

# DALI RUBICON

WHITEPAPER



IN ADMIRATION OF MUSIC

# INTRODUCTION

Over the last 30 years DALI have continuously broken new ground in the loudspeaker industry, and have constantly proven that attention to detail and the genuine love of music is the foundation of loudspeaker craftsmanship excellence.

Having introduced the SMC based 'Linear Drive System' with our flagship EPICON series, we wanted to utilise this technology's ability to create extremely low distortion within the RUBICON series. Using SMC only in the pole piece, we found that we could remove a very large part of the unwanted distortion, and lower the complexity of the central part of the magnet motor. This simplifies the production process and ensures that the benefit of SMC can be enjoyed by even more Hi-Fi lovers around the world.

The DALI trademark hybrid tweeter module has once again received a make-over in order to bring the latest developments into the series. Using the same soft dome diaphragm used in the EPICON series, and many of the same magnet system technologies, the RUBICON soft dome tweeter and ribbon are able to deliver the detailed and spacious sound stage that DALI is so well known for.

However, drivers alone do not make a great loudspeaker. The cabinet is the drivers' terminating point and therefore has to offer a solid, ridged and resonance free environment for them to work in. Constructed from solid MDF, the simple yet majestic cabinet is the sturdy base from where the drivers do their work. Following the design lines of the very popular MENTOR MENUET, the RUBICON series builds on a well known design language, and takes it to new heights.

With the RUBICON series of loudspeakers, DALI continues its tradition of bringing 'best in class' products to the market. With drivers manufactured in-house at our Danish factory, and featuring the latest in magnet motor technology, DALI RUBICON is ready to set new standards for audio quality in the mid-range loudspeaker segment.

It is with great pride we introduce DALI RUBICON



## PRODUCTS



The DALI RUBICON series consist of five unique loudspeaker models that all are built around a brand new 6½ inch woofer, and the well known DALI hybrid tweeter module. They are available in high-gloss Black or White, and in two real wood veneers, Walnut and Rosso.

RUBICON 2 is a compact 2-way stand mount loudspeaker. The perfect blend between compact size and cabinet inner volume has created the perfect working environment for the 6½ inch woofer and soft dome tweeter.

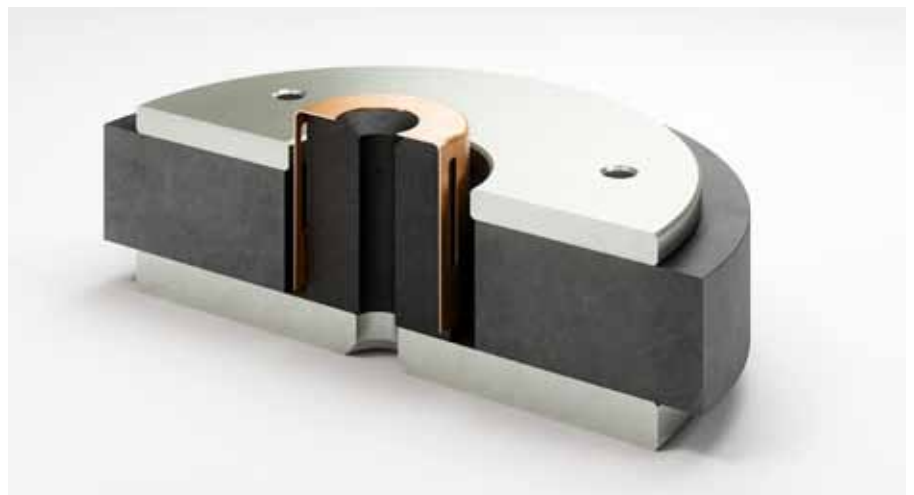
The floor standing RUBICON 5 extends on the RUBICON 2 by adding a larger cabinet with extended internal volume. RUBICON 5 also utilises the hybrid tweeter module, which features both a soft dome and ribbon tweeter. All this add up to a potent loudspeaker despite its still compact size.

The RUBICON 6 adds another 6½ inch woofer and a larger cabinet. The two woofers work together to move a lot more air and reach even lower into the deep bass area.

The large RUBICON 8 has no less than 3 woofers that kick in at different frequencies. This adds up to what in effect is a 2½+½+½-way construction.

RUBICON LCR is the dedicated on-wall speaker in the series. With a 6½ inch woofer and a rotatable hybrid tweeter module, it can be set up to play both vertically or horizontally, making it the perfect choice for surround use in a home cinema set-up. The ingenious bass port gives the otherwise small loudspeaker the ability to deliver surprising large bass.

# WOOFER



*The SMC based pole piece covered by a slitted copper cap forms the basis in the low distortion magnet system.*

## Magnet system

Reproducing undistorted, uncoloured sound rich on detail has always been the goal at DALI. With the recently introduced SMC 'Linear Drive System' we knew that we had the tools to raise the bar on sound quality in the mid-range loudspeaker segment. Finding

a way to implement the knowledge was where things became more complicated. Wanting to maximise the effect of the SMC whilst keeping the magnet motor simple, led to countless experiments in our R&D department. The result was a pole piece constructed

entirely from SMC, surrounded with a copper cap, and enclosed within a large ferrite magnet. This way the effect of the SMC was maximised and the design of the magnet motor system was kept fairly simple.



## SMC

The use of SMC (Soft Magnetic Compound) has many advantages, but the overshadowing result is a significant reduction of distortion from the mechanical loss in the magnet

motor. SMC's unique ability to deliver a high magnetic conductivity and a very low electrical conductivity gives us all the wanted qualities of a really good

speaker magnet without the traditional downsides. The result is a significant lowering of the colouration of the reproduced sound.



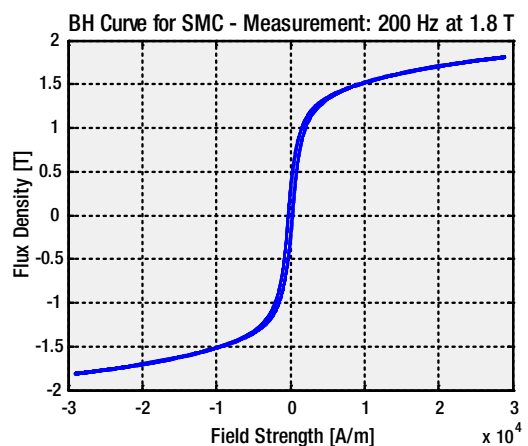
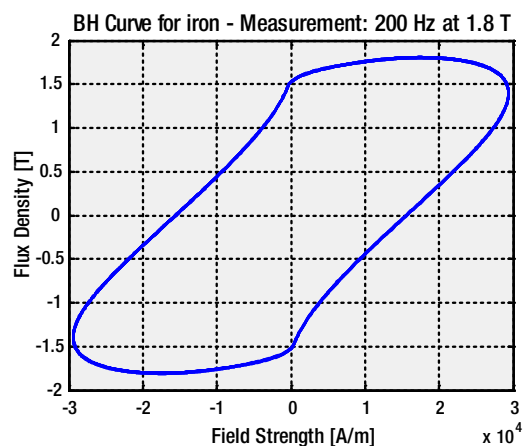
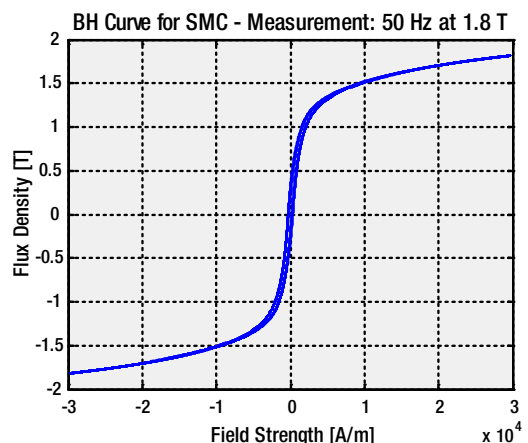
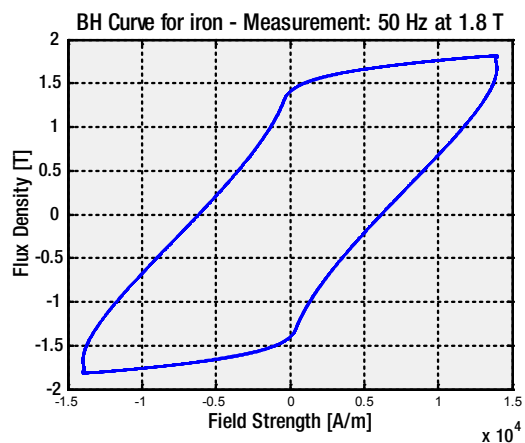
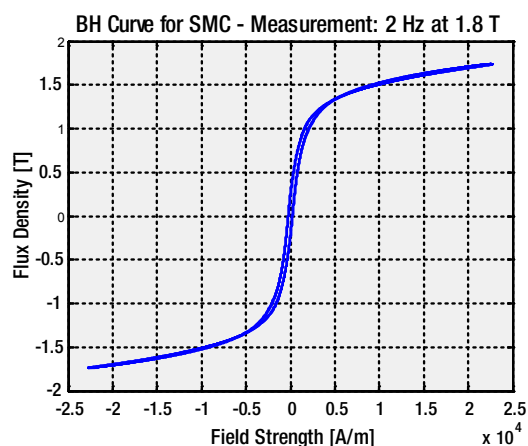
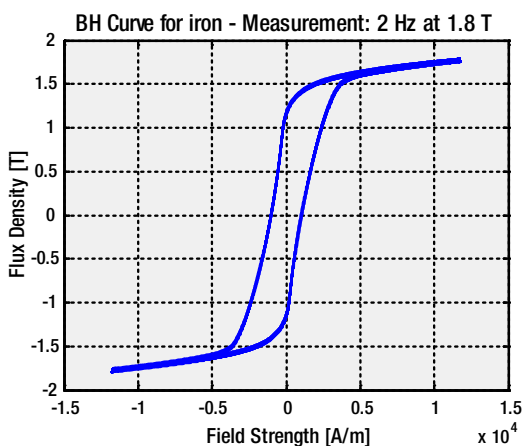
*The individually coated magnet gradual makes it possible to mold a strong magnet that is not electrical conductive.*

## Hysteresis

When using iron based magnets in speakers, the magnetization and demagnetization introduced by the shifting current directions does not happen at the same pace. The demagnetization process is slower than the magnetization. This phenomenon is called hysteresis, and is a known

problem in almost all speaker magnet motor systems. The problem with hysteresis is that it introduces an unintended resistance to the voice coil, meaning unwanted distortion. The reason hysteresis occurs is that iron is not only magnetically conductive, but also very electrically conductive.

SMC on the other hand is very highly magnetically conductive, but has a very low electrical conductivity (approx. 1/10.000's of iron). The result of using SMC is almost no hysteresis, and therefore no distortion.



## Current linearity

In a traditional iron magnet system, the current in the voice coil will modulate the flux in the magnet gap. This flux modulation is a course of distortion, and creates a far from ideal working environment for the voice coil. This

modulation of the magnetic flux is caused by the iron being electrically conductive.

By introducing SMC into the area close to the magnet gap, this modulation is

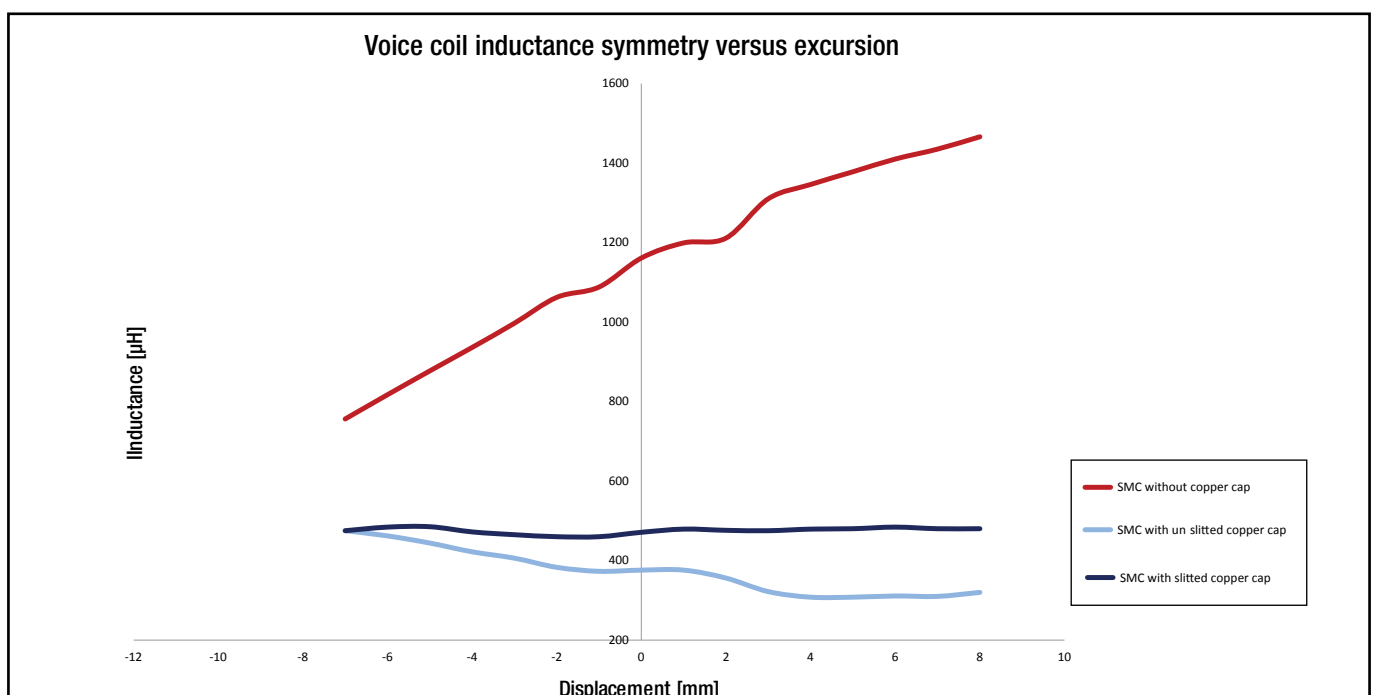
significantly less influenced by the current in the voice coil. As a result we manage to reduce the distortion from current generated flux variations greatly.

## Inductance Linearization

Making our speakers amplifier friendly is an important part of the design process. We want to make sure that it is the amplifier and not the speaker that forms the audio signal. To get the best from any amplifier the speaker has to deliver a stable working environment.

By keeping the impedance as flat as possible across the entire frequency range, the amplifier is able to deliver the same amount of power at all frequencies, keeping the sound stage complete without any sudden drop-offs. In many magnet motor designs the voice coil inductance depends

on the position of the voice coil. By surrounding the SMC pole piece with a copper cap, and controlling the effect via small slits in the copper cap, we focus the effect of the SMC around the voice coil and linearise the inductance generated in the voice coil to a degree that it is seen as almost flat.



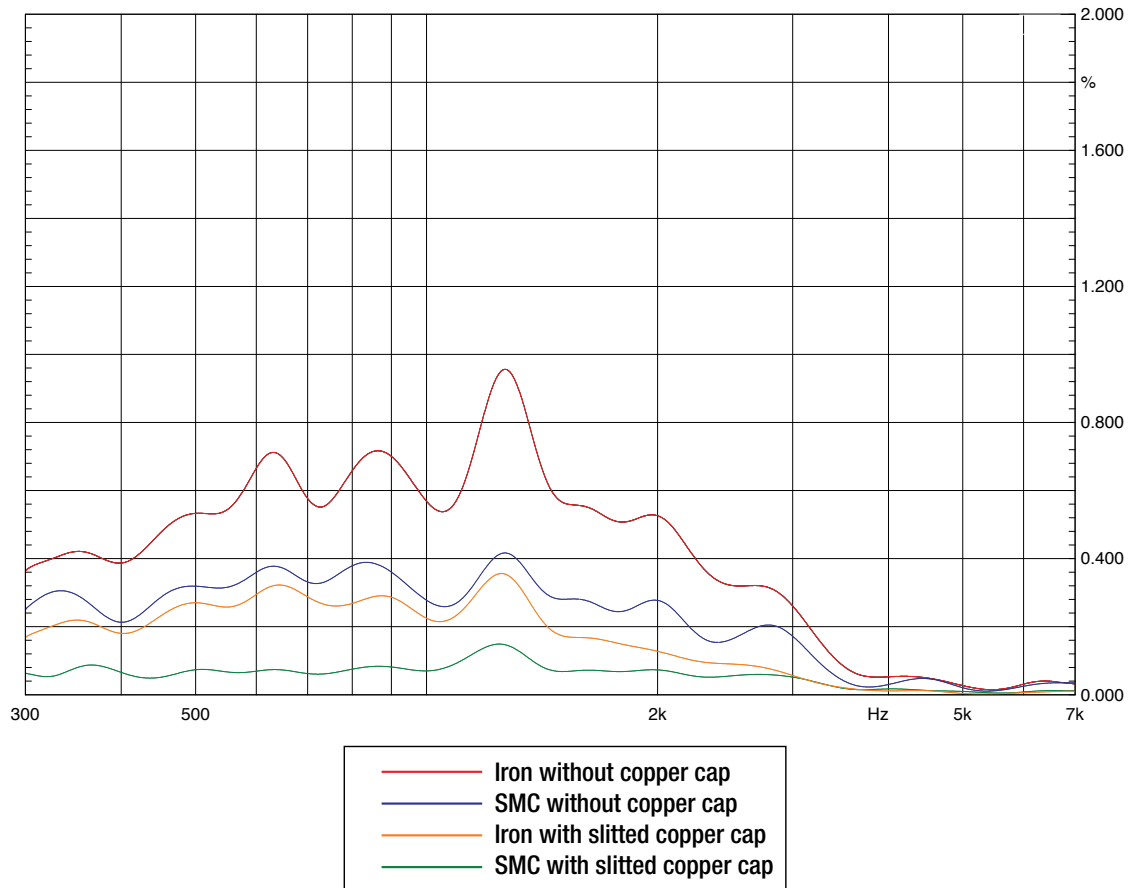


### **Low-loss**

Having designed a magnet motor system that introduces almost no unwanted distortion, we wanted to add components that had these same qualities. Using a wood fibre cone manufactured by the same company that makes the EPICON cones, gives the woofer a light, rigid and randomly uneven membrane. This makes the cone easy to move, ensures even piston like movements and reduces the possibility of surface resonance greatly. These things combined results in lots of detail and very little colouration in the reproduced signal, even at low volume. The cone terminates in a soft low-loss rubber surround that has been designed from the ground up, and is bespoke for the RUBICON driver. The surround ensures that the cone moves easily and without loss of energy. All of the components are situated in an aluminium chassis that is designed for maximum airflow around the cone and magnet system. The use of aluminium for the chassis also minimises the effect of the magnet motor, since aluminium is not magnetically conductive and therefore does not interfere with the magnetic field around the magnet.



### RUBICON 8 woofer, 3rd order distortion

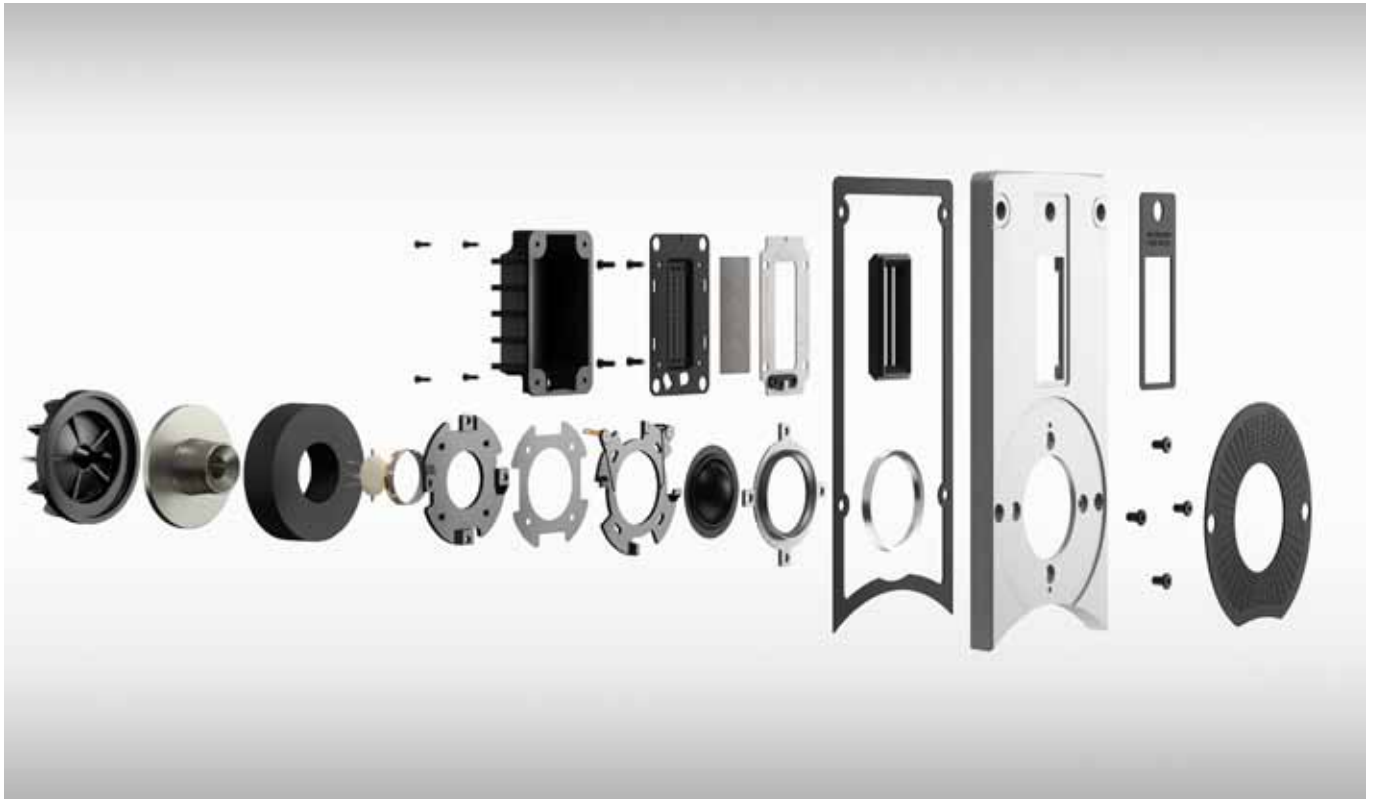


All of these individual component parts are assembled in-house to produce the RUBICON driver. They work together to reproduce clean, detailed sound, with no colouration or unwanted distortion. Every driver is configured to match

the model they are destined for. This is done, using the RUBICON 8 as an example, by optimising the bass drivers for long excursion, and the midrange driver for a large useful frequency range, so roll-off is handled in the

crossover and not in the driver. This same type of optimisation is done for the entire range of woofers used in the other models..

## TWEETER



DALI's trademark hybrid tweeter module combines the dome tweeter with the ribbon tweeter for an amazing rendering of the high frequencies, and a dispersion of high frequency sounds that outperform all other tweeter technologies. In the RUBICON series, DALI makes use of both the soft dome working alone, and the hybrid tweeter configuration.

The ultra-lightweight soft dome tweeter module is designed to reach

higher into the very high frequencies than is normal for a soft dome used in a DALI hybrid tweeter. This is done since it is required to work on its own in the RUBICON 2. To achieve this broader bandwidth we designed a voice coil that was very light and agile. We therefore replaced the traditional copper wire on the voice coil with copper clad aluminium. This lighter voice coil is placed inside a powerful ferrite magnet that keeps tight control of its movements.

The ribbon part of the hybrid module is a magneto static type tweeter. Four bands of conductive material make up the active diaphragm that is controlled by a strong magnetic field formed around it. The ribbon tweeter is the master of wide dispersion and combining it with the soft dome, we get a tweeter module that starts working as low as 2.5 KHz and continues to perform well above 30 KHz. This extreme bandwidth combined with the ultra wide dispersion is an important part of the DALI sonic definition.

## CABINET



*The gracefully elegant exterior of the RUBICON works as the base for the low-loss drivers.*

Made from Medium Density Fibre board (MDF), the RUBICON series' cabinets form a rigid base for the drivers, which are screw-mounted directly into the 25 mm thick front baffle. To ensure the best possible hold on the woofer and thereby integration with the cabinet, the five screw holes are placed along the arms of the woofer chassis. The tweeter module is held securely in place with four screws to eliminate vibrations and resonance.

In every cabinet the mid-range and

bass drivers are separated into their own chambers. This enables us to individually tune every driver to its specified frequency range, and thereby maximise the woofer output. Furthermore, every woofer has its own bass reflex port placed directly behind the woofer to minimise turbulence, and optimise the timing between the woofer and the bass port.

Comprehensive internal bracing is applied to eliminate cabinet resonance and colouration of the sound.



*Every woofer has its own bass port to minimise internal turbulence and optimize timing.*



## SIGNAL PATH

When the audio signal is delivered to the speaker it still has a way to go before it is transformed into audible sound. Knowing that the shortest path is always the best when it comes to electrical signals, DALI designed the internal signal path of the RUBICON series to be as short as possible. Mounting the crossover directly on the back of the terminals ensures that the audio signal from the speaker cable is split up into the correct frequency ranges as soon as they enter the

speaker. Due to the high quality wideband drivers used in the RUBICON series, the crossover can be kept relative simple, pertaining as much of the original electrical signal as possible. The separated signal then travels the last short distance to the driver in carefully selected cables optimised for lowest possible signal loss.

On the floor standing RUBICON models it is possible to connect the speakers through bi-wiring/amping terminals,

with single wired terminal connections offered on the RUBICON 2 and LCR. The gold plated terminals for the entire RUBICON Series accept banana plugs, Y-spade lugs and bare wire ends. It is also possible to tighten the terminals with a high torque as they use very fine threads, which ensure mechanical precision and help create a proper electrical connection between the loudspeaker cables and the loudspeaker.



## APPLICATION

RUBICON 2 is a stand mounted speaker built around a 6½ inch low-loss woofer and a 29mm ultra light soft dome tweeter. It is rich on detail with an impressive soundstage and has surprisingly large bass reproduction with both precision and timing. This makes it perfect for a stereo or surround setup in a smaller room, or as rear speakers in a larger room surround setup.



RUBICON LCR is a brand new speaker construction that is optimized for on-wall use. The rotatable hybrid tweeter module makes it possible to use the RUBICON LCR as either the left or right channel, or as a centre speaker. The 6½ inch woofer uses the ingeniously designed bass port to reach maximum bass depth. Detailed and coherent sound, with a fantastic soundstage, it's simply in a class of its own.



RUBICON 5 is a floor standing speaker. It expands the sonic performance of the RUBICON 2 by adding a hybrid tweeter and a larger cabinet offering more of everything. Extending and widening the high frequencies for improved detail, and adding more well timed deep bass for a more demanding presence. The RUBICON 5 is perfect for stereo listening or as the front speakers in a medium sized surround setup.

RUBICON 6 is like the RUBICON 5 a floor standing speaker, but features an additional 6½ inch woofer. This extra woofer makes it more powerful, with an enhanced and controlled performance. Utilising the extra surface area, the RUBICON 6 is able to deliver even more physical bass to fill a larger room.

RUBICON 8 is the largest in the series. Using no less than three 6½ inch woofers to generate an amazing range and impressive sound pressure. Mid-range detail and extended bass are taken to new levels, whilst the mind blowing large soundstage and impressive large scale physical bass need to be heard to be believed.



## RUBICON TECHNICAL SPECIFICATIONS

	RUBICON 2	RUBICON 5	RUBICON 6	RUBICON 8	RUBICON LCR
Frequency Range [+/- 3] dB [Hz]	50 -26,000	45 - 34, 000	38 - 34,000	38 - 34,000	59 -34,000
Sensitivity [2.83V/1m] [dB]	87	86	88.5	90.5	89
Nominal Impedance [ohms]	4	4	4	4	4
Maximum SPL [dB]	107	107	110	112	109
Recommended Amp. Power [Watt]	40-150	60-150	40-200	40-250	20-150
Crossover Frequency [Hz]	3,100	2,900 /14,000	2,600/14,000	500/800/2,500/14,000	3,100/14,000
Crossover Principle	2-way	2+½-way	2+½-way	2½ + ½ + ½-way	2+½-way
High Frequency Driver	1 x 29 mm soft dome	1 x 29 mm soft dome 1 x 17 x 45 mm ribbon	1 x 29 mm soft dome 1 x 17 x 45 mm ribbon	1 x 29 mm soft dome 1 x 17 x 45 mm ribbon	1 x 29 mm soft dome 1 x 17 x 45 mm ribbon
Low Frequency Driver(s)	1 x 6½"	1 x 6½"	2 x 6½"	3 x 6½"	1 x 6½"
Enclosure Type	Bass reflex	Bass reflex	Bass reflex	Bass reflex	Bass reflex
Bass Reflex Tuning Frequency [Hz]	42.5	39	33	33	49
Connection Input(s)	Single	Bi-wire / Bi-Amp	Bi-wire / Bi-Amp	Bi-wire / Bi-Amp	Single
Recommended Placement	Stand/Shelf	Floor	Floor	Floor	On wall/Shelf/ Table/ Below TV screen
Recommended Distance from rear wall to speaker's rear side [cm]	20 – 120	20 – 150	20 – 180	25 – 180	0 -30
Dimensions (H x W x D) [mm]	350 x 195 x335	890 x 195 x 338	990 x 200 x 380	1100 x 220 x 444	465 x 278 x 142
Dimensions (H x W x D) [inches]	13.9 x 7.7 x 13.3	35.2 x 7.7 x 13.4	39.1 x 7.9 x 15.0	43.5 x 8.7 x 17.6	18.4 x 11.0 x 5.6
Weight [kg/lb]	8.0 / 17.7	15.7 / 34.7	20.2 / 44.6	27.3 / 60.3	8.0 / 17.9
Accessories	Rubber feet, Polishing cloth, manual	Spike set, rubber feet, Polishing cloth, manual	Spike set, rubber feet, Polishing cloth, manual	Spike set, rubber feet, Polishing cloth, manual	Rubber feet, Polishing cloth, manual

All technical specifications are subject to change without notice.