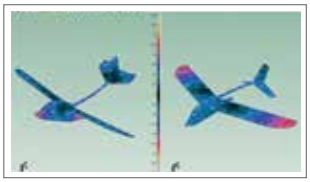
A FULL RANGE OF SOUND AND VIBRATION SOLUTIONS

Industry qualifications

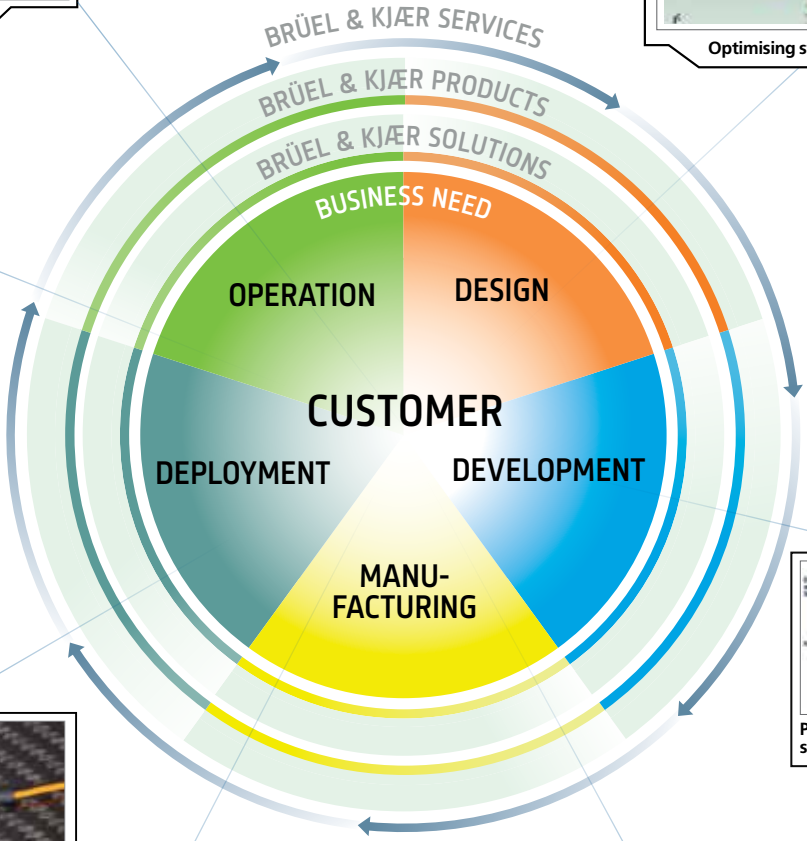
Customer support



Optimising structural behaviour

Evaluate vehicle NVH virtually

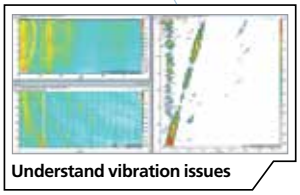
Advanced hand-held analyzers



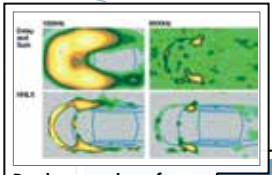
Problem solving

Robust transducers for extreme conditions

Replicate real life vibrations



Understand vibration issues



Precise mapping of sound sources

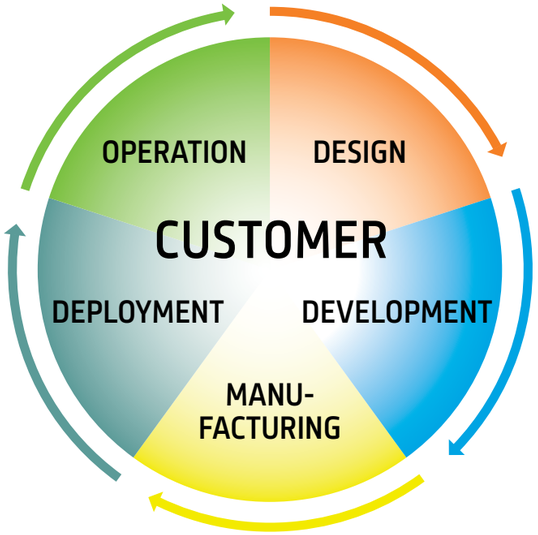
Trace noise sources, test compliance quickly

Brüel & Kjær

BEYOND MEASURE

THE COMPANY

Brüel & Kjær Sound & Vibration Measurement A/S is a world leader in sound and vibration measurement and analysis, supplying a comprehensive range of advanced solutions. Since the 1950s, Brüel & Kjær products have proudly set the standard to which others are compared.



The Life Cycle Wheel represents our commitment to helping our customers' business through the complete product life cycle from your initial design and development, to manufacturing, deployment and operation

The complete solution

We are unique in the industry, producing all of the elements for complete sound and vibration test systems. Our goal is to create the most technologically advanced solutions, built to the highest quality and designed to save time and eliminate errors in the measurement process. We have an unequalled product range, but our real advantage lies within our ability to supply a complete solution.

The individual components meet the highest performance standards in the industry and they are designed to interact and communicate with each other to provide unrivalled measurement security and user feedback. This allows us to create solutions that are targeted at optimizing our customers' work processes, to provide rapid, reliable results.

Innovation

We thrive on innovation. Our philosophy of incorporating the latest technological advances in our products attracts talented engineers and designers from all over the world to work on new product developments. For over 70 years we have been an industry pioneer, collaborating closely with customers and partners to develop innovative methods of solving their noise and vibration measurement and management challenges.

Many of our research and development personnel are recognized global experts in their fields and are regularly invited to speak at conferences, advise on new standards and write industry papers. They also teach at our Brüel & Kjær University in Denmark and at regional training centres around the world.

Our world-leading experts teach hundreds of courses every year

www.bksv.com/Courses

Global and local

We have the largest sound and vibration sales and support network in the world and regularly hold local courses and roadshows to facilitate continual dialogue with our customers. With more than 90 sales offices in 55 countries and a global network of engineers to advise on measurement and analysis problems, we can help you no matter where you are.

In addition to specialist training, our unrivalled support services include installation, software updates, calibration, planned maintenance, repair and rental.

Quality

The valuable knowledge and expertise we have gained over the years have given us a reputation for superlative reliability and quality. We rigorously maintain this by thoroughly testing our products, systems and solutions in harsh environmental conditions. Our status as an ISO 9001-certified company gives our customers the peace of mind that extremely high standards are met in all aspects of our products and services.

Our heritage

Brüel & Kjær was founded by Per V. Brüel and Viggo Kjær on November 28, 1942. In 1943, Brüel & Kjær entered the vibration measurement market by launching the world's first charge accelerometer. Then, Sound Level Recorder Type 2301 was introduced in 1949, which went on to become probably the most important instrument for acoustical measurements for half a century.

The ability to source complete measurement chain solutions from one partner is unique in the sound and vibration industry as is the ability to provide solutions throughout our customers' life cycle.

CONTENT

TEST SUITES FOR AEROSPACE, SPACE AND DEFENCE SOLUTIONS

Ever-shortening design and development time frames within modern aerospace and space programmes, demand 'right-first-time' engineering. For the aerospace sector, this not only affects aviation efficiency and aeronautical targets, but also requires compliance with enviromental directives. For the defence industry manufacturers, they have the added issue of ensuring total reliability and high performance of military systems – also under extreme conditions.

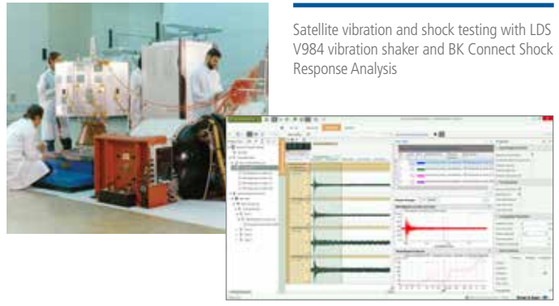
Recognizing that high-quality, goal-focused, time- and cost-efficient testing is critical to meeting programme milestones, Brüel & Kjær addresses today's engineering needs by providing user-friendly and seamless noise and vibration testing, analysis, data storage and reporting capabilities.

Acoustic Test Suite

Whether your concern is exterior or interior noise, our acoustic test suite provides data acquisition and assessment systems to combat your noise problems by optimizing noise identification, improving sound quality, and ensuring compliance with environmental legislation.

- Noise source mapping and location
- Wind tunnel and flight testing
- Engine and aircraft certification
- Acoustic material testing
- Cabin comfort and occupational health
- Ramp noise and sonic boom
- Underwater acoustics
- Acoustic stealth and noise signature management

Acoustic and vibration sensors



Satellite vibration and shock testing with LDS V984 vibration shaker and BK Connect Shock Response Analysis

Environmental Test Suite

Reproducing realistic operational conditions in the laboratory is essential for qualifying the real-life integrity of structures to ensure durability. Whether for billion-dollar satellites, launchers, aircraft, instruments or simple structures, our comprehensive vibration test solutions provide a wealth of environmental test systems.

- Durability and acoustic fatigue testing
- Classical and pyro shock
- Sine, random, sine-on-random, random-on-random testing
- Shock response spectrum
- Kurtosion
- Field data replication

Rotating Test Suite

Vibration analysis of rotating machinery provides valuable information on engine health, reliability and performance. From R&D and production test-cell applications to on-ground maintenance, our vibration measurement and analysis systems provide you with powerful machine analysis tools.

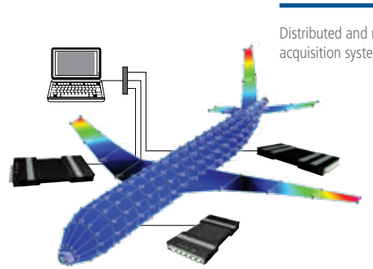
- Vibration analysis, monitoring and diagnostics
- Vibration data acquisition and analysis in engine test cells
- On-ground vibration check of aircraft engines
- Order analysis and autotracking
- Balancing and trim balancing
- HUMS transducers

PULSE LabShop used for real-time and post-processing analysis

Structural Test Suite

Structural dynamics testing is vital to understand and optimize the inherent dynamic properties of structures, to ensure reliable and safe operation. Our complete systems provide solutions for controlled excitation testing, real-life operational testing and test-FEA integration – from the smallest components to the largest assembled structures.

- Operating deflection shapes analysis
- Operational modal analysis
- Classical modal analysis
- Normal mode testing
- Structural dynamics modifications
- Model correlation and updating



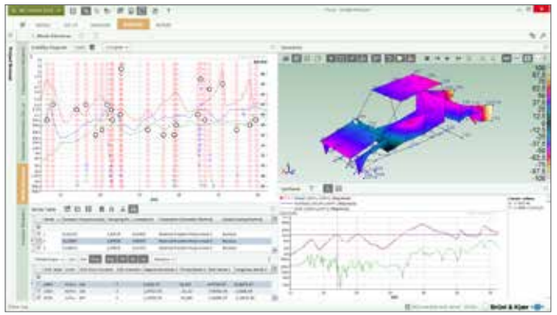
Distributed and rack-mounted LAN-XI data acquisition systems

AUTOMOTIVE/GROUND VEHICLES

Passenger vehicles such as cars, trucks, motorcycles, buses and trains continuously need to be more exciting and pleasant, while becoming safer and quieter. This makes Noise, Vibration and Harshness (NVH) testing a key to competitive advantages for vehicle manufacturers.

Brüel & Kjær's expert knowledge of the industry, combined with extensive experience of customer-driven projects, allow us to cover the whole vehicle NVH development process. Our solutions range from vehicle NVH simulators for target setting, to spherical beamforming for 360-degree noise mapping.

Our flagship test centre near Detroit is a state-of-the-art facility that includes a hemi-anechoic, four-roll chassis dynamometer



BK Connect Modal Analysis – part of a complete structural analysis suite providing results you can trust

Interior NVH
Our Source Path Contribution (SPC) system covers the entire measurement chain – from transducer to final analysis platform – allowing engineers to analyse structural and airborne contributions in vehicles, and even tune their sound and vibration characteristics.

Wind tunnel testing
Surface microphones on the exterior of a vehicle measure the pressure fluctuations at different positions, while beamformers placed outside the main airflow pinpoint the location of noise sources and quantify the relative noise contributions. When combined with a spherical beamformer inside the vehicle, a detailed noise cause-effect relationship is achieved using minimal testing time.

Engineering services
We provide a wide range of engineering services to improve products or execute complete development programmes, in cooperation with global partners.

Exterior noise
As community regulations put ever-tighter restrictions on noise emission, our Vehicle Pass-by solutions offer complete support to ensure compliance with the latest standards.
Adding moving source beamforming enables noise source localization and troubleshooting during measurements. Our Indoor Simulated Pass-by Noise System enables efficient comparison of design alternatives.

NVH Desktop Simulator helps you evaluate the sound before you build the vehicle and design the sound of the vehicle to meet brand and customer expectations

Moving source beamforming used to pinpoint noise sources on high-speed trains

Structural analysis
The Structural Dynamics Suite helps improve the dynamic behaviour of any structure. It includes Operating Deflection Shapes analysis covering the full set of methods (frequency, order, time), Classical Modal Analysis with a wide range of powerful curve-fitters, and Operational Modal Analysis.

Squeak and rattle
Our unique equipment range ensures that automotive components and interiors are durable and free from noise, and supports industry-standard QA practices for squeak and rattle vibration testing.

- Low-noise shaker systems
- Sound quality analysis software
- Array-based systems for quick localization of noise sources

Battery testing for hybrid electrical vehicles with lifetime simulation of the car and its sub-components

Sound engineering
The NVH Simulator Suite auralizes NVH data with advanced sound-simulation techniques, allowing you to efficiently communicate NVH targets to non-experts even before physical prototypes are available. The On-road Simulator allows evaluation of virtual vehicles, and even benchmarking of competitive vehicles under real driving conditions.

Power train testing
Brüel & Kjær provides tools for efficient power train testing:

- Very high-temperature triaxial accelerometers
- Crankshaft angle analysis software
- Systems for measuring sound power versus RPM
- Holography systems for locating noise sources and measuring partial sound power versus RPM and crank angle
- Wideband noise source identification systems customised to fit engine test cells
- NVH simulators to evaluate powertrain components or complete power trains in full vehicle context

Hybrid-electrical and electrical vehicles:

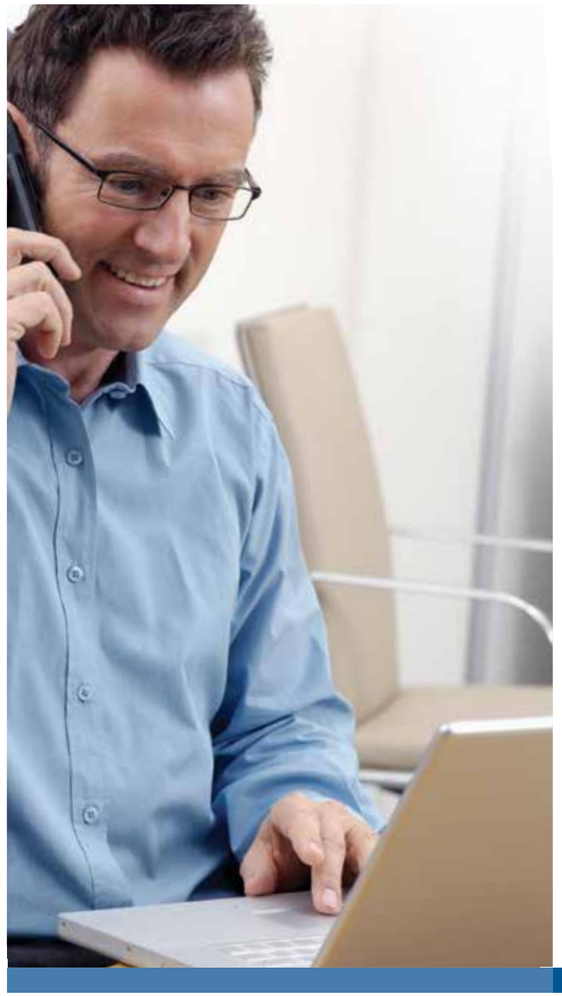
- For measuring in unknown sound fields, the tools include: switching noise analysis, transient analysis, high-frequency beamforming, and the Multi-field Microphone with very low magnetic sensitivity
- NVH simulator for exterior vehicle noise
- Vibration testing of large batteries

TELECOM AND AUDIO

Acoustic performance has become increasingly important as users demand high quality audio in every situation, whether this concerns handsets, headsets, loudspeakers, hearing aids, microphones, or any other device reproducing music or transmitting speech.

Brüel & Kjær has a long history and close connections within the fields of telecommunications and audio, pioneering many methods that are now standard practice all over the world.

Today, based on our accumulated knowledge and experience, we offer a variety of electroacoustic test systems, audio analyzers, and transducers for electroacoustic applications.



Electroacoustic test systems
Our experience of providing quality acoustic solutions gives us a solid background when developing new systems for emerging technologies and markets. Our range of dedicated electroacoustic test systems is eminently suitable for acoustic design, benchmarking, prequalification and conformance testing of mobile phones, tablets, VoIP phones, headsets, loudspeakers, etc.
Each test system supports the entire workflow required by typical test procedures. This covers system calibration and verification, various acoustic measurement suites for evaluating the performance of devices under testing, and reporting. Tools for easy comparison of measurements as well as tools to hear and edit recordings are available.

An extensive range of vibration shakers accommodates everything from evaluating printed circuit card construction to examining package materials

LAN-XI data acquisition hardware constitutes a high-quality, state-of-the-art platform for electroacoustic measurements

PULSE LabShop and BK Connect offer various software packages for dedicated electroacoustic applications, as well as general acoustical and vibration analysis

Audio analyzers
Brüel & Kjær analyzer platform is one of the most commonly used platforms for conducting acoustic measurements, it forms a solid foundation for our audio analyzers. These analyzers offer a variety of analysis methods, covering traditional sine testing (using SSR and TSR) and spectrum analysis (using FFT and CPB) for testing using real speech, and perception-based test methods.
In combination with dedicated hardware, this supports the audio engineer in achieving his acoustic design goals. Besides its measurement and analysis capabilities, Brüel & Kjær analyzer platform also offers tools to automate test procedures, as well as reporting and data management tools for easy archiving and retrieving of measurement data and related information.

Transducers
To guarantee reliable acoustic measurements, most national standards laboratories use Brüel & Kjær reference microphones. Consequently, most acoustical measurements in the world ultimately refer back to Brüel & Kjær products.
Our range of acoustical transducers includes ear simulators, mouth simulators and microphones.
All transducers supplied by Brüel & Kjær contain information about their actual sensitivity.
When the transducer is connected to the analyzer this information is automatically transferred to the analyzer, ensuring that the proper setting is always used for the specific measurement task.

A comprehensive portfolio of transducers supports standardized testing of telephones, hearing aids, headphones, headsets, ear phones, loudspeakers, receivers and many other applications

SOUND AND VIBRATION IN THE ENVIRONMENT

Sound and vibration in the environment comes from a variety of sources, such as industrial plants, road and rail traffic, construction work and aircraft. Add typical urban situations, such as sports events, outdoor concerts, leisure parks and residential and commercial neighbours, and you have many different sources of sound and vibration, each with different characteristics that pose specific problems for the professionals who assess them.

A range of tools are available from Brüel & Kjær to support you in the various tasks involved in managing environmental noise, including: basic sound level meters, permanent noise monitoring stations, post-processing software, noise mapping software, and advanced analysis tools such as sound intensity or narrow-band analysis and centralized noise monitoring software.

Sound Level Meter and Hand-held Analyzer Type 2270 with Sound Level Calibrator Type 4231

Environmental noise

The jobs involved in managing environmental noise are many and varied: from solving noise complaints to mapping noise; from policing noise limits to setting up noise abatement programmes and zoning. Reports must be made and all data, results, reports and analyses must be safely and intuitively archived.

Weather Station Kits MM-0316-A and MM-0256-A

Measurement of weather conditions

Weather conditions affect the propagation of sound and must be taken into account when measuring noise outdoors. Consequently, most environmental noise standards define limits for wind speed and direction.
Brüel & Kjær's Weather Station Kits and Type 2250 simultaneously measure weather and noise parameters. Post-processing in Measurement Partner Suite completes a comprehensive solution for consultants.

Personal Noise Dose Meter Type 4448

Triaxial hand-arm vibration measurement

Type 2270-based building acoustics system

Noise at work

Occupational health and safety is a major concern throughout the world, and measures must taken to minimize risk in the workplace. Millions of people suffer from noise-induced hearing loss (NIHL), resulting in a reduced quality of life. Hearing protection programmes have been implemented in most countries and are governed by international and national standards. Any such programme involves an assessment of the noise problem using hand-held sound level meters and personal noise-dose meters.

Hand-arm and whole-body vibration

Human vibration is defined as the effect of mechanical vibration on the human body. The effect might be on the body as a whole, or on parts of the body – of which the hands and arms are the most important and most frequently affected. Hand-held power tools such as chisels, drills and pressure hammers, expose the user to dangerous vibration.
The relevant international standards involve measurements of whole-body vibration and hand-arm vibration using instruments, such as Type 4447, that fulfil the requirements of the standards.

Sound insulation in buildings

Building acoustics is the assessment of sound insulation and impact noise in buildings and their component elements. The acoustics of buildings are important for the well-being of people in their homes, workplaces or public venues, and minimum standards are consequently defined in the building regulations of most countries.
Building acoustic measurements are used to validate new constructions and troubleshoot existing ones. Proper measurement of minimum requirements should fulfil relevant standards such as ISO 140.

Room and office acoustics

The way sound is created, propagated, perceived, measured and modelled inside an enclosed space is called room acoustics. Enclosed spaces include dwellings, offices, workshops, factory halls, lecture rooms, auditoriums, concert halls and transportation terminals.
Acoustic measurements are used to validate new constructions and troubleshoot existing ones. Reverberation time is the single most important parameter used to describe room acoustics, but parameters describing music quality and speech intelligibility are also important.

Room acoustics measurements using Type 2250, DIRAC Room Acoustics Software and the stand alone Echo Speech Sound Source

STRUCTURAL ANALYSIS

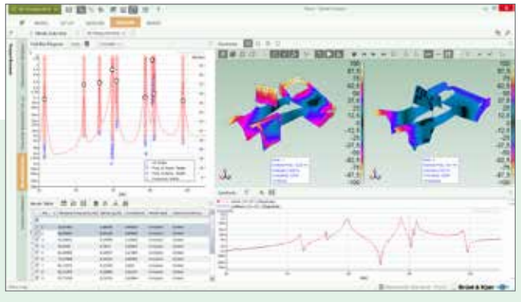
Structural analysis is vital to understand and optimize the actual behaviour and inherent dynamic properties of structures, leading to lighter, stronger and safer constructions, lower fuel/power consumptions, higher comfort and better performance.

With product development cycles becoming increasingly complex, shorter, more integrated, highly automated and performed in parallel, structural analysis is done at various stages and levels during the development process. Consequently, systems for structural analysis must efficiently and accurately identify the root causes of structural weaknesses and provide powerful tools for finding optimal solutions to the problems.

Brüel & Kjær offers unique, fully-featured and easy-to-use structural analysis solutions developed in close cooperation with leading companies and academics around the world. With our range of LDS vibration test systems and products, Brüel & Kjær offers complete solutions for combined structural and vibration testing.

Classical modal analysis

In classical modal analysis, a model of a structure's dynamic behaviour is obtained by exciting the structure with measurable forces and determining the response/excitation ratio. Our hammer and (multi-) shaker testing systems are used in many areas, including trouble-shooting and diagnostics, benchmarking, simulation studies and design optimization. Our modal analysis solutions guide you through the complete setup, measurement and analysis in simple and intuitive steps, and provides you with accurate and reliable results even in the most demanding situations, with a targeted set of best-in-class modal parameter estimators and validation tools.



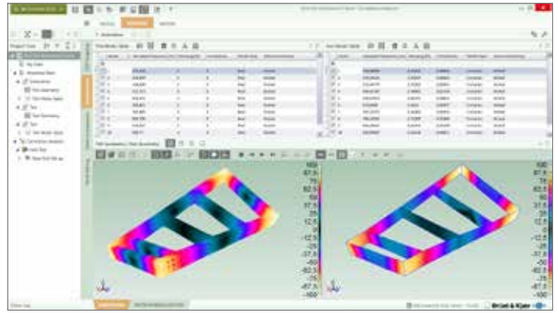
BK Connect Modal Analysis is an intuitive and powerful application for classical modal analysis

Operational modal analysis

In operational modal analysis (OMA), only the output responses are measured and the natural ambient and operating forces are used as unmeasured input. OMA is used instead of classical modal analysis for accurate modal identification under actual operating conditions, and in situations where it is difficult or impossible to control artificial excitation of the structure. Our systems use state-of-the-art technology providing automatic suppression of harmonic components, unbiased modal parameter estimators, clear stabilization diagrams, and automated mode estimation.

Distributed LAN-XI modules facilitate operational modal analysis of large civil engineering and mechanical structures

BK Connect Correlation Analysis helps test engineers and analysts improve their models by correlating test and FEA results



In-operation engine and power train testing using OMA and ODS analysis

Operating deflection shapes analysis

In operating deflection shapes (ODS) analysis, the vibration pattern of a structure is measured and visualised during stationary, quasi-stationary or transient operating conditions influenced by factors like engine speed, pressure, temperature, flow or ambient forces. Our solutions support all types of ODS analysis including time ODS, spectral (frequency or order based) ODS and non-stationary (run-up/down) ODS. Also included are unique capabilities like graphical tacho setup for easy conditioning of tacho signals, and autotracking for fundamental frequency extraction directly from a measurement signal when no physical tacho signal is available.

Structural dynamics modifications

With structural dynamics modifications (SDM), you can simulate the effects that structural modifications will have on your structure without having to actually make them. Based on an original modal model, a modal model of the modified structure is calculated and can be compared to the original. Our solutions support modal models obtained from testing or finite element analysis (FEA), and include industry standard FEA elements such as springs, masses, dampers, rods, bars, plates, bricks and tuned absorbers.

Test–FEA integration

Integration of test and FEA is a core discipline in structural analysis. Using a finite element model you can increase the quality of your modal test by providing optimal excitation and response locations. By comparing FEA and model test results, you can refine your finite element models. Our solutions include a variety of tools for pre-test analysis, model correlation, model updating, and design optimization. Interfaces for leading FEA programs like Nastran (MSC, NX, NEi), Ansys and Abaqus are also provided.

The complete measurement chain

Our complete and fully integrated measurement chain includes accelerometers, impact hammers, force transducers, modal exciter systems, data acquisition front-ends, and measurement and post-processing software, letting you select the optimal solution for your structural analysis needs. Whether you require a small system for ODS analysis, or a multi-shaker system with hundreds of accelerometers for large-scale modal surveys, we can meet your needs with flexible, scalable and open solutions.

A fully integrated product portfolio for structural analysis

NOISE SOURCE IDENTIFICATION

Achieve more rapid benchmarking, troubleshooting and target setting with a complete set of noise source identification (NSI) methods. These methods cover a wide range of applications across the complete audible frequency range, with informative maps and accurate quantities that enable you to rapidly locate and quantify noise sources. One platform for all methods ensures full interoperability, maximizing ease-of-use and yielding optimal value for money.

The NSI methods have proved their worth on such varied sound sources as hearing aids, wind turbines, cars, aeroplanes and high-speed trains by identifying the most important sub-sources in terms of position, frequency content and sound power. Sub-sources may be ranked to identify where design changes will most effectively improve the overall noise radiation.

Practical NSI began in the early 1980s with the introduction of sound intensity measurement techniques and associated mapping. This opened new applications such as in situ sound power determination and in situ absorption measurements. At the same time, the first near-field acoustical holography methods were developed. Taking advantage of the ever-increasing processing power, the NSI tools have evolved to fulfil ever-more stringent demands from customers.

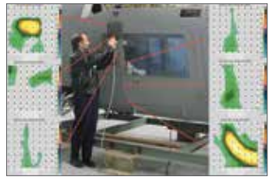
The latest additions to the portfolio are conformal mapping calculations and sound quality metrics calculations.

Sound intensity mapping
Sound intensity is a well-established, cost-efficient method for mapping and ranking sources. The world's smallest hand-held sound intensity system based on a sound level meter is eminently suited for on-site measurements. Sound intensity is used for sound power determination, particularly in difficult acoustic environments. Since sound intensity mapping typically involves a large number of points, measurements are most effectively performed using an automated microphone positioning system (robot).

Hand-held Sound Intensity System Type 2270-G

Robot and sound intensity system

Hand-held array with position detection system using SONAH



Acoustic holography
Array-based measurements (fixed or hand-held arrays) provide the fastest measurement process and the highest quality of results. Statistically optimized near-field acoustic holography (SONAH) provides detailed acoustical information of steady or transient noise sources either as a planar or a conformal map. A position detection system integrated into the hand-held array automatically registers the positions measured, which greatly reduces measurement error and increases measurement speed.

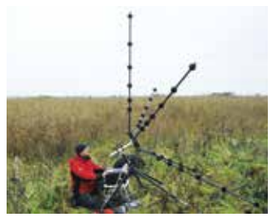
Gearbox test rig with colour contour plot

Array calibration

Beamforming
Beamforming is a method of mapping noise sources by distinguishing sound levels based on the direction from which they originate. The method is very quick, allowing a full map to be calculated from a single-shot measurement where all channels are measured simultaneously. During real-time beamforming, you can quickly and accurately evaluate the mapping before data capture.
Beamforming uses a planar wheel array of microphones to combine optimal acoustical results with ease of use and handling. It is used in wind tunnels, for pass-by noise evaluation of vehicles and trains, and aeroplane fly-over measurements.

Spherical beamforming
Spherical beamforming quickly produces an omnidirectional overview map of sound pressure contributions from all directions. Transient spherical beamforming is used in vehicle cabins to rapidly evaluate squeak and rattle in an easy to understand manner.

Pentangular array in field use



Spherical beamformer used for in-vehicle measurements

Semi-circular array used for moving source beamforming

VIBRATION TRANSDUCERS

Transducers are the vital first link in your measurement chain. They stand on the front line and provide you with the raw data you need, therefore, it is critically important that they are trustworthy.

Application specific integrated circuit (ASIC) amplifier

Brüel & Kjær's uniquely designed circuit for the built-in preamplifier of CCLD/IEPE accelerometers enables accelerometers with a low noise floor. ASIC technology permits amplifiers with a high bias voltage temperature stability and a high open-loop amplification, which give high sensitivity. ASIC also facilitates CCLD amplifiers with a low output impedance that can drive long cables.

Low noise (IEPE)

Brüel & Kjær's transducers provide a very wide dynamic range, which is especially important for measuring low-level vibration since a transducer can never measure a vibration lower than its noise floor.

Finite element method

Accelerometer design based on the finite element method (FEM) has been used at Brüel & Kjær since the late 1990s. FEM allows potential technical problems to be spotted and solved at a very early stage, ensuring the design quality.

Impact Hammer Type 8206

High temperature

Our CCLD, high-temperature accelerometers can continuously operate at 180 °C. This unprecedented temperature tolerance can bring the test location closer to the hot vibration sources. We also offer a wide range of charge accelerometers for high-temperature applications.

Calibration Exciter Type 4294, for hand-held, battery-powered accelerometer calibration

Best-in-class calibration

All accelerometers are individually calibrated and supplied with a comprehensive calibration chart using state-of-the-art, random FFT technology. The 1600-point, high-resolution calibration (magnitude and phase) ultimately gives a unique characterization and secures the integrity of the vibration measurement.

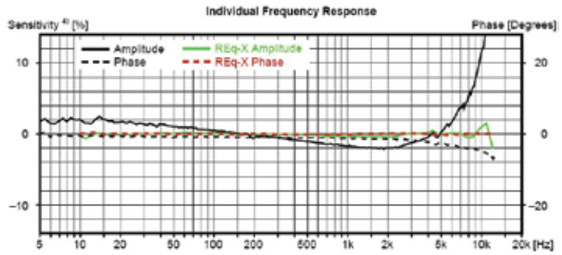
Type 8344 – low noise floor, low frequency response for low-level vibration tests

Type 4524-B – an optimal solution for modal analysis

Type 4393 – robust charge accelerometer for high-temperature, light-structure tests

Type 4326-A-001 – de facto accelerometer for engine testing

Calibrated frequency response with and without REq-X

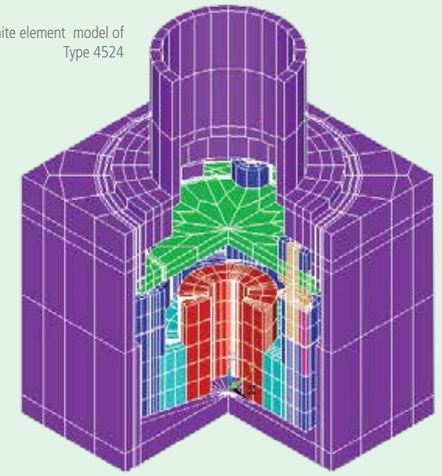


REq-X technology

Brüel & Kjær's analyzer platform provides response equalization (REq-X), which allows you to flatten the frequency response of an accelerometer in real-time. This provides more accurate measurements and a wider frequency range and allows the same transducers to cover more applications.

Type 4511 – health and usage monitoring system (HUMS) accelerometer

Finite element model of Type 4524



Vibration transducer highlights

More than seven decades of experience in transducer development has given us a wealth of exclusive knowledge and has consistently enabled unique breakthroughs in transducer technology:

1940s Early bender constructions

1950s Innovation in PZ material and case optimisation

1960s Precision charge accelerometer – Unigain™

1970s The DeltaShear™ principle

1980s Built-in charge amplifier

1990s From Δ to Θ – ThetaShear™
Orthoshear™
Centre bolt

2000s Microchip revolution (ASIC), transducer electronic data sheets (TEDS)

Our dedicated research and development team continuously scour the technological horizon to inspire transducer evolution, or possibly revolution. At present, the massive advances in microelectronics, digital transducers, fibre optical transducers and wireless communication bode well for the future of transducers and acquisition systems.
Whatever the future may bring, our transducers will be at the cutting edge, reliably supplying all the data you need. Just make sure you choose the right transducers that will give you what you expect.

Read the whole Brüel & Kjær accelerometer story:
WWW.BKSV.COM/ACCELEROMETERHISTORY

ACOUSTIC TRANSDUCERS

In the world of measurement-grade microphones, Brüel & Kjær has always set the standard that others have tried to follow. Brüel & Kjær offers the industry's largest selection of measurement microphones to help you make the most accurate acoustic measurements possible.

Microphones are assembled in a clean room environment

Laboratory Standard Pressure Microphone Type 4160

Listen

Sound may be defined as any pressure variation (in air, water or other medium) that the human ear can detect. Measurement microphones convert the pressure variation to an equivalent electrical signal.

Amplify

The electrical signal produced by a microphone is quite small, so it is amplified by a preamplifier before being processed.

Titanium

Using materials such as titanium and stainless steel together with advanced assembly methods like laser welding results in superior robustness and long-term stability. This ensures the expected result – time and again.

Sterile

Highly skilled specialists assemble our microphones in our 225 square-metre clean room. This guarantees that the microphones maintain their low inherent noise and high stability even when used in humid and high-temperature environments.

Imagine

A Brüel & Kjær microphone is a very reliable, but delicate instrument. Exposed to 60 dB (normal conversation), the diaphragm will move approximately 10^{-10} m. In order to get an impression of this tiny movement: Imagine a microphone the size of the earth (diameter 12,700 km) – the diaphragm would only move 10 centimetres.

CCLD A-weighted Microphone Preamplifier Type 2699

Multi-field Microphone Type 4961 is optimized for multi-field response

Sound Calibrator Type 4231

No drilling

The aerodynamic surface microphone was originally designed for flight testing, as it eliminates the drawbacks of flush-mounting. However, with its extremely flat geometry and compact design, the surface microphone soon found its way into a great variety of measuring situations, including automotive, thanks to benefits including:

- Flush mounting without the need to drill holes
- Easy to mount even on glass and in confined spaces
- Low wind-induced noise

Automotive Surface Microphone Type 4949

Acoustic transducer highlights

Brüel & Kjær has more than 50 years of proven commitment to continuous product improvement and groundbreaking new innovations in measuring microphones:

1950s World's first volume-produced measurement microphone

1960s World's first 1/8" measuring microphone

1970s Reference Microphone Types 4160 and 4180 were introduced. These remain the world's de facto acoustical standard

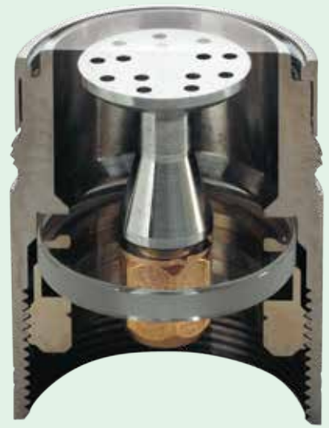
1980s Low-noise microphone Type 4179 has a noise floor of –2.5 dB(A) – still unbeaten after nearly 30 years!

1990s Falcon™ range is introduced. Featuring stainless steel, press-fitted diaphragms, these microphones result in a step change in microphone technology

2000s The surface microphone – another Brüel & Kjær first. All-titanium construction

Multi-field Microphone Type 4961 – giving correct data in any sound-field

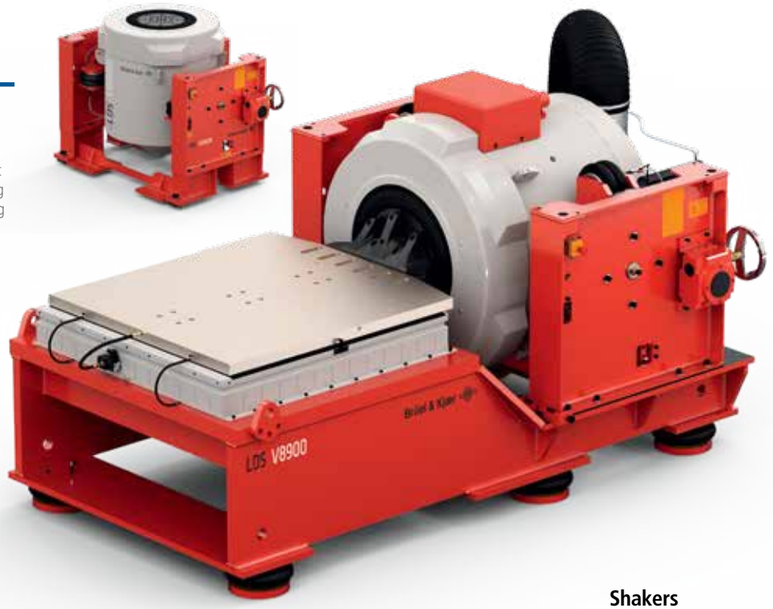
Read the whole Brüel & Kjær microphone story: WWW.BKSV.COM/MICROPHONEHISTORY



VIBRATION TEST SYSTEMS

With our LDS brand of electrodynamic shakers, we provide solutions for applications as diverse as laboratory testing, fully-featured modal and structural analysis, squeak and rattle, package testing and stress testing.

Our complete solution comprises all aspects of structural analysis including the latest control systems, shakers and energy-efficient power amplifiers that can analyse anything from sub-assemblies through to complete systems. The entire range of systems and solutions are backed up by excellent global support, servicing and training.



Brüel & Kjær's LDS V8900 is a new class of high-force (80 kN), air-cooled shaker designed from the ground up to deliver cost-effective performance without compromise – high force, high overturning moment restraint, high frequency and long displacement

Brüel & Kjær offers the largest range of shakers in the world. Our range runs from 9 N hand-held accelerometer calibration exciters to 289 kN water-cooled shakers, covering every interval in between

Shakers

Our standard range covers from 9 N to 289 kN. From hand-held calibration exciters and small permanent-magnet shakers, through to high-performance, air-cooled shakers and enormous water-cooled shakers – including the world's biggest shaker system. With an impressive range of standard and optional fittings, there is sure to be a solution to meet any test requirement.

IS PRODUCT RELIABILITY A CONCERN?
Vibration testing can be the answer

Space

Can this one-tonne satellite withstand the excessive vibration of being launched into orbit?

Aerospace and defence

What is the operational service time for these jet engine turbine blades?

Automotive

Will this hybrid vehicle battery be able to endure 250,000 kilometres on the road?

Consumer products

Can we choose the cheapest mounting method for this printed circuit card?

Package testing

Will this type of packaging material ensure that your flat-screen TV arrives safely?

Amplifiers and replacement amplifiers

The LDS range of linear and digital switching amplifiers offers energy-efficient and robust operation for power requirements up to 280 kVA.

- Linear power amplifiers
- High-performance switching power amplifiers
- Replacement amplifiers to fit any shaker

Control the LDS amplifiers remotely via a PC. All amplifiers can be used to power legacy LDS and third-party shakers

Powerful, flexible and economical vibration controllers

Head expanders and slip tables

Our range of high-quality head expanders and slip tables provides numerous possibilities for increasing the effective mounting surface, to accommodate test objects of almost any size.

Vibration controllers

Full-capability control and analysis applications for random, swept-sine, resonance and dwell, classical shock, random-on-random, sine-on-random, shock SRS, and field data replication – you name it, we can do it!
Apply kurtosis control for better real-world simulation. The capability to specify kurtosis (the 'peakedness' of a random signal) provides better simulation of real-world environments. Tailoring kurtosis is also important to accelerate fatigue tests.
Fatigue monitoring protects the test article and shaker. Offering an unprecedented level of protection, the built-in fatigue monitor detects looseness or fatigue in the product, fixture or shaker system.

Customized solutions

In addition to a comprehensive standard product range, we actively work with our customers to provide solutions specific to their needs.
We have a proven track record in project management gained from working in a wide range of industry sectors including space, aerospace, automotive, defence, consumer products and transport simulation.

The revolutionary quad V9 vibration test system enables independent control of vibration at multiple positions on a single payload. More than 400 kN force on a 6000 kg payload is possible

LAN-XI DATA ACQUISITION PLATFORM

LAN-XI is Brüel & Kjær's latest generation of data acquisition hardware. It seamlessly integrates unique technologies to not only save time, but also provide accurate measurement results the first time.

For example, all our input modules support TEDS (transducer electronic data sheets), wherein they automatically read information from TEDS transducers and configure the signal conditioning and sensitivity. This results in faster, easier setup with less chance of user error and makes for more reliable data.

Depending on your needs, you can now choose between the standard LAN-XI hardware solution or the new 4-channel LAN-XI Light version. Both deliver the raw power and reliability you need, but now with options to meet your requirements for capabilities and price

One-cable operation

You can use standard LAN cables for synchronous sampling between modules, and to provide system power, thanks to Power over Ethernet (PoE). This minimises the number of cables required and results in lower cost, less downtime, easier maintenance, and greater installation flexibility.

One system, more flexibility

Any module is a measurement system in itself, and can be used as a stand-alone module, in a rack, or in a distributed system. As a result you get fewer cables, fewer errors, and faster setup.

Interchangeable front panels

Interchangeable front panels let you decide which cable type to use and make swapping transducers easy, meaning less hardware is needed.

LAN-XI modules can be collected together in racks that use a single LAN cable for data transfer. All racks can be combined to make systems up to 1000+ channels

Not recommended, but LAN-XI can handle it. Brüel & Kjær used high accelerated life testing (HALT) for increased reliability

Measure anywhere with compact LAN-XI hardware, here LAN-XI Notar

LAN-XI hardware is the basis for advanced solutions like noise source identification

Rugged solid-state recorder

LAN-XI Notar™ is firmware that allows any LAN-XI module to be used as a stand-alone recorder. Since the key feature of LAN-XI is flexibility, the same module can be used as:

- Stand-alone recorder
- Front end for real-time analyzer (for example, FFT, 1/3-octave, order tracking)
- One part of a much larger, multi-channel data acquisition system

Built for field and lab use

The modules and the detachable front panels are cast in magnesium for maximum stability and lightweight with tough field use in mind.

SOFTWARE

Advanced solutions for sound and vibration measurement, Brüel & Kjær's BK Connect® and PULSE™ analyzer platforms support all your measurement needs – from single-channel, real-time applications to complex, multi-channel recording and post-processing scenarios.

BK Connect, the latest software platform from Brüel & Kjær, adds a new dimension to testing and analysis user friendliness. The software architecture is structured around your needs and tasks, and in particular, your workflow. It simplifies testing and analysis procedures, enabling you to work even more efficiently and with a high degree of flexibility.

Our unique service covers the complete measurement chain, supplying transducers, data acquisition hardware, analysis software, and reporting tools. Offering all of this from one company makes it possible for us to optimize our solutions so they give maximum benefit to the user.

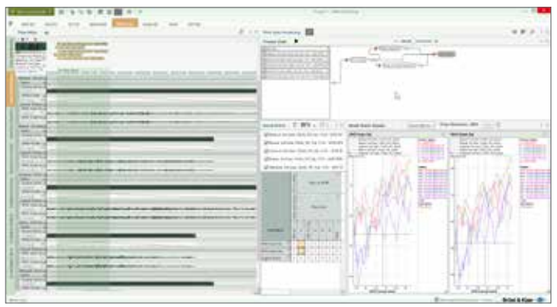
Real-time

The real-time capability of means there is the closest possible link between cause and effect. You see your analysis results instantaneously on screen as they are measured, enabling you to validate your data immediately. The multi-analysis side of our software means you can perform FFT, 1/n-octave (CPB), order, and overall analyses simultaneously on the same or different channels/signals while displaying real-time results on screen.

Post-processing

Brüel & Kjær analyzer platform can also act as the nucleus for off-line processing of stored time domain and frequency domain data. From troubleshooting to routine testing, Our platforms bring high efficiency, high productivity and high-quality results. Quickly view and listen to large volumes of time data across multiple recordings, or select sections of time data for further processing such as filtering, statistical analysis, spectral analysis and order analysis.

Workflow – automation – time data processing – graphical process chain – integrated reporting tools



Complete measurement chain

Designing and manufacturing all parts of the measurement chain ourselves gives unique integration benefits for the user, such as automatically reading transducer-specific data stored inside the transducer (TEDS). Our platforms can even make on-line equalization of a transducer's frequency response (REq-X). Further benefits include automatic cable-break-detection and Dyn-X, which eliminates the need for auto-ranging before a measurement is made. All factors ensure the highest quality measurements.

SERVICE AND SUPPORT

Brüel & Kjær employees are committed to three golden rules governing the way we provide service and support:

UPTIME IS PARAMOUNT

Our employees strive to ensure maximum uptime of your systems where Brüel & Kjær components are included by responding rapidly and efficiently

DIALOGUE

We keep you informed of where in our system your service or support request is, so you can plan your work efficiently

HIGHLY SKILLED PROFESSIONALS

Support staff are continuously trained to serve you in the best possible way, allowing us to always meet you on your own terms

Remote installation – avoid problems starting up and running

From software to comprehensive systems, our skilled field engineers will not leave you until you are up and running. Their expertise will save you time.

Training – efficiency right from the start

Get instruction from the people who know the products best: Brüel & Kjær. We offer extensive national and international training programmes that give you the opportunity to improve and increase your capabilities.

Support – help is at hand

If you need help, just call our hotline during normal working hours to talk to experienced Brüel & Kjær engineering support teams.

Software updates and revisions

Get automatic access to revised and enhanced software features that offer the following benefits:

- Tested to work with current Microsoft® Windows® – keep your products secure and reliable
- Upgradable – increase efficiency using the newest technology
- Unified software versions – become more flexible

Calibration – formal, periodic metrology

Planned regular calibration guarantees your measurement data's quality and validity. Brüel & Kjær offers a comprehensive range of calibration services including: accredited calibration, traceable calibration and verification performed on site or in our lab.

Hardware maintenance – no unpleasant surprises

Under our maintenance scheme we test your instruments according to their original specifications and bring them up to scratch should they fall short. Our service covers repair where necessary – maximizing your uptime.

Repair – by authorised service staff with authorised parts

Our highly skilled service engineers use only original tools and spare parts to ensure repair quality and extend your product's working life. We offer services either on site or in our workshop.

Rental – a realistic option

For short-term projects, or when your instrumentation is being repaired, why not rent from us? This means you can always say "yes" to sound and vibration measurement opportunities and solve them using best-in-class kit.

Managed services

Instead of purchasing and deploying systems, why not let Brüel & Kjær take care of supplying, operating and maintaining solutions, providing you with the data you need.

We recommend

You can combine the basic service and care products as you wish, and achieve appreciable gains if agreements are made over longer periods.

For example, it is popular to combine software updates and a support agreement, typically over a 5-year period. As well as having the latest software and an emergency hotline to call, agreement holders get unique access to attractive offers and receive invitations to join seminars and user days.

Another popular combination is a calibration and maintenance agreement, also spanning a few years. This combination minimizes operational cost and downtime.

www.bksv.com

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Brüel & Kjær

BEYOND MEASURE