

TAD-E1TX technical note

TAD



Speaker System
TAD Evolution One
TAD-E1TX-K

TAD-E1TX

TAD Evolution series speaker system

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Model No.	TAD-E1TX-K
Type	3way bass-reflex floor-stand
Base driver	16cm cone type x 2
Midrange/Tweeter	Concentric 9cm magnesium cone (midrange) 2.5cm beryllium dome (tweeter)
Frequency range	29Hz to 60kHz
Crossover frequency	420Hz/2.5kHz
Maximum input power	200W
Sensitivity	88dB at 2.83V/m
Rated impedance	4 ohms
Weight	46kg
Dimensions	350 (W) x 1215 (H) x 512(D)mm with spikes

9cmCST (Coherent Source Transducer) Driver



TAD-E1TX uses a 9 cm CST (Coherent Source Transducer) driver that has been proven in TAD-ME1.

The CST driver is designed to align the sound source position of midrange and tweeter and to work the midrange cone as part of Tweeter's waveguide. Therefore, the directivity of 2 units matches, and then the response in the crossover range does not have any mismatch.

Since this makes on-axis response and energy response smooth enough at the same time, it can just be called an ideal point source driver.

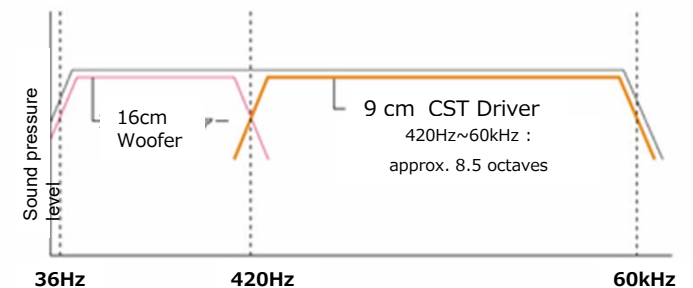
Moreover, for reproduction of a natural sound, a setup of a crossover is important. The crossover point of TAD-E1TX is set at 420 Hz same as TAD-ME1

In consideration of the sound dispersion not only on axis but off axis also to the space, the directive radiation pattern of the CST shows the superb characteristic finely decreased over a wide frequency band. By superior phase characteristics and directivity characteristics over a wide frequency of 420 Hz to 60 kHz, CST driver can express natural sound field and sound image with good localization.

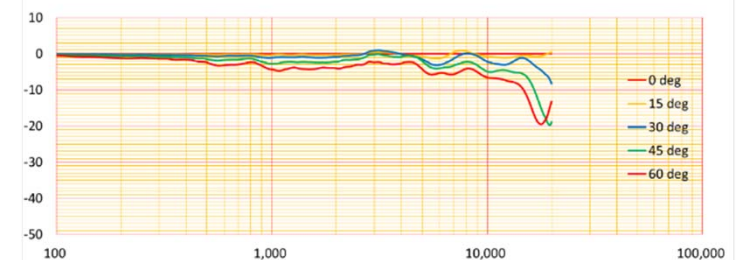
*CST : Coherent Source Transducer



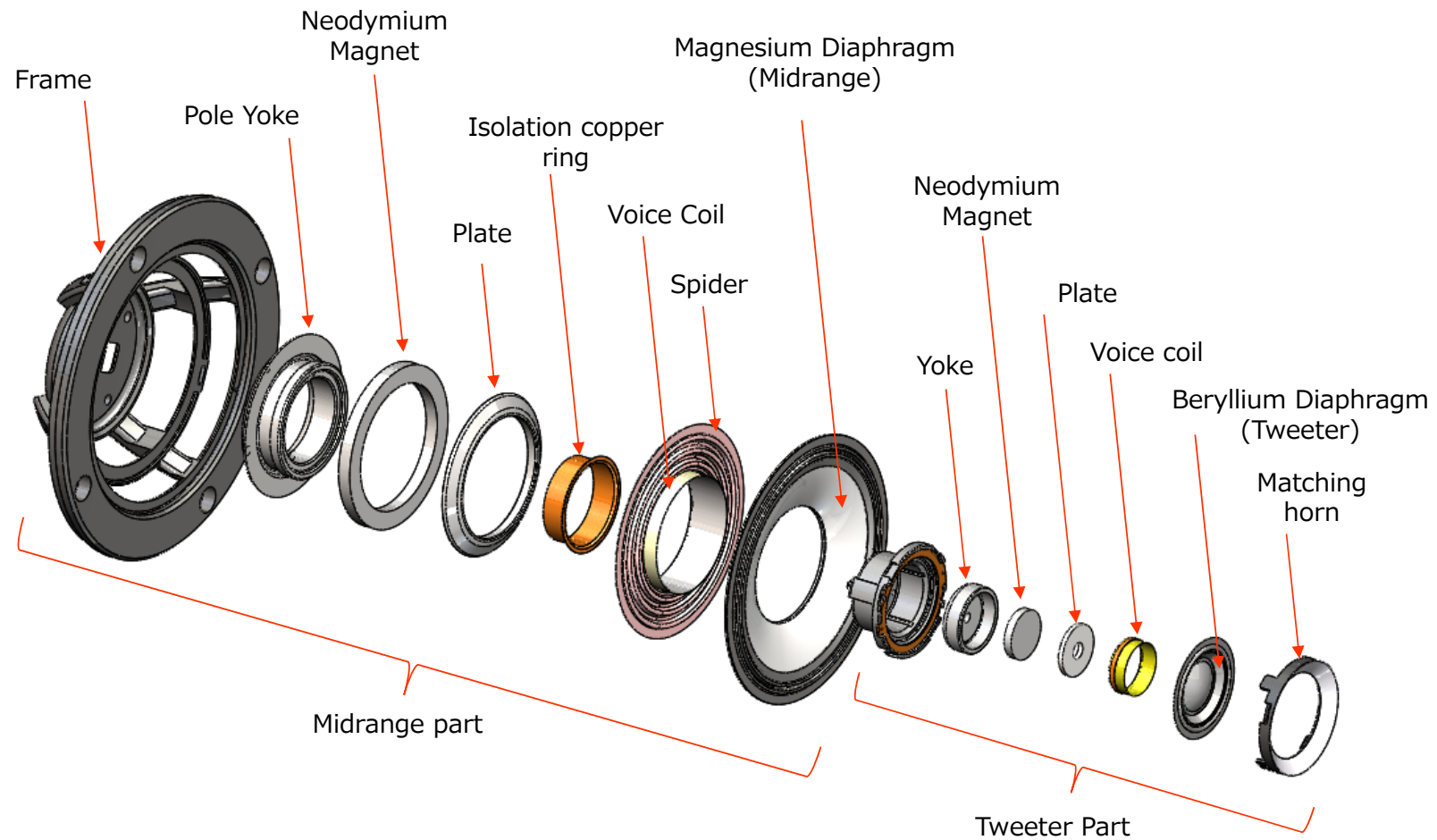
TAD-E1TX Frequency characteristics



Directivity with 0 degree as reference



9cmCST (Coherent Source Transducer) Driver



9cmCST (Coherent Source Transducer) Driver



Beryllium Diaphragm for Tweeter

The diaphragm of the coaxial tweeter is made of beryllium, one of the lightest and most rigid of metals available for diaphragms. The material called beryllium has the most essential properties of light weight and high rigidity for the diaphragm of mid-high frequency drivers.

The beryllium diaphragm has a smooth frequency response, and it can reproduce very smooth and clear sound compared to other high frequency diaphragm material.

Based on the technology HSDOM* for finding the most optimum profile for TAD Evolution One by computer analysis of the diaphragm profile, 9cm CST driver can reproduce the sound up to 60 kHz.

*HSDOM : Harmonized Synthetic Diaphragm Optimum Method



beryllium diaphragm

Material	Density (g/m3)	Young modulus (*E10N/m2)	Velocity (m/s)	Inner loss (-)
Aluminum	2.7	7	5092	0.003
Titanium	4.4	11.9	5201	0.003
Beryllium	1.85	28	12302	0.005
Magnesium	1.78	4.5	5028	0.006
Boron Alloy	4.5	23	7149	0.005
Paper	0.2-0.8	0.03-0.6	1200-3750	0.02-0.1
Ceramic Carbon	1.4	3.5	5000	0.005
Ceramic Graphite	1.8	18	10000	0.01
Crystalized Diamond	3.4	90	16270	0.014

Diaphragm material physical-properties table

9cmCST (Coherent Source Transducer) Driver



Magnesium Diaphragm for Midrange

Magnesium is the lightest in practical metals and has the characteristic of large internal loss.

It is possible to give rigidity more than three times than aluminum as the cone body material, because when comparing with aluminum in the same weight, you can realize 1.5 times thicker than aluminum.

Moreover, because of the large internal loss, it realizes a clear mid-frequency sound with less distortion and less coloration inherent to the material.

Independent Neodymium Magnetic Circuit

We are using a ultra miniaturized neodymium magnet having about 10 times the energy of the ferrite.

Although it is compact, it strongly drives a super lightweight diaphragm with a strong magnetic circuit.

The midrange and tweeter magnetic circuits are independent.

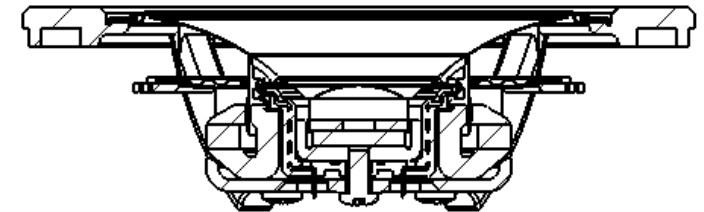
By attaching an isolation copper ring, the magnetic force generated by each voice coil of the tweeter / midrange are cut off to avoid mutual influence.

As the result, it realizes a clear middle / high performance.

Furthermore, by ensuring sufficient air-flow at the back of the mid-range diaphragm, it is shaped to eliminate unnecessary reflection.



Magnesium Diaphragm



CST cross-section drawing

16cm Woofer

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MACC* Diaphragm

In order to obtain the ideal physical properties as a diaphragm for woofer, we developed a composite diaphragm which separately molds diaphragms of different materials and bond them together in a later process.

The diaphragm is laminated with a woven fabric of aramid to surface side, and with a non woven fabric of different material to back side.

By choosing the optimum combination for both physical properties and sound quality among many different material combination studies, it can reproduce rich and clear bass together with supple medium and low frequency sound without coloration.

*MACC : Multi-layered Aramid Composite Cone

Linearity Improvement of Driving Force

Equipped the "LDMC (Linear Drive Magnetic Circuit)" which simultaneously improves the uniformity of the magnetic flux distribution of the magnetic gap and symmetry of the magnetic flux density near magnetic gap, to achieve outstanding linearity.

In order to make the magnetic distribution outside the magnetic gap symmetrical, the shape of the pole piece was optimized and accurately reproduced by the CNC processing of the iron block.

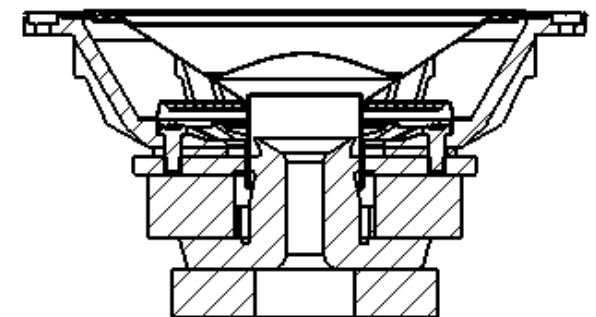
By flattening the driving force (BL factor) of the woofer, we achieved high linearity and achieves low distortion.

In addition, titanium is adopted as the voice coil former in order to transmit this linear and powerful driving force to the diaphragm, and this titanium also secures power linearity by high heat dissipation property.

In addition, a large ferrite magnet with a strong driving force reproduces rich bass by matching with an optimized bass reflex enclosure.

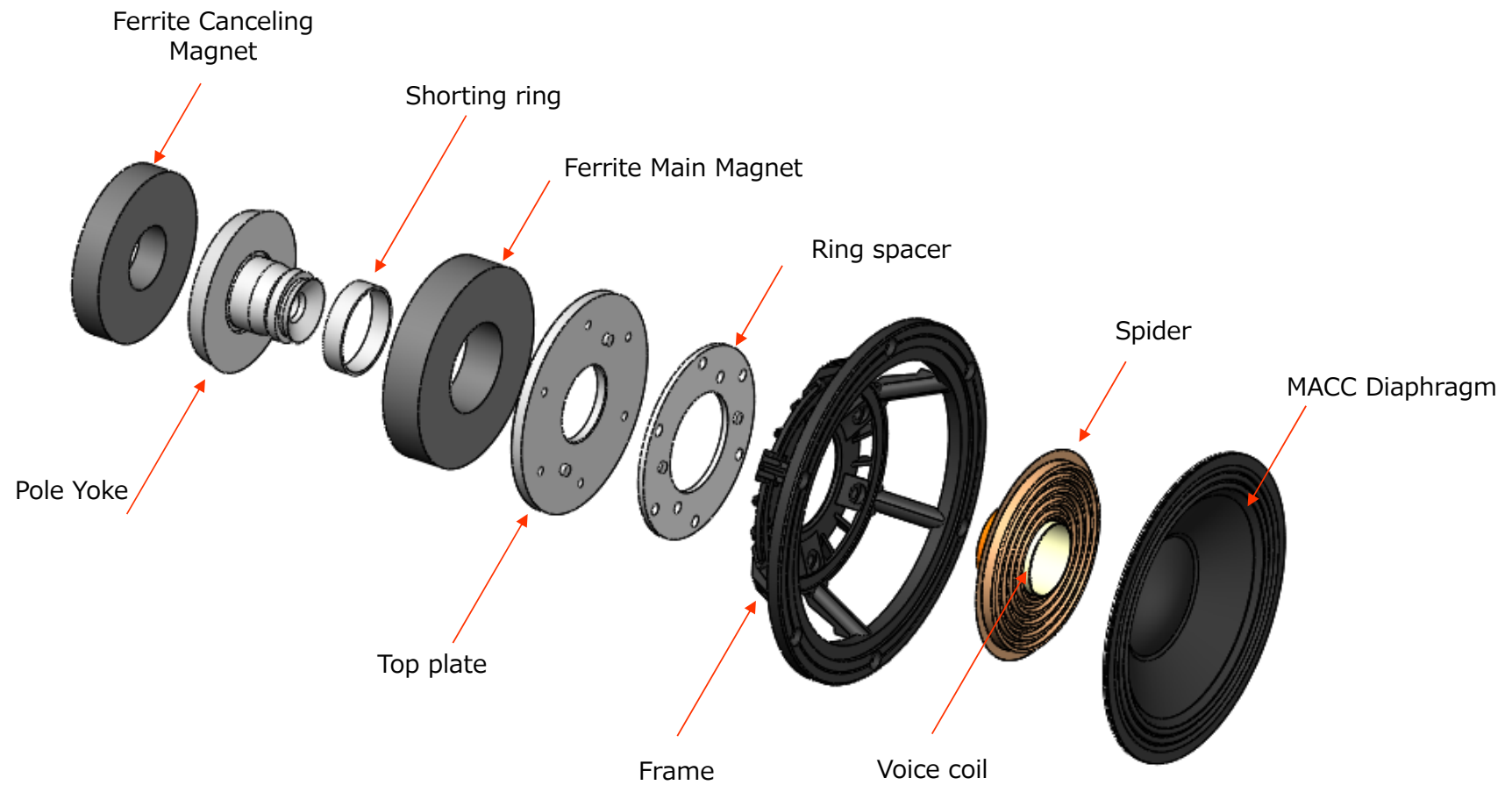


16cm Woofer



Woofer cross-section structure

16cm Woofer



Bi-Directional ADS Port

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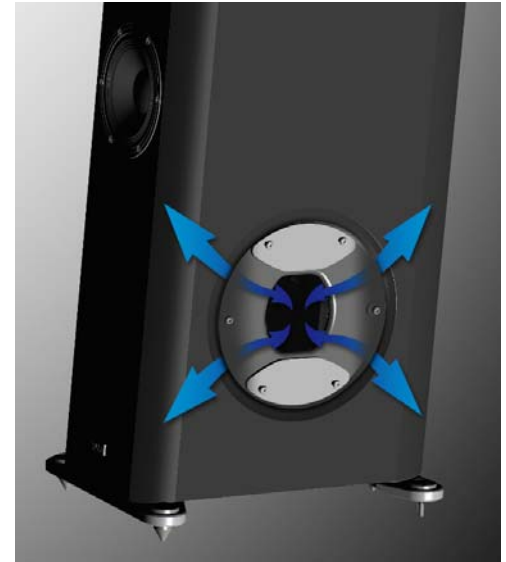
"Bi-Directional ADS * Port" for natural rich base sound reproduction

Bi -Directional ADS port adopted in Compact Evolution One, Micro Evolution One is also installed. Slit-shaped ports were placed on both side panels of the enclosure, and further openings were installed in the front and rear. Since the inlet to the opening has a horn shape, the port is driven smoothly and efficiently.

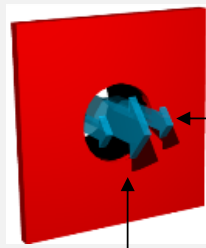
By reducing port noise at large amplitude, and suppressing the phenomenon that low-order internal standing wave strongly affecting the woofer reproduction band leaks from the port, clear and responsive middle low range is reproduced.

Also, since the ports are arranged symmetrically in the front / rear / left / right direction, the force to drive the ports is canceled, realizing rich and powerful low frequency reproduction.

*Bi-Directional ADS : Bi-Directional Aero-Dynamic Slot



General Bass-Ref Port



Surrounding part
: Low flow rate

Center part : High flow rate

Due to this difference in flow velocity, as the sound pressure rises, air noise at the port opening occurs, which originally is not included in the music source, or which the producer is not aiming for.

Shape of the enclosure & Turn into high rigidity / Enclosure Finish **TAD**

Matching sound source position and optimize the acoustic axis

By tilting the baffle surface of the enclosure by 3 degrees, matching sound source position of CST and Woofer unit makes sound field expression of floor-standing double woofer system more accurate.

Also, in order to reduce the influence of diffraction around the CST, the round of the enclosure baffle edge part is taken large, and the acoustic axis of the CST is installed at an angle so that it faces the listener directly.

In addition, by performing standing wave analysis inside the enclosure, by selecting the optimum sound absorbing material and arranging it effectively, we eliminate the internal standing waves which adversely affect the sound image / sound field.

SILENT* Enclosure To reduce unnecessary resonance

Equipped SILENT * enclosure which realizes high strength and low resonance by combining a frame of high rigidity birch plywood and a panel of MDF material with high internal loss.

In addition, unnecessary resonance of cabinet is reduced by sandwiching from the left and right with 4 mm thick steel panel.

*SILENT : Structurally Inert Laminated Enclosure Technology

Fearless and beautiful "piano black finish"

The enclosure adopts the graceful finish of piano black.

The process of spraying the paint, grinding the foundation paint, and polishing the final are carefully finished by a skilled craftsman.

The steel plates constituting the Bi-Directional ADS ports on both sides are finished with sand tone finish and are common design taste with Micro Evolution One.

ISO Mount Network Filter / Base Plate & Spike



Acoustically isolated from the enclosure

All network filters are stored at the bottom of the enclosure and acoustically isolated from the main enclosure.

Since the network filter is designed not to be affected by the high sound pressure inside the cabinet of the Woofer and the CST driver, and each element of the network filter does not acoustically vibrate, it is reproduced a clear air feeling that is free from noise.

Aluminum Base Plate Enabling Unrestricted Installation

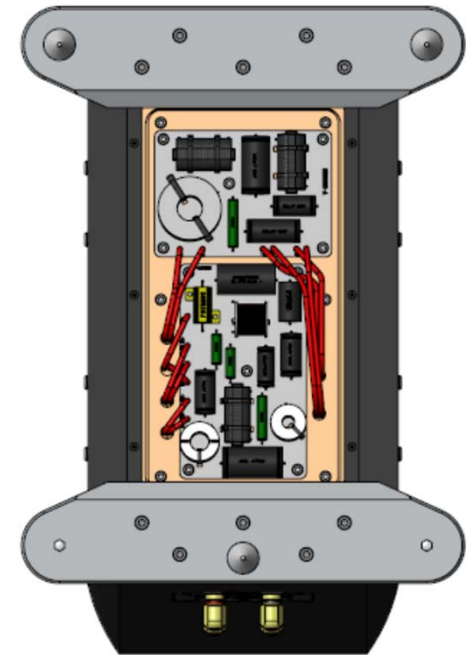
At the bottom part of the enclosure, two base plates shaved out from a 15 mm thick aluminum plate are installed.

By sandwiching the resin plate between the base plate and the enclosure body, the vibration of the base plate itself is damped.

By using 3 spikes including 2 front and 1 rear, the base can be reliably installed on any floor surface.

Furthermore, it is possible to install safely with two auxiliary legs with length adjustment mechanism.

By setting the center of gravity position of the 3 degrees slanted body to the optimum position of supporting three points, it is structured to firmly receive the reaction of Woofer with strong driving force.



**Network Filter
stored at the
bottom of the
enclosure**

Network Filter & Input Terminal

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Network Filter

The network filters for CST (tweeter / midrange) and woofer are independent board assemblies, and are mounted in different places to further minimize the interference of each.

For the filters for CST, carefully selected PP film capacitors, non-inductive resistors, air core coils, etc. are used.

For the filter for Woofer, the coils which is inserted in series adopt the low loss core which is excellent in magnetic characteristics, and its resistance is reduced as much as possible. In addition, low loss bipolar capacitor · non-inductive wound resistance · air core coil etc. are used.

Each component's value is determined to optimize acoustic output characteristics, energy characteristics, impedance characteristics, etc., and filter slope characteristics optimizing response and phase characteristics are realized.



Input Terminal

In order to correspond to bi-wiring connection for minimizing the signal loss on the connecting cable, input can be connected to the network filter for CST driver and the network filter for Woofer separately.

By selecting of the cable independently for each input, the possibilities for your favorite tuning will expand.

Also, large-size brass CNC machined input terminals, exclusive design with a simple structure, is mounted on a resin plate of 8 mm thick.

Even with extreme thick cables, it is easy to ensure reliable connection.



Main features

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Type :	3way bass-reflex Floor-stand type		
Driver :	16cm Multi layered aramid composite cone Woofer *2pcs 9cm Magnesium/Beryllium CST, Coaxial Midrange/tweeter *Tweeter 2.5cm diameter		
Frequency range:	29Hz to 60kHz		
Crossover frequency:	420Hz, 2.5 kHz		
Maximum input power:	200W		
Sensitivity:	88dB at 2.83V/m		
Rated impedance:	4 Ω		
Weight:	46Kg (pc)		
Dimensions:	350 (W) x 1215 (H) x 512(D)mm with spikes		
	Without spikes	H:	1189mm
	With spikes & Spike receiver	H:	1218mm

