IEC 60704-2-15

Edition 1.0 2024-09
EXTENDED VERSION

INTERNATIONAL STANDARD

colour inside

This full version of IEC 60704-2-15:2024 includes the content of the references made to IEC 60704-1:2021

Household and similar electrical appliances – Test code for the determination of airborne acoustical noise – Part 2-15: Particular requirements for household food waste disposers

IEC 60704-2-15:2024-09 EXV(en)

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Household and similar electrical appliances – Test code for the determination of airborne acoustical noise – Part 2-15: Particular requirements for household food waste disposers

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 2-15: Particular requirements for household food waste disposers

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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This extended version (EXV) of the official IEC Standard provides the user with the full content of the Standard.

IEC 60704-2-15:2024 EXV includes the content of IEC 60704-2-15:2024, and the references made to IEC 60704-1:2021.

The specific content of IEC 60704-2-15:2024 is displayed on a blue background.

IEC 60704-2-15 has been prepared by IEC subcommittee 59L: Small household appliances, of IEC technical committee 59: Performance of household and similar electrical appliances. It is an International Standard.

This first edition cancels and replaces the first edition of IEC/PAS 60704-2-15, published in 2008. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to IEC/PAS 60704-2-15:2008:

a) measurement uncertainty and standard deviations have been reviewed;
b) definitions of standard test programme and standard test load have been reviewed;
c) definition of the test enclosure has been reviewed;
d) additional microphone position for test in free field environment;
e) information to be reported has been reviewed;
f) aligned to IEC 60704-1:2021.

The text of this International Standard is based on the following documents:

Draft	Report on voting
59L/252/CDV	59L/264/RVC

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

This Part 2-15 is intended to be used in conjunction with the fourth edition of IEC 60704-1:2021, *Household and similar electrical appliances – Test code for the determination of airborne acoustical noise – Part 1: General requirements*.

The relevant text of IEC 60704-1:2021 as amended by this publication establishes the test code for household food waste disposers.

This document supplements or modifies the corresponding clauses in IEC 60704-1:2021. When a particular subclause of IEC 60704-1:2021 is not mentioned in this document, 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 IEC 60704-1:2021 are to be adapted accordingly.

Subclauses, tables and figures that are additional to those in IEC 60704-1:2021 are numbered starting from 101. Additional annexes are lettered AA, BB, etc.

Unless notes are in a new subclause or involve notes in IEC 60704-1:2021, they are numbered starting from 101, including those in a replaced clause or subclause.

In this standard, the following print types are used:

- terms defined in Clause 3: **bold type**.

A list of all parts in the IEC 60704 series, published under the general title *Household and similar electrical appliances – Test code for the determination of airborne acoustical noise*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION to IEC 60704-1:2021

Although the noise emitted by household appliances does not generally present a hazard to the hearing of the operator and other exposed persons, the need for standardization procedures for the determination of the noise emitted has been recognized for a long time. Such procedures should be specified, not only for special types of appliances, but also the principles should be applicable to the majority of appliances in general use.

Generally, the determination of noise levels is only part of a comprehensive testing procedure covering many aspects of the properties and performances of the appliance. It is therefore important that the requirements for noise measurements (such as test environment, instrumentation, and amount of labour involved) be kept at a modest level.

The results of noise measurements are used for many purposes, for example for noise declaration, as well as for comparing the noise emitted by a specific appliance to the noise emitted by other appliances of the same family. In other cases, the results are taken as a basis for engineering action in the development stages of new pieces of equipment, or in deciding on means for sound insulation. For all purposes, it is important to specify procedures with known accuracy so that the results of measurements taken by different laboratories can be compared.

These conditions have, as far as possible, been taken into account in the preparation of this test code. The acoustic measuring methods are based on those described in ISO 3743-1:2010, ISO 3743-2:2018 and ISO 3744:2010.

The adoption of these methods permits the use of semi-anechoic rooms, special reverberation test rooms and hard-walled test rooms. The result of the measurements is the sound power level of the appliance. Within the measuring uncertainty specific to these methods, the results from the determination under free field conditions over a reflecting plane are equal to those obtained in reverberant fields.

The use of intensity methods as described in ISO 9614-1:1993, ISO 9614-2:1996, and ISO 9614-3:2002 is applicable under special conditions, which are described in specific parts of the IEC 60704-2 series.

This test code is concerned with airborne noise only. In some cases, structure-borne noise, for example transmitted to the adjoining room, can be of importance.

INTRODUCTION to IEC 60704-2-15:2024

The noise of food waste disposers has been measured up to now by making use of IEC/PAS 60704-2-15[1].

The measuring conditions specified in this document 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 food waste disposers.

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 food waste disposers.

NOTE As stated in the introduction to IEC 60704-1:2021, this test code is concerned with airborne noise only.

1 This publication has been withdrawn.

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

Part 2-15: Particular requirements for household food waste disposers

1 Scope

These particular requirements apply to single unit electric food waste disposers for household use, with or without automatic programme control, for cold water supply, for permanent connection to water supply and sewage systems, intended for connection to the kitchen sink drain and contained within a kitchen cabinet enclosure.

Food waste disposers for restaurants, hotels and industry purposes are excluded.

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

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60704-2 (all parts), *Household and similar electrical appliances – Test code for the determination of airborne acoustical noise*

IEC 60704-3:2019, *Household and similar electrical appliances – Test code for the determination of airborne acoustical noise – Part 3: Procedure for determining and verifying declared noise emission values*

IEC 61260-1:2014, *Electroacoustics – Octave-band and fractional-octave-band filters – Part 1: Specifications*

IEC 61672-1:2013, *Electroacoustics – Sound level meters – Part 1: Specifications*

ISO 3743-1:2010, *Acoustics – Determination of sound power levels of noise sources – Engineering methods for small, movable sources in reverberant fields – Part 1: Comparison method for hard-walled test rooms*

ISO 3743-2:2018, *Acoustics – Determination of sound power levels of noise sources using sound pressure – Engineering methods for small, movable sources in reverberant fields – Part 2: Methods for special reverberation test rooms*

ISO 3744:2010, *Acoustics – Determination of sound power levels of noise sources using sound pressure – Engineering method in an essentially free field over a reflecting plane*

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*

ISO 9614-3:2002, *Acoustics – Determination of sound power levels of noise sources using sound intensity – Part 3: Precision method for measurement by scanning*

ISO 6926:2016, *Acoustics – Requirements for the performance and calibration of reference sound sources used for the determination of sound power levels*

ISO 12001:1996, *Acoustics – Noise emitted by machinery and equipment – Rules for the drafting and presentation of a noise test code*

ANSI/ASME A112.19.3-2022, *Stainless Steel Plumbing Fixtures*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply. Terms and definitions pertinent to the determination of sound power levels can be found in ISO 3743-1:2010, ISO 3743-2:2018 and ISO 3744:2010.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
measurement time interval
portion or a multiple of an operational period or operational cycle for which the sound power levels are determined

3.2
operational period
interval of time during which a specified process is accomplished by the appliance under test (for example, washing or rinsing or drying for a dishwasher)

3.3
operational cycle
specific sequence of operational periods occurring while the appliance under test performs a complete work cycle

Note 1 to entry: During the operational cycle, each operational period is associated with a specific process that can occur only once, or can be repeated (for example, washing and rinsing and drying for a dishwasher).

3.4
time history
continuous recording of the sound pressure level (for a distinct microphone position) as a function of time, which is obtained during one or more operational periods of an operational cycle

3.5
reference box
hypothetical right parallelepiped terminating on the reflecting plane(s) on which the noise source under test is located, that just encloses the source including all the significant sound radiating components and any test table on which the source is mounted

[SOURCE: ISO 3744:2010, 3.10, modified – The note has been omitted.]

3.6
test enclosure
enclosure used for simulating the typical acoustic built-in or/and mounting conditions

3.101
batch feed operation
method of operation in which the operator loads the food waste into the container body

3.102
standard hard test load
rigid standard test load for noise measurements

4 Measurement methods and acoustical environments

4.1 General

This document is concerned with objective methods of engineering accuracy grade 2 in accordance with ISO 12001:1996 for determining sound power levels L_W, expressed in decibels (dB), with reference to a sound power of one picowatt (1 pW), of airborne acoustical noise within the specified frequency range of interest (generally including the octave-bands with centre frequencies from 125 Hz to 8 000 Hz), and for prescribed operating conditions of the appliance to be measured.

Methods for determining sound power levels with precision accuracy grade 1 in accordance with ISO 12001:1996, as specified for example in ISO 3741 and ISO 3745, are not included in this document. They may, however, be applied if the appropriate test environment and instrumentation are available.

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

NOTE 1 The noise values obtained under the described conditions of this document will not necessarily correspond to the noise experienced under the operational conditions of practical use.

NOTE 2 For quality control during production etc., simplified methods can be appropriate. For noise reduction purposes, other measurement methods employing, for example, narrow-band analysis or intensity techniques usually have to be applied. These methods are not covered by this document.

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. Within the accuracy range of this document, the sound power of a machine is basically 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 dB (re 1 pW).

According to this document, two principal methods exist, the direct method and the comparison method, as described in 4.2 and 4.3. These two methods can be used alternatively.

Different types of environments, as described in 4.4, may be used. A part of the IEC 60704-2 series may, if necessary, exclude one or several combinations among those available.

4.2 Direct method

The direct method can be used only for measurements in qualified test environments in accordance with ISO 3744:2010 for free field conditions over reflecting plane(s), and in accordance with ISO 3743-2:2018 for special reverberation test rooms.

With this method, the sound power level is determined

– in free field conditions over reflecting plane(s), from time-averaged sound pressure levels (on a mean-square basis) over the measurement surface and from the area of the measurement surface, S, or

– in reverberation and special reverberation test rooms, from averaged sound pressure levels, and from the reverberation time and the volume of the test room.

If for a measurement in a free field, reverberation or special reverberation room is not possible because the appliance cannot be placed or operated in such an environment, the intensity method in accordance with ISO 9614-1:1993, ISO 9614-2:1996, and ISO 9614-3:2002 shall be applied. For the intensity method, the standard deviations given in the parts of the IEC 60704-2 series and IEC 60704-3:2019 are not applicable unless stated explicitly.

These methods yield results expressed in A-weighted sound power levels (and in octave- or 1/3 octave-band sound power levels, if required) that are calculated directly from measured sound pressure levels.

NOTE This method can also be used in conjunction with more precise methods, such as those given in ISO 3741 and ISO 3745.

If pure tone components are present in the noise emitted, proper precautions shall be taken as specified in ISO 3743-2.

4.3 Comparison method

The comparison method for measurement is explicitly described in ISO 3743-1:2010 and in ISO 3743-2:2018.

NOTE The term "comparison method" is not explicitly given in ISO 3744:2010, but when applying the "absolute comparison test" for the determination of the environmental correction given in A.3 of ISO 3744:2010, by using a reference sound source, the procedure is, in fact, a comparison method.

With this method, the sound power level is determined by comparing the averaged values (on a mean-square basis) of the sound pressure levels produced by the source in the test room to the averaged values of the sound pressure levels produced in the same room by a calibrated reference sound source (RSS) of known sound power output, complying with the requirements of ISO 6926:2016. The difference in sound pressure levels is equal to the difference in sound power levels when conditions are the same for both sets of measurements.

This method yields results expressed in octave- or 1/3 octave-band sound power levels, and the A-weighted sound power level is calculated from the octave- or 1/3 octave-band sound power levels.

To check whether there is a systematic difference between results obtained in different environments, the use of the comparison method is recommended.

If pure tone components are present in the noise emitted, proper precautions shall be taken as specified in ISO 3743-1 and ISO 3743-2.

4.4 Acoustical environments

4.4.1 General requirements and criterion for adequacy of the test environment

They are given in the following clauses:

– Clause 4 of ISO 3743-1:2010 for hard-walled test rooms;

– Clause 5 of ISO 3743-2:2018 for special reverberation test rooms and

– Clause 4 of ISO 3744:2010 for free-field conditions over a reflecting plane.

A classification of different types of noise is given in ISO 12001:1996. The method specified in ISO 3744:2010 is suitable for measurements of all types of noise emitted by household

appliances. The methods specified in ISO 3743-1:2010 and ISO 3743-2:2018 are suitable for all types of noise, except for sources of impulsive noise consisting of short-duration noise bursts. This will be taken into account in the preparation of parts of the IEC 60704-2 series.

The method specified in ISO 3744 is applicable to noise sources of any size. When applying ISO 3743-1 and ISO 3743-2, it shall be ensured that the maximum size of the cabinet enclosing the food waste disposer under test fulfils the requirements specified in ISO 3743-1:2010, 4.2, and ISO 3743-2:2018, Clause 5.

NOTE For free-field conditions over a reflecting plane, the absolute comparison test for the qualification of the environment, described in Clause A.2 of ISO 3744:2010, is preferred.

Guidelines for the design of simple test rooms with free-field conditions are given in Annex C.

Guidelines for the design of a suitable special reverberation test room are given in ISO 3743-2:2018, Annex A.

4.4.2 Criterion for background noise level

Requirements for the background noise level are given in 4.5 of ISO 3743-1:2010, in 6.5 of ISO 3743-2:2018 and in 4.2 of ISO 3744:2010. Averaged over the microphone positions, the background noise level shall be at least 6 dB below, and preferably more than 15 dB below, the sound pressure level to be measured.

NOTE If the difference between the sound pressure levels of the background noise and the appliance noise is less than 6 dB, see 8.2.

4.4.3 Environmental conditions

Environmental conditions having an adverse effect on the microphone used for the measurements (for example, strong electric or magnetic fields, wind, impingement of air discharge from the equipment being tested, high or low temperatures) shall be avoided by proper selection or positioning of the microphone.

The instructions of the manufacturers of the measurement instruments regarding adverse environmental conditions shall be followed. The microphone shall always be oriented in such a way that the angle of incidence of the sound waves is that for which the microphone is calibrated.

4.5 Measurement uncertainties

4.5.1 General

The estimated values of the standard deviations of reproducibility of sound power levels determined in accordance with this document are given in 9.1 of ISO 3743-1:2010, in 11.1 of ISO 3743-2:2018 and in 9.1 of ISO 3744:2010. But for a particular family of appliances of similar size with similar operating conditions, the standard deviations of reproducibility can be smaller than these values. Hence, in the IEC 60704-2 series, standard deviations smaller than those listed in ISO standards can be stated if substantiation is available from the results of suitable interlaboratory tests.

In the case of discrepancies between the measurements where the results normally remain inside the foreseen standard deviation, it can be helpful to perform measurements according to the upper grade of accuracy: grade 1, laboratory or precision, as described in ISO 3741 or ISO 3745.

4.5.2 Standard deviations on repeatability and reproducibility and standard deviations related to declaration and verification

The estimated values of standard deviations of sound power levels determined in accordance with this document are currently not available.

For the purpose of determining and verifying declared noise emission values for food waste disposers in accordance with IEC 60704-3, the value σ_M is 2,5 dB.

5 Instrumentation

5.1 Instrumentation for measuring acoustical data

Requirements for the instrumentation system and for its calibration are given in Clause 5 of ISO 3743-1:2010, in Clause 7 of ISO 3743-2:2018 and in Clause 5 of ISO 3744:2010.

The instrumentation system shall meet the requirements for a type 1 instrument laid down in IEC 61672-1:2013, in accordance with the basic standard used. For measurements in octave- and 1/3 octave-bands, the instrumentation system shall meet the requirements of IEC 61260-1:2014.

RSS shall meet the requirements of ISO 6926:2016, and shall be calibrated annually.

5.2 Instrumentation for measuring climatic conditions

5.2.1 The temperature is determined with instruments having an accuracy of ±1 °C.

5.2.2 The relative humidity is determined with instruments having an absolute accuracy of ±2 % within the measuring range.

5.2.3 The absolute air pressure is determined with instruments having an accuracy of ±0,5 kPa.

5.3 Instrumentation for measuring operating conditions

5.3.1 The voltage at the plug of the cable or cord of mains-powered appliances is measured with voltmeters having an accuracy of class 0,5 instruments.

5.3.2 The voltage at the battery terminals of battery-powered appliances is measured with voltmeters having an accuracy of class 0,5 instruments.

5.3.3 The rotational speed of motors, attachments, etc. is measured, if necessary, with speed indicators having an accuracy of ±1 % of full scale.

6 Operation and location of appliances under test

6.1 Equipping and pre-conditioning of appliances

6.1.1 The appliance is equipped with attachments, accessories, etc. as delivered by the manufacturer for the intended use or function.

6.1.2 Care shall be taken to ensure that any auxiliary equipment (such as electrical conduits or cables, piping for water supply or drainage, air ducts, etc.) necessary for the operation of the appliance, does not radiate a significant amount of sound into the test environment or change the sound output of the appliance. Guidelines are given in 6.2 of ISO 3743-1:2010, in 8.4 of ISO 3743-2:2018 and in 6.2 ISO 3744:2010.

6.1.3 Prior to commencing measurements, the inside of the grind chamber shall be clean and free of any debris from prior operation. The food waste disposer shall be run through 10 complete operational cycles, of a 30 s duration, with a **standard hard test load** (3.102).

6.1.4 Not applicable.

6.2 Supply of electric energy and of water or gas

6.2.1 The supply voltage is measured at the plug of a non-detachable cable or cord, at the appliance inlet if a detachable cord is provided or no cable is provided, but in no case at the entrance of extensions cables or cords.

6.2.2 Not applicable.

6.2.3 Not applicable.

6.2.4 The temperature of the supply water shall be between 4 °C and 27 °C.

The flow rate of the water supply shall be 6 l/min ± 0,3 l/min. The water faucet shall be positioned in such a way that the water flows down the side of the sink into the drain, creating negligible water splash noise.

6.3 Climatic conditions

In general, household appliances (unless otherwise specified for a special family) are operated under the following climatic conditions:

ambient temperature	18 °C to 28 °C
relative humidity	25 % to 70 %
atmospheric pressure	86 kPa to 106 kPa

6.4 Loading and operating of appliances during tests

6.4.1 General requirements are given in 6.5 of ISO 3743-1:2010, in 8.5 of ISO 3743-2:2018 and in 6.6 of ISO 3744:2010. For the purpose of establishing a noise test code, the following guidelines are given, unless otherwise specified in the relevant part of the IEC 60704-2 series.

In general, the loading and operating conditions should, as far as practicable, simulate normal use but, in every case, preference has to be given to simple conditions providing satisfactory repeatability and reproducibility.

The presence of an operator should be avoided. An operator shall be present only if the application of the load is not practicable without an operator. This operator shall not wear abnormally sound absorptive clothing that might influence the sound measurements.

6.4.2 In **batch feed operation** the food waste is loaded in the container body (see Figure 101) prior to starting the water flow and then the operational cycle of the disposer.

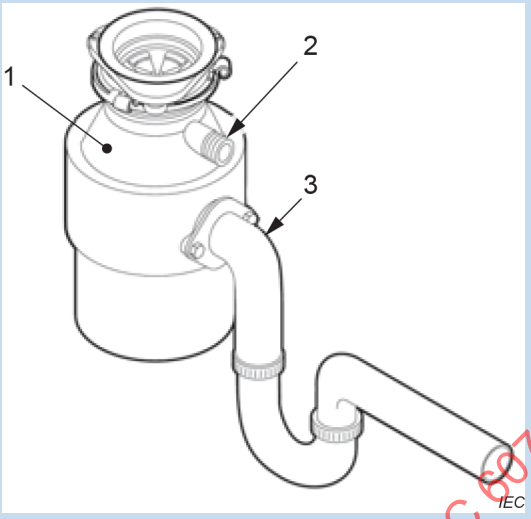
The **standard hard test load** consists of fifteen (15) 12,7 mm (0,5 in) diameter nylon 6/6 solid balls. This grind media shall be conditioned by soaking in water for seven days prior to use.

The test load shall be at room temperature when the test programme starts.

The appliance under test shall be at room temperature when the test programme starts.

The appliance shall be operated according to 3.101 using the test load as described in 3.102. If an operator has to be present to place the test load in the grind chamber and to start and stop the operational cycle of the disposer, the operator's position shall be chosen to minimize the influence upon the acoustic measurement and shall be consistent for all tests. A switch may be used to start and stop the operational cycle and minimize the influence of the operator on the measurements.

Upon completion of the measurements, the remaining material in the grind chamber is to be removed and the disposer flushed with water to ensure no material remains. An auditory check shall be made of the unit running without any water or load to ensure that no material remains in the grind chamber. Ensure that no test load remains on the top lip of the grind chamber.



Key:

1 container body (grind chamber)

2 dishwasher inlet

3 discharge (to the sewer lines)

Figure 101 – Food waste disposer

6.4.3 Appliances operated during normal use in operational cycles are operated likewise for determining noise emission, taking measurements during appropriate parts of the operational cycles of the main functions.

It is recommended to record the A-weighted sound pressure level during the operational cycle(s) – time history – at one of the microphone positions, preferably in front of the appliance to be tested.

6.4.4 When applying loading and operating conditions for determining noise emission, care shall be taken to avoid possible overheating of the appliance under test. Rated operating and resting times and/or the manufacturer's instructions shall be followed.

6.5 Location and mounting of appliances

6.5.1 The basic requirements in 6.3 and 6.4 of ISO 3743-1:2010, in 8.2 and 8.3 of ISO 3743-2:2018 and in 6.3 and 6.4 of ISO 3744:2010 shall be followed. The following guidelines are given, unless otherwise specified in the relevant part of the IEC 60704-2 series.

6.5.2 Not applicable.

6.5.3 Not applicable.

6.5.4 For measurements on floor-standing appliances intended for placing against a wall (including cabinets, counters, or **test enclosure**s for building in or under counter types), a vertical reflecting plane shall be available.

When the measurements are made in a hard-walled test room or in a special reverberation test room, a part of a wall of the room will serve for this purpose. The minimum area of this part of the wall should be determined by the projection of the appliance, extended by at least 0,5 m upwards and to both sides. The minimum distance between any surface of the appliance (cabinet, counter, or **test enclosure**) and the nearest corner of the room shall be 1 m.

When measurements are made in a free-field environment, a vertical reflecting plane (supported by the horizontal reflecting plane) shall be provided. The minimum size of this vertical plane shall be at least equal to the size of the projection of the measurement surface.

For both types of test environments, the requirements given below shall be followed:

- the acoustic absorption coefficient of the vertical reflecting plane shall be less than 0,06;
- the appliance shall be placed in the test environment without any resilient means other than those incorporated in the appliance;
- care should be taken to avoid any direct contact between the appliance (including protruding parts, worktops, spacers, etc.) and the vertical reflecting plane;
- the distance between the vertical reflecting plane and the appliance shall be established by placing the appliance in direct contact with the vertical reflecting plane and then moving it away a distance of 10 cm ± 1 cm.

6.5.5 Not applicable.

6.5.6 The food waste disposer manufacturer's instructions regarding installation and use of the disposer shall be followed.

The test cabinet shall be constructed as shown in Figure 102. Details of a recommended design are shown in Annex B, Figure B.1, Figure B.2 and Figure B.3.

A standard 19 mm thick particle board countertop shall be rigidly mounted to the top of the cabinet. A 838 mm × 540 mm × 167 mm (33 in × 21,25 in × 6,57 in), 20 gauge, double bowl stainless steel sink conforming to ANSI/ASME A112. 19.3-2022 shall be installed in the countertop as specified by the sink manufacturer's instructions. The bowl dimensions shall be 356 mm × 400 mm × 167 mm (14 in × 15,75 in × 6,57 in). The drain holes shall be centred within each bowl. The (0,5 in) copper tubing shall be deck mounted using the mounting holes provided in the sink and installed as specified by the detail drawing of recommended design in accordance with Annex B. Any damping pads on the underside of the sink bowls shall be removed.

NOTE Different pad type material or amounts will cause varying damping. Removing them leads to consistent results.

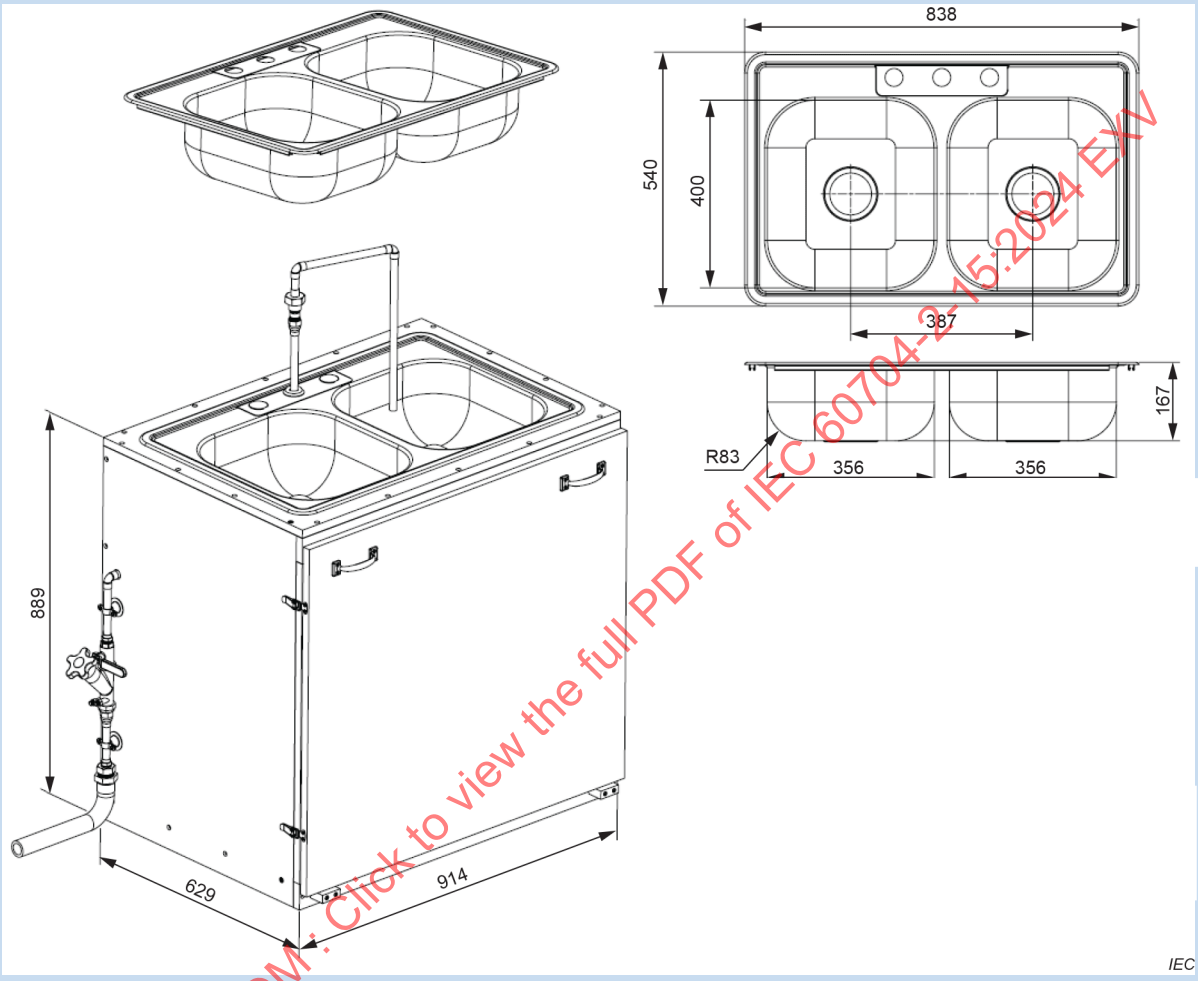
The sink shall be installed in the cabinet in accordance with the instructions of the sink manufacturer.

The food waste disposer shall be mounted in one bowl of the sink. Each sink bowl shall have an individual P-trap, connecting to a Y-fitting. The sewer or drain line shall be connected to the Y-fitting.

Cut-outs required for the services shall be at a minimum size and shut by sealing means to prevent noise leakage. Supply lines shall be properly isolated to prevent transmission of structure-borne noise.

The **test enclosure** with appliance is to be placed as specified in 6.5.4.

Dimensions in millimetres



Double bowl drop in sink, with centre drain placement, stainless steel 838 mm x 540 mm x 167 mm, 0,8 mm thick

The front panel shall be removable to access disposer plumbing.

NOTE Material: 19 mm thick untreated particle-board (chipboard) or untreated plywood, having a density between 600 kg/m^3 and 750 kg/m^3.

Figure 102 – Test enclosure – Mandatory characteristics drawing

7 Measurement of sound pressure levels

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

7.1.1 The requirements in 7.1 to 7.2 of ISO 3744:2010 shall be followed. Guidance for the selection of the measurement surface and microphone array in the relevant part of IEC 60704-2 series is given below; care shall be taken to use only one of the following two

shapes and one of the possible microphone arrays for a particular family of appliances, unless otherwise specified in the relevant part of the IEC 60704-2 series.

7.1.2 Not applicable.

7.1.3 For floor-standing or counter-type appliances for placing against a wall, including built-in appliances, the measurement surface is a parallelepiped, with six microphone positions, as specified in 7.2.4 of ISO 3744:2010 and in Figure 2 of this document. Additional measurement positions can be required in accordance with 8.1.2 of ISO 3744:2010 and Annex C of ISO 3744:2010. The number of microphones can also be reduced in accordance with 8.1.2 of ISO 3744:2010 and Annex C of ISO 3744:2010.

The preferred value of the measurement distance d is 1 m.

For determining time histories, frequency spectra, etc. of the appliance, microphone position no. 1 is recommended for the six-microphone array.

This measurement surface can also be used for wall-mounted appliances.

NOTE 1 The front of the appliance is directed in the direction of the x-axis.

NOTE 2 In this case, 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 being directed in the direction of the z-axis.

Coordinates of microphone positions:

No.	x	y	z
1	$2 \cdot a$	0	$0{,}5 \cdot c$
2	a	b	$0{,}5 \cdot c$
3	a	$-b$	$0{,}5 \cdot c$
4	$2 \cdot a$	b	c
5	$2 \cdot a$	$-b$	c
6	a	0	c

Measurement surface area:

$S = 2\,(2 \cdot a \cdot c + 2 \cdot a \cdot b + b \cdot c)$

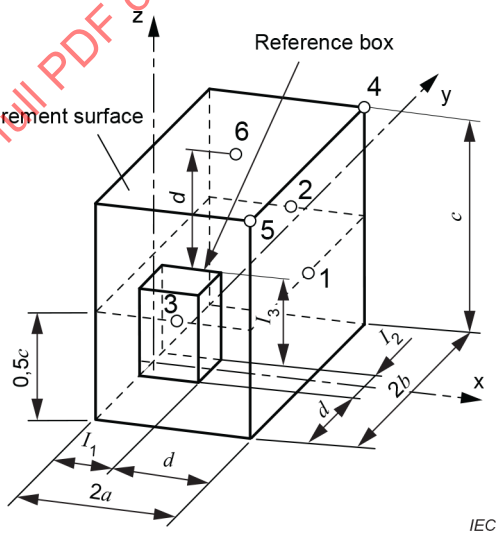
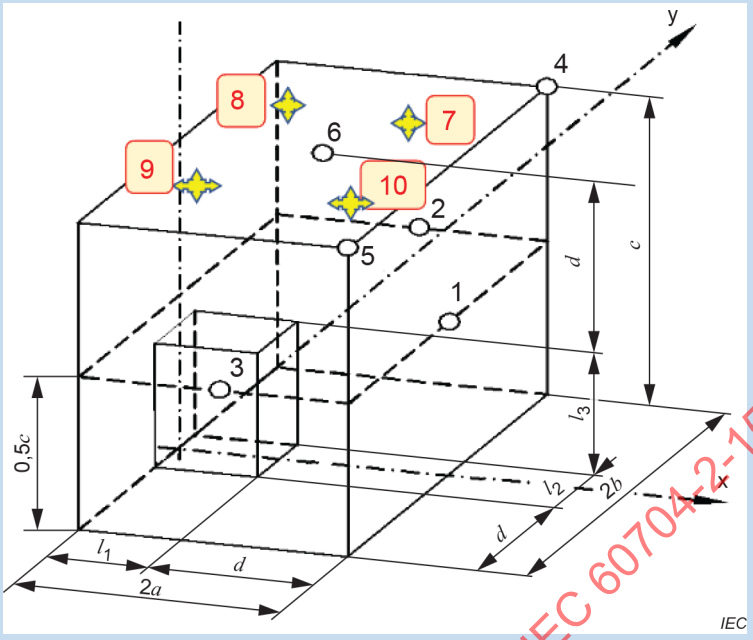


Figure 2 – Measurement surface – parallelepiped – with key microphone positions, for floor standing appliances placed against a wall

All food waste disposers exhibit a dominant noise transfer path from the open grind chamber and baffle to the top surfaces of the sink and cabinet. The need for any additional microphone positions in this test is driven by ISO 3744:2010, 8.1.2, to better evaluate conditions of localized noise sources where assigning too large an area to an individual key microphone position will not accurately represent the unit under test.

The additional microphones may be added at the four quadrant centres of the surface plane requiring improved spatial coverage according to ISO 3744:2010, Figure C.3.

The microphone array of six key microphones (#1 to #6) plus four optional microphones (#7 to #10) on the top measurement plane is shown in Figure 103:



Key:

1 to 6 microphone positions according to IEC 60704-1:2021, 7.1.3

7 to 10 additional microphone positions with following coordinates:

No.	x	y	z
7	1,5·a	0,5·b	c
8	0,5·a	0,5·b	c
9	0,5·a	-0,5·b	c
10	1,5·a	-0,5·b	c

Figure 103 – Six-microphone geometric setup with four optional microphones on the top measurement plane

7.1.4 Not applicable.

7.1.5 Not applicable.

7.1.6 Not applicable.

7.1.7 Not applicable.

7.1.8 If the appliance under test emits steady noise, it is permissible to measure the surface sound pressure level by traversing a microphone along measurement paths, instead of at individual microphone positions, as described in 7.4.3 of this document and in Annex B and Annex C of ISO 3744:2010.

7.1.9 Guidelines for the location of the RSS are given in Annex A of ISO 3744:2010.

7.2 Microphone array and RSS location in hard-walled test rooms

The requirements in Clause 7 of ISO 3743-1:2010 shall be followed.

In general, at least three microphone positions should be used.

According to 7.2 of ISO 3743-1:2010, the hard-walled test room is more suitable for sources not designed to be placed on the floor against a wall or to be wall-mounted. Should the source under test be closer than 1 m to the wall, the RSS shall not be placed at the position of the source, but at a position on the floor 1 m from the wall.

7.3 Microphone array and RSS location in special reverberation test rooms

The requirements in Clause 9 of ISO 3743-2:2018 shall be followed.

In general, the number of microphone positions N_m = 6 and the number of source locations N_s = 1.

A change of these numbers depends on the results of a preliminary measurement in accordance with 9.4 of ISO 3743-2:2018.

When, according to these preliminary investigations, the standard deviation s_M is above 4,0 dB, in order to reduce the effort of measuring in a special reverberation test room, the use of a moving microphone instead of 12 individual microphone positions is recommended; alternatively, measurements under free field conditions can be preferable.

NOTE The use of a moving microphone traversing a path, in accordance with 9.6 of ISO 3743-2:2018, is often more convenient than the use of a number of fixed microphones.

In general, the RSS used for the comparison method is measured with the same microphone array and with the same number of source locations as used for the appliance under test. The RSS is located on the floor so that the projection of the centre of its reference box coincides with the projection of the centre of the reference box of the appliance under test.

7.4 Measurements

7.4.1 For measurements in free-field conditions over a reflecting plane, the requirements in 4.1, Clause 5 and 8.2.1 of ISO 3744:2010 shall be followed; for measurements in hard-walled test rooms, the requirements in Clause 7 of ISO 3743-1:2010 shall be followed; for measurements in special reverberation test rooms, the requirements in Clause 9 of ISO 3743-2:2018 shall be followed.

The time-average sound pressure level has to be observed at each microphone position over a typical period of operation of the appliance. For noise that varies with time, the period of observation shall be specified carefully.

In the case of a moving microphone, the integration time should include at least one full traverse for measurements in accordance with ISO 3743-1:2010 or ISO 3743-2:2018, and at least two full traverses for measurements in accordance with ISO 3744:2010.

NOTE The measurement time interval can be chosen to be representative of the period of maximum noise level.

A 20 s measurement shall be taken that encompasses the start of the operational cycle.

The operational cycle begins with the start of the cycle by the operator and ends either when the operator turns off the disposer for manual operation or the disposer is turned off by a controller for automatic operation.

Three trials shall be conducted.

To obtain the final result, the logarithmic mean value is calculated. If, however, the difference between any two of the results exceeds 3 dB, three additional measurements shall be carried out, and the final result will be the logarithmic mean value of the six measurements. At least 5 min with cold water running through the disposer shall be allowed between trials to allow the food waste disposer to return to ambient conditions.

7.4.2 The following data shall be measured and considered when using the comparison method in hard-walled test rooms, or in special reverberation test rooms:

– time-averaged octave- or 1/3 octave-band sound pressure levels at each microphone position (or each traverse) during operation of the appliance under test;

– time-averaged octave- or 1/3 octave-band sound pressure levels at each microphone position (or each traverse) when the RSS is operating;

– time-averaged octave- or 1/3 octave-band sound pressure levels produced by the background noise.

7.4.3 The following data shall be measured and considered for measurements in free field conditions over a reflecting plane, or when using the direct method in special reverberation test rooms:

– A-weighted or octave- or 1/3 octave-band time-averaged sound pressure levels during operation of the appliance under test;

– A-weighted or octave- or 1/3 octave-band time-averaged sound pressure levels produced by the background noise.

7.4.4 Not applicable.

8 Calculation of sound pressure and sound power levels

8.1 General

For measurements in hard-walled test rooms, the requirements in Clause 8 of ISO 3743-1:2010 shall be followed. For measurements in special reverberation test rooms, the requirements in Clause 10 of ISO 3743-2:2018 shall be followed. For measurements in free-field conditions over a reflecting plane, the requirements in 8.2 of ISO 3744:2010 shall be followed.

8.2 Corrections for background noise levels

If the background noise levels, L_{p}'', are more than 6 dB below the measured sound pressure levels, L_{p}', the values of L_{p}' shall be corrected to take into account the influence of background noise. The corrected value, L_{p} is given by

$$L_p = 10 \cdot lg\left(10^{0,1 \cdot L_p'} - 10^{0,1 \cdot L_p''}\right) \text{ dB (re 20 µPa)} \quad (2)$$

For measurements in hard-walled test rooms or in special reverberation test rooms, this formula applies to the sound pressure levels measured at each microphone position, before calculating the sound pressure level averaged over the microphone positions.

For measurements in free-field conditions over a reflecting plane, Formula (2) applies to the sound pressure level averaged over the microphone positions (see 8.4).

When the background noise levels are more than 15 dB below the sound pressure levels with the source operating, no correction is made.

Even if the measurement is invalid for one or more frequency bands, it can still be valid for the A-weighted value, provided that the difference between $L_{p\mathrm{A}}'$ and $L_{p\mathrm{A}}''$ is greater than 6 dB.

If it can be demonstrated that the absolute criteria for background noise is fulfilled and the background noise levels in the test room at the time of the measurements are less than or equal to those given in 4.2.2 of ISO 3744:2010 for all bands within the frequency range of

interest, the measurements can be taken as having met the background noise requirements of this document, even if the 6 dB requirement is not met for all bands. It can be assumed that the source emits little or no measurable noise in these frequency bands, and that the data reported represent an upper bound to the sound power level in these bands.

If the 6 dB criterion is not satisfied and the absolute criteria for background noise is not fulfilled, the accuracy of the result(s) is reduced. No correction for those levels is allowed if the measurements are made in hard-walled rooms or in special reverberation test rooms, and for measurements made in free field over a reflecting plane, a maximum correction of 1,3 dB can be subtracted from the measured values. The results may, however, be reported and may be useful in determining an upper bound to the sound power level of the appliance under test. If such data are reported, it shall be clearly stated in the text of the report, as well as in the graphs and tables of results, that the background noise requirements of this document have not been fulfilled.

8.3 Corrections for the test environment

For measurements in free-field conditions over a reflecting plane, the environmental correction K_2 (see 8.2.4 and Annex A of ISO 3744:2010) is applied to the sound pressure level averaged over the measurement surface, calculated according to the equation given in 8.2.4 of ISO 3744:2010.

The environmental correction is assumed to be zero for measurements made in hemi-anechoic rooms which meet the requirements of ISO 3745.

8.4 Calculation of sound pressure level averaged over the microphone positions

For the A-weighted sound pressure level or the level in each band of interest, an averaged sound pressure level over the microphone positions is calculated from the measured sound pressure levels, using the following equation:

$$L_{p\mathrm{m}} = 10 \cdot \lg\left(\frac{1}{N}\sum_{i=1}^{N} 10^{0,1 \cdot L_{p,i}}\right) \text{ dB} \quad \text{(re 20 µPa)}$$

where

$L_{p\mathrm{m}}$ is the sound pressure level averaged over the microphone positions or over the measurement surface, in dB, re 20 µPa;

$L_{p,i}$ is the sound pressure level resulting from the i-th microphone position, in dB, re 20 µPa;

N is the number of microphone positions (multiplied if necessary in reverberant field conditions by the number of source locations).

The total average sound pressure level is subject to the calculation in ISO 3744:2010, 8.2.2.2, Equation (14), which averages each microphone position with a weighting function proportional to each microphone's represented area portion of the total measurement surface. In this case, microphones 1 to 5 each represent 1/6th of the total surface area, and microphones 6 to 10 each represent 1/30th of the total surface area (that being an evenly split 1/5th each of the 1/6th area assigned to the key microphone alone).

8.5 Calculation of sound power levels with the comparison method

For measurements in hard-walled test rooms or in special reverberation test rooms, the sound power level of the appliance under test, L_W, is calculated in each octave- or 1/3 octave-band within the frequency range of interest, using the equation

$$L_W = L_{W(\mathrm{RSS})} + (\overline{L_{p(\mathrm{AT})}} - \overline{L_{p(\mathrm{RSS})}})$$

where

$L_{W(\mathrm{RSS})}$ is the calibrated sound power level of the RSS, in dB (re 1 pW);

$\overline{L_{p(\mathrm{RSS})}}$ is the sound pressure level of the RSS averaged (energy basis) over the microphone positions or the microphone path, in dB (re 20 µPa);

$\overline{L_{p(\mathrm{AT})}}$ is the sound pressure level of the appliance under test averaged (energy basis) over the microphone positions or the microphone path, in dB (re 20 µPa).

Then, the A-weighted sound power level is calculated from the equation

$$L_{W\mathrm{A}} = 10 \cdot \lg\left(\sum_j 10^{0{,}1\cdot(L_{W,j}+A_j)}\right) \text{ dB (re 1 pW)}$$

where

$L_{W,j}$ is the octave-band level, in band j, in dB (re 1 pW);

A_j is the A-weighted value of the midband frequency of octave- or 1/3 octave-band j, as given in Table B.1 of ISO 3743-1:2010.

8.6 Calculation of sound power levels in free field conditions over a reflecting plane

The sound power level of the appliance under test L_W is calculated from the value of the surface sound pressure level determined in accordance with 8.4, corrected from K_1 and K_2 (see 8.2 and 8.3) and from the area of the measurement surface, S, as follows:

$$L_W = L_{p\mathrm{mc}} + 10 \cdot \lg\left(\frac{S}{S_0}\right) \text{ dB}$$

where

$L_{p\mathrm{mc}}$ is the A-weighted or frequency band surface sound pressure level in accordance with 8.4, corrected from background noise and from environmental correction K_2, in dB (re 20 µPa);

S is the area of the measurement surface in m^2;

S_0 is 1 m^2.

8.7 Calculation of A-weighted sound power level with the direct method in special reverberation test rooms

The A-weighted sound power level of the appliance under test $L_{W\mathrm{A}}$ is calculated from the value of the mean sound pressure level over the microphone positions determined in accordance with 8.4 and the properties of the reverberation test room, as follows:

$$L_{W\mathrm{A}} = L_{p\mathrm{mA}} - \left(10 \cdot \lg\left(\frac{T_\mathrm{N}}{T_0}\right) + 10 \cdot \lg\left(\frac{V}{V_0}\right) - 13\right) \text{ dB}$$

where

$L_{p\mathrm{mA}}$ is the A-weighted sound pressure level averaged in dB over the microphone positions in accordance with 8.4 in dB (re 20 µPa);

T_N is the nominal reverberation time of the test room in seconds;

T_0 is 1 s;

V is the volume of the test room in cubic metres;

V_0 is 1 m^3.

9 Information to be recorded

9.1 General data

9.1.1 Name and address of the laboratory where measurements are carried out.

9.1.2 File number and date(s) of measurements.

9.1.3 Name and address of the company, organisation, or person, who ordered the measurements.

9.1.4 Purpose of the measurements.

9.1.5 Statement of compliance with this document and the appropriate part of the IEC 60704-2 series.

9.2 Description of appliance under test

9.2.1 Category: for example, vacuum cleaner, washing machine, etc.

9.2.2 Design characteristics: for example, hand-held, table-type, floor-standing.

9.2.3 Manufacturer or dealer, trademark.

9.2.4 Model or type designation (name of product).

9.2.5 Serial number or production date.

9.2.6 Rating data (name plate data): for example, voltage, input capacity, water supply pressure, etc.

9.2.7 Power source and motor data: for example, mains-powered, battery-powered, induction motor, commutator motor, motor speed, etc.

9.2.8 Supplied and/or advertised attachments and/or accessories.

9.3 Measurement method

9.3.1 Direct method and/or comparison method.

9.3.2 Basic ISO standards used.

9.4 Acoustical test environment

9.4.1 Hard-walled test room and/or special reverberation test room and/or free field over reflecting plane.

9.4.2 Test room characteristics: for example, hemi-anechoic laboratory room, outdoor area, ordinary room with or without acoustical treatment, special reverberation test room, hard-walled test room.

9.4.3 Room inner (free) dimensions, volume.

9.4.4 Acoustical treatment of surfaces.

9.4.5 Room qualification, method and data.

9.5 Instrumentation

9.5.1 Instrumentation for measuring acoustical data: name, type, serial number, accuracy, manufacturer of equipment and auxiliaries, date of latest calibration.

9.5.2 Reference sound source with calibration data, manufacturer.

NOTE Calibration date can be according ISO 6926:2016.

9.5.3 Instrumentation for measuring climatic conditions: name, type, serial number, accuracy, manufacturer (if known).

9.5.4 Instrumentation for measuring operating conditions: name, type, serial number, accuracy, manufacturer (if known).

9.6 Equipment and pre-conditioning of appliance under test

9.6.1 Equipment, attachments, accessories selected for measurements.

9.6.2 Not applicable.

9.6.3 Not applicable.

9.7 Electric supply, water supply, etc.

9.7.1 Mains supply voltage with tolerances, AC, DC, frequency.

9.7.2 Not applicable.

9.7.3 Water flow rate with tolerance.

9.7.4 Not applicable.

9.8 Climatic conditions

9.8.1 Temperature.

9.8.2 Relative humidity.

9.8.3 Atmospheric pressure.

9.9 Operation of the appliance under test

9.9.1 Idling and/or loading conditions; description of the applied load(s).

9.9.2 Selected operation procedure(s): for example, period(s), cycle(s), speed of motor(s), position of controls, etc.

9.9.3 Description of period(s) or cycle(s) used for measurements.

9.10 Location and mounting of the appliance under test

9.10.1 Description of the location of the appliance under test and of the RSS in the test environment: for example, distances from floor and wall(s) (if necessary by making a sketch).

9.10.2 Description of the mounting of the appliance under test: for example, fixtures, built-in cabinets, resilient support(s), floor covering(s), etc.

9.11 Microphone array

9.11.1 Description of the array: for example, number of microphone positions, co-ordinates, measurement distance, radius of the hemisphere, area of the measurement surface, etc.

9.11.2 Description of the location of the microphone array in the test environment: for example, distances from the environment boundaries, etc.

9.11.3 Microphone angle of incidence and orientation with respect to the source.

9.11.4 Fixed microphone(s) or moving microphone, transfer of a single microphone or scanning of the output from all microphones of the array, scanning procedure.

9.11.5 Attachments for microphones: for example, wind shielding accessories with correction data, etc.

9.12 Measurement data

9.12.1 Measured octave- or 1/3 octave-bands and/or A-weighted sound pressure levels for each microphone position and for each of the selected load and operation conditions of the appliance under test, and the periods or cycles used for measurements.

9.12.2 Measured octave- or 1/3 octave-bands sound pressure levels for each microphone position of the RSS.

9.12.3 Measured octave- or 1/3 octave-bands and/or A-weighted sound pressure levels of the background noise before and after each series of measurements.

9.12.4 Applied corrections to the measured values for the appliance under test and for the reference sound source (influence of the background noise and microphone attachments, environmental correction).

9.12.5 Determined time histories (preferably A-weighted sound pressure levels versus time) for selected loads and operation conditions and the periods or cycles used for measurements.

9.12.6 Determined frequency spectra.

9.12.7 Remarks on subjective impression of noise.

9.13 Calculated sound pressure and sound power levels

See Clause 8.

9.14 Reporting

Only those data, recorded in accordance with this clause, which are of importance for the purpose of the measurements, shall be reported. In general, the data of Clause 10 is important.

10 Information to be reported

		Subclause
10.1	**General data**	9.1
10.2	**Appliance under test**	9.2
10.2.1	Category	9.2.1
10.2.2	Design characteristics	9.2.2
10.2.3	Manufacturer, dealer, trademark	9.2.3
10.2.4	Model or type, designation	9.2.4
10.2.5	Serial number, production date	9.2.5
10.2.6	Rating data	9.2.6
10.2.7	Power source	9.2.7
10.2.8	Attachments, accessories	9.2.8

10.3 Test conditions for the appliance

		Subclause
10.3.1	Selected attachments, accessories	9.6.1
10.3.2	Supply from mains	9.7.1
10.3.3	Not applicable.	
10.3.4	Water supply	9.7.3
10.3.5	Not applicable.	
10.3.6	Temperature	9.8.1
10.3.7	Relative humidity	9.8.2
10.3.8	Atmospheric pressure	9.8.3
10.3.9	Applied load	9.9.1
10.3.10	Operation procedure	9.9.2
10.3.11	Periods, cycles	9.9.3
10.3.12	Location in the test room	9.10.1
10.3.13	Mounting	9.10.2

10.4 Acoustical data

		Subclause
10.4.1	Direct and/or comparison method	9.3.1
10.4.2	Basic ISO standard(s) used	9.3.2
10.4.3	Reference sound source (RSS)	9.5.2
10.4.4	Test environment	9.4.1
10.4.5	Microphone array	9.11.1
10.4.6	Scanning procedure	9.11.4
10.4.7	Measured sound pressure levels of the appliance	9.12.1
10.4.8	Measured sound pressure levels of the RSS	9.12.2
10.4.9	Applied corrections	9.12.4
10.4.10	Time history of operation procedure	9.12.5
10.4.11	Frequency spectra	9.12.6
10.4.12	Calculated sound power levels	9.13

Annex A
(normative)

Standard test table

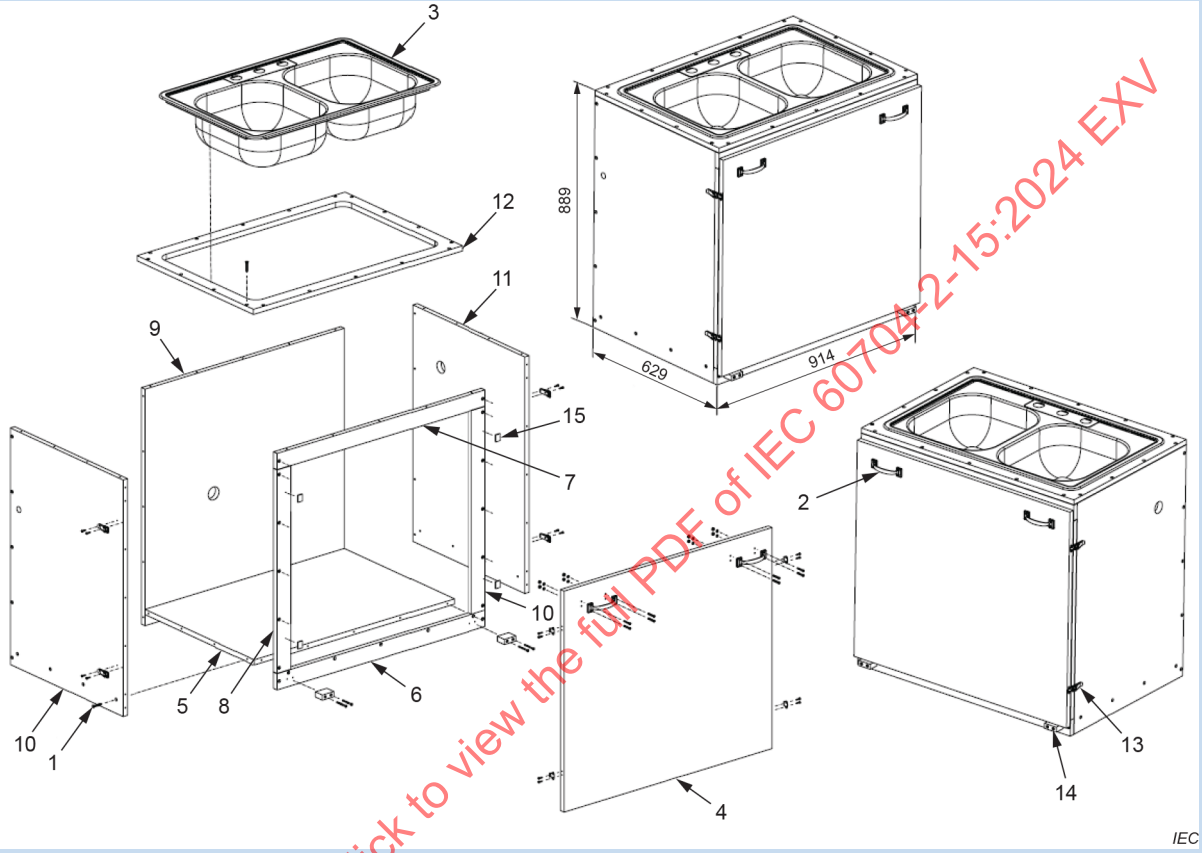
This Annex of IEC 60704-1:2021 is not applicable.

Annex B
(normative)

Test enclosure

This annex of IEC 60704-1:2021 is replaced by the following.

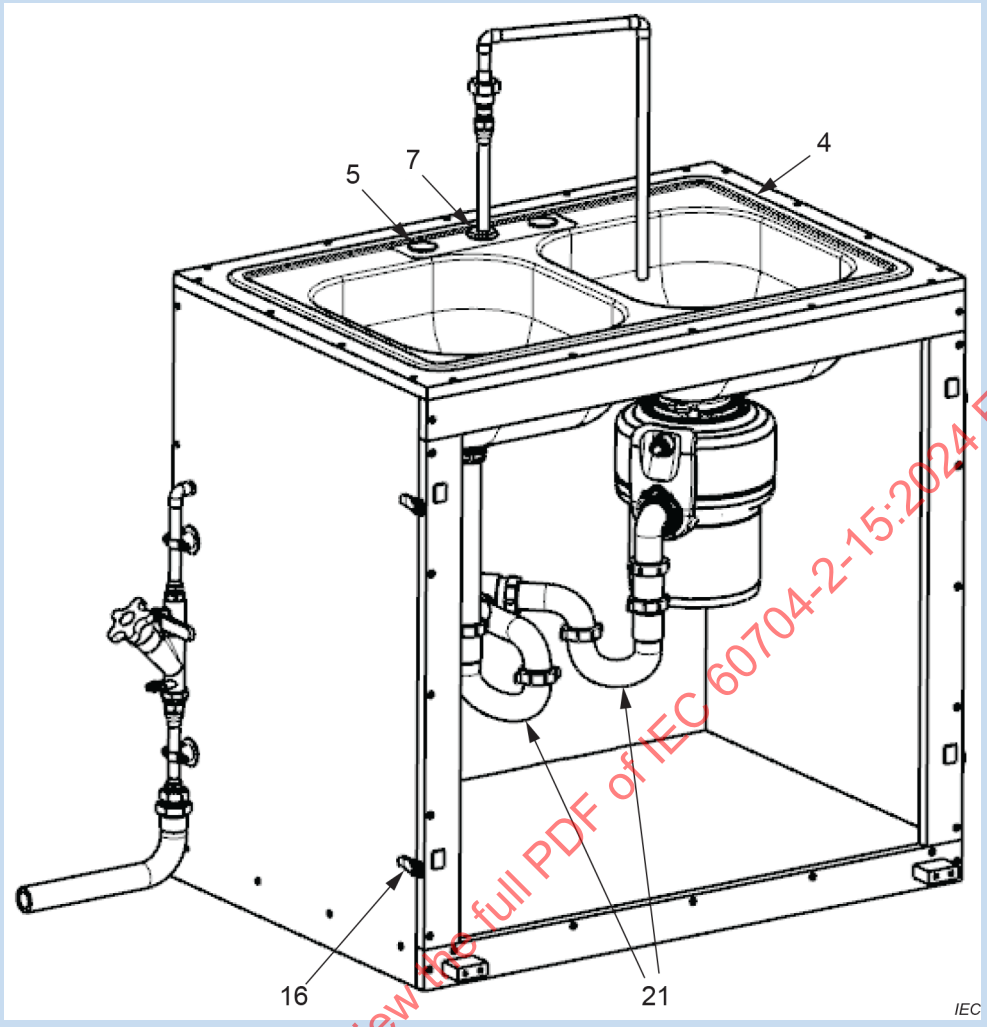
Dimensions in millimetres



Key:

1 stainless steel screws
2 stainless steel pull handle
3 sink, double basin stainless steel
4 front panel
5 bottom
6 front strip bottom
7 front strip top
8 front side strip
9 back
10 left side
11 right side
12 countertop
13 latch
14 51 mm x 38 mm x 19 mm support pad
15 25 mm x 19 mm x 3 mm shim

Figure B.1 – Detail drawing of recommended design

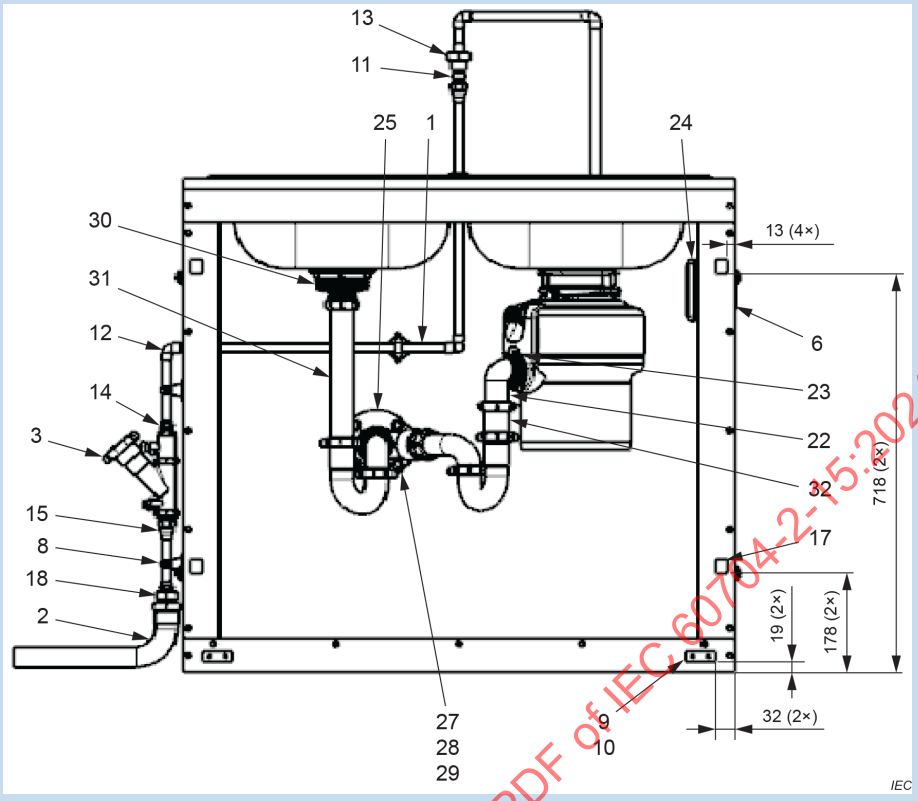


Key:

See key of Figure B.3

Figure B.2 – ISO view without front panel and with hardware

Dimensions in millimetres



Key:
1 1/2" copper tube
2 1" supply hose
3 1/2"-14 NPT fixed orifice double regulating valve w/isolation ball valve
4 sink, double basin stainless steel
5 1-1/2" sink hole cover
6 flanged inlet 15 A
7 grommet
8 1/2" copper bell pipe hanger
9 51 mm x 38 mm x 19 mm support pad
10 #8 x 2" LG stainless steel flat wood screw
11 1/2" NPT x 2" LG pipe nipple
12 1/2" copper pressure 90-degree cup x cup elbow fitting
13 socket connect adapter, 1/2" NPT female x 1/2" copper tube
14 1/2" copper pressure CUP x 1/2" MIP male adapter fitting
15 1/2" copper pressure cup x 1/2" FIP female adapter fitting
16 latch
17 25 mm x 19 mm x 3 mm shim
18 1" male NPT x 1/2" female NPT low pressure brass threaded pipe fitting
19 8-32 x 1-1/4 LG stainless steel oval screws, nuts & washers (not shown)
20 stainless steel pull handle (not shown)
21 1-1/2" sink P trap
22 tailpipe, plastic
23 clamp, spring
24 power box
25 1-1/2" socket flange
26 1-1/2" hub x slip joint trap adapter (not shown)
27 5/16"-18 x 2-1/4" hex bolt
28 5/16" zinc plated washer
29 5/16"-18 hex lock nut
30 sink basket assembly
31 tailpipe, plastic
32 tailpipe, plastic

All dimensions of the sink given in the drawing have a tolerance of ±10 %.
All dimensions of the cabinet given in the drawing have a tolerance of ±5 %

Figure B.3 – Front view without front panel and with hardware, sink disposer and mounting assembly

Annex C
(informative)

Guidelines for the design of simple test rooms with essentially free field conditions

The inner volume and the dimensions of the test room with essentially free field conditions depend on the size and the shape of the measurement surface used in the test. The measurement surface shall be at least 0,9 m distant from the absorptive surfaces of the test room

The floor of the test room shall be a hard, smooth, plane where the average sound absorption coefficient shall not exceed 0,06 over the 1/3 octave-band centre frequency range 100 Hz to 10 000 Hz. Usually, floors of painted poured concrete, or floors with asphalt or ceramic tiles, are satisfactory. If the floor is not a ground plane or integral with the building structure with adequate thickness, care shall be exercised that it does not radiate any appreciable sound due to vibrations.

The applicability of the test room for the purpose of this test code depends essentially on the quality of the acoustical treatment of its walls and ceiling.

A common treatment, consisting of wedges of absorptive material mounted (with a small airgap behind them) on the walls and on the ceiling of the building structure, will be extremely expensive, can be easily damaged in practical use, and will be hard to keep clean.

A very simple treatment consists of three layers of mineral wool (felt), each layer with a thickness of at least 80 mm, with different densities, the first layer being in contact with the building structure and having a density of approximately 55 kg/m^3, the second layer having a density of approximately 33 kg/m^3 and the third layer, forming the inner boundary of the test room, having a density of approximately 23 kg/m^3.

The three layers are fastened together to the walls and to the ceiling of the building structure by a mesh with a size of approximately 50 mm of galvanized steel wires with a diameter of approximately 1 mm.

This treatment is not expensive, the risk of damage is small, and the room can be cleaned easily.

Bibliography

IEC 60038:2009, *IEC standard voltages*

ISO 3741:2010, *Acoustics – Determination of sound power levels of noise sources using sound pressure – Precision methods for reverberation rooms*

ISO 3745:2012, *Acoustics – Determination of sound power levels of noise sources using sound pressure – Precision method for anechoic and hemi-anechoic rooms*
ISO 3745:2012/AMD:2017

IEC 60704-2-15

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INTERNATIONAL STANDARD

colour inside

Household and similar electrical appliances – Test code for the determination of airborne acoustical noise –
Part 2-15: Particular requirements for household food waste disposers

IEC 60704-2-15:2024-09(en)

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 2-15: Particular requirements for household food waste disposers

FOREWORD

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IEC 60704-2-15 has been prepared by IEC subcommittee 59L: Small household appliances, of IEC technical committee 59: Performance of household and similar electrical appliances. It is an International Standard.

This first edition cancels and replaces the first edition of IEC/PAS 60704-2-15, published in 2008. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to IEC/PAS 60704-2-15:2008:

a) measurement uncertainty and standard deviations have been reviewed;
b) definitions of standard test programme and standard test load have been reviewed;
c) definition of the test enclosure has been reviewed;

d) additional microphone position for test in free field environment;

e) information to be reported has been reviewed;

f) aligned to IEC 60704-1:2021.

The text of this International Standard is based on the following documents:

Draft	Report on voting
59L/252/CDV	59L/264/RVC

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

This Part 2-15 is intended to be used in conjunction with the fourth edition of IEC 60704-1:2021, *Household and similar electrical appliances – Test code for the determination of airborne acoustical noise – Part 1: General requirements*.

The relevant text of IEC 60704-1:2021 as amended by this publication establishes the test code for household food waste disposers.

This document supplements or modifies the corresponding clauses in IEC 60704-1:2021. When a particular subclause of IEC 60704-1:2021 is not mentioned in this document, 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 IEC 60704-1:2021 are to be adapted accordingly.

Subclauses, tables and figures that are additional to those in IEC 60704-1:2021 are numbered starting from 101. Additional annexes are lettered AA, BB, etc.

Unless notes are in a new subclause or involve notes in IEC 60704-1:2021, they are numbered starting from 101, including those in a replaced clause or subclause.

In this standard, the following print types are used:

- terms defined in Clause 3: **bold type**.

A list of all parts in the IEC 60704 series, published under the general title *Household and similar electrical appliances – Test code for the determination of airborne acoustical noise*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

The noise of food waste disposers has been measured up to now by making use of IEC/PAS 60704-2-15[1].

The measuring conditions specified in this document 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 food waste disposers.

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 food waste disposers.

NOTE As stated in the introduction to IEC 60704-1:2021, this test code is concerned with airborne noise only.

[1] This publication has been withdrawn.

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

Part 2-15: Particular requirements for household food waste disposers

1 Scope

Replacement:

These particular requirements apply to single unit electric food waste disposers for household use, with or without automatic programme control, for cold water supply, for permanent connection to water supply and sewage systems, intended for connection to the kitchen sink drain and contained within a kitchen cabinet enclosure.

Food waste disposers for restaurants, hotels and industry purposes are excluded.

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

2 Normative references

Addition:

ANSI/ASME A112.19.3-2022, *Stainless Steel Plumbing Fixtures*

3 Terms and definitions

Addition:

3.101
batch feed operation
method of operation in which the operator loads the food waste into the container body

3.102
standard hard test load
rigid standard test load for noise measurements

4 Measurement methods and acoustical environment

4.1 General

Addition after the second paragraph:

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

4.2 Direct method

Addition:

If pure tone components are present in the noise emitted, proper precautions shall be taken as specified in ISO 3743-2.

4.3 Comparison method

Addition:

If pure tone components are present in the noise emitted, proper precautions shall be taken as specified in ISO 3743-1 and ISO 3743-2.

4.4 Acoustical environments

4.4.1 General requirements and criterion for adequacy of the test environment

Replace the third paragraph with the following:

The method specified in ISO 3744 is applicable to noise sources of any size. When applying ISO 3743-1 and ISO 3743-2, it shall be ensured that the maximum size of the cabinet enclosing the food waste disposer under test fulfils the requirements specified in ISO 3743-1:2010, 4.2, and ISO 3743-2:2018, Clause 5.

4.5 Measurement uncertainties

4.5.2 Standard deviations on repeatability and reproducibility and standard deviations related to declaration and verification

Replacement:

The estimated values of standard deviations of sound power levels determined in accordance with this document are currently not available.

For the purpose of determining and verifying declared noise emission values for food waste disposers in accordance with IEC 60704-3, the value σ_M is 2,5 dB.

6 Operation and location of appliances under test

6.1.3 *Replacement*:

Prior to commencing measurements, the inside of the grind chamber shall be clean and free of any debris from prior operation. The food waste disposer shall be run through 10 complete operational cycles, of a 30 s duration, with a **standard hard test load** (3.102).

6.1.4 Not applicable.

6.2 Supply of electric energy and of water or gas

6.2.1 *Replacement*:

The supply voltage is measured at the plug of a non-detachable cable or cord, at the appliance inlet if a detachable cord is provided or no cable is provided, but in no case at the entrance of extensions cables or cords.

6.2.2 Not applicable.