IEC 60098

Edition 4.0 2020-01

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Analogue audio disk records and reproducing equipment

Disques audio analogiques et appareils de lecture

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ANALOGUE AUDIO DISK RECORDS AND REPRODUCING EQUIPMENT

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International Standard IEC 60098 has been prepared by IEC technical committee 100: Audio, video and multimedia systems and equipment.

This fourth edition cancels and replaces the third edition published in 1987. This edition constitutes a full revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) addition of a tolerance on groove width.

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

CDV	Report on voting
100/3261/CDV	100/3331/RVC

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

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

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
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ANALOGUE AUDIO DISK RECORDS AND REPRODUCING EQUIPMENT

1 Scope

This document applies to analogue audio disk records and the corresponding professional and domestic reproducing equipment. It excludes amplifiers and loudspeakers, methods of measurement for which can be found in IEC 60268-3, IEC 60268-5, IEC 60268-21 and IEC 60268-22[1] .

This document specifies the characteristics that are necessary to ensure compatibility between analogue audio disk records and the corresponding reproducing equipment.

It also lists and defines the most important characteristics affecting the performance of reproducing equipment, and establishes agreed methods of measurement for these characteristics

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.

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IEC 60050-806:1996, *International Electrotechnical Vocabulary (IEV) – Part 806: Recording and reproduction of audio and video*
IEC 60050-806:1996/AMD1:2001
IEC 60050-806:1996/AMD2:2018

IEC 60263:1982, *Scales and sizes for plotting frequency characteristics and polar diagrams*

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IEC 60386:1972, *Method of measurement of speed fluctuations in sound recording and reproducing equipment*

IEC 60417, *Graphical symbols for use on equipment* (available at http://www.graphical-symbols.info/equipment)

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

IEC 62368-1:2018, *Audio/video, information and communication technology equipment – Part 1: Safety requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-806 and the following apply.

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

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

[1] Under preparation. Stage at the time of publication: IEC CDV 60268-22:2019.

3.1
rated value
value of a quantity used for specification purposes, established for a specified set of operating conditions of a component, device, equipment, or system

Note 1 to entry: The rated value is normally the value stated by the manufacturer.

[SOURCE: IEC 60050-151:2001, 151-16-08, modified – Note 1 to entry has been added.]

3.2
terminated, adj
<of a circuit or connection port> connected to a specified impedance required for correct operation or for specified test conditions

Note 1 to entry: 'Specified test conditions' can include open-circuit and short-circuit.

4 General

4.1 Scales for graphical presentation of data

Linear or logarithmic scales are recommended for graphical presentation. Linear decibel scales are equivalent to logarithmic scales. Other kinds of scale, such as double logarithmic, should be avoided. When using decibel scales, the zero reference should, if possible, be the rated value. In those cases, where each of the scales refers directly to physical units, it is recommended to avoid a combination of linear and logarithmic scales.

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Where quantities represented by the axes are of the same kind, it is recommended that the same unit length be used for both.

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Linear scales with remote zero point should be avoided as far as possible. For further information, see IEC 60263.

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4.2 Scales for frequency characteristics

Graphs should be drawn with frequency in Hz on the x-axis with a logarithmic scale, and the level expressed in dB on the y-axis with a linear scale. The scale ratio should be such that the length representing one decade of frequency is the same as the length representing a 25 dB or a 50 dB difference in level. The preferred length per decade is 50 mm. If the size of the graph is changed, the scale ratio should be left unaltered.

5 The disk

5.1 Types of disk records

The types of disk record given in Table 1 shall be standard.

Table 1 – Standard types of disk

Type designation	**Nominal diameter** (cm)	**Nominal speed** (rev/min)
3033	30	33⅓
2533	25	33⅓
1733	17	33⅓
3045	30	45
2545	25	45
1745	17	45

5.2 Dimensions of disks

The dimensions for types 30xx and 25xx are shown in Figure 1.

Dimensions in millimetres

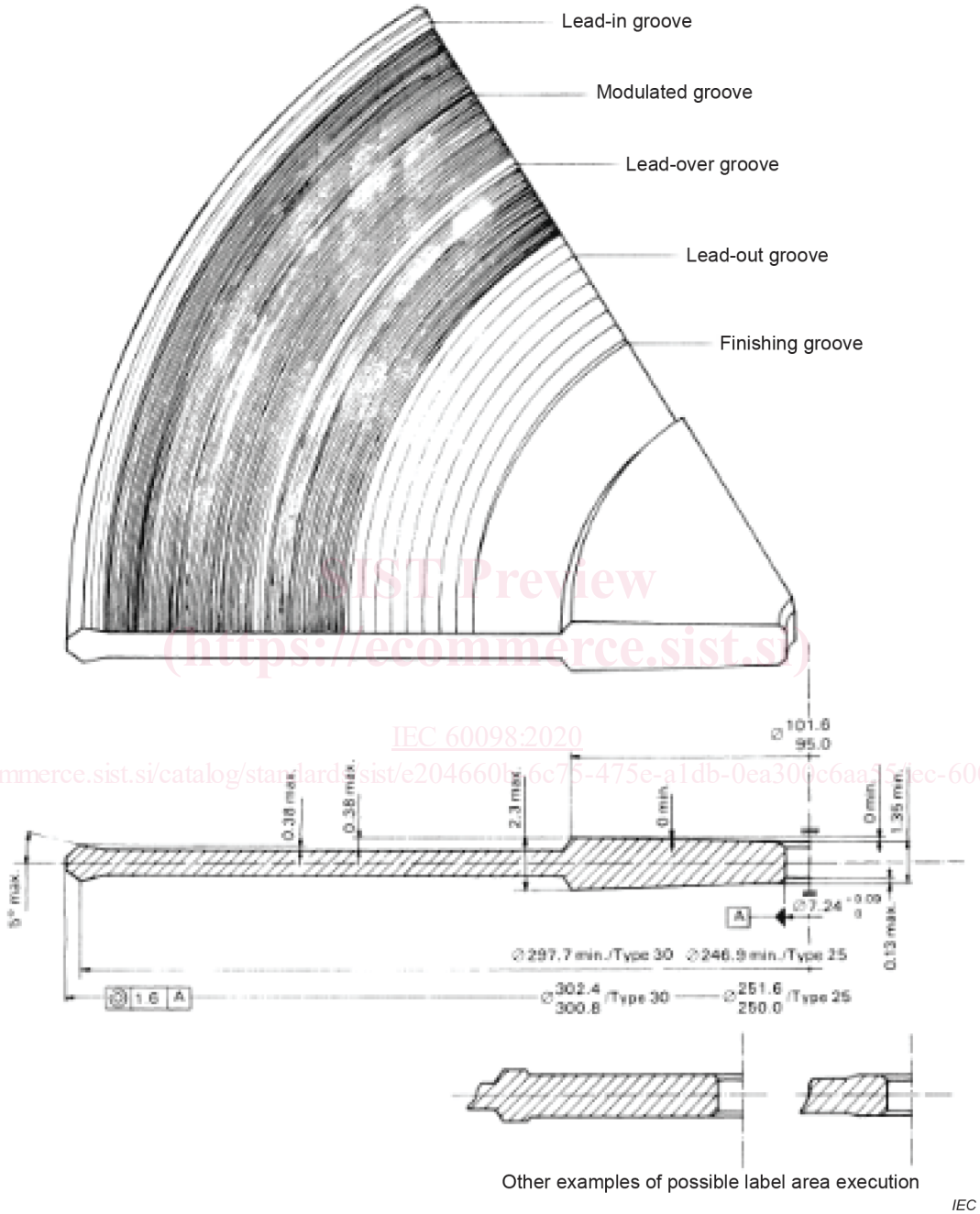
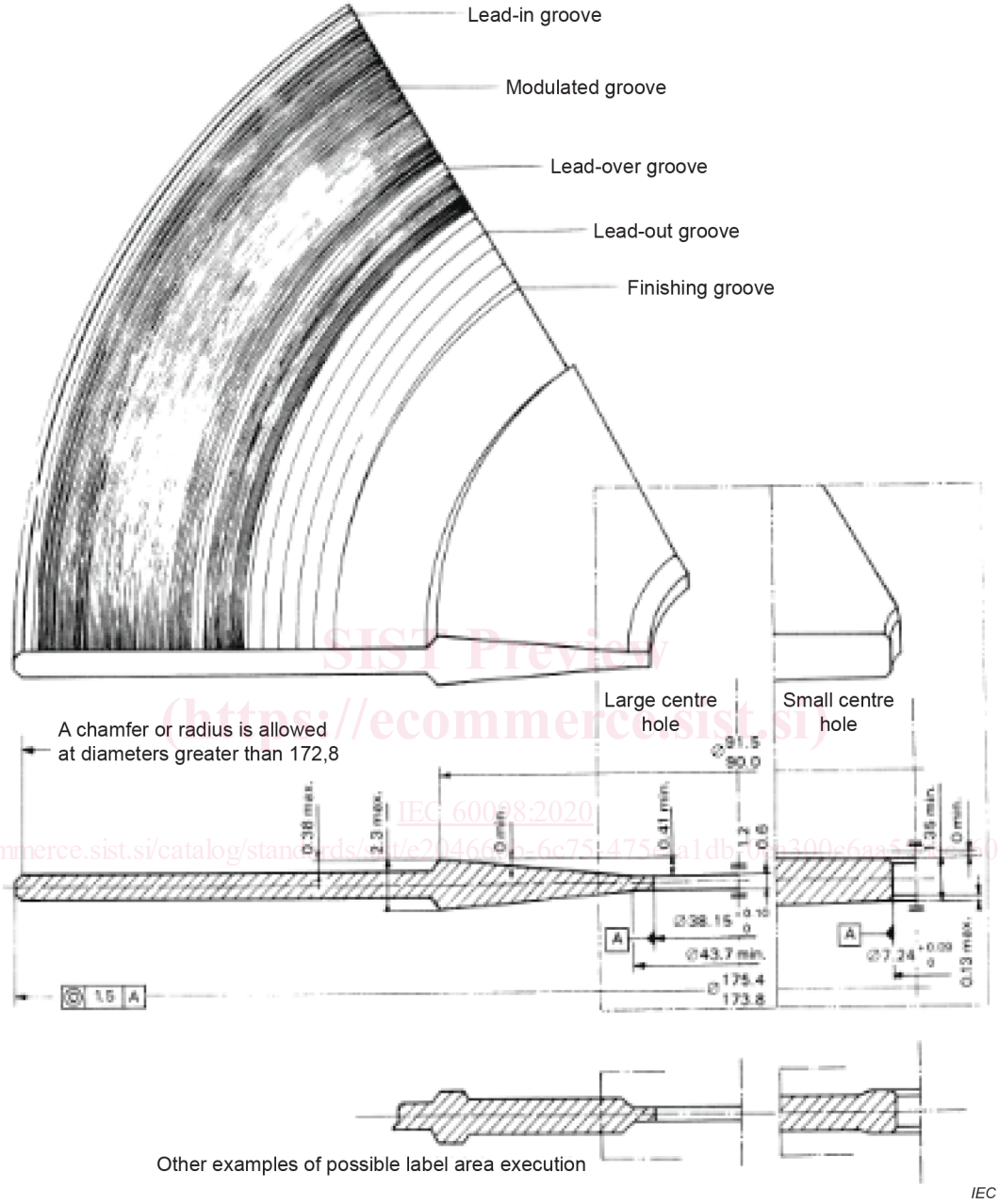


Figure 1 – Dimensions for record types 30xx and 25xx

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The dimensions for type 17xx are shown in Figure 2.

Dimensions in millimetres



A small centre hole click may have an optional push-out centre that, when removed, leaves the large centre hole dimensions. Both configurations should fulfil the requirements of the diagram.

An optional push-out centre should have a closed structure within a diameter of 16 mm concentric with the centre hole.

Figure 2 – Dimensions for record type 17xx

5.3 Unbalance of disks

The centre of gravity of disks having a small centre hole shall lie within an 8 mm diameter circle concentric with the centre of the centre hole.

5.4 Direction of rotation

The direction of rotation of the disk shall be clockwise when viewed from the side being reproduced.

5.5 Direction of recording

The direction of recording shall be such that, on reproduction, the pickup shall travel as closely as possible along a straight radial line towards the centre of the disk.

5.6 Speed of rotation

The speed of rotation during recording shall be within ±0,5 % of the rated recording speed, the rated recording speed being such as to give the intended musical pitch at one of the following rated reproducing speeds:

- 33⅓ r/min: for disk record types 3033, 2533 and 1733,
- 45 r/min: for disk record types 3045, 2545 and 1745.

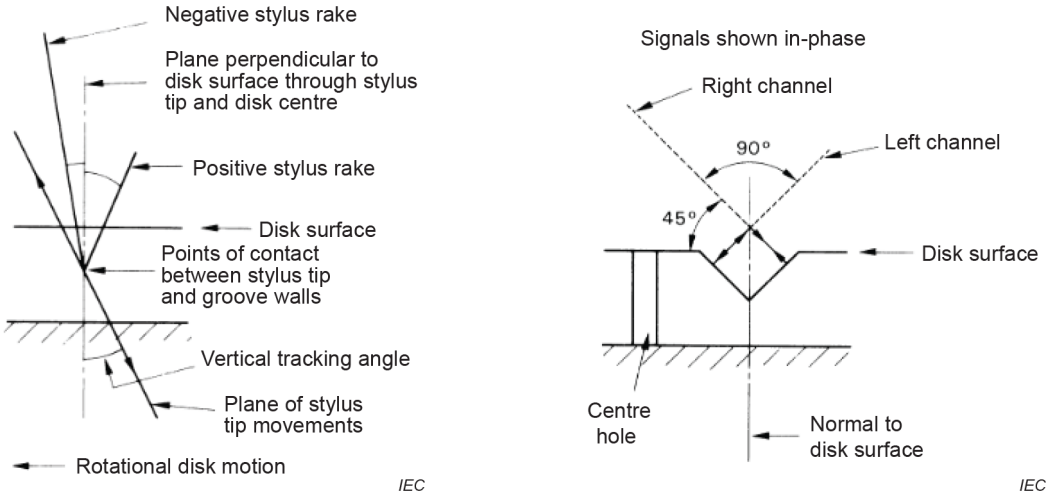
NOTE Verification of reproducing speed by means of stationary stroboscopic bars in countries employing 50 Hz electric supplies can be made at 45,112 r/min only.

6 The groove

6.1 Direction of groove modulation

The stereophonic groove shall carry two channels of information. The two channels shall be recorded in such a manner that they can be reproduced by movements of a reproducing stylus tip in two directions at 90° to each other, and at 45° to a radial line through the stylus tip and the centre of the record; these movements shall be tangential to, or lie in a plane through the stylus tip and the record centre, inclined at an angle of 20^{+5}_{0}° anticlockwise to the normal to the record surface through the stylus tip as viewed towards the record centre (vertical tracking angle). The resulting modulation shall be optimum for reproducing styli having a rake angle of between 0° and −5° (for detail, see Figure 3).

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a) View of groove in direction from stylus tip to disk centre (see 8.1)

b) View of groove in plane of stylus tip movements (see 8.1)

Figure 3 – Groove

The monophonic groove shall carry one channel of information. It shall be recorded on both groove walls in such a manner that it can be reproduced by lateral movements of a stylus tip as described above.

6.2 Arrangement of stereophonic channels

6.2.1 Channel orientation

The right-hand channel, as viewed by the audience, shall be recorded on the outer groove wall, the left-hand channel on the inner groove wall.

6.2.2 Channel phasing

The phasing of the two recorded signals shall be suitable for reproduction on two-channel equipment so connected that movement of the reproducing stylus tip along the radial line through stylus tip and disk centre (as with a monophonic record) produces in-phase sound pressures at the left-hand and right-hand loudspeakers.

6.2.3 Channel levels

The levels of the two recorded signals shall be suitable for reproduction on two-channel equipment, of identical channel gain, so connected that movement of the reproducing stylus along the radial line through the stylus tip and disk centre (as with a monophonic record) produces equal sound pressures at the left-hand and right-hand loudspeakers.

6.2.4 Channel polarity

The polarity of the two recorded signals should preferably be suitable for reproduction on two-channel equipment so connected that movement of the reproducing stylus tip along the radial line through stylus tip and disk centre in a direction away from the disk centre shall produce compression in front of the left and right-hand loudspeakers similar to that produced by the live programme source.

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6.3 Groove dimensions

Instantaneous top width: 30 µm (0,012 in) minimum

Bottom radius: 8 µm (0,000 32 in) maximum

Included angle: (90 ± 5)°

6.4 Lead-in groove

The pitch of the lead-in groove shall be (1,2 ± 0,4) mm. The groove width shall be (60 ± 10) µm.

6.5 Outer diameter of recorded surface

The recorded surface shall start with at least one turn of plain groove and have a maximum outer diameter of:

- 292,6 mm for types 3033 and 3045;
- 241,8 mm for types 2545 and 2533;
- 168,3 mm for types 1733 and 1745.

6.6 Eccentricity of groove spiral

The distance of the centre of the groove spiral to the centre of the centre hole shall be not more than 0,2 mm.

6.7 Marker space

The pitch of the lead-over groove in a marker space shall be not greater than 1,6 mm. A marker space shall not occur at a diameter of less than 127 mm.

6.8 Lead-out groove

The pitch of the lead-out groove shall be 6,4 mm ± 3,2 mm.

The top width of the lead-out groove shall increase to a minimum of 0,075 mm when the pitch exceeds 6,4 mm.

The lead-out groove shall have at least one turn.

6.9 Finishing groove

The diameter of the finishing groove shall be:

- 106,4 mm ± 0,8 mm for types 3033, 2545 and 2533 and 3045;
- 97,4 mm ± 1,0 mm for types 1733 and 1745.

7 Label information

The label shall give at least the following information:

a) catalogue number;
b) if there is more than one record, side number and total number of sides, for example "Side 5 of 8";
c) programme title;
d) nominal speed of rotation;
e) type of recording.

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If stereophonic, it shall be clearly marked with either the word "STEREO" or with the symbol specified by IEC 60417-5071:2002-10. Word and symbol may be used simultaneously. If monophonic, it shall be clearly marked with either the word "MONO" or with the symbol specified by IEC 60417-5070:2002-10. Word and symbol may be used simultaneously.

8 Recording and reproducing characteristics

8.1 Recording characteristic

8.1.1 Standard recording characteristic

The standard recording characteristic shall be a combination of the following three curves:

- one rising with increasing frequency in conformity with the admittance of a parallel combination of a capacitance and a resistance having a time constant of t_1 = 75 µs;
- one falling with decreasing frequency in conformity with the admittance of a series combination of a capacitance and a resistance having a time constant of t_2 = 318 µs;
- one rising with decreasing frequency in conformity with the impedance of a series combination of a capacitance and a resistance having a time constant of t_s = 3 180 µs.