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Edition 3.0 2011-11

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Household and similar electrical appliances – Test code for the determination of airborne acoustical noise –
Part 2-4: Particular requirements for washing machines and spin extractors

Appareils électrodomestiques et analogues – Code d'essai pour la détermination du bruit aérien –
Partie 2-4: Exigences particulières pour les machines à laver le linge et les essoreuses centrifuges

IEC 60704-2-4:2011

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

Part 2-4: Particular requirements for washing machines and spin extractors

FOREWORD

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International Standard IEC 60704-2-4 has been prepared by subcommittee 59D: Home laundry appliances, of IEC technical committee 59: Performance of household and similar electrical appliances.

This third edition cancels and replaces the second edition (2001). Main changes are:

- measurement uncertainty and standard deviations are taken into account,
- definitions of standard test load and standard test program are modified,
- test enclosure was replaced by common test enclosure defined in Part 1,
- information to be reported is modified.

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

CDV	Report on voting
59D/379/CDV	59D/387/RVC

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 2-4 is intended to be used in conjunction with the third edition (2010) of IEC 60704-1, *Household and similar electrical appliances – Test code for the determination of airborne acoustical noise – Part 1: General requirements.*

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

The relevant text of Part 1 as amended by this publication establishes the test code for washing machines and spin extractors.

This Part 2-4 supplements or modifies the corresponding clauses in IEC 60704-1. When a particular subclause of Part 1 is not mentioned in this Part 2-4, 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 should be adapted accordingly.

Subclauses, tables and figures that are additional to those in Part 1 are numbered starting from 101. Additional annexes are lettered AA, BB, etc.

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.

A list of all the parts in the IEC 60704 series, 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 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.

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INTRODUCTION

The measuring conditions specified in this Part 2-4 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 washing machines and spin extractors.

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 washing machines and spin extractors.

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

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

Part 2-4: Particular requirements for washing machines and spin extractors

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 single unit electrical washing machines and the washing and spinning function of combined appliances for household and similar use and to spin extractors for household and similar use.

NOTE 101 For drying function, see IEC 60704-2-6.

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 washing machines and spin extractors.

1.1.3 Size of the 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 washing machine or spin extractor under test fulfils the requirements specified in 1.3 of ISO 3743-1 and ISO 3743-2.

1.2 Object

Addition:

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

NOTE 101 For determining and verifying noise emission values declared in product specifications, see IEC 60704-3.

1.3 Measurement uncertainty

Replacement:

For washing machines the estimated values of standard deviations of sound power levels, determined according to this standard, are as indicated in Table 101:

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Table 101 – Standard deviations of sound power levels for washing machines

Standard deviation (dB)	
σ_r (repeatability)	σ_R (reproducibility)
0,6	1,0

For spin extractors the estimated values of standard deviations of sound power levels, determined according to this standard, are as indicated in Table 102:

Table 102 – Standard deviations of sound power levels for spin extractors

Standard deviation (dB)	
σ_r (repeatability)	σ_R (reproducibility)
0,5	1,0

1.101 Standard deviation for declaration and verification

For the purpose of determining and verifying declared noise emission values for washing machines according to IEC 60704-3, the values indicated in Table 103 apply:

Table 103 – Standard deviations for declaration and verification for washing machines

Standard deviation (dB)		
σ_P (production)	σ_t (total)	σ_M (reference)
1,0 to 2,2	1,4 to 2,4	2,5

For the purpose of determining and verifying declared noise emission values for spin extractors according to IEC 60704-3, the values indicated in Table 104 apply:

Table 104 – Standard deviations for declaration and verification for spin extractors

Standard deviation (dB)		
σ_P (production)	σ_t (total)	σ_M (reference)
1,0 to 1,2	1,4 to 1,6	2,0

2 Normative references

This clause of Part 1 is applicable except as follows:

Addition:

IEC 60456:2010, *Clothes washing machines for household use – Methods for measuring the performance*

3 Terms and definitions

This clause of Part 1 is applicable except as follows:

3.101
washing machine
appliance for cleaning and rinsing of textiles using water which may also have a means of extracting excess water from the textiles

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3.102
rated capacity
maximum mass in kg of dry textiles of a particular defined type which the manufacturer declares can be treated in the washing machine on the program selected. If the rated capacity is not declared, it shall be deduced from the free inside volume of the drum, according to the following ratio:

– horizontal axis washing machines 1 kg / 13 l
– agitator washing machines 1 kg / 15 l
– impeller washing machines 1 kg / 20 l
– spin extractors 1 kg / 4,6 l

3.103
cotton test load
textile load consisting of towels only as defined in Annex C of IEC 60456:2010

3.104
washing period
begins at the first water filling of the main wash, ends at the start of the drainage pump before the first rinsing operation

NOTE Options such as "pre-wash" are not included in the washing period.

3.105
rinsing period
begins at the start of the drainage pump before the first rinsing, ends at the start of the drainage pump after the last rinsing

3.106
final spin extraction period
begins at the start of the drainage pump after the last rinsing, ends with the end of the programme

3.107
end of programme
the programme is complete when the washing machine indicates the end of the programme and the load is accessible for the user. Where there is no end of programme indicator and the door is locked during operation, the programme is complete when the load is accessible to the user. Where there is no end of programme indicator and the door is not locked during operation, the programme is complete when the power consumption of the appliance drops to some steady state condition and the appliance is not performing any function

3.108
test series
sequence of three consecutive runs of the standard test programme in order to determine the sound power level of the appliance

NOTE For the function “spin extraction” three additional runs may be necessary.

4 Measurement methods and acoustical environments

This clause of Part 1 is applicable except as follows:

4.2 Direct method

Addition:

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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:

5.3 Instrumentation for measuring operating conditions

5.3.1 *Addition:*

Spin speed shall be recorded at intervals of 1 s or less.

6 Operation and location of appliances under test

This clause of Part 1 is applicable except as follows:

6.1 Equipping and pre-conditioning of appliances

6.1.3 *Replacement:*

Prior to noise measurements, the washing machine shall have been operated for at least five complete cycles as specified in 6.101 with standard test load as specified in 6.102, but regardless of the averaged age of the test load.

Separate spin extractors shall have been operated without load for a total duration of at least 1 h at the highest speed setting and if necessary, with rest periods as specified in the manufacturer's instructions.

6.1.4 Not applicable.

6.2 Supply of electric energy and of water or gas

6.2.2 and **6.2.3** Not applicable.

6.2.4 *Replacement:*

For noise measurements, the static water pressure during filling shall be (240 ± 50) kPa, if not contradictory to the manufacturer's instructions.

Appliances shall be supplied with cold water, if not otherwise specified by the manufacturer.

The temperature of cold water shall be (15 ± 5) °C, the temperature of hot water shall be (55 ± 5) °C.

The water hardness may be neglected.

NOTE 101 When, in some countries, the water supply pressure/temperature differs from the water supply pressure/temperature of the country concerned, measurements carried out at rated pressure/temperature may be

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misleading for the consumer. In this case, additional measurements may be necessary. If the test pressure/temperature differs from the rated pressure/temperature, this should be reported.

6.4 Loading and operating of appliances during tests

6.4.2 *Replacement:*

Washing machines are operated in the standard test programme according to 6.101, with a load according to 6.102.

Single spin extractors, or separate spin extractor drums in combination with a washing machine, or washing machines, where the spinning action is not included in the programme, shall be loaded according to 6.102. In this case, wet pieces which have been washed and rinsed before, in an appropriate washing machine (for a machine combination, in the accompanying washing machine), shall be used. If, for a machine combination, the rated capacity for spin extraction is different from that for washing, the load shall be adjusted for this function accordingly.

NOTE 101 The way of loading the machine influences the results of the noise measurements. To get reproducible results it is necessary to load the machine always in layers from bottom to top. The cotton test load for each subsequent step is evenly distributed in one level of the drum or basket. Excessive force should not be used.

In case of a spin extractor with vertical axis, wet pieces of textile shall be placed as close together as possible in an arrangement around the inner wall of the drum so as to reduce the chance of the spin extractor becoming unbalanced.

6.5 Location and mounting of appliances

6.5.1 and **6.5.2** Not applicable.

6.5.4 Not applicable

6.5.5 *Addition:*

Appliances designed for front loading and specified by the manufacturer for building under a counter or for placing under a worktop between cabinets (under-counter types) shall be built-in according to the manufacturer’s installation instructions in an appropriate test enclosure according to Annex B of Part 1.

6.101 Standard test programme for noise measurements

The standard test programme for noise measurements is a 60 °C cotton programme without pre-wash as advised by the manufacturer.

If this programme is not available, then the most effective programme for white cotton according to the manufacturer's instructions shall be used. Other special options shall be deselected.

Highest available spin speed is to be chosen.

The standard test programme for noise measurements is carried out without detergent.

6.102 Standard test load for noise measurements

6.102.1 General

The standard test load for noise measurements of washing machines consist of conditioned cotton test load at a weight close to, but in any case not more than, the rated capacity.

To minimize the influence of changes in the characteristics of the cotton test load items with increasing age, the standard test load shall consist of cotton test load items which are well

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