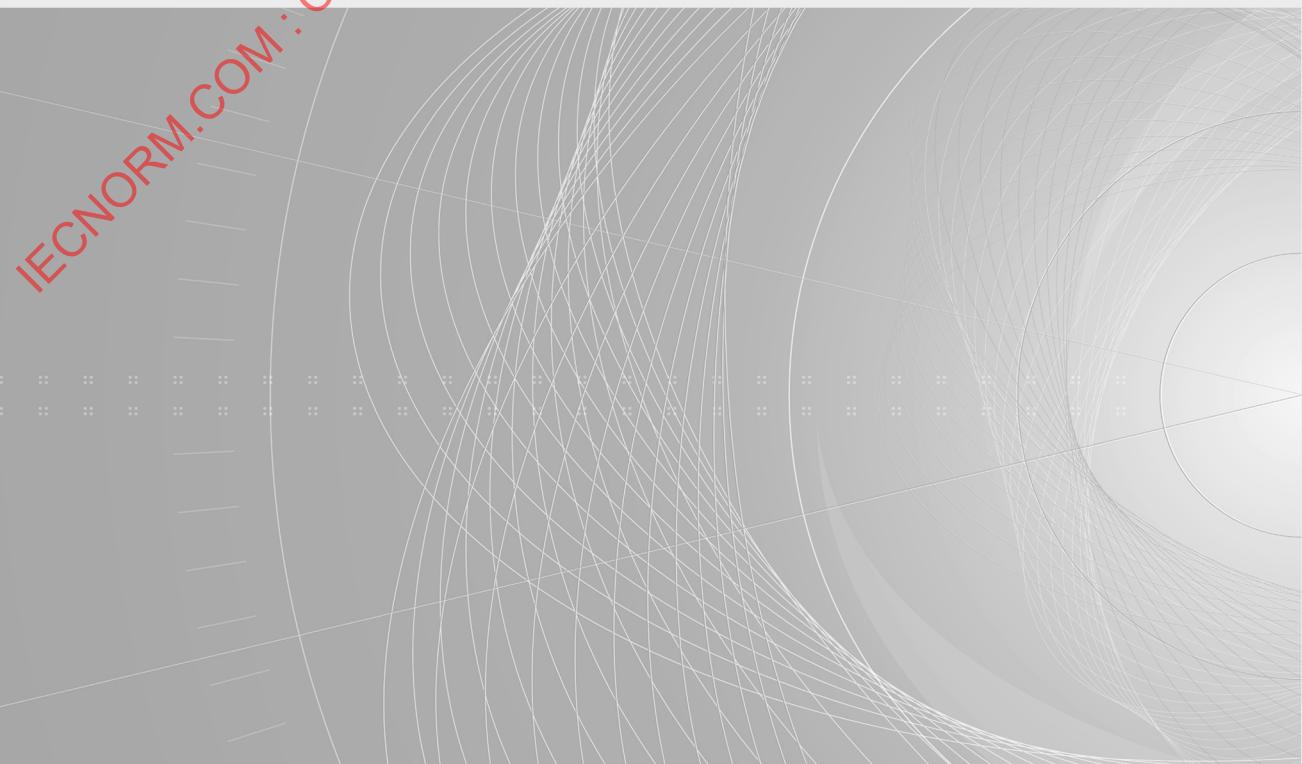
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**Electroacoustics – Instruments for the measurement of sound intensity –
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTROACOUSTICS –
INSTRUMENTS FOR THE MEASUREMENT OF SOUND INTENSITY –
ELECTROMAGNETIC AND ELECTROSTATIC COMPATIBILITY
REQUIREMENTS AND TEST PROCEDURES**

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In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

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**ELECTROACOUSTICS –
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1 Scope

1.1 This Technical Specification specifies requirements for instruments that measure sound intensity using pairs of pressure sensing microphones with respect to their immunity to power- and radio-frequency fields and to electrostatic discharge, and the permitted radio-frequency emissions, together with test procedures to verify conformance. Sound intensity measuring instruments are available in many different configurations and may be powered by batteries or from external power supply systems. The technical requirements in this Technical Specification apply to all configurations of instruments for the measurement of sound intensity.

1.2 The electromagnetic and electrostatic compatibility requirements are equally applicable for sound intensity measuring instruments used in residential, commercial and light-industrial environments, or industrial sites. The requirements of this Technical Specification are additional to those contained in IEC 61043 and do not alter any of the specifications contained therein. The requirements do not apply retrospectively to sound intensity measuring instruments complying with IEC 61043 prior to the publication of this Technical Specification.

NOTE 1 Compliance with this Technical Specification does not insure that the sound intensity measuring system is immune to interference from all electromagnetic sources.

NOTE 2 These requirements are the first attempt at defining electromagnetic and electrostatic compatibility requirements for sound intensity measuring systems. Requirements can be changed later when wider experience has been gained if found necessary.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61000-4-2, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 2: Electrostatic discharge immunity test*

IEC 61000-4-3:2002, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*
Amendment 1 (2002)

IEC 61000-4-20:2010, *Electromagnetic compatibility (EMC) – Part 4-20: Testing and measurement techniques – Emission and immunity testing in transverse electromagnetic (TEM) waveguides*

IEC 61000-6-1:1997, *Electromagnetic compatibility (EMC) – Part 6: Generic standards – Section 1: Immunity for residential, commercial and light-industrial environments*

IEC 61000-6-2:1999, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments*

CISPR/IEC 61000-6-3:1996, *Electromagnetic compatibility (EMC) – Part 6: Generic standards – Section 3: Emission standard for residential, commercial and light-industrial environments*

IEC 61043, *Electroacoustics – Instruments for the measurement of sound intensity – Measurement with pairs of pressure sensing microphones*

CISPR 22:2003, *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*

3 Terms and definitions

For the purpose of this document, the following definitions apply in addition to those specified in IEC 61000-4-2, IEC 61000-4-3, IEC 61000-6-1, IEC 61000-6-2 and CISPR 61000-6-3.

3.1

reference orientation (of a sound intensity measuring system)

orientation of a sound intensity measuring system with respect to the principal direction of an emitter or receiver of radio frequency fields

3.2

group X sound intensity measuring system

self-contained instrument which includes sound intensity measuring facilities according to this Technical Specification and which specifies internal battery power for the normal mode of operation, requiring no external connections to other apparatus to operate the instrument

3.3

group Y sound intensity measuring system

self contained instrument which includes sound intensity measuring facilities according to this Technical Specification and which specifies connection to a public power supply system for the normal mode of operation, requiring no external connections to other apparatus to operate the instrument.

3.4

group Z sound intensity measuring system

instrument that includes sound intensity measuring facilities according to this Technical Specification requiring two or more items of equipment to be connected together by some means for the normal mode of operation, with operation either from batteries or from a public power supply

4 Electromagnetic and electrostatic compatibility requirements

4.1 General

4.1.1 This clause specifies requirements for sound intensity measuring systems with respect to their immunity to power- and radio-frequency electromagnetic fields and to electrostatic discharge, and the permitted radio-frequency emissions, together with Clause 5 which specifies test procedures to demonstrate conformance to the specifications of this Technical Specification. Sound intensity measuring systems are available in many different configurations and may be powered by batteries or from external power supply systems.

For conformance with these requirements, a probe and a processing system shall be tested together, and the system this comprises shall be specified with all necessary cables and accessories. The technical requirements in this clause are for three sound intensity measuring system configurations: first, Group X, for self-contained instruments that are designed primarily for battery operation; second, Group Y, for self-contained instruments that incorporate sound intensity measuring facilities according to this Technical Specification and that are operated from public power supply systems; third, Group Z, for sound intensity measuring systems that are formed by interconnection of two or more items of equipment (for the purposes of EMC testing, the probe is not a separate item of equipment).

4.1.2 The electromagnetic and electrostatic compatibility requirements are equally applicable for sound intensity measuring systems used in residential, commercial and light-industrial environments, or industrial sites. The requirements of this clause are additional to those contained in IEC 61043 and do not alter any of the specifications for sound intensity measuring systems or parts thereof contained therein.

4.2 Emission limits

4.2.1 The upper limits on radio-frequency emissions from any apparatus are defined for compatibility with many different standards with the limits laid down in Table 1 of CISPR 61000-6-3:1996, forming the basic requirements for sound intensity measuring systems in groups X, Y or Z. These are summarized in Annex A.

4.2.2 Sound intensity measuring systems in groups Y or Z powered from a public power supply system shall also comply with the limits for disturbance to the public supply system specified in CISPR 22 for Class B equipment. For sound intensity measuring systems, the requirements are summarized in Annex A.

4.2.3 The instruction manual shall state the configuration of, the mode of operation of, and the connecting devices (if any) to, the instrument that produce the greatest radio-frequency emissions.

4.3 Electrostatic discharges

4.3.1 Sound intensity measuring systems in groups X, Y or Z shall withstand electrostatic discharges of specified magnitudes. The requirements are those specified in 1.4 of Table 1 in IEC 61000-6-1:1997 and are summarized as follows:

- contact discharges up to 4 kV and air discharges up to 8 kV with both positive and negative voltages. The polarity of the electrostatic voltage is with respect to earth ground.

4.3.2 Clause 5 of IEC 61000-6-1 specifies performance criterion B during and after electrostatic discharge tests, given as follows:

"The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended".

The term "apparatus" means any sound intensity measuring system conforming to this Technical Specification.

NOTE An example of a permissible loss of performance could be the display of the apparatus becoming unreadable during the execution of discharges, but returning to full operation following completion of the discharges.

4.3.3 After each and every electrostatic discharge test is complete, the sound intensity measuring system shall be fully operational and in a configuration identical to that established before the start of the electrostatic discharge tests. Previously stored data (if any) shall remain unchanged.

4.4 Immunity to power- and radio-frequency fields and conducted disturbances

4.4.1 Sound intensity measuring systems in groups X, Y and Z shall exhibit a minimum degree of immunity over a range of power- and radio- frequencies and field strengths. The requirements are those specified in 1.1 of Table 1 in IEC 61000-6-1:1997 and 1.2 of Table 1

in IEC 61000-6-2:1999 with minor amendments. These amendments extend the range of radio-frequency fields to cover from 27 MHz to 1 000 MHz, and increase the field strength for the power frequency field to 80 A/m. The requirements can be summarised as follows:

- frequency range from 27 MHz to 1 000 MHz. Root-mean-square electric field strength up to and including 10 V/m (unmodulated) with 80 % sinusoidal amplitude modulation at 1 kHz,
- uniform root-mean-square alternating magnetic field of 80 A/m strength at 50 Hz or 60 Hz.

4.4.2 For sound intensity measuring systems in groups Y or Z that are connected to a public power supply, the instruments shall also conform to additional requirements. These requirements are given in Table 4 of IEC 61000-6-2:1999.

4.4.3 For sound intensity measuring systems in group Z, and where any interconnecting cable between any two parts of the system (excluding any cable between the probe and the processor) exceeds 3 m in length, the instruments shall also conform to the requirements of Table 2 in IEC 61000-6-2:1999.

4.4.4 For all groups of sound intensity measuring systems, the immunity of any instrument to power and radio-frequency fields shall be demonstrated by placing the probe in a known sound field whilst maintaining both the probe and the processor in a near-uniform power or radio-frequency field. The sound field shall consist of a pure sinusoidal tone of 925 Hz simulating a sound field with a sound intensity level of $74 \text{ dB} \pm 0,5 \text{ dB}$ and a pressure intensity (PI) indicator of 5 dB. The PI indicator displays the difference between the sound intensity and sound pressure levels in an actual sound field. This source may be applied to the microphones in any way that does not alter the susceptibility of the probe or the source to power and radio-frequency emissions. The sound intensity measuring system shall be positioned in the reference orientation relative to the source of radio-frequency emissions as specified in the instruction manual. The probe shall be positioned close to the processor unit as defined for the reference orientation and fitted with a spacer of not more than 25 mm length. Excess cable shall be folded back on itself in a figure of eight configuration with an even number of folds of equal length, typically 250 mm long, and all parts secured closely together at each end of the folds, and in their centre.

NOTE A non-conductive standing wave tube may be a means of creating this field.

4.4.5 During testing, the sound intensity measuring system shall be set for the normal mode of operation as described in the instruction manual. It shall be turned on, powered by its preferred supply, and set to read sound pressure level. The level range control shall be set (if applicable) to a range where overload occurs between 90 dB and 110 dB.

4.4.6 When the power-frequency or radio-frequency field as specified in 4.4.1 is applied, the indication of the sound intensity measuring system shall not change by more than $\pm 1 \text{ dB}$ for a Class 1 system or $\pm 2 \text{ dB}$ for a Class 2 system.

4.4.7 When testing the additional requirements in 4.4.2 and 4.4.3, the susceptibility of the sound intensity measuring system shall not change by more than $\pm 1 \text{ dB}$ for a Class 1 system or $\pm 2 \text{ dB}$ for a Class 2 system when these tests are applied. No power- or radio-frequency field is applied during the testing for conformance to these additional requirements.

4.4.8 The instruction manual shall state the configuration, the mode of operation and the connecting devices (if any) that produce the minimum immunity to power- and radio-frequency fields.

5 Test procedures

5.1 General

5.1.1 The tests described in this subclause shall be carried out unless the particular configuration of the sound intensity measuring system renders them inappropriate, in which case equivalent tests should be substituted if equivalence to these tests can be demonstrated. Unless stated otherwise, these tests apply to sound intensity measuring systems in groups X, Y, and Z.

5.1.2 During testing, the sound intensity measuring system under test shall be set in the configuration for the normal mode of operation as described in the instruction manual. The instrument shall be turned on, powered by its preferred source of supply, and set to read the 1 kHz octave or third-octave band.

5.1.3 Full details of equipment required to perform the tests and the methods of executing them are mostly contained in other standards with the additional requirements for sound intensity measuring systems specified in this clause. Other standards listed in Clause 2 shall be referred to for all relevant tests.

5.2 Emission measurements

5.2.1 The instrument under test shall be configured and set according to the specification in the instruction manual to produce the greatest emissions in the frequency range being investigated.

5.2.2 Measurements of emissions shall be performed as described in Clauses 6 and 10 of CISPR 22:2003. All results from measurements of radiated emissions shall conform to the requirements for enclosure ports given in 4.2.1.

5.2.3 The instrument under test shall initially be tested in the reference orientation with the probe cable arranged as in 4.4.4 if appropriate.

5.2.4 Maintaining the configuration of 5.2.3, the instrument under test shall be tested for emissions in at least one other plane, each orthogonal to the reference orientation, within the limits of suitable positioning for the measuring system employed.

5.2.5 Any fixtures and fittings used to maintain the position of the instrument under test (including the probe and any cables if appropriate) shall be such as to have no significant influence on the measurement of any emissions from the instrument.

5.2.6 If the instrument under test is fitted with a connection device that allows interface or interconnection cables to be attached to it, then all tests of emissions shall be carried out with cables connected to all available connection devices. All cables shall be left unterminated and be arranged as described in Clause 8 of CISPR 22:2003, unless the manufacturer of the sound intensity measuring system also supplies the device connected to the sound intensity measuring system by this cable, in which case all items shall be tested together.

5.2.7 Where several connections may be made to the same connecting device, emissions shall be measured only with the configuration that produces the greatest emissions. Other configurations emitting similar or lower levels of emissions may be included in the instruction manual in a list of compliant configurations without further testing, provided the tested configuration fully conforms with the limits of 4.2.

5.2.8 For sound intensity measuring systems in groups Y and Z connected to a public power supply, disturbances conducted to the public power supply shall be measured as described in CISPR 22 and shall conform to the requirements of Clause 5 of this Technical Specification for Class B equipment.

5.3 Tests for electrostatic discharge

5.3.1 Equipment required and methods of testing are described in IEC 61000-4-2.

5.3.2 If the instrument under test is fitted with connection devices that are not required as part of the configuration for the normal mode of operation, then no cables shall be fitted during the electrostatic-discharge test. Discharges shall not be made to pins on connectors that are recessed behind the surface of either the connector or the sound intensity measuring system

5.3.3 Any supports or other items used to maintain the position of the instrument under test during testing shall not obscure any part of sound intensity measuring system required for access for static discharge, nor shall they affect the testing of the sound intensity measuring system.

5.3.4 Contact and air discharges of all required polarities and voltages shall be applied 10 times each to all appropriate parts of the instrument under test.

NOTE Care should be taken to ensure that the sound intensity measuring system under test is fully discharged from any effects of each test before repeating the application of a discharge.

5.3.5 If the instruction manual specifies a temporary performance degradation or loss of function after the electrostatic discharge tests, this degradation or loss of function shall not allow any reduced operation, change of configuration or corruption or loss of any stored data.

5.4 Tests for immunity to power- and radio-frequency fields and conducted disturbances

5.4.1 The equipment required and the test methods needed to test for radio-frequency fields are described in IEC 61000-4-3. An alternative test method using Transverse Electromagnetic (TEM) waveguides may be employed for immunity testing. The requirements that shall be applied for the TEM waveguide are specified in IEC 61000-4-20, and Annex B of IEC 61000-4-20:2010 defines methods of implementing the testing. The performance requirements for the instrument under test are unchanged including the range of frequencies tested and step size.

5.4.2 Testing shall first be made in the reference orientation with any probe cables arranged as described in 4.4.4. The signal from the acoustic source described in 4.4.4 shall be applied.

5.4.3 Tests for immunity to radio-frequency fields may be performed at discrete frequencies with increments of up to 4 % for frequencies less than 500 MHz and up to 2 % for all other frequencies. Dwell time at each frequency shall be appropriate to the sound intensity measuring system under test. Testing at a limited number of discrete frequencies does not negate the need to meet the requirements of 4.4 at all frequencies within the specified range. Testing at 1% increments may be required to satisfy other standards requirements.

5.4.4 If the instrument under test is fitted with any connection device that allows interface or interconnection cables to be attached to it, then all tests for immunity to power- and radio-frequency fields shall be performed with cables connected to all available connection devices. All cables shall be left unterminated and shall be arranged as described in Clause 8 of CISPR 22:2003 unless the supplier of the sound intensity measuring system also supplies the device connected to the sound intensity measuring system by this cable, in which case all items shall be tested together.

5.4.5 Where several connections may be made to the same connecting device, tests shall be performed only with the configuration specified in the instruction manual as producing minimum immunity. Other configurations that are equally or more immune may be included in the instruction manual in a list of conforming configurations without further testing, provided the tested configuration fully conforms to the limits of 4.4.

5.4.6 Power-frequency testing shall be at 50 Hz or 60 Hz. The acoustic source of 4.4.4. and any connections to the sound intensity measuring system shall be made in a manner that has no influence on the power frequency field

5.4.7 Maintaining the configuration of 5.4.2 and 5.4.4, the instrument under test shall be tested in at least one other plane, each orthogonal to the reference orientation, within the limits of suitable positioning for the radio-frequency transmitting system employed.

5.4.8 During testing, the instrument under test shall remain fully operational and in the same configuration as it was before testing commenced.

5.4.9 For sound intensity measuring systems in groups Y and Z operating from a public power supply, tests shall be performed to demonstrate conformance to the additional specifications given in 4.4.2.

5.4.10 For sound intensity measuring systems in group Z using or specifying interconnecting cables (other than the probe cable) longer than 3 m and approved by the manufacturer, tests shall be performed to demonstrate conformance to the additional specifications given in 4.4.3.

6 Information to be included in the instruction manual

The instruction manual shall contain the following:

- a) the configuration for the reference orientation and method of securing the microphone cable, if appropriate;
- b) the approved cables and accessories as required for the tests of 5.2.6 and 5.4.4;
- c) the configuration for the normal mode of operation;
- d) any specified degradation in performance or loss of functionality following the application of electrostatic discharges;
- e) the setting and configuration within a normal method of operation for greatest radio-frequency emissions;
- f) the mode of operation, within a normal method of operation, and connecting devices that produce minimum immunity to power- and radio-frequency fields.

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Annex A

(informative)

Radio-frequency emission limits

Table A.1 – Limits for radiated disturbance of Class B information technology equipment (ITE) at a measuring distance of 10 m

Frequency range MHz	Quasi-peak limits dB (μ V/m)
30 to 230	30
230 to 1 000	37

NOTE 1 The lower limit applies at the transition frequency.

NOTE 2 Additional provisions may be required for cases where interference occurs.

NOTE The characteristics of a quasi-peak receiver are specified in 4.2 of CISPR 16-1-1:2003. The reference level for quasi-peak signals is 1 μ V/m.

For sound intensity measuring systems powered from a public supply, the requirements given in Table A.2 shall also be fulfilled.

Table A.2 – Limits for conducted disturbance at the mains ports of Class B ITE

Frequency range MHz	Limits	
	Quasi-peak	Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50

NOTE 1 The lower limit applies at the transition frequencies.

NOTE 2 The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz.

Bibliography

CISPR 16-1-1:2003, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus*

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This Final version does not show where the technical content is modified by amendment 1. A separate Redline version with all changes highlighted is available in this publication.

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This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of the base publication and its amendment will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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**ELECTROACOUSTICS –
INSTRUMENTS FOR THE MEASUREMENT OF SOUND INTENSITY –
ELECTROMAGNETIC AND ELECTROSTATIC COMPATIBILITY
REQUIREMENTS AND TEST PROCEDURES**

1 Scope

1.1 This Technical Specification specifies requirements for instruments that measure sound intensity using pairs of pressure sensing microphones with respect to their immunity to power- and radio-frequency fields and to electrostatic discharge, and the permitted radio-frequency emissions, together with test procedures to verify conformance. Sound intensity measuring instruments are available in many different configurations and may be powered by batteries or from external power supply systems. The technical requirements in this Technical Specification apply to all configurations of instruments for the measurement of sound intensity.

1.2 The electromagnetic and electrostatic compatibility requirements are equally applicable for sound intensity measuring instruments used in residential, commercial and light-industrial environments, or industrial sites. The requirements of this Technical Specification are additional to those contained in IEC 61043 and do not alter any of the specifications contained therein. The requirements do not apply retrospectively to sound intensity measuring instruments complying with IEC 61043 prior to the publication of this Technical Specification.

NOTE 1 Compliance with this Technical Specification does not insure that the sound intensity measuring system is immune to interference from all electromagnetic sources.

NOTE 2 These requirements are the first attempt at defining electromagnetic and electrostatic compatibility requirements for sound intensity measuring systems. Requirements can be changed later when wider experience has been gained if found necessary.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61000-4-2, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 2: Electrostatic discharge immunity test*

IEC 61000-4-3:2002, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*
Amendment 1 (2002)

IEC 61000-4-20:2010, *Electromagnetic compatibility (EMC) – Part 4-20: Testing and measurement techniques – Emission and immunity testing in transverse electromagnetic (TEM) waveguides*

IEC 61000-6-1:1997, *Electromagnetic compatibility (EMC) – Part 6: Generic standards – Section 1: Immunity for residential, commercial and light-industrial environments*

IEC 61000-6-2:1999, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments*

CISPR/IEC 61000-6-3:1996, *Electromagnetic compatibility (EMC) – Part 6: Generic standards – Section 3: Emission standard for residential, commercial and light-industrial environments*

IEC 61043, *Electroacoustics – Instruments for the measurement of sound intensity – Measurement with pairs of pressure sensing microphones*

CISPR 22:2003, *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*

3 Terms and definitions

For the purpose of this document, the following definitions apply in addition to those specified in IEC 61000-4-2, IEC 61000-4-3, IEC 61000-6-1, IEC 61000-6-2 and CISPR 61000-6-3.

3.1

reference orientation (of a sound intensity measuring system)

orientation of a sound intensity measuring system with respect to the principal direction of an emitter or receiver of radio frequency fields

3.2

group X sound intensity measuring system

self-contained instrument which includes sound intensity measuring facilities according to this Technical Specification and which specifies internal battery power for the normal mode of operation, requiring no external connections to other apparatus to operate the instrument

3.3

group Y sound intensity measuring system

self contained instrument which includes sound intensity measuring facilities according to this Technical Specification and which specifies connection to a public power supply system for the normal mode of operation, requiring no external connections to other apparatus to operate the instrument.

3.4

group Z sound intensity measuring system

instrument that includes sound intensity measuring facilities according to this Technical Specification requiring two or more items of equipment to be connected together by some means for the normal mode of operation, with operation either from batteries or from a public power supply

4 Electromagnetic and electrostatic compatibility requirements

4.1 General

4.1.1 This clause specifies requirements for sound intensity measuring systems with respect to their immunity to power- and radio-frequency electromagnetic fields and to electrostatic discharge, and the permitted radio-frequency emissions, together with Clause 5 which specifies test procedures to demonstrate conformance to the specifications of this Technical Specification. Sound intensity measuring systems are available in many different configurations and may be powered by batteries or from external power supply systems.

For conformance with these requirements, a probe and a processing system shall be tested together, and the system this comprises shall be specified with all necessary cables and accessories. The technical requirements in this clause are for three sound intensity measuring system configurations: first, Group X, for self-contained instruments that are designed primarily for battery operation; second, Group Y, for self-contained instruments that incorporate sound intensity measuring facilities according to this Technical Specification and that are operated from public power supply systems; third, Group Z, for sound intensity measuring systems that are formed by interconnection of two or more items of equipment (for the purposes of EMC testing, the probe is not a separate item of equipment).

4.1.2 The electromagnetic and electrostatic compatibility requirements are equally applicable for sound intensity measuring systems used in residential, commercial and light-industrial environments, or industrial sites. The requirements of this clause are additional to those contained in IEC 61043 and do not alter any of the specifications for sound intensity measuring systems or parts thereof contained therein.

4.2 Emission limits

4.2.1 The upper limits on radio-frequency emissions from any apparatus are defined for compatibility with many different standards with the limits laid down in Table 1 of CISPR 61000-6-3:1996, forming the basic requirements for sound intensity measuring systems in groups X, Y or Z. These are summarized in Annex A.

4.2.2 Sound intensity measuring systems in groups Y or Z powered from a public power supply system shall also comply with the limits for disturbance to the public supply system specified in CISPR 22 for Class B equipment. For sound intensity measuring systems, the requirements are summarized in Annex A.

4.2.3 The instruction manual shall state the configuration of, the mode of operation of, and the connecting devices (if any) to, the instrument that produce the greatest radio-frequency emissions.

4.3 Electrostatic discharges

4.3.1 Sound intensity measuring systems in groups X, Y or Z shall withstand electrostatic discharges of specified magnitudes. The requirements are those specified in 1.4 of Table 1 in IEC 61000-6-1:1997 and are summarized as follows:

- contact discharges up to 4 kV and air discharges up to 8 kV with both positive and negative voltages. The polarity of the electrostatic voltage is with respect to earth ground.

4.3.2 Clause 5 of IEC 61000-6-1 specifies performance criterion B during and after electrostatic discharge tests, given as follows:

"The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended".

The term "apparatus" means any sound intensity measuring system conforming to this Technical Specification.

NOTE An example of a permissible loss of performance could be the display of the apparatus becoming unreadable during the execution of discharges, but returning to full operation following completion of the discharges.

4.3.3 After each and every electrostatic discharge test is complete, the sound intensity measuring system shall be fully operational and in a configuration identical to that established before the start of the electrostatic discharge tests. Previously stored data (if any) shall remain unchanged.

4.4 Immunity to power- and radio-frequency fields and conducted disturbances

4.4.1 Sound intensity measuring systems in groups X, Y and Z shall exhibit a minimum degree of immunity over a range of power- and radio- frequencies and field strengths. The requirements are those specified in 1.1 of Table 1 in IEC 61000-6-1:1997 and 1.2 of Table 1

in IEC 61000-6-2:1999 with minor amendments. These amendments extend the range of radio-frequency fields to cover from 27 MHz to 1 000 MHz, and increase the field strength for the power frequency field to 80 A/m. The requirements can be summarised as follows:

- frequency range from 27 MHz to 1 000 MHz. Root-mean-square electric field strength up to and including 10 V/m (unmodulated) with 80 % sinusoidal amplitude modulation at 1 kHz,
- uniform root-mean-square alternating magnetic field of 80 A/m strength at 50 Hz or 60 Hz.

4.4.2 For sound intensity measuring systems in groups Y or Z that are connected to a public power supply, the instruments shall also conform to additional requirements. These requirements are given in Table 4 of IEC 61000-6-2:1999.

4.4.3 For sound intensity measuring systems in group Z, and where any interconnecting cable between any two parts of the system (excluding any cable between the probe and the processor) exceeds 3 m in length, the instruments shall also conform to the requirements of Table 2 in IEC 61000-6-2:1999.

4.4.4 For all groups of sound intensity measuring systems, the immunity of any instrument to power and radio-frequency fields shall be demonstrated by placing the probe in a known sound field whilst maintaining both the probe and the processor in a near-uniform power or radio-frequency field. The sound field shall consist of a pure sinusoidal tone of 925 Hz simulating a sound field with a sound intensity level of $74 \text{ dB} \pm 0,5 \text{ dB}$ and a pressure intensity (PI) indicator of 5 dB. The PI indicator displays the difference between the sound intensity and sound pressure levels in an actual sound field. This source may be applied to the microphones in any way that does not alter the susceptibility of the probe or the source to power and radio-frequency emissions. The sound intensity measuring system shall be positioned in the reference orientation relative to the source of radio-frequency emissions as specified in the instruction manual. The probe shall be positioned close to the processor unit as defined for the reference orientation and fitted with a spacer of not more than 25 mm length. Excess cable shall be folded back on itself in a figure of eight configuration with an even number of folds of equal length, typically 250 mm long, and all parts secured closely together at each end of the folds, and in their centre.

NOTE A non-conductive standing wave tube may be a means of creating this field.

4.4.5 During testing, the sound intensity measuring system shall be set for the normal mode of operation as described in the instruction manual. It shall be turned on, powered by its preferred supply, and set to read sound pressure level. The level range control shall be set (if applicable) to a range where overload occurs between 90 dB and 110 dB.

4.4.6 When the power-frequency or radio-frequency field as specified in 4.4.1 is applied, the indication of the sound intensity measuring system shall not change by more than $\pm 1 \text{ dB}$ for a Class 1 system or $\pm 2 \text{ dB}$ for a Class 2 system.

4.4.7 When testing the additional requirements in 4.4.2 and 4.4.3, the susceptibility of the sound intensity measuring system shall not change by more than $\pm 1 \text{ dB}$ for a Class 1 system or $\pm 2 \text{ dB}$ for a Class 2 system when these tests are applied. No power- or radio-frequency field is applied during the testing for conformance to these additional requirements.

4.4.8 The instruction manual shall state the configuration, the mode of operation and the connecting devices (if any) that produce the minimum immunity to power- and radio-frequency fields.

5 Test procedures

5.1 General

5.1.1 The tests described in this subclause shall be carried out unless the particular configuration of the sound intensity measuring system renders them inappropriate, in which case equivalent tests should be substituted if equivalence to these tests can be demonstrated. Unless stated otherwise, these tests apply to sound intensity measuring systems in groups X, Y, and Z.

5.1.2 During testing, the sound intensity measuring system under test shall be set in the configuration for the normal mode of operation as described in the instruction manual. The instrument shall be turned on, powered by its preferred source of supply, and set to read the 1 kHz octave or third-octave band.

5.1.3 Full details of equipment required to perform the tests and the methods of executing them are mostly contained in other standards with the additional requirements for sound intensity measuring systems specified in this clause. Other standards listed in Clause 2 shall be referred to for all relevant tests.

5.2 Emission measurements

5.2.1 The instrument under test shall be configured and set according to the specification in the instruction manual to produce the greatest emissions in the frequency range being investigated.

5.2.2 Measurements of emissions shall be performed as described in Clauses 6 and 10 of CISPR 22:2003. All results from measurements of radiated emissions shall conform to the requirements for enclosure ports given in 4.2.1.

5.2.3 The instrument under test shall initially be tested in the reference orientation with the probe cable arranged as in 4.4.4 if appropriate.

5.2.4 Maintaining the configuration of 5.2.3, the instrument under test shall be tested for emissions in at least one other plane, each orthogonal to the reference orientation, within the limits of suitable positioning for the measuring system employed.

5.2.5 Any fixtures and fittings used to maintain the position of the instrument under test (including the probe and any cables if appropriate) shall be such as to have no significant influence on the measurement of any emissions from the instrument.

5.2.6 If the instrument under test is fitted with a connection device that allows interface or interconnection cables to be attached to it, then all tests of emissions shall be carried out with cables connected to all available connection devices. All cables shall be left unterminated and be arranged as described in Clause 8 of CISPR 22:2003, unless the manufacturer of the sound intensity measuring system also supplies the device connected to the sound intensity measuring system by this cable, in which case all items shall be tested together.

5.2.7 Where several connections may be made to the same connecting device, emissions shall be measured only with the configuration that produces the greatest emissions. Other configurations emitting similar or lower levels of emissions may be included in the instruction manual in a list of compliant configurations without further testing, provided the tested configuration fully conforms with the limits of 4.2.

5.2.8 For sound intensity measuring systems in groups Y and Z connected to a public power supply, disturbances conducted to the public power supply shall be measured as described in CISPR 22 and shall conform to the requirements of Clause 5 of this Technical Specification for Class B equipment.