

# INTERNATIONAL STANDARD

**Household and similar electrical appliances – Test code for the determination of  
airborne acoustical noise –  
Part 2-13: Particular requirements for range hoods**



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ELECTROTECHNICAL  
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# INTERNATIONAL ELECTROTECHNICAL COMMISSION

## HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – TEST CODE FOR THE DETERMINATION OF AIRBORNE ACOUSTICAL NOISE –

### Part 2-13: Particular requirements for range hoods

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International Standard IEC 60704-2-13 has been prepared by subcommittee 59K: Ovens and microwave ovens, cooking ranges and similar appliances, of IEC technical committee 59: Performance of household and similar electrical appliances.

This second edition cancels and replaces the first edition (2000) and constitutes an adaptation to the third edition of IEC 60704-1 (2010).

The text of this standard is based on the following documents:

FDIS	Report on voting
59K/219/FDIS	59K/223/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

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

This Part 2-13 is intended to be used in conjunction with IEC 60704-1:2010 (3rd edition) *Household and similar electrical appliances – Test code for the determination of airborne acoustical noise – Part 1: General requirements*.

NOTE 1 When "Part 1" is mentioned in this standard, it refers to IEC 60704-1.

This Part 2-13 supplements or modifies the corresponding clauses in IEC 60704-1, so as to establish the test code for range hoods. When a particular subclause of Part 1 is not mentioned in this Part 2-13, that subclause is applicable as far as reasonable. Where this standard states "addition", "modification" or "replacement", the relevant requirements, test specifications or explanatory matter in Part 1 is to be adapted accordingly.

Subclauses, tables and figures that are numbered starting from 101 are additional to those in Part 1.

Unless notes are in a new subclause or involve notes in Part 1, they are numbered starting from 101, including those in a replaced clause or subclause.

Additional annexes are lettered AA, BB, etc.

The committee has decided that the contents of this publication 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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

## INTRODUCTION

The measuring conditions specified in this Part 2-13 provide for sufficient accuracy in determining the noise emitted and comparing the results of measurements taken by different laboratories, whilst simulating as far as possible the practical use of household range hoods.

It is recommended to consider the determination of noise levels as part of a comprehensive testing procedure covering many aspects of the properties and performance of household range hoods.

Compared to the first edition (2000) of this Part 2-13, the second edition doesn't contain the description of an appropriate test enclosure which has now been incorporated in Part 1. The scope of this Part 2-13 has been extended to range hoods with an external fan. Furthermore the values of standard deviations of sound power levels determined according to this part are given.

In case of unavailability of an acoustical environment which is specified in Clause 4 of ISO 3743-1, ISO 3743-2 and ISO 3744 alternatively the sound power of range hoods can be determined according to Annex AA using the sound intensity method specified in ISO 9614-1 and ISO 9614-2. This method is not suitable if the source under test has significant noise over 4,0 kHz for octave band frequencies or 6,3 kHz for one-third octave band frequencies. Sound intensity method for the determination of sound power levels shall not be used for the purpose of verification.

NOTE As stated in the introduction to IEC 60704-1, this test code is concerned with airborne noise only.

# HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – TEST CODE FOR THE DETERMINATION OF AIRBORNE ACOUSTICAL NOISE –

## Part 2-13: Particular requirements for range hoods

### 1 Scope and object

This clause of Part 1 is applicable except as follows:

#### 1.1 Scope

##### 1.1.1 General

*Addition:*

These particular requirements apply to electrical range hoods for household and similar use intended for filtering the air of a room or for exhausting the air out of a room, including their accessories and their component parts. It also applies to range hoods with an external fan which may be mounted inside or outside of the room where the range hood is located.

##### 1.1.2 Types of noise

*Replacement:*

The methods specified in ISO 3743-1, ISO 3743-2 and ISO 3744 can be used for measuring noise emitted by range hoods.

##### 1.1.3 Size of source

*Replacement:*

The method specified in ISO 3744 is applicable to noise sources of any size. When applying ISO 3743-1 and ISO 3743-2, care should be taken that the maximum size of the range hood under test fulfils the requirements specified in 1.3 of ISO 3743-1 and ISO 3743-2.

#### 1.2 Object

*Addition:*

This standard describes the determination of the noise emission of household range hoods under normal operating conditions and at the highest fan speed setting for normal use.

NOTE 101 If a boost position is incorporated, this is not taken into account (see 6.5 of IEC 61591).

NOTE 102 A boost position is a setting of a control for occasional use, which results in a higher temporary fan speed (see 6.5 of IEC 61591).

Requirements for the declaration of noise emission values are not within the scope of this standard.

NOTE 103 For determining and verifying noise emission values declared in product specifications, see IEC 60704-3.

#### 1.3 Measurement uncertainty

*Replacement:*

The estimated values of standard deviations of sound power levels, determined according to this standard, are as follows:

**Table 101 – Standard deviations of sound power levels**

Standard deviation (dB)	
$\sigma_r$ (repeatability)	$\sigma_R$ (reproducibility)
0,4	1,0

### 1.101 Standard deviation for declaration and verification

For the purpose of determining and verifying declared noise emission values according to IEC 60704-3, the following values apply:

**Table 102 – Standard deviations for declaration and verification**

Standard deviation (dB)		
$\sigma_P$ (production)	$\sigma_t$ (total)	$\sigma_M$ (reference)
1,5 – 1,7	1,8 – 2,0	2,0

## 2 Normative references

This clause of Part 1 is applicable with the following addition:

*Addition:*

IEC 61591:1997, *Household range hoods – Methods for measuring performance*  
Amendment 1 (2005)<sup>1</sup>  
Amendment 2 (2010)

ISO 7235:2003, *Acoustics - Laboratory measurement procedures for ducted silencers and air-terminal units - Insertion loss, flow noise and total pressure loss*

## 3 Terms and definitions

This clause of Part 1 is applicable with the following addition:

### 3.101

#### **range hood**

appliance installed over a hob and through which air is passed to remove contaminants from the room

[IEC 61591, definition 3.1]

### 3.102

#### **recirculation-air range hood**

range hood containing filters to remove contaminants, after which the cleaned air is discharged back into the room

[IEC 61591, definition 3.2]

<sup>1</sup> There exists a consolidated edition 1.1 of IEC 61591 (2005), that includes IEC 61591 (1997) and its amendment 1 (2005).



**3.103****air-extracting range hood**

range hood which discharges the collected air to the outside of the building by means of ducting. The range hood can incorporate an internal or external fan.

**4 Measurement methods and acoustical environments**

This clause of Part 1 is applicable except as follows:

**4.2 Direct method**

*Addition:*

NOTE 101 If pure tone components are present in the noise emitted by the source, the estimated standard deviation of the measured sound pressure levels in the special reverberation room may increase. In such cases additional microphone positions or source positions may be necessary as specified in ISO 3743-2.

**4.3 Comparison method**

*Addition:*

NOTE 101 If pure tone components are present in the noise emitted by the source, the estimated standard deviation of the measured sound pressure levels in the hard-walled test room or in the special reverberation room may increase. In such cases additional microphone positions or source positions may be necessary as specified in ISO 3743-1 or ISO 3743-2.

**5 Instrumentation**

This clause of Part 1 is applicable except as follows:

**5.1 Instrumentation for measuring acoustical data**

*Addition:*

Windscreens should be used if necessary and then corrections for change in the microphone sensitivity shall be added to the observed sound pressure levels.

**6 Operation and location of appliance under test**

This clause of Part 1 is applicable except as follows:

**6.1 Equipping and pre-conditioning of appliance****6.1.1**

*Addition:*

Recirculation-air range hoods should be fitted with a clean filter(s).

Air-extraction range hoods shall be fitted with the pipe coupling ring, if any, having the largest diameter among those provided by the manufacturer. If the range hood is designed to accommodate additional filters, those filters shall be clean and appropriately fitted.

**6.1.3**

*Replacement:*

Prior to noise measurements, the range hood shall have been in operation for running in for at least 4 h at the highest speed setting for normal use (see notes in 1.2).

#### 6.1.4

*Replacement:*

Immediately before each series of noise measurements, the range hood equipped for its intended use is operated for stabilizing at the highest speed setting for normal use (see notes in 1.2) for 10 min.

### 6.2 Supply of electrical energy and of water or gas

6.2.3 and 6.2.4 Not applicable

### 6.4 Loading and operating of appliance during test

#### 6.4.2

*Replacement:*

The appliances shall be equipped according to 6.1.1.

The range hood shall be operated at the highest speed setting for normal use (see notes in 1.2).

Air-extraction range hoods shall be loaded using a pipe connected to a muffler according to Figure 101. The pipe shall be rigid with smooth inner walls and shall have the widest diameter among those specified by the manufacturer. If not stated, a standard pipe with the best fitting diameter shall be used. The muffler shall have an insertion loss as specified in the table of Figure 101. It shall have a circular section with the same internal diameter as that of the pipe, a length as specified in Figure 101 and shall not have parts protruding inside that may cause additional pressure drops. The pipe and the muffler shall also comply with all the specifications reported in Figure 101 and care shall be taken that they do not radiate noise.

Range hoods with external fan shall be connected to the fan with a pipe and a muffler according to Figure 103. The pipe shall be rigid with smooth inner walls and shall have the widest diameter among those specified by the manufacturer. If not stated, a standard pipe with the best fitting diameter shall be used. The muffler shall be provided with the appliance. If the manufacturer did not provide a muffler, the appliance is tested without muffler.

In particular, when connecting the pipe and muffler system to the range hood, care shall be taken that this connection does not transfer any additional structure borne noise. For this purpose, isolating connecting pieces can be used.

Static forces from the standard exhaust to the range hood shall also be avoided.

NOTE 101 The fastening of the muffler should not influence the acoustical field in the test room; for example two wires could be fixed around the muffler and on the ceiling.

Whenever it is possible to choose among two or more exit holes for the pipe connection, the one on the upper side of the range hood, if any, shall be used.

Range hoods designed for connection with more than one pipe at the same time shall be connected accordingly to the number of pipes required.

6.4.3 Not applicable

## 6.5 Location and mounting of appliance

### 6.5.1

*Replacement:*

Range hoods not intended to be placed against a wall shall be supported by a stand with resilient means (example is given in Figure 102)

- either at a height of 0,6 m from the floor of the hard-walled test room or of the special reverberation test room with a minimum distance of 1 m between any surface (including protruding parts) of the range hood and the nearest wall;
- or at a height of 0,6 m from a reflecting plane of the free field environment, taking into account the shape and size of the specified measurement surface.

Care shall be taken in order to avoid any kind of interference between the supports and the air intake of the appliance under test.

**6.5.2 and 6.5.3** Not applicable

### 6.5.4

*Replacement:*

Range hoods intended to be placed against a wall are placed with a distance of  $D = 1 \text{ cm} \pm 0,5 \text{ cm}$  between the back of the appliance and a vertical wall and supported by a stand with resilient means (example is given in Figure 102)

- either at a height of 0,6 m from the floor of the hard-walled test room or of the special reverberation test room with the mentioned distance from one vertical wall and with a minimum distance of 1 m between any surface (including protruding parts) of the range hood and the nearest other wall;
- or at a height of 0,6 m on a horizontal reflecting plane in the free field environment and with the mentioned distance between the back of the range hood and the vertical reflecting plane. The minimum size of this vertical plane shall be at least equal to the size of the projection of the measurement surface. The acoustic absorption coefficient of the vertical reflecting plane shall be smaller than 0,06.

Care shall be taken in order to avoid any kind of interference between the supports and the air intake of the appliance under test.

Care should be taken to avoid any direct contact between the appliance (including protruding parts, worktops, spacers, etc.) and the vertical reflecting plane.

#### 6.5.101

For range hoods with external fan the air inlet device shall be located and mounted as described in 6.5.1 or 6.5.4. The external fan shall be located in a way that the noise emitted by the housing of the fan and by the air outlet does not influence the measurement result.

## 7 Measurement of sound power levels

This clause of Part 1 is applicable except as follows:

## **7.1 Microphone array, measurement surface and RSS location for essentially free-field conditions over reflecting plane(s)**

### **7.1.1**

#### *Replacement:*

For range hoods not intended to be placed against a wall, including built-in appliances, the measurement surface is a parallelepiped with nine microphone positions, as specified in 7.3.1 of ISO 3744 and in Figure 1 of IEC 60704-1. Additional measurement positions may be required according to 7.3.2 of ISO 3744. The number of microphone positions may also be reduced according to 7.4.2 of ISO 3744.

While defining the reference box around the appliance, the loading pipe connected to a range hood operating in exhausting mode should not be taken into account.

NOTE 101 The front of the appliance is directed in the direction of the  $x$ -axis. The preferred value of the measurement distance  $d$  is 1 m.

### **7.1.2**

#### *Replacement:*

For range hoods intended to be placed against a wall, including built-in appliances, the measurement surface is a parallelepiped with six microphone positions, as specified in 7.3.1 of ISO 3744 and in Figure 2 of IEC 60704-1. Additional measurement positions may be required according to 7.3.2 of ISO 3744. The number of microphone positions may also be reduced according to 7.4.2 of ISO 3744.

While defining the reference box around the appliance, the loading pipe connected to a range hood operating in exhausting mode should not be taken into account.

NOTE 101 The  $x$  and  $y$  axes are located in the vertical reflecting plane, with the  $x$ -axis directed vertically upwards and the front of the appliance directed in the direction of the  $z$ -axis. The preferred value of the measurement distance  $d$  is 1 m.

**7.1.3 to 7.1.6** Not applicable

## **7.4 Measurements**

### **7.4.1**

#### *Addition:*

The A-weighted time averaged sound pressure level shall be measured over a period of at least 30 s.

## **8 Calculation of sound pressure and sound power levels**

This clause of Part 1 is applicable except as follows:

### **8.1**

#### *Addition:*

Noise emitted by the housing or by the air outlet of an external fan shall be considered as background noise.

## 9 Information to be recorded

This clause of Part 1 is applicable except as follows:

### 9.2 Description of appliance under test

#### 9.2.2

*Replacement:*

Design characteristics: for example chimney, free-standing, built-in group, slim line.

### 9.7 Electric supply, water supply, etc.

9.7.3 and 9.7.4 Not applicable

### 9.12 Measurement data

9.12.5 Not applicable

## 10 Information to be reported

This clause of Part 1 is applicable except as follows:

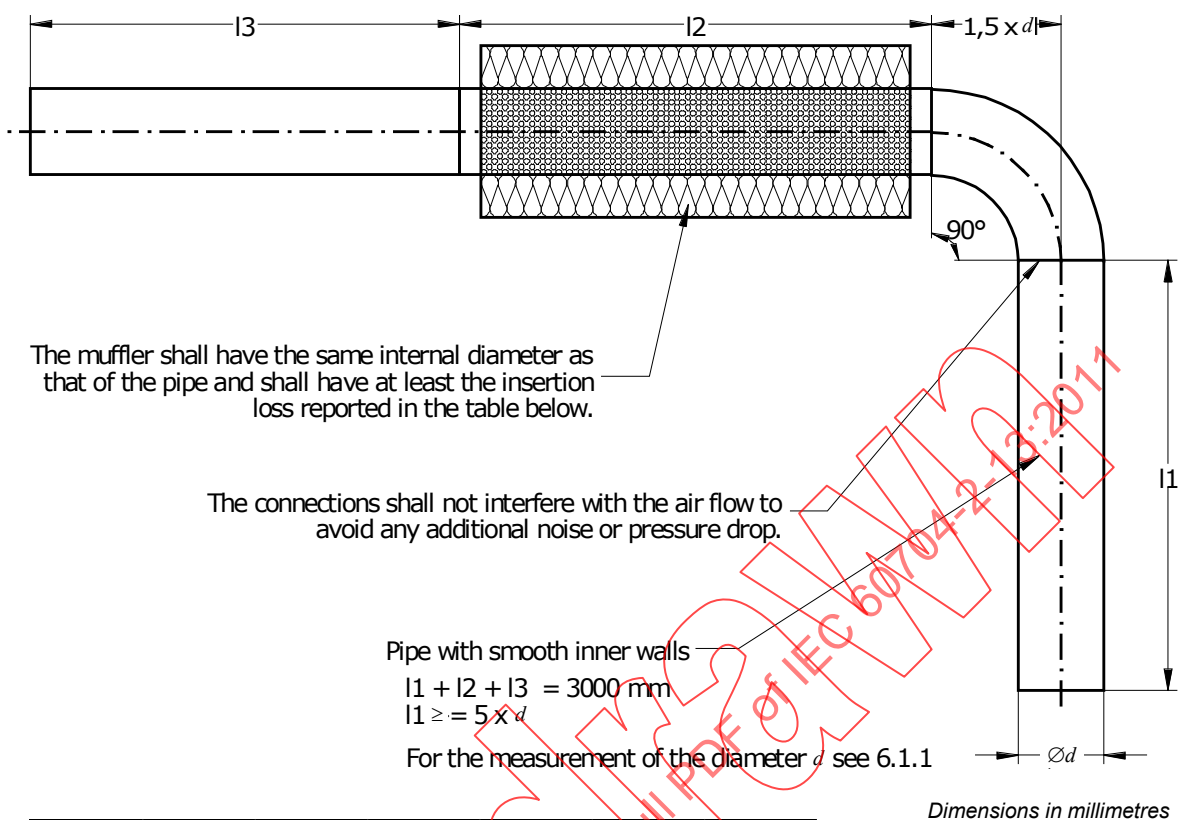
### 10.3 Test conditions for the appliance

10.3.4 and 10.3.5 Not applicable

10.3.11 Not applicable

### 10.4 Acoustical data

10.4.10 Not applicable

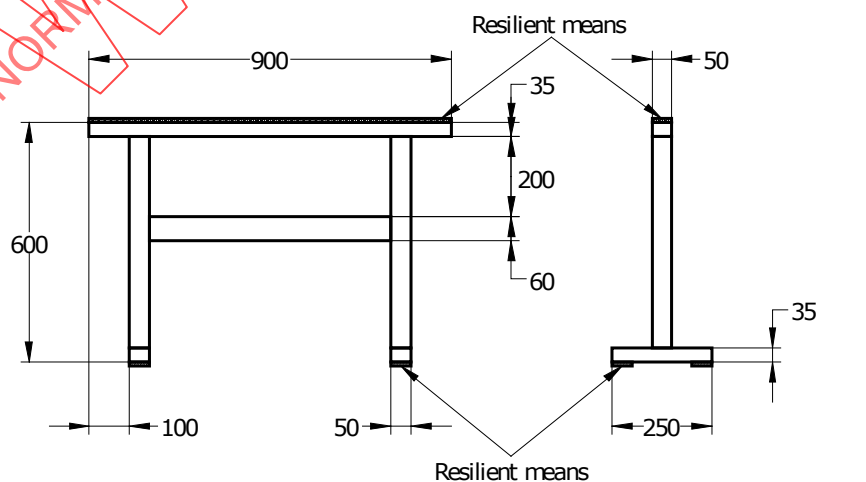


Minimum insertion loss in decibels for octave bands <sup>a</sup>						
125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
8	20	20	20	20	20	20

<sup>a</sup> Insertion loss measured according to ISO 7235

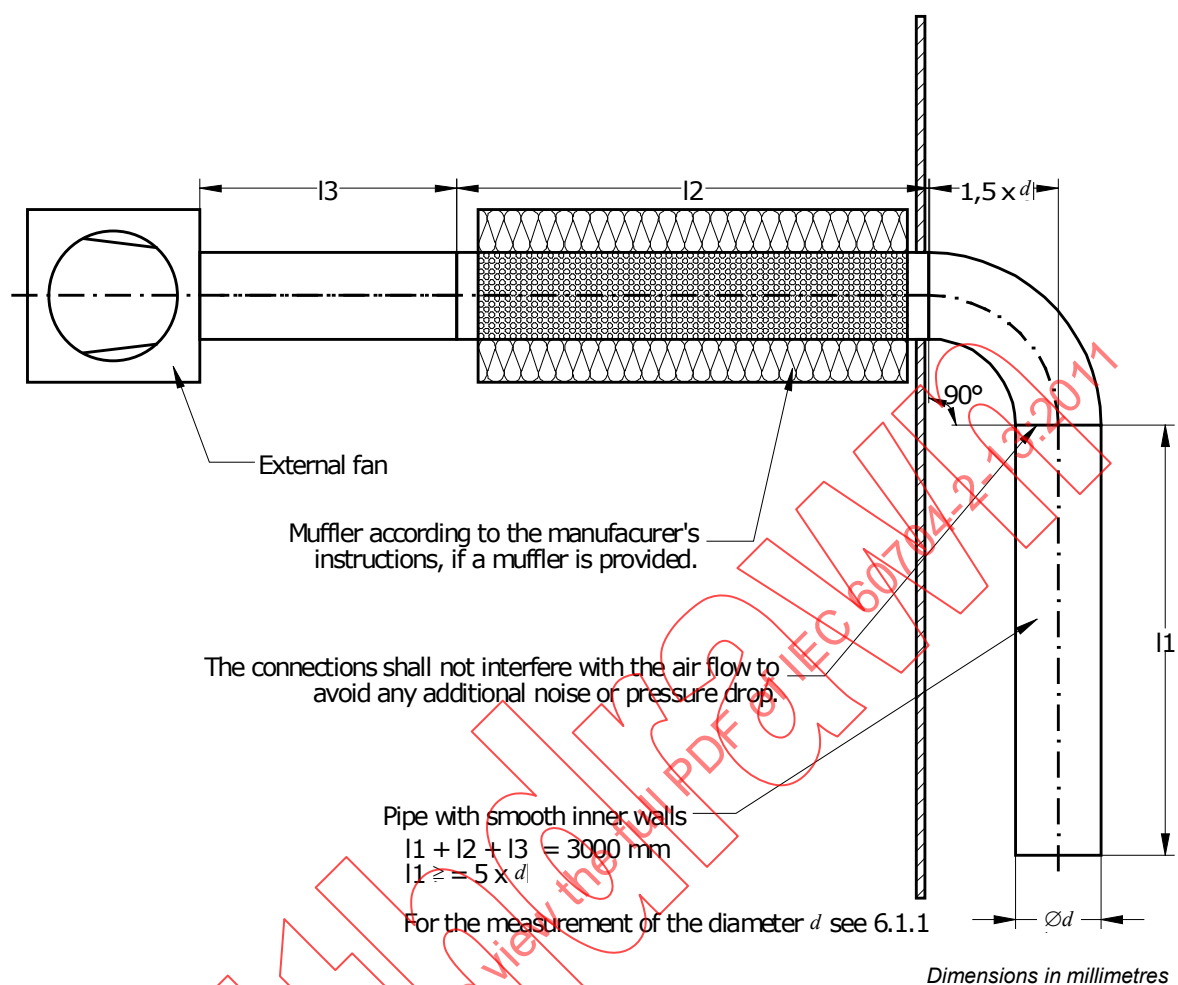
IEC 152/11

Figure 101 – Standard load



IEC 153/11

Figure 102 – Example of standard stand



Minimum insertion loss in decibels for octave bands <sup>a</sup>						
125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
8	20	20	20	20	20	20

<sup>a</sup> Insertion loss measured according to ISO 7235

Figure 103 – Standard load for range hoods with an external fan

## **Annexes**

The annexes of Part 1 are applicable except as follows:

### **Annex A** (normative)

This annex of Part 1 is not applicable.

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*Addition:*

## **Annex AA** **(informative)**

### **Sound intensity method for the determination of sound power levels of range hoods**

NOTE This Annex AA supplements or modifies the corresponding clauses in IEC 60704-1, so as to establish the test code for range hoods using sound intensity.

When "Part 1" is mentioned in this standard, it refers to IEC 60704-1.

When a particular subclause of Part 1 is not mentioned in this annex, that subclause is applicable as far as reasonable. Where this annex states "addition", "modification" or "replacement", the relevant requirements, test specifications or explanatory matter in Part 1 should be adapted accordingly.

#### **AA.1 Scope and object**

Clause 1 of Part 1 is applicable except as follows:

##### **AA.1.1 Scope**

###### **AA.1.1.1 General**

*Addition to 1.1.1 of Part 1:*

These particular requirements apply to electrical range hoods for household and similar use intended for filtering the air of a room or for exhausting the air out of a room including their accessories and their component parts. It also applies to range hoods with an external fan which may be mounted inside or outside of the room where the range hood is mounted.

Sound intensity method for the determination of sound power levels shall not be used for the purpose of verification.

###### **AA.1.1.2 Types of noise**

*Replacement of 1.1.2 of Part 1:*

The methods specified in ISO 9614-1 and ISO 9614-2 can be used for measuring noise emitted by range hoods, except the source under test has significant noise in the one-third-octave-bands below 50 Hz and above 6,3 kHz.

NOTE 101 For the purpose of this assessment, significant levels are band levels which after A-weighting are no more than 6 dB below the A-weighted value computed.

###### **AA.1.1.3 Size of source**

*Replacement of 1.1.3 of Part 1:*

The methods specified in ISO 9614-1 and ISO 9614-2 are applicable to noise sources of any size. The extend of the source is defined by the choice of the measurement surface.

##### **AA.1.2 Object**

*Addition to 1.2 of Part 1:*

This standard describes the determination of the noise emission of household range hoods under normal operating conditions and at the highest fan speed setting for normal use.

NOTE 101 If a boost position is incorporated, this is not taken into account (see 6.5 of IEC 61591).

NOTE 102 A boost position is a setting of a control for occasional use which results in a higher temporary fan speed (see 6.5 of IEC 61591).

Requirements for the declaration of noise emission values are not within the scope of this standard.

NOTE 103 For determining and verifying noise emission values declared in product specifications, see IEC 60704-3.

### AA.1.3 Measurement uncertainty

*Replacement of 1.3 of Part 1:*

The uncertainty in the determination of the sound power level of a noise source is related

- to the nature of the sound field of the source;
- to the nature of the extraneous sound field;
- to the absorption of the source under test;
- to the type of intensity-field sampling and measurement procedure employed.

The normal range for A-weighted data is covered by the one-octave bands from 63 Hz to 4 kHz, and the one-third-octave bands from 50 Hz to 6,3 kHz.

The estimated values of standard deviations of sound power levels, determined according to this standard, are as follows:

**Table AA.101 – Standard deviations of sound power levels**

Standard deviation (dB)	
$\sigma_r$ (repeatability)	$\sigma_R$ (reproducibility)
1,5	2,0

#### AA.1.101 Standard deviation for declaration and verification

For the purpose of determining and verifying declared noise emission values according to IEC 60704-3, the following values apply:

**Table AA.102 – Standard deviations for declaration and verification**

Standard deviation (dB)		
$\sigma_P$ (production)	$\sigma_t$ (total)	$\sigma_M$ (reference)
1,5 – 1,7	2,5 – 2,6	2,0

### AA.2 Normative references

Clause 2 of Part 1 is applicable except as follows:

*Addition:*

IEC 61591:1997, *Household range hoods – Methods for measuring performance*  
Amendment 1 (2005)<sup>2</sup>  
Amendment 2 (2010)

ISO 7235:2003, *Acoustics – Laboratory measurement procedures for ducted silencers and air-terminal units – Insertion loss, flow noise and total pressure loss*

ISO 9614-1:1993, *Acoustics – Determination of sound power levels of noise sources using sound intensity – Part 1: Measurement at discrete points*

ISO 9614-2:1996, *Acoustics – Determination of sound power levels of noise sources using sound intensity – Part 2: Measurement by scanning*

### AA.3 Terms and definitions

Clause 3 of Part 1 is applicable except as follows:

#### AA.3.101 range hood

appliance installed over a hob and through which air is passed to remove contaminants from the room

[IEC 61591:1997, definition 3.1]

#### AA.3.102 recirculation-air range hood

range hood containing filters to remove contaminants after which the cleaned air is discharged back into the room

[IEC 61591:1997, definition 3.2]

#### AA.3.103 air-extracting range hood

range hood which discharges the collected air to the outside of the building by means of ducting. The range hood can incorporate an internal or external fan.

### AA.4 Measurement methods and acoustical environments

Clause 4 of Part 1 is applicable except as follows:

#### AA.4.1 General

*Replacement of 4.1 in Part 1:*

The total noise emitted by machinery or equipment and radiated in all directions to the space surrounding the machine can be characterized by the sound power of the machine. The sound power of a machine is essentially independent of the environment in which the machine is installed.

Therefore, the concept of sound power level has been chosen for expressing the noise emission of appliances for household and similar purposes.

The preferred noise emission quantity is the A-weighted sound power level,  $L_{WA}$ , in decibels (refer to 1 pW).

<sup>2</sup> There exists a consolidated edition 1.1 of IEC 61591 (2005), that includes IEC 61591 (1997) and its amendment 1 (2005).

According to this annex, two principal methods exist, the discrete points method and the scanning method, as described in AA.4.2 below. These two methods can be used alternatively.

## **AA.4.2 Direct method**

*Replacement of 4.2 in Part 1:*

The measurements can be performed according to two sound intensity methods, the “discrete points method” and the “scanning method”, as described below.

### **AA.4.2.101 Discrete points method**

Define, as the measurement surface, a parallelepiped-shaped surface around the range hood; then divide it in partial areas (segment) so as to obtain a grid. The dimension of the parallelepiped depends on the dimension of the range hood; the distance between each face of the parallelepiped and the range hood under test depends on the value of  $F_2$  and  $F_3$  indicators (see Annexes A and B of ISO 9614-1) but shall be at least 10 cm. The density of measurement positions on parallelepiped faces depends on extraneous noise and on the value of  $F_4$  indicator (see Annexes A and B of ISO 9614-1). The total sound power of source is obtained from calculation of partial sound power of each segment of parallelepiped, by multiplying the “local” sound intensity by its partial area, and then by adding all the partial sound powers (absolute value).

### **AA.4.2.102 Scanning method**

This method is very similar to the previous one, with the only difference that each face of the parallelepiped is not divided in partial areas, but is continuously scanned with the intensity probe, and the space and time average of sound intensity is multiplied by its area; then the total sound power of the range hood is obtained by adding the partial sound powers of each face of the parallelepiped.

NOTE 101 The distance of 20 cm between each face of the parallelepiped and the range hood is usually acceptable.

## **AA.4.3 Comparison method**

Subclause 4.3 in Part 1 not applicable

## **AA.4.4 Acoustical environments**

### **AA.4.4.1 General requirements and criterion for adequacy of the test environment**

*Replacement of 4.4.1 of Part 1:*

They are given in Clause 5 of

- ISO 9614-1 for the discrete points method;
- ISO 9614-2 for the scanning method.

### **AA.4.4.2 Criterion for background noise level**

Subclause 4.4.2 of Part 1 not applicable.

#### **AA.4.4.101 Extraneous intensity**

The level of extraneous intensity shall be minimized so that it does not unacceptably reduce measurement accuracy. See Clause 5 of

- ISO 9614-1 for the discrete points method;

- ISO 9614-2 for the scanning method.

## **AA.5 Instrumentation**

Clause 5 of Part 1 is applicable except as follows:

### **AA.5.1 Instrumentation for measuring acoustical data**

*Replacement of 5.1 of Part 1:*

Requirements are given in Clause 6 of

- ISO 9614-1 for the discrete points method;
- ISO 9614-2 for the scanning method.

## **AA.6 Operation and location of appliances under test**

Clause 6 of Part 1 is applicable except as follows:

### **AA.6.1 Equipping and pre-conditioning of appliance**

#### **AA.6.1.1**

*Addition to 6.1.1 of Part 1:*

Recirculation-air range hoods should be fitted with a clean filter(s).

Air-extraction range hoods shall be fitted with the pipe coupling ring, if any, having the largest diameter among those provided by the manufacturer. If the range hood is designed to accommodate additional filters, those filters shall be clean and appropriately fitted.

#### **AA.6.1.3**

*Replacement of 6.1.3 of Part 1:*

Prior to noise measurements, the range hood shall have been in operation for running in for at least 4 h at the highest speed setting for normal use (see notes in 1.2).

#### **AA.6.1.4**

*Replacement of 6.1.4 of Part 1:*

Immediately before each series of noise measurements, the range hood equipped for its intended use is operated for stabilizing at the highest speed setting for normal use (see notes in 1.2) for 10 min.

### **AA.6.2 Supply of electrical energy and of water or gas**

Subclauses 6.2.3 and 6.2.4 of Part 1 not applicable.

### **AA.6.4 Loading and operating of appliance during test**

#### **AA.6.4.1**

*Replacement of 6.4.1 of Part 1:*

The appliances shall be equipped according to AA.6.1.1.

The range hood shall be operated at the highest speed setting for normal use (see notes in 1.2).

Air-extraction range hoods shall be loaded using a pipe connected to a muffler according to Figure 101. The pipe shall be rigid with smooth inner walls and shall have the widest diameter among those specified by the manufacturer. If not stated, a standard pipe with the best fitting diameter shall be used. The muffler shall have an insertion loss as specified in the table of Figure 101. It shall have a circular section with the same internal diameter as that of the pipe, a length as specified in Figure 101 and shall not have parts protruding inside that may cause additional pressure drops. The pipe and the muffler shall also comply with all the specifications reported in Figure 101 and care shall be taken that they do not radiate noise.

Range hoods with external fan shall be connected to the fan with a pipe and a muffler according to Figure 103. The pipe shall be rigid with smooth inner walls and shall have the widest diameter among those specified by the manufacturer. If not stated, a standard pipe with the best fitting diameter shall be used. The muffler shall be provided with the appliance. If the manufacturer did not provide a muffler, the appliance is tested without muffler.

In particular, when connecting the pipe and muffler system to the range hood, care shall be taken that this connection does not transfer any additional structure borne noise. For this purpose, isolating connecting pieces can be used.

Static forces from the standard exhaust to the range hood shall also be avoided.

NOTE 101 The fastening of the muffler should not influence the acoustical field in the test room; for example two wires could be fixed around the muffler and on the ceiling.

Whenever it is possible to choose among two or more exit holes for the pipe connection, the one on the upper side of the range hood, if any, shall be used.

Range hoods designed for connection with more than one pipe at the same time shall be connected accordingly to the number of pipes required.

Subclause 6.4.3 of Part 1 not applicable.

## **AA.6.5 Location and mounting of appliance**

### **AA.6.5.1**

*Replacement of 6.5.1 of Part 1:*

Range hoods not intended to be placed against a wall shall be supported by a stand with resilient means (example is given in Figure 102) at a height of 0,6 m from a horizontal reflecting plane and with a minimum distance of 1 m between any surface (including protruding parts) of the range hood and any other wall. The acoustic absorption coefficient of the horizontal reflecting plane shall be smaller than 0,06.

Care shall be taken in order to avoid any kind of interference between the supports and the air intake of the appliance under test.

Subclauses 6.5.2 and 6.5.3 of Part 1 not applicable

### **AA.6.5.4**

*Replacement of 6.5.4 of Part 1:*

Range hoods intended to be placed against a wall are placed with a distance of  $D = 1 \text{ cm} \pm 0,5 \text{ cm}$  between the back of the appliance and a vertical reflecting plane and supported by a stand with resilient means (example is given in Figure 102) at a height of

0,6 m from a horizontal reflecting plane and with a minimum distance of 1 m between any surface (including protruding parts) of the range hood and any other wall. The minimum size of the vertical plane shall be at least equal to the size of the projection of the measurement surface. The acoustic absorption coefficient of the horizontal and the vertical reflecting plane shall be smaller than 0,06.

Care shall be taken in order to avoid any kind of interference between the supports and the air intake of the appliance under test.

Care should be taken to avoid any direct contact between the appliance (including protruding parts, worktops, spacers, etc.) and the vertical reflecting plane.

#### **AA.6.5.101**

For range hoods with external fan the air inlet device shall be located and mounted as described in AA.6.5.1 to AA.6.5.4. The external fan shall be located in a way that the noise emitted by the housing of the fan and by the air outlet does not influence the measurement result.

### **AA.7 Measurement of sound pressure levels**

Clause 7 of Part 1 not applicable

*Replacement:*

#### **AA.7.101 Measurement of normal sound intensity component levels**

##### **AA.7.101.1 Initial test – discrete points method**

Choose a typical measurement position on the initial measurement surface for the assessment of whether the sound field is stationary or not. With the appliance under test turned on, calculate indicator  $F_1$  for all frequency bands of measurement according to A.2.1 of ISO 9614-1. The temporal variability of the sound field shall not exceed the values specified in Table B.3 of ISO 9614-1.

Extraneous noise is insignificant if A-weighted sound pressure levels measured at five positions (distributed reasonably uniformly over the measurement surface) fall by at least 20 dB when the source is turned off.

Calculate the field indicators  $F_2$ ,  $F_3$  and  $F_4$  for all frequency bands of measurement according to Annex A of ISO 9614-1, and introduce them into the formulae given for the qualification procedure of B.1.1 in ISO 9614-1. When this requirement is fulfilled for each frequency band, the initial sound power determination is qualified as a final result within the range of uncertainty given in 1.3.

##### **AA.7.101.2 Initial test - Scanning method**

Make two separate scans (the two individual scan paths shall be orthogonal) on each segment of the measurement surface, and separately record the partial sound power levels  $L_{Wi(1)}$  and  $L_{Wi(2)}$  according to 9.2 of ISO 9614-2 for all frequency bands of measurement. The values shall fulfil criterion 3 of B.1.3 in ISO 9614-2.

Evaluate indicator  $F_{pl}$  for all frequency bands of measurement according to equation (A.1) of A.2.1 in ISO 9614-2 and introduce the values into the formula given for qualification procedure B.1 of Annex B of ISO 9614-2.  $F_{pl}$  shall be less than 20 dB.



Evaluate indicator  $F_{+/-}$  for all frequency bands of measurement according to equation (A.2) of A.2.2 in ISO 9614-2 and introduce the values into the formula given for the qualification procedure of B.1.2 in ISO 9614-2.

## AA.7.102 Measurements

### AA.7.102.1 Discrete points method

When the preliminary tests described in AA.7.1 have been carried out, measure the normal component of sound intensity in each frequency band of interest and for each segment of parallelepiped-shaped grid. The probe shall be placed normal to the surface. The "local" value  $I_{ni}$  is obtained by time integration of the acoustic signal over a period of at least 20 s.

### AA.7.102.2 Scanning method

Carry out scanning either manually or by means of a mechanized traversing system. The extraneous intensity generated by this mechanism, as measured by the probe, shall be at least 20 dB lower than the one generated by the appliance on the measurement surface. Move the intensity probe continuously along specified paths on each segment of the selected measurement surface. The basic element of a scan is a single straight line. The duration of each scan over an individual segment shall not be less than 20 s. Initiate time averaging at the beginning of the scan over each segment and terminate it at the completion of the scan of the segment.

## AA.8 Calculation of sound pressure and sound power levels

Clause 8 of Part 1 not applicable.

*Replacement:*

### AA.8.101 Calculation of sound intensity and sound power levels

#### AA.8.101.1 Calculation of partial powers for each segment of surface

Calculate a partial A-weighted sound power,  $P_i$ , for each segment of the measurement surface from the following equation:

$$P_i = I_{ni} \cdot S_i$$

where

$P_i$  is the partial A-weighted sound power for segment  $i$  given by the sum of all the sound power levels found in each frequency band;

$I_{ni}$  is the sum of A-weighted normal intensity components in all frequency bands of interest for segment  $i$ :

*Discrete points method:* is the signed magnitude of the normal sound intensity component measured at position  $i$  on the measurement surface;

*Scanning method:* is the mean segment-average normal sound intensity component measured on segment  $i$  of the measurement surface:

$$I_{ni} = [I_{ni}(1) + I_{ni}(2)]/2$$

and  $I_{ni}(1)$  and  $I_{ni}(2)$  are the values of  $I_{ni}$  obtained from two separate scans of segment  $i$ ;

$S_i$  is the area of segment  $i$ .

Where the normal sound intensity component level,  $L_{I_{ni}}$ , at position  $i$  is expressed as XX dB, the value of  $I_{ni}$  shall be calculated from the following equation: