

Continued evolution to turn into Legend.

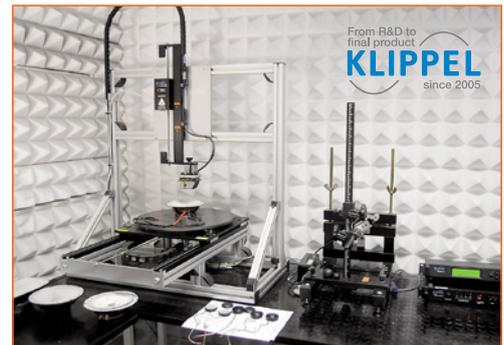


ML 2500.3 Legend

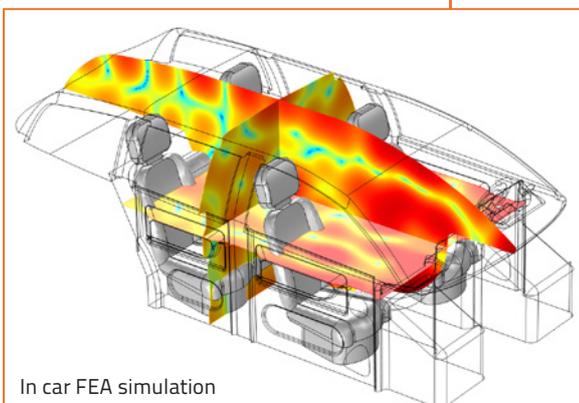
Since its introduction in 1999, the Mille series has always had one goal: **to be a reference for the enthusiasts**. The Hertz designers' commitment has been rewarded by both the International press representatives' and the in-car listening enthusiasts, not to forget the several awards collected during the time.

The Hertz Design team approaches each new project as a continuous challenge: **driven by their passion for music reproduced in car, they constantly improved the performance level** compared to the past. To make the difference in your car audio system today.

The way a speaker is designed is in continuous evolution: Hertz has always invested in **research and development**. For this reason, from 2005 Hertz joined the **"Klippel" certification program**. In order to be allowed to use the "Verified with Klippel" brand, the Hertz R&D electro-acoustic engineers were trained and keep themselves periodically up to date with regards to the different systems for the speakers design, he development and quality control: Klippel DA-2 & Klippel Scan Vibrometer (Designed) - Klippel PM-8 (Developed) - Klippel QC (Tested).



From R&D to final product
KLIPEL
since 2005



In car FEA simulation

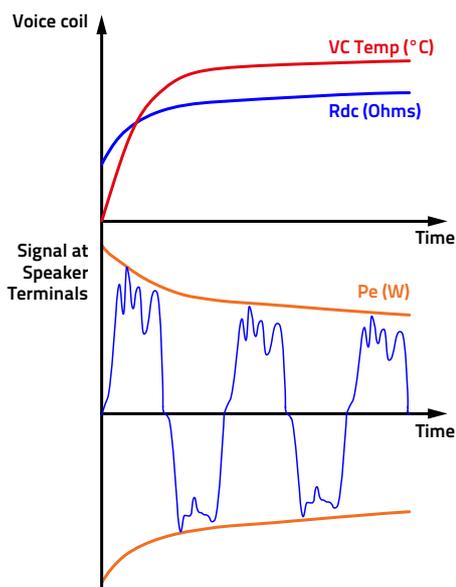
Huge amounts of resources have been employed in the **FEA (Finite Element Analysis) simulations** which, through a long phase of **material characterization**, led to the optimization of each cubic millimetre of the speaker, giving the advantage of predicting performance and sound behaviours in their final application: the car environment!

All the results of this research course, focused on the **cone geometry** and their modal analysis, on the **surround and spider optimization**, on the **thermal and magnetic advanced modelling techniques**, allowed to achieve an ambitious goal: **to improve the Mille line, a reference product for the enthusiasts**.

This constant evolution during the years nurtured the myth of the Mille line which, in its latest expression, has been deservedly embellished by the adjective "Legend" to celebrate its fifteen years of presence in the market.

Dynamic Compression

The musical signal is much more complex than a sine wave, since it is characterized by continuous and quick variations of level, especially at low frequency range. Think about the rhythmically pulsing of an electric bass coupled with the bass drum: at each pulsation, the amplifier applies power to the subwoofer voice coil (**Pe**) which gets warmer (**VC Temp**) as the track is being played, increasing its resistance (**Rdc**). The resistance increase behaves like a bottle neck constraining the current flow, limiting the power the amplifier can deliver to the subwoofer during the reproduction of the track. This phenomenon is known as dynamic compression.



The **IN/OUT** wound 100 mm (4") voice coil, employed in the ML 2000.3 Legend and in the ML 2500.3 Legend, **requires longer heating times compared to products featuring a smaller diameter voice coil built with the traditional multi-layer winding method.** Therefore, when the most demanding musical programs are reproduced, **the Mille.3 Legend subwoofers voice coil remains within the optimal temperature operational range, reducing dynamic compression to the minimum.** This feature is fundamental **to re-create the same emotion of a Live performance inside the car, and so to be able to appreciate the whole dynamic range of the different instruments.**

The design.

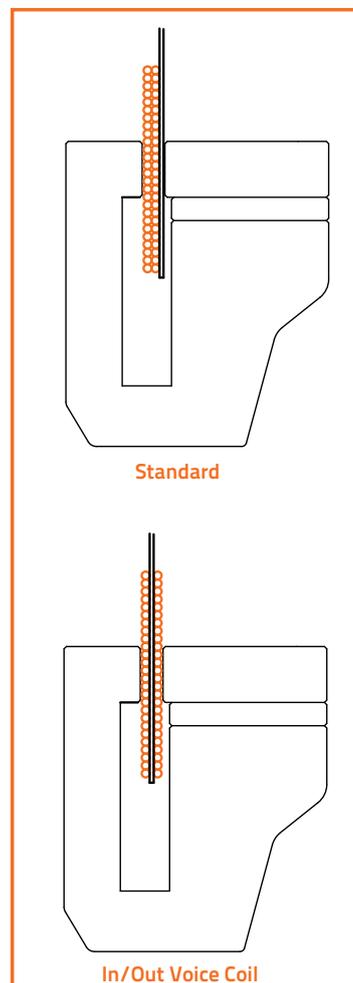
Music fans who attend live concerts know well the emotions that **low undistorted frequencies without dynamic compression** can arouse. For this reason, the Hertz R&D created **ML 2000.3 Legend and ML2500.3 Legend, the two reference subs for the Mille.3 Legend line.** During the long development phase, the designers set themselves just one ambitious goal: **to transfer the emotions of a live performance to the car environment.**

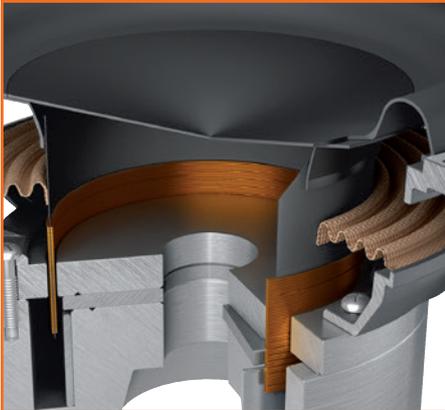
Thanks to a completely renewed design, **the subwoofers have extremely compact size** and are optimized to play in **enclosures with reduced boxes.** This choice of design combines two requirements hard to achieve up to now: **reference performance and ease of installation.**

The Hertz electro-acoustic designers had the Mille Legend subs mount a **CCA W (Copper Clad Aluminium Wire) 100 mm (4") voice coil**, to ensure unparalleled heat dissipation capability compared to the average subs that mount voice coils with considerably smaller diameter. A larger diameter ensures better stability of the voice coil during extended excursions, as that makes the voice coil less sensitive to undesired resonances, such as for example the "rocking mode".

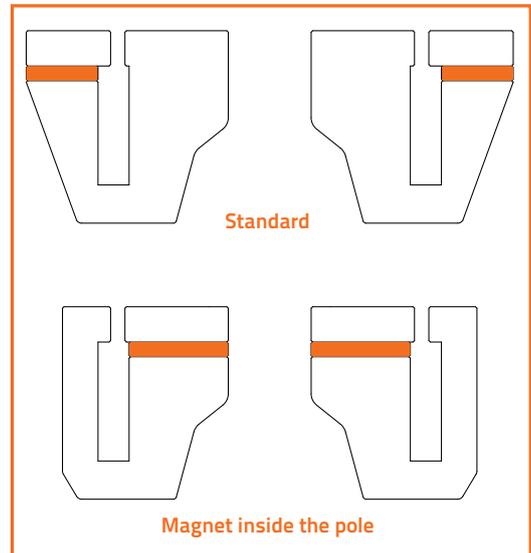
Besides size, the voice coil features a **new winding process called "In/Out"**. This technique, although more complex and expensive from a production perspective, provides the ability to obtain an even cooling of the different coil layers. With standard build methods, the internal layers, those close to the former, considering heat dissipation, are more disadvantaged than the external ones. In the case of **In/Out coils, thanks to their build, the internal layers have same dissipation capability as the external ones.**

The subs spider, **made from CONEX**, has been designed to work in perfect synergy with the 100 mm coil and to ensure **maximum mechanical linearity during long excursions of the cone**, that is made from **paper with the add of mineral powders to increase stiffness and damping.**



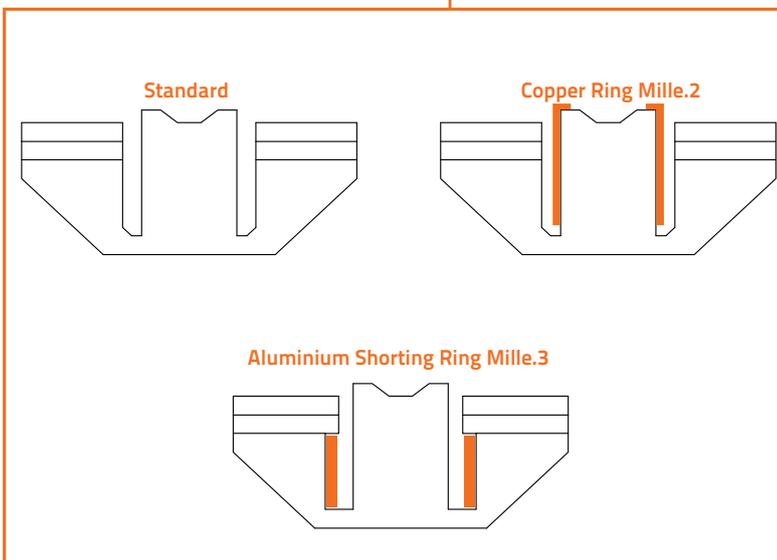


To make the most of the capability of this special mobile voice coil, through the use of the **FEA simulation** technology, a specific magnet assembly has been optimized, employing a **5 mm thick Neodymium ring, capable of generating even, magnetic flux, also during the cone maximum excursion.** The use of a 100mm (4") mobile voice coil provided the ability to **insert the magnet in its inside** and not on its outside, as it is common in conventional designs, so to minimize energy waste maximizing efficiency and, at the same time, minimizing overall dimensions by adopting a **compact design.**



The movement of the mobile voice coil inside the air gap causes a variation of the inductance value that, at high excursions, becomes significant, causing distortion. To keep this phenomenon to the

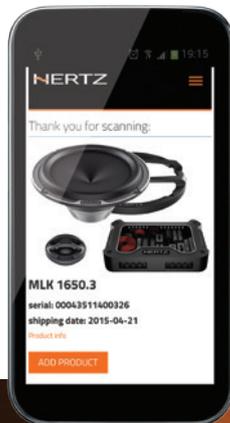
minimum, a copper ring outside the motor pole called "Copper Ring" is employed, effectively minimizing distortion. However, using the "Copper ring" in the subs motor would have required reducing the air gap, thus reducing energy as a matter of fact, with the result of losing low frequency level. For this reason, the Hertz electro-acoustic designers went beyond that, developing a **technology specifically thought for the Mille Legend subwoofers called "Aluminium Shorting Ring"**. In this case, an **aluminium ring inside the pole** is employed, leaving the gap area free, **preventing loss of energy in the low frequencies, though keeping the distortion reduction unaltered.**



A powerful motor, capable of extreme performance, requires a frame extremely resistant to twisting stresses to unload all the power. This concept, applicable in car contests, is perfectly applicable also in electro-acoustics. This is the reason why the Hertz designers, through FEA simulations, designed a **six-spoke compact anti-resonant alloy basket with spider built-in vented holes.** Together with the eight holes of the bottom plate and the motor central hole, these vented holes allow the cone to move as free as it needs making long excursions, **eliminating every distortion due to acoustic compression phenomena.**



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