

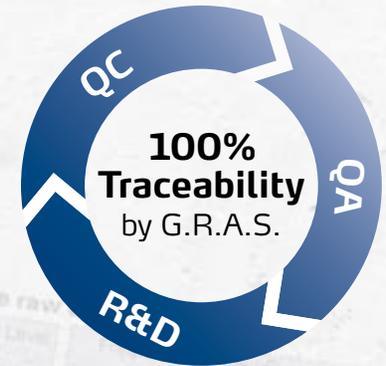
# ***Headphone Testing***

*Accurate Repeatable Standardized*



**G.R.A.S.**  
SOUND & VIBRATION

# Philosophy and method



Gunnar Rasmussen did not get the nickname Mr. Microphone for nothing. More than 50 years ago, our founder revolutionized the acoustic sensor industry when he designed the modern condenser microphone. 20 years ago he decided to do it again when he established his own company, G.R.A.S. Sound & Vibration. His belief that there is always room for improvement has given our company a purpose and motivation to excel. His passion for quality, innovative thinking and manufacturing continuously drives us to design and to deliver solutions to your challenges.

You want something accurate and repeatable that will get the job done and complies with the highest standards. You want something that works globally, across multiple platforms and testing environments. Measurements done in one place need to be correlated with and compared to measurements in other locations. Results from the manufacturing line have to be reliable and traceable to the specifications outlined by the R&D lab.

## **The following acoustic properties of the headphones are measured:**

- Frequency response: Verify the headphone response across the entire audible bandwidth (20 Hz - 20 kHz).
- Distortion: How well do the headphones reproduce the fundamental frequency, and the harmonics associated with it?

- Tracking/wiring: Are the headphones wired correctly (right/left) and do they produce a similar output across the frequency range?
- SPL: Min. volume / max. usable volume (120 dB or 3% distortion)
- Isolation: How well do the headphones passively suppress background noise? Do they have Active Noise Reduction?
- Leakage: How much noise do the headphones add to the surroundings when playing at 90 dB?

These parameters give you a valid indication of how the headphones perform and the aspects, if any, you may want to improve. "Golden ear" test subjects can certainly add value to the design phase, but by maintaining the same objective testing method in all phases of your product's life cycle, you ensure that the product is delivered to your customer with the same specifications and performance that you envisioned from the beginning.

Audio performance is definitely the most important feature to test on a pair of headphones. Therefore it makes sense for you to support your vision with test equipment that leaves no room for doubt. With the G.R.A.S. headphone testing systems you are guaranteed repeatable and high quality results that you can rely on – every time.



G.R.A.S. 45BC



G.R.A.S. 45CA



G.R.A.S. 43AG

## Traceability throughout the entire value chain

### Research & Development

Headphones are made for people and should always be designed for optimum enjoyment and great sound delivery. With that in mind, the KEMAR manikin is the only standardized, anthropomorphic head and torso simulator that replicates the human auditory system while thoroughly representing the listener in the soundscape. KEMAR is therefore the ideal partner for objective in-situ diagnostics that will provide you with the most realistic and detailed picture of your device's performance regardless of user environment. KEMAR is available in several pre-configured versions or can alternatively be customized top-down.

### Quality control

After having blended science and artistry to develop your sound, you need to translate these elements to your production line and maintain the quality you want your brand to be associated with. At G.R.A.S. we have several production line solutions that deliver data transparent to your R&D group. This enables a fact-based dialogue focusing on your product quality and yield, rather than on non-comparable data created under non-comparable conditions. The shown test fixture, designed for noisy environments, can be equipped with the same pinna and the same ear simulators as KEMAR, providing accurate and repeatable end-of-line testing of both channels.

### Quality Assurance

As your product is put together, you need to ensure that individual changes do not conflict with your overall vision. You need to be comfortable giving your stamp of approval. Very few headphone manufacturers have their entire production vertically integrated and are therefore highly depending on the quality delivered by their sub-suppliers. To ensure the quality of the complete product, G.R.A.S. offers a variety of mobile test platforms that can easily be deployed at your supplier and in your own in-coming control department. The ear and cheek simulator above provides a subset of the KEMAR manikin data and thereby completes the measurement value chain.



## We Make Microphones

Since the company was established in 1994, we have been 100% dedicated to develop and manufacture high-quality measurement microphones and related acoustic equipment.

### Tradition

We are located in Denmark and founded by the Danish acoustics pioneer, Gunnar Rasmussen who for more than 60 years has contributed to the world of sound and vibration with his unique ideas and designs. In 1956 Mr. Rasmussen designed the first reproducible 1" condenser measurement microphones. And the commercialization of these measurement microphones enabled quality measurements and instrumentation which could be acoustically calibrated and accredited.

Mr. Rasmussen's ingenuity and understanding of not yet spoken customer needs soon lead to the world's most popular and probably most copied acoustic sensor: The 1/2" measurement microphone. Then the 1/4" and 1/8" microphones followed with outstanding dynamic and high-frequency capability that brought higher definition

and transparency into impulse noise diagnostics. Many variants have been made available over the years; all based on Gunnar Rasmussen's original 1" pressure microphone design.

### Innovation

At G.R.A.S., we and our customers benefit daily from Mr. Rasmussen's exceptional understanding of acoustics, physics, electronics and measurement needs. Not only in our R&D department but in the entire house we are proud to develop, produce and offer the broadest range of high-quality measurement microphones and accessories in the industry. And as a family company, now owned and managed by the two sons, Per Rasmussen and Peter Wulf-Andersen, we safeguard our heritage and knowledge to help create new opportunities with our customers. We work with everybody who has an interest in sound or noise within the fields of aerospace, automotive, audiology, consumer electronics, noise monitoring, building acoustics and telecommunications, metrology, education, consultancy, legislation and system integration.

### Quality

All our microphones are solely produced in stainless steel and in a quality that allows for a 5 year warranty.

Should you by mistake damage the diaphragm on a G.R.A.S. microphone, our special technique enables repair at a very reasonable price. A fact often valued not only by the users but also by their purchase departments who are guaranteed a long term investment with equipment from G.R.A.S.

### Partners

G.R.A.S. is represented worldwide in more than 40 countries by subsidiaries and partners. Whether you are searching for a multi-channel solution, a replacement microphone for your sound level meter or a customized sensor design, your local G.R.A.S. partner will in close cooperation with us be able to help solve your measurement needs.

Please visit [gras.dk](http://gras.dk) for your local G.R.A.S. partner.