Class D loop amplifier LD Séries

PERIMETER LOOP AMPLIFIER

EN

Installation and user manual

LD 1.0 / 2.0 / 3.0

FABRICATION FRANÇAISE

OPUS Technologies

TABLE OF CONTENTS| EN

TABLE OF CONTENTS| EN

1. Intro

Thank you for have purchasing an Opus Technologies Induction Loop Amplifier.
Please take a few moments to read this manual. It will ensure you the best use of the product and many years of service.

1.1 Purpose

The user manual provides the necessary information for installing, configuring and using an LD series amplifier.

1.2 Targeted audience

The installation and user's manual is intended for installers and users of LD Opus Technologies series amplifiers.

1.3 Warnings

This user guide relates to three types of alerts.
The type of alert is closely related to the effect that may occur if this one is not observed. These alerts, ranked in ascending order of severity, are as follows:

•Note
Additional information. Generally, the non-observance of a Note type alert does not lead to any material or bodily injury.

• Attention
Failure to observe a caution alert may result in property damage.

• Warning
Failure to observe a warning alert can result in severe personal injury and property damage.

1.4 Icons

1.4.1 Icons and notes

Icons used with notes provide additional information about the note.
See the following examples:

Note:
General icon of the notes

Note:
Symbol referring to the indicated information source.

1.4.2 Icons of attention, warning and danger

The icons used in combination with Attention, Warning and Danger indicate the type of risk present.
See the following examples:

Attention, warning, danger :
General icon of precautionary statements, warnings and dangers.

Attention, warning, danger :
Electrocution risk icon.

Attention, warning, danger :
Risk icon of electrostatic discharge.

2. Presentation of the amplifier

2.1 Description

The LD Series range includes induction loop amplifiers made to equip voiced rooms for people with hearing loss.

The LD Series has been developed with strict and rigorous specifications that allow us to offer a 5 year warranty. The products have been designed with options to facilitate their use and their installation.

Product photo Figure 1

Perimeter amplifiers composed of LD1.0, LD2.0 and LD3.0 cover different surfaces described below.

2.2 The range

The LD1.0, LD2.0 and LD3.0 Opus Technologies are new generation of induction loop amplifiers and French manufacture.
The amplifiers, are the most compact on the market while offering the necessary features (AGL, MLC, compressor, etc.) to ensure installation for rooms ranging from 100m² to 1000m² :

· LD 1.0 covers 250 m² - max width: 10m
· LD 2.0 covers 450 m²- max width : 15m
· LD 3.0 covers 1000 m² - max width : 20m

These coverage data are indicative, they meet the international standard **IEC-60118-4**.
However, depending on the configuration of the room (step, height installation, etc.) these room widths do not meet the requirements of **IEC-60118-4**, so it is important to call a specialist. You can also use our simulation software or get closer to your local dealer for more information

2.3 Packing list

Upon receipt of the amplifier inspect the unit and look for any damage that may have occurred during transport. If it is damaged notify your distributor and the shipping company immediately, stating the delivery date, the nature of the damage and if no damage was visible on package before unpacking. If possible give the delivery number and a tracking number.

Inside your box:

- LD1.0, LD 2.0 or 3.0 amplifier
- Power cord
- 2x 3-point connectors
- 1x 2-point connectors
- 1x 2-point connectors
- A set of 2 stickers "space adapted for the hearing impaired
- A guide to installation and use
- OP-R (option)

2.4 OP-R (option)

Content of the OP-R
2x rack mounting brackets

- 2x brackets
- 8x fixing screws

Product photo - Figure 1

2.4 Advices and safety

The majority of problems with the induction loops happens when the installation has not been properly reflected so let's take a little time before starting the installation and gain in result and time.

Ideally, the loop amplifier should be placed near the area to be covered. This may involve placing the amplifier on a panel, under a desk, or under a counter.

See figure 9 page 17

To position the loop in the space to be equipped, it is important to take into account the future users of the system.

For example, if you only need to have the speaker and the client, a reduced coverage with a centered loop may be a better solution than a loop around the perimeter of the room. It will limit radiation and increase confidentiality.

3. Technology presentation

3.1 What is an induction loop system?

An hearing loop (also know as Audio Frequency Induction Loop System)), is a help system for people with hearing loss. With this system, the sound from a speaker's microphone, PA equipment, TV set, etc. is transmitted wirelessly to the hearing aid of the person who can hear it without being hampered by any ambient noise. This system is mainly used in public places (conference rooms, cinemas, courts, churches, counters, etc.) but can also be installed at home. A large part of hearing aids incorporate the "T" loop function.

3.2 Working principles

An induction loop system is installed mainly in a room. The installation consists of an electrical wire that travels around the perimeter of the room forming a loop. Both wire tips are connected to an audio amplifier. The hearing aid has a coil often called "T Position" or "T-coil". This coil, placed inside the prosthesis, is also made of a wire that makes a large number of turns. The magnetic field generated by the large loop around the room will cross the small loops in the prosthesis and, by the induction principle, the electrical signal present in the large loop will be found in the small one. This transmits the signal of the audio amplifier to the prosthesis, which will then return it to the ear of the hearing-impaired person.

The sound source can be anything. In a cinema, for example, the sound of the film will be transmitted . In a conference room, is the sound of the speaker's microphone. In a metro station, the voice of the agent, etc.
The loop can be installed at the floor or ceiling level, more precisely between 1.10m and 2.20m from the listening height (ears). The loop is integrated in the building, as is the electrical installation.
The presence of a hearing loop is often indicated by a blue logo representing a barred ear and a letter "T".

Pictogram used to signal the presence of a induction loop system -Figure 2

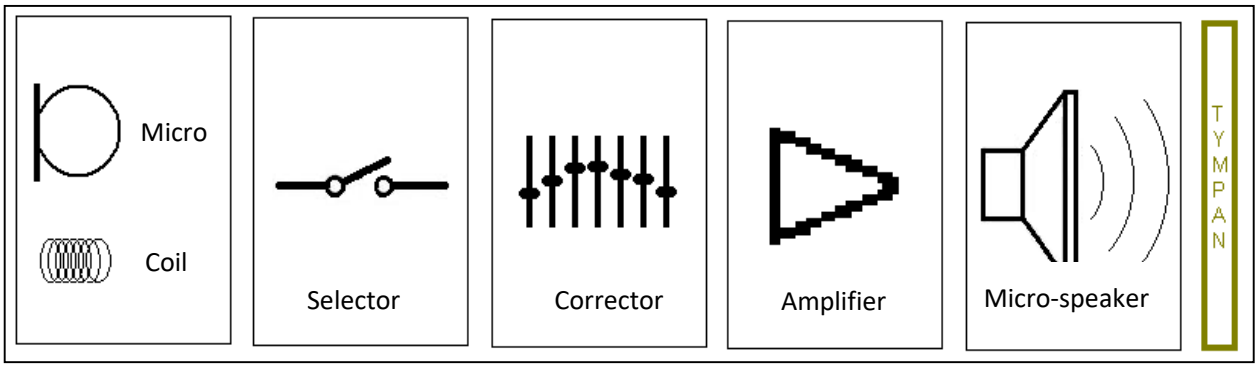


Diagram of operation of a hearing aid with “T” position - Figure 3

4. Controls, Connections and Settings

4.1 Controls

The amplifiers integrate a fault system which makes it possible to control the main functions of the equipment: like the power amplifier, the integrity of the loop cable connected to the amp and the inputs. If one of the functions is faulty, an LED on the front panel of the amplifier will not work.

4.2 Multi-loop output

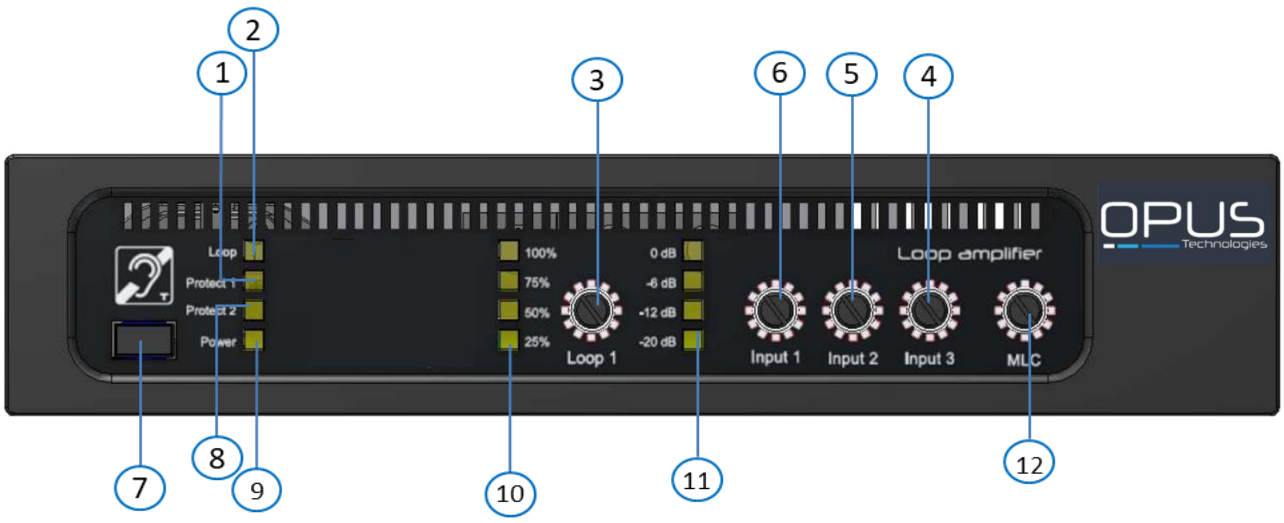
The LD2.0 and LD3.0 amplifiers have two 0 ° and 90 ° outputs and one input on the rear panel (See Figure 4 on page 41), these options do not exist on the LD1.0. This feature offers the possibility to couple multiple amplifiers together.
Depending on the implementation of the loops, the aim is to control the external radiation of the field and/or the homogeneity of coverage in the coverage area.

See Implantation section page– 51

This type of functionality is important in order to explore all the possibilities of using a loop system.

For more information on using the input and slave outputs, and to find out the best loop layout according to your project please use SmartLoop software or contact us at contact@opus-technologies.com.

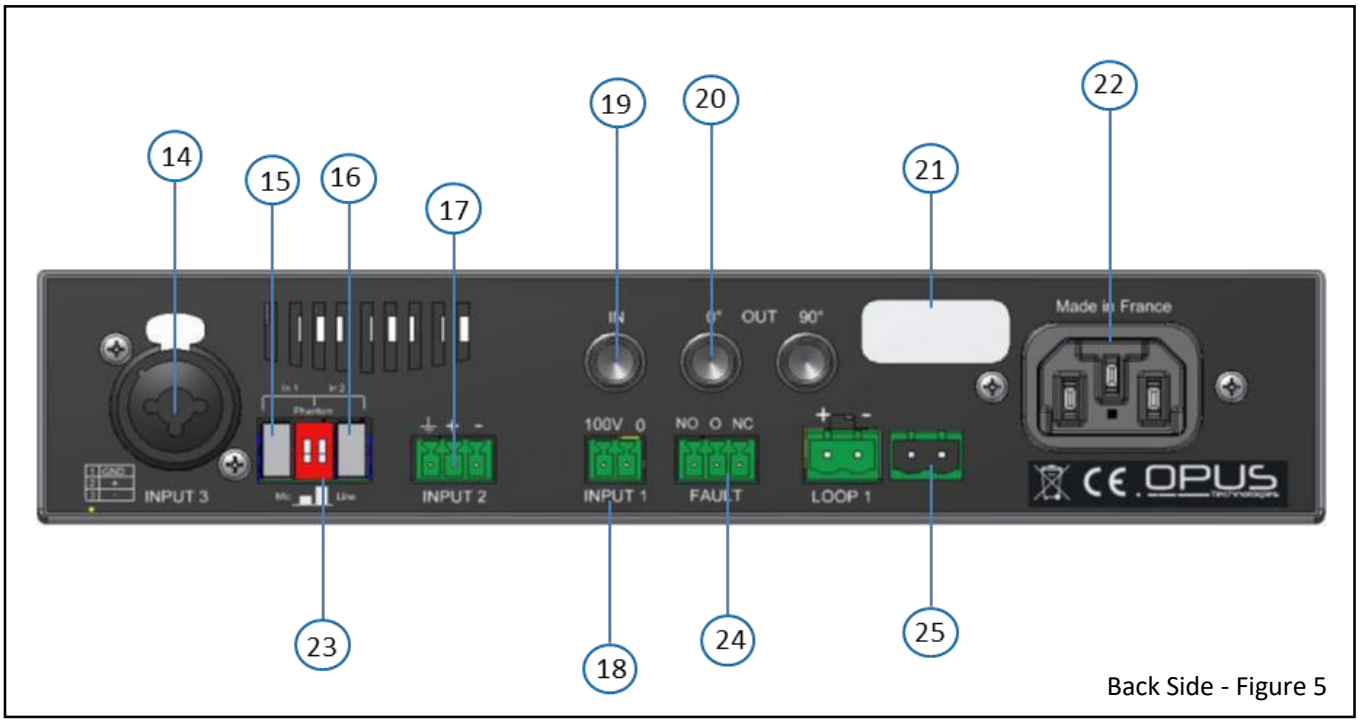
4.3 Front panel and settings



Front Panel- Figure 4

1. **LED «Protect», fault display.** This LED is displayed when the power amplifier, loop or priority input is in fault.
2. **LED "Loop", presence of loop.** This LED is displayed when the loop is cut or its impedance is not suitable
3. **Current output setting.** Used to control the output electric current diffused in the loop
4. **Input 3 setting (100V).** Used to control the signal of input n°3.
5. **Input 2 setting (Line or microphone).** Used to control the signal of the input n°2.
6. **Input 1 setting (Line or microphone).** Used to control the signal of the input n°1.
7. **ON / OFF power button**
8. **LED 'Clip', display saturation amplifier.** This LED is displayed when the amplifier goes into safety mode.
9. **Power LED, ON / OFF display**. Power indicator light on the device
10. **Meter input signal.** Indicates the level of the input signal after setting from -26dB to 0dB.
11. **Meter signal output.** Indicates the electric current in the induction loop.
12. **MLC (Metal Loss Compensation) adjustment** reduces interference problems with metal structures.

4.4 Back side and settings



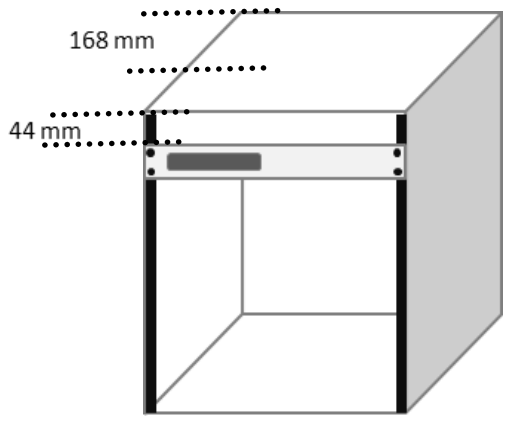
Back Side - Figure 5

14. **Audio Input n°1 Combo: Mic or Line.** This input is used to connect external audio inputs from a line-level source (mixer, preamp, etc.) or a microphone. The Combo connector accepts an XLR or a 6.35 jack.
15. **Push button for line or microphone communication of the input 1.** allows to switch the input according to the source (microphone or line).
16. **Push button for line or microphone communication of the input 2.** Allows to switch the input according to the source (microphone or line).
17. **Phoenix type 2 terminal block input: microphone or line.** This terminal block input is used to connect external audio inputs from a line-level source (mixer, preamp, and) or microphone.
18. **3 terminal block type Phoenix input: 100V priority**. This terminal block input allows you to connect an external audio input from a 100V sound system, the audio is directly recovered from the loudspeakers line
19. **IN slave input.** This input is used to connect a 0 ° or 90 ° output (Master / Slave) of another LD loop amplifier.
20. **0 ° or 90 ° output to slave amplifier**. These outputs are used to connected the Master amplifier to a Slave loop amplifier of the LD range.
21. **Location of the serial number label.**
22. **AC power cord connection.** Connect the loop amplifier to the Master.
23. **Phantom power selection switch.** Send or not the supply voltage of a microphone.
24. **NO / NC fault synthesis relay.** Allows system status information to be forwarded via a relay.
25. **Loop output on terminal block type Phoenix.** Connect the wired loop to the amplifier.

4.5 Racking

4.5.1 Ventilation and rack mounting

For better ventilation leave a space of 1U (44mm) above the amplifier.
Leave a space of at least 168 mm between the bottom of the rack and the amplifier.



Aeration of the amplifier - Figure 6

However, if the rack is enough ventilated you can integrate other items above the amplifier.

Attention, warning, danger :
The LD1/2/3.0 amplifiers contain an advanced protection circuit, which allows them to reduce the power output to maintain safe operating temperatures.
Insufficient ventilation may cause the amplifier output power to be reduced during normal operation (indicated by the red LIMITER / PROTECT LEDs lighting up). To reduce the risk of thermal limitation and allow proper heat dissipation, it is recommended to keep clear the space directly above and behind these amplifiers.

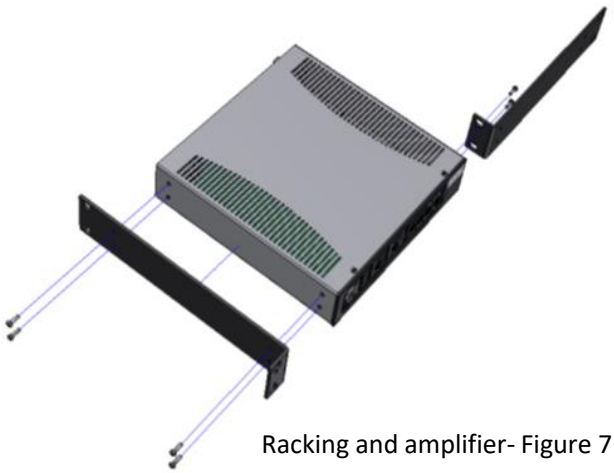
It is also strongly recommended that you do not put anything directly on the amplifier.

4.5.2 Rack integration

Necessary accessory: Fixing kit OP-R *

Secure the rack mounting brackets as shown in the right using the mounting screws provided in the kit.

Then integrate the amplifier into the rack.



Racking and amplifier- Figure 7

4.5.3 Racking two amplifiers

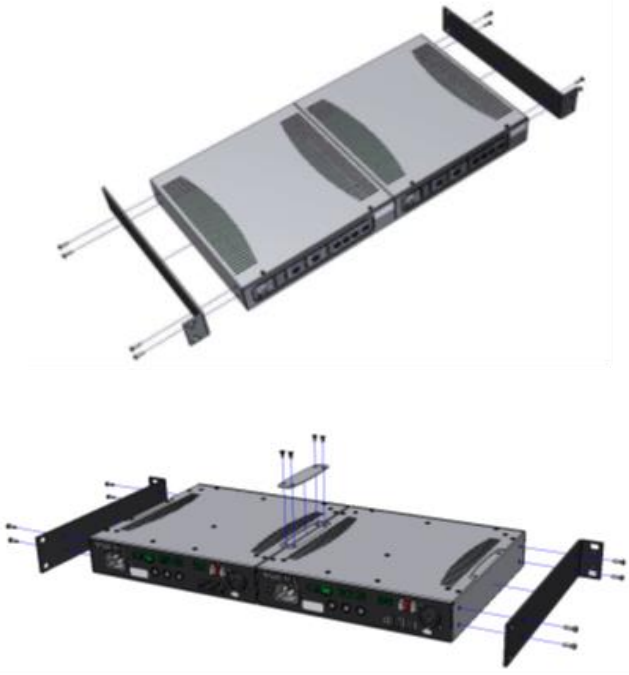
Option required: OP-R * Fixation Kit

Secure the rack mounting brackets as shown in the right using the mounting screws provided in the kit.
Then, attach the amplifiers to each other using the brackets.

Finally, integrate the amplifiers in the rack.

*** Nota:** *The OP-R mounting kit is not supplied with the LD series LD1.0, LD2.0 and LD3.0 amplifiers.*

Illustration of two amplifiers racking



Racking two amplifier side by side- Figure 8

4.5.3 Integrating an amplifier on a wall

Option required: OP-R * Fixation Kit

Fasten the brackets as shown in the picture using the screws provided in the kit.

Then, attach the amplifier to the desired wall

Integrating an amplifier on a wall - Figure 9

**The OP-R mounting kit is not supplied with the LD series LD1.0, LD2.0 and LD3.0 amplifiers.*

4.6 Adjustment and connection

4.6.1 Loop connection

The magnetic induction loops are connected via a green 2-point terminal block provided for this purpose located on the rear panel of the amplifier.

For the connection between the loop and the amplifier it is important to take into account a maximum distance of 15 m, moreover the cables must be twisted or placed close to one another and parallel.
This position avoids the inductions that can be created by transformers external to the system. The references OP-LI5 / 10 or 15 make it possible to create this type of laison.

4.6.2 Audio inputs

Audio sources connect via the 3 inputs of the amplifier provided for this purpose.

LD amplifiers have 3 inputs :

- Input 1 : 100 V
- Input 2 : line or micro
- Input 3 : line or micro

4.6.3 Priority 100V input

Input 1 (100V) of the LD series amplifiers are made to prioritize PA systems in order to facilitate evacuation situations.

If several audio sources arrive in the inputs of the amplifier it will always be the input 1 that will have the priority over the others, the inputs 2 and / or 3 will be muted.

In some cases, and if the configuration allows it, we recommend to connect the sound system on the inputs 2 and 3 of the amplifier and the sound security source on the input 1.

4.6.4 Input and outputs jack 6.35

On the back of the amplifier you can see 3 jacks 6.35mm, these inputs and outputs can connect several loop amplifiers together to create phased single loop systems, low overspill systems or ultra low overspill systems.
See the connection types in section 4.7 and the different types of installation in section 6.

4.6.5 Line output

It is possible to connect a recorder to the line output of the loop amplifier. The line output of the amplifier is a 6.35 OUT 0 ° jack which is mainly used to link several amplifiers when installing complex systems (double loop)

4.6.6 Power supply

LD amplifiers have an integrated power supply of 230V (or 115V), of a power of 300VA.

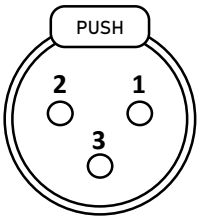
4.6.7 Status relay

The status output is used to send information about the status of the loop amplifier to external devices via a NO / NC relay.

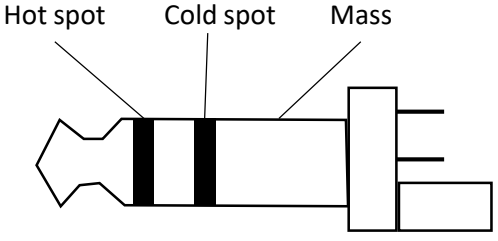
4.6.8 Connectors :

Symetrics :
Pin 1 : Mass
Pin 2 : Hot spot
Pin 3 : Cold spot

XLR 3 pins



Asymmetric :
Pin 1 : Mass
Pin 2 : Signal
Pin 3 : Connected to the mass (plug 1)



Jack 6,35

4.6 Adjustments and connections

4.6.9 Power on

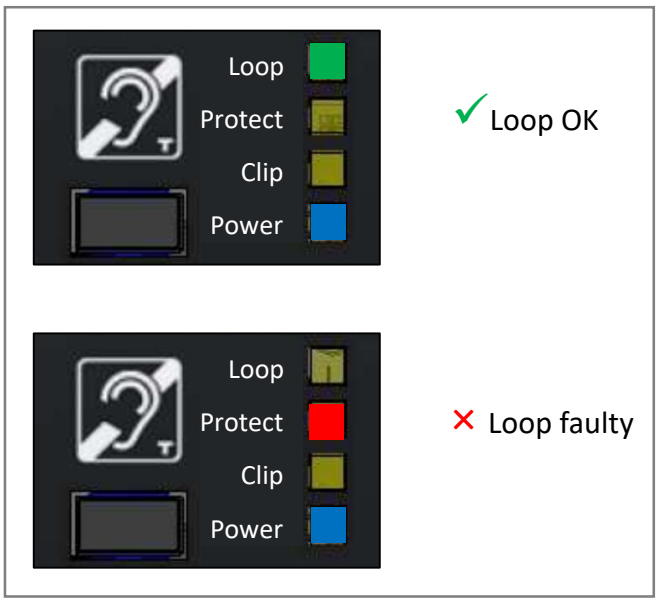
The unit is powered up using the gray switch on the front panel of the amplifier. If the amplifier is powered, the **Power** LED lights in blue.

To turn off the unit press the Power switch on the front of the amplifier again.

4.6.10 Loop Status

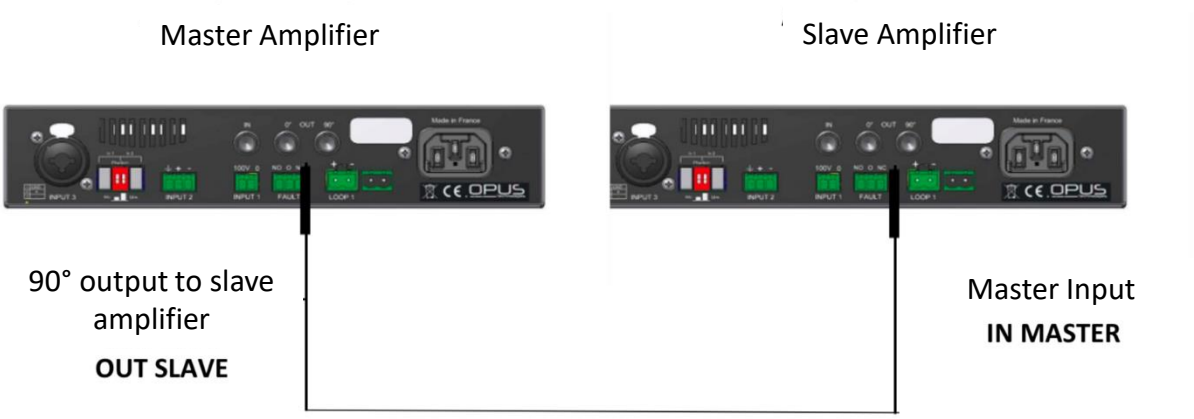
The green LED on the front of the amplifier allows to control the good working of the loop. (See figure below)

If the loop is cuted or if the loop impedance is not between 0.5 and 3 Ohm the **Loop** LED will not be displayed and the **Protect** LED will light.



4.7 Connections of two amplifiers

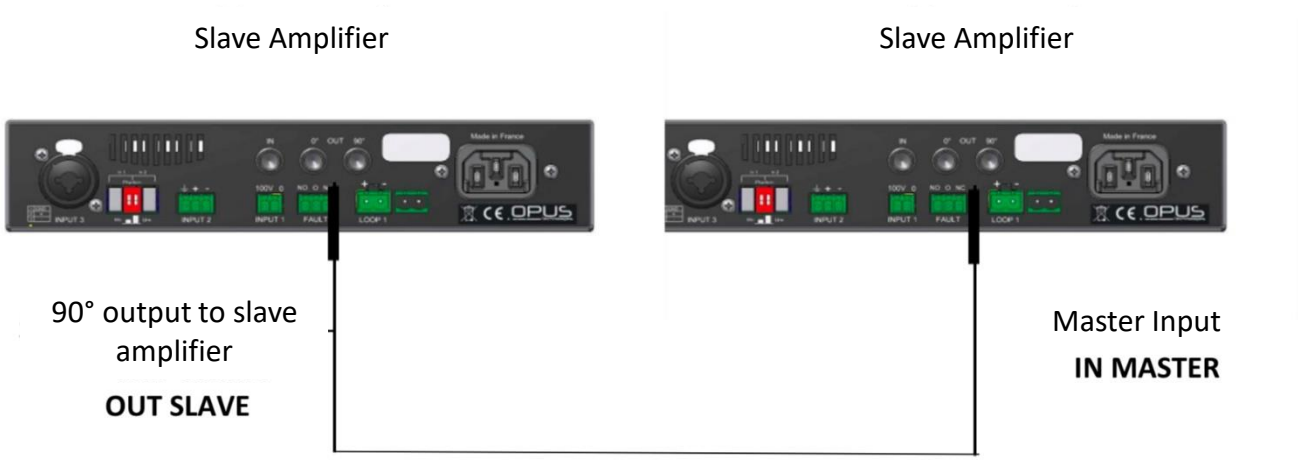
4.7.1 Slave over master



For using of in a low overspill or high coverage system :

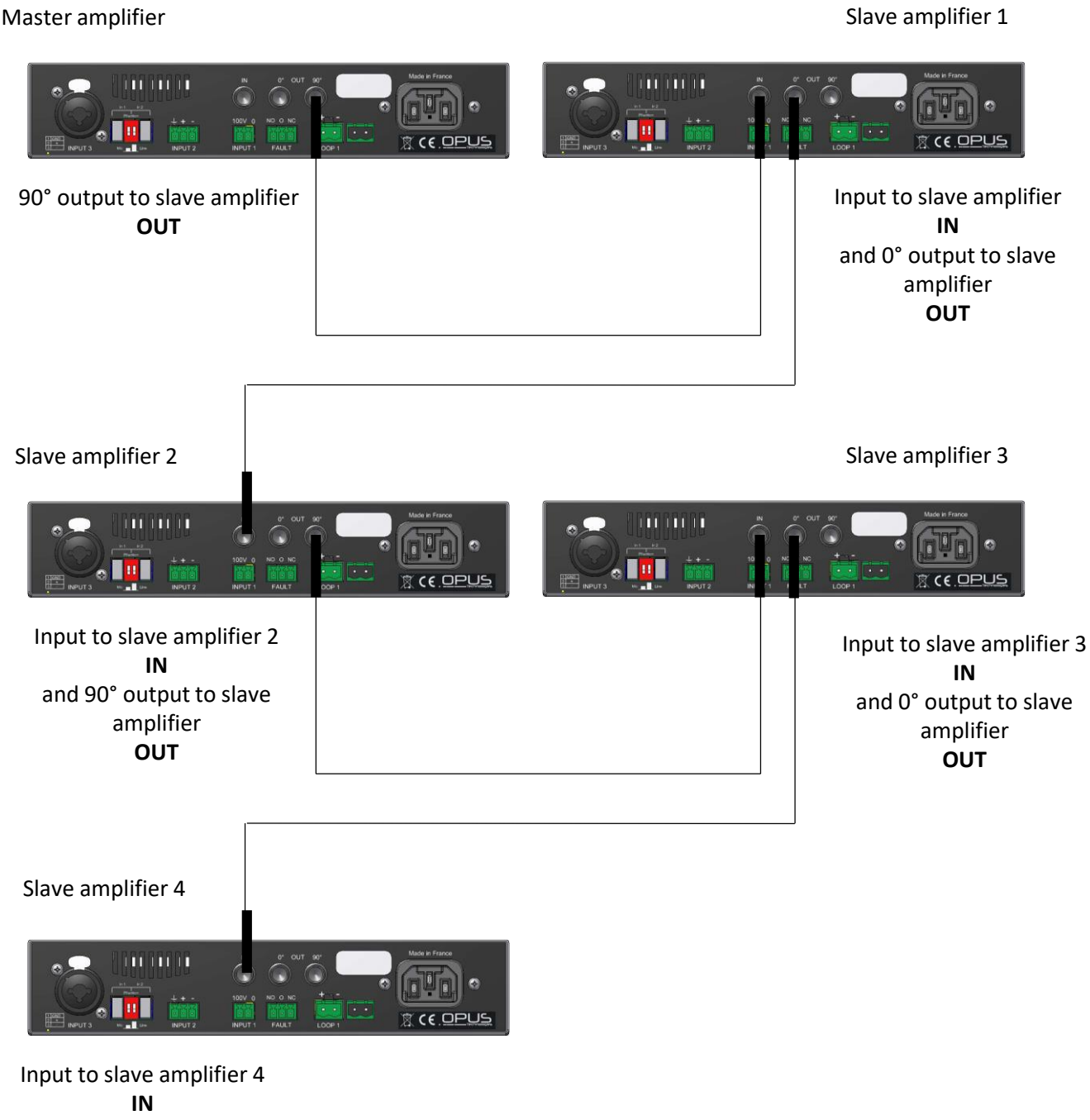
1. Connect the loops on the terminal blocks provided for this purpose: Loop terminal block of the amplifier.
2. Insert an audio source at input 1, 2 or 3 of the master amplifier.
3. Connect the master amplifier to the slave amplifier using a 6.35 connection cord.

4.7.2 Slave over master



Connect the OUT SLAVE jack of the slave loop amplifier to the MASTER jack of the following slave loop amplifier.
You can connect slave amplifiers to each other infinitely.

4.7.2 Slave over slave



This type of configuration will be used to cover large areas like exhibition parks or gyms.

5. Setting up

5.1 Setting a single loop

1. Power up your amplifier and check that all potentiometers are at 0
2. Connect your loop to the Loop terminal block
3. Connect a 1 kHz sinusoidal source to one of the inputs
4. Increase the input signal used on the front panel of the amplifier to between 75 and 85% of the input meter
5. Increase the output current via the Loop 1 button on the front panel of the amplifier to reach between 75%
6. Take an OP-FSM type magnetic field meter and take a first measurement in the center of your room
7. Then readjust the settings to -3dB in the center of the zone
8. Then follow the test procedure described in the OP-FSM manual to perform an IEC60118-4 compliant installation.

5.2 Setting up a master amplifier and a slave amplifier

5.2.1 Master amplifier

To know the different types of implementation of a low overflow loop system or single phased loops refer to paragraphs 6.3.2 and 6.3.3.

Depending on the type of amplifier of the LD series, the settings will be made differently:

- Units in the LD1/2/3.0 series will use a second (or more) unit for loop installations with phase shift
- The units of the LD1/2/3.2 series integrate a second amplifier in the unit which makes it possible not to use a second amplifier for the systems with low overflow, a second amplifier will be necessary as soon as a third loop will be installed.

Master amplifier is the unit to which the audio signal is connected at input 1, 2 or 3. This will be the basic signal, the phase shift module integrated in the units will then shift this signal by 90 ° or 0 ° to inject it into the next slave amplifier.
There is no particular setting to determine the slave amplifier, only the connection layout will define the slave amplifier and the master amplifier.

1. Power up your amplifier and check that all potentiometers are at 0
2. Connect your loop to the Loop terminal block
3. Connect a 1 kHz sinusoidal source to one of the inputs
4. Increase the input signal used on the front panel of the amplifier to between 75 and 85% of the input meter
5. Increase the output current via the Loop 1 button on the front panel of the amplifier to reach between 75%
6. Take an OP-FSM type magnetic field meter and take a first measurement in the center of your room
7. Also see section 5.2.2

5.2.2 Slave Amplifier

8. Power up your amplifier and check that all potentiometers are at 0
9. Connect your loop to the Loop terminal block
10. Connect the 6.35 jack cable to the IN jack
11. Disconnect the loop of the master amplifier
12. Increase the output current via the Loop 1 button on the front panel of the amplifier to reach between 75%
13. Take an OP-FSM type magnetic field meter and take a first measurement in the center of your room

5.2.3 Final adjustments

14. Connect the two loops and then adjust the settings until you reach a minimum signal of -3dB in the lowest receive area
15. Then follow the test procedure described in the OP-FSM manual to perform an IEC60118-4 compliant installation.

Nota : You can download a certificate to conformity template from our website www.opus-technologies.fr in the download section or use the one include at the end of this user manuel.

For more details on the IEC60118-4 standard settings contact us at contact@opus-technologies.fr or contact your local dealer.

5.3 Locking settings

The amplifiers are supplied with a Plexiglass plate that allows to are intended to close the setting buttons to avoid unwanted adjustments, as well as keep an eye on Led displays. The plate can be installed with or without the OP-R rack system.

5.4 Metal loss compensation adjustment

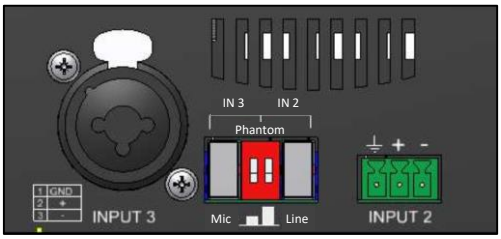
If you detect a distortion of the signal due to magnetic pollution, turn the MLC (Metal Loss Compensation) control on the front of the amplifier clockwise.
Check your measurements in high frequencies with a sine wave at 4kHz and adjust the compensation settings to achieve acceptable measurements to IEC60118-4.

5.5 Operation of the fault contact

When the amplifier is working properly the NO / NC relay is activated in the normally closed position: NC.
If the fault synthesis detects an operating problem (sectioned loop, bad loop impedance, faulty amplifier, etc.) the NO / NC relay is disabled on the normally open position: NO.

5.6 Audio Input

5.6.1 Audio source selection



The level of inputs 2 and 3 can be set according to the audio source used.

- When the audio source connected to one of the inputs is a microphone position the gray button pressed to the **Mic position**
- When the audio source connected to one of the inputs is line-level, set the gray button to the **Line position**

5.6.2 Phantom power

With the DIP switch on the rear panel of the amplifier (see you can turn on or off the phantom power of microphones that require power with the Phantom switch.

- When the audio source connected to one of the inputs is a microphone position the DIP switch up.
- When the audio source connected to one of the inputs is a microphone that does not require phantom power, or if it is not a microphone, set the DIP switch to the down position.

6. Understanding and planning of a loop system

6.1 Preamble

Studies have found that more than 60% of Magnetic Induction Loop installations, do not work or are not working well and are far from the requirements of the standard (IEC60118-4). Indeed, the great difficulty lies in the implementation of "the design of the loop". This observation has led us to seek and provide effective solutions to meet this standard.

It is therefore important to carefully follow the instructions that allow to ensure proper system operation and comply with the IEC60018-4 standard. Do not hesitate to contact us, we can support you in the study phase before the installation of the system.

6.2 Basic principles

6.2.1 Magnetic field :

When in a copper cable is fed with alternating current, it generates a magnetic field.

The intensity of the magnetic field is directly related to the intensity of the electric current flowing in the wire.

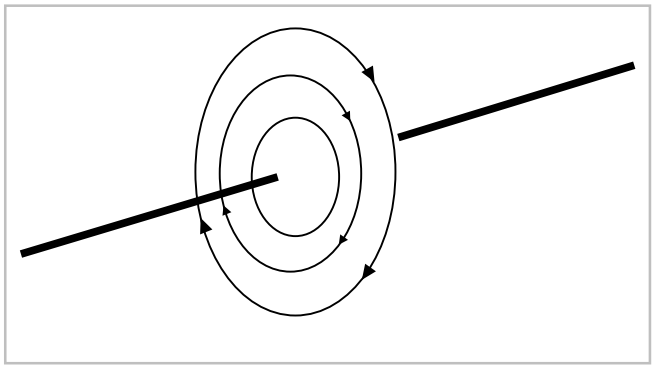
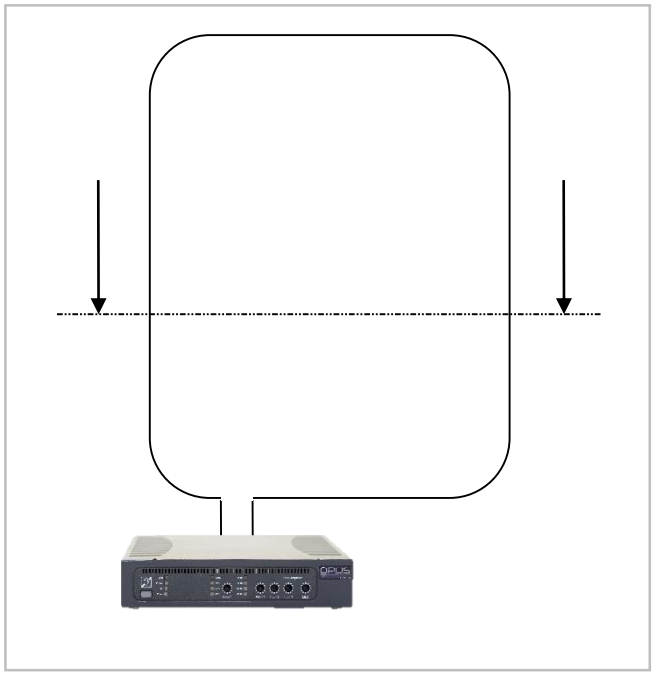


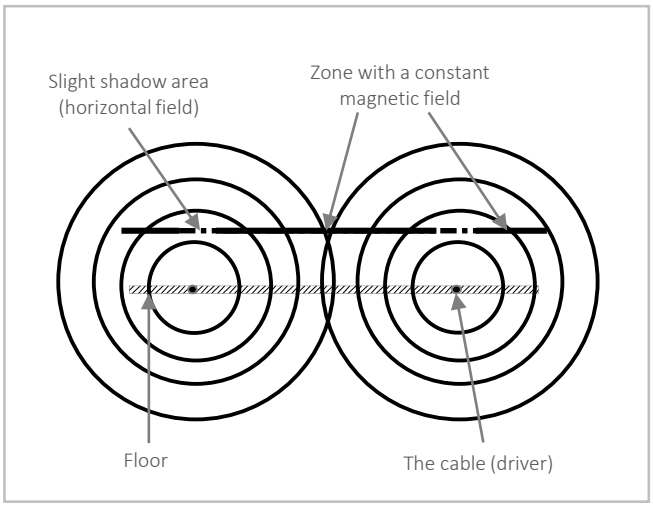
Illustration of an electromagnetic wave around a conductor - Figure 10

6.2.2 Diffusion of the magnetic field in a loop

When the intensity of the current flowing in a loop is adapted to the width of the room to be equipped, the radiation created allows to cover the whole room.



Top view of a loop installation in a room - Figure 11



Sectional view of a loop installation in a room - Figure 12

6.2.3 Composition of a system

A magnetic induction loop system is composed of:

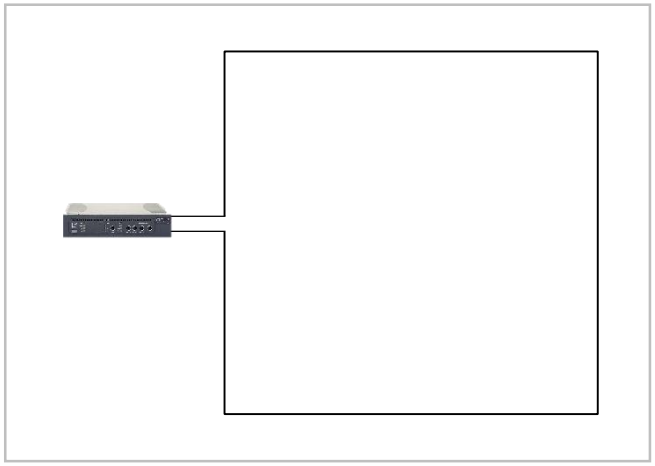
- An amplifier
- One or more loops created using a driver
- An audio signal (microphone or line)
- In some configurations, a twisted cable (REF: Opus : OP-LI5/10 or 15)

See figure 15

6.3 The different types of implantation

6.3.1 The simple loop

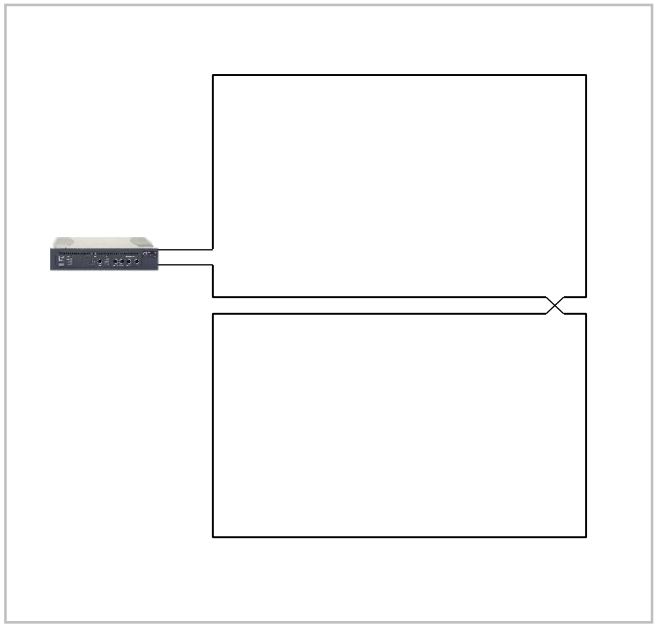
A simple magnetic loop is composed of an amplifier and one or more induction loops.



Implantation of a simple loop - Figure 14

6.3.2 The simple loop in the “8” form

In some configurations, it will be preferable to use an 8-loop rather than a simple loop to generate a stronger magnetic field on the surface to be covered. This type of implementation improves the coverage area.



Implantation of a simple loop in a “8” form- Figure 15

Why a loop in a “8” form?

- An 8-shaped magnetic loop reduces the crosstalk of the magnetic field
- It allows to cover more area and to have a homogeneity of cover
- Power consumption is also reduced since less electric current is need

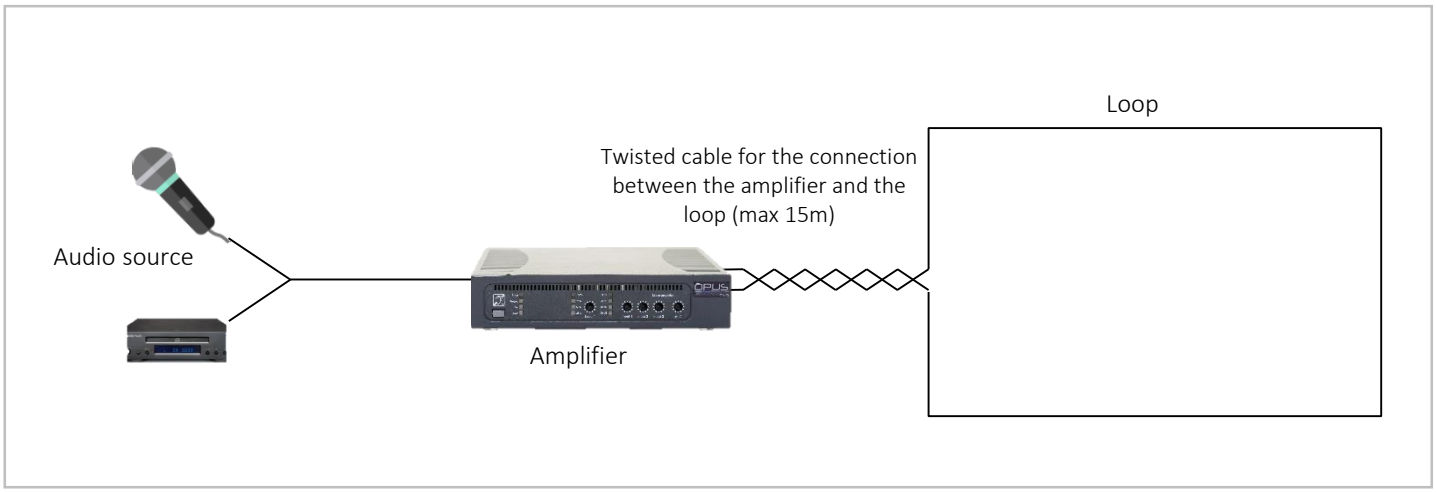
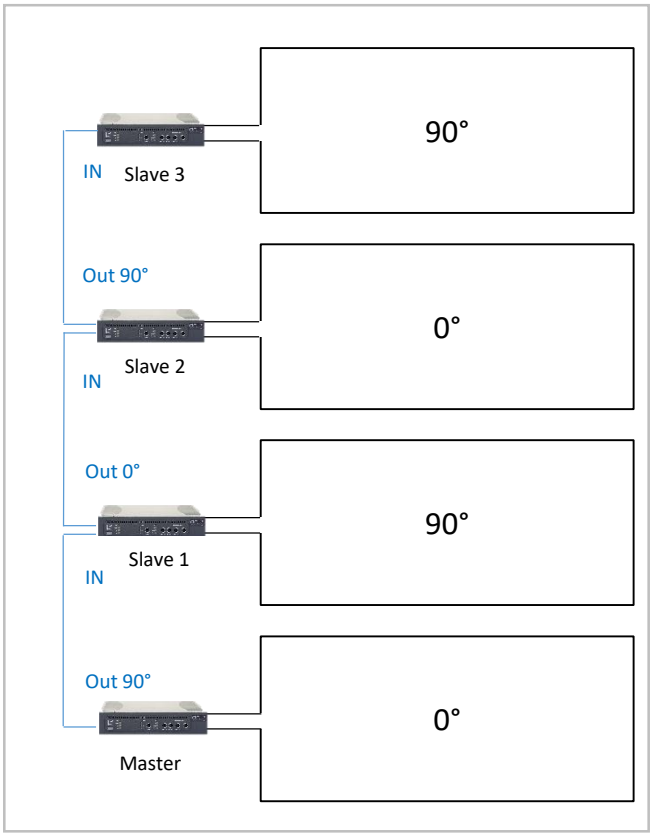


Illustration of a complete magnetic loop system - Figure 13

6.3.2 Phased simple loops

In order to allow more coverage in large spaces such as an exhibition park, a gym or a zenith, it is possible to install several simple loops using slave inputs and outputs..



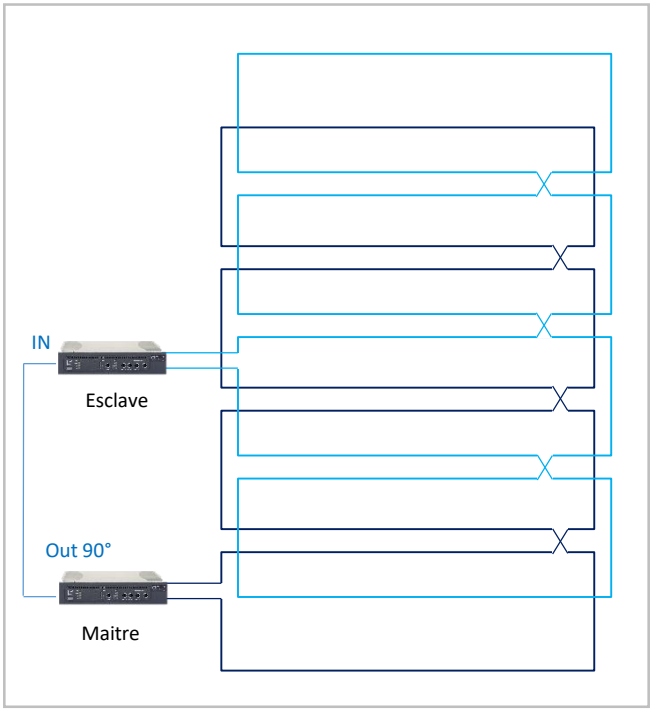
Implantation of a phased simple loop - Figure 16

See page 47 to understand the connection betewwen two amplifiers on this configuration.

6.3.3 Phased loops with low overspill

When several rooms are contiguous to each other, it is important to take into account the external radiation of the magnetic field. Indeed if the amplifier is adapted, a magnetic induction loop radiates perfectly in the desired area but also outside this area. Generally, the outer cover is equal to the width of the room and it takes 4 times the width to have a total isolation area.

To respond appropriately to this type of problem, there is a type of implementation that limits the emergence of the field. This type of installation also provides other benefits (see below).



Implementation of a system of phased loops - Figure 17

Why install low spill multi-loop ?

- Deletion of the directivity of the magnetic field (The vertical and horizontal fields are transmitted).
- No attenuation in the cover.
- Reduction of the electricity consumption.
- Better reproduction of the signal.
- Decrease in the influence of metals.
- Reduced risk of Larsen effect.
- External radiation reduced.

7. The magnetic induction loop

Installing a magnetic induction loop is a complex exercise. To ensure that it works properly, it is important to take into account several essential parameters and to adapt your installation according to the specificities of the place.
The following point allow to understand how tol maximize audio quality and minimize the variation in magnetic field strength.

7.1 Placing the loop

To locate the best location for a magnetic induction loop it is important to determine the listening height (human ear height) in the equipped area. For example in a conference room people are sitting so the listening height is between 1.10m and 1.40m.

For better audio performance, the position of the magnetic loop must respect a precise distance with this area. This distance must be between 11% and 16% of the width of the room.

Once this distance is determined it is possible to install the loop on the ground or on the ceiling (if it respects the recommended distances).

7.2 Thickness of the wire

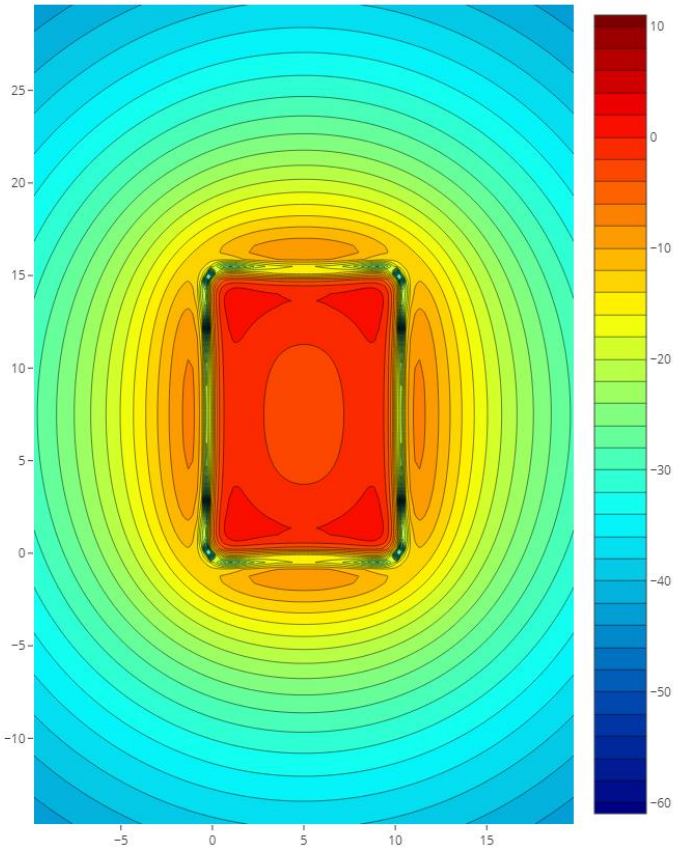
The resistance of the direct current depends on the diameter of the wire and its length. It must be between 1 and 3 Ω for an optimal result.
This result depends on the length of the wire and its section, you can use our Opus Smartloop simulation software.

7.3 The magnetic field

At 1.2m above ground level in the area surrounded by a magnetic induction loop, the vertical component of the magnetic field shall be 100mA / m +/- 3dB and peaks of field strength shall not exceed 400 mA / m.
The strength of the magnetic field depends on the electric current in the loop.

7.4 Connections

To connect the magnetic induction loop cables, twist the cables so that they are parallel and close. This position avoids unwanted inductions.

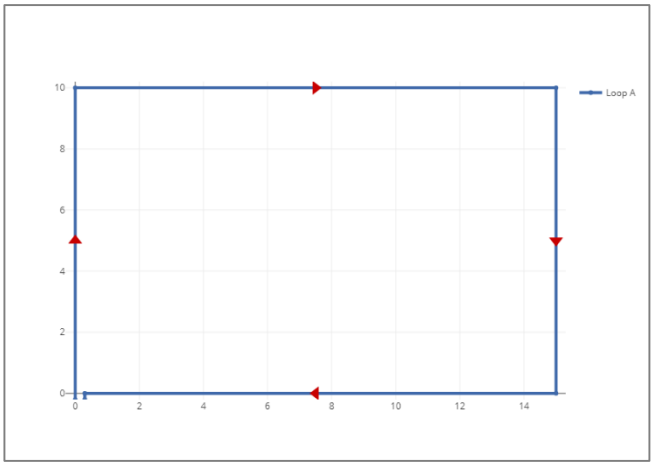


Magnetic field cover simulation with Opus Smartloop software - - Figure 18

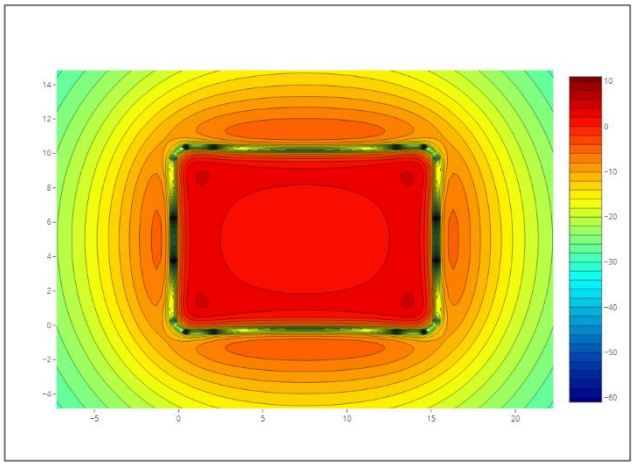
7.5 Loop layouts simulation

Magnetic field necessary to cover for a 15x10m room. Data from Opus Smartloop simulation tool.

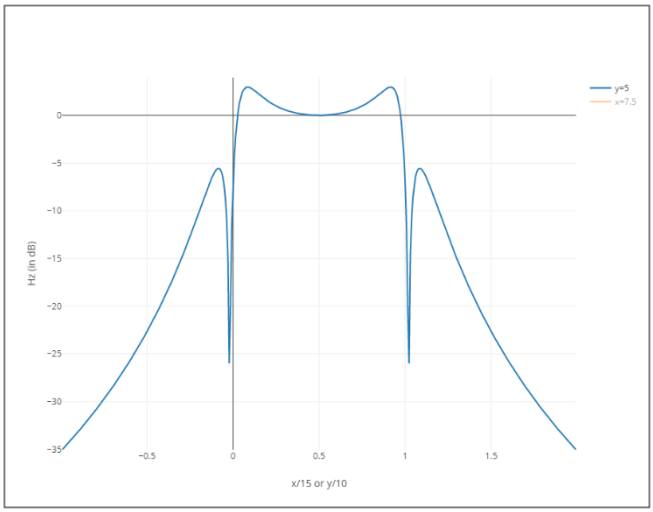
1. Simple loop:



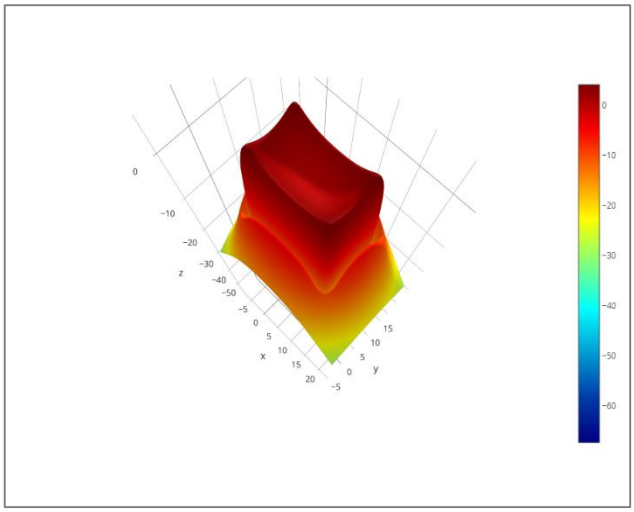
Simple loop layout



2D view of a simple loop magnetic field



Magnetic field variation of a simple loop



3D view of a simple loop magnetic field

Liste des fils disponibles:

Longueur de la boucle A: 50m

Longueur de la boucle B: 0

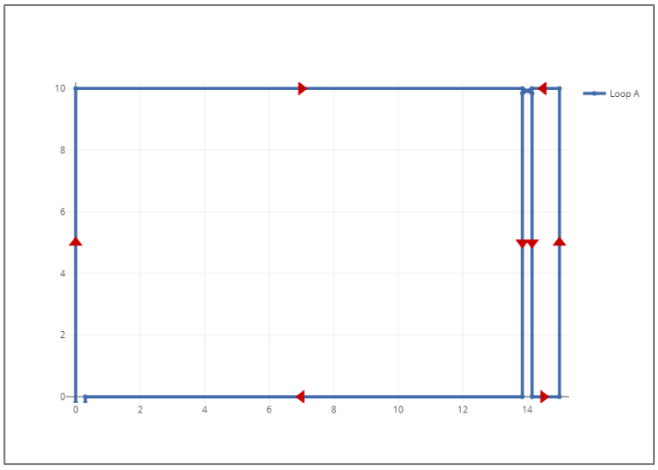
Section de fil	Boucle de résistance A
0,5 mm^2	1.72500 Ω
1,0 mm^2	0.86250 Ω
1,5 mm^2	0.57500 Ω
2,5 mm^2	0.34500 Ω
4,0 mm^2	0.21563 Ω
Feuille de cuivre	0.45395 Ω

Table of cable sections

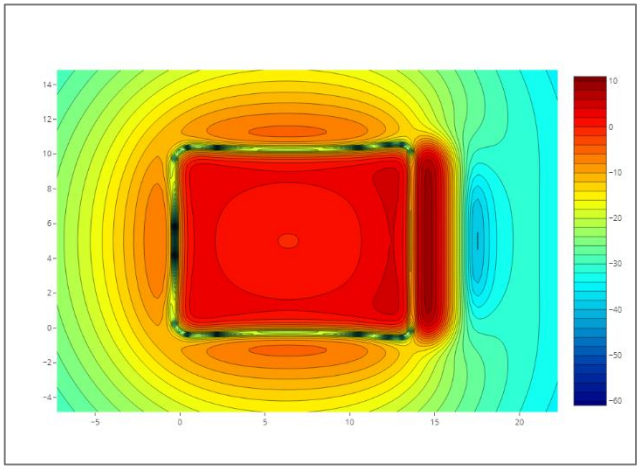
7.5 Loop layouts simulation

Magnetic field necessary to cover for a 15x10m room. Data from Opus Smartloop simulation tool.

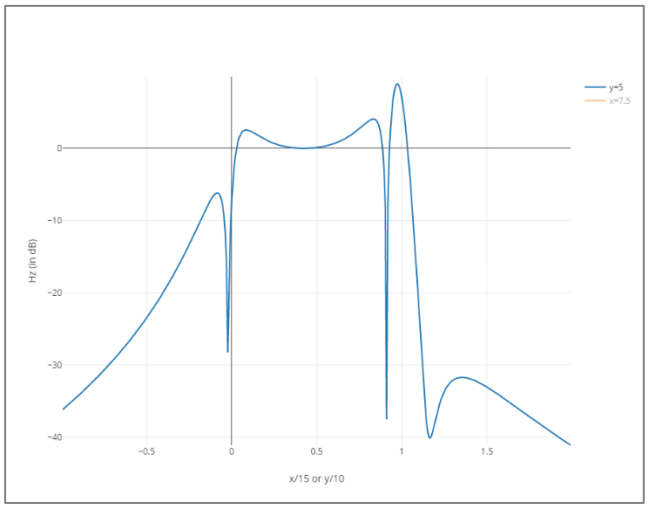
2. Cancellation loop:



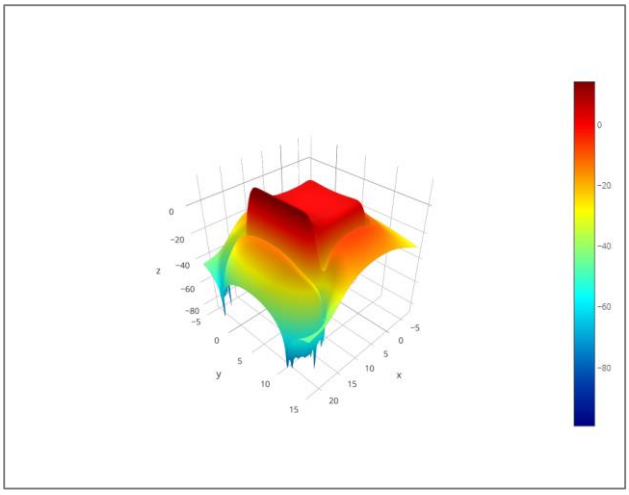
Cancellation loop layout



2D view of a cancellation loop magnetic field



Magnetic field variation of a cancellation loop



3D view of a cancellation loop magnetic field

Liste des fils disponibles:

Longueur de la boucle A: 92m

Longueur de la boucle B: 0

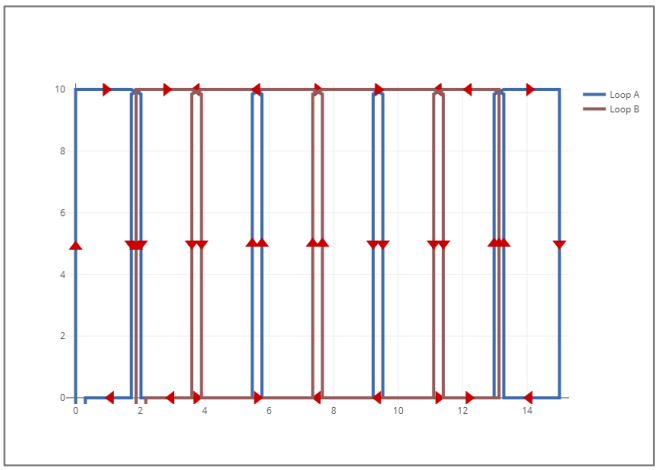
Section de fil	Boucle de résistance A
0,5 mm^2	3.17400 Ω
1,0 mm^2	1,58700 Ω
1,5 mm^2	1,05800 Ω
2,5 mm^2	0,63480 Ω
4,0 mm^2	0,39675 Ω
Feuille de cuivre	0,83526 Ω

Table of cable sections

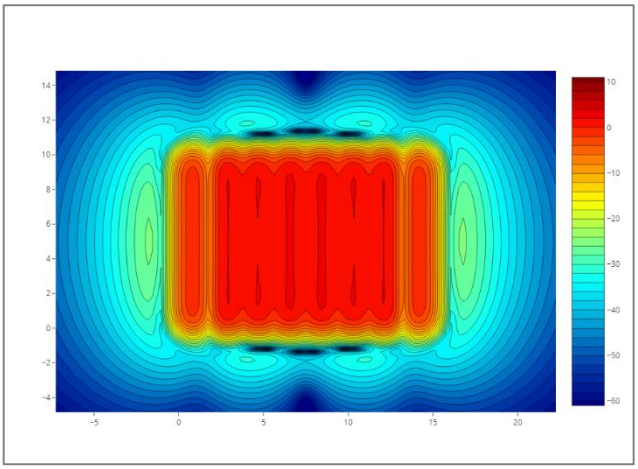
7.5 Loop layouts simulation

Magnetic field necessary to cover for a 15x10m room. Data from Opus Smartloop simulation tool.

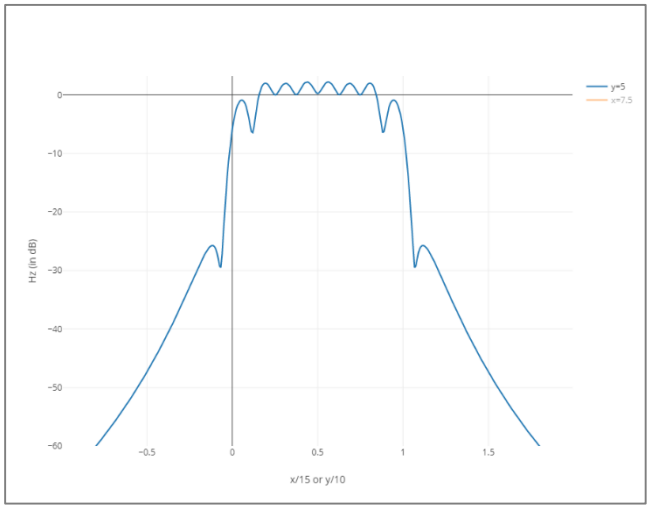
3. Ultra-low spill system :



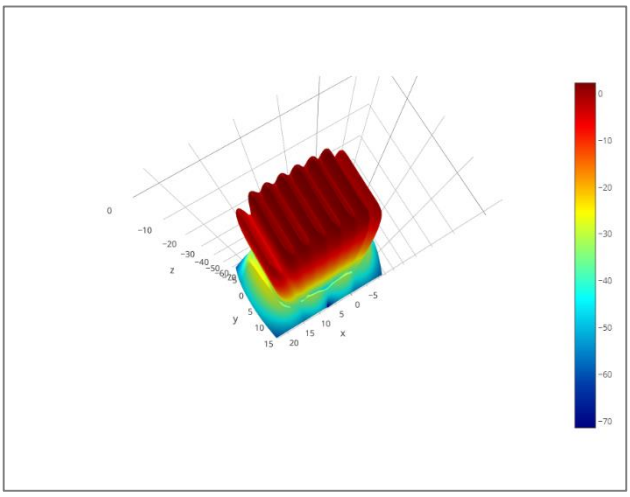
Ultra-low spill system layout



2D view of an ultra-low spill sytem magnetic field



Magnetic field variation of an ultra-low spill system



3D view of an ultra-low spill magnetic field

Liste des fils disponibles:

Longueur de la boucle A: 130m

Longueur de la boucle B: 102.5m

Section de fil	Boucle de résistance A	Boucle de résistance B
0,5 mm^2	4.48500 Ω	3.53625 Ω
1,0 mm^2	2.24250 Ω	1.76812 Ω
1,5 mm^2	1.49500 Ω	1.17875 Ω
2,5 mm^2	0.89700 Ω	0.70725 Ω
4,0 mm^2	0.56062 Ω	0.44203 Ω
Feuille de cuivre	1.18026 Ω	0.93059 Ω

Table of cable sections

To ensure compliance with the EN60018-4 standard when installing a magnetic induction loop, Opus Technologies and its local distributors will guide you in the study and implementation of your project.

Go to http://opus-technologies.com/contact-us/ to find your local distributor or to contact us.

8. Installation constraints

Some environments may interfere with magnetic loops, here are the main causes:

8.1 External overspill

The installation of a simple loop system is ideal for covering a room if the amplifier is properly sized, however it is important to note that the magnetic field of a loop will cover the interior of the room but also the 'outside. The larger the loop, the greater will be the overspill of it (note: in principle it takes 4 times the width of a loop to have a total isolation zone). This phenomenon of external spill can be problematic when it is necessary to equip several side by side rooms or for confidentiality reasons.

To overcome this problem, it is possible to create low overspill installations that will prevent the radiation of the magnetic field. See sections 6.3.3 et 7.5.3.

8.2 Distortion due to metal

The metal according to created distortions on the magnetic field in high frequencies and many buildings contain metal, especially in their structures.
To limit this malfunction we have created a tone compensation thanks to the MLC (for Metal Loss Compensation) setting on the front of the amplifiers.

9. Warranty and after-sales service

Opus Technologies amplifiers are manufactured in France according to strict specifications guaranteeing quality and reliability.

9.1 CE certifications

Opus Technologies amplifiers have been certified according to the following European standards :

- **EN55103-1:2009 + A1:2013 :** Electromagnetic compatibility. Product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use. Immunity .
- **EN60065-1:2015 :** Audio, video and similar electronic apparatus. Safety requirements
- **EN 60118:2014** Acoustics, hearing aid, acoustic frequency, magnetic field, field strength, measurement and characteristic.
  RoHS Directive : 2011 / 65 / EC

9.2 Warranty

Opus Technologies products have been designed to meet the needs of the end user and offer the best possible audio and reliability. The quality of manufacture allows to offer its customers 5 years of manufacturer's warranty.

9.3 After-sales service and product returns

Opus Technologies teams are committed to providing fast and efficient after-sales service. In case of product malfunction you should contact your local distributor or write to us at contact@opus-technologies.fr

Declaration of Conformity

October 16, 2016 in Pessac

AUDIOFILS

9 Chemin de la Vieille Ferme

33650 MARTILLAC – France

Declares that the product :

LD Series : Induction Loop Amplifier

Complies with the following directive and norms :

EN55103-1:2009 + A1:2013 : Electromagnetic compatibility. Product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use. Immunity

EN60065-1:2015 : Audio, video and similar electronic apparatus. Safety requirements

EN 60118:2015 for a maximal coverage of 1000 sqm² :

Acoustics, hearing aid, acoustic frequency, magnetic field, field strength, measurement and characteristic.

RoHS Directive : 2011 / 65 / EC

The amplifier must be adjusted and connected according to the Opus Technolgies instruction manual.

Lucas CASTELNAU

Manager Sales (AUDIOFILS)

AUDIOFILS SARL
9 Chemin de la Vieille Ferme
Bâtiment B
33650 MARTILLAC

Pierre DELAGE

Manager Development (NEOSYSTEMES)

Certificate of conformity IEC 60118-4

AFILSinstallation for accessibility of hearing impaired people in publicvenues

OPUS Technologies

Costumer Informations	Installer Informations
Client :	Installer :
Room :	Company :
Adresse :	Device :
	Serial Number :
	Tested by :

1 ROOM SKETCH

Draw the room and the coverage area indicating measurement points and background noise

2 SEARCH FOR BACKGROUND NOISE AND INTERFERENCES

Amplifier off and OP-FSM in "-20dB" position. Note the tolerable or polluted interference on the sketch

Warning: The existence of areas polluted by background noise compromises the conformity of the system with the IEC 60118-4 standard

Acceptable backgroud noise zones **> - 32 dB** ☐	**Tolerable** backgroud noise zones **> - 22 dB** ☐	Backgroud noise **polluted** areas **< - 22 dB** ☐

3 MAKE MEASURES

Draw on the sketch 6 to 8 points corresponding to measurements made sitting (A) and standing (A1) at different points of the room.
IEC 60118-4 standard states that the listening height is 1.2m for a sitting position and 1.7m for standing. Hold the OP-FSM always verticaly .

Measuring points		A	B	C	D	E	F	A1	B1	C1	D1	E1	F1
Magnetic field (dB)) *Before settings, with pink noise*													
Frequency response *After settings*	100KHz												
	1KHz												
	5KHz												
Magnetic field (dB) *After settings, with audio source*													

4 SETTINGS MADE

Draw the adjustments made on the magnetic induction loop amplifier

Loop2 ◯ Loop1 ◯ Input1 ◯ Input2 ◯ Input3 ◯ MLC ◯

5 FINAL CHECKS

Once the tests are completed, the staff of the equipped site must be informed and prepared to guide the hearing impaired in the use of the system.
The "T-Coil Heaing Aidr" sticker must be glued and visible to visitors. Otherwise, the installation cannot be declared in accordance with IEC 60118-4

Trained staff member :

Visible stickers ? YES☐ NO☐

Comments :

System installation complies with IEC 60118-4 YES ☐ NO ☐

Name :
Surname :

Date :
Signature :

Cut along dotted lines

NOTES

For any questions, contact us.

OPUS TECHNOL£OGIES — ZI Lagrange II — 9 Chemin de la Vieille Ferme — 33650 MARTILLAC
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09/2018