

COST-EFFICIENT SOLUTION FOR high-precision acoustic analysis



Whether for voice control in-car entertainment and consumer applications, or for safety-relevant warning signals - modern vehicles and audio-controlled systems rely on **precise acoustic performance**.

In both development and production, reliable analysis of frequencies, phase response, distortion factors, phase alignment, signal-to-noise characteristics, response behavior, and background filtering is essential to ensure **functional integrity** and a high-quality user experience.

INITIAL SITUATION

A global automotive manufacturer, who had long relied on a standardized measurement solution from a third-party supplier for all his acoustic testing tasks, was confronted with a sudden discontinuation of that product line. The existing devices had been deployed across R&D and production environments worldwide. To mitigate the risk of system obsolescence, the long-standing customer of MCD's customized functional and end-of-line test systems turned to MCD to develop a **future-ready** replacement for the previously used devices.

OBJECTIVES AND CHALLENGES

The previous measurement devices had long been established as the global standard for acoustic validation in both development and series production. These systems were deeply integrated into automation environments across multiple international sites, supporting critical test procedures for audio performance and compliance.

Thus, when the end-of-life of the devices without compatible successor was announced, the customer was in urgent **need for action**. Not only did the unavailability of spare units threaten continuity in production, but the absence of backward compatibility among available alternatives introduced considerable risk: automated test sequences, developed and refined over many years, would require significant rework or even complete redevelopment if a replacement could not replicate the original system's behavior.

At the same time, the customer saw the opportunity to tailor the scope of functionality to actual operational needs. The discontinued system included a wide range of features, many of which were rarely used in day-to-day workflows. Eliminating such features became another objective – not primarily to reduce cost, but to focus the solution on what was truly required, while still enabling future expansion if needed. Long-term availability and a **future-proof system** design were thus crucial for the proposed concept.

COST-EFFICIENT SOLUTION FOR high-precision acoustic analysis

REQUIREMENTS

To be approved as a qualified successor any new measurement system needed to fulfill a clearly defined set of technical and operational criteria. Foremost was full compatibility with the customer's existing SCPI command structures. This was essential to preserve automated **test sequences** and eliminate the need for changes to the software environment, particularly in long-standing test setups.

In addition, the new device had to deliver precise and repeatable acoustic measurements across both analog and digital domains. Thus, the new solution needed to meet the high standards of DAkkS-compliant calibration. This was critical not only for **validating signal quality** in development but also for ensuring reliable series production testing under time-sensitive conditions. Equally important was the ability to integrate the solution into the customer's current test architecture without requiring (significant) changes to hardware or workflow. The solution needed to be a **"drop-in" replacement**, both physically and logically.

A streamlined feature set - focusing on actual needs rather than broad, unused functionality - was expressly requested. This would simplify configuration, reduce complexity, and lay the foundation for long-term maintainability without compromising on technical performance. Finally, the system had to offer **future-proof** availability and long-term support.

SOLUTION CONCEPT

Based on these requirements, MCD Elektronik proposed a customized version of its well-established **AudioAnalyzer** platform – a modular test system designed for flexible deployment in R&D and production environments.

The core of the solution is a compact device with integrated PC capable of operating as a stand-alone measurement unit. Its hardware design supports both analog and digital channels at high sampling rates, while maintaining the physical footprint needed for **seamless rack integration**.

One of the central elements of the concept was the development of the customer-specific SCPI command set. This allowed the new system to mimic the behavior of the legacy hardware without requiring changes to the customer's test scripts or automation routines. Instead of attempting to replicate every feature of the previous solution, the AudioAnalyzer was purposefully tailored to include only the functions used in the customer's workflows. This made the system more **efficient** and **easier to maintain**.

To further reduce integration effort, MCD provided extensive documentation and support, ensuring that the system could be embedded directly into the customer's MES and network infrastructure. Optional **remote access functionality** was included to support maintenance and diagnostics in all distributed global sites.



COST-EFFICIENT SOLUTION FOR high-precision acoustic analysis

MEETING THE REQUIREMENTS

- **Drop-in compatibility:**
Tailored SCPI command set development aligned with the customer's legacy structure
- **Validation:**
Multi-phase testing at production sites to verify operational readiness
- **Software integration:**
Fully documented interface and remote support option
- **Cost framework:**
System design without excessive features to provide a solution within the target budget
- **Scalability:**
Option for future expansion via modular software packages (FFT, SINAD, THD, burst, sweep, WAV analysis)

CUSTOMER BENEFITS

With the new **AudioAnalyzer** platform in place, the customer benefits from a stable and future-ready solution that integrates seamlessly into their existing measurement ecosystem. The system delivers high-precision, DAkkS-compliant acoustic testing across both analog and digital signal paths.

A key advantage lies in the system's immediate compatibility with the customer's established automation environment. By maintaining the original SCPI interface and minimizing integration effort, the transition was smooth and efficient.

While cost reduction was not the primary goal of the project, the tailored feature set turned out to offer an additional advantage. By deliberately omitting underused or unnecessary functionalities, the system not only became easier to maintain but also more economical without compromising performance. This reflects MCD's approach of thinking ahead by aligning system design closely with **customer needs**, while keeping operational efficiency and lifecycle costs in mind.



MCD AUDIOANALYZER IN DETAIL:

- // Use of the compact 1U design for rack mounting in production lines
- // Digital and analog channels with 192 kHz sample rate
- // SCPI-controlled audio evaluation in the frequency and time domain
- // Software-based visualization via MCD Toolmonitor
- // Direct integration into existing MES structures via USB/Ethernet
- // Optional remote maintenance via VNC/Remote Desktop

