final

The comprehensive pursuit of things
that are fundamentally right

final

final is a Japanese high-end audio brand established in the 1970s. We use cutting-edge technology to manufacture earphones and headphones.

In order to provide the best sound quality for different purposes through our headphones, our researchers and engineers have conducted extensive internal research in acoustic engineering, spatial audio and psychology, aiming to bring revolutionary breakthroughs in the world of audio.

With our persistence in bringing the best sound quality and the support of the enthusiast community, we have successfully expanded our product range from as low as US$20 earphones to US$4,300 high-end flagship headphones.

Regardless of the price difference, final always provides the best quality and service we can provide. Sound quality is something that will never be compromised by us. This is our pride and commitment as a Japanese brand, as well as a commitment and respect to the community.

High-End Flagship


D8000 Pro Edition


A8000

Middle Class


A4000


B1

Entry Model


E1000


E3000

Introduction

final ZE3000

final ZE3000

Perfecting the Fundamentals

A true wireless earphones have been very attractive and intriguing to final for years, because who doesn't dream of easily bringing their favorite music to their ears without using cables?

However, as an audio brand that places the utmost importance on sound quality, *final* considers this project to be one of the biggest challenges.

To create a Hi-Fi quality earphone, our team researched wireless technology, looked for the main factors that limit the sound quality of wireless earphones. We went deep into the roots of earphone design, perfected every detail, reviewed the drivers and internal structure of the earphone based on pure physics and science, leveraged high-end audio know-how we have accumulated, and incorporated the latest manufacturing techniques for this project.

We are proud to present the *ZE3000*, a wireless earphone that redefines the possibilities of wireless earphones and pushes the boundaries of wireless sound quality.

ZE3000 Black

ZE3000 White

PRODUCT CONCEPT

How does final realize
a truly Hi-Fi quality TWS?

The Design Concept of ZE3000

Determines the Priority & Strive for Innovation

Since *final* aims to realize the ZE3000 as a Hi-Fi quality earphone and to impress audiophiles, "sound quality" and "comfort" were our top priorities from the beginning. For this reason, we made the following decisions. :

Driver

- To employ **single driver design** to avoid phasing issue
- To design a driver which has **extremely low distortion** for highest fidelity playback

Earphone Housing

- To make an earphone design which could achieve a **perfect balance** between comfortable size and capability of creating a flawless acoustic chamber design
- To **reduce unnecessary features** which would degrade the sound quality
- To design a **comfortable shape** which is great for handling and touch

Bluetooth Technology

- To employ the **latest Bluetooth technology** to ensure exceptional connection stability
- To create a system which support variation of high-quality codec to suit users' need

Driver Technology

f-Core for Wireless

Ultra-Low Distortion Driver

Reducing Overall Distortion of the System

Distortion means the change of the signal waveform after going through a particular process. The bigger the change, the more degradation of the sound quality has.

After music data signals are received by the wireless earphones, the signals go through a series of processes such as codec decompression, digital-to-analog conversion, analog signal amplification and finally being converted to sound by the drivers.

Nowadays, audio makers have successfully minimized the distortion of amplifier and DAC to as low as 0.0001%. However, the distortion of earphone driver units could go up to more than 3% even for a high-end model. In the other words, there is over **30,000** times more distortion occurring in the process of converting electrical signals into audible sound.

In order to achieve a high-fidelity sound for the *ZE3000*, our major task is to reduce the overall distortion of the system. And to do so, reducing the distortion of the driver unit become our main focus due to its high contribution to the overall distortion. Therefore, *final* has designed an ultra-low distortion driver unit "*f-Core for Wireless*" which could only be fabricated by utilizing the latest manufacturing technology.

Music Source

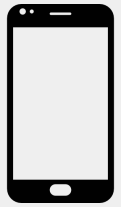
Music

TIDAL

Spotify

Hi-Res AUDIO

Device



Receive music data from streaming service/memory

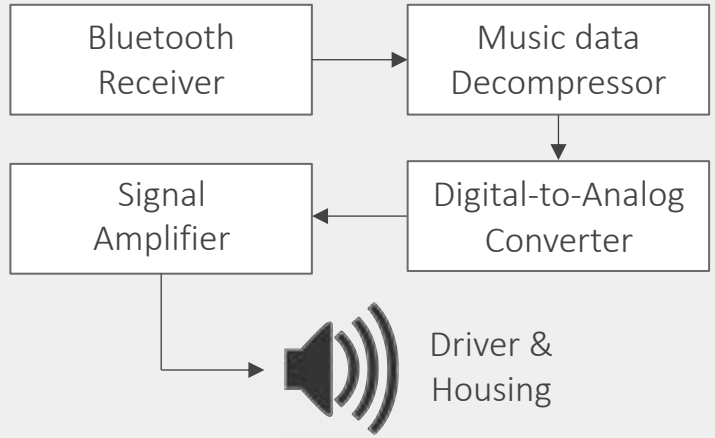
↓

Music data compression

↓

Transmitting data through Bluetooth

Wireless Earphones



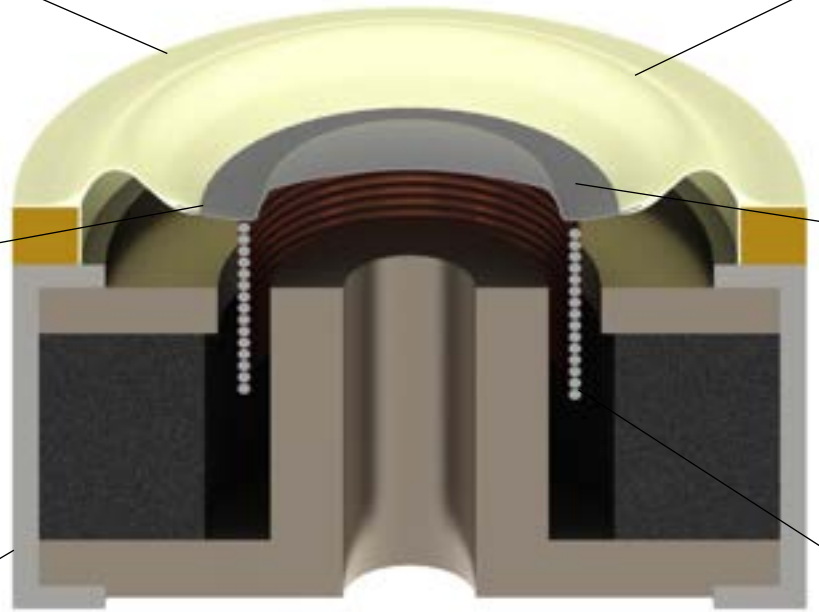
f-Core for Wireless

Redesigned for Ultra-Low Distortion

Full-ranged Dynamic Driver
Strong against electronic noise and delicately designed to easily perform the whole frequency range flawlessly

Adhesive -less Injection Molded Diaphragm
Tremendously light and precisely fabricated diaphragm for exceptional accuracy and clarity

6mm Driver
A miniature yet powerful which specially design for TWS to secure more space for acoustic chamber



Corrugation-less Special Silicone Surround
Featuring special silicone which is soft and elastic to realize accurate pistonic motion

100% Increment of Center Area
Increased area of the center dome to improve the purity of sound

CCAW Voice Coil
Aluminum base cable leading to lighter coil for faster transient response

	Dynamic	Balanced Armature	Planar Magnetic	EST
Full Range Capability	○	○	○	×
Can be Made Small	○	○	×	○
Low Distortion	○	×	○	×
Single Driver Capability	○	△	○	×

◯ Very Strong
△ Moderate / Case dependent
× Very Poor

Single Dynamic Driver

ONE for ALL Full-Ranged Natural Sounding Driver

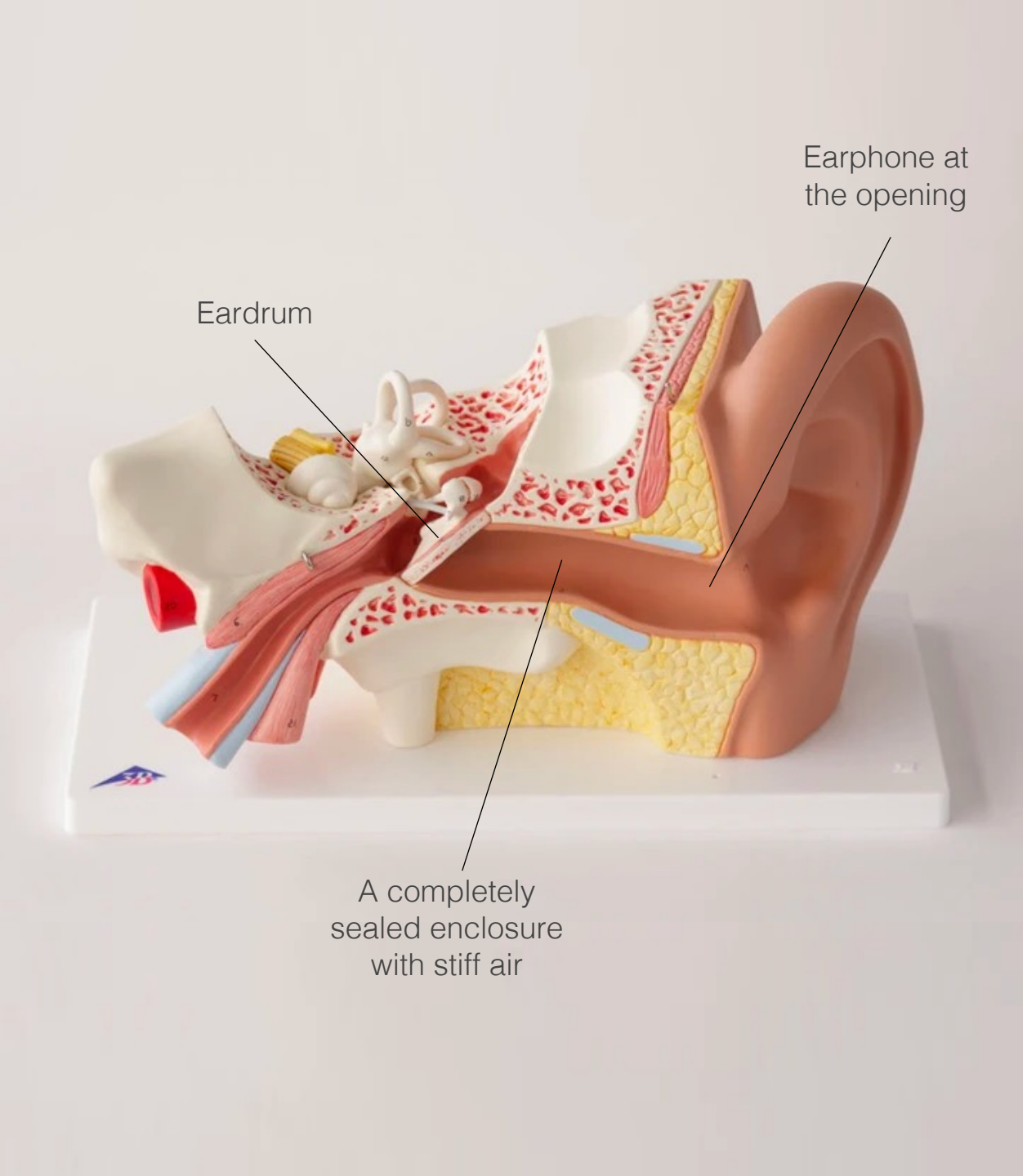
In order to achieve Hi-Fi quality sound performance, *ZE3000* driver must meet the following requirements:

- Not taking a lot of space to make room for a bigger acoustic chamber
- Minimal phasing issue
- Capable of handling all frequencies range effortlessly
- Sound natural and pleasant

Multi-driver setups require a great deal of space, and phasing issue can be quite a trouble if not carefully addressed by additional circuitry.

Therefore, without a doubt, a single dynamic driver is the top choice to consider.

final excels in dynamic driver technology, and has proven our capability with the *E series*, *A series*, and the flagship IEM *A8000*. We are very confident that "*f-Core for Wireless*" will bring another big leap again for the *ZE3000*.



6mm with Sealed Design

Miniature yet Powerful Enough for Quality Sound

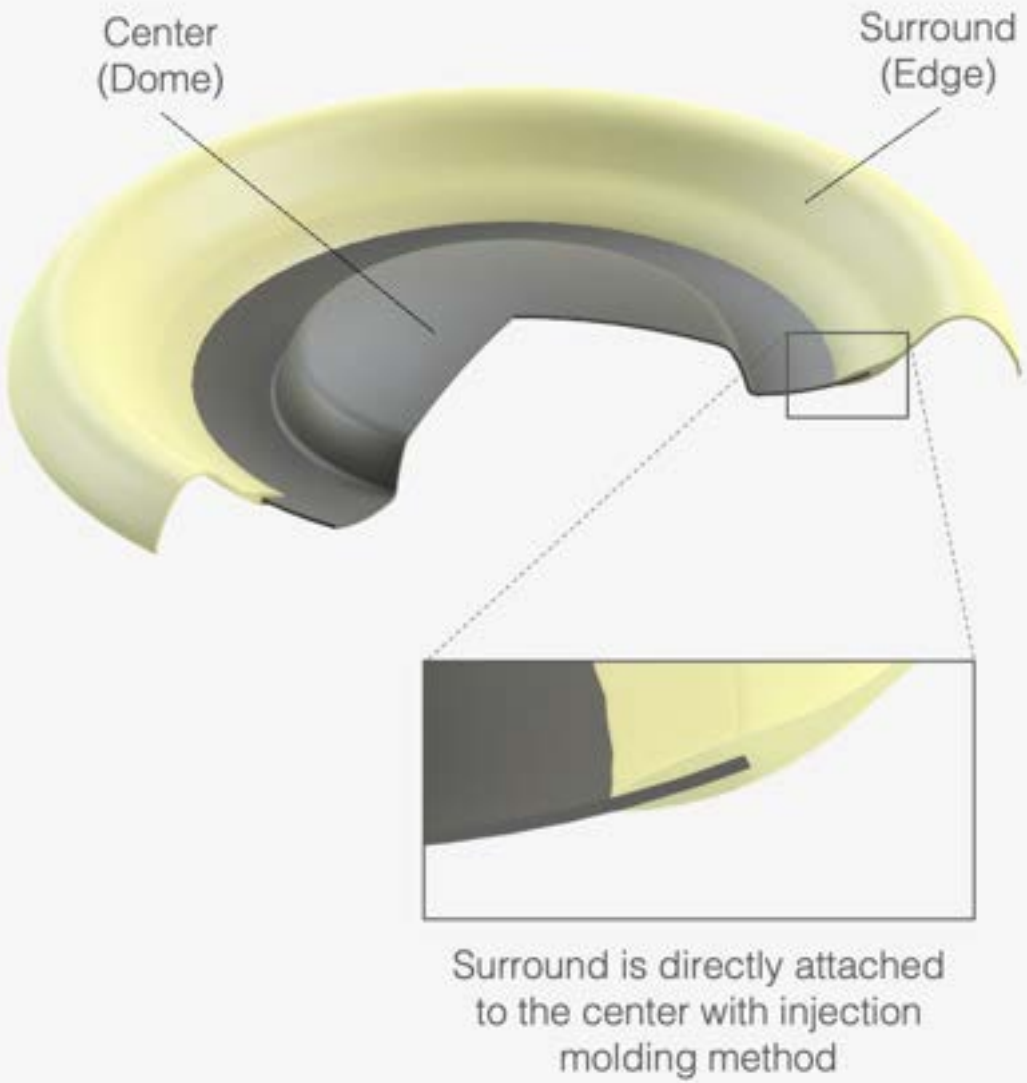
Since the circuitry and battery occupy a large space in the *ZE3000*, it is essential to reduce the size of the driver in order to secure enough space for a good acoustic chamber design.

Considering the balance between the size of the earphone body, the design of the acoustic chamber, and the performance of a dynamic driver, we decided to use a 6 mm driver.

Important note:
It is often misunderstood that small drivers are not good at reproducing low frequencies. This is only true if the driver is playing music in an open space (such as bookshelf speakers or on-ear earphones).

However, in the case of in-ear TWS with sealed ear tips, the space between the eardrum and the driver is completely sealed. In this case, the sound energy is trapped inside and can be easily transferred to the eardrum.

In order to provide the best sealing, *ZE3000* is enclosed with five sizes of our award-winning *final TYPE E for Wireless* ear tips to achieve perfect sealing with any ears.



Adhesive-less Diaphragm

Balanced, Accurate, Light and Fast Movement Enabled

One of the major causes of distortion in dynamic drivers is the weight of the diaphragm.

The heavier the diaphragm, the greater the inertial force, making it difficult to vibrate 100% in sync with the magnitude and frequency of the music signal.

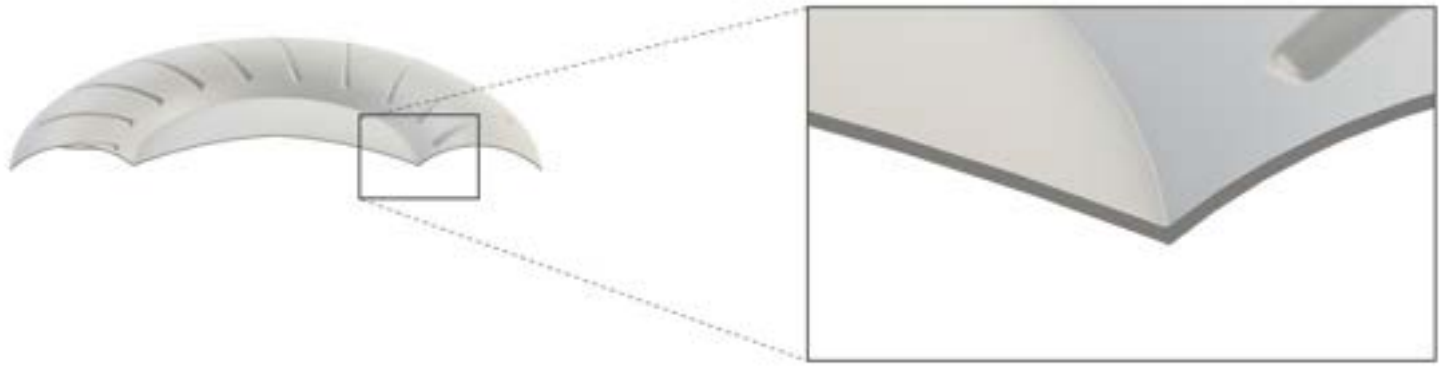
A good diaphragm for a dynamic driver must be hard for the center (dome) to prevent self-deformation at resonance frequencies range and soft for the surround (edge) to reduce energy loss.

In a high-quality dynamic driver, different materials are used for the center and the surround and they are assembled with adhesive glue to make the diaphragm. However, this glue causes the entire diaphragm to become heavier, and this weight gain is leading to a more significant impact for small drivers.

By utilizing a new manufacturing technology, *final* has designed the diaphragm of the *ZE3000* without using any adhesive, making the diaphragm extremely light.

Conventional Diaphragm - 1

Monolithic Injection Molded Diaphragm where material is injected into a mold and the center and surround are formed at the same time with the same material.



Pros	Cons
Cheaper production cost	Same material for center and surround and therefore it is difficult to achieve the ideal diaphragm characteristic (hard center & soft surround). Normally surround is added with tangential corrugations to increase strength.
Applicable for smaller driver	
Easier and faster production	
Easier to achieve an even weight distribution	

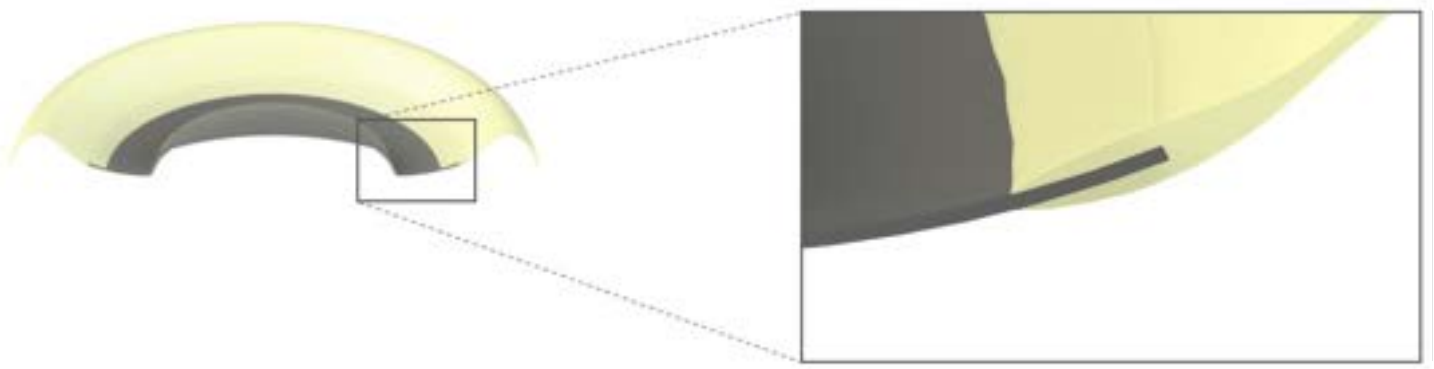
Conventional Diaphragm - 2

Assembled Diaphragm where the center and surround are formed separately with different materials.
The center and surround is then assembled using adhesive glue.

Pros	Cons
Possible to employ different material for center and surround and therefore the ideal diaphragm characteristic (hard center & soft surround) is achievable.	Adhesive glue is causing the diaphram to become heavier and uneven application of adhesive would cause uneven weight distribution
	Difficult to control manufacturing precision such as center alignment of center and surround
	Normally surround is added with tangential corrugations to increase strength.

New Diaphragm Design for ZE3000

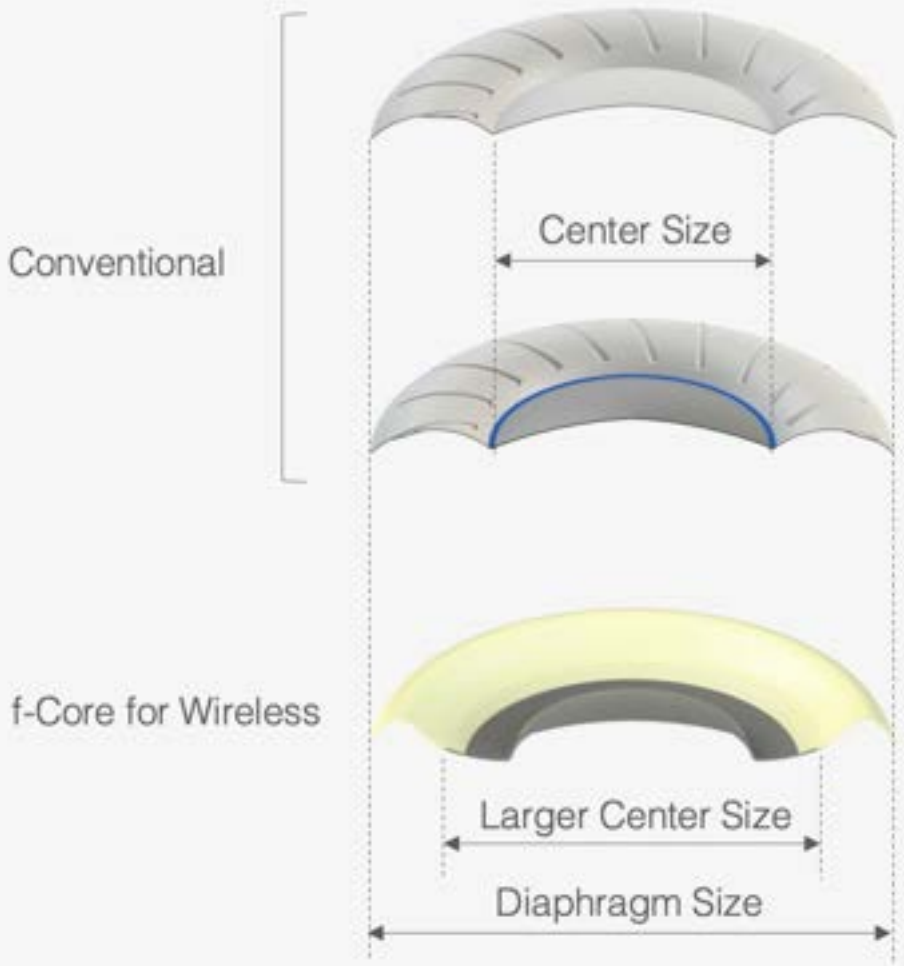
Adhesive-less Injection Molded Diaphragm is having the center being formed first. Then the surround material is injected to the edge of the center forming the surround which directly holding the center.



Pros	Cons
Possible to employ different material for center and surround and therefore the ideal diaphragm characteristic is achievable: hard center & soft surround	High production cost and slower production speed
	High technical requirement
Lightweight due to adhesive-free design	Limited production due to facilities requirement
Easier to achieve an even weight distribution	

	Monolithic Injection Molded	Assembled	Adhesive-less Injection Molded
			
Different material for center and surround	×	○	○
Application for smaller size driver	○	×	○
No Extra Weight from Adhesive	○	×	○
Even Weight Distribution	○	Δ	○

* It is crucial to have different materials for the center and the surround to achieve ideal physical characteristic for a dynamic diaphragm. Hence, even an assembled diaphragm might have its weight affected by adhesive it is still better than monolithic injection molded diaphragm.



* The area of the harder center is increased by around 100%

Special Silicone Surround

Elastic and Soft Properties Reduces Energy Loss

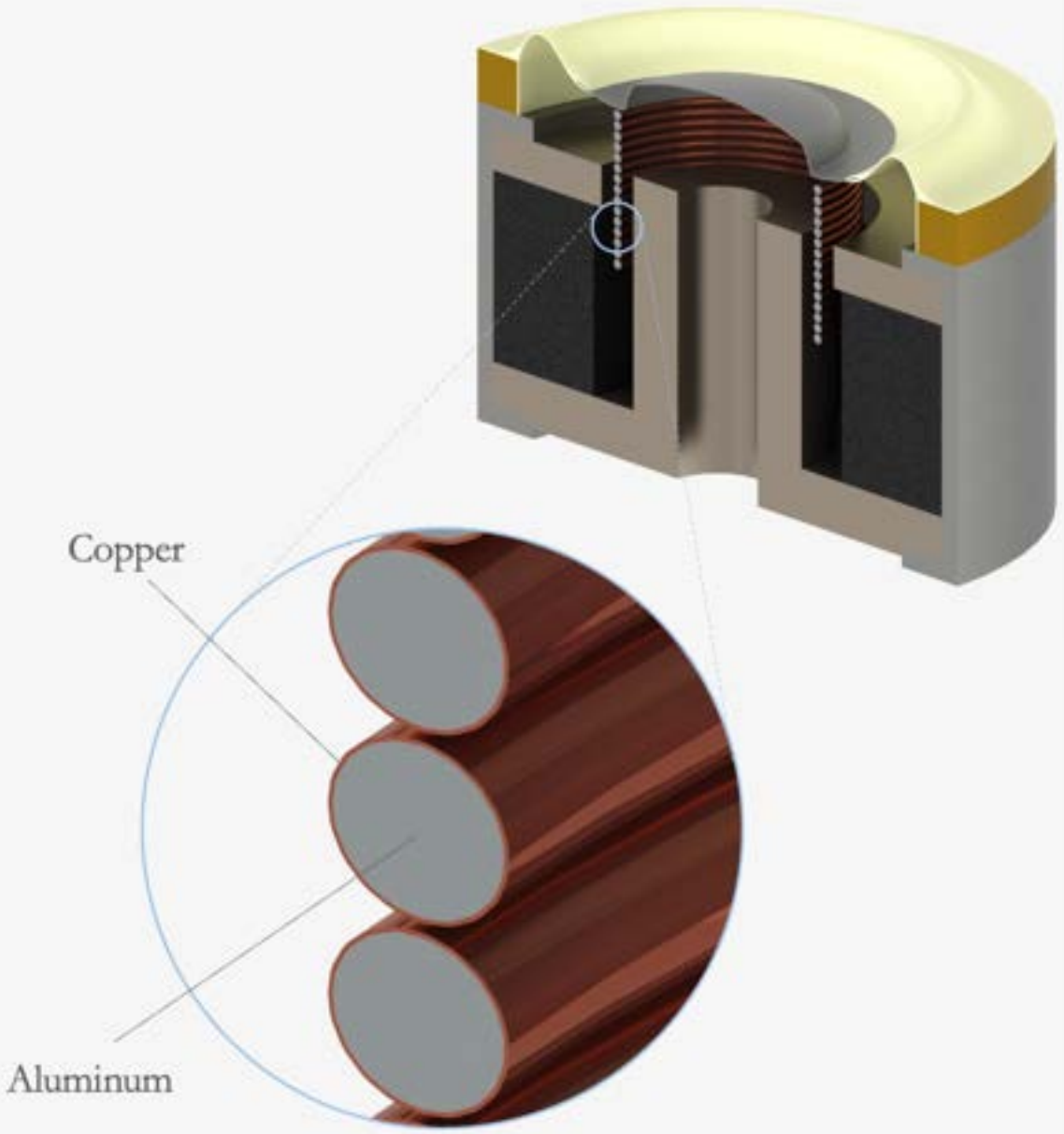
The material of the surrounds has been upgraded to a new type of silicone compound that is soft and has an excellent elasticity.

Taking advantage of the excellent properties of this material, several improvements have been made to the design as well.

- The area of the surround is be reduced
- The area of the center is increased
- Corrugations which normally strengthen the surround but cause the diaphragm to rotate slightly during vibration are removed

When the diaphragm vibrates, both the center and the surround vibrate, so they both produce sound. However, the sound produced by the hard center is always more accurate (less distortion) than the sound produced by the soft surround. Therefore, increasing the area ratio of the center will result in higher sound quality.

Removing corrugations also allows the diaphragm to make more accurate piston movements, which also reduces distortion.



CCAW Voice Coil

Lighter Coil for Faster Transient Response

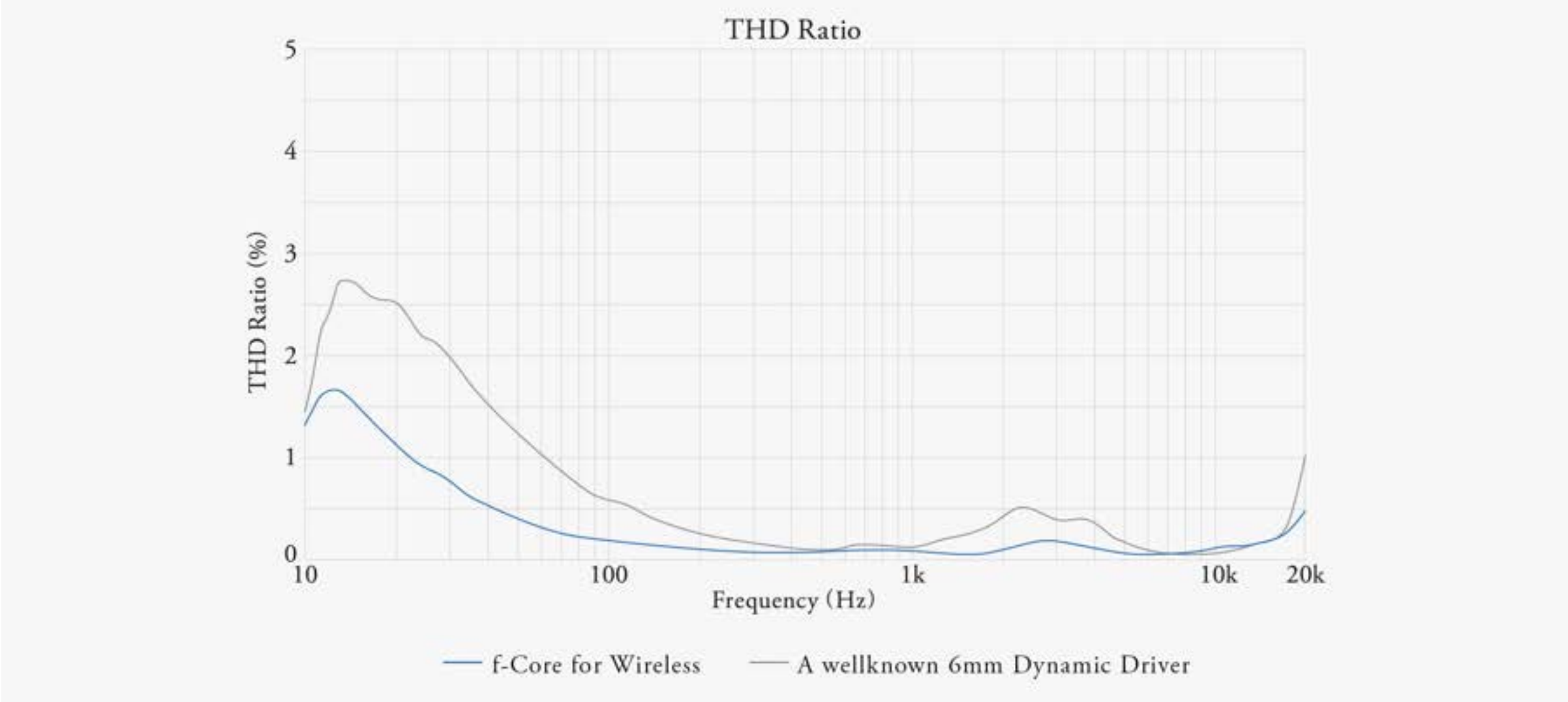
The voice coil is the main component that moves the diaphragm in response to electrical signals and magnetic flux.

To further improve the performance of the *f-Core for Wireless*, the *ZE3000* uses a CCAW (Copper-Clad Aluminum Wire) voice coil instead of the usual copper voice coil.

Since aluminum is only 32% as dense as copper, it is about 70% lighter than copper voice coils. This allows for faster speed and transient response.

The Result: Extremely Low THD+N (Distortion) Dynamic Driver

By combining these approaches, *final* succeeded in designing f-Core for Wireless as an ultra-low THD+N dynamic driver. The figure below shows a comparison of THD+N between *f-Core for Wireless* and another dynamic driver that is famous for its low distortion, and it is obvious that f-Core for Wireless achieves about 50% lower distortion.



Acoustic Chamber Technology

f-LINK Damping System

Acoustic Chamber

The Backbone of Quality Sound

Many users believe that the driver unit is the major factor in determining sound quality.

However, this is not entirely true. The structure and space around the driver (acoustic chamber) is equally important to maximize the performance of the driver units and finetune the overall sound presentation. If the acoustic room is not properly designed, not only will the driver's performance not be at its full potential, but also minimal delay and phasing issues will occur which would tremendously reduce the expressiveness of the sound.

For example, our flagship IEM, the *A8000*, introduced a *Tetra Chamber Construction* for its acoustic chamber. Four different chambers are employed in the earphone to precisely regulate the air pressure changes at the back of the Beryllium driver and allow the driver to perform at its best. The front of the driver also features a curved shape to properly control sound phasing issues, echoes, and delays.

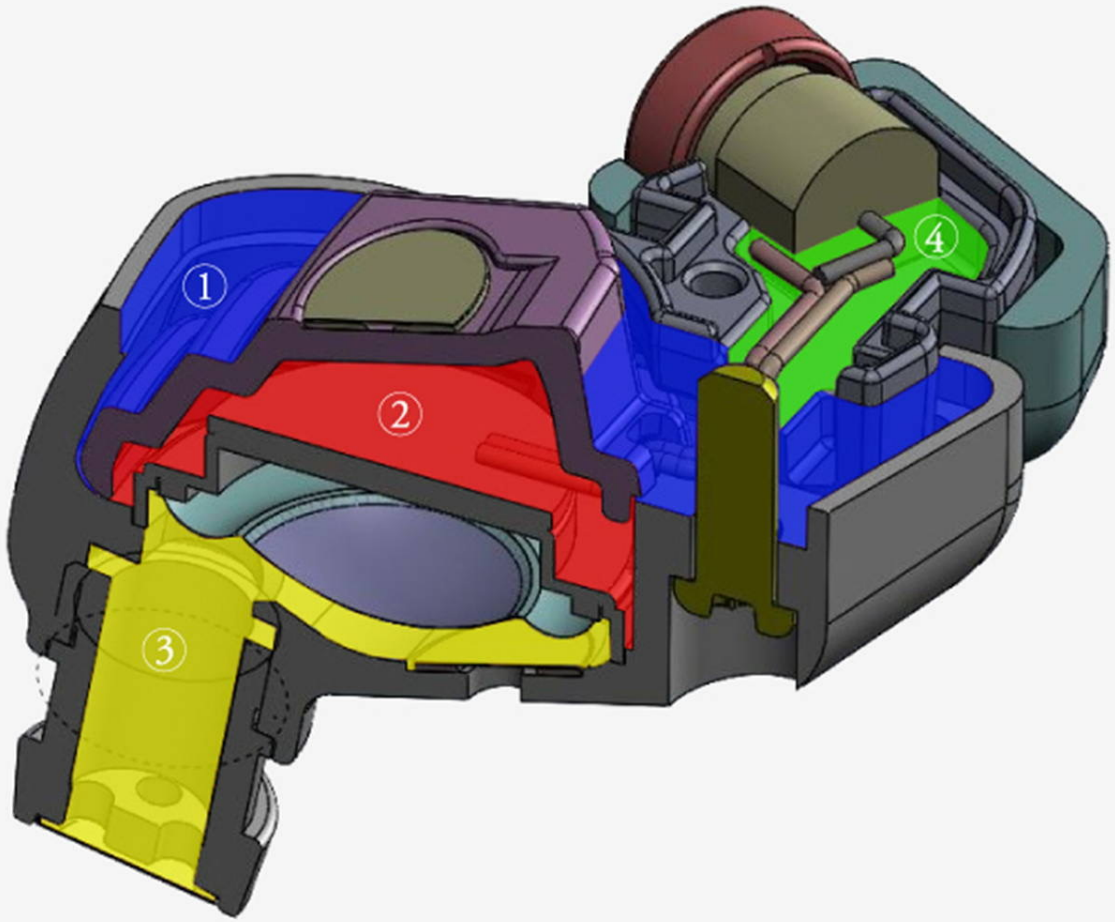


Figure shows the internal structure of the *final A8000*. 4 different chambers (colored and labelled differently) are carefully designed in order to achieve the clean, fast and transparent sound quality.

Difficulty of TWS

Basic Components Causing Difficult Design

However, in order to receive signals wirelessly and make the earphones sound independently without the need for wired input, each unit of TWS needs to be equipped with a chipset, electronic circuit, battery, antenna and microphone.

As a result, most of the space inside the earphone was occupied, making it very difficult to design a great acoustic chamber which is essential for high quality sound.

Of course, this problem can be easily solved by increasing the size of the earphone unit. However, increasing the size of the earphone unit would compromise the fit and comfort, therefore the balance between them has to be carefully considered at the design stage.

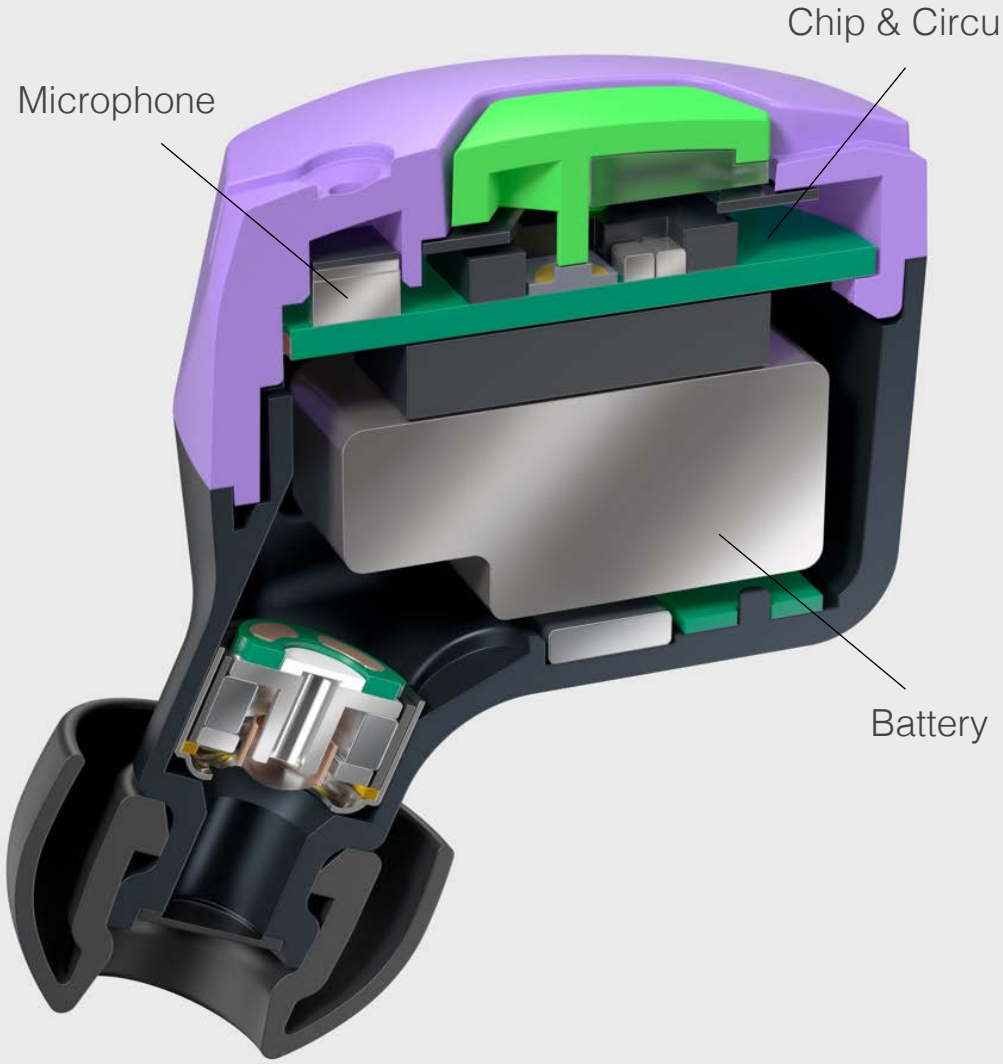
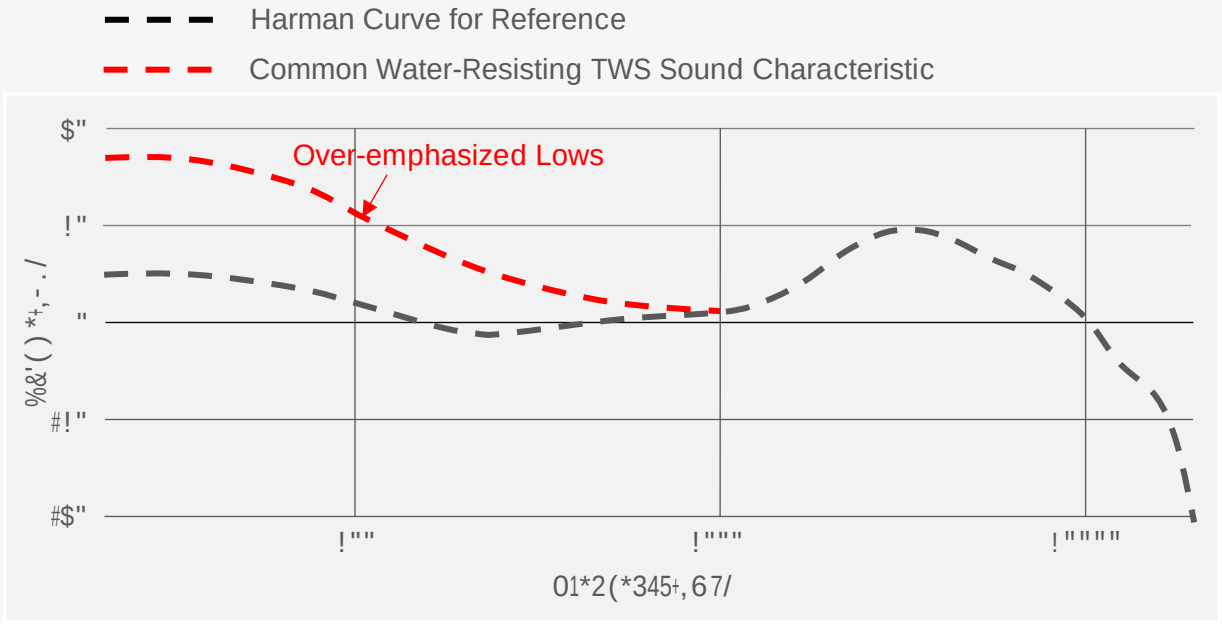
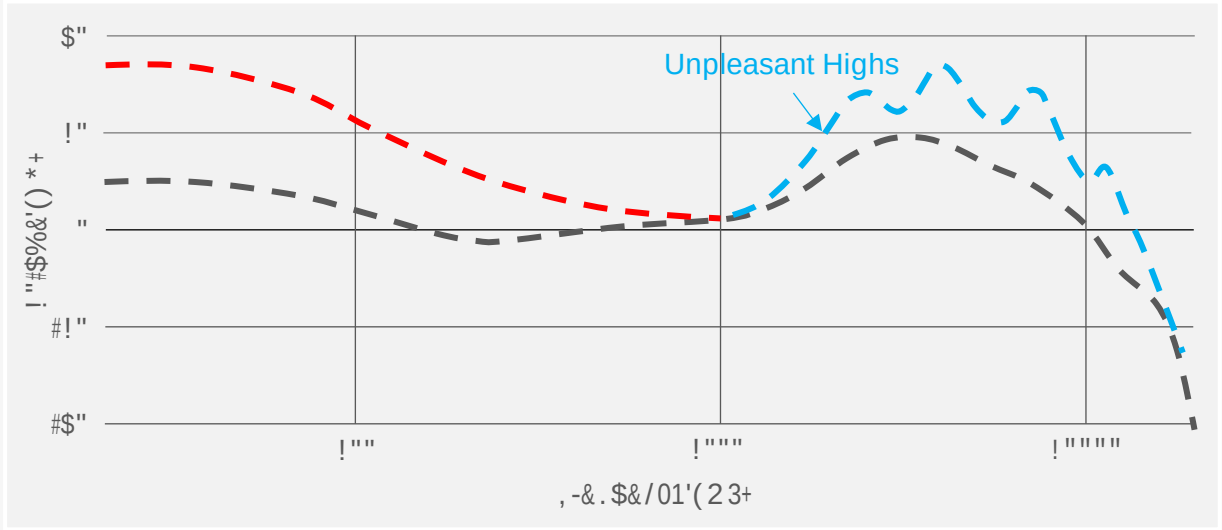


Figure shows the internal structure of the Evangelion x final collaboration TWS. Most of the space inside the earphones are occupied by the basic components.

Common Issue of a Water-Resisting TWS



Common Solution by Most Makers



Water Resistance Challenge

Bloating Lows that Mask Off the Vocal

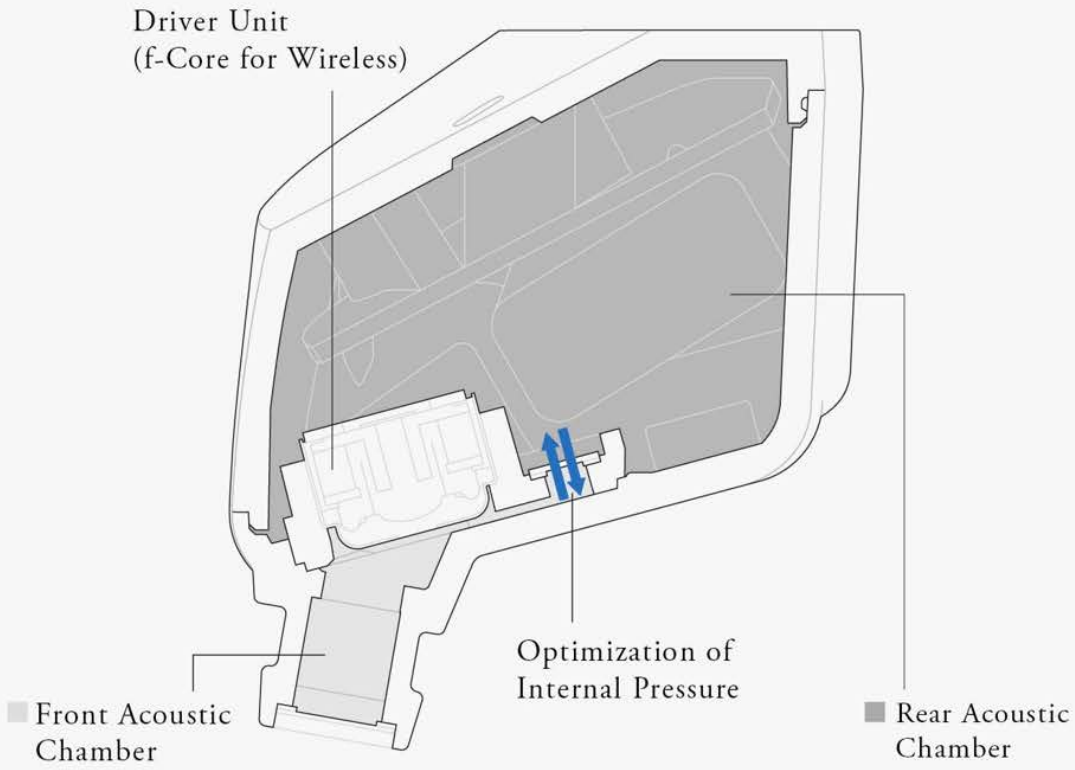
Unlike ordinary wired earphones, one of the major challenges faced by TWS is the generally expected waterproof feature.

In order to prevent water from entering the housing of the TWS, the earphone body needs to be completely sealed with no vent is allowed to regulate the air pressure inside the acoustic chamber. As a result, bass frequencies are naturally over-emphasized and the direct effect is that mids and vocals lose its clarity due to the auditory masking effect.

One common solution adopted by many brands is to tune up the treble with the on-chip equalizer to balance the amount of bass and treble.

While this is a very effective solution for regular earphones, it is not ideal for Hi-Fi level earphones due to the unpleasant highs, unnatural overall sound presentation, and distant vocals.

*According to Auditory Masking Effect, when multiple sounds from different frequencies are playing at the same time, sounds in low frequencies tend to mask off the audibility of those in mid and high frequencies.



f-LINK Damping System

Dual-Chamber Linking Structure for Pressure Optimization

To resolve the issue from the root, ZE3000 introduces proprietary *f-LINK Damping System* to regulate the air pressure change inside the enclosed housing without introducing a vent.

f-LINK Damping System composed of 2 two linking acoustic chambers.

Front Chamber – The chamber where the air pressure is strongly affected by the sound

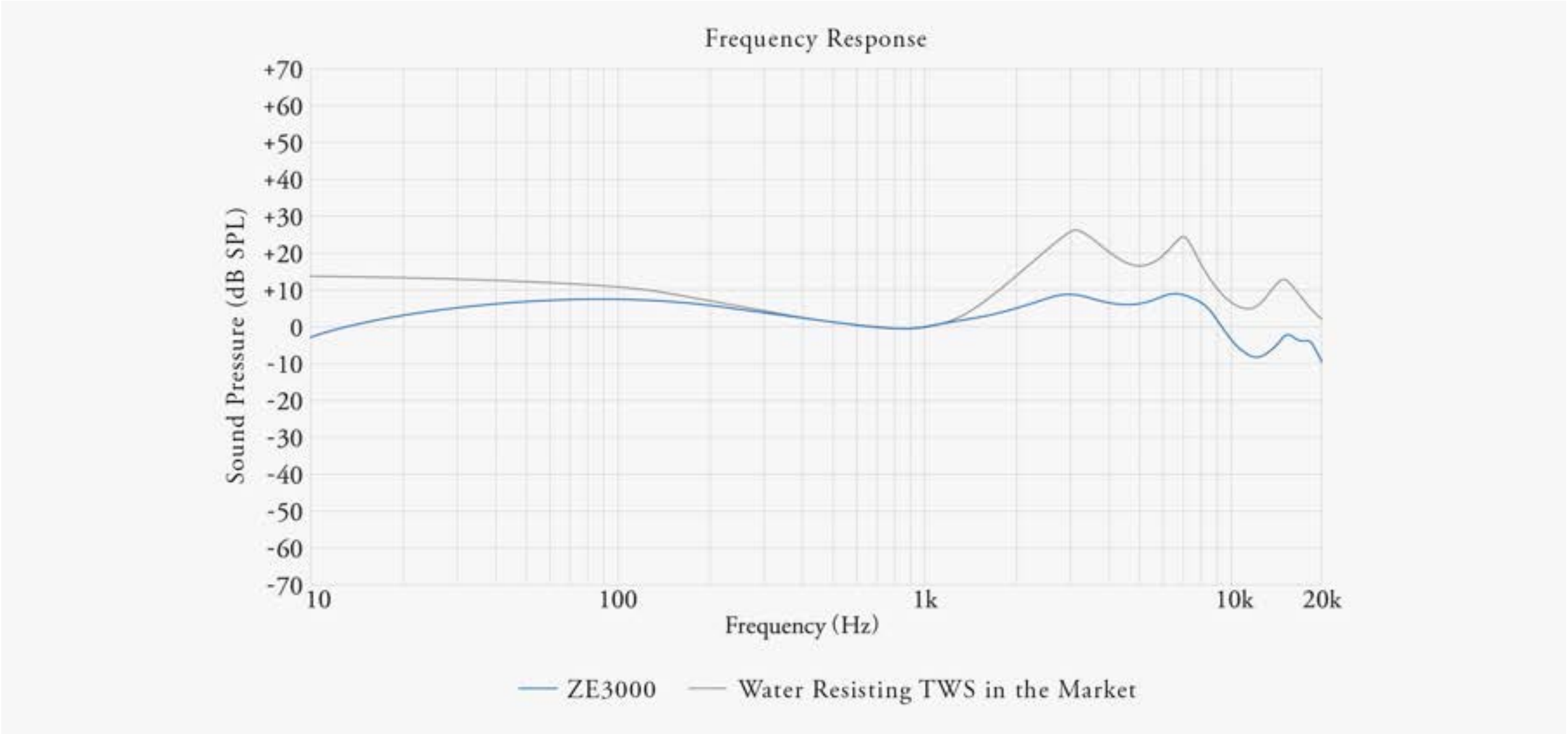
Rear Chamber – The chamber which has its space limited by the electronic components and its air pressure strongly affected by the movement of the dynamic driver

By fully utilizing the unoccupied acoustic space inside the *ZE3000* and our knowledge in fluid mechanic engineering, an air pressure regulating system is introduced between the 2 chambers to perform optimal pressure regulation.

This makes it possible to properly control the low frequencies and deliver sound which is pleasant to be listened to.

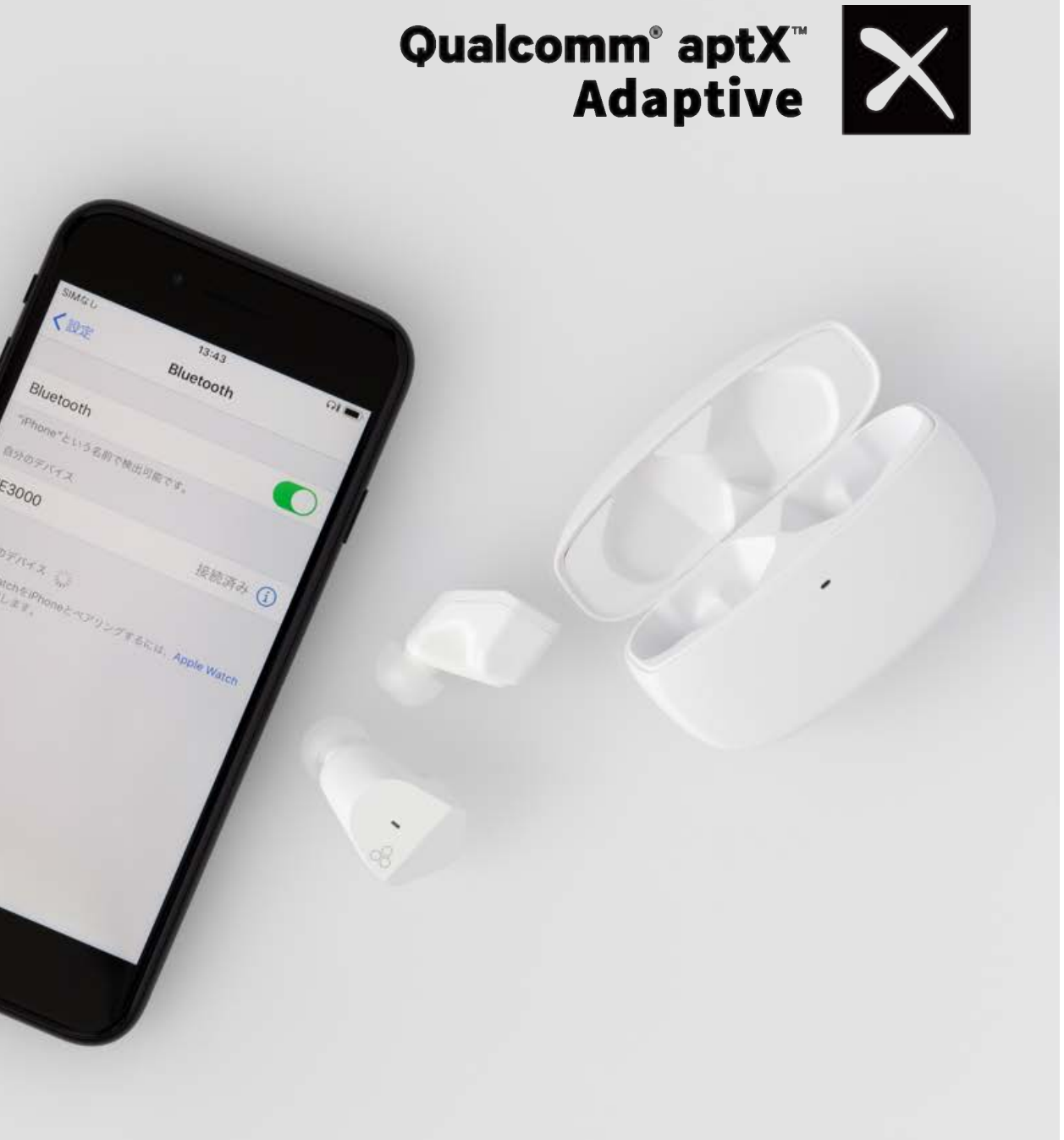
The Result: Balanced and Smooth Sound Signature

Compared to most of the water resisting TWS in the market where both low and high frequencies being overly emphasized which leads to fatigue after a long time of listening, *ZE3000* delivers a more pleasant, relaxing and enjoyable music experience regardless of the music genres.



Other Features

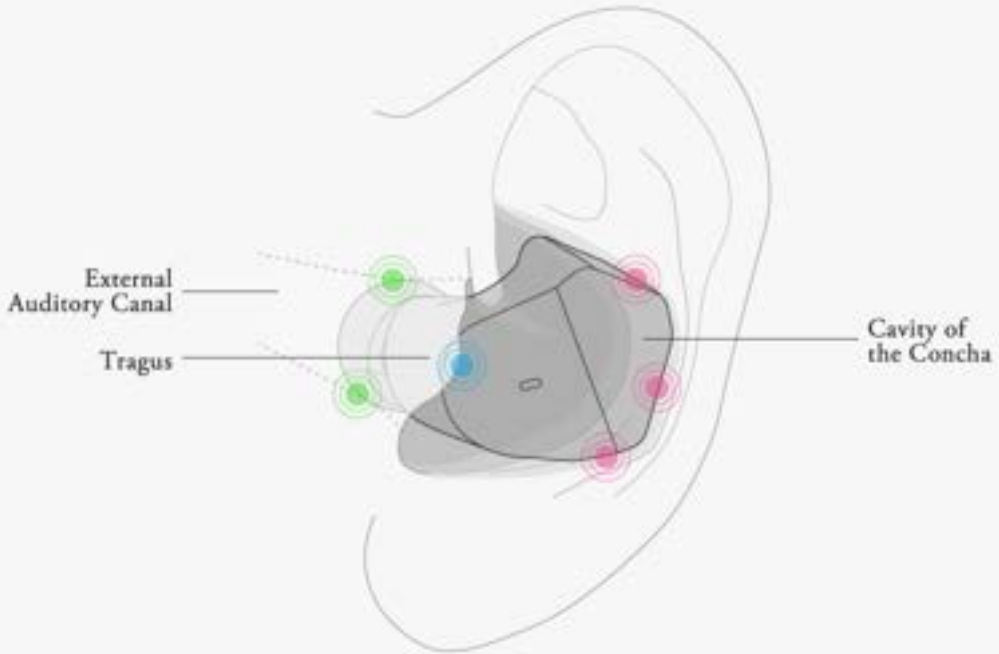
final ZE3000



Latest Bluetooth 5.2 with aptX Adaptive Support

The *ZE3000* is equipped with the latest Bluetooth version 5.2 to ensure a stable connection and uninterrupted music.

In addition, Qualcomm aptX Adaptive supports music files up to 24bit/48kHz. This allows the *ZE3000* delivers every details to reproduce lossless CD music files and lossless music from streaming services.



Minimal Oppression Design for Custom-Like Fit

Whether or not an earphone is comfortable to wear depends on how little oppressive they are. At first glance, the method of holding earphone in ear with the repulsive force of housing with ergonomic shape seems to be correct, but as it always apply pressure onto the ear, fatigue accumulates and lead to discomfort.

Different from the ergonomic shape, *ZE3000* employs a shape that has the earphone being held at 3 points for a stable fit. The 1st point at the cavity of concha (Pink), the 2nd point at the ear tip(Green), and the 3rd point at the tragus (Blue) as shown in the figure. This design minimizes the feeling of oppression and provides comfort even for long hour of listening.

Award-Winning Ear Tips Exclusively Designed for TWS

In order to fully enjoy the Hi-Fi sound quality of the *ZE3000*, perfect sealing and perfect fit are very important.

To ensure perfect sealing and comfort, the *ZE3000* comes with *TYPE E for Wireless ear tips* which is designed specifically for true wireless earphones.

Five sizes are available: S, SS, M, L, and LL, allowing users to choose the one that best suits their needs.

This ear tips were awarded in VGP Lifestyle 2021 – The most reputable award for audio and visual products in Japan.

* *ZE3000 White* is supplied with the Clear ear tips while *ZE3000 Black* is supplied with the Black ear tips.

IPX4 Lifestyle Water Resistance

The *ZE3000* is designed to be water resistant to IPX4 standard for daily life to withstand sudden rain and sweat during sports.

Unlike other TWS, the *f-LINK Damping System* allows the users to enjoy true HiFi sound without worrying about sweat or sudden rain.

Ideally Shaped for Maximum Comfort

Instead of trying to achieve a cool design, the shape of the charging case and earphone units are design for the maximum comfort for daily frequent use.

Hundreds of shape prototype were made and tested out by true feeling and sensation while having them in the hand. The one with the most acceptance decided the final shape.

Premium SHIBO Finish

Soft-textured Shibo* coating offers a beautiful surface that is superb at dirt resistance and fingerprint resilience on top of giving valuable impression of premium range of products.

* Shibo; an old Japanese word meaning a wrinkle on the surface of paper or leather.

Auto Pairing Feature

By simply opening the lid of the charging case, the *ZE3000* will enter its pairing mode ready for its first pairing.

After the pairing is completed, every time when the case is opened, the *ZE3000* will automatically established a connection with the paired device.

Touch Sensor

One of the most basic function to let users control their media playback easily simply through a few taps.

	Control	L	R
Music	Play	Single Tap	
	Pause	Single Tap	
	Next	-	Tap & Hold until Beep
	Previous	Tap & Hold until Beep	-
	Volume ↑	Double Tap	
	Volume ↓	Double Tap	
Phone Call	Answer	Single Tap	
	End	Tap & Hold until Beep	
	Decline	Double Tap	
Siri/Google Assistant	Initiate	Triple Tap	

Specifications

final ZE3000

Specification

Connection	Bluetooth ver 5.2
Driver	6mm f-Core for Wireless
Codec	AAC, SBC, aptX, aptX Adaptive
Music Playback Time	Earphone : Max 7 hours Case: Max 35 hours
Charging Time	Earphone : 1.5 hour Case: 2 hours
Water Resistance	IPX4

Awards

VGP2022 Lifestyle Gold Winning Award
Category:　True Wireless Earphones
Price:　JPY 12,000 ～ 15000

金賞

VGP2022 Lifestyle Project Planning Award
Successfully employing innovative & unique design for the driver and the internal housing structure

企画賞

Thank You!

We deeply appreciate your time and effort in trying out and reviewing our new product, final ZE3000.

Thank you for patiently reading through this introductory document and we hope that this has successfully provided you with the product information and the concept we had for true wireless earphones.

If you wish to know more about this product, please feel free to contact me anytime by sending me an email.

Kindly access here for the photos dedicated for this product.

final

Bestellungen an

at.order@audiotuning.at