When many small (and also some larger) aspects of a new design are optimised with painstaking accuracy, and proven material is complemented practically by modern innovations regardless of antiquated prejudices, the outcome will be a sound reinforcement system like the new VT20 Vertical Line Array which distinguishes itself in a strikingly positive way from the mainstream by its overall performance. For physical reasons the use of components such as the horn-loaded VT20 11.5" line source results in an ideal air coupling factor of 1. Compared to a conventional compression driver, this may be equated with the technological leap from a combustion engine to the precise, efficient and high-torque electric powertrain.
The VT20 System has been in the field since 2015 and soon convinced both users and customers after live jobs. Here are some statements from – also international – sound engineers who are on tour with the VT20:

**VT20: User Feedback**

Already in the first test the VT20 System surpassed our rather high expectations. The top sounds very well-balanced, even at extreme sound levels, it offers a uniquely low level drop-off over distance and a smart rigging system.

Combined with the high-power subwoofers, you get a fullrange PA system with quasi only two loudspeakers and a frequency response down to below 30 Hz which does not reveal any weak points in the useable bass range, either. We believe this system is a true innovation on the market that is certainly able to outperform the established market standard clearly.

Christopher Klar

After Using the VT20 on several festivals over the summer the response has been overwhelmingly positive. House & guest engineers alike have really enjoyed the system repeatedly commenting on the clarity, headroom and massive threshold before feedback. Every show we have used it on has been amazing! So much space to place things in the mix.

Pete Sharmann

I didn’t know the VT20 System, and after the first song during the PA check I was definitely surprised at how good this PA sounds! The top with its line array driver is impressive.

I have never heard such a “small” loudspeaker with such a high output and acoustic fidelity. That’s a real statement! Altogether a very good sound system which I’d like to take anytime again.

Hansi Schädler
The VT20 loudspeaker is a fully horn-loaded, passive 2-way vertical line array speaker with an impedance of 8 ohms and a horizontal coverage of 90 degrees.

Through cone-symmetric phase plugs its two 10” low-mid drivers work on a tuned bass reflex horn and are arranged symmetrically around the horn-loaded 11.5” line array driver.

For design reasons the horn-loaded 11.5” line source driver is a physically ideal line source with a perfect air coupling factor of 1.

Its linear frequency response, high efficiency, enormous power handling capacity and also the perfect acoustic coupling among the systems provide outstanding dynamics and imaging as well as an incredible projection.

With a weight of 35 kg (72.8 lbs) the VT20 loudspeaker is pleasantly lightweight with regard to its overall performance. The mechanical construction and acoustical characteristics allow vertical line arrays with a maximum of 24 VT20 loudspeakers.

The advantages of the 11.5” line source speaker over compression drivers with a waveguide:

For physical reasons and owing to its cone geometry the 11.5” line source driver, which we use in the VT20 loudspeaker, is the perfect line source. Contrary to typical compression drivers with waveguides it produces coherent cylindrical waves and is therefore ideally suited for line arrays.

The illustration below shows the comparison between a typical compression driver with a waveguide (pictured left) and the line source driver (pictured right).
VT20: Acoustic Coupling and True-Phase Design

Due to our Linear-Phase Technology, the passive frequency crossovers provide an acoustically linear phase response up to 20 kHz. The typical multiple phase rotations in the crossover zone between the drivers and the typical delay differences between the individual drivers have been completely eliminated.

**VT20 with Linear Phase-Technology** — Natural sound and long throw due to the flat acoustical phase

**Electrical perfection:**

The crossovers are precisely calibrated using selected foil capacitors and linear air coils without an iron core, coupling all drivers in an electrically perfect and level-independent way to the system amplifiers. Within the system the very flat impedance response around 8 ohms with almost 0 degree electrical phase allows to easily link up to four VT20s in parallel to one amp channel and, owing to the very high effective power coefficient, an optimum energy flow between system amplifier and VT20 is ensured over the entire frequency range.

The VT20 is a perfect electrical match for the system-amplifiers

[Graph showing impedance curve and electrical phase of VT20]
**VT20 System: Subwoofers**

In the bass range the VT20 is completed by the two Groundstack subwoofers VS18 (1x18” driver) and VS28 (2x18” drivers). The flying version VS18F (1x18” driver) can be integrated into VT20 arrays or flown as a cardioid bass array beside a VT20 array, making a 140 cm (55 in.) or 210 cm (82 in.) wide fullrange line array.

All three subwoofers are acoustically, mechanically and visually compatible and may be combined in a mixed operation as you please. Two extra SpeakON sockets on the front allow to link up to four VS28 or eight VS18 / VS18F to two separate amplifier channels without the need for additional reversible cables. Combined to form a system with the VT20, the subwoofers provide a linear frequency response between 25 Hz and 20 kHz.
VT20 System: Rigging and Trucking

The integrated 3-point flying hardware is made of lightweight, high-strength aircraft aluminium. With the flying hardware, which is designed for a maximum payload of ten tons, the speakers can be flexibly angled in three different modes between 0 and 8 degrees in steps of 0.5 degree. For flying and groundstack operation two different flying frames are available: the FRAME09-VT20 for up to nine VT20s and the FRAME24-VT20 for up to 24 VT20s. Transport dollies, protective covers, flyable amp racks and tailor-made cable sets make the VT20 system complete and ensure maximum flexibility, stressless transportation and short rigging times.

The cabinet designed in the truck packing size is 70 cm (27.6") wide, 32.5 cm (12.8") high and 56 cm (22") deep (60 cm / 23.6" on transport dolly).
VT20 System

Grand-Venue application or the new world of modular sound reinforcement

Beside the established groundstacking and flown setup configurations, the VT20 also offers the Grand-Venue application. For sound system operators with high demands on efficiency the VT20 Grand-Venue application is a radical new approach to working with line array sound systems.

Focus on the essentials: the three core components

Instead of filling venues of different sizes with sound through line-array tops of different sizes and various subwoofers, you can focus on no more than three core components which are up to all future tasks:
- VT20 vertical array top (1 x 8 ohms)
- VS18F subwoofer (1 x 8 ohms)
- 20.4-DSP amplifier (4 x 2 Ohms)

From Groundstack to Mid-Size to the Grand-Venue application for arenas, all kinds of sound reinforcement jobs can be handled fast and easily in a system width of 70, 140 and 210 cm using only three core components. This means that from a groundstack job up to an arena system the VT20 system is the only high-power modular (large size) PA system of a sound company or installation. The disposition of the material is quite simple: top and sub have 1 x 8 ohms each, the amp can deliver into 4 x 2 ohms. Always true to the motto: keep it simple.

This sound reinforcement solution bears an unprecedented flexibility and yields considerable economic and logistical benefits. It’s all but a must-do to take a close look at the facts (logistics, handling, flexibility and return on investment) to set the right course for future investments.

Graham Bonnett
FOH engineer during the UK theatre and symphony hall tour:
"Rival PA systems seem to me to have their own sonic signature – which I often find myself wasting time and brainpower trying to reduce – but the VT20s present more of a 'blank canvas', giving us more control of the voicing"
It must be noted that a single 20.4-DSP amplifier runs a set of 6 x VT20-GVs, 4 x VS18F-GVs and 4 x VS18F infras. Definitely remarkable is also the fact that four 20.4-DSP amplifiers on four Schuko power outlets will supply up to 24 x VT20s, 16 x VS18Fs and 16 x VS18F infras. Amp cities and cable harnesses as thick as an arm therefore belong to the past.

To whom and what the Grand-Venue application is of interest?

- Sound companies who occasionally serve larger festivals and therefore don’t want to rent an external system including tech. Instead they can fall back on their own PA.
- Sound companies who serve a large scope of event series and sizes.
- Dry-hire companies who completely and efficiently restructure their front PA equipment from scratch, which has not yet been possible this way for technical reasons. Three core components will solve all problems.
- Permanent installations for large areas.

ProAudio Technology organises technology days where the three different VT20 applications — Groundstack, Mid-Size and Grand-Venue — will be demonstrated. Please look out for the respective official invitations on www.proaudio-technology.de.

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How and why does the VT20 Grand Venue application work acoustically?

The basis are the outstanding physical properties of the VT20 top. The symmetrically arranged, horn-loaded 10” drivers, the high-performance Air Motion line source driver with an electrical power handling of 250 watts AES (peak 1 kW) plus further technical details make for an extremely powerful and compact low-mid/high-frequency unit of 70 cm width.

Precisely for this reason the VS18F subwoofers – controlled by the Grand-Venue setup – can be flown usefully beside the tops in larger applications. Here two VS18F subs have precisely the same column height as three VT20 tops. For instance, 6 x VT20s can be flown in parallel with 4 x VS18Fs or 18 x VT20s with 12 x VS18Fs.

Thus already with single-sided flown subs we have a 140 cm wide fullrange PA with a linear frequency response from 30 Hz to 20 kHz. Compared to other systems, the VT20 goes deeper by 10 Hz to 20 Hz acoustically and, due to its technological advantages, it offers an ideal acoustic coupling with increased projection.

With the Infra setup the optionally added VS18F ground subs produce a usable frequency range above 25 Hz. The question of 21” subwoofers may therefore be scrapped. The subwoofers can be flown and, as infras, be run in cardioid or omnidirectional mode. This flexibility is unique.

The acoustical phase of the entire system is linear already above 80 Hz, notabene without the usual high long DSP latencies. This is unique, too.

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Pete Sharman reporting as the tech in charge for Isophase Audio from UK:

„The VT20 has vast headroom, it’s easy to mix on and it never seems to need much EQing: you feel confident the system will perform as the calculation indicates – which is everything we wanted!“
VT20 Groundstack 3-3

With the 3-3 Groundstack one 20.4-DSP system amplifier drives a total of six VT20s plus six VS18Fs, both in stereo. Each output channel drives three VT20s or three VS18Fs resp. Only one 4-pole SpeakON cable per side is required as supply line. When needed the six VS18Fs can be run in mono cardioid mode. In this case one channel runs four VS18Fs (front) and one channel runs two VS18Fs (rear). With one 20.4-DSP the 3-3 Groundstack is expandable to a maximum of eight VT20s and eight VS18Fs for a 4-4 Groundstack.

VT20 Mid-Size 8-6

The standard configuration is the 6-6 Mid-Size array with six VT20s, six VS18Fs and one 20.4-DSP system amplifier.

On the picture one 20.4-DSP runs an 8-6 Mid-Size array with a total of eight VT20s and six VS18Fs. Each output channel drives four VT20s or three VS18Fs resp. Only two 4-pole SpeakON cables per side are required as supply lines. One 20.4-DSP can run a maximum of eight VT20s and eight VS18Fs to make an 8-8 Mid-Size array.
VT20 Grand-Venue 9-6-6

In the standard configuration for large venues one 20.4-DSP system amplifier runs six VT20-GVs, four VS18F-GVs and four VS18F-INFRAs in a 6-4-4 Grand-Venue setup with 140 cm of array width. Larger VT20 arrays are expandable in steps of six units to a maximal 24-16-16 Grand-Venue 140 setup with 24 VT20-GVs, 16 VS18F-GVs, 16 VS18F-INFRAs and four 20.4-DSPs per side with an array length of 8 m.

The picture shows a different 9-6-6 Grand-Venue 140 array with 140 cm array width where one 20.4-DSP per side drives three VT20-GVs and six VS18F-INFRAs. The second 20.4-DSP drives six VT20-GVs and six VS18F-GVs. Four 20.4-DSP system amplifiers run a total of 18 VT20-GVs, 12 VS18F-GVs and 12 VS18F-INFRAs.

Only four 4-pole SpeakON cables per side are required as supply lines.

Note: 'GV' and 'INFRA' are additional DSP system setups for VT20 and VS18F.
VT20 System: Accessories and features of the System Loudspeakers

VT20:
- LF drivers: 2 x 10” bass reflex, horn-loaded, symmetrical to HF driver
- HF driver: 1 x 11.5” Air Motion line source driver, horn-loaded
- Power handling capacity (RMS / programme): 800 W / 1,600 W
- SPL max. 140 dB
- Frequency response: 90 Hz *) to 20 kHz
- Linear acoustic phase response up to 20 kHz, LP technology
- Directivity pattern: 90 degrees horizontal
- Impedance: 1 x 8 ohms
- 2+1™ SpeakON sockets (2-channel wiring without reversible cable)
- Integrated 3-point flying hardware for angles between 0 and 8 degrees in steps of 0.5 degree
- Weight: 35 kg (77.2 lbs.)
- Dimensions (W x H x D): 700 x 325 x 560 mm (600 mm on dolly)
- Four handles
- Water-repellent acoustic foam behind the front grille
- 5 years warranty
- Made & engineered in Germany

*) Operation on system amplifier with active setup VT20-90 (no GV)

Accessories:
- DOL-VT20  Transport dolly for VT20
- FRAME09-VT20  Flying frame for up to 9 VT20s or 6 VS18Fs
- FRAME24-VT20  Flying frame for up to 24 VT20s or 16 VS18Fs
- CASE-FR09-FR24-2  Case for 2 x FRAME09-VT20 or 2 x FRAME24-VT20
- COV3-VT20  Protective cover for 3 x VT20 and DOL-VT20
- COV4-VT20  Protective cover for 4 x VT20 and DOL-VT20
- DM-WM-Set  Angle measurement instrument set
- VT-Trimset  Trim set for VT8, VT16 and VT20
- DOL-VS1828  Transport dolly for VS18, VS18F and VS28
- COV-VS1828  Protective cover for VS18, VS18F and VS28

Matching system components:
- VS18, VSF and VS28 subwoofer
- 10.4-DSP / 20.4-DSP system rack
VS18:
- Omnidirectional and cardioid operation (stacked and flown)
- Fully integrated flying system without protruding and losable parts
- 0 and 1.5 degrees selectable
- 2 + 2 SpeakON sockets (front/rear system wiring)
- Useable from 25 Hz
- Max. SPL 130 dB
- Stacking feet with sockets on the opposite side
- Acoustically, mechanically and visually compatible with the VS28 subwoofer
- Acoustic foam behind the front grille
- Four well-positioned handles
- Weight 46 kg (101.5 lbs)
- Dimensions 500 x 700 x 780 mm (H x W x D) / 19.7" x 27.6" x 30.7" (H x W x D)
- Truck size with protective sleeve
- 5 years warranty
- Made & engineered in Germany

VS28:
- Omnidirectional and cardioid operation (stacked and flown)
- 2 + 2 SpeakON sockets (front/rear system wiring)
- Useable from 25 Hz
- Max. SPL 136 dB
- Stacking feet with sockets on the opposite side
- Acoustically, mechanically and visually compatible with the VS18 subwoofer
- Acoustic foam behind the front grille
- Four well-positioned handles
- Weight 88 kg (194.3 lbs)
- Dimensions 996 x 700 x 780 mm (H x W x D) / 39.2" x 27.6" x 30.7" (H x W x D)
- Truck size with protective sleeve
- 5 years warranty
- Made & engineered in Germany
VT20 System: System Amplifier, Controlling and Cabling

Owing to the integrated 56-bit DSP in IIR and FIR filter technology and an efficiency of up to 80%, the lightweight (12 kg / 26.5 lbs.) 4-channel system amplifiers 8.4-DSP and 20.4-DSP provide an optimum drive for a maximum of 8 or 16 VT20s respectively per amplifier. The built-in 2+1™ SpeakON sockets allow to connect up to four VT20s on the 8.4-DSP (eight on the 20.4-DSP) to two separate channels without the need for extra reversible cables.

For the amplifier configuration we offer the Konfigurator2™ software for Windows and Macintosh including all available speaker blocks. The closed libraries contain all parameters for all filter and limiter settings and ensure an optimum performance and a safe operation. By means of the system-inherent pre-defined LFC (low-frequency control) and HFC (high-frequency control) filters the system can be adapted very easily to the various situations.
Together with the shock-mount system rack the ProAudio Technology system patchbay PAB-88 makes the VT20 sound reinforcement system complete. The abrasion-proof patchbay clearly mirrors the amplifier’s rear side to the front with all SpeakON output sockets featured twice. Moreover, there is an 8-pole SpeakON socket and a no-compromise 8-pole CA-COM socket available for a robust 4-way cabling. All SpeakON connectors are equipped with high-current contacts to match the system amplifiers and all loudspeakers and allow optimum electric damping factors throughout the system.
The system amplifiers are programmed conveniently in a project-related manner with the Konfigurator™ software which runs under Windows and Macintosh. Within a project the speaker blocks are pulled via drag & drop onto the channels of a memory location, the signal distributed in the DSP over eight 4x4 mix blocks and the corresponding filters selected. The 300 DSP memory locations of the system amplifiers allow to save all required configurations, recall them accordingly and, when needed, remote-control them in online mode.
To ensure the perfect phase linearity within the VT20 System, we have already provided true-phase HFC filters (HFC: high-frequency correction) in the VT20 loudspeaker blocks to precisely boost or cut the HF range up to 20 kHz.

In live operation it should be noted that, owing to the ideal 11.5" line source, the VT20 line array element can directly translate very small level boosts even in the HF range – which cannot be compared to the usual HF compression drivers. An HFC of only a few decibels is sufficient to adjust the HF sound energy over very long distances.

In addition to fully parametric filters, the low-mid range also offers a low-frequency correction (LFC) filter preset. Here again the following is true: due to an acoustically perfect coupling of the VT20 elements over the entire frequency bandwidth, only minimal filter corrections are required and sensible for the horn-loaded 10" drivers in the array.
VT20: Acoustical 3-D Simulation

To optimally tune the VT20 System to the respective acoustical requirements, high-res 3-D simulation data are available for the worldwide acknowledged Ease Focus simulation software.

With it even complex PA situations, both in flying and stacking operation, can be conveniently and precisely simulated in the 3-D space. The simulation will help you to accurately determine the curving, the flying points, the angulation, levels and other parameters.

The diagram “Sound level distribution at ear level” below shows a VT20 stereo system with two arrays of 12 tops each which has been optimised for a listening area of 35 m x 70 m. This simulation illustrates how evenly the VT20 System will cover a depth of 70 m.

- Sound level distribution at ear level (top view of the 35 m x 70 m listening area)
Rigging and Curving

The simulation shows that most of the VT20 elements within the array have a 0 degree beam width against each other. The diagram “Sound level distribution – top view” illustrates that the vertical radiation of the VT20 works perfectly, and no undesired interferences will occur between the loudspeakers at 0 degree angulation. Furthermore we can see that one array of 12 weighing 455 kg can be flown on one 500 kg flying point.

The following diagram depicts the broadband-weighted sound level distribution. The average level with this configuration is 113.8 dBA at ear level with a deviation of only ±2.8 dB, related to the simulated listening area of 35 m x 70 m.

This exemplary simulation shows that, due to its uncompromising design, the VT20 system is very well suited for large sound reinforcement applications.