IEC 60118-4

Edition 3.0 2017-11

INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 1
AMENDEMENT 1

**Electroacoustics – Hearing aids –
Part 4: Induction-loop systems for hearing aid purposes – System performance requirements**

**Électroacoustique – Appareils de correction auditive –
Partie 4: Systèmes de boucles d'induction utilisées à des fins de correction auditive – Exigences de performances système**

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FOREWORD

This amendment has been prepared by committee IEC technical committee 29: Electroacoustics.

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

CDV	Report on voting
29/952/CDV	29/961/RVC

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

The committee has decided that the contents of this amendment and the base publication will remain unchanged until the stability date indicated on the IEC website 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- withdrawn,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.

3 Terms and definitions

Add, after 3.3, the following new term and definition:

3.4
automatic gain control
AGC
process or device by which the gain of an amplifier is controlled by the level of the output signal so as to reduce changes in this level as compared with the changes in the input signal

Note 1 to entry: Frequently, automatic gain control is used to keep the output signal level nearly constant.

Note 2 to entry: There is a consistent but more general definition in IEC 60118-7, but this standard may have a limited future, so the IEV definition is preferred.

9 Small-volume systems

Replace the existing text of Clause 9 by the following new text:

9.1 Definition of measurement points

For small-volume systems, it is possible and necessary in some applications to specify in this standard the positions of the measurement points. For this reason, points are specified for both disabled refuge and similar call points, and for counter systems. However, where these suggested measurement points are not practical, the "useful magnetic field volume" method

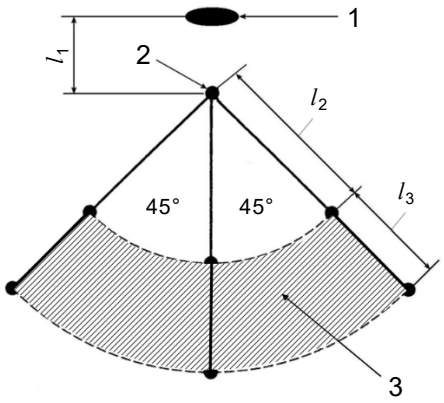
as defined in 9.4 can be applied, the details of which should be agreed as part of the contractual requirements.

9.2 Disabled refuge and similar call-points

Measurements shall be made at the six points specified in Figures 2 a) and b). The reference point (or line) is the face or surface of the call point, intercom, or help point closest to the user, and is not necessarily the location of the magnetic field source.

The semi-circular layout is suitable for small magnetic field sources and the rectangular layout is suitable for vertical or floor loop sources. Only one of the methods shall be used for a given system.

NOTE An offset (shown as l_1 in Figure 2) between the reference point (or line) and the position of the magnetic field source promotes evenness of field pattern over the area where people are expected to stand.



Key

1 magnetic field source

2 reference point

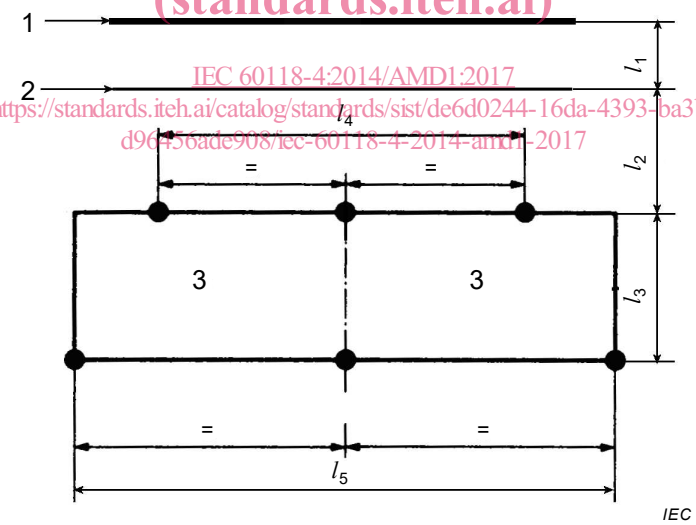
3 area where people are expected to stand

l_1 offset

l_2 inner radius: 300 mm

l_2+l_3 outer radius: 500 mm

a) Magnetic field source of small dimensions



Key

1 magnetic field source (vertical loop)

2 reference line

3 area where people are expected to stand

l_1 offset

l_2 300 mm

l_3 200 mm

l_4 424 mm

l_5 700 mm

b) Larger magnetic field source

Figure 2 – Measurement points for disabled refuge and similar call-points

The six measurement points are required at 1,2 m and 1,7 m (see Figure 3 b)), but there is no requirement to measure at 1,45 m.

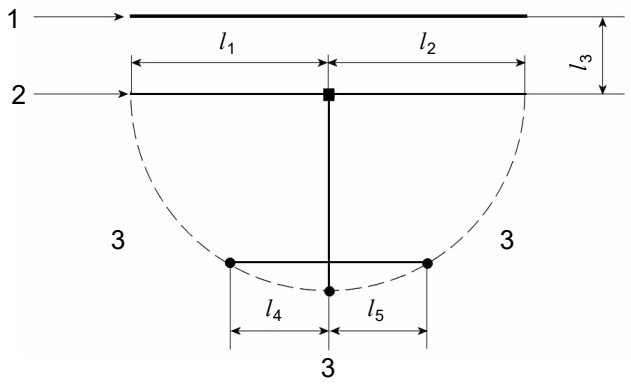
9.3 Counter systems

Measurements shall be made at the points specified in Figures 3 a) and b). The reference point is the face or surface of the counter closest to the user, and is not necessarily the position of the magnetic field source. For counter systems, there is often a requirement to control overspill to an adjacent counter position. Controlling this overspill is likely to be a significant factor in design, and as such may result in a compromise of evenness of field over the area where people are expected to stand.

NOTE 1 It is not necessary to reduce the magnetic spill between counter positions below a level comparable with the acoustic spill. A difference greater than 20 dB between equivalent positions at the two counters is normally enough.

NOTE 2 The boundaries of the area where people are expected to stand cannot be standardized as they depend on the building layout and counter design.

NOTE 3 For vertical loops, an offset (shown as l_3 in Figure 3) between the reference point and the position of the loop promotes evenness of field pattern over the area where people are expected to stand, but reduces the effectiveness of overspill control to the next counter position.



Key

1 magnetic field source

2 reference line

3 area where people are expected to stand (outside the dotted semi-circle)

l_1 300 mm

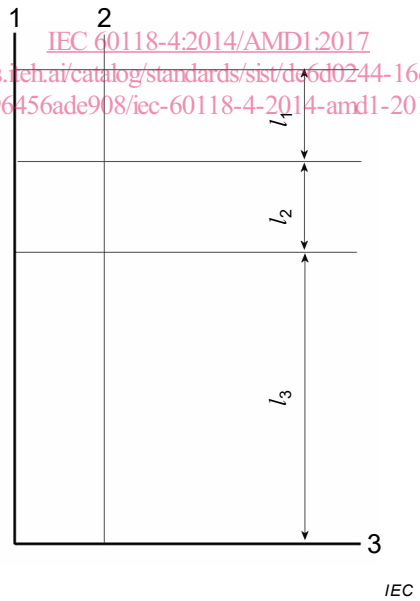
l_2 300 mm

l_3 offset

l_4 150 mm

l_5 150 mm

a) Plan view



Key

1 magnetic field source

2 reference line

3 floor level

l_1 250 mm

l_2 250 mm

l_3 1 200 mm

b) Side elevation

Figure 3 – Measurement points for a counter system

Measurements at the three points shown in the plan view are required at 1,2 m, 1,45 m and 1,7 m.

9.4 Useful magnetic field volume method

Requirements based on a useful magnetic field volume, as described in 8.4, may be used in place of the methods in 9.2 or 9.3, if agreed contractually. The useful magnetic field volume shall be defined, and a set of representative measurement points determined which are distributed so as to ensure that the requirements are met in that volume (3-dimensional space). Measurements shall be made at these representative points, whose positions shall be recorded with the results of the measurements.

As a minimum, the requirements shall be met for at least one position at each of the heights defined in 9.2 and 9.3 in the area where people are expected to stand.

All notes in 9.2 and 9.3 are applicable where appropriate.

9.5 Requirements

The magnetic field strength level at all measurement points specified in 9.2, 9.3 or 9.4 shall be ±6 dB ref. 400 mA/m, measured according to 8.2. At one point at least, it shall be at least 0 dB ref. 400 mA/m. In addition, the requirements in 8.3.7 shall be met at all measurement points.

The magnetic field strength level shall not be above +8 dB ref. 400 mA/m in the area where people are expected to stand.

NOTE 1 This high field strength is inevitable for a simple vertical loop of practicable dimensions. If the signal is too loud or distorted, the user can move a short distance further away from the source of the magnetic field.

NOTE 2 Clauses 4 and 7 deal with the subject of magnetic background noise level. It is not practicable to specify a requirement, as this might rule out the provision of a system that would be at least helpful to users.

10 Setting up (commissioning) the system

Replace the existing text by the following new text:

10.1 Procedure

The commissioning procedure shall include a test with the sound sources (talker, etc.) in their normal positions with respect to the system microphone(s), and with any other sources, such as a CD player. Measurements shall be made to check that the controls of the amplifier, etc., are set so that the magnetic field strength specified in 8.2.7 is achieved. If the amplifier has a gain control preceding the AGC stage, and an indicator that the AGC is operating, it is normally sufficient to set the control so that the indication specified by the manufacturer is achieved. The reference speech signal as defined in 6.3.3.3 can also be used for a more objective test, but as in all cases it should not be necessary to adjust the 'loop drive' control (gain control after the AGC stage) of the amplifier. It is desirable that a small number of hearing-aid users should be present when a system is being set up for the first time or after extensive changes, to check that the subjective results are consistent with the measurements. It is important to check these hearing aid users for correct operation of their aids, and to ensure that they actually understand what they are supposed to be listening to. It is essential that the trained persons(s) specified in Clause E.5 are present, with the receivers they will use for normal system checking.

NOTE Some hearing aid users set their volume controls much too high, and some older hearing aids tended to overload at a rather low field strength. Where significant variations of opinion are experienced between hearing aid users, on the performance of a system, it could be necessary to check the settings of the aids.

10.2 Requirements

The maximum value of the magnetic field strength obtained from the reference speech signal (see 6.3.3.3) shall normally be 400 mA/m, measured with a meter as specified in 6.1.

For the reference signal and all real sound sources, the measured value depends on the characteristics of the AGC circuit as well as the signal source itself, and as a result the measured r.m.s levels are likely to deviate from the target value. Provided the measurement time is long enough to observe true maximum levels, the system should usually achieve ±3 dB ref 400 mA/m (283 mA/m to 566 mA/m).

If a field strength of 400 mA/m ± 3 dB is not achieved with real signals, the measurement shall be repeated using the signal specified in 6.3.3.3. If the requirement is still not met, the system specification and the set-up procedure given in 4.1 shall be reviewed, to determine whether the system as a whole, and the amplifier, have been correctly specified.

10.3 Amplifier overload at the upper bound of maximum power bandwidth

10.3.1 Explanation

If frequency-response correction is applied to the amplifier in order to compensate for metal loss, even if the amplifier is capable of producing the required maximum magnetic field strength at 1,0 kHz, it might be overloaded (in terms of output voltage or current capability) at a higher frequency.

The maximum power bandwidth required for a system is dependent on the signal to be used in the application. For speech, the upper bound is generally considered to be 1,6 kHz. For systems which are designed to reproduce music this figure may need to be increased. For systems which are only designed for brief or transient use (and so fatigue is not a factor), 1,25 kHz may be enough.

This test is for evaluating the capability when delivering real programme signals, but a simple test using a sinewave signal causes the amplifier to draw an unusually high current from its power supply, and as such is considered inappropriate. A test using a reduced current at approximately double the desired maximum power frequency yields more representative results, as it results in a more realistic power supply current.

10.3.2 Methods of test

Apply a sine wave signal at 1,0 kHz and adjust its level so that a magnetic field strength 7 dB less than the required value is obtained at a given point. Apply this signal only for the shortest practicable time, in order to prevent overheating of the amplifier. Measure the voltage across the loop. Increase the input frequency, without changing its level, until the voltage across the loop is doubled, or the relevant test frequency specified in Table 4 is reached, whichever is the greater frequency.

NOTE 1 The magnetic field strength is intentionally increased by the frequency-response compensation.

NOTE 2 The reduction in level of 7 dB is used so that systems on the threshold of clipping do not fail the test.

Table 4 – Programme material and test frequency

Typical system programme material	Upper frequency bound of the maximum power bandwidth	Test frequency
Transient use speech e.g. small volume systems	1,25 kHz	2,5 kHz
Speech (default)	1,6 kHz	3,15 kHz
Music	2,0 kHz	4,0 kHz

To determine whether the amplifier is overloaded, apply one of the following tests:

- observe the 'clip indicator' on the amplifier, if one is provided;
- compare the measured output voltage with the manufacturer's specified value, provided that this is specified as ‘compliance voltage’ according to IEC 62489-1;
- examine the output voltage waveform with an oscilloscope for signs of clipping. This may be alternatively detected as a sharp increase in THD as the input frequency is increased to the test frequency.

NOTE 3 The voltage waveform is appropriate to be examined, because if the loop has high inductance, clipping might not be apparent on the current waveform. When measuring the voltage, note that neither side of the amplifier output is likely to be at earth potential. For some portable measuring systems, an attenuator might be required to measure or display the voltage.

Once the test is complete, remove the test signal and adjust the level back to the previous 0 dB level as established in Clause 8.

10.3.3 Requirements

No clipping shall be experienced at the applicable test frequency specified in Table 4 and level specified in 10.3.2.

10.4 Magnetic noise level due to the system

10.4.1 Explanation of term

Magnetic field strength, measured with a pick-up coil whose magnetic axis is vertical (unless otherwise specified, see 8.1), due to the combination of background fields and the field due to amplifier noise, with all the signal inputs muted.

NOTE This value cannot be measured correctly until the rest of the commissioning procedure has been carried out.

10.4.2 Method of measurement with a speech signal

Not applicable.

10.4.3 Method of measurement with pink noise

Not applicable.

10.4.4 Method of measurement with a sinusoidal signal

Not applicable.

10.4.5 Method of measurement with a combi signal

Not applicable.

10.4.6 Method of measurement – Other (no input signal)

The magnetic field strength shall be measured as specified in Clause 7, with A-weighting, at a sufficient number of points within the useful volume, with the system switched on but with all the signal inputs muted.

NOTE If the signal is derived from sound system equipment, the muting is applied at the inputs of that equipment.

10.4.7 Requirements

If the reference signal-to-noise ratio as measured in 7.2 is greater than 47 dB, the magnetic field strength level at any point with the system switched on shall not exceed –47 dB. If the