



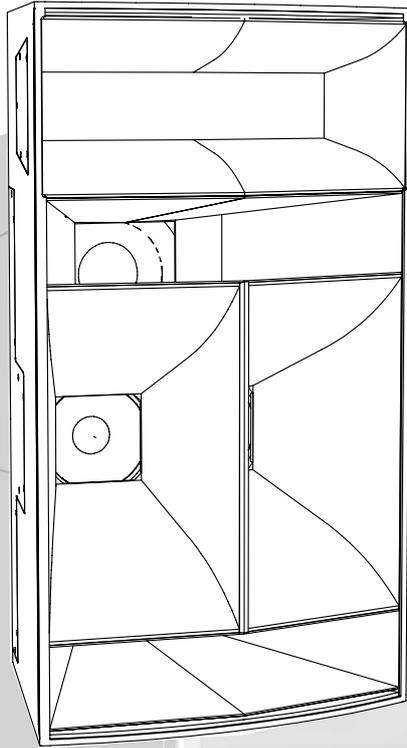
stage accompany

Design considerations

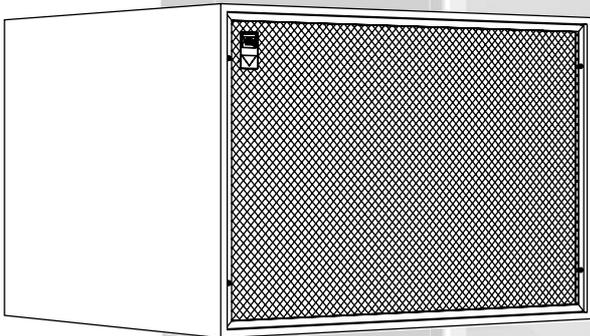
Preliminary



XL SERIES
XL 36

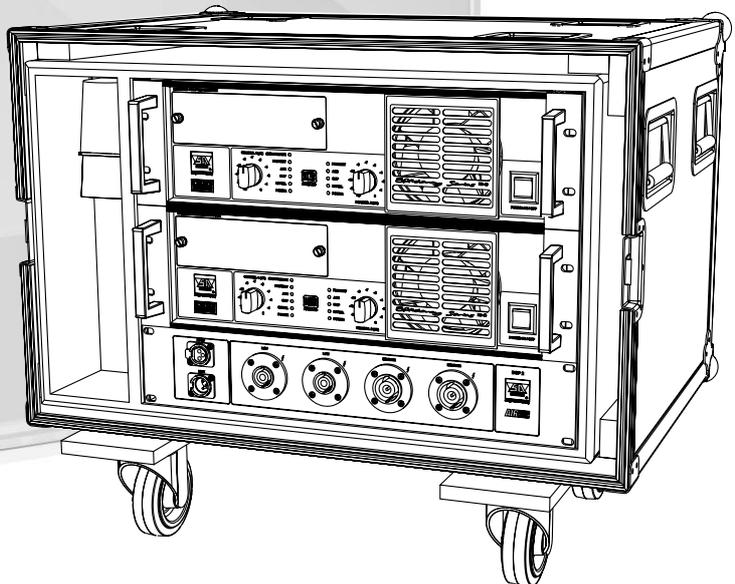


XL 36
Ribbonloaded three-way
(Lowmid/Mid/High)
frequency system



XL 30
High-power bass cabinet

XLR 80
Amplifier rack



(Contains: 2x ES 40, Power amplifier 1x XLCP2 Connector panel)

XL Series

- **frequency response exceeding HiFi standards**
- **absolute “line arrayability” H 36 degrees**
- **very dynamic power handling**
- **SPLmax 145dB @ 1 m.**
- **unparalleled “gain-before-feedback”**
- **for medium to long throw applications**
- **complete system design for full “component-synergy”**
- **“plug & play”**

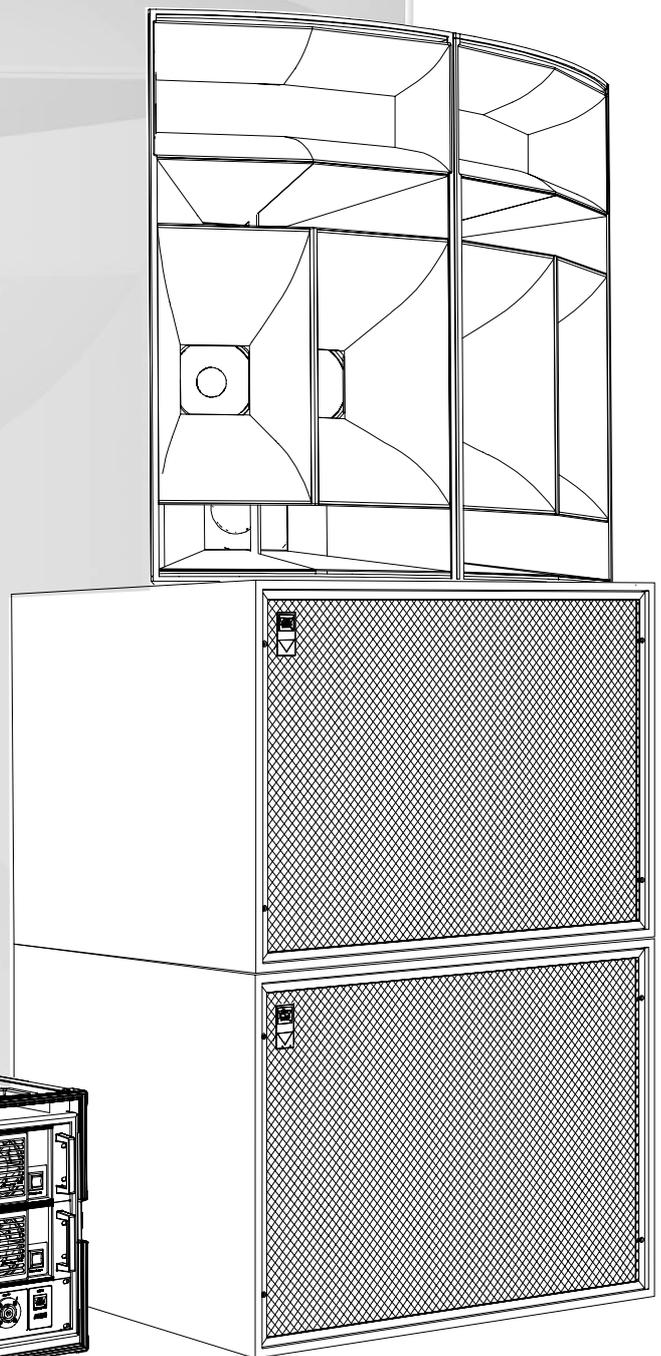
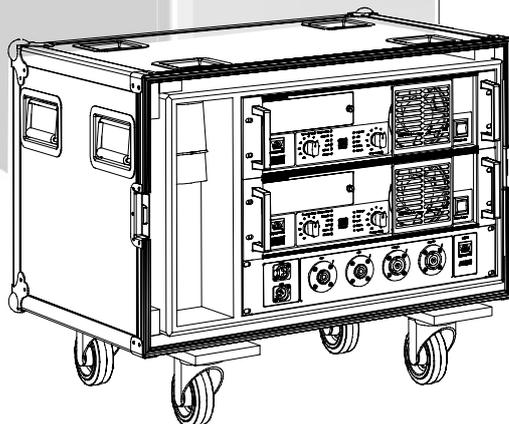
Design considerations

Today's touring sound reinforcement market is getting more and more competitive. Clients demand nothing but the best (sound) quality for less money; The “biggest bang for the buck”. This puts a tremendous pressure on the design of a sound system; “Efficiency” is now a matter of both logistic specifications as well as sound specifications and application specifications. In other words, a (touring) system has to be compact (less truck space), light in weight (less handling cost), roady-proof (less errors), very efficient (high “SPL-to-size” ratio) and versatile in application (more turnover with same system).

SA's new touring system had to combine the best of today's acoustical developments, together with the (possible) demands of tomorrow's live-sound and installation market.

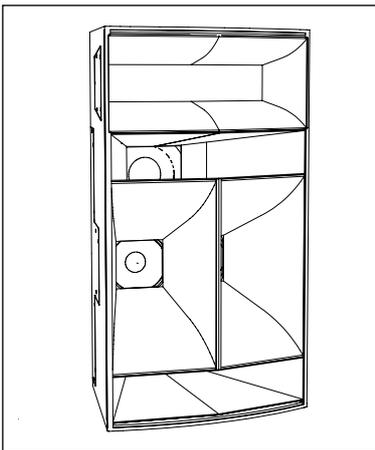
The XL Series has been designed as a complete system, with integrated loudspeakers, amplifier racks, dedicated processing, flying hardware and cables. It is suitable for applications as “stand-alone” stack system as well as (part of) a large-scale sound reinforcement system, with precise coverage control required. It performs with excellent sound quality on both low- as well as very high-sound pressure levels.

By bringing the XL Series as a complete system it also offers the advantage of compatibility between SA users throughout the world, extending the systems flexibility even further. Although the basic configuration will be two tops/two subs per side, there is no specific required system size for obtaining the systems full capabilities.



The XL system consists of XL 36 mid/high systems, XL-bin low systems and XLR 80 amplifier racks.





XL 36 lowmid/mid/high frequency system

The XL 36 is a three-way active-filtered LMF/MF/HF cabinet, featuring double SA 1206 12" speakers, double SA custom 8" speakers and double SA 8535D Ribbon Compact Drivers; All mounted on their own wave-guide. Dispersion is 36 degrees Horizontal and 30 degrees Vertical, symmetrical.

Freq. response exceeding HiFi standards

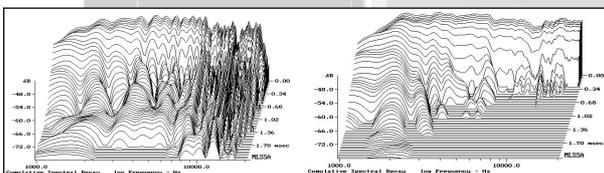
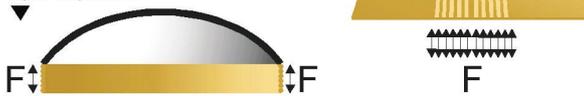
The high frequencies are reproduced by SA's proprietary Ribbon Compact Driver; the first breakthrough in loudspeaker technology in 80 years. Because of its different working principle, the speaker can generate frequencies up to 30.000 Hz. with a previously unknown clarity and speech intelligibility. Due to this very high transient-response, the actual "throw" of the system is enhanced, while offering unparalleled "gain-before-feed back".

Striking differences between existing (compression driver) technology and SA's proprietary "Ribbon Compact Driver" is

- 1) the lack of a compression chamber (resulting in the same tonal balance on all levels) and
- 2) the lighter weight of the moving mass (quicker mass response, up to 30.000 cycles per second = 30kHz).

The Ribbon Compact Driver, is a complete integration of the diaphragm and the voice coil.

The total structure of a conventional voice coil has more mass and thus increased distortion at higher frequencies.



Compression driver

SA 8535 Ribbon Compact Driver

These decay plots show the initial frequency response (back line) and transient response in time (lines to front). Clearly visible is the excellent initial response (no cone break-up!) and the lack of time-smear of the Ribbon Compact Driver (especially 8kHz.).

Ribbon tweeters have traditionally been characterized as fragile, with low power handling, poor efficiency and difficult impedance. As a result of SA's "learning curve" of over 15 years in pro-ribbon technology, the SA 8535 features a frequency response of 1 kHz. to 30kHz., a power handling of up to 2000W, a sensitivity of up to 107dB @ 1W./1m. The XL 36 features a modified version of the SA 8535 with different specifications.

Frequently asked question is "how durable is the diaphragm"? With today's digital dynamics, the output demand of frequencies in the "fidelity" area of 10kHz. to 16kHz has increased dramatically. Increasing power in this area makes the "break-up" problem of a compression driver even worse (remember, 16kHz. = 16.000 cycles per second!). Under practical circumstances, the



Ribbon diaphragm has proved to be even stronger than the compression driver diaphragm.

Now high "concert sound" power output has been combined with "studio sound" sound quality.

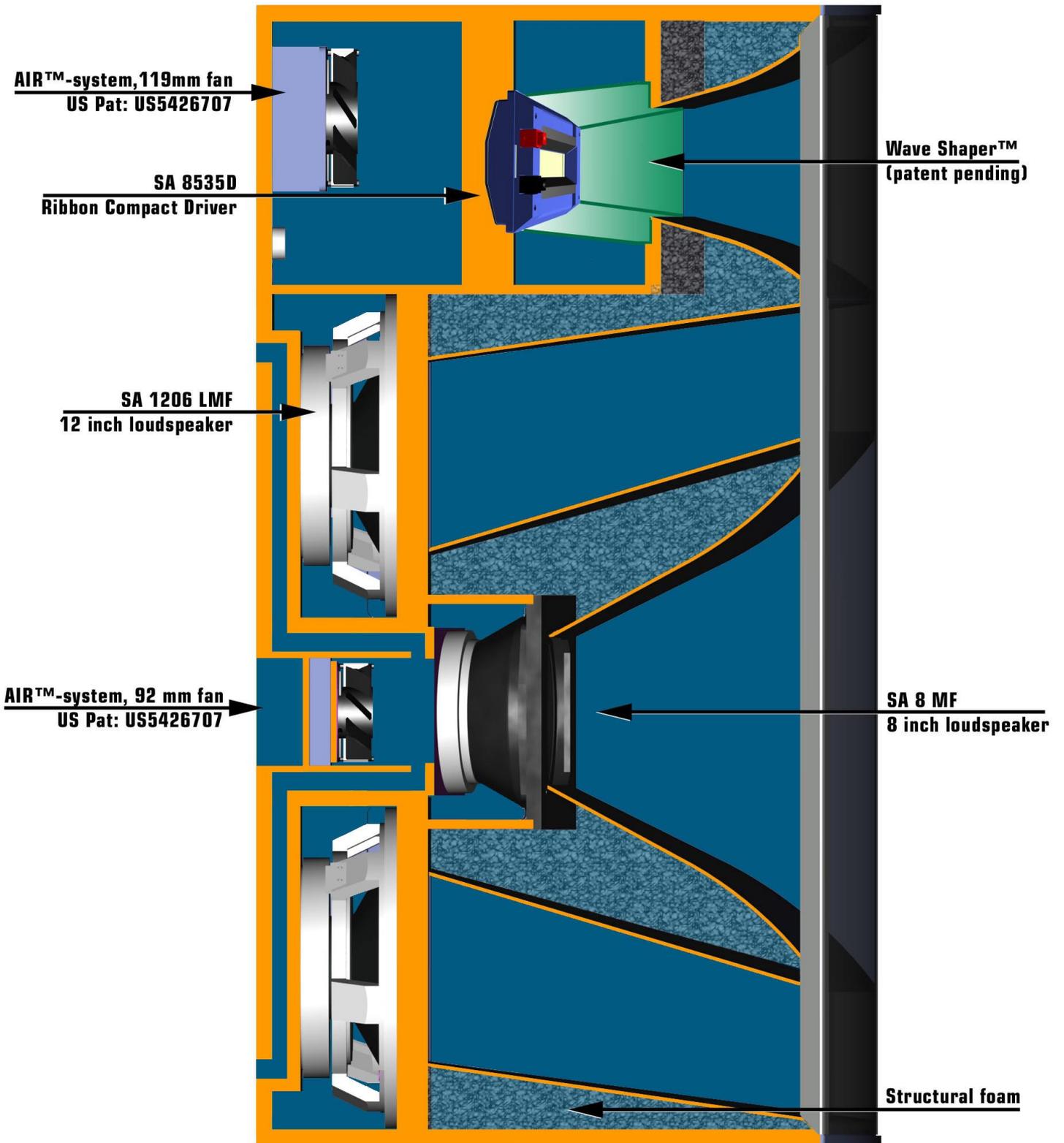
SA 8535 Ribbon Compact Driver

Absolute seamless "line-arrayability" over entire frequency spectrum

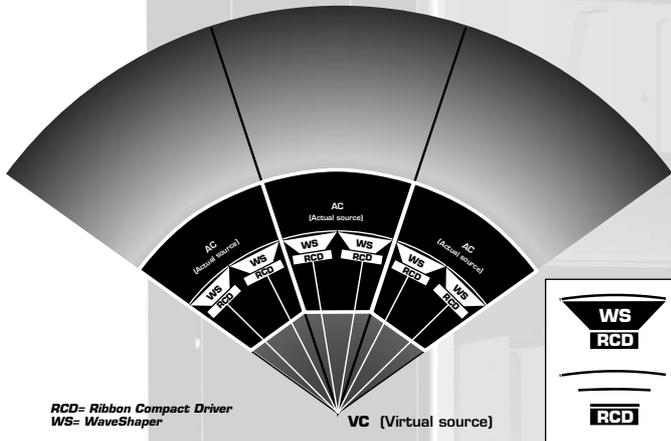
The most difficult aspect of larger, compiled sound systems is their interactivity. When combining different sources (multiple speaker cabinets), the output of one cabinet is interfering with the output of the other cabinet. The effect is usually "lobing" and "comb-filtering", resulting in diffuse sound (multiple sources), lack of efficiency (speakers working against each other), etc. By getting control over the dispersion pattern of a cabinet, this "interactivity" can be improved. Because all sections of the XL 36 system are "wave-guided", there is complete control over the dispersion pattern in the horizontal and vertical plane.

The HF section features SA's proprietary "WaveShaper™" (patent pending) with which a precise acoustical HF coupling is realized between the two planar ribbon drivers, forming a genuine "linesource" output. When using multiple cabinets in "tight pack" configuration, a continuous array of planar ribbon drivers forms a coherent and continuous line-array dispersion pattern in the horizontal plane.

The propagation of the WaveShaper™ places the acoustical centers of the drivers behind the cabinet, resulting in a superb consistent dispersion, without the usual comb-filtering ("lobing"). This brings many advantages in both sound quality as well as sound "quantity"; Less coloring, very high "gain-before-feedback", superb frequency stability within the dispersion pattern and higher efficiency as a result of near-perfect coupling.

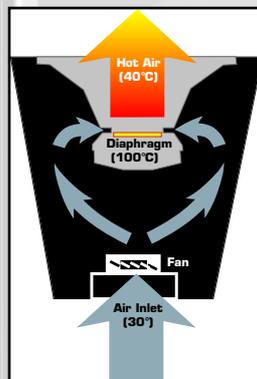


The MF section features double high power SA custom 8" speakers, each in their own dedicated wave-guide. In order to reach a smooth dispersion transition near the HF cross-over region, multiple smaller drivers were chosen; By separating the output of the drivers in the horizontal plane, multiple sources are created, improving coupling. In the vertical plane this is not ideal (increase of lobing and diffusion), therefore no additional (phase-plug) devices have been used.



Since the midband frequencies of 250Hz - 1.8 kHz are very important for the total systems response (vocal range), it was a very difficult task to combine small sources with very high power handling and horn-loading. The custom designed driver features 2" voice-coil with stiff suspension and a carbon dustcap.

The LMF section consists of two high power SA 1206 speakers, each in a complex shaped resonance chamber. This chamber consists of a carefully tuned, broadband quarter wave pipe resonator, with a huge efficiency of 107dB. (1W/1m for a complete LMF section) The resonance chamber transforms symmetrical cone-loading to asymmetrical propagation. The two LMF outputs cooperate as a double source, gaining improved vertical coverage control. Since this arrangement brings single LMF outputs in the horizontal plane, directivity in the area of 90Hz to 250 Hz is greatly improved.



State-of-the-Art weight saving construction

All horns are a combination of traditional craftsmanship and high-tech CNC routers. The horn flares of each section are formed by 3mm. Baltic birch wood for smooth guided curves. The cavities between the cabinets side walls and behind the horn flares are filled with structural foam. This construction has an excellent "stiffness-to-weight" ratio with excellent acoustic damping and cavity resonance suppression. The cabinet construction is made of 15mm/ 0.60 inch multi-layer Baltic birch panels, connected with tongue and groove for a larger connecting surface; The construction is supported by lightweight bracing. As result of our 25 years craftsmanship, our cabinets are both extremely durable and very light in weight.

Very dynamic power handling

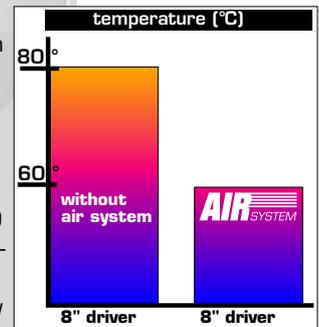
Consistent power handling over a prolonged period of time is an important part of the systems performance. Heat is one of the most influential aspects of "power compression"; Already after a few hours at max. SPL, the systems output can drop a whopping 7dB just because of this heat build-up.

Designing a system that performs at peak level for the first (demo) 30 minutes is not difficult; Designing one that has a sustained dynamic power reserve up to 145dB @ 1 m. is something else!

Using large, over-dimensioned magnets and voice-coils, will only delay the occurrence of power compression, but cannot overcome this phenomenon.

AIR SYSTEM Fifteen years ago, Stage Accompany developed the first generation "AIR™ system" (Active-intercooled Ribbon), for application in one of the first ribbon-loaded systems. Here, the cooling system increased the power handling of the ribbon with 100% and reduced power compression by 3 dB. (US pat.: US5426707)

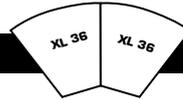
Now, SA has extended the use of her second generation AIR™-system to the cone drivers as well. All speakers in the D 36 system are cooled by air. The AIR™-system is reducing magnet operating temperature by 20 degrees (Celsius). This reduction of operating temperature caters for a dramatically reduced power compression for the cone drivers and a doubled power handling for the ribbon tweeter.



The AIR™-system consists of two quick start fans at the rear of the cabinet; One for the Ribbon Compact Driver and one for both the double 8" and double 12". The airflow for the RCD is, by means of two "spoilers" blown onto the ribbon diaphragm and leaves the speaker at the front, together with the sound; The airflow of the cone drivers is, by means of two channels, blown along the speaker magnet structures. Because the speaker baskets are sealed off of these channels, there is no interference with the speaker output. The AIR™-system features optimized airflow for low noise and maximum cooling; Its operation is visible through a LED indication on the connector well of the XL 36.

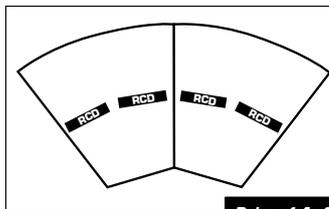
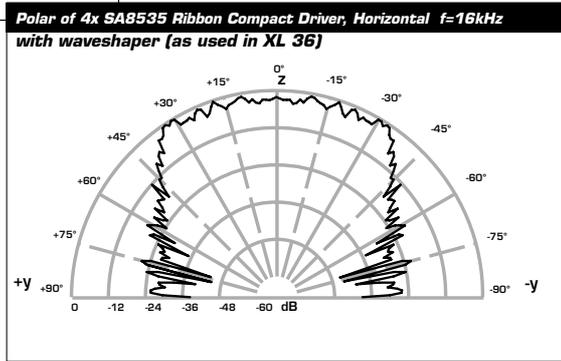
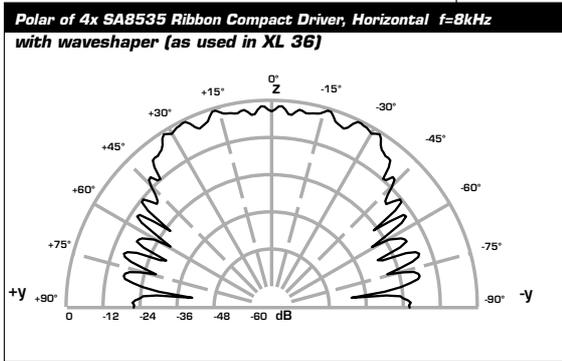
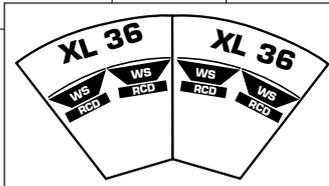
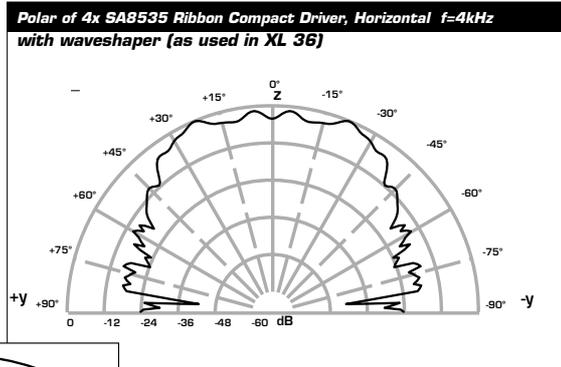
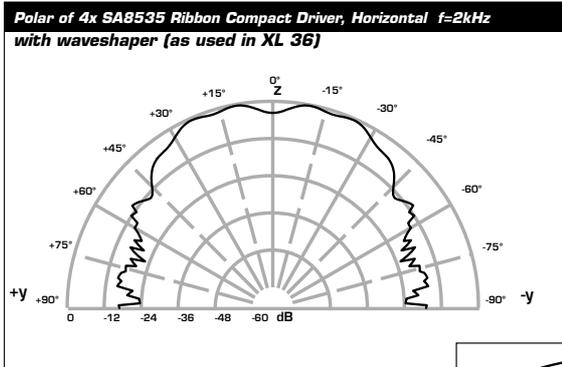
The speed of the fan, as well as the powering, is micro-processor controlled from the EFN circuitry within the amplifier. No additional cables are needed! The micro processor on the EFN-OP module controls:

- fail-safe switching for fan; When fan function is interrupted (obstruction or fail) the system automatically switches over to passive HF protection ("current-to-light" conversion)
- fans switch off after certain period of time, to prevent dust forming in the cabinet and increasing the lifetime of the fan. The system will also switch to passive protection then.

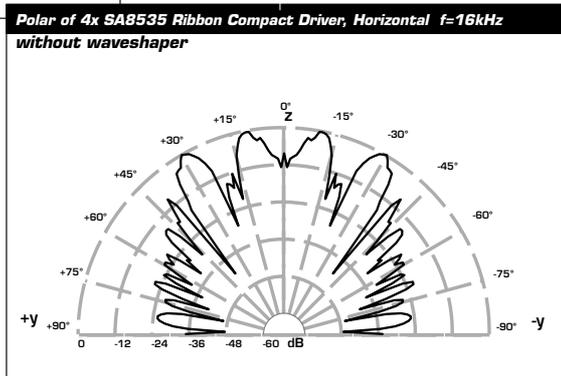


Polar plots of two XL 36 tight-packed

f= frequency (Hz). All measurements are taken at a distance of 6m (3.28ft). All plots are unsmoothed.
 In this situation 4 Ribbon Compact drivers are equivalent to 2 XL 36 tight-packed.



compare



Dynamic Damping Control

As all SA systems, the XL 36 is completely DDC pre-wired. When using an SA amplifier, the influence of speaker cables and connectors is completely eliminated, resulting in an impressive damping factor of 10.000 at the speaker terminals, regardless of cable length. As a result of this high damping factor, the optimized transient response caters for tighter and more accurate mid and bass reproduction. Furthermore, DDC substantially reduces both linear and non-linear distortion.

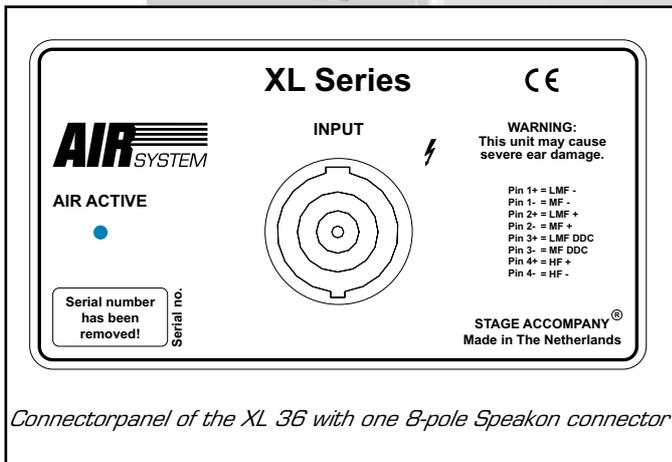
Please note; More information on EFN and DDC in the amplification section.

Connection

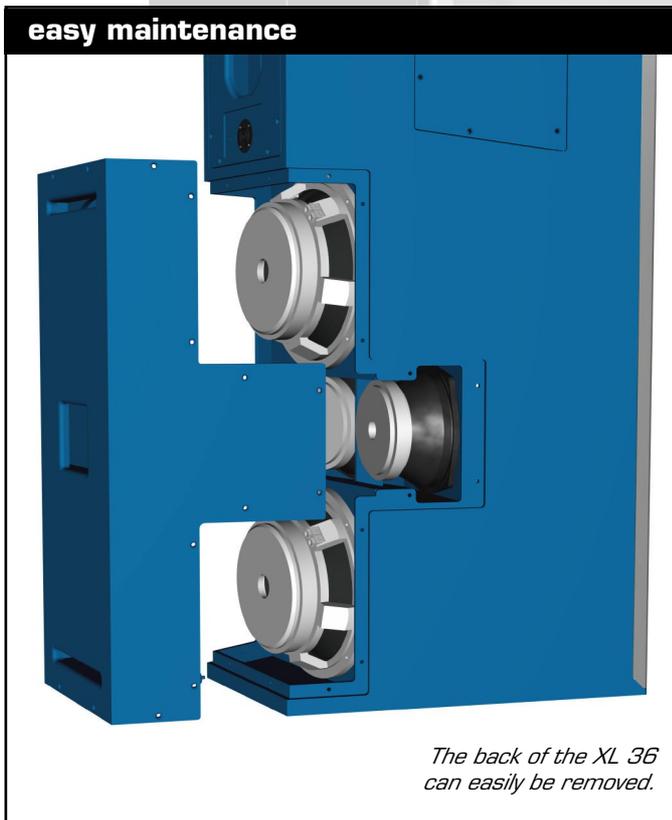
The cabinet is connected with one single Speakon-8 connector; This connects speaker input LMF MF, HF driver, DDC for the LMF and MF driver and fan power for the HF driver.

Technical specifications XL 36 (preliminary)

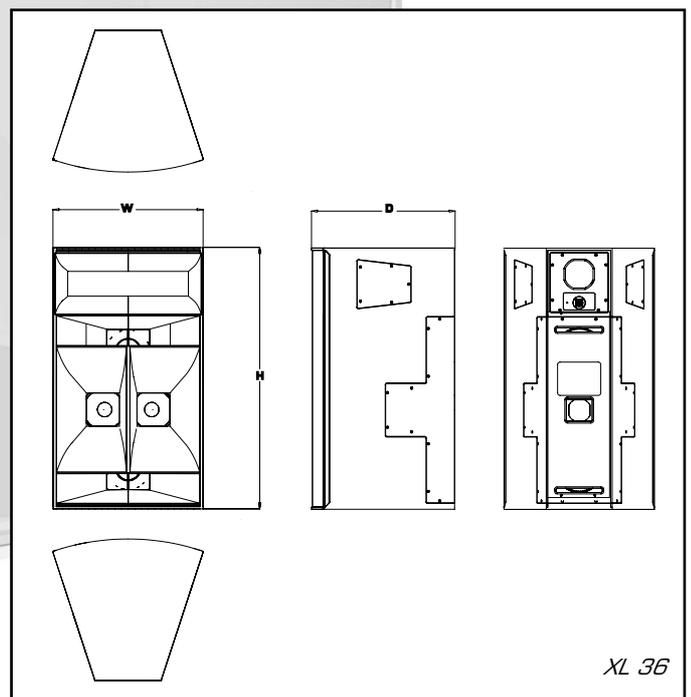
Frequency response (-3dB)	90 - 20.000Hz
Drivers	LMF 2x SA 1206, MF 2x SA 8, HF 2x SA 8535D
Cross-over frequency	250 -1500Hz
Nominal impedance ohm	LMF 4 ohm, MF 8 ohm, HF 7 ohm
Sensitivity @ 1 w/1 m	LMF 107dB, MF 112dB, HF 113dB
Max RMS power	LMF 300W, MF 200W, HF 240W
Max peak power	LMF 2000W, MF 1300W, HF 1540W
SPL program/peak (dB)	LMF 133/140, MF 137/145dB
Dispersion H x V	36° x 30°
Color	black Protecture™, others on request
Connectors	1 x Speakon™-8
Physical dimensions HxWxD	1100 x 626 x 592 mm. (43.3 x 24.7 x 23.3 in.)
Weight	80 kg. (176.4 lb)
Warranty	5 years limited (1 year on "moving parts")



Connectorpanel of the XL 36 with one 8-pole Speakon connector

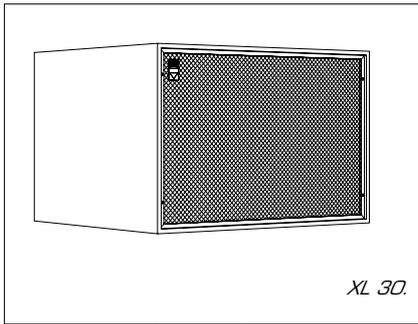


The back of the XL 36 can easily be removed.



XL 36





XL 30.

XL-bin low frequency system

The XL 30 is a high output bass cabinet, with double SA 1513 long-excursion woofers in push/pull configuration, recommended for applications where very high output bass reinforcement is needed.

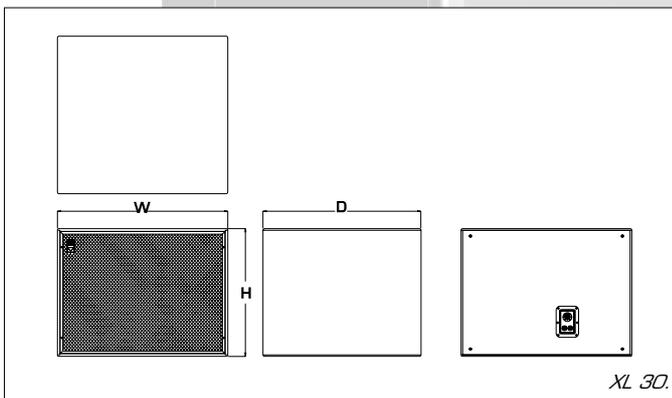
Very high efficiency

A high quality sound system is not complete with good, fundamental bass response. Through the years, many attempts have been made to increase efficiency in the lower octaves. This resulted either in very complex horn constructions or a limited system bandwidth down to 70Hz., adding the need for subwoofer extensions.

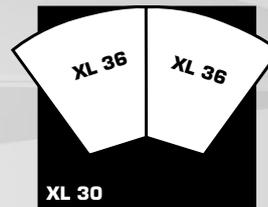
The bass of the XL system is reproduced by the XL 30, a worthy successor of SA's well-known "W-bin", which made SA's entry in the live sound market in 1977. Basis of the XL 30 is "Two Stage Tunnel"-loading (TST-loading™). With this principle, a double SA 15" configuration has a maximum SPL of 140 dB @ 2000W peak.

This new technology in the XL 30 combines the sonic qualities of a front-loaded system with the high efficiency of a horn-loaded system. With this "tunnel-loading", the air mass in front of the speakers, is being coupled to the loudspeaker/cone surface, generating a resonance over a wide frequency bandwidth, resulting in a very high system sensitivity. To increase this efficiency even further, the output of the reflex vents enters the tunnel at 1/3 of the tunnel length from the speaker baffle. The applied speakers are two SA 1513, long-excursion, low power compression bass speakers. The speakers are mounted in "push/pull" configuration for reduced second-harmonic distortion.

The sensitivity of the XL 30 is 107 dB @ 1W./1m. from 52 Hz.- 125 Hz. (± 3dB); This means the XL 30 has more than twice the efficiency of a standard front-loaded dual driver cabinet!

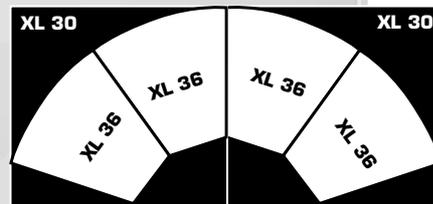


XL 30.



XL 30

The XL 30 and the XL 36 can be stacked in two ways.



XL 30

XL 30

State-of-the-Art weight saving construction

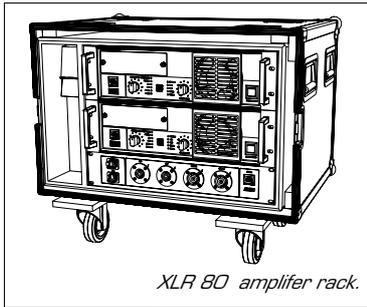
Also the construction of the XL 30 shows SA's dedication to "application-driven" design; Panels are made of 15mm Baltic birch, connected with tongue and groove for a larger connecting surface; An internal "cross-mounted" bracing makes the XL 30 virtually indestructible.

Our 25 years craftsmanship guarantees "one-man" handling; The weight of the cabinet is balanced to the rear, so that "flipping" the cabinet on its wheels can be done by one person.

Technical specification XL 30

Frequency response (3dB)	52 - 125Hz
Drivers	LF 2x SA 1513
Cross-over frequency	100Hz.
Nominal impedance	LF 4 ohm
Sensitivity @ 1 w/1 m	LF 107dB
Max RMS power	LF 800W
Max peak power	LF 2000W
SPL program/peak (dB)	LF 136/140
Dispersion H x V	omni
Color	black Protecture™, others on request
Connectors	1x Speakon™-8, 2x Speakon™-4
Physical dimensions HxWxD	730 x 970 x 900 mm. (28.7 x 38.2 x 35.4)
Weight	75 kg. (165 lb)
Warranty	5 years limited (1 year on "moving parts")





XLR 80 amplifier rack.

DR 80.2 amplifier rack

Understanding the relationship between loudspeakers and amplifiers SA started development of amplifiers in 1980. Since then, SA has always reached for the best possible sound reproduction and creating the highest synergy between speakers and amplifier without any weak links.

Also, with the development and application of the Ribbon Compact Driver, new goals in sound quality were set, while increasing power output and maintaining reliability. Over the years, the amps have earned themselves an outstanding quality reputation of their own, by using proven quality concepts. These designs excel in uncommon sound quality with proven reliability under even the most harsh user conditions.

Mechanical integrity is applied in all amplifiers. That's why glass-fibre reinforced epoxy circuit boards placed on thick copper traces are used, instead of SMD circuit boards.

"The show must go on under all conditions" is a well-known expression, which is especially applicable on power amplifiers!

The recommended amplifier for the XL touring system is the ES 40. The ES 40 is built with a "high speed, high current" class G design, for increased efficiency. The Class G "push/pull" design is one of the most efficient "traditional power supply" designs. In the ES 40, two large torodial power supplies in combination with a large capacitor bank (400 Joules) bring out massive, sustained power (2x 2700W peak @ 2 ohm).

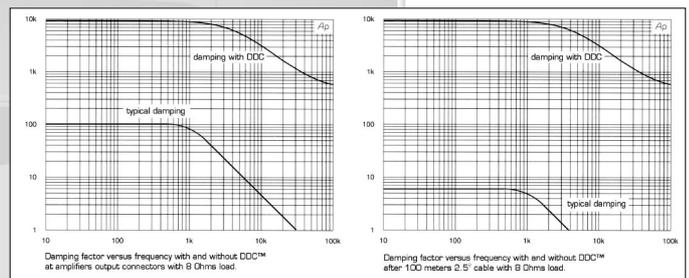
Dynamic Damping Control

An important feature of the ES 40 amplifier is the Dynamic Damping Control (DDC™) system. This circuitry is designed to improve the transient response for the cone driver, for better matching the very high transient response of the Ribbon Compact Driver. With DDC developed already 15 years ago, the new DDC-3™ was developed specifically for the Director system.



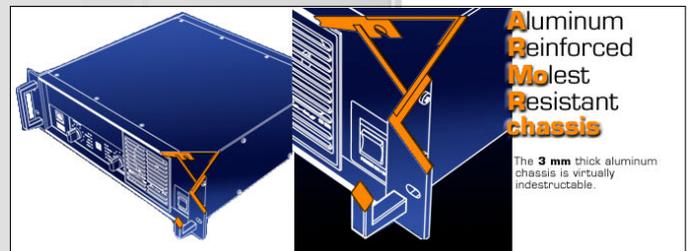
By means of one (used to be two) extra core in the loudspeaker cable ("sense-wiring") all the way up to the speaker chassis terminals of the XL 36 components, the influence of cable and connector resistance is fully compensated. This caters for a extremely high damping factor of 10.000 at the speaker chassis terminals. With DDC™, both linear and non-linear distortion are reduced substantially. This DDC™ circuitry actually causes "negative feedback" which allows the amplifier "to see" a zero impedance from the cable, ensuring a virtually infinite amplifier damping factor at the speaker terminals. Speaker cable and connector resistances no longer affect the amplifiers properties. It extends the "circle of control" from inside the amp (up to speaker outputs) to outside the amp. By integrating the

cabling in the amps control circuit; this becomes part of the amplifier-loop, eliminating the influence of the cable.



SA's indestructible ARMoR™ chassis

The ARMoR chassis™ can be seen as the "signature" of SA amplifiers. This chassis is made from 3 mm thick "mil-spec" aluminum and is the important ingredient of SA amps reputation of being road(y) proof! Indestructible, absolute torsion free, excellent strength-to-weight ratio, improved heat dispersion and a high radiation shielding are the characteristics of this chassis.



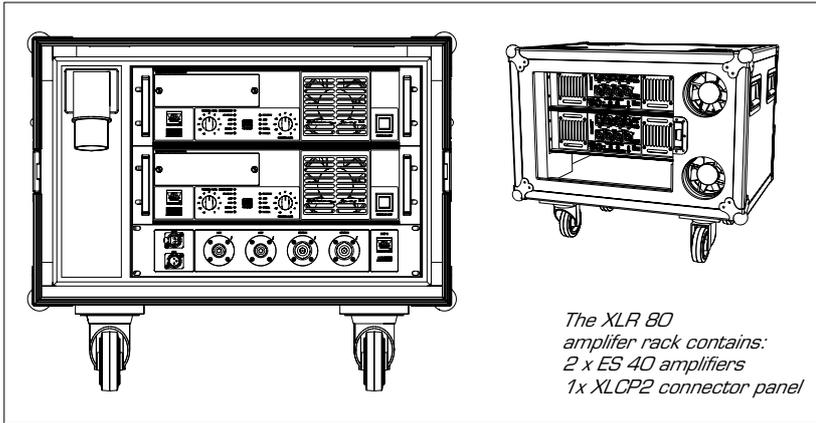
Contrary to the general used "stamped-steel-box" design, the modular concept improves shock absorption at accidents and enables easy repair; In case things really go wrong, the chassis made of separate screwed sections deforms at impact. In most cases, repair can be done just by refitting the screws with the sections in the right position.

Active Clip Eliminator

The ES 40 features ACE™ Active Clip Eliminator; a circuit which constantly monitors both outputs of the amplifier for continued clipping. This newly designed control circuit goes far beyond the traditional clip limiter: When clipping is detected, the related input level is inaudibly reduced to the safest maximum level, in order to prevent harmonics from damaging the drivers. A high speed attacking protection without any compression side-effects. This guarantees operation under all circumstances, while maintaining the (amplifiers) sonic qualities.

The ES 40 is equipped with a "Soft Start" circuit to reduce





“inrush” current. Stepless variable fan speed ensures reduced “dust-drag” into the unit, while offering ample air flow at all temperature levels.

Plastic conductive potentiometers are used for less wear, contrary to the commonly used carbon film type, which will start to “creak” after prolonged use. The attenuators are 21-position detent.

Standard features include “easy bridge mode” (one switch / one-connector bridge-mode), ground lift and LED indication for “power” (blue!), “signal”, “clip”, “ACE”, “bridge-mode” and “protect”). They are protected against high temperature, DC on output, short circuit and RF.

The ultimate synergy

With the ever increasing output power of amplifiers, also the necessity of “controlling” this power arises. “Power isn’t everything, control is just as important!”. Loudspeaker management systems offer a variety of flexibility, with increased chance of wrong settings, tampering, etc.

The EFN™ circuitry in the ES 40 amplifier provides dedicated control over the XL 36, by means of plug-in modules, placed in the (front-accessible) EFN slots. By using this EFN™ circuitry, the system delivers optimized performance without chance of speaker/system damage whatsoever. This processing goes far beyond today’s typical loudspeaker management systems;

The EFN-DP and EFN-AIR modules have 4 functions, all operating at the same time:

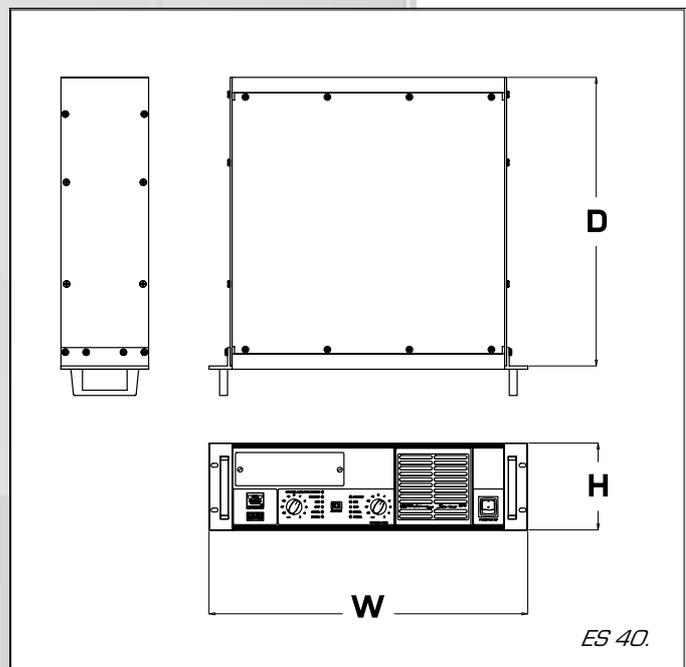
- 1) clip/excursion protection. (EFN-DP)
- 2) dedicated filtering. (EFN-DP, EFN-AIR)
- 3) power optimizing. (EFN-DP, EFN-AIR)
- 4) AIR™ system processing. (EFN-AIR)

The clipexcursion parameters are dedicated to the drivers specifications of the XL 36. The excursion protection is a frequency-dependent, zero-attack limiter and up to the in/mm. accurate. Also, the clip protection is inaudible, due to newly designed circuitry.

The filtering is completely adjusted to the system set-up, matching phase correction/alignment of top and bass system.

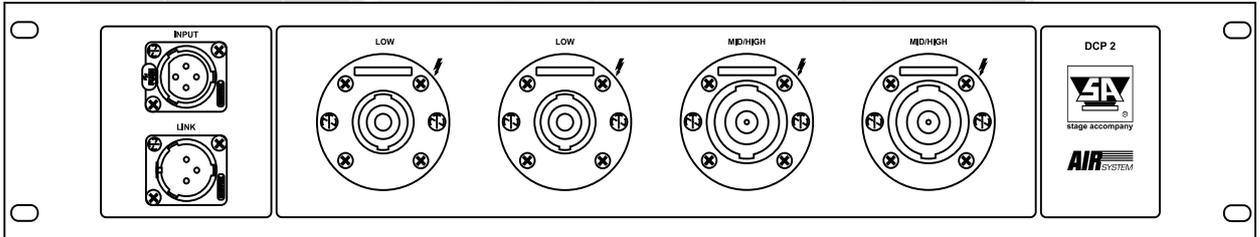
The third function of the EFN-DP module is “power optimizing”. Due to the different RMS/peak power values of a speaker and an amplifier, either the actual output capacity of a speaker is never used 100%, or the speaker is exposed to over powering (over excursion or burned voice-coil). The “power optimizing” of the EFN-DP module matches power output of the ES 40 with the RMS/peak power handling of the speaker. The circuitry is Opto-coupler regulated for less noise and distortion. The fourth function features all control and powering processing for the AIR™ system.

Combining the EFN-DP processing with SA’s Dynamic Damping Control circuitry, the absolute ultimate synergy between speaker and amplifier is reached!



Connections

The XL 80 features the XLCP 2 connector panel. The panel features one XLR-3 (female) input and XLR-3 (male) link connector, 2x Speakon-4 LF output and 2x Speakon-8 MF/HF output.



Technical specifications ES 40

Input sensitivity	1.72 Vrms (+7 dBu) for full RMS power into 4 Ohm
Maximum input level	+22 dBu
Input impedance	50kOhm
Common mode rejection	> 70 dB @ 20 Hz..20 kHz >90dB@<1 kHz
Frequency range	@ 100 W into 8 Ohm 10 Hz..20 kHz +0..-0.4 dB 10 Hz..55 kHz +0..-3 dB
Gain	33 dB (44.7x)
Total harmonic distortion	< 0.3 % @ 20 Hz..20 kHz, more than 2 Ohm load at all powers 1 dB below clipping < 0.007 % @ 1 kHz, 100 W into 8 Ohm < 0.05 % @ 20 kHz, 100W into 8 Ohm
Intermodulation distortion (SMPTE)	@ 100 W into 8 Ohm < 0.06 % @ 200 Hz..20 kHz
Signal to noise ratio	> 110 dB A-weighted
Slew rate	> 40 V/us
Damping factor	10.000 @ 1 kHz, 8 Ohm
Output power	RMS 1 Peak @ 1 kHz, < 1 % THD 2 x 1010 /1250 W @ 8 Ohm 2 x 1520 / 2050 W @ 4 Ohm 2 x 1930 / 2700 W @ 2 Ohm
Power consumption	200 VA (standby) 2800 VA 118 of maximum output power pink noise in 2 Ohm
Weight	35.2 kg, 77 lb
Housing	19 inch rack mount
Dimensions (without connectors and rack handles)	3 HU, 440 mm (17.3 in) deep behind the mounting surface 133 x 482 x 445 mm (h x w x d) (5.25 x 19.0 x 17.5 in)



Notes:



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