Siemens Digital Industries Software

Industrial quality testing

Providing robust and reliable end-of-line testing functionality adds value to your product

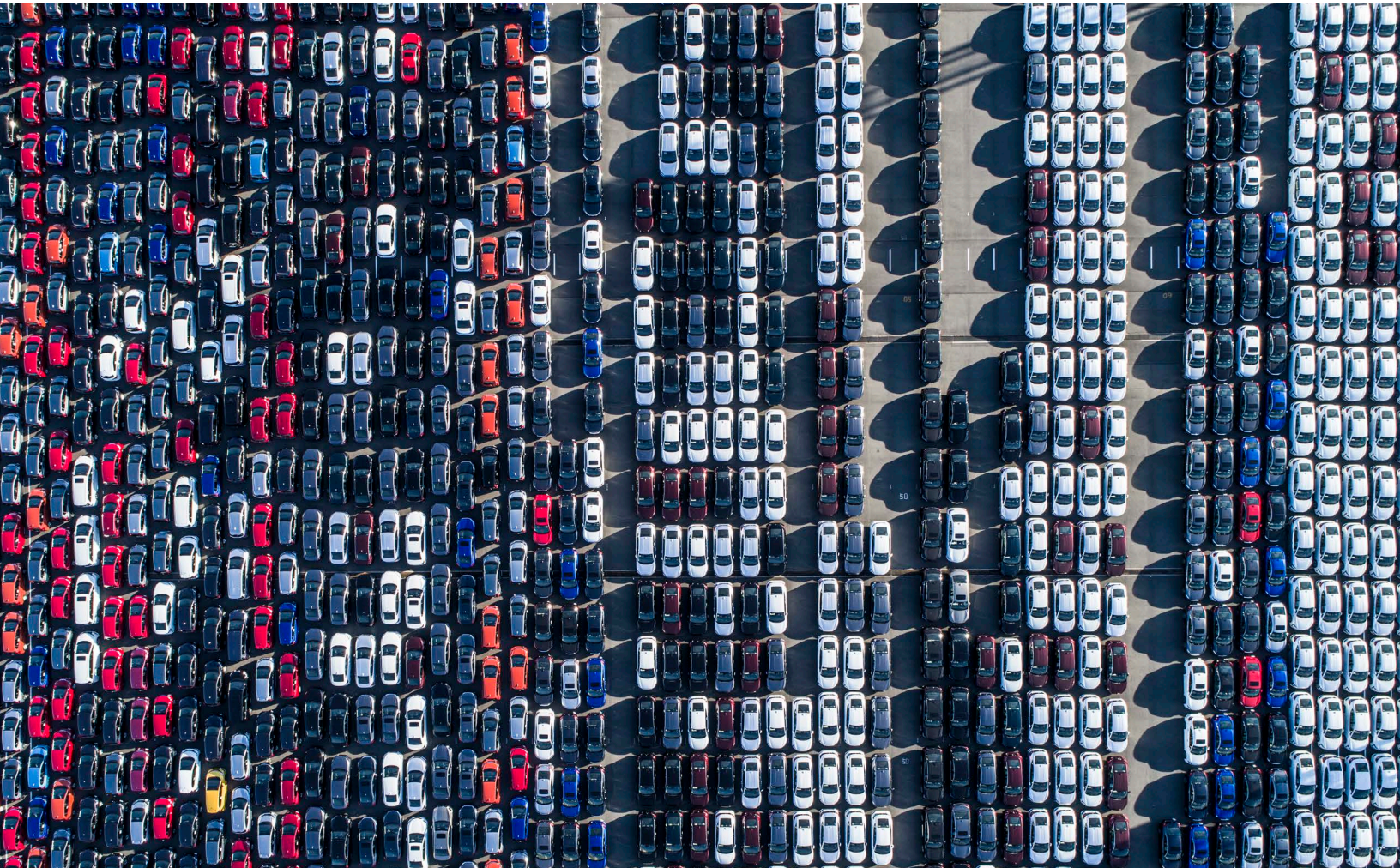
siemens.com/simcenter-anovis

Ever-increasing pressure to improve product quality

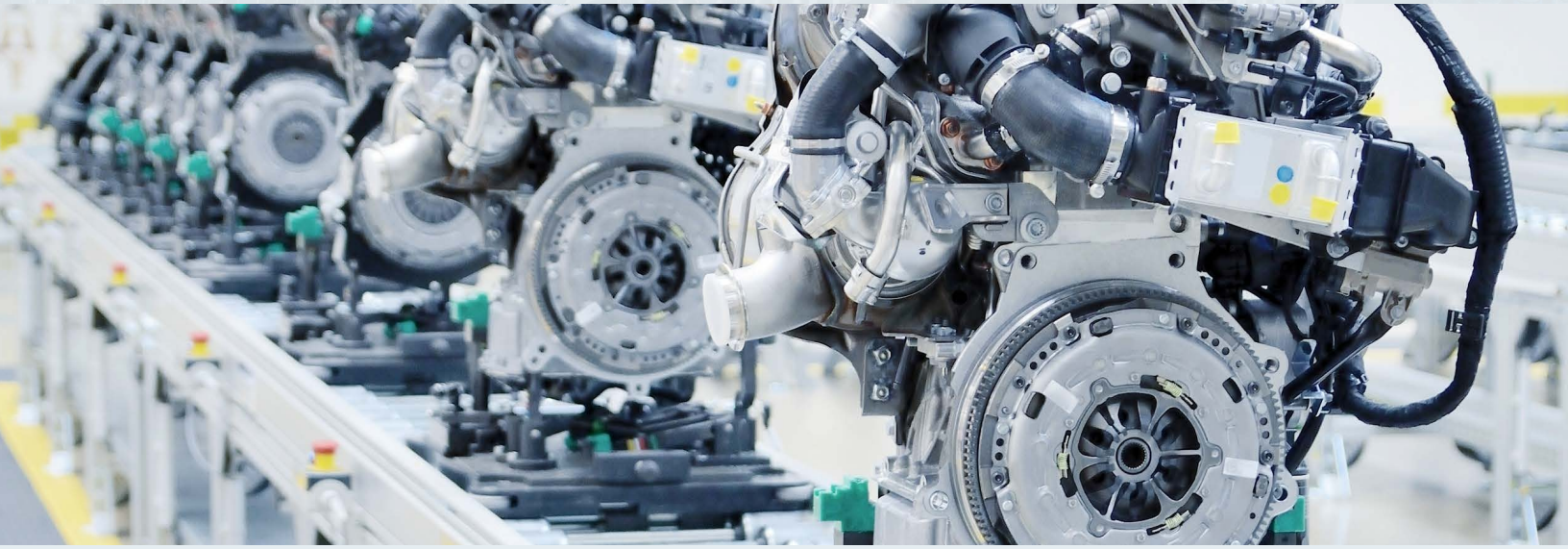
Manufacturers must build products on time and right-the-first-time to remain competitive in global markets.

To keep up with customer expectations, you must provide excellent manufacturing quality. The cost of poor manufacturing quality is just too high: Rework, scrap, product failures and recalls can severely damage a manufacturer by creating inefficiencies, delays, direct costs, customer dissatisfaction and low shareholder confidence. Today manufacturers must build products on time and right-the-first-time to remain competitive in global markets.

Quality assurance (QA) and production teams play a vital role in making sure quality standards are met by running a series of tests. Industrial quality test systems must generate reliable results in a cost-effective and timely manner. Top-quality control testing of dynamic, rotating and highly resonant systems and components requires extended and evolved testing methods, including vibration and sound measurements. For example, the need for noise, vibration and harshness (NVH) end-of-line (EoL) quality testing on electric motors, internal combustion engines, transmissions, axles, turbo chargers and other moving components is rapidly increasing across the automotive and transportation industries. This phenomenon is accelerating with the growing prominence of electric vehicles, which have a low general noise level and are lacking the masking effect of a combustion engine.

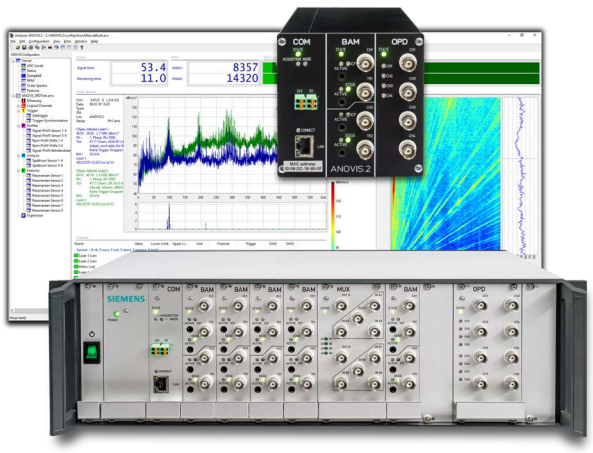


Adapting to a broad range of automotive applications



Siemens' robust and reliable industrial quality testing system is easily integrated into EoL test benches and production lines to deliver product and process manufacturing quality. The dedicated Simcenter™ Anovis™ system combines all necessary sensors, accurate sound and vibration signal recording hardware, smart signal analysis and flexible interfaces to test bench control software so you can precisely perform pass/fail checks and deliver formal proof the part meets its specifications and the machine operates safely. The reliability of our assessment features is confirmed by standard measurement system analysis (MSA) methods (as it is known in QA).

Based on innovative sound and vibration-based fault detection algorithms that combine automatic limit adaptation with classic NVH measurement features, Simcenter Anovis system automatically spots and identifies product or process anomalies within seconds. Our proven test procedures, based on decades of industry expertise, facilitate the shortest possible cycle time. Our standardized system can be adapted to a wide range of automotive applications, ranging from EoL testing of rotating machinery, non-destructive component testing using acoustic resonance testing (ART) and production machine monitoring with vibration and sound analysis



Our proven test procedures, based on decades of industry expertise, facilitate the shortest possible cycle time

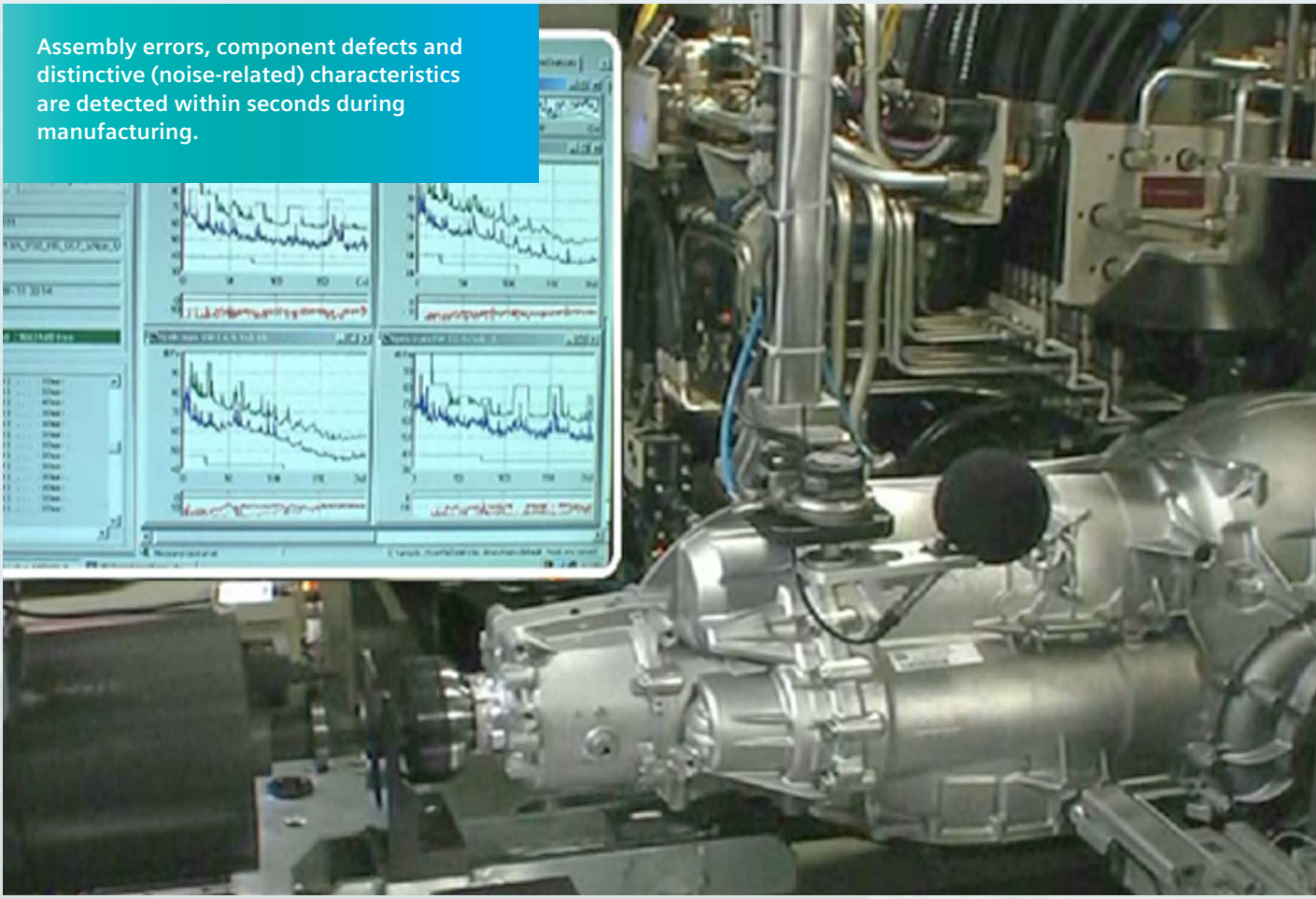
Customer trainings – in-house or at our lab – are offered for all required levels of expertise.

Systematically improving product and manufacturing quality

Siemens' solutions are globally supported with highly qualified and experienced engineers for initially configuring systems and assisting with optimal parameter setting and on-site service for maximizing uptime. Customer trainings – in-house or at our lab – are offered for all required levels of expertise.

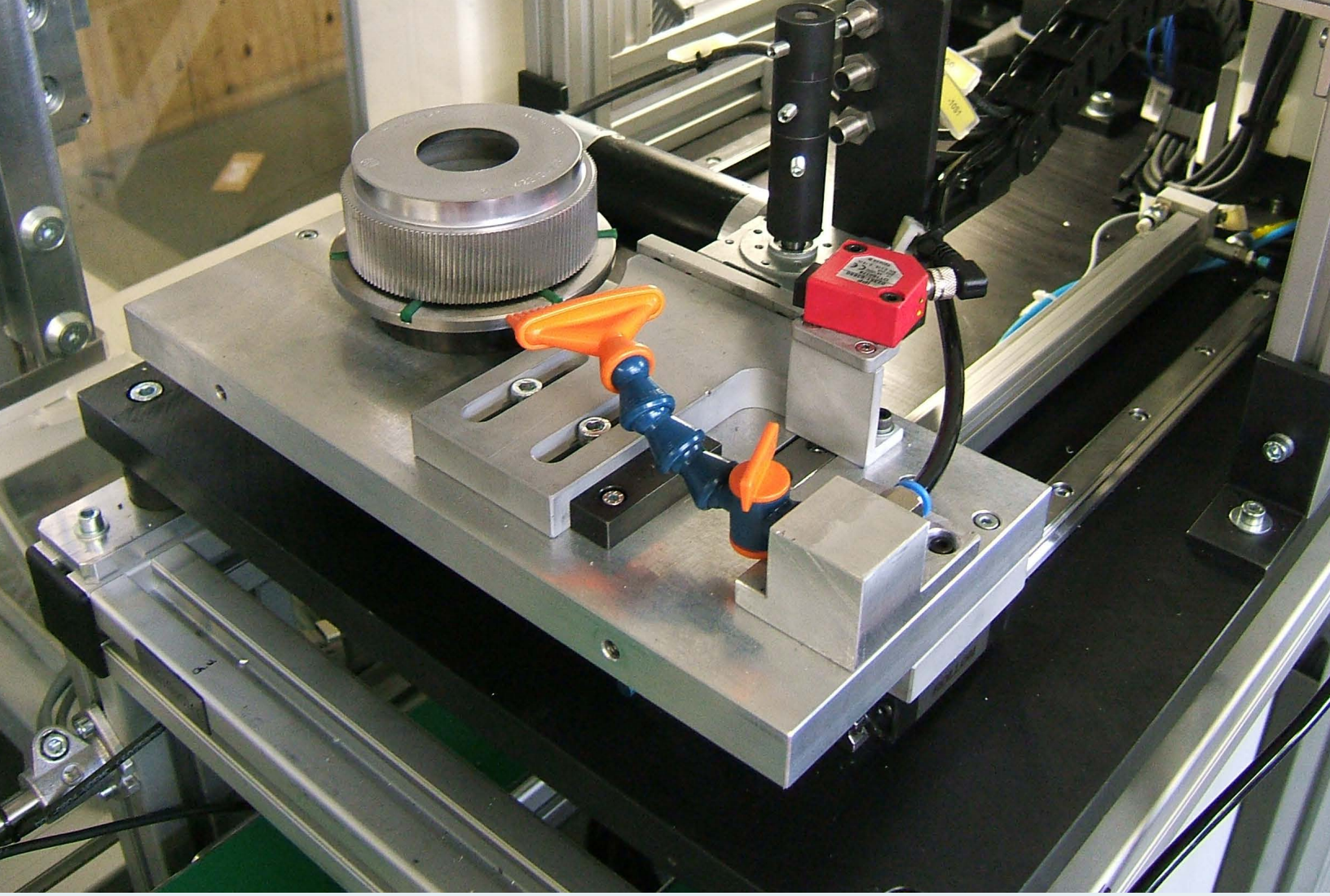
With Siemens' solutions you can: Develop a highly reliable test facility, implement short cycle times and high throughput rate during series production, increase the level of automation – reducing manual operations and operator errors, combine objective and reproducible pass-fail results with root-cause analysis to generate insights for possible intermediate redesigns, and easily adapt to changing requirements. This systematically improves overall product and manufacturing quality and leads to reducing customer complaints. In addition, it supports continuous process improvement by providing valuable input to both the product and production digital twin.

Providing end-of-line testing for rotating machinery



Assembly errors, component defects and distinctive (noise-related) characteristics are detected within seconds during manufacturing.

EoL testing solutions employ vibration and sound measurements to perform process-secure, fully automated and highly reliable fault detection and identification under volume-production conditions. Typical applications include internal combustion engines, transmissions, electric motors and motor-driven components and systems. Assembly errors, component defects and distinctive (noise-related) characteristics are detected within seconds during manufacturing. Cost savings are realized thanks to increased automation, early detection of failures, less reworking and fewer recalls.



Using acoustic resonance testing for nondestructive testing

Our nondestructive testing solution enables quick, objective, reproducible and automated quality testing.

Nondestructive component testing on volume production series includes ART, a comparison-inspection technology that evaluates natural vibrations, which are unique physical characteristics that describe the complete component such as material, structure and geometry. Identical components show the same resonance behavior. Other than with imaging methods, the influencing factors are directly linked to stiffness and elastic modulus of the components, and therefore to its mechanical stability. Statistically relevant differences in resonance frequency, amplitude and damping compared to normal production scatter reveal quality-relevant issues. Our nondestructive testing solution enables quick, objective, reproducible and automated quality testing based on moderate investment and low cost of operation.

Process monitoring of production machinery

Perform process monitoring of production machinery with the help of sound and vibration analysis. Our process monitoring solutions are used to inspect production machines such as presses, saws and punches. Process and machine sounds and vibrations are assessed by using vibration and sound analysis. Broken parts, pre-damaged material, foreign bodies, polluted press set-ins, etc., are recognized immediately and the machine is stopped.

Proven test procedures

EoL testing: sound and vibration-based fault and early damage detection on:

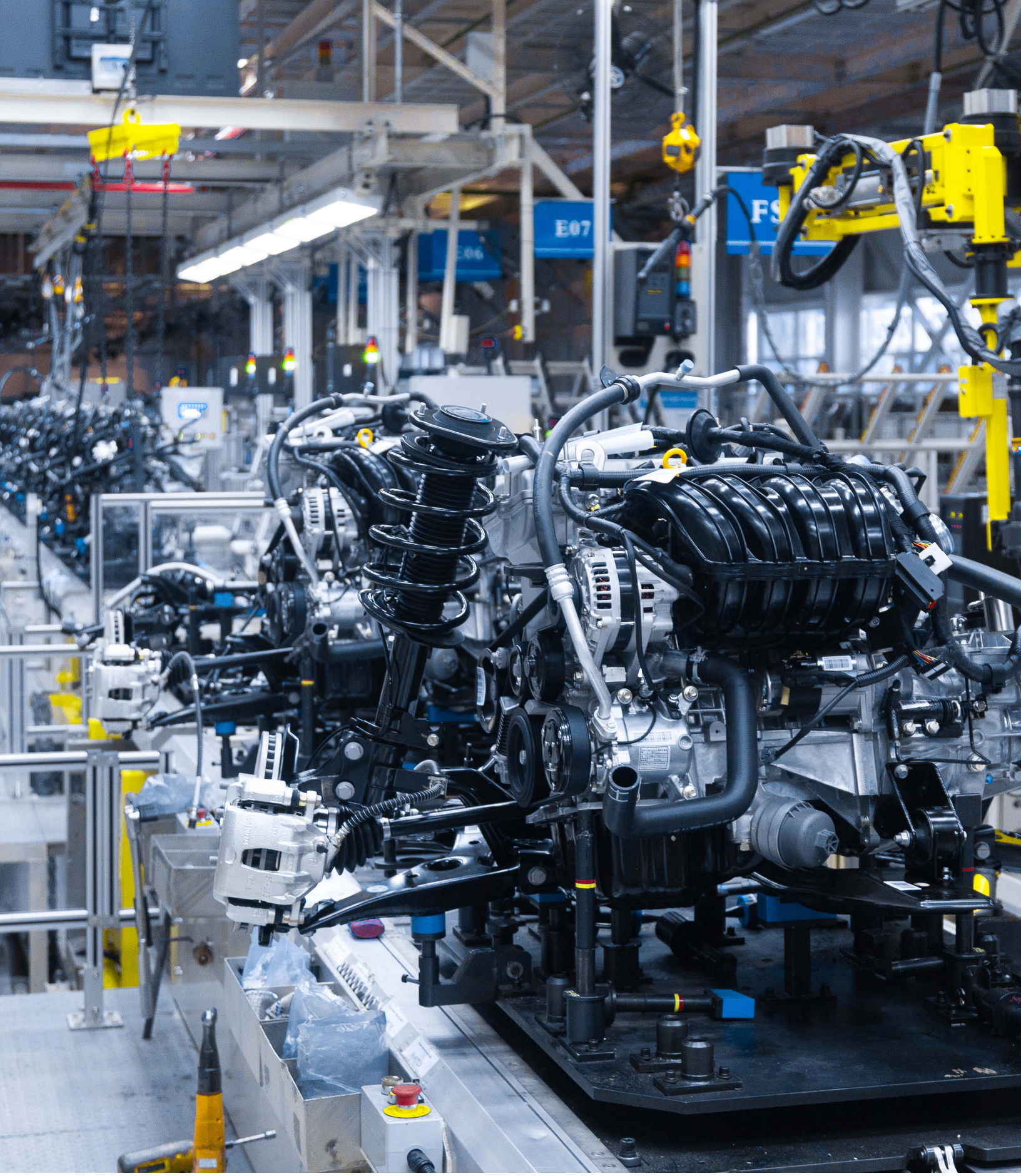
- Internal combustion engines: automated cold and hot testing during production of diesel and petrol engines
- Transmissions: EoL testing during production of automatic, continuously variable transmissions (CVT) and manual transmissions
- Electric motors: automated checks during production of electric drives and servo motors
- Turbocharger testing: order analysis at high revolution speed
- Steering components: EoL testing of parts relevant to safety
- Electric motors for small components: the quieter the car, the more precise testing is needed
- Modules for motorized drive mechanisms such as adjustable covers, air conditioning units, seat structures, electric steering systems

Nondestructive testing using acoustic resonance analysis. Detect quality issues like cracks, porosity, geometric, hardness and density deviations mainly for:

- Testing of sintered components: EoL testing of power metallurgy (PM) and metal injection molding (MIM) parts
- Testing of car body parts: Testing at the end of the press line, mainly for cracks and constrictions
- Testing of cast, forged, ceramic parts. Testing in mass production, mainly for cracks

Process monitoring of production machines with the help of sound and vibration:

- Tooling machines
- Punches
- Joining machines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Simcenter Anovis – standard platform for industrial quality testing

The reliability, percision and modularity of Simcenter Anovis hardware makes it an excellent choice for integrating with EoL test benches.

Simcenter Anovis, which stands for acoustic noise and vibration signal testing system, is our standard platform for industrial quality testing. It combines all necessary sensors, accurate sound and vibration signal recording hardware, smart signal analysis and flexible interfaces to test bench control software to automatically perform pass/fail checks, delivering formal proof the part meets its specifications or the machine operates safely. It is robust, reliable and can be swiftly integrated into EoL test benches and production lines to deliver both product and process manufacturing quality.

Sound and vibration recording

The reliability, precision and modularity of Simcenter Anovis hardware makes it an excellent choice for integrating with EoL test benches. Our signal recording device records a variety of sensors over large bandwidths, including vibration (accelerometer or laser vibrometers), sound (microphone), rotational speed (high-precision tachometer), temperature and torque. The channel count is scalable, and it is available in a 19-inch rack-mountable unit or as a compact German Institute for Standardization (DIN) rail mountable version. The hardware can be seamlessly integrated with Simcenter Anovis software.

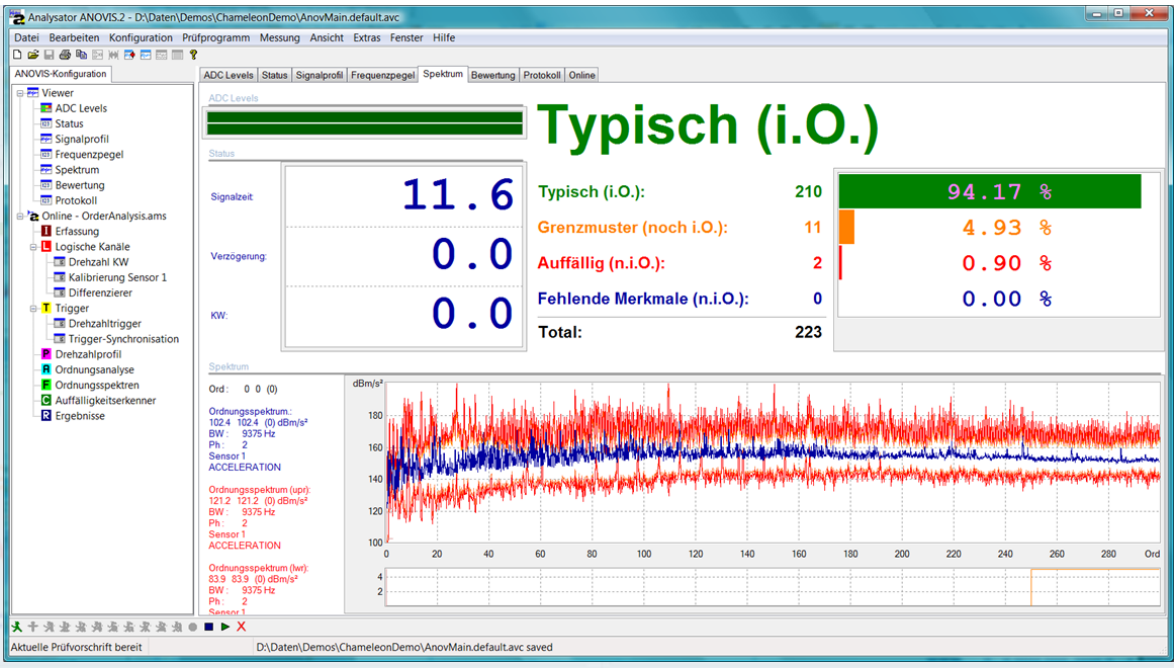
Smart signal analysis

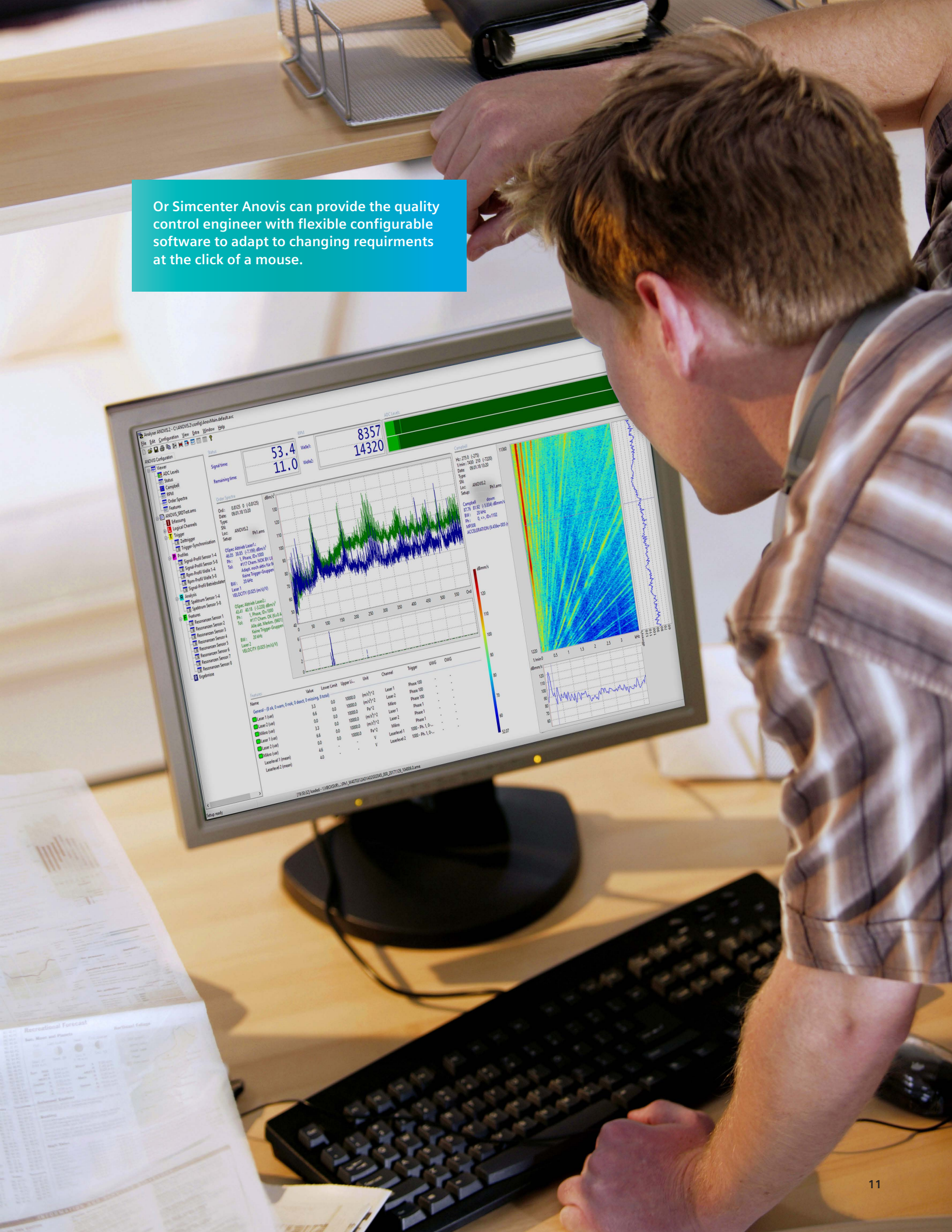
Simcenter Anovis can act as an intelligent sensor to the test bench, which sets abnormality limits.

Innovative sound and vibration-based fault detection algorithms are embedded in Simcenter Anovis software. It combines automatic limit adaptation with classic NVH measurement features to automatically identify product and process anomalies within seconds. The software analyzes the recorded signals based on smart methods operating in frequency, order, angle and time domain, and reliably detects quality-relevant fault patterns. Statistical assessment procedures dynamically tune thresholds and turn the system into a self-learning system, reducing setup effort and expertise required.

Flexible test-bench integration

Using Simcenter Anovis software enables you to convert decades of industrial expertise in automated NVH test procedures, delivering minimal cycle time. Test bench integration is flexible and scalable. Simcenter Anovis can act as an intelligent sensor to the test bench, which sets abnormality limits. Or it can operate as a self-learning system that automatically tunes parameters based on preset quality criteria. Or Simcenter Anovis can provide the quality control engineer with flexible configurable software to adapt to changing requirements at the click of a mouse.





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About Siemens Digital Industries Software
Siemens Digital Industries Software, a business unit of Siemens Digital Industries, is a leading global provider of software solutions to drive the digital transformation of industry, creating new opportunities for manufacturers to realize innovation. With headquarters in Plano, Texas, and over 140,000 customers worldwide, we work with companies of all sizes to transform the way ideas come to life, the way products are realized, and the way products and assets in operation are used and understood. For more information on our products and services, visit siemens.com/plm.

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