- Active Audio -

L'acoustique active

Public address in large volumes…

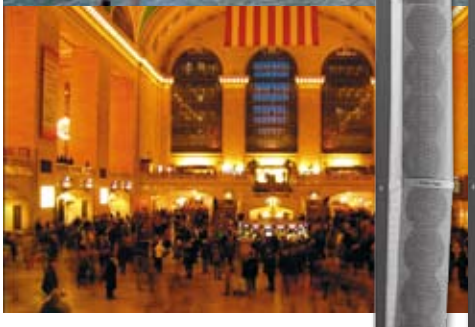
StepArray, DSP column loudspeakers

Voice messages are perfectly heard and understood, even in highly reverberant and noisy environments.

The clear and dynamic sound is at the same level (SPL) at 1 m or 35 m from the StepArray column.

With their slim shape, StepArray columns become an almost invisible part of the decor.

Installation and use are made easy with the SAdrive calibration and control real-time software.



A single column can cover an enclosed space of more than 35 m in length. Cabling is reduced to a minimum. One processor can be used for several columns.

StepArray

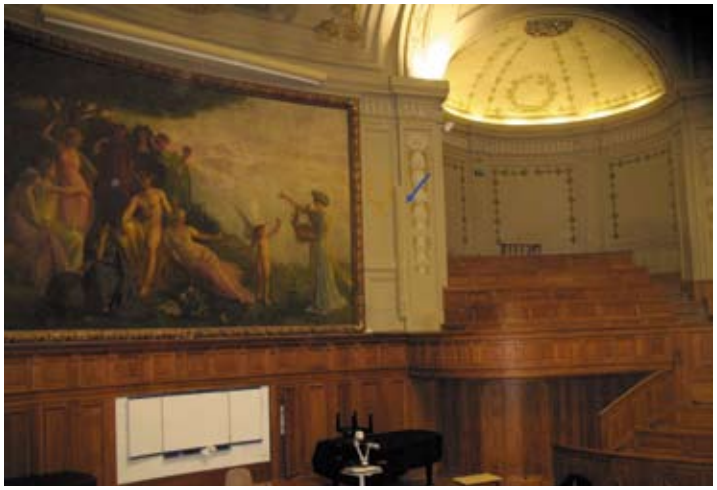
Railway stations, airports, swimming pools, places of worship, shopping malls, conference halls, lecture theatres, auditoriums, museums, historical buildings.

SNCF Train Station - Toulouse
1 column SA250P

«In place of this blurred sound, which for years, attempted to inform passengers of delays and platform changes, the SNCF French railway operator installed an intelligible PA system and to top it all, it is almost invisible».
Le Moniteur, 7 March 2008

St Pierre Church - Olonne
1 column SA250P and 2 columns SA100P

«The comparison between a StepArray column and the existing traditional system of about fifteen columns is without question in favour of the Active Audio system».
Actualité de la scénographie N° 187, January 2008



La Sorbonne University - Richelieu Amphitheatre - Paris
1 column SA250S

«Compared to a traditional public address system, the restricted number of necessary channels leads to a simplification of the wiring, a facilitated maintenance and a limited impact on interior design».
Acoustique & Techniques, N°52-2008

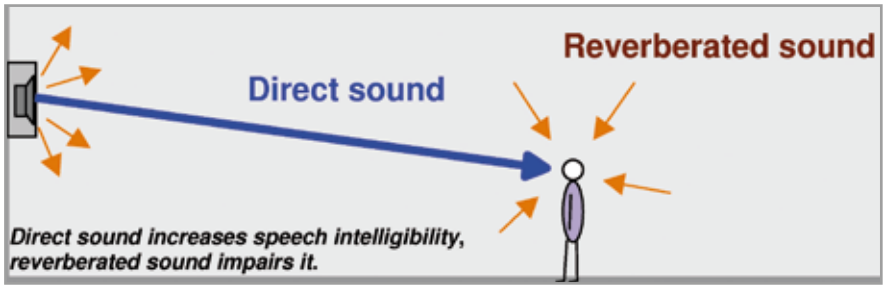
Nanterre University - Paris
1 column SA250P

Théâtre de Paris
2 columns SA100P

How does it work ?

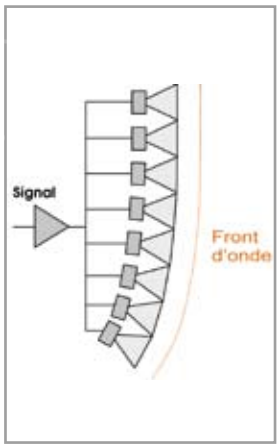
The StepArray system is a Line-Array based on ACTIVE AUDIO's patented DGRC technology. It consists of a range of column loudspeakers controlled by a DSP processor.

The aim of DSP controlled column loudspeakers is to deliver perfect intelligibility. In order to do so, it is crucial to reduce to the maximum the reverberations on the walls and ceiling of the emitted sound, and to have a strong direct sound. In other words, it is necessary to control the directivity of the sound, with respect to the enclosed space to be covered.



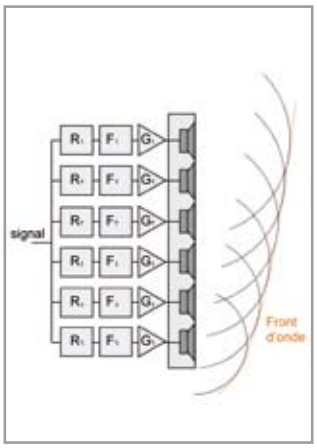
Line-Array Geometric

In a geometric array, loudspeakers are aligned to follow the shape of the wave front to be generated, usually a J shape.



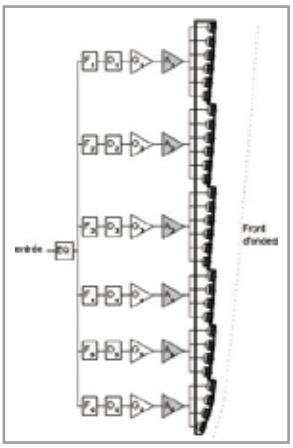
Line-Array Electronic

In an electronic array, loudspeakers are aligned vertically and the J-shaped wave front is created by adjusting delays D_i, filters F_i and gains G_i relating to ***each loudspeaker.***



StepArray Geometric + Electronic

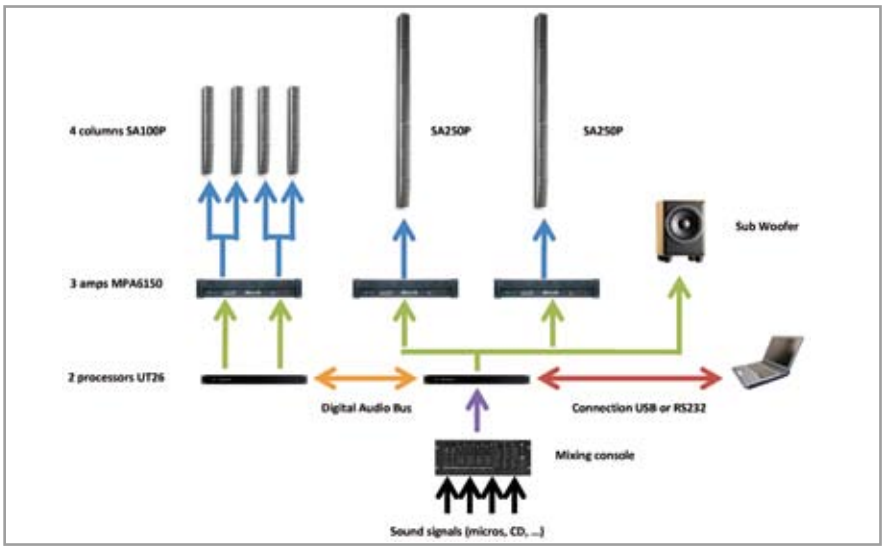
With the DGRC principle (Digital and Geometric Radiation Control) used in StepArray columns, the wave front is shaped and controlled by ***both*** *the geometric positioning and orientations of the loudspeakers, and the electronic adjusting of delays D_i, filters F_i and gains G_i of* ***each channel.***



The main advantage of DGRC is that it decreases the number of channels to be controlled, compared to a system where every loudspeaker must be controlled independently. This means that it becomes possible to separate the electronics from the columns, giving further advantages: reduced weight, slimmer dimensions for equivalent power, facilitated maintenance of the electronics, less electronics, cost efficiency.

A typical installation

The SAdrive software is used to calibrate the system. It is installed on a PC connected to the DSP processor UT26. The UT26 processor calculates the signals to be sent on each channel (group of loudspeakers) of the column via the amplifier MPA6150.
Once the system is calibrated and tuned, the PC can be disconnected, the parameters having been saved in the processor. It is possible to modify them by re-connecting the PC.
For music diffusion, we recommend adding a subwoofer. An option allowing this is available for integration into the StepArray solution.

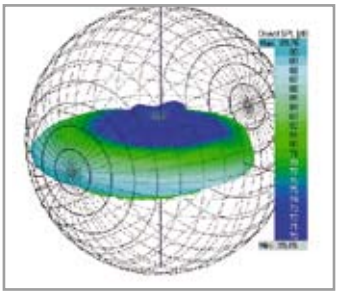


Typical StepArray architecture including a subwoofer for music diffusion, in the zone covered by the SA250P columns.
The SA100P columns are connected in parallel, work in pairs and are in stereo mode.

Since both UT26 processors are linked together by the Digital Audio Bus, only one connection to the sound source is required.

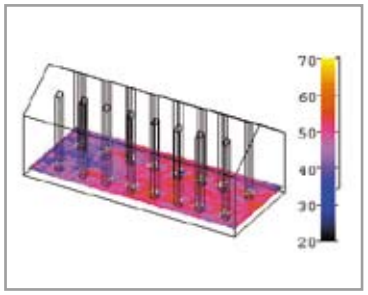
Simulation models

A simulation model of the sound coverage of the StepArray columns can be done with the acoustic simulation software CATT-Acoustic™ and EASE. The corresponding DLL are available for free download at www.activeaudio.fr.

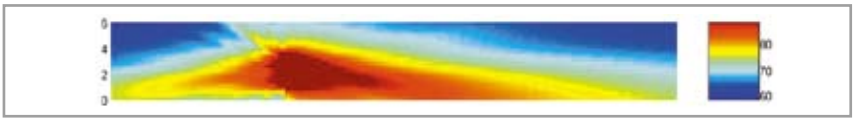


Balloon plot of SPL radiated in octave 1 kHz by column SA250S.

Result of a simulation with EASE equipped with the StepArray DLL.



Result of a simulation with Catt-A equipped with the StepArray DLL. RASTI map in a basilica of dimensions 43x18x12 m and of RT 3,2 s at 1kHz, covered by two columns SA250P (light blue).



Map of the SPL in octave 1 kHz in median vertical plane generated by the column SA250S.

Security Sound System (SSS)

In cases where the PA system also ensures the diffusion of emergency / evacuation messages, the system has to comply with the EN60849 standard (acoustic quality in public places) which specifies a minimum level of intelligibility, but also imposes a permanent surveillance of the proper working order of the system. This is called a Security Sound System (SSS). StepArray complies in terms of intelligibility and becomes surveillance compliant by adding the surveillance module SSS. For further details, please refer to the option SSS described on www.activeaudio.fr.

The StepArray range

The StepArray columns have 3 standard colours : black, grey and white. In order to blend the columns into the decor, the COL option allows you to order a specific colour for your columns - all we need from you is the exact RAL/Pantone code.

SA250S :
2.50 m column for a step-seated audience.
Its range is over 30m.
It is the ideal solution for lecture theatres, auditoriums, sports halls.

SA250P :
2.50 m column for a horizontally-seated audience. Its range is almost 40m, making it suitable for very large plane volumes such as railway stations, airports, swimming pools, places of worship, shopping malls, museums, historical buildings.

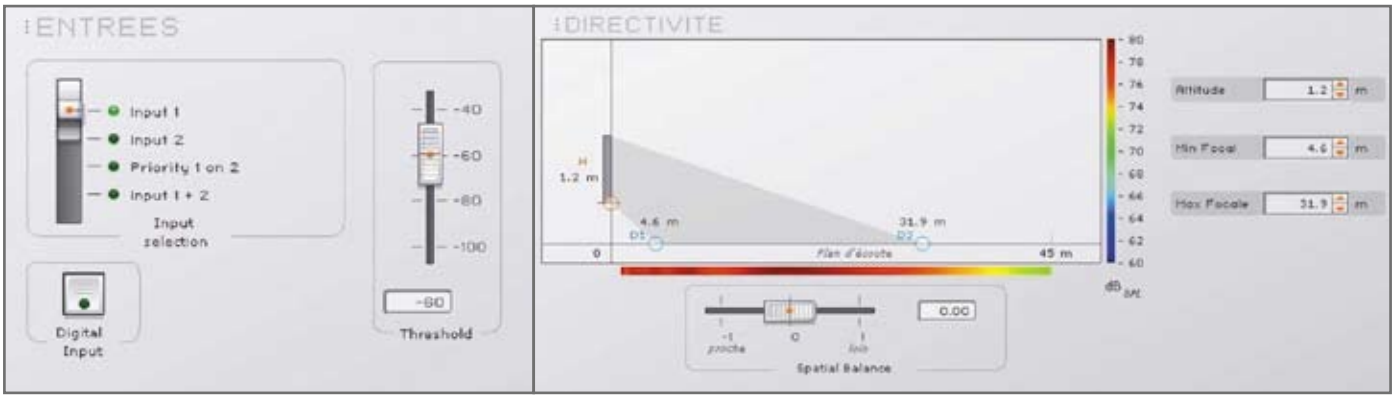
SA100P :
1 m column for a horizontally-seated audience. Its range is almost 20m. It is often coupled with another SA100P for a stereo sound using the same UT26 processor and the same MPA6150 amplifier. It is the right solution for medium length spaces with high ceilings such as conference halls, lecture theatres, classrooms, courts of justice.

SA180P :
1.80m column for a horizontally-seated audience. Its range being close to 30m, it is a good compromise for medium-sized spaces.
This latest addition to the range will be available beginning 2009.

SAdrive

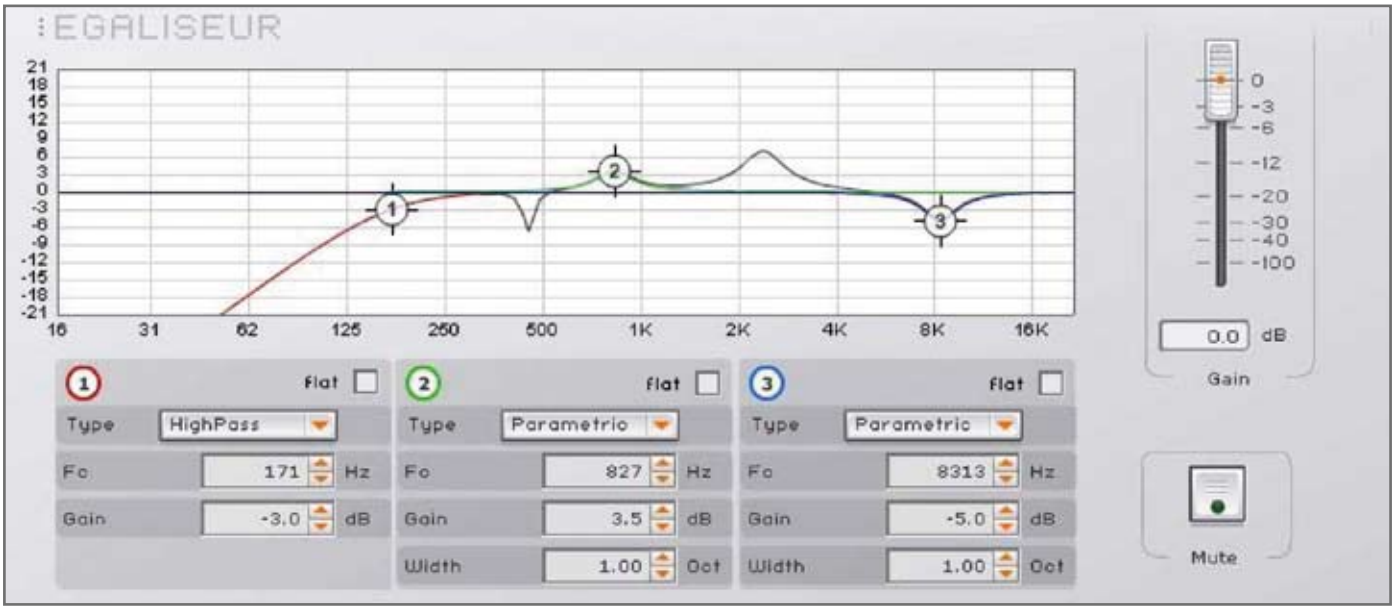
SAdrive is the software tool for calibrating, tuning and controlling an installation.

- Directivity setting, based on the shape of the enclosed space,
- Sound equalisation per column or per group of columns,
- Priority settings for sound signal inputs,
- Setting of delays of one column with respect to other columns,
- Adding a subwoofer,
- Anti-Larsen activation,
- Automatic Gain Control…



Input management: priority of inputs 1 and 2, selection of type of input signal (Analog / Digital) and control of the threshold for input signal detection.

Directivity is set simply by specifying the height of the bottom of the column with respect to the listening plane (ears = 0), and the min and max focal distances of the zone. The Spatial Balance slider allows boosting the SPL in a given part of the zone, e.g. to compensate the effect of the acoustics of the enclosed space. The resulting sound level (SPL) on the listening plane is displayed as a colour graph.



There are 6 filtering cells in each processor: 3 group cells, and 3 processor-specific cells. Parameter setting for each cell can be done by digital data input, by increment / decrement, or by dragging the control points on the graph. The frequency responses curves of each cell and the overall response are displayed.

Choosing the right installation set-up

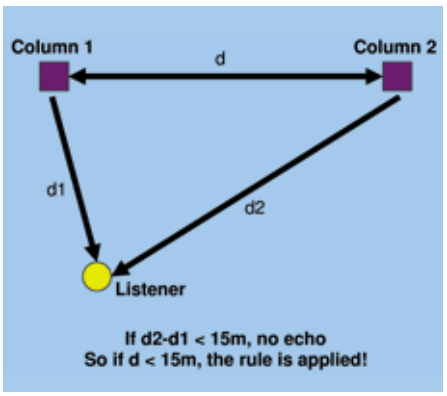
In choosing the set-up it is important that the following are reached: :
- Ensuring a proper SPL coverage,
- Delivering a satisfying intelligibility of vocal messages,
- Avoiding echoes and Larsen effects,
- Giving the feeling that the sound comes from the speaker,
- Optimising aesthetics and discretion of the PA system,
- Allowing an easy cable routing.

1. Choosing the number and type of columns based on the size of the enclosed space

Start by choosing the column offering the coverage range needed and then if necessary add columns to cover the whole space, the sound mapping being obtained by adding the SPL levels of the columns. And finally make adjustments to the result with respect to reverberation which reinforce the SPL in the zones close to walls. For example, a column having a constant range of 35 m can adequately cover a 45 m space if there is a reflecting wall at the back. To increase the range of the columns it is possible to fit them higher up than the nominal height, bearing in mind that the mean SPL level will be lower. Please refer to the technical manuals for further details. All these parameters can be easily set and tested with the SAdrive software available for free download at www.activeaudio.fr.

2. Optimum combination of columns

When dealing with column combinations certain parameters have to be taken into account :
- Avoid interferences between columns : without going into too much detail, it is recommended not to separate two columns covering the same zone by more than 15 m, so as to avoid possible echoes for certain sections of the audience.
- For conference halls it is also important that the speaker be placed not more than 15 m from the columns, failing which he runs the risk of hearing the echo of his own voice.



- It not advisable to add more columns than necessary since intelligibility could be impaired.

3. Acoustic location of the sound source

When there is a speaker, it is recommended that the audience feels that the sound comes from the speaker. This is achieved by fitting a column on each side of the speaker area so as to «re-centre» the sound. A single column can be used but in this case it has to be close to the zone to be covered.

Besides, aesthetic integration in the interior design is to be borne in mind in choosing the fitting position of the columns as well as the constraints inherent to the building such as: ease of routing of the cables for the columns, distance between the column and the technical/equipment bay housing the electronics. This distance can be greater than 100 m, with a slight loss in SPL.

4. Preventing the Larsen effect

As with all sound system installations, it is important to make the appropriate choice regarding the type of microphones and their positions with respect to the columns in order to prevent Larsen. In addition, the StepArray system is geared towards limiting the risk of Larsen. In the electronics part an Anti-Larsen algorithm has been integrated in the processor allowing a gain of about 4dB compared to a classical system. In the geometric part, since the columns deliver excellent intelligibility, there is no need to raise the volume to hear and understand as is unfortunately often the case in traditional systems.

In all cases, a detailed simulation under CATT-Acoustic™ or EASE can validate the chosen installation set-up.

5. Determining the number of DSP processors and amplifiers needed

A single UT26 processor manages several columns. For columns SA100P and SA180P, it is even possible to connect two columns with different signals on the same processor to obtain a stereo sound (for example) as well as performing different settings for directivity, equalisation and delays. Several processors can be coupled together within the same installation so that all the signals are synchronised. As for the MPA6150 amplifier, it can manage one column SA250X, 2 columns SA180P and up to 4 columns SA100P.

6. Is it necessary to add a sub woofer ?

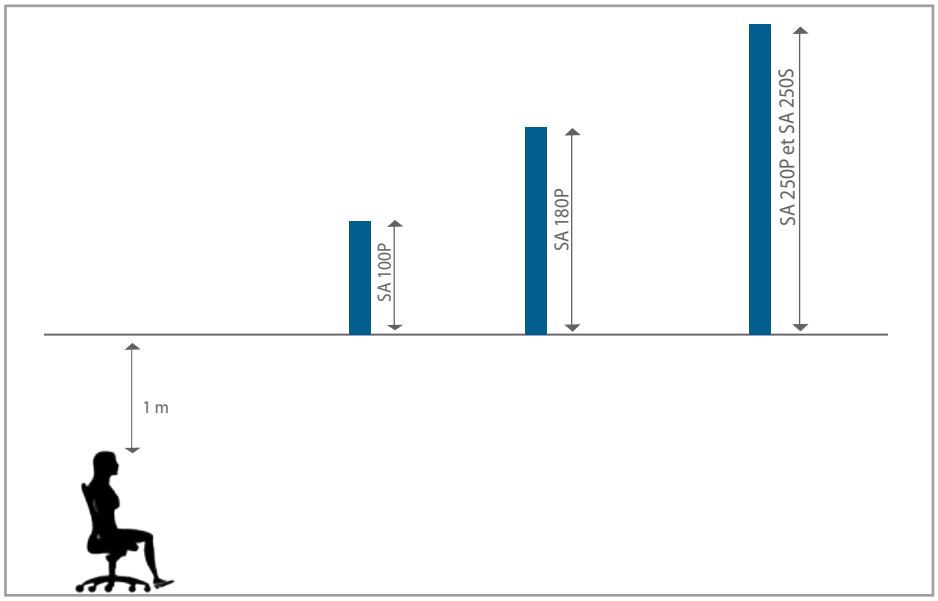
In cases where the StepArray system diffuses music, the sound fidelity will be better (roundness and fullness) if a sub woofer and its associated amplifier is added. The sub will be managed by the UT26 processor fitted with the SUB option. This option is not necessary for installations aimed at vocal diffusion since the human voice hardly has component frequencies in the bass range below 150 Hz.

Our engineers at Active Audio are at your disposal to advise you and to help you choose the optimum solution - *our contact details are at the back of this document.*

Technical data

	SA100P	SA180P	SA250P	SA250S
Constant SPL cover (+/- 3dB) max	15 m	30 m	35 m	28 m
Constant SPL cover (+/- 5dB) max	21 m	40 m	45 m	36 m
Horizontal coverage angle (-6dB, at 1kHz - 2kHz)	180°	180°	180°	180°
IP Protection Index	IP54	IP54	IP54	IP54
Max SPL level (pink noise)	95 dB at 10 m	95 dB at 15 m	95 dB at 20 m	95 dB at 20 m
Bandwidth	220 Hz-18kHz	220 Hz-16kHz	220 Hz-16kHz	220 Hz-16kHz
Recommended cable type	5 x 1,5 mm² or higher section depending on distance	5 x 1,5 mm² or higher section depending on distance	8 x 1,5 mm² or higher section depending on distance	8 x 1,5 mm² or higher section depending on distance
Dimensions	1024x 124x131 mm	1840x 124x135 mm	2505x 124x151 mm	2505x 124x151 mm
Weight	9 kg	17kg	24kg	24kg
Mounting with square set (supplied)	Yes	Yes	Yes	Yes
Suspended mounting	Yes	Yes	Yes	Yes
Standard colours *	Black, grey or white	Black, grey or white	Black, grey or white	Black, grey or white
N° of amplification channels	3	3	6	6
Temperature	0 - 40°C	0 - 40°C	0 - 40°C	0 - 40°C
N° of 3" loudspeakers	12	22	30	30
Impedance of each line	**8 Ω**	**8 Ω**	**5.3 to 8 Ω**	**4 to 8 Ω**
Number of channels	**3**	**3**	**6**	**6**

*All other RAL/Pantone colours possible on request



SA100P	Column Loudspeaker - H 1.00 m - Audience : Horizontally-Seated
SA180P	Column Loudspeaker - H 1.80 m - Audience : Horizontally-Seated
SA250P	Column Loudspeaker - H 2.50 m - Audience : Horizontally-Seated
SA250S	Column Loudspeaker - H 2.50 m - Audience : Step-Seated
UT26-SA	DSP Processor, with StepArray plug-in and SAdrive
MPA6150	Power amplifier 6x100W / 8 ohms
Option COL	Option for specific RAL colour
Option CV232	Option for connecting UT26 to a PC via RS232
Option MIC	Microphone option, for CAG (Automatic Gain Control)
Option SUB	Option for a Sub-bass output
Option SSS	Option for EN-60849 compliance (Security Sound Systems)
FC2250	Flight case for transportation of 2 columns SA250X or 4 SA100P
C650UTMPA	Batch of 6 cables (50cm) for connection UT26 —> MPA6150
SAdrive	Software for Calibration, Tuning and Operation
SA100P-P2	Pack : 2 columns SA100P + electronics 2x SA100P + 1x UT26 + 1x MPA6150 + 1x Option CV232 + SAdrive
SA250X-P1	Pack : 1 column SA250P or SA250S + electronics 1x SA250P or SA250S + 1x UT26 + 1x MPA6150 + 1x Option CV232 + SAdrive
SA250X-P2	Pack : 2 columns SA250P or SA250S + electronics 2x SA250P or SA250S + 1x UT26 + 2x MPA6150 + 1x Option CV232 + SAdrive

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Contact

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