



**Lessons from the production line:  
Building trust with  
customers is essential in  
contract manufacturing**

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**Trust!** *It all comes down to trust when you are running a global production setup. As a premium brand we have to rely on the production quality and tests conducted by our contract manufacturers. If the quality fails and customers complain – we pay the price. That is why we stay loyal to manufacturers we can trust – and why we look for trustworthiness above all else in prospective contract manufacturers.*

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## Introduction

When premium audio brands opt to outsource the production of their high-end audio products to contract manufacturers, they do so looking for advantages like cost-effectiveness, scalability, and supply chain efficiency. However, despite these benefits, concerns and worries related to trust can quickly arise when relying on contract manufacturers in different regions.

Maintaining stringent quality control measures becomes crucial to the premium audio brands to ensure that the final products meet the brand's high standards. At the same time, brands squeeze contract manufacturers on production costs. This leaves plant managers with a big challenge: Building trust by upholding strict quality and test regimes while at the same time making a profit for the plant.

In this whitepaper we'll explore some common pitfalls in audio quality testing and introduce a passive solution to overcoming them – and building trust with your customers.



## THE PROBLEM WITH TEST EQUIPMENT

Plant managers face penalties or loss of business from high-end brands if they fail to comply with audio test regimes. On the other hand, precision testing with test microphones is expensive and time consuming and means getting fewer finished products off the production line each day.

### The costs of audio testing include:

- Initial setup of test microphones at workstations
- Longer production times
- Lower earnings per finished unit
- Replacing broken or faulty test microphones, and validating that the problem is fixed.
- Engineering development costs associated with adding or adjusting a test.

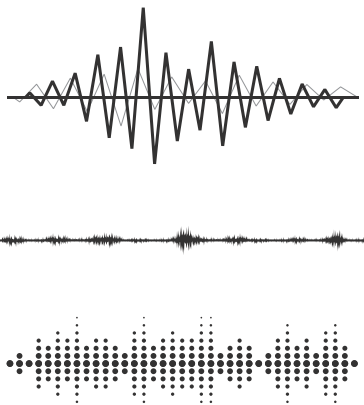
### Cost of setting up test microphones

Most test microphones available on the market today deviate slightly. This requires them to be individually adjusted both in terms of sensitivity and frequency response when they are first installed or moved. This makes setting up a production line a costly affair, as manually calibrating each workstation can take several minutes. Multiply this by hundreds or even thousands of workstations, and you have a major cost.

### Cost of moving around microphones

Whenever a microphone is installed or repurposed, it has to be verified and adjusted to your equipment, slowing down production, if not outright stopping it. The result is fewer finished products per shift.

In addition, readjustment might mean having to employ acoustic engineers or other specially trained workers to handle the verification and adjustment, further adding costs for increased pay grades or training of unskilled workers.





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**Cost of replacing and verifying broken microphones**

Whenever a microphone is removed from its workstation, it risks breaking. This means that plants must tie up capital in reserve microphones, adding further costs to the operation.

Sometimes microphones are disconnected from the test bench and moved to another bench. In the process, it happens that microphones are dropped to the floor. This will impact the performance of the microphone – however, the employee dropping the microphone may not be aware and continues to use the microphone which will impact the test and the quality assurance of the products until it is discovered to be faulty and replaced. When replacing the microphone, the new one must be verified to the system, adding further delays to the production run.

**Time spent on identifying faulty microphones**

Barring mishandling or accidents, microphones don't usually stop working from one moment to the next – they slowly fail and start drifting. On the production line, that means yield slowly drops on a test station, which will then need to be shut down to investigate the cause. This slows down production, prolonging overall production time, and possibly causing costly delays. Once the microphone has been proven to be faulty, verifying its replacement to the system adds further delay.

**THE COSTS OF NOT TESTING**

Plants choosing to cut costs and increase production output by not testing face certain consequences that can add costs in other ways.

**Possible consequences:**

- Non-compliance penalties from customers
- Waste due to false negatives
  - throwing away perfectly fine products
- Litigation and legal claims
- Cost of fixing the issue

In conclusion, test microphones are a variable on the production line that takes away control over test regimes and sows mistrust. Plant managers can't trust their employees to handle the microphones correctly or with care, calibrating and recalibrating them adds extra costs in terms of planned downtime, and premium brand customers lose trust in their contract manufacturers' ability or willingness to adhere to test protocols.



**FIGURE 1:**  
**Higher precision, higher quality**  
 Switching to microphones with EQset technology will immediately improve the precision of your acoustic testing, in turn raising the quality of the final products. The figure to the right compares the direct frequency response and sensitivity spread of 100 GRAS 40PM and GRAS 40PM-1 microphones to 100 randomly chosen array microphones when no compensation is applied, and when the sensitivity is retrieved via the TEDS interface. EQset microphones consistently produce the same results, while microphones without EQset technology produce wildly differing results, even after adding time consuming and costly TEDS compensation.

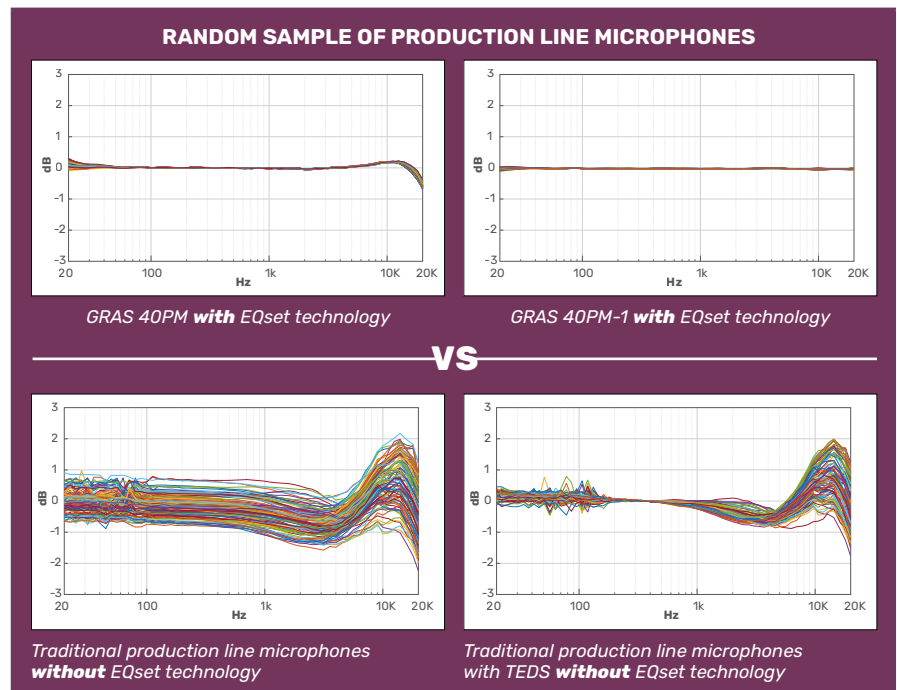
**THE SOLUTION:**  
**GRAS EQset™ PRODUCTION LINE MICROPHONES**

Microphones with EQset technology require no individual adjustment and provide much more reliable measurements across the spectrum, ensuring accurate testing and high quality of the resulting products. In addition, they are very resilient to changes in atmosphere and weather.

EQset technology removes all of the traditional hassle associated with installing, setting up, and replacing microphones in a production line setting.

This provides a number of immediate benefits.

- Cost efficiency—low microphone entry cost, no special hardware needed.
- Ease of use—EQset microphones are plug and play in your existing test setup
- Reduced risk—EQset greatly reduces the risk of false passes and false failures, which greatly reduces the risk of bad units reaching the customer and the risk of good units being scrapped or recycled.
- High environmental stability— no need for corrections due to temperature or humidity.





## PRODUCTS DESCRIPTION

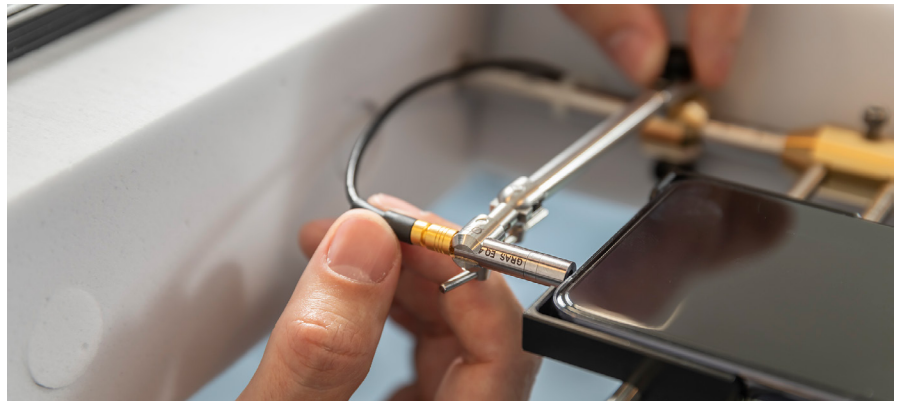
The 40PM, 40PM-1, 40PO-L, and 40PO-H are 1/4" pressure production line microphones equipped with EQset technology, designed to address all the identified customer challenges. 40PM is the go-to microphone for most production line test applications.

40PM-1 is an enhanced version of 40PM for those users requiring tighter frequency response tolerances up to 20 kHz. 40PO-L and 40PO-H are the premium options for users demanding a higher dynamic range or the ability to measure frequencies up to 40 kHz.

**TABLE 1:**

*Comparison of main specifications for GRAS EQset Microphones. These microphones feature exceptionally tight tolerances in both sensitivity and frequency response. As a result, all EQset microphones of the same type exhibit virtually identical performance.*

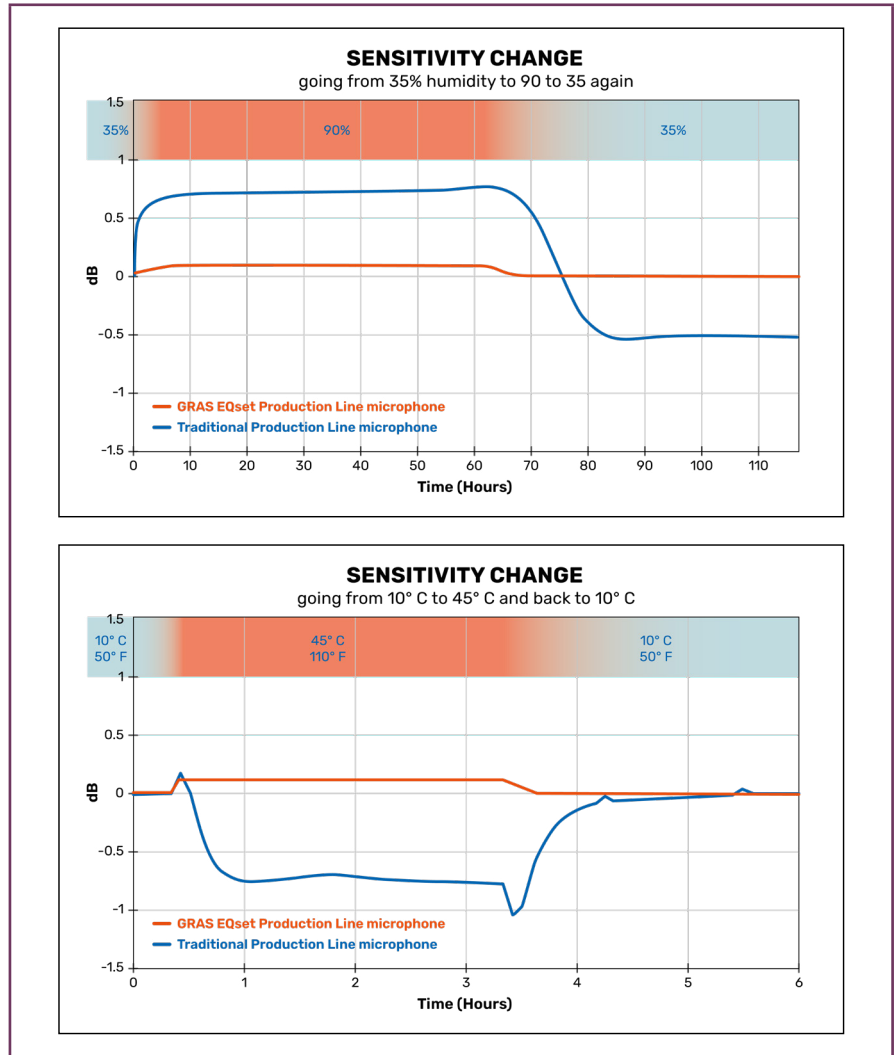
SPECIFICATIONS				
GRAS Microphones	40PM	40PM-1	40PO-L	40PO-H
<b>Sensitivity (<math>\pm 0.2</math> dB)</b>	25 mV/Pa	20 mV/Pa	25 mV/Pa	8 mV/Pa
<b>Frequency Range</b>	$\pm 0.5$ dB	20 Hz - 10 kHz	20 Hz - 20 kHz	10 Hz - 25 kHz
	$\pm 1$ dB	-	-	10 Hz - 40 kHz
	$\pm 2$ dB	10 Hz - 20 kHz	-	-
<b>Dynamic Range</b>	30 dBA to 120 dB	30 dBA to 125 dB	30 dBA to 128 dB	36 dBA to 138 dB



**FIGURE 2:**  
 Microphones with EQset technology all have the exact same sensitivity. Swap them around all you like, and you'll still get the same accurate testing and high quality of the resulting products. In addition, microphones with EQset technology are resilient to changes in atmosphere and weather.

### Environmental stability

Following the COVID pandemic, companies have sought to spread their production lines across different countries and regions. However, this poses a new question for audio products: How to mitigate the impact of environmental differences like temperature, humidity, and static pressure on traditional test microphone measurements when your production lines are spread across multiple locations.



Yet another benefit of microphones with EQset technology is their higher environmental stability as compared to other production line microphones. EQset microphones produce the same precision measurements regardless of the climate your production lines operate in, using the same test equipment across the board and requiring far less validation and adjustment.



### Using GRAS EQset microphones with Audio Precision analyzers

Combining GRAS EQset microphones with audio analyzers from Audio Precision (AP), it is possible to remove more uncertainties from your testing and measurement capabilities, further building trust with employees and clients.

### Build trust through recognition

GRAS and AP have a long history of cooperation. By choosing GRAS and AP together, you will get a complete, integrated system that is known to deliver the accuracy, repeatability, and reliability necessary for uninterrupted production line testing. Using the same software throughout the entire process (and indeed in QA and R&D as well), also helps minimize the risk of human error that can come from switching between different platforms. By choosing a recognized solution from GRAS and AP, you can present premium audio brand customers with a reliable, proven system as a key selling point - and to build trust.



### CONCLUSION:

By switching to EQset microphones, you remove a major variable from your production line test setup, eliminating a number of headaches. At the same time, switching to EQset microphones shows your customers that you care about precision testing. This means taking a huge step towards establishing or re-establishing trust with your customers - potentially paving the way for more lucrative deals in the future.

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#### ABOUT GRAS SOUND & VIBRATION

GRAS Sound & Vibration is a worldwide leader in the sound and vibration industry. We develop and manufacture state-of-the-art measurement microphones and related equipment for industries where acoustic measuring accuracy and repeatability are of the utmost importance. This includes applications and solutions for customers within the fields of aerospace, automotive, audiology, consumer electronics and other highly demanding industries. GRAS microphones are designed to live up to the high quality, durability and accuracy that our customers have come to expect and trust.

GRAS is represented through subsidiaries and distributors in more than 40 countries and is part of Axiometrix Solutions, a leading test solutions provider comprised of globally recognized measurement brands. Read more at [www.grasacoustics.com](http://www.grasacoustics.com)