

# Generic - Hearing Loop - (AFILS) U.S. System Specification

Hearing Loop - Audio Frequency Induction Loops

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This document is a generic specification for any Hearing Loop – (Audio Frequency Induction Loop System). For the remainder of the document, we will refer to using the term “Hearing Loop” rather than Audio Frequency Induction Loop Systems or, (AFILS).

The text may be used in part or in full for any purpose.

While the text aims to be generic, you will need to modify sections to be specific to your application:

- Section 1 should state your requirements for loop locations and areas.

You may also have specific requirements to add or modify in the following areas:

- Section 2 : modify if you have any additional or differing standards requirements (IEC 60118-4:2006 should *not* be removed – this is the core performance standard).
- Section 4: add any specific audio Inputs that are needed.
- Section 8 : add any specific installation requirements.
- Section 10 : add any specific requirements for post installation maintenance or training of operating staff.

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### 1 Hearing Loop Requirements

Supply and install the complete systems, detailed within this specification. Provide Hearing Loop Systems at the following locations and areas:

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*Insert locations to suit your project's needs – here are some examples of 'typical' areas:*

*Reception Counters (one local Hearing Loop for each service position); Auditorium 1 and 2; Meeting rooms A, B, C*

The Hearing Loop system shall incorporate all necessary components and accessories, including but not limited to the following:

- Hearing Loop system design including loop layout design;
- Hearing Loop drive equipment, ancillary components and mounting accessories;
- Appropriate Audio Input systems;
- Hearing Loop wire or flat copper tape with appropriate mounting accessories and associated feed cables;
- Hearing Loop test equipment.

### 2 Compliance

The Hearing Loop system shall comply with:

- IEC 60118-4:2006

A Certificate of Conformity to this standard shall be issued for each Hearing Loop System in the project. In addition the system shall comply with:

- 2010 Americans with Disabilities Act (Section 706)
- 2012 International Building Code (Section 1108.2)

### 3 System Design

The Contractor shall:

- At the earliest opportunity in the project, (When all electrical devices and circuits in the room can be turned on) provide evidence that the background magnetic noise in the areas designated for loop coverage is within the limits defined in the standard, IEC 60118-4:2006. Where the background magnetic noise exceeds  $-32\text{dB re: } 400\text{mA/m}^{-1}$  [ $-22\text{dB}$  for short-term use/localized applications], the contractor shall not proceed without client approval. This approval will require a realistic demonstration of what the finished loop system will sound like.
- Prior to installation, show that cross-talk between adjacent looped areas (whether part of this contract or not), and that magnetic spill from any Hearing Loop System where the signal is defined as 'confidential' will, by design, be less than  $-32\text{dB}$  peak with normal signal levels.
- Prior to installation, provide evidence that the effect of metal within the structure of the building has been adequately assessed and compensated for by loop design and / or appropriate loop driver selection. Where necessary, the effect of metal shall be assessed by site survey and using test loops on relevant construction, carried out by a competent test specialist.
- Prior to installation, provide a pre install test data sheet to demonstrate that the field strength of the proposed systems will meet the requirements of the standard IEC 60118-4:2006.
- Prior to installation demonstrate that all seating areas will be covered by the hearing loop.

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### 4 Audio Input

Audio inputs shall provide clear pick up of all wanted audio signals while minimizing unwanted audio and background noise.

- Signal-to-noise improvement is important to provide benefit to the hearing aid user.
- The input system design shall provide selective amplification of the intended audio signal above the general sound level in the area.
- Where multiple un-attended microphones are used a good auto-mixing system is highly recommended and for attended system the number of open microphones is critical and should be kept as low as possible
- Where a sound reinforcement system is installed, a balanced, line level XLR feed from the system to the hearing loop should be used
- A single boundary microphone mounted on the ceiling shall never be used as it in no way improves the signal-to noise

### 5 Hearing Loop Drivers

Hearing Loop drivers shall be provided to amplify input audio signals and to drive the loop systems appropriately. The drivers shall meet the requirements for a type A or type B driver as defined below.

#### 5.1 Type A: Area Coverage Hearing Loop Driver(s)

Where the horizontal loop area that must be covered is in excess of 6½ feet x 6½ feet, for either a one-phase (perimeter) or two-phase (phased array) system:

Each induction loop driver shall have the following characteristics:

- 'Current drive' output.
- Rated current and voltage capable of driving the designed loop without clipping or distortion of the signal with full power bandwidth up to at least 5kHz.
- Capable of delivering the rated current and voltage into a load with 1kHz and 5kHz sine wave signal continuously without damage to the unit or interruption of the output signal.
- Frequency response from 80Hz to 6.5kHz
- THD+N less than 0.2% at 1kHz sine at full current.
- Automatic Gain Control (AGC) optimized for both speech and music, with a dynamic range greater than 36dB
- Metal loss correction with an adjustable gain slope range of at least 0dB to +3dB per octave.
- Input facilities of a type and connection suitable for the intended audio inputs to the system. Where input connections are to exceed 10 feet in length, balanced inputs shall be available. Balanced microphone inputs shall have phantom power available.
- Front panel indication of audio signal activity on the output of the unit and the input .
- Controls for commissioning shall all be located on the front of the unit and commissioning shall be achievable without exposure of terminals carrying hazardous voltages.
- Height no greater than 3.5 inches (i.e. 2 unit of standard 19 inch rack space) per unit.
- All AC powered devices shall have passed testing at a Nationally Recognized Testing Laboratory (NRTL) for safety with reference to the current edition of UL 60065 and any other applicable safety standards.

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Where two-phase systems are required, an assembled unit shall be provided (height no greater than 3.5 inches or 2U of standard 19" rack space) that is capable of driving two separate outputs with a 90° phase shift accurate to  $\pm 1^\circ$  from 100Hz to 5kHz

### **5.2 Type B: Counter / Local Area Hearing Loop Driver(s)**

Where the loop system provides assistance to a single end user in a defined location, such as a retail counter or information point.

Each hearing loop driver shall have the following characteristics:

- 'Current drive' output with current capability of at least 2 A rms with 1KHz sine signal
- Voltage output of no less than 4.0V peak at maximum current.
- Earthed chassis or ground plane
- Frequency response from 80Hz to 6.5KHz
- Automatic gain control (AGC) optimized for speech
- Minimum of 2 inputs: 1 microphone input and 1 fully isolated line input
- Panel / wall mounting capability (using screws or other appropriate and reliable mounting)
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## **6 Hearing Loops**

Loops connected to the Hearing Loop system shall meet the following requirements:

- Be designed and implemented to meet all requirements of section 3 above.
- The implementation of the hearing loop design shall take into account the layout and construction materials of the building
- Appropriate materials for the installation location shall be used (e.g. wire in the floor/ceiling, flat copper tape under floor coverings, or a purpose-designed loop coil inside a counter vertical front)
- Loop wire containment shall be of non-metallic construction (to avoid short circuit grounding paths parallel with the loop wire). This restriction does not apply to the loop feeder cables between a loop amplifier and the start of the loop itself, which may be installed in metal or non-metal containment.
- Where flat copper tape is accepted for use under carpet or other floor coverings, this does not require the use of containment and shall be installed according to the manufacturer's recommendations and current best practice.
- Implementation of the loops shall in general follow best practices.

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## **7 Hearing Loop Receivers and Test Equipment**

### **7.1 Hearing Loop Receivers**

For each hearing loop system a hearing loop receiver shall be provided for operational staff to check and monitor the performance of the hearing loop system. The receiver shall have the following characteristics:

- Headphone output and be provided with headphones or, ear piece.
- Active low frequency cut filter.

### **7.2 Field Strength Meter**

If the Client or operational staff are required to set up, commission or carry out a specified maintenance period (i.e. every 3, 6, 9 or 12 months), a field strength meter shall be provided capable of commissioning to the requirements of IEC 60118-4:2006. The meter shall have the following characteristics:

- Calibrated reading of 0dB at 400mA/m rms as per IEC 60118-4:2006
- True RMS measurement with 125mS time constant.
- A-Weighted background noise range of at least -50dB to -12dB
- Field strength measurement range of at least -56dB to +8dB, with increments better than 1dB from -6dB to +6dB
- Frequency band mode with 1/3 octave frequency bands centred on at least 100Hz, 1kHz and 5kHz meeting IEC 61260:1996 and IEC 60118-4:2006
- Headphone output for both listening to the hearing loop signal and use with a spectrum analyser if needed.
- Instructions for setting up a Hearing Loop System to IEC 60118-4:2006 by use of the field strength meter.

## **8 Installation**

The contractor shall:

- Coordinate with other relevant contactors to ensure that all appropriate audio signals are connected to the induction loop system and transmitted clearly.
- Provide appropriate cabling and/ or connection points for system integration.
- Wire and connect to all items of equipment in accordance with the manufacturers' recommendations.
- Ensure complete segregation of the Extra-Low Voltage (ELV) wiring system, from any other ELV or Low Voltage (LV) wiring system.
- Provide all necessary and supplementary grounding conductors and connections to each component or item of equipment.
- Follow good audio and other relevant practice to ensure that proper grounding and other cable system design does not cause degradation of this or other system performance by allowing interference in inappropriate paths.
- Confirm locations of all local power supply requirements and equipment spatial requirements.
- All wiring of loops and between equipment locations shall be installed and concealed in appropriate containment.
- All wiring, including that inside equipment enclosures or racks, will be of a neat and tidy appearance. Wiring shall be identified at both ends of each cable.
- Ensure that all aspects are in accordance with appropriate (AHJ) Authority Having Jurisdiction.

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### **9 Commissioning**

The contractor shall:

- Include commissioning of the complete system(s) in accordance with IEC 60118-4:2006
- Provide a procedure for testing and commissioning. Provide all necessary test equipment to complete the process, all test results to be fully recorded and copies included in the Operation and Maintenance manuals.
- Provide a minimum of 14 days notice of all testing in order that a Client's representative may have reasonable option to attend and witness tests.
- Provide operating instructions for all items of equipment and installed systems. Demonstrate all systems and methods of use to the end user.
- Provide "As Installed" drawings and Operation and Maintenance manuals for all Hearing Loop Systems.
- When carrying out commissioning tests, use a Field Strength measurement tool with a minimum specification as in section 7.2 above.
- Issue Certificates of Conformity to IEC 60118-4:2006 that clearly state the results of testing and whether the system performance meets the relevant requirements of the standard.
- Commissioning shall not be complete until adequate signage has been both approved by the facility and installed where users will note the systems has been installed before taking their seats
- Demonstrate that all seats within the facility meet the IEC 60118-4 standard and any exceptions are appropriately covered by the signage.

Where the induction loops are to be installed prior to the driver/amplifier equipment, the loops shall be tested for continuity and for isolation from electrical ground and metal structures/containment. The Client shall have the opportunity to witness these tests which shall be recorded and documented.

### **10 Training and Maintenance**

Training and instruction documentation shall be provided that enables operational staff to understand the proper use of the hearing loop system and how to ensure that people with TeleCoil or, T-Coil equipped hearing aids can make use of the system effectively.

A test and maintenance schedule shall be provided.

Training and instruction documentation shall be provided for operational staff such that they can use and perform regular functional tests on the system(s). This training shall include, but not be limited to, demonstrating the correct use of the test equipment and hearing loop drivers provided.