

# O<sub>2</sub> SERIES

USER MANUAL



USER MANUAL  
VERSION : 1.01  
DATE : 06/10/10



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## I.



## Introduction

Thank you for selecting NEXO Alpha Series. This manual is intended to provide you with necessary and useful information about your Alpha System:

- S2
- B1-15, B1-18
- M3, M8
- EM, EF

Please devote some attention to reading this manual. A better understanding of some specific features of the Alpha Series will help you to operate your system to its full potential.

This manual is intended to be comprehensive, and we hope that it will satisfy your requirements. Should you require further information, please contact your NEXO agent.



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# PLEASE READ CAREFULLY BEFORE PROCEEDING

## BASIC PRECAUTIONS

**Do not open** the speaker system or attempt to disassemble the internal parts or modify them in any way. The speaker system contains no user-serviceable parts. If it should appear to be malfunctioning or damaged, discontinue use immediately and have it inspected by qualified NEXO service personnel.

**Water exposure:** Do not expose the speaker system to direct rain, do not use it near water or in wet conditions. Do not place containers with liquid on speaker system as they might spill into openings. If any liquid such as water seeps into the speaker system, have it inspected by qualified NEXO personnel.

## SYSTEM DEPLOYMENT SAFETY RULES



**Read User Manual before deployment.** Before use of enclosed speaker system, please ensure that anyone involved in system deployment understands the rigging – stacking – pole mounting safety rules as described in the speaker system User Manual. Failure to do this exposes people to potential injury or death.

Always consult qualified NEXO personnel if the device installation requires construction work and make sure to observe the following precautions:

### Mounting precautions

- choose mounting hardware and an installation location that can support the weight of the speaker system;
- do not use speaker system handles for suspended installation;
- do not expose speaker system to excessive dust or vibration, or extreme cold or heat to prevent possibility of component damage;
- do not place the speaker system in an unstable position from which it might fall accidentally;
- if speaker systems uses a stand, ensure that stand specifications are adapted, and that stand height does not exceed 1.40m/55"; never move the stand while the speaker is in position.

### Connection and powering precautions

- remove all connected cables before moving the speaker system;
- turn off AC power of all power amplifier units before connecting the speaker system;
- when turning on the AC power to the audio system, always turn on the power amplifier last; when turning the AC power off, always turn off the power amplifier first;
- when used in cold conditions, a gradual power ramp up should applied to the system on an 5 mn period to allow the loudspeaker components to stabilize during the very first minutes of usage.

**Inspect the speaker system periodically.**



**SAFETY INSTRUCTIONS FOR NEXO TD CONTROLLERS**



NEXO ANALOGUE PSTDCONTROLLERS, NX242 DIGITAL CONTROLLER, NXAMP4x1 AND NXAMP4x4 POWERED CONTROLLERS ARE CLASS 1 APPARATUS AND MUST BE EARTHED.

THE GREEN AND YELLOW WIRE OF THE MAINS CORD MUST ALWAYS BE CONNECTED TO AN INSTALLATION SAFETY EARTH OR GROUND. THE EARTH IS ESSENTIAL FOR PERSONAL SAFETY AS WELL AS THE CORRECT OPERATION OF THE SYSTEM, AND IS INTERNALLY CONNECTED TO ALL EXPOSED METAL SURFACES.

- Read these instructions.
- Keep these instructions.
- Heed all warnings.
- Follow all instructions.
- Do not use this apparatus near water.
- Clean only with dry cloth.
- Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
- Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
- Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet. (US market)
- Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
- Only use attachments/accessories specified by the manufacturer.
- Unplug this apparatus during lightning storms or when unused for long periods of time.
- Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

 The lightning flash with arrowhead symbol, within an equilateral triangle is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.	 <div style="background-color: black; color: white; padding: 2px; display: inline-block; font-weight: bold;">CAUTION</div> <small>RISK OF ELECTRIC SHOCK DO NOT OPEN</small> 	 The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.
<p><b>WARNING: To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.</b></p> <p>To avoid electrical shock, do not remove covers.                  Dangerous voltages exist inside.                  Refer all servicing to qualified personnel only.</p>		



### HIGH SOUND PRESSURE LEVELS



**Exposure to extremely high noise levels may cause permanent hearing loss.** Individuals vary considerably in susceptibility to noise-induced hearing loss but nearly everyone will lose some hearing if exposed to sufficiently intense noise for a sufficient period of time. The U.S. Government's Occupational and Health Administration (OSHA) has specified the following permissible noise level exposures: Sound Duration Per

Day In Hours	Sound Level dBA, Slow Response
8	90
6	92
4	65
3	97
2	100
1 ½	102
1	105
½	110
¼ or less	115

According to OSHA, any exposure in excess of the above permissible limits could result in some hearing loss. Ear plugs or protectors to the ear canals or over the ears must be worn when operating this amplification system in order to prevent permanent hearing loss, if exposure is in excess of the limits as set forth above. To ensure against potentially dangerous exposure to high sound pressure levels, it is recommended that all persons exposed to equipment capable of producing high sound pressure levels such as this amplification system be protected by hearing protectors while this unit is in operation.

### DISPOSAL OF OLD ELECTRICAL & ELECTRONIC EQUIPMENT



This symbol on the product or on its packaging indicates that it shall not be treated as household waste. Instead it shall be handed over to the applicable collection point for the recycling of electrical and electronic equipment. By ensuring this product is disposed of correctly, you will help prevent potential negative consequence for the environment and human health, which could otherwise be caused by inappropriate waste handling of this product. The recycling of materials will help to conserve natural resources. For more detailed information about recycling of this product, please contact your local city office, your household waste disposal service or the shop where you purchased the product.



# 1. Alpha Series description

## 1.1. LOUDSPEAKERS

The Alpha range includes the following speakers :

- The S2 Sub-bass is a double 18-inch resonator loaded sub-bass, dedicated to very low frequency reproduction ( < 80 Hz ) ;
- The B1-15 & B1-18 are complex loaded (bass-reflex & exponential horn) bass cabinets ; the B1-15 houses one 15-inch driver, while the B1-18 houses one 18-inch driver ; frequency response ranges from 40 Hz up to 200 Hz ;
- The Mid-high M3 & M8 are concentric horn cabinets dedicated to the 200 Hz - 20 kHz frequency range reproduction ; the MF range is handled by two exponential horn loaded 10-inch drivers whose response is optimised by two Nexo designed phase plugs ; the HF range is handled by one constant directivity horn loaded two-inch Neodymium driver.; M3 coverage is 35° (H) x 35°(V), M8 75° (H) x45° (V) ;
- The Mid-high EM forms part of the recently introduced Alpha E Series; its size and power-rating is smaller than that of the Alpha M3 & M8 ; the mid range is handled by an exponential horn loaded 10" driver, while the HF range is handled by a constant directivity horn loaded ceramic 2" driver. Alpha EM coverage is 75°x30°.
- The compact EF is dedicated to the full audio range reproduction 40 Hz – 20 kHz ; it resembles one EM and one B1-18 stacked in a monoblock compact format.

Alpha cabinet formats are designed for optimal array assembly (see section VII "Dimensions") ; all the cabinets have the same width and depth, height is in multiples of 200 mm.

- Double height (1200 mm ) : Alpha S2, Alpha EF ;
- 4/3 height (800 mm ) : Alpha B1-18 ;
- Single height (600 mm) : Alpha B1-15, Alpha M3, Alpha M8 ;
- 2/3 height (400 mm) : Alpha EM

## 1.2. NEXO TDCONTROLLERS

The Alpha Series speakers are associated with the following Nexo TDcontrollers :

- SubTDcontroller : Alpha S2 ;
- AlphaTDcontroller : Alpha B1-15, B1-18, M3 & M8 ;
- AlphaETDcontroller : Alpha B1-18, EM & EF ;
- NX241 Digital TDcontroller : all current Nexo speakers.

## 1.3. THE X-BOW FLYING SYSTEM

The design of the X-BOW flying system has been optimised for the dispersion specifications of the Alpha range, its mechanical characteristics match accurately the acoustical properties of the speakers.

The concept of this flying system enables efficient array assembly, with minimum space between cabinet, thus reducing edge diffraction.



The X-BOW flying system includes four main components, references are:

- ALXBOW : main chassis (1) ;
- ALXKIT : hinge (1) and cable links (2) ;
- ALXBRIDLE : D-ring (1) and leg chains (3);
- ALXCASE : flight-case for a complete X-BOW flying kit (capacity :4 X-Bows).

## 2. General Setup Instructions

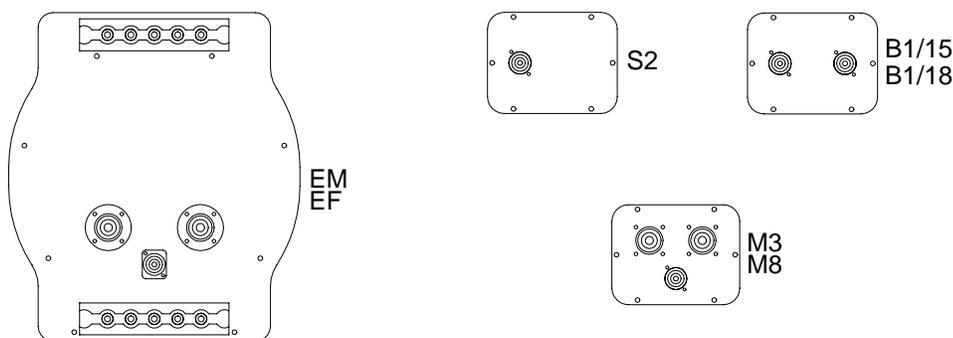
### 2.1. SPEAKER WIRING

#### 2.1.1. CONNECTORS

The loudspeakers are connected via SPEAKON connectors, NL4FC and NL8FC (not supplied). A wiring diagram is printed on the connection panel located on the back of each cabinet.

The pins of the SPEAKON plugs are identified in/out and paralleled within the enclosures. Each of these connectors can thus be used independently and simultaneously receive the power amplifier signal feeding the main and the sub-bass systems : a single 8 conductors cable can connect the amplifier rack and the speaker.

*NB : Alpha S2 back panel features only one 4-pins SPEAKON connector, in order to prevent paralleling : very few amplifiers could drive such low impedance loads.*



CONNECTOR		S2	B1-15 / B1-18	M3 / M8	EM / EF
SP4 #1	1 ±	In / Out VLF	To VLF (S2)	To VLF (S2)	To VLF (S2)
	2 ±	Not connected	In / Out LF (B1)	To LF (B1)	To LF (B1)
SP4 #2	1 ±	-	To VLF (S2)	-	-
	2 ±	-	In / Out LF (B1)		-



SP8 #1	1 ±	-	-	In VLF (S2)	In / Out VLF (S2)
	2 ±	-	-	In / Out LF (B1)	In / Out LF (B1)
	3 ±	-	-	In / Out MF	P : In / Out MF+HF A : In / Out MF
	4 ±	-	-	In / Out HF	P : Not connected A : In / Out HF
SP8 #2	1 ±	-	-	In VLF (S2)	In VLF (S2)
	2 ±	-	-	In / Out LF (B1)	In / Out LF (B1)
	3 ±	-	-	In / Out MF	P : In / Out MF+HF A : In / Out MF
	4 ±	-	-	In / Out HF	P : Not connected A : In / Out HF

*P = MF-HF passive / A = MF-HF active*

### 2.1.2. CABLES

Nexo recommends the exclusive use of multi-conductor cables to connect the system : the cable kit is compatible with all the cabinets, and there is no possible confusion between VLF, LF, MF and HF sections.

Cable choice consists mainly of selecting the correct cable section (size) in relation to the load resistance and the cable length. Too small a cable section will increase its serial resistance, this would induce power-loss and response variations (damping factor).

For a serial resistance less or equal to 4% of the load impedance (damping factor = 25), the maximum cable length is given by :

$$L_{\max} = Z \times S \quad S \text{ in mm}^2, Z \text{ in Ohm, } L_{\max} \text{ in meters}$$

The table below indicates these values, for 3 common sizes.

Load Impedance (Ω)	2	3	4	6	8	12	16
Cable section	Maximum Length (meters)						
1,5 mm <sup>2</sup> (AWG #14)	3	4.5	6	9	12	18	24
2,5 mm <sup>2</sup> (AWG #12)	5	7.5	10	15	20	30	40
4 mm <sup>2</sup> (AWG #10)	8	12	16	24	32	48	64

#### Important :

- long speaker cables induce capacitive effect that damage the quality of the audio signal (up to hundreds of pF depending on the quality of the cable, with a low-pass effect in high frequencies) ;
- if long speaker cables are to be used, insure that they do not remain coiled while in use. .



## 2.2. FLYING THE SYSTEM

Alpha Series loudspeakers are equipped with steel anchor plates that can be fitted with the corresponding Fly Rails. The X-Bow flying system is supplied as an accessory. **The X-Bow Flying Manual must be read before flying the system.**

The following points are designed to remind the user of safe practice when flying the X-Bow system. They cannot address every possible circumstance in which the system might be deployed, therefore the user must always apply his or her knowledge and experience. If in doubt, seek advice from your NEXO agent.

### 2.2.1. FLOWN SYSTEMS SAFETY

- Always inspect all the X-Bow components and cabinet Fly Rails for damage before assembly. Pay special attention to the lifting points, trombone sockets and safety clips. If you suspect that any of the components are defective, DO NOT USE THE AFFECTED PARTS. Contact your supplier for replacements.
- Read the X-Bow Flying manual carefully. Also, be familiar with the manuals and safe working procedures for any ancillary equipment which will be used with the X-Bow.
- Ensure that all local and National regulations regarding the safety and operation of flying equipment are understood and adhered to. Information on these regulations can usually be obtained from Local Government Offices.
- When deploying the X-Bow system always wear protective head wear, footwear and eye protection.
- Do not allow inexperienced persons to handle X-Bow flying systems. Installation personnel should be trained in loudspeaker flying techniques and should be fully conversant with this manual.
- Ensure that motor hoists, hoist control systems and ancillary rigging components are currently certified as safe and that they pass a visual inspection prior to use.
- Ensure that public and personnel are not allowed to pass beneath the system during the installation process. The work area should be isolated from public access.
- Never leave the system unattended during the installation process.
- Do not place any object, no matter how small or light, on top of the system during the installation procedure. The object may fall when the system is flown and is likely to cause injury.
- Secondary safety steels must be installed once the system has been flown to the operating height. Secondary steels must be fitted irrespective of the local safety standards applicable to the territory.
- Do not fly the system over areas to which the audience has access.
- Ensure that the system is secure and prevented from pivoting about the motor hoist. Avoid any form of dynamic loading to the assembly.
- NEVER attach any item to the X-Bow other than the NEXO X-BOW accessories.
- When flying outdoor systems ensure that the system is not exposed to wind or snow loads and is protected from rainfall.
- The X-BOW requires regular inspection and testing by a competent test centre. NEXO recommend that the system is load tested and certified annually or more frequently if local regulations require.
- When de-rigging the system ensure that the same duty of care is given to the procedure as for the installation. Pack X-BOW components carefully to prevent damage in transit.



- Correct training is fundamental to safe practise when working with loudspeakers flying systems. NEXO recommend that users contact local industry associations for information on specialist course. Information for UK and International training agencies can be obtained by contacting :

The Production Services Association (PSA),  
 School Passage,  
 Kingston-upon-Thames,  
 KT1 SDU Surrey,  
 ENGLAND  
 tel : +44 (0) 181 392 0180

### 2.2.2. GROUND STACKS SAFETY

Statistically, many more injuries occur due to unstable ground stacked PA systems than those associated with flown systems. There are several reasons for this fact, however the message is clear :

- Always survey the supporting structure upon which a ground stack is to be built. Always look beneath PA wings to inspect the deck support and if necessary ask for the stage scrims and dressings be removed to allow access.
- X-BOW components can be used to stabilise ground stacks and to ensure that cabinets remain securely registered to each other.
- If the stage surface slopes, as it does in some theatres, ensure that the system is prevented from sliding forwards due to vibration. This may require the fitting of timber battens to the stage floor.
- For outdoor systems ensure that that the system is protected from wind forces which might cause the ground stack to become unstable. Wind forces can be huge, especially upon large systems, and should never be underestimated. Observe meteorological forecasts, calculate the likely effect upon the system prior to erection and ensure that the system is secured appropriately.
- Take care when stacking cabinets. Always employ safe lifting procedures and never attempt to build stacks without sufficient personnel and equipment.
- Never allow anyone, whether operators, artists or members of the public to climb onto a ground stacked PA system. Anyone who must climb over 2m high should be fitted with suitable safely equipment including a clip-on harness. Please refer to local Health and Safety legislation in your territory. Your dealer can help with advice on access to this information.
- Apply the same attention to all safety matters when de-stacking systems.
- Be aware that safety procedures are as important in the truck and in the warehouse as they are at the venue.



## 2.3. TDCONTROLLERS SETTINGS

The Alpha Series speakers do not work properly without their associated TDcontrollers.

Sound quality, reliability are totally dependent on the proper use of the TDcontrollers, in agreement with Nexo instructions.

- SubTDcontroller : Alpha S2 ;
- AlphaTDcontroller : Alpha B1-15, B1-18, M3 & M8 ;
- AlphaETDcontroller : B1-18, EM & EF ;
- NX241 Digital TDcontroller : all current Nexo speakers.

**These device manuals must be read before set-up.**

### 2.3.1. SUBTDCONTROLLER + S2 PARAMETER BOARD

The SubTDcontroller output is a monophonic low-pass filtered sum of Left and Right inputs ; Therefore, stereophonic use of Alpha S2 requires 2 SubTDcontrollers.

Connecting one single input of the device will reduce signal output by 6 dB. Three different solutions can be applied to compensate for this 6 dB loss :

- Increase the output level on the front panel potentiometer by 6 dB ;
- move the J4 jumper on the mother board to the "A" position (refer to SubTDcontroller manual) ;
- parallel the inputs with a "Y" split signal cable.

*NB : the S2 parameter board disables the main system left an right XLR outputs, as well as the Burst generator*

Front panel phase switch and "Sub Delay" / "Sub Fine Delay" potentiometers are usefull to align properly Alpha S2 phase relatively to Alpha B1. Below is what must be done depending on the vertical alignment of the speakers :

S2 & B1 in the same vertical plane : phase Switch in "INV" position, « Sub Delay » potentiometer at "0" position, , « Sub Fine Delay » rotated 3 steps to the right from the "0" position ;

S2 forward : phase Switch in "INV" position, « Sub Delay » and « Sub Fine Delay » potentiometers adjusted to the average offset distance

S2 backward : : phase Switch in "INV" position, « Sub Delay » and « Sub Fine Delay » potentiometers at "0" position.

### 2.3.2. ALPHATDCONTROLLER

The AlphaTDcontrollers features the following adjustments :

- LF, MF & HF ouput level ( +/- 6 dB ) ;
- « Array EQ » potentiometer (see section III.2) ;
- « X-Over / Wideband » switch.

If the main system is to be used without Alpha S2 sub-bass cabinet, the AlphaTDcontroller must be used in the "Wideband" mode : the B1-15 response is then extended down to 42 Hz (B1-18



down to 40Hz).

On the contrary, if the system includes Alpha S2 sub-bass cabinets, and the required SPL level in the LF region is important, it is then recommended to switch to the “X-Over” mode.

It is also possible to overlap the S2 and B1 responses by switching the AlphaTDcontroller to “Wideband” mode : the radiated energy will increase in the 40 Hz – 80 Hz range, but the Alpha B1 power capability will decrease.

### 2.3.3. ALPHAETDCONTROLLER (FOR USE WITH ALPHA E SERIES)

The AlphaETDcontroller LF output is a low-pass filtered monophonic sum of the stereo inputs ; MF/HF outputs are stereophonic.

The only available front panel adjustment is the LF output level, on a 12 dB range :

- LF mono , 1 AlphaETDcontroller, 2 inputs connected : the recommended position is “2” ;
- LF stereo, 2 AlphaETDcontrollers with 1 input connected : the recommended position is “1”.

The cross-over frequency between Alpha B1-18 and EM being located around 200 Hz, a monophonic use of the LF range induces random phase relation between cabinets (image distortion, inaccurate low-mid frequency reproduction) ; therefore, except for some specific situation (stadium PA systems, announcements...), Nexo do not recommend monophonic use of the LF range.

### 2.3.4. NX241 DIGITAL TDCONTROLLER

The digital NEXO NX241 controller is able to drive the entire current Nexo range (PS & Alpha series). Different software setups are loaded for the Alpha Series :

- Alpha B1-18 / EM / EF : NEXO NX241 is stereo in configuration (2 inputs, 4 outputs).
- Alpha S2 / B1-15 / M3 & M8, Full Range Mode : NEXO NX241 is in mono configuration (1 input, 4 outputs)
- Alpha S2 / B1-15 / M3 & M8, Aux Sub Mode : NEXO NX241 is in mono configuration, “Aux Sub” input drives output “1”, “Full Range” input drives outputs 2, 3 and 4 ;
- Other setups are loaded, please refer to the NEXO NX241 user manual in order to avoid inappropriate configurations that could damage your speakers.

#### Very important :

*Due to the DSP processing time, there is no compability between analog SubTD / AlphaTD / AlphaETD controllers and Digital NX241 unless the signal feeding the analog devices is delayed by 1.4 ms.*



## 2.4. INITIAL SET-UP PRECAUTIONS

When starting up a system including brand new cabinets, NEXO recommends gradual power ramp up. The loudspeaker components may need stabilising during his very first hours of usage. This is particularly true for adhesives within the speaker's moving assemblies.

In all cases, it is advisable to connect the loudspeakers only after all the other components have been wired and are operating correctly. This is particularly important for the amplifiers and the TDcontroller. It is a good practice to turn down all the amplifier gains before connecting the cabinets and then turn them up again individually with a medium level music source fed into the system. The sense LEDs of the corresponding TDcontroller channel should light up accordingly. This will help to locate cabling errors, particularly channel line inversions which would disable the TDcontroller protections and may invalidate the warranty.

## 3. Alpha Arrays - Some Basic Rules

The concept of arraying speakers derives from two requirements :

- increased sound pressure level ;
- extended coverage area.

Array behaviour is very complex, and a bad design can lead to very poor results. The Alpha system was designed to be flexible, allowing the user to optimise his design for a dedicated situation ; its development included a long measurement program on a very large variety of arrays. Below are some simple rules that the user must respect in his design.

### 3.1. ALPHA S2 PLACEMENT

The nominal efficiency data for Alpha S2 is given for when positioned on the floor (half-space). When flown, the sensitivity is 3 dB lower ; on the contrary, if the Alpha S2 is positioned in an angle - respectively in a corner -, the sensitivity will increase by 3 dB - respectively by 6 dB.

### 3.2. SPL VERSUS FREQUENCY

Array frequency response is strongly related to wavelength and array architecture.

- At low frequencies, wavelength being very large in relation to the size of the cabinets, speakers set close to each other will always radiate in phase. The gain in sound pressure level  $L_{GSPL}$  will be of 6 dB per doubling, i.e. if  $n$  Alpha S2 or B1 are installed :

$$L_{GSPL}(20\text{Hz}-100\text{Hz}) = 20 \log_{10}(n)$$

- In the mid frequency range, the gain depends on the configuration of the array, and will range from 3 to 6 dB per doubling, i.e. for  $n$  Alpha M3, M8, EM or EF :

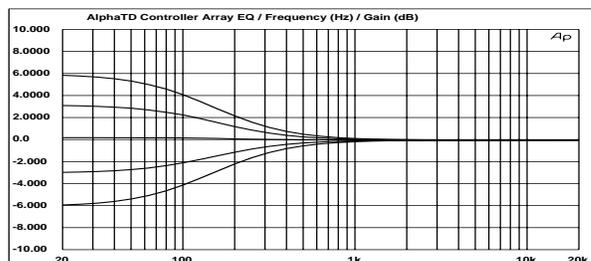
$$10 \log_{10}(n) \leq L_{GSPL}(100\text{Hz}-1\text{kHz}) \leq 20 \log_{10}(n)$$



- At high frequencies, wavelength being short in relation to the size of the cabinet, the gain level is smaller : no gain will be obtained for cabinets angled at their nominal coverage, maximum gain will be obtained for  $n$  cabinets pointing in the same direction. Therefore, the gain will range from 0 to 3 dB per doubling ; for  $n$  Alpha M3, M8, EM or EF :

$$0 \leq L_{\text{GSPL}}(1\text{kHz}-10\text{kHz}) \leq 10 \log_{10}(n)$$

- The Alpha TDcontroller Array EQ is derived from array measurements to compensate the array coupling effect.



Alpha TDcontroller Array EQ

### 3.3. SPL VERSUS DISTANCE

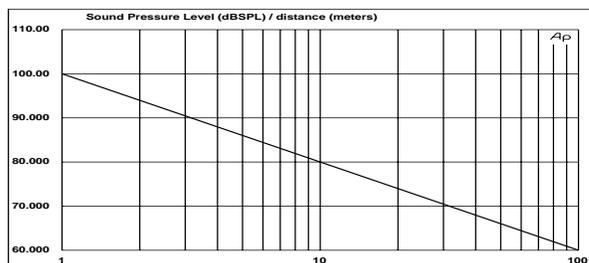
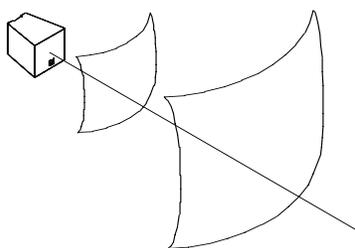
In open-air conditions, the level of sound at a given distance is related to the following parameters :

- the size and the geometry of the source, which determines the shape of the sound wave (spherical, cylindrical, plane) ;
- hygrometry and temperature : viscosity of the air and thermal conduction cause an energy loss increasing with frequency. This phenomena is referred to as excess attenuation.

#### 3.3.1. SINGLE CABINET

$L_p(1\text{m})$  being the sound pressure level at 1m, the level at a distance  $d$  (in meters) is given by :

$$L_p(d) = L_p(1\text{m}) - 20 \log_{10}(d)$$



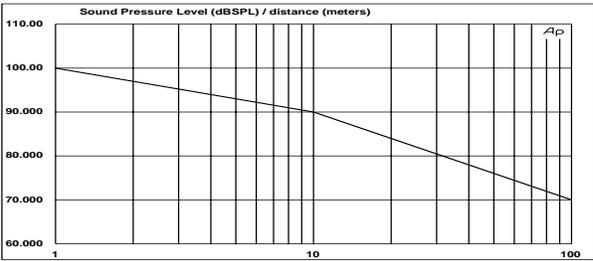
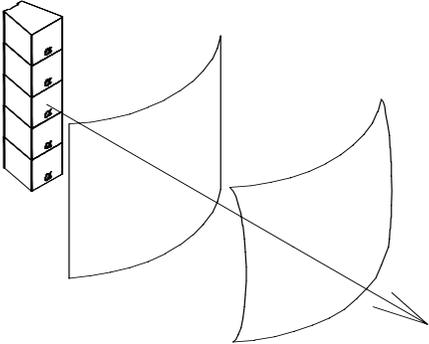
Single Cabinet SPL versus Distance



For example, if the level measured at 1 meter is  $L_p(1m) = 100$  dB SPL, the level at 2 meters will be 94 dB SPL, 80 dB SPL at 10 meters and so on. Note that under these conditions of small source and open air, the sound pressure level will be decreasing by 6 dB when doubling the distance.

**3.3.2. STRAIGHT VERTICAL ARRAY (LONG THROW)**

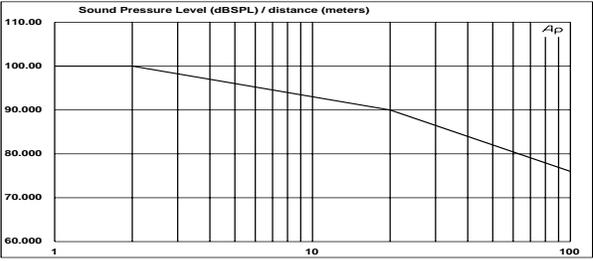
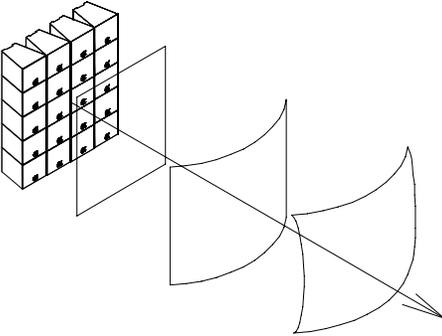
Some open-air applications might require loud level on a wide frequency range at a long distance. It is then recommended to stack a large number of Alpha M3/M8/EM vertically. Up to a determined distance - function of the frequency and the height of the stack -, the sound wave is cylindrical (3dB/2d) ; it becomes progressively spherical (6dB/2d) above that distance.



*Transition from cylindrical to spherical wavefront*

**3.3.3. PLANE RECTANGULAR ARRAY**

When both dimensions of an array are greater than the listening distance, the energy is spread over a plane surface : there is no attenuation with distance. As the listening distance increases, the sound wave becomes cylindrical (-3dB/2d), and then spherical (-6dB/2d)



*Transition from plane to cylindrical, to spherical wavefront*



### 3.3.4. HYGROMETRY AND TEMPERATURE - AIR ABSORPTION

Under usual conditions, air absorption :

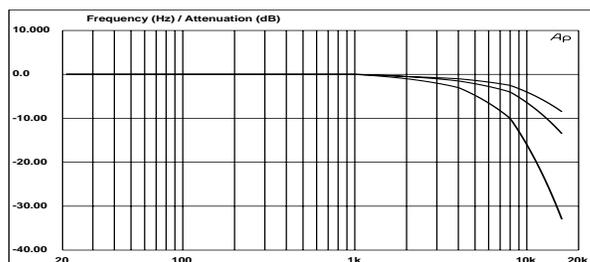
- increases when relative humidity decreases ;
- increases when temperature decreases.

Air absorption gives a linear attenuation, i.e. a constant value of loss of dB per meter : if 1 dB is lost from 10 to 20 meters, 2 dB will be lost from 20 to 40 meters, 4 dB from 40 to 80 meters and so on...

The tables below list these values for normalised frequencies, and various values of relative humidity and temperature :

At 20°C :

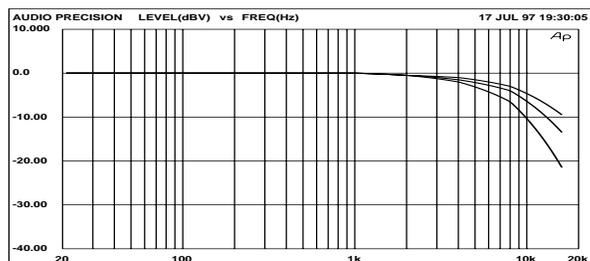
[dB] loss / meter	Up to 1 kHz	2 kHz	4 kHz	8 kHz	16 kHz
RH 20%	0	0.02	0.06	0.20	0.66
RH 50%	0	0.01	0.03	0.08	0.27
RH 80%	0	0.00	0.02	0.05	0.17



Air absorption over a 50m distance ; RH=20%-50%-80%

At RH 50% :

[dB] loss / meter	Up to 1 kHz	2 kHz	4 kHz	8 kHz	16 kHz
10°C	0	0.01	0.04	0.13	0.43
20°C	0	0.01	0.03	0.08	0.27
30°C	0	0.01	0.02	0.06	0.19



Air absorption over a 50m distance ; t=10°C-20°C-30°C



The speed of sound  $C$  varies with temperature according to the formula below :

$$C = 20\sqrt{t^\circ + 273} \quad \text{where } t^\circ \text{ is the temperature in } ^\circ\text{C}$$

The delay time between two sources spaced at a distance  $d$  is then :

$$\Delta t = C/d$$

### 3.4. DIRECTIVITY - COVERAGE

The two main qualities one might expect from a cabinet for array constructions are :

- a good directivity control in the mid and high frequency region, which guarantees the steadiness of the interference region where dips and lobes occur ;
- a strong roll-off of the directivity function at the -6dB cut-off angle, which minimises the size of the interference region.

The Alpha series cabinets were designed to respect these two criteria. Particularly, the Alpha M3 features a constant coverage angle  $\pm 5^\circ$  from as low as 800 Hz up to 12 kHz, with high values of dB loss / degrees at cut-off angle.

#### 3.4.1. DIRECTIVITY OF MULTIPLE SOURCES - WHAT HAPPENS ?

In order to understand the coverage behaviour of combined sources, wavelength must be related to the space between sources.

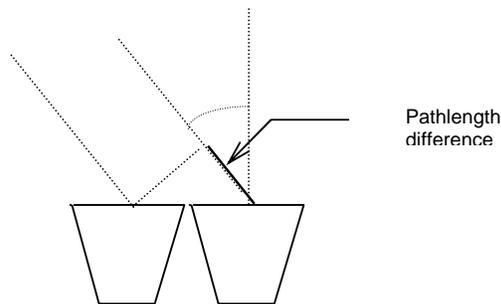
The wavelength  $\lambda$  (in meters) of a sine wave is determined by :

$$\lambda = C/f \quad \text{where } f \text{ is the frequency of the sine wave}$$

This gives :  $\lambda(20\text{Hz}) = 17 \text{ m}$ ,  $\lambda(100\text{Hz}) = 3.4 \text{ m}$ ,  $\lambda(1\text{kHz}) = 34 \text{ cm}$  and  $\lambda(20\text{kHz}) = 1.7 \text{ cm}$

- interference

The distance between sources generates a pathlength difference between the two signals that is nil on axis and increases with the listening angle. If this pathlength difference increases to half the wavelength in a specific direction, the two signals will cancel in that direction. This phenomenon is often described as « interference ».



*pathlength difference between two sound waves*



- resulting directivity

At low frequencies, because wavelength is much larger than the spacing between sources, interference cannot result in cancellation ; however, directivity index will increase.

In the mid and high frequency range, where wavelength is comparable to spacing between sources, the directivity polar plots will show dips and lobes. The amplitude of these lobes will depend on the directivity of the individual sources and on their angulation.

However, lobes and dips will only appear on single tone signals (sine wave) ; on third octave or full octave excitement, they will be smoothed.

### **3.4.2. SMALL ARRAYS (LESS THAN 4 ALPHAS M3 / M8)**

The amplitude of the dips and the lobes is minimised when angling the cabinets at their nominal coverage angle. If the angle is less than the coverage, the interference region will be larger, and if the angle exceeds that value, there will be a « hole » between the cabinets.

It is therefore strongly recommended when using a small amount of cabinets to angle them at their nominal coverage angle (Alpha M3 : 35°x35°, M8 : 75° x 45° ; EM/EF : 75° x 30°).

The only situations where such arrays can be assembled with very little angle are long throw applications (very small vertical coverage).

### **3.4.3. LARGE ARRAYS (4 ALPHAS M3 / M8 AND ABOVE)**

Construction of large arrays derives from important SPL requirements rather than large listening angles: although the Alpha M3 is a high Q cabinet, 4 boxes are enough to cover a 140° horizontal plane... Therefore, large arrays will usually assemble cabinets at less than their nominal coverage angle.

Measurements and simulations show that when using a large amount of cabinets, the individual behaviour of a cabinet will determine the roll-off on the limits of the coverage zone, and the architecture of the array will be responsible for the behaviour in the coverage zone.



## 4. Amplifiers

### 4.1. RECOMMENDED POWER

For best results, NEXO specifies a range of amplifier powers relative to the capacity of the cabinets (see « Technical Specifications »). The use of amplifiers with lower power rating has no justification other than budgetary. On the contrary, high power amplifiers (within reasonable limit) present no real technical problem (bearing in mind that the servo-control system limits the delivered power when needed), but may simply represent an unnecessary expense.

### 4.2. CURRENT CAPABILITY

When evaluating an amplifier, it is important to take account of its behaviour under load conditions (current capacity) : a speaker system is highly reactive, with transient signals like music it can require a lot more current than the nominal impedance would indicate. Apart from the manufacturer' specifications, it is possible to test the amplifier with two times the intended number of cabinets (two cabinets per channel in place of one, four in place of two, etc...), and drive the system to the onset of clipping. If there is no noticeable (audio) signal degradation, the amplifier is well suited (do not take much notice of amplifier heating after several minutes but amplifier protection should not appear too quickly).

### 4.3. VOLTAGE GAIN

If  $V_{in}$  is the voltage applied to the input of the amplifier (small, so that the amplifier does not clip, typically 100 mV@1kHz between pin 2 and pin 3 of the XLR connector), and  $V_{out}$  the voltage measured at the output of the amplifier (between black and red barrier strip, in Volts), then the voltage gain is :

$$L_G = 20 \log_{10} (V_{out} / V_{in})$$

It is very important that all the amplifiers within an installation have closely matched gains ; the variation allowed must be less than +/- 0.5 dB. This precaution is very important for reliability in the case where only one TD Controller is being used for several amplifiers. It is also recommended to use the same amplifiers throughout and to check their gain periodically. If some different amplifiers must be mixed (e.g. in rental situations), at least check their gain and adjust as necessary.

NEXO recommends the use of low gain amplifiers whenever possible, 26 dB being the preferred value as it is quite common. The use of high-gain amplifiers has a negative effect in terms of signal to noise ratios : the delivered noise is increased whilst the maximum voltage level remains the same (4.5 V peak at the input is enough to drive a 26 dB gain, 500 W / 8 Ohm power amplifier to the onset of clipping).

Some amplifiers use non-linear compression circuits to smooth signal before clipping: for correct use of the TD Controllers, NEXO recommends that these circuits are switched off in order to maintain the amplifier linearity.



## II. TECHNICAL SPECIFICATIONS

### 4.4. ALPHA S2

SYSTEM SPECS	ALPHA S2 with SubTD Controller	
Frequency Response [a]	32(?) Hz – 64 Hz ± 3 dB	
Usable Range @-6dB [a]	29 Hz – 180 Hz	
Sensitivity 1W @ 1m [b]	105 dB SPL	
Peak SPL @ 1m [b]	140 dB Peak	
Nominal Impedance	3 ohms (2.7 min)	
Recommended Amplifiers	1800 to 2400 Watts into 3 ohms	

FEATURES	ALPHA S2	
Components	2 x 18" (46cm) long excursion 6 ohms drivers, high efficiency acoustic load.	
Height x Width x Depth	1200 x 689 x 754 mm carpet version (47 1/4" x 27 1/8" x 29 11/16")	
Shape	22.5 Trapezoid	
Weight : Net	85 kg (187 Lb) with wheelboard: 95 kg (209 Lb)	
Connectors	1 x 4 poles Speakon	1+ & 1- (Sub S2)
Construction	Baltic Birch with Dark Grey carpeting, Structured Black coating painting finish also available.	
Handles	4 Metal Bar Handles	
Front Finish	Acoustic Foam on hex perforated steel grid (77% transparent)	
Flying points	4 Flying Tracks on front (7 positions on 2" steps) Top to bottom Steel Backplate 2 Flying Tracks on Back (Hinge fixing) Internal top to bottom Steel links Painted version without Flying Tracks also available	
Fixed Installation	The X-Bow Flying Tracks can also receive standard Aircraft Flying Fittings.	

As part of a policy of continual improvement, NEXO reserves the right to change specifications without notice.

- [a] Response Curves and Data : Anechoic Far Field above 200 Hz, Half-space Anechoic below 200 Hz.  
Usable Range Data : Frequency Response Capability with TD crossover slopes removed.
- [b] Sensitivity & Peak SPL : will depend on spectral distribution. Measured with band limited Pink Noise.  
Refers to the specified +/- 3 dB range. Data are for Speaker + Processor + recommended amplifier combinations.



## 4.5. ALPHA B1-15 / B1-18

SYSTEM SPECS	ALPHA B1-15	ALPHA B1-18
Frequency Response [a]	Wideband : 42 Hz – 180 Hz ± 3 dB Xover : 80 Hz – 190 Hz ± 3 dB	40 Hz – 230 Hz ± 3 dB
Usable Range @-6dB [a]	39 Hz – 600 Hz	38 Hz – 600 Hz
Sensitivity 1W @ 1m [b]	106 dB SPL	107 dB SPL Nominal
Peak SPL @ 1m [b]	140 dB Peak	142 dB Peak
Nominal Impedance	6 ohms (5.2 mini)	6 ohms (4.7 mini)
Recommended Amplifiers	900 to 1200 Watts into 6 ohms	900 to 1400 Watts into 6 ohms

FEATURES	ALPHA B1-15	ALPHA B1-18
Components	1 x 15" (38 cm) 6 ohms Folded Horn, Composite Curve	1 x 18" (46 cm) 6 ohms Folded Horn, Composite Curve
Height x Width x Depth	600 x 689 x 754 mm (23 5/8" x 27 1/8" x 29 11/16")	800 x 689 x 754 mm (31.49" x 27 1/8" x 29 11/16")
Shape	22.5° Trapezoid	
Weight : Net	51 kg (112 Lb) with wheelboard : 58 kg (128 Lb)	69.9 kg (155 Lb) with wheelboard : 79 kg (175 Lb)
Connectors	2x 4 poles Speakon (In / Out)	1+ & 1- (Sub S2) 2+ & 2- (Bass B1)
Construction	Baltic Birch with Dark Grey carpeting, Structured Black coating painting finish also available.	
Handles	2 Metal Bar Handles	4 Metal Bar Handles
Front Finish	Acoustic Foam on hex perforated steel grid (77% transparent)	
Flying points	4 Flying Tracks on front (7 positions on 2° steps) Top to bottom Steel Backplate 4 Flying Tracks on Back (Hinge fixing) Internal top to bottom Steel links Painted version without Flying Tracks also available	Crossbow Flying System cabinet Hardware: Optional 4 Flying Tracks on Front Internal top to bottom Steel links Optional 2 Flying tracks on back (Hinge fixing) Painted version without Flying Tracks also available
Fixed Installation	The X-Bow Flying Tracks can also receive standard Aircraft Flying Fittings.	

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- [a] Response Curves and Data : Anechoic Far Field above 200 Hz, Half-space Anechoic below 200 Hz.  
Usable Range Data : Frequency Response Capability with TD crossover slopes removed.
- [b] Sensitivity & Peak SPL : will depend on spectral distribution. Measured with band limited Pink Noise.  
Refers to the specified +/- 3 dB range. Data are for Speaker + Processor + recommended amplifier combinations.



## 4.6. ALPHA M3 / M8

SYSTEM SPECS	ALPHA M3	ALPHA M8
Frequency Response [a]	190 Hz – 19 kHz $\pm$ 3 dB	190 Hz – 19 kHz $\pm$ 3 dB
Usable Range @-6dB [a]	150 Hz – 20 kHz	150 Hz – 20 kHz
Sensitivity 1W @ 1m [b]	110 dB SPL	108 dB SPL
Peak SPL @ 1m [b]	145 dB Peak	143 dB Peak
Dispersion [c]	35° x 35°	75° x 45° (HF Horn Rotatable)
Directivity : Q & DI [c]	Q = 32 – DI = 15 dB (Nominal f > 630 Hz)	Q = 20 – DI = 13 dB (Nominal f > 630 Hz)
Nominal Impedance	MF : 12 ohms (15.5 min) HF : 12 ohms (8.0 min)	MF : 12 ohms (15.5 min) HF : 12 ohms (8.0 min)
Recommended Amplifiers	MF : 650 to 900 Watts into 12 ohms HF : 350 to 500 Watts into 12 ohms	MF : 650 to 900 Watts into 12 ohms HF : 350 to 500 Watts into 12 ohms

FEATURES	ALPHA M3	ALPHA M8
Components	MF : 2 x 10" (24 cm) 8 ohms 3" Coil Drivers ; Dual Ring Phase Plugs HF : 1 x 3" Neodymium Driver, Titanium diaphragm Coaxial mounted waveguide	
Height x Width x Depth	600 x 689 x 754 mm Carpet version (23 5/8" x 27 1/8" x 29 11/16")	
Shape	22.5° Trapezoid	
Weight : Net	57 kg (126 Lb) with wheelboard: 64 kg (141 Lb)	
Connectors	2 x 8 poles Speakon (In / Out)	1+ & 1- (Sub S2) 2+ & 2- (Bass B1) 3+ & 3- (MF) 4+ & 4- (HF)
	1 x 4 poles Speakon (to B1 & S2)	1+ & 1- (Sub S2) 2+ & 2- (Bass B1)
Construction	Baltic Birch with Dark Grey carpeting, Structured Black coating painting finish also available.	
Handles	2 Metal Bar Handles	
Front Finish	Acoustic Foam on hex perforated steel grid (77% transparent)	
Flying points	4 Flying Tracks on front (7 positions on 2° steps) Top to bottom Steel Backplate 4 Flying Tracks on Back (Hinge fixing) Internal top to bottom Steel links Painted version without Flying Tracks also available	
Fixed Installation	The X-Bow Flying Tracks can also receive standard Aircraft Flying Fittings.	

As part of a policy of continual improvement, NEXO reserves the right to change specifications without notice.

- [a] Response Curves and Data : Anechoic Far Field above 200 Hz, Half-space Anechoic below 200 Hz.  
Usable Range Data : Frequency Response Capability with TD crossover slopes removed.
- [b] Sensitivity & Peak SPL : will depend on spectral distribution. Measured with band limited Pink Noise.  
Refers to the specified  $\pm$  3 dB range. Data are for Speaker + Processor + recommended amplifier combinations.
- [c] Directivity Curves and Data : 1/3 octave smoothed frequency response, normalised to On-Axis response.  
Data obtained by computer processing on off-axis response curves.



## 4.7. ALPHA EM / EF

SYSTEM SPECS	ALPHA EM	ALPHA EF
Frequency Response [a]	220 Hz – 19 kHz $\pm$ 3 dB	40 Hz – 19 kHz $\pm$ 3 dB
Usable Range @ -6dB [a]	180 Hz – 20 kHz $\pm$ 6 dB	38 Hz – 20 kHz $\pm$ 6 dB
Sensitivity 1W @ 1m [b]	107 dB SPL	107 dB SPL
Peak SPL @ 1m [b]	140 dB Peak	LF : 142 dB Peak MF/HF : 140 dB Peak
Dispersion [c]	75° x 30°	75° x 30°
Directivity : Q & DI [c]	Q = 25 – DI = 14 dB (Nominal f > 630 Hz)	Q = 25 – DI = 14 dB (Nominal f > 630 Hz)
Cross-Over Frequency	MF/HF : 2.2 kHz (Passive)	LF/MF : 210 Hz (Active) MF/HF : 2.2 kHz (Passive)
Nominal Impedance	8 ohms (7.5 min)	LF : 6 ohms (4.7 min) MF/HF : 8 ohms (7.5 min)
Recommended Amplifiers	700 to 1000 Watts into 8 ohms	MF : 900 to 1400 Watts into 6 ohms MF/HF : 700 to 1000 Watts into 8 ohms

FEATURES	ALPHA EM	ALPHA EF
Components	MF : 1 x 10" (24 cm) 8 ohms HF : 1 x 3" Ceramic Driver, Titanium diaphragm Coaxial mounted waveguide	LF : 1 x 18" (46cm) 6 Ohms Composite Curve MF : 1 x 10" (24 cm) 8 ohms HF : 1 x 3" Ceramic Driver, Titanium diaphragm Coaxial mounted waveguide
Height x Width x Depth	400 x 689 x 754 mm Carpet version (15 3/4" x 27 1/8" x 29 11/16")	1200 x 689 x 754 mm Carpet version (47 1/4" x 27 1/8" x 29 11/16")
Shape	22.5° Trapezoid	
Weight : Net	46.6 kg (99 Lb)	98 kg (209 Lb) with wheelboard : 105 kg (231 Lb)
Connectors	2 x 8 poles Speakon (In / Out)	1+ & 1- (Sub-bass S2) 2+ & 2- (Bass B1) 3+ & 3- (MF/HF) 4+ & 4- (NC)
	1 x 4 poles Speakon (to B1 & S2)	1+ & 1- (Sub-bass S2) 2+ & 2- (Bass B1)
Construction	Baltic Birch with Dark Grey carpeting, Structured Black coating painting finish also available.	
Handles	2 Metal Bar Handles	4 Metal Bar Handles
Front Finish	Acoustic Foam on hex perforated steel grid (77% transparent)	
Flying points (optional)	4 Flying Tracks on front (7 positions on 2° steps) Top to bottom Steel Backplate 4 Flying Tracks on Back (Hinge fixing) Internal top to bottom Steel links Painted version without Flying Tracks also available	
Fixed Installation	The X-Bow Flying Tracks can also receive standard Aircraft Flying Fittings.	

As part of a policy of continual improvement, NEXO reserves the right to change specifications without notice.

- [a] Response Curves and Data : Anechoic Far Field above 200 Hz, Half-space Anechoic below 200 Hz.  
Usable Range Data : Frequency Response Capability with TD crossover slopes removed.
- [b] Sensitivity & Peak SPL : will depend on spectral distribution. Measured with band limited Pink Noise.  
Refers to the specified +/- 3 dB range. Data are for Speaker + Processor + recommended amplifier combinations.
- [c] Directivity Curves and Data : 1/3 octave smoothed frequency response, normalised to On-Axis response.  
Data obtained by computer processing on off-axis response curves.



## 4.8. DIRECTIVITY TABLES

Off-Axis Attenuation from On-Axis Frequency Response (dB)

125 Hz

Angle / dB	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
B1+M3 hor	0.0	0.5	1.3	2.0	2.5	3.5	4.3	4.5	5.0	4.8	6.0	6.0	6.5	6.8	6.3	7.0	6.3	5.8	5.5
B1+M3 vert	0.0	0.3	0.5	1.5	2.0	2.8	3.5	4.3	4.8	5.5	6.0	6.8	6.8	6.0	7.0	6.5	6.0	5.5	5.5
B1+M8 hor	0.0	0.5	1.3	2.0	2.5	3.5	4.3	4.5	5.0	4.8	6.0	6.0	6.5	6.8	6.3	7.0	6.3	5.8	5.5
B1+M8 vert	0.0	0.3	0.5	1.5	2.0	2.8	3.5	4.3	4.8	5.5	6.0	6.8	6.8	6.0	7.0	6.5	6.0	5.5	5.5
EM/EF hor	0.0	0.3	0.5	1.0	2.0	2.5	3.3	4.0	4.5	5.0	5.5	6.3	6.0	6.0	5.8	5.3	4.5	4.3	4.0
EM/EF vert	0.0	0.0	0.3	0.5	1.0	1.5	2.0	2.8	3.5	4.0	4.8	5.5	6.0	6.0	5.8	5.0	4.5	4.3	4.0

250 Hz

Angle / dB	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
B1+M3 hor	0.0	0.3	1.0	2.0	3.0	4.3	5.5	6.8	8.0	8.5	9.5	9.8	9.8	10.0	9.5	8.8	8.0	7.5	7.5
B1+M3 vert	0.0	0.3	0.8	1.5	2.5	4.0	5.3	6.5	7.5	8.5	9.8	10.8	12.0	12.0	11.0	9.8	8.5	8.0	7.5
B1+M8 hor	0.0	0.3	0.8	2.0	3.0	4.3	6.0	7.0	8.0	8.8	9.3	10.0	10.5	10.3	10.0	9.3	8.0	7.5	7.8
B1+M8 vert	0.0	0.3	1.0	1.8	3.0	4.3	5.5	7.0	8.0	9.3	10.3	11.3	12.0	12.0	11.0	9.8	8.8	7.8	7.8
EM/EF hor	0.0	0.3	0.8	1.8	3.0	4.0	5.3	6.3	7.0	7.8	8.0	8.5	8.8	8.8	8.8	8.3	7.5	6.5	6.0
EM/EF vert	0.0	0.0	0.5	1.0	1.5	2.5	3.3	4.0	4.8	5.5	6.5	7.5	8.5	8.8	8.8	8.0	7.0	6.3	6.0

500 Hz

Angle / dB	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
B1+M3 hor	0.0	0.5	2.0	4.5	7.3	9.8	12.0	14.0	15.8	16.8	17.8	18.8	19.0	18.8	18.5	18.0	17.0	15.0	14.5
B1+M3 vert	0.0	0.5	2.0	4.3	6.8	9.3	11.8	13.5	15.0	16.3	17.3	18.3	19.0	20.0	20.5	21.0	19.3	16.0	14.5
B1+M8 hor	0.0	0.5	2.0	4.3	6.5	9.0	12.0	14.0	16.3	17.8	18.5	19.0	19.3	19.5	19.5	19.5	17.5	15.5	15.8
B1+M8 vert	0.0	0.5	2.0	4.0	6.5	8.8	11.3	13.5	15.5	16.8	17.5	18.3	19.3	20.5	21.5	21.8	19.5	16.5	15.8
EM/EF hor	0.0	0.5	2.0	4.0	6.5	9.3	11.8	14.0	15.8	17.0	17.0	17.3	17.8	18.0	17.8	18.0	17.8	14.3	12.5
EM/EF vert	0.0	0.3	1.0	1.8	3.0	4.5	6.0	7.5	8.8	10.0	11.0	11.3	12.0	13.0	15.0	16.3	14.5	12.8	12.0

1000 Hz

Angle / dB	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
B1+M3 hor	0.0	1.3	5.0	10.0	13.0	14.5	15.8	17.3	18.8	20.0	21.5	22.3	23.5	24.5	23.5	20.5	21.0	18.5	16.8
B1+M3 vert	0.0	1.8	6.0	10.8	12.3	13.0	14.3	15.5	17.3	18.5	19.5	20.5	21.5	22.0	22.8	23.5	26.3	20.5	16.8
B1+M8 hor	0.0	1.5	5.5	9.8	11.5	12.5	13.8	15.3	17.0	18.8	19.5	21.0	22.0	22.3	22.0	20.0	20.8	17.5	16.3
B1+M8 vert	0.0	1.8	6.5	11.0	11.5	12.0	13.3	15.0	16.5	17.8	18.5	20.0	21.0	21.3	21.8	21.5	20.5	19.5	16.3
EM/EF hor	0.0	2.0	6.3	9.8	9.5	10.3	11.3	12.5	13.5	14.3	15.3	16.5	17.5	18.8	17.3	18.8	19.0	19.0	17.0
EM/EF vert	0.0	0.8	2.5	5.0	8.0	10.8	13.0	15.3	17.5	19.3	20.3	21.0	21.5	22.0	23.0	23.0	21.3	19.0	17.0

2000 Hz

Angle / dB	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
B1+M3 hor	0.0	1.3	6.0	14.0	14.5	16.0	18.3	19.8	21.5	23.3	25.5	27.5	28.5	30.0	30.0	29.8	27.8	27.3	28.0
B1+M3 vert	0.0	1.8	7.0	14.3	15.8	17.0	20.0	21.8	23.3	24.5	25.8	27.0	28.3	29.0	29.0	29.3	29.5	29.3	28.0
B1+M8 hor	0.0	1.5	5.8	10.5	11.5	11.3	13.5	16.5	20.5	24.0	25.5	28.0	27.3	27.5	27.5	28.5	27.0	28.5	28.0
B1+M8 vert	0.0	2.3	7.5	12.5	15.0	16.0	18.0	20.5	22.5	24.5	25.8	27.0	28.0	29.0	27.8	26.8	29.0	29.5	28.0
EM/EF hor	0.0	1.5	4.5	7.8	7.8	8.0	10.0	12.5	15.5	18.0	19.5	20.0	21.5	22.8	23.0	23.8	25.5	25.8	24.0
EM/EF vert	0.0	1.8	5.5	10.5	14.5	16.5	18.3	20.0	22.0	24.0	25.5	26.3	27.0	28.0	29.3	28.0	26.5	25.0	24.0

4000 Hz

Angle / dB	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
M3 hor	0.0	2.0	6.5	11.3	16.0	19.5	22.5	25.5	28.8	31.8	34.5	37.3	38.3	39.8	40.5	40.3	40.5	38.0	37.8
M3 vert	0.0	2.3	6.8	12.3	16.5	19.0	22.5	25.5	29.5	32.0	34.5	36.8	38.3	39.3	39.3	40.0	39.5	38.8	37.8
M8 hor	0.0	1.0	3.8	6.8	11.3	14.3	18.0	21.0	25.0	28.8	31.0	33.0	34.3	35.0	36.0	37.0	38.0	39.5	38.0
M8 vert	0.0	2.0	5.8	11.0	15.5	20.0	23.3	27.0	30.0	33.0	34.8	36.5	37.3	38.0	39.0	40.0	41.0	40.5	38.0
EM/EF hor	0.0	1.5	3.8	5.5	6.8	9.3	12.3	16.0	19.8	23.8	26.5	28.3	29.3	30.0	31.0	33.8	33.0	33.5	32.3
EM/EF vert	0.0	2.8	7.8	12.8	16.3	19.3	21.8	24.0	26.0	28.3	30.0	31.0	32.5	33.8	34.5	35.0	34.8	34.0	32.3

8000 Hz

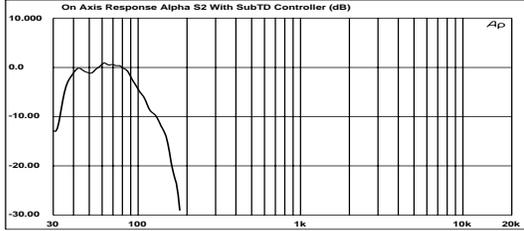
Angle / dB	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
M3 hor	0.0	1.5	7.0	13.3	18.5	22.3	25.0	29.5	34.8	39.0	42.8	45.3	45.5	47.8	48.8	47.0	48.0	46.3	47.3
M3 vert	0.0	1.8	7.0	13.5	18.8	21.5	25.0	28.5	33.8	38.0	40.5	42.5	44.5	45.5	46.3	47.3	48.0	49.0	47.3
M8 hor	0.0	0.3	2.0	6.3	11.8	15.0	19.0	22.5	28.0	31.8	40.5	43.0	44.0	45.0	46.0	47.0	48.0	49.0	47.5
M8 vert	0.0	1.8	5.8	11.3	16.5	20.8	24.3	29.0	32.0	35.0	42.0	44.0	45.0	46.0	47.0	48.0	49.0	47.0	47.5
EM/EF hor	0.0	0.8	3.0	6.0	8.0	11.5	14.5	18.5	24.3	30.0	33.8	36.3	37.0	39.3	40.5	41.8	41.8	42.5	42.0
EM/EF vert	0.0	3.3	9.5	15.5	20.0	23.3	24.5	26.5	30.8	34.3	36.0	38.0	38.8	39.8	40.0	41.5	41.5	40.8	42.0

*NB* data available in EASE™ format.

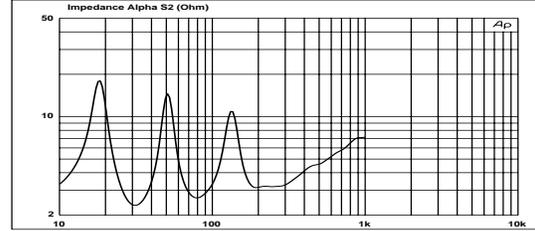


## 5. CURVES

### 5.1. ALPHA S2

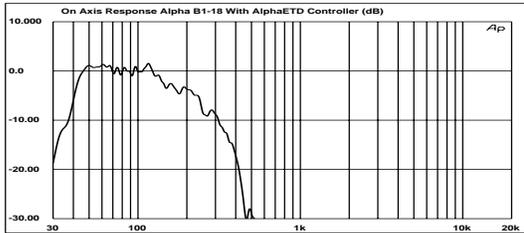


Frequency Response with SubTD Controller (dB)

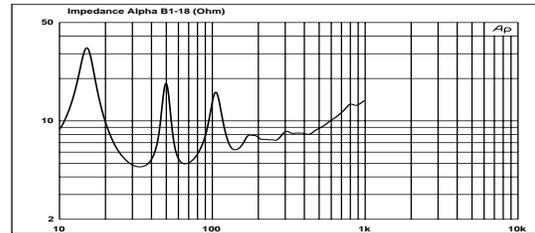


Impedance (Ohms)

### 5.2. ALPHA B1-18

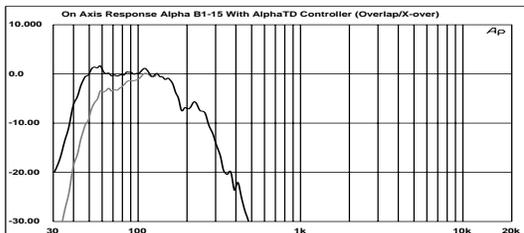


Frequency Response with AlphaETD Controller (dB)

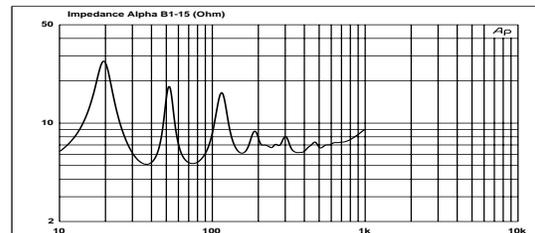


Impedance (Ohms)

### 5.3. ALPHA B1-15



Frequency Response with AlphaTD Controller (dB)  
Black : Overlap Mode, Grey : X-Over mode



Impedance (Ohms)

Frequency Response Curves : Anechoic Far Field above 200 Hz, Half-space Anechoic below 200 Hz.

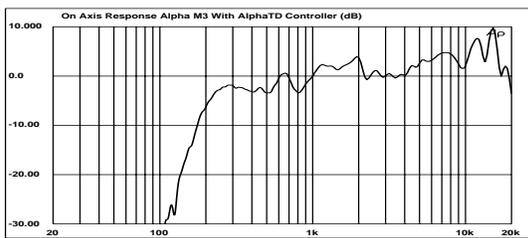
Impedance : Voltage to Current Ratio, Free Field measurement

Off-Axis Frequency Response : 1/3 octave smoothed frequency response, normalised to On-Axis response.

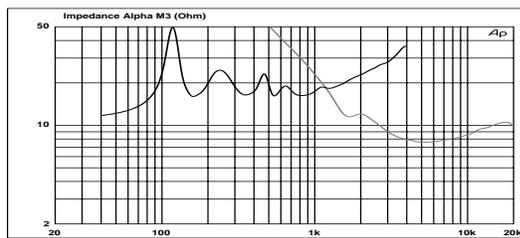
Directivity Curve, Coverage Angle and Polar Diagram from computer processing on off-axis response curves.



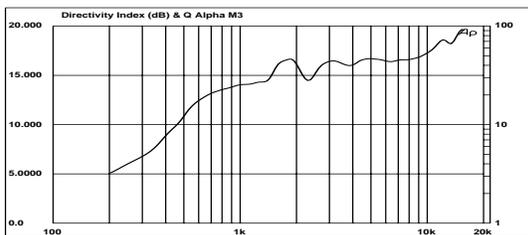
## 5.4. ALPHA M3



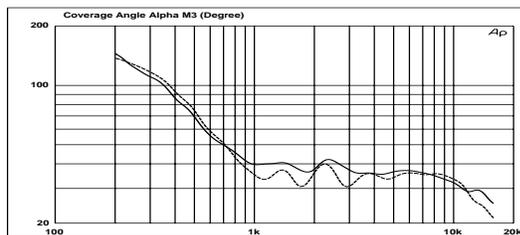
Frequency Response with AlphaTD Controller (dB)



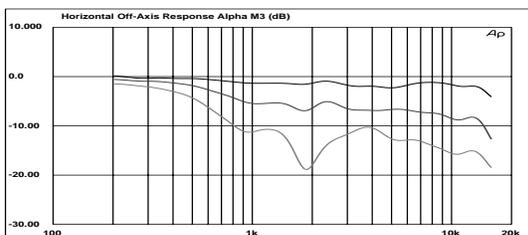
Impedance (Ohms)  
Black : MF, Grey : HF



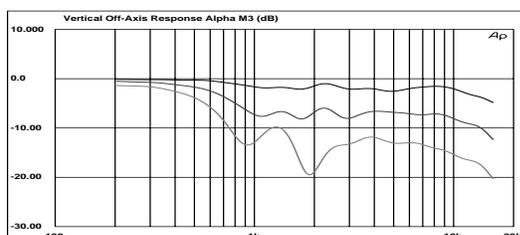
Directivity Index (dB) and Factor



Nominal Coverage @ -6 dB (Degrees)



Horizontal Off-Axis Frequency Response @ 10, 20 & 30°



Vertical Off-Axis Frequency Response @ 10, 20 & 30°

Frequency Response Curves : Anechoic Far Field above 200 Hz, Half-space Anechoic below 200 Hz.

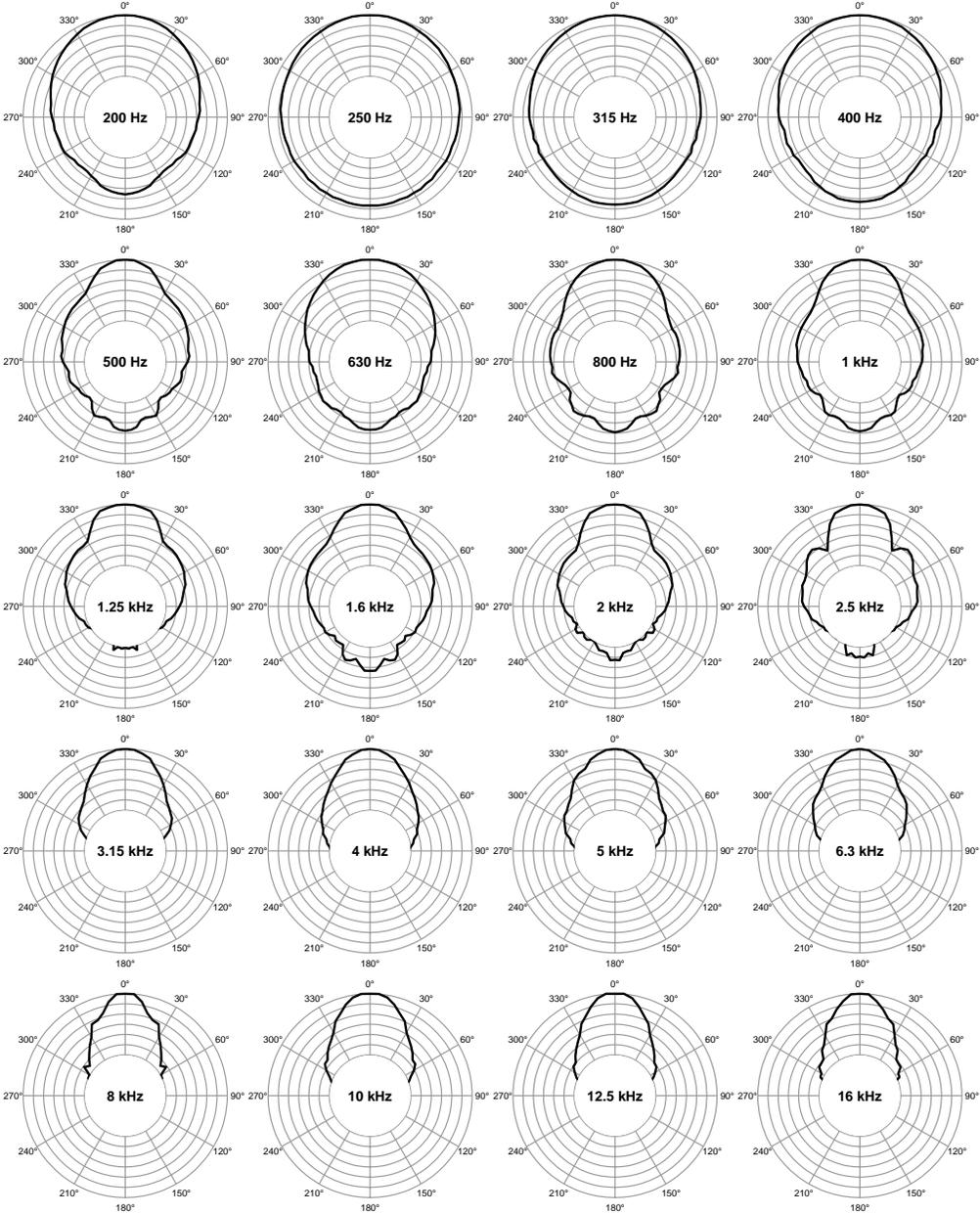
Impedance : Voltage to Current Ratio, Free Field measurement

Off-Axis Frequency Response : 1/3 octave smoothed frequency response, normalised to On-Axis response.

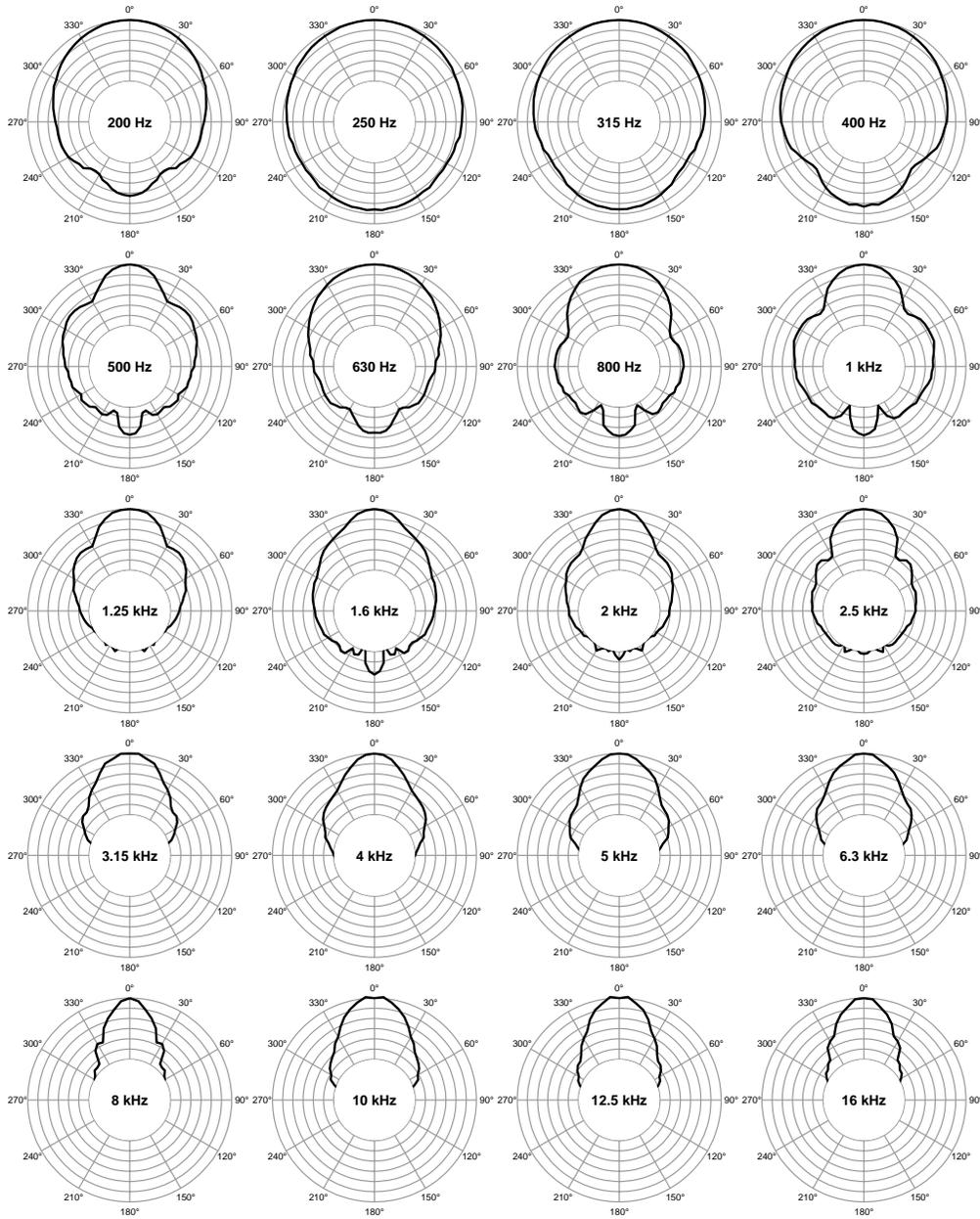
Directivity Curve, Coverage Angle and Polar Diagram from computer processing on off-axis response curves.



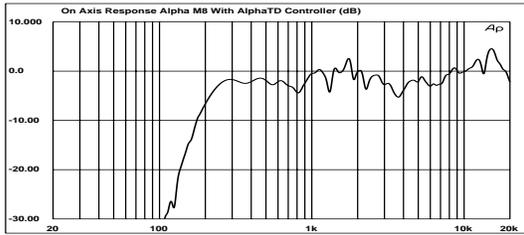
Alpha M3 - Horizontal Directivity ( 5dB / div.)



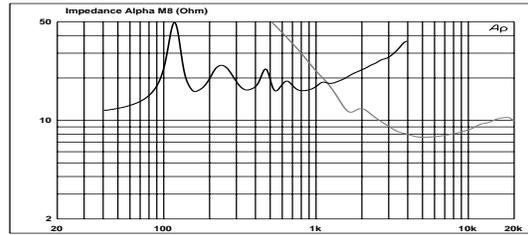
Alpha M3 – Vertical Directivity ( 5dB / div.)



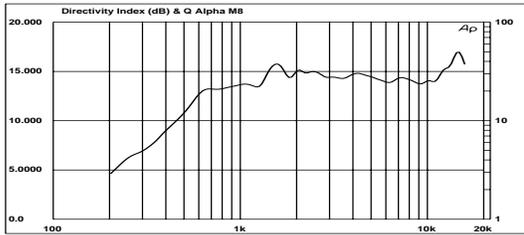
## 5.5. ALPHA M8



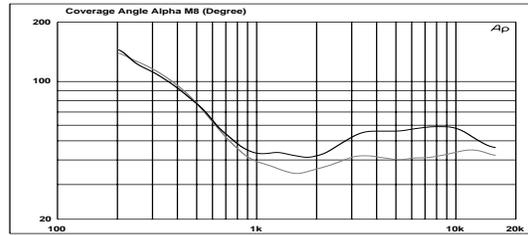
Frequency Response with AlphaTD Controller (dB)



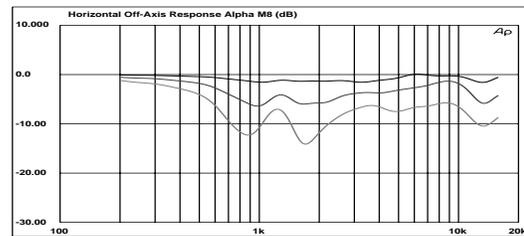
Impedance (Ohms)  
Black : MF, Grey : HF



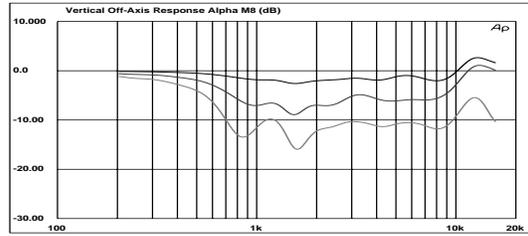
Directivity Index (dB) and Factor



Nominal Coverage @-6 dB (Degrees)



Horizontal Off-Axis Frequency Response @ 10, 20 & 30°



Vertical Off-Axis Frequency Response @ 10, 20 & 30°

Frequency Response Curves : Anechoic Far Field above 200 Hz, Half-space Anechoic below 200 Hz.

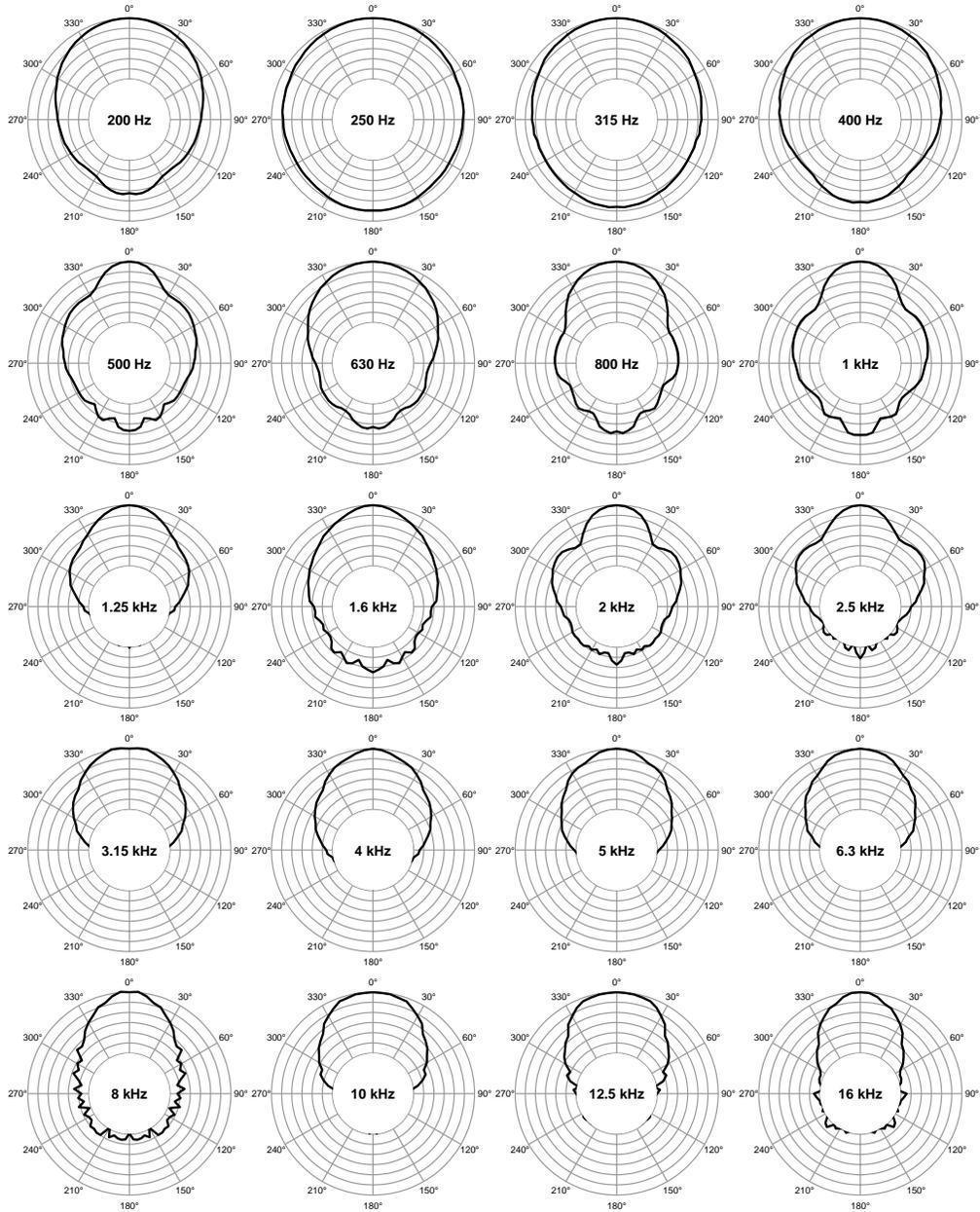
Impedance : Voltage to Current Ratio, Free Field measurement

Off-Axis Frequency Response : 1/3 octave smoothed frequency response, normalised to On-Axis response.

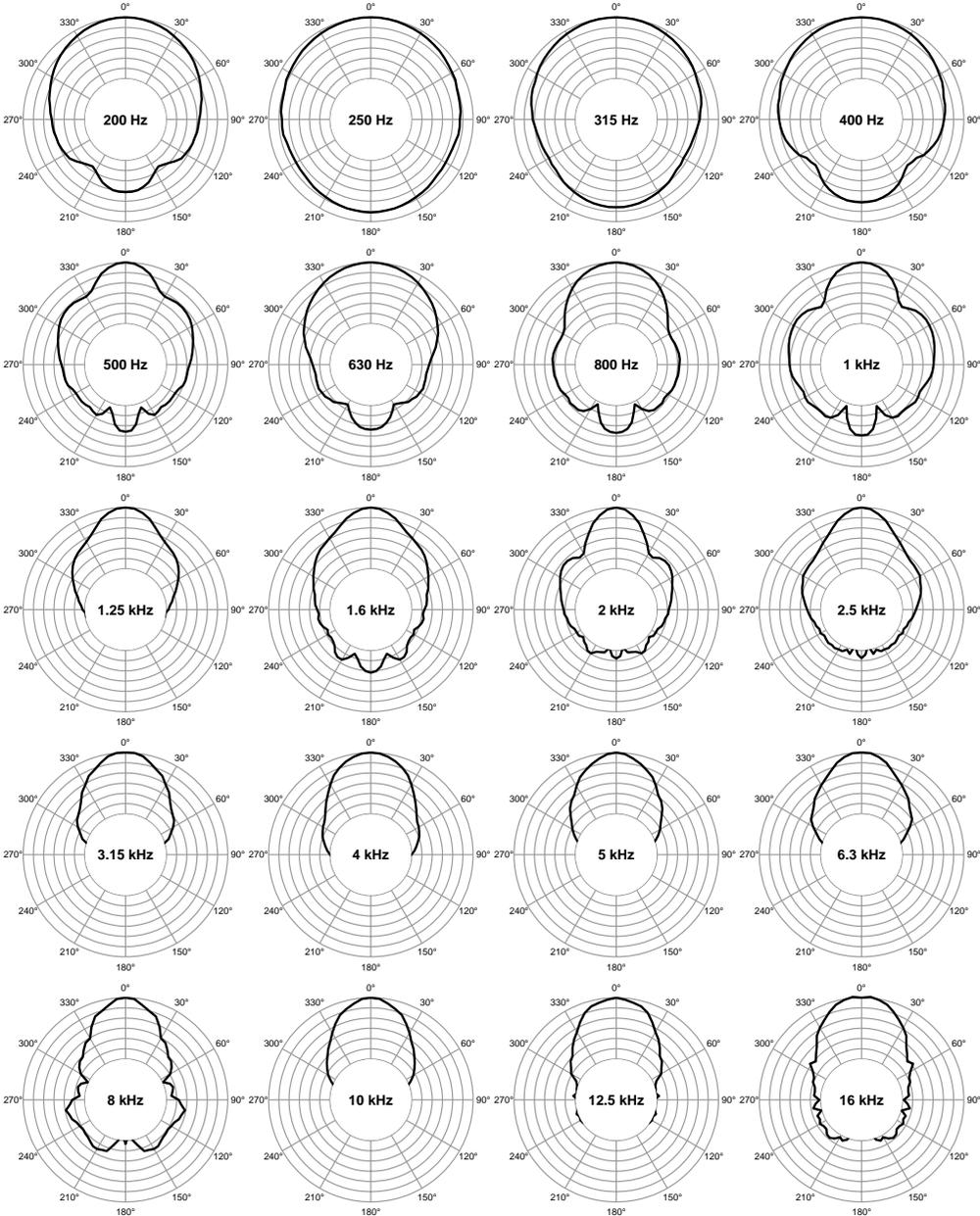
Directivity Curve, Coverage Angle and Polar Diagram from computer processing on off-axis response curves.



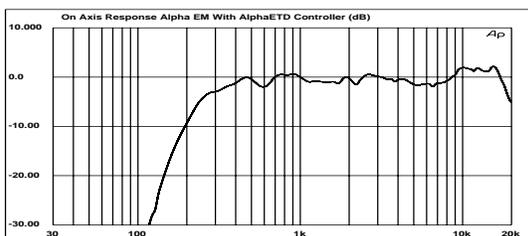
Alpha M8 – Horizontal Directivity ( 5dB / div.)



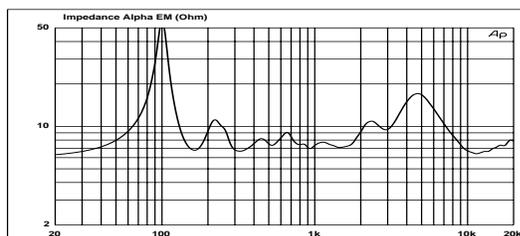
Alpha M8 Vertical Directivity ( 5dB / div.)



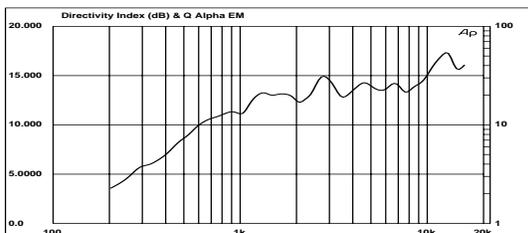
## 5.6. ALPHA EM



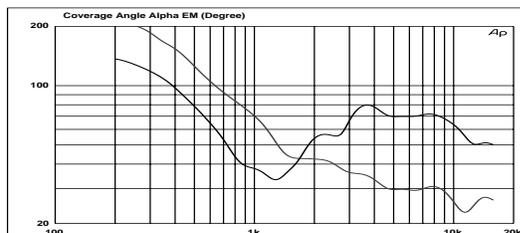
Frequency Response with AlphaETD Controller (dB)



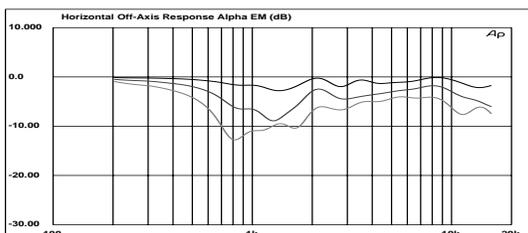
Impedance (Ohms)



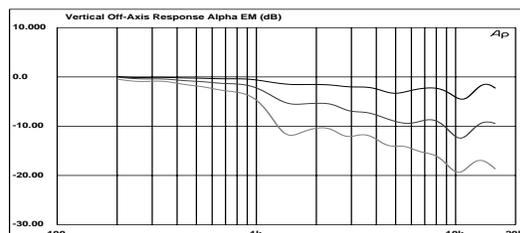
Directivity Index (dB) and Factor



Nominal Coverage @-6 dB (Degrees)

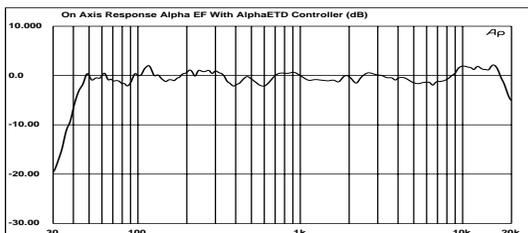


Horizontal Off-Axis Frequency Response @ 10, 20 & 30°

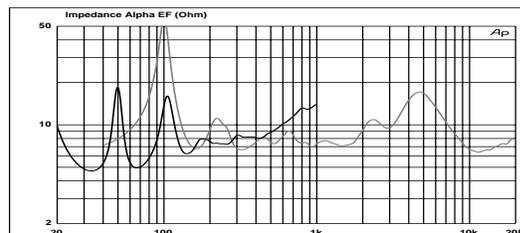


Vertical Off-Axis Frequency Response @ 10, 20 & 30°

## 5.7. ALPHA EF



Frequency Response with AlphaETD Controller (dB)



Impedance (Ohms)  
Black : LF, Grey : MF+HF

Frequency Response Curves : Anechoic Far Field above 200 Hz, Half-space Anechoic below 200 Hz.

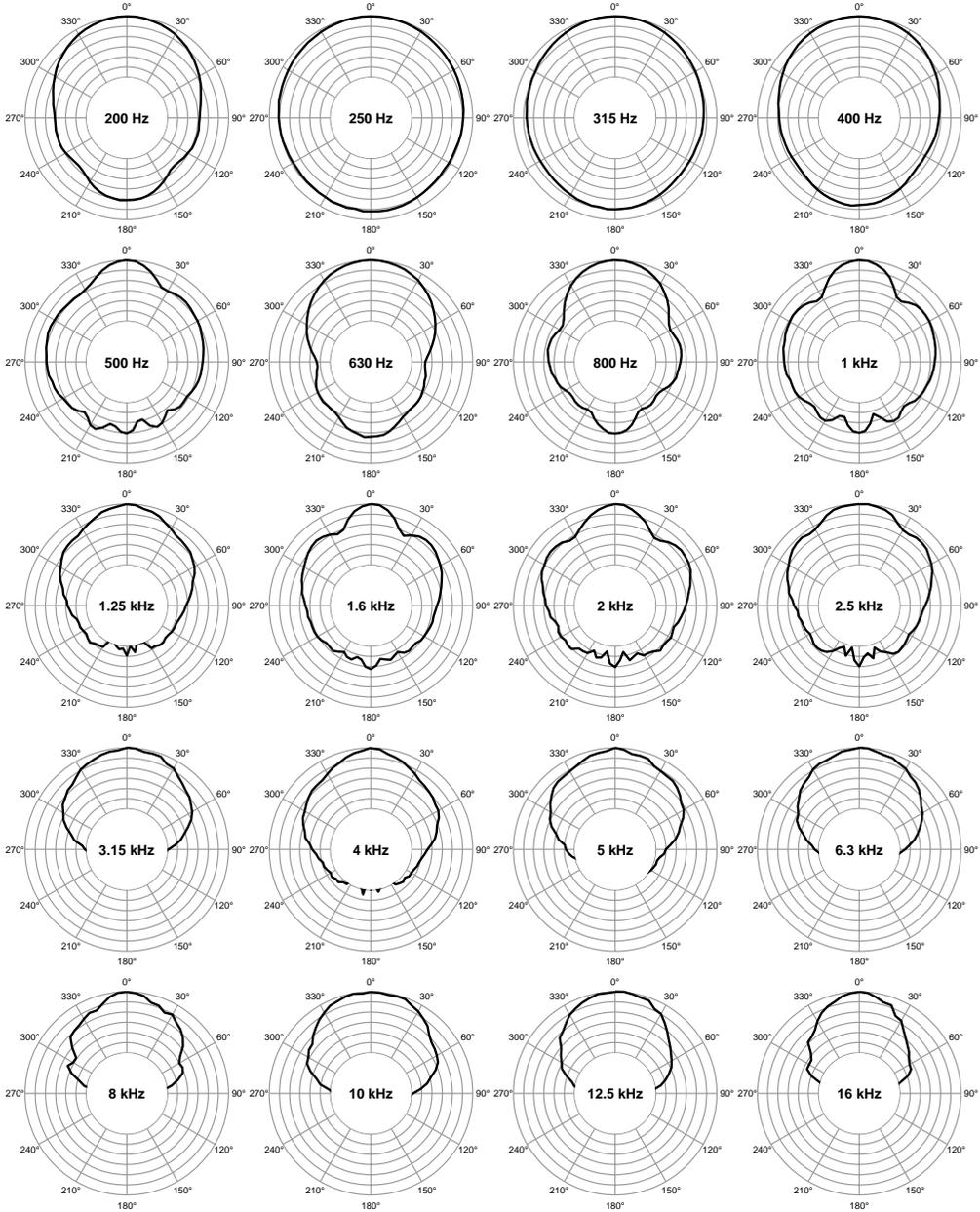
Impedance : Voltage to Current Ratio, Free Field measurement

Off-Axis Frequency Response : 1/3 octave smoothed frequency response, normalised to On-Axis response.

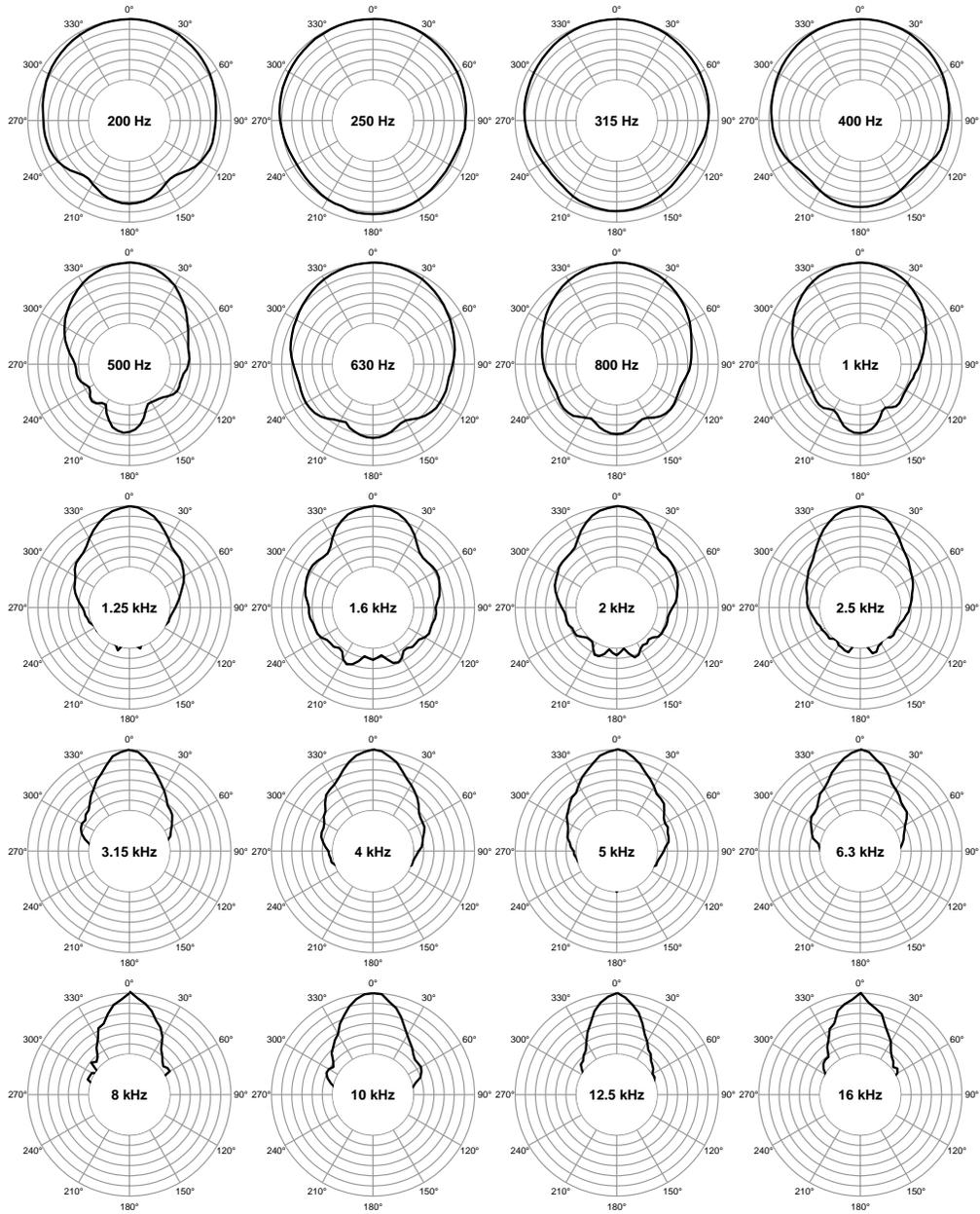
Directivity Curve, Coverage Angle and Polar Diagram from computer processing on off-axis response curves.



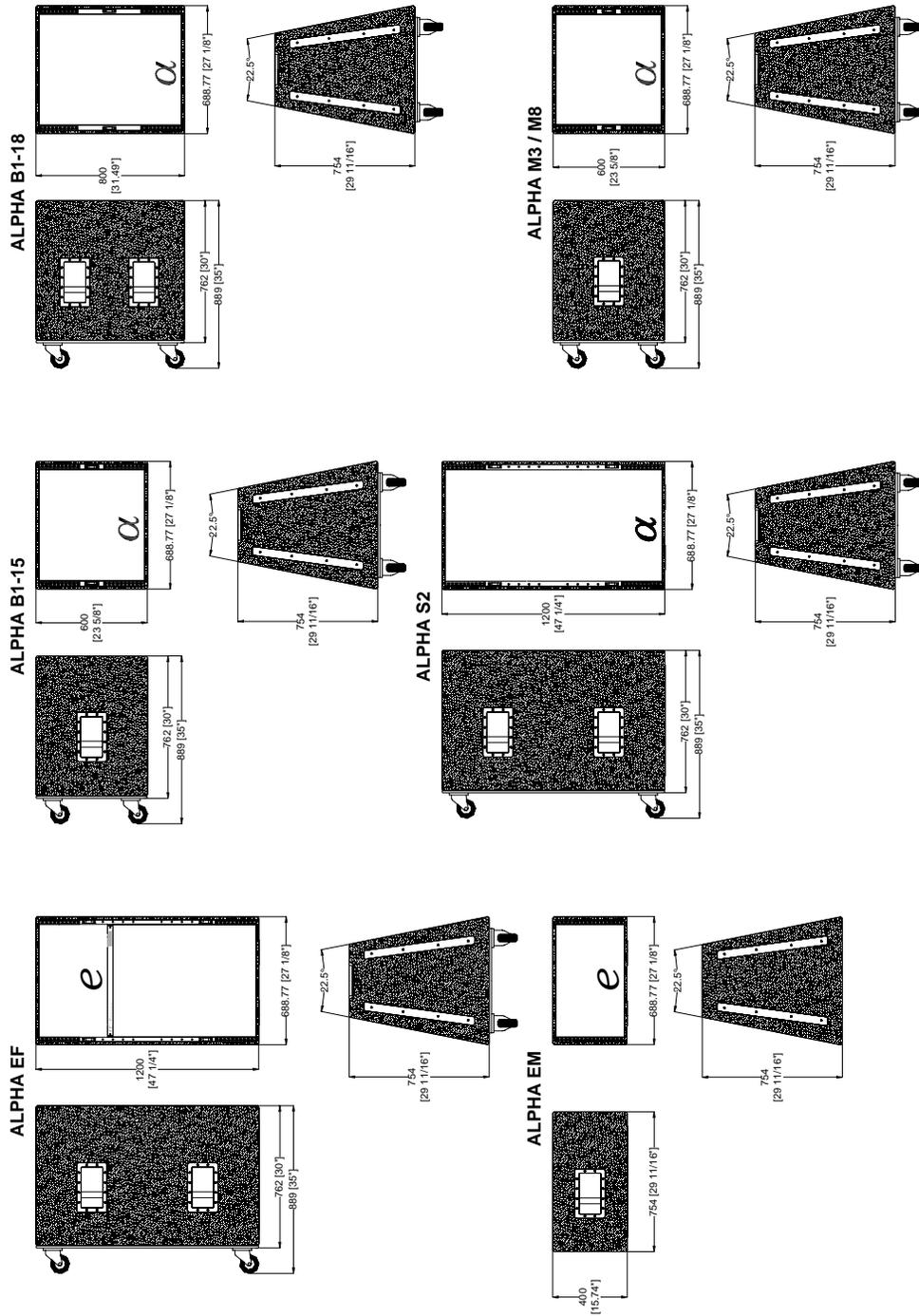
Alpha EM – Horizontal Directivity ( 5dB / div.)



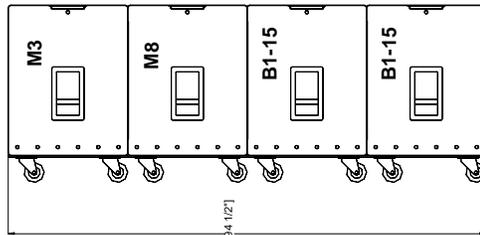
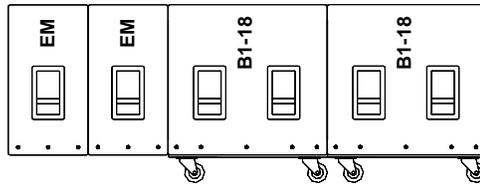
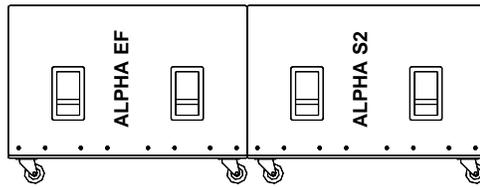
Alpha EM – Vertical Directivity ( 5dB / div.)



### III. DIMENSIONS

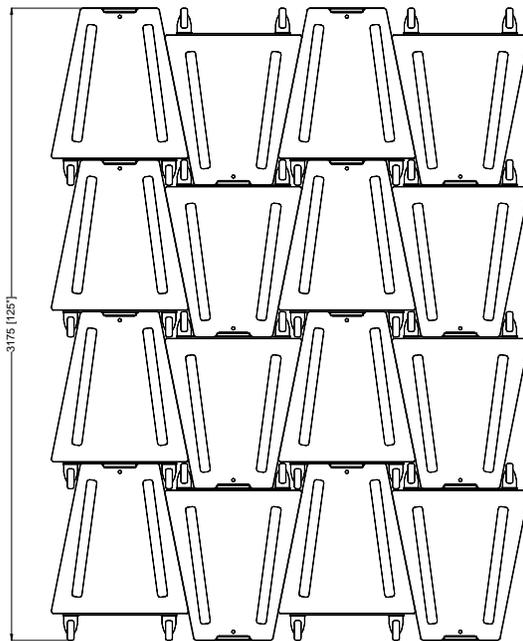


# IV. TRANSPORT



2400 [4 1/2']

VUE DE COTE

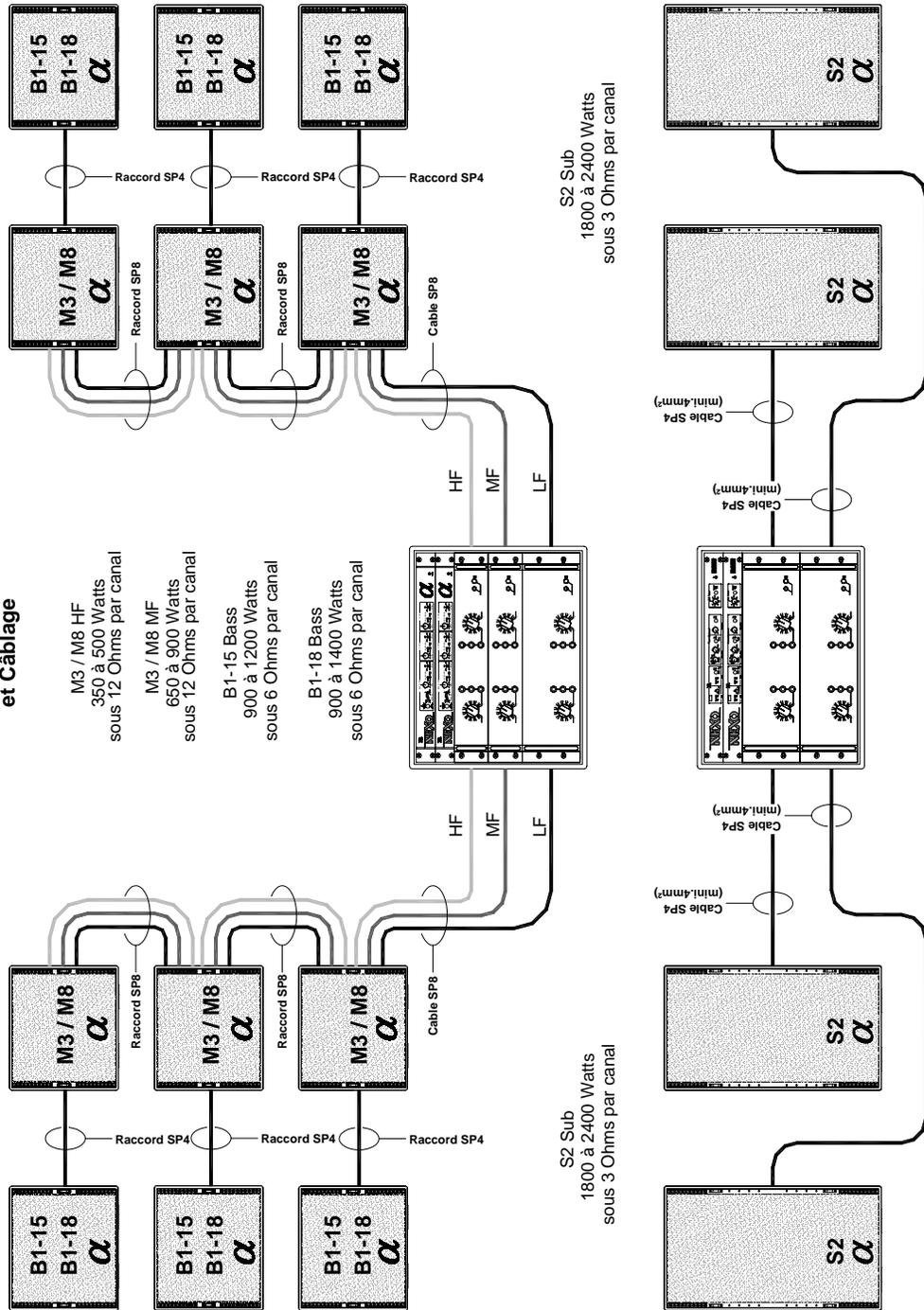


VUE DE DESSUS

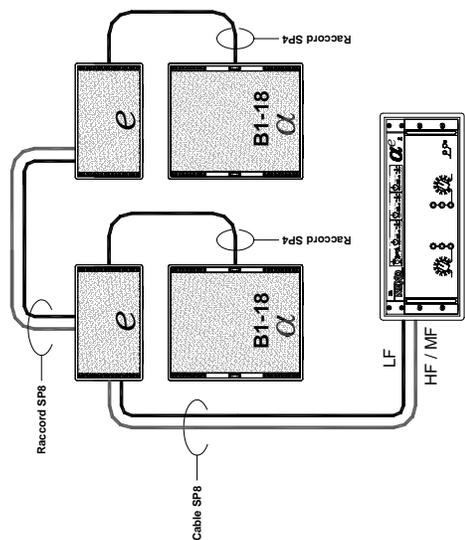


# V. Connection Diagrams

## α Puissances Requises et Câblage

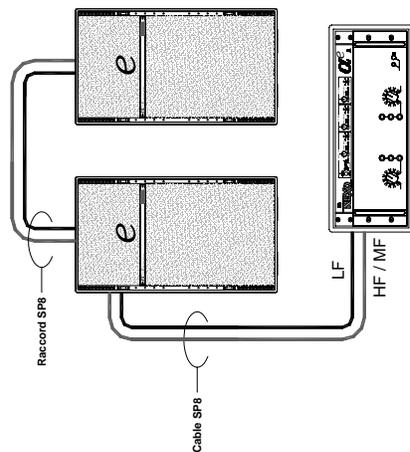


**α<sup>e</sup> Puissances Requises et Câblage**



**EM**  
HF / MF  
700 à 1000 Watts  
sous 8 Ohms par canal

**B1-18**  
900 à 1400 Watts  
sous 6 Ohms par canal



**EF**  
HF / MF  
700 à 1000 Watts  
sous 8 Ohms par canal

**LF**  
900 à 1400 Watts  
sous 6 Ohms par canal

