EVALUATE MEASUREMENT DATA – WITH NO LIMITS

jBEAM Durability

a software product from Kistler

www.kistler.com

KISTLER

measure. analyze. innovate.

Contents

Data-driven development process for structural durability

An exact durability design is necessary to meet expectations in terms of life expectancy, resource efficiency, and quality. The right conclusions must be drawn from precise data for this purpose. Kistler not only supports its clients with measurement technology solutions and practical know-how, but also with special software.

Tools that ensure efficient analysis and evaluation of the applied loads and the availability of relevant data are a central component of durable vehicle design. jBEAM Durability fits seamlessly into existing development processes, increases the efficiency and safety of data evaluation, and streamlines the approval process by providing a dependable basis for decision making.

Benefit from the advantages of jBEAM Durability in the following situations:

You want to approve components and systems in terms of durability, while at the same time

- minimizing the likelihood of errors through standardized, personalized, and specialized analyses and reports.
- creating valid, comprehensive and, simultaneously, efficient documentation as the basis for approvals.
- ensuring that available knowledge is used as input for each of your decisions.

You are responsible for testing components and systems in terms of their durability characteristics, and you want to

- acquire load data and, as part of a comprehensive measurement campaign, efficiently ensure that all the necessary sensors are delivering valid data.
- commission tests and prepare the relevant testing data in a repeatable and intuitive way.
- issue status reports on tests while at the same time achieving a consistently high assessment quality with minimal time expended.

You analyze and evaluate measurement data in terms of durability and want to

- offer recommendations for action and draw conclusions that require valid methods and algorithms.
- ensure that complex analyses are carried out equivalently across departments and on the basis of the same standards.
- create decision-making templates that allow for spontaneous, targeted discussions of the data in which all parties are informed.

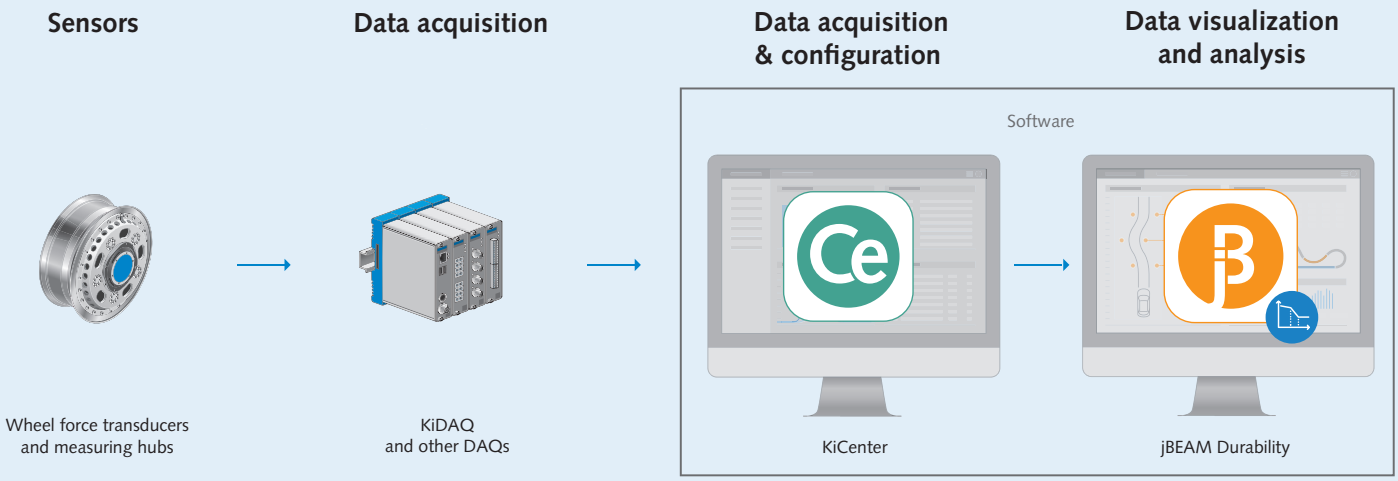
Your partner for durability

Measurement expertise
RoaDyn wheel force transducers from Kistler have raised the bar in the area of durability testing for more than 25 years. They are modular measuring systems with a rugged design. Kistler provides the perfect wheel force sensors for every load class. Customers around the world appreciate the high degree of precision and quality of measurement technology from Kistler for driver, load, and test stand applications. RoaDyn wheel force transducers have proven their worth for traditional drives with a combustion engine, electric vehicles (EV), and vehicles with new drive concepts (NEV).

Hardware for acquisition of your measurement data
KiRoad Performance allows RoaDyn wheel force transducers from Kistler to be flexibly connected to various data acquisition systems or directly connected to a computer. Reliable electronics ensure that RoaDyn wheel force transducers can be configured and controlled quickly and securely. The wireless control unit guarantees reliable processing of all measurement data from wheel force measurement systems.

Software for data acquisition and configuration
KiCenter is the right partner for measurement data acquisition and configuration. This software can be used for wireless control of all settings through mobile devices via an intuitive, web-based graphic user interface.

Software for analysis of measurement data and report creation
jBEAM is an analysis and visualization software that works independently of operating systems as a standalone program and, also, in web-based applications. Full interactivity and performance enable quick analysis, visualization, and evaluation of measurement data. The jBEAM Durability edition combines all key components for an optimum evaluation of load data and supports the user during vehicle and component validation on the test stand.



From sensor to software – the complete measuring chain

jBEAM Durability – the edition for durability analyses

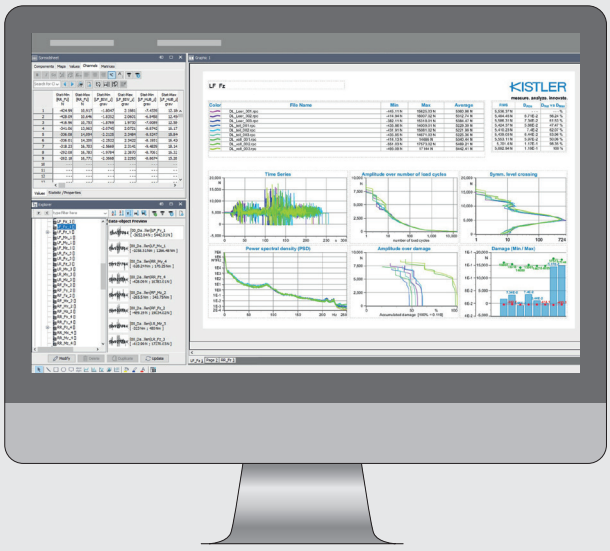
Durability is a highly specialized area of vehicle development. Functions in the jBEAM Durability edition are tailored to match specific needs in this field. Testing and release of components and systems to ensure they meet durability requirements calls for reliable, efficient analysis and evaluation of relevant load data.

Product details:

Advantages of jBEAM:

- Optimum support during analysis and visualization of your data
- Modular design can be expanded as needed
- Automation of processes and repetitive tasks
- Interfaces for integration into the customer's existing ecosystem
- Support from software experts at Kistler
- Specialized consulting of the desired depth

The Durability edition is available in different versions suited to respective requirements:



Starter

Application-specific and standard functions* from jBEAM that already cover a wide range of options in terms of durability

Professional

Comprehensive, user-friendly functions*, tailored to the needs of durability – developed with and for customers

Ultimate

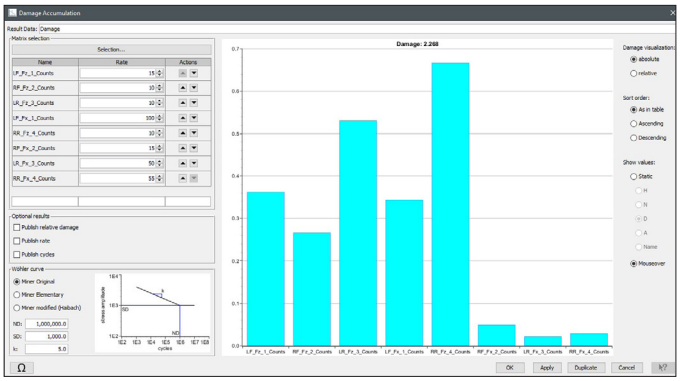
For experts who require the broadest range of functions*

*For an overview of all functions, see pages 12–13

Application-specific software modules at a glance

Modules such as damage accumulation, collective view, and many more provide you with a vast range of instruments to realize processes on the test stand, on the road, and in dealings with regulatory bodies.

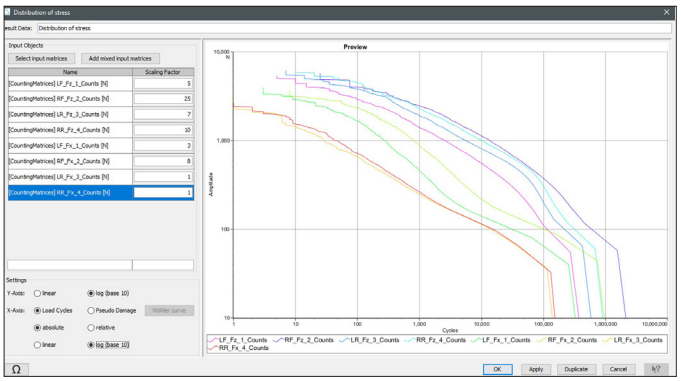
Damage accumulation



Calculation to evaluate the influence of a load spectrum on the life expectancy of a component. The required input data is provided by the Rainflow analysis.

- Variable number of input matrices
- Freely configurable S-N curve
- Interactive display of damage for immediate evaluation

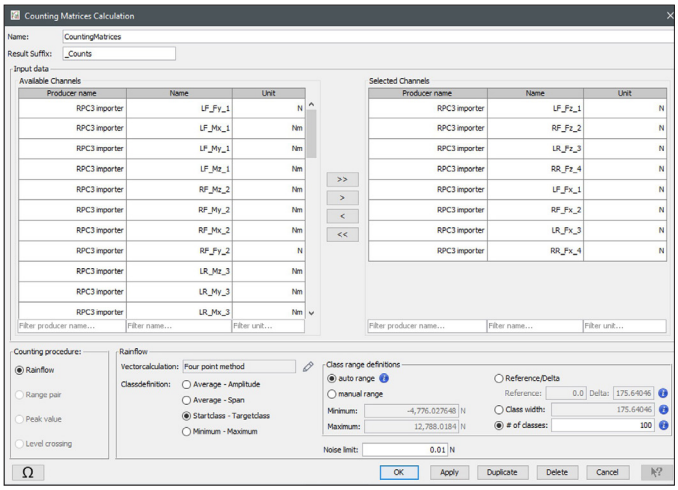
Collective view



On the basis of counting matrices, such as Rainflow, these components calculate the load spectra and display them comparatively. Extrapolation and mixing simplifies discussions in committees.

- Calculation of load spectra for any amount of input data
- Individually adjustable display
- Extrapolation through scaling factors
- Definition of mixtures

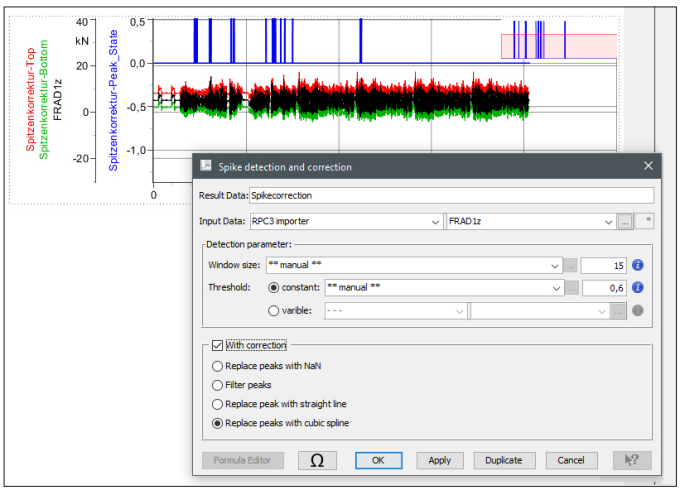
Expanded Rainflow analysis



The Rainflow analysis determines a two-dimensional distribution. It is mainly used to analyze life expectancy. The results are output as a matrix.

- Variable number of input channels
- Flexible configuration of the Rainflow calculation
- Filter function for easier data selection

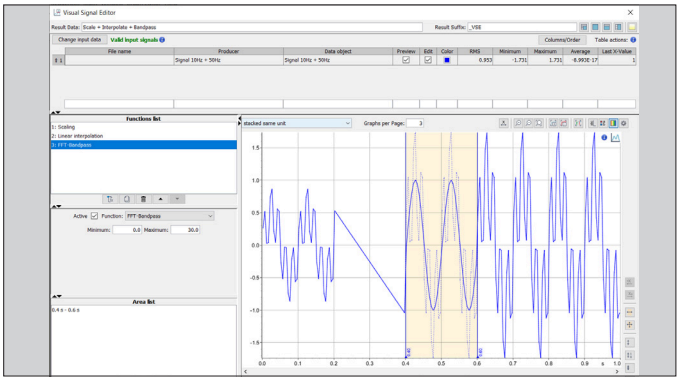
Spike detection and correction



The calculation determines outlier values in a measuring signal and corrects them in a definable mode. Spike detection is easy to configure by defining a range of permitted values.

- Intelligent detection of spikes
- A wide range of correction functions

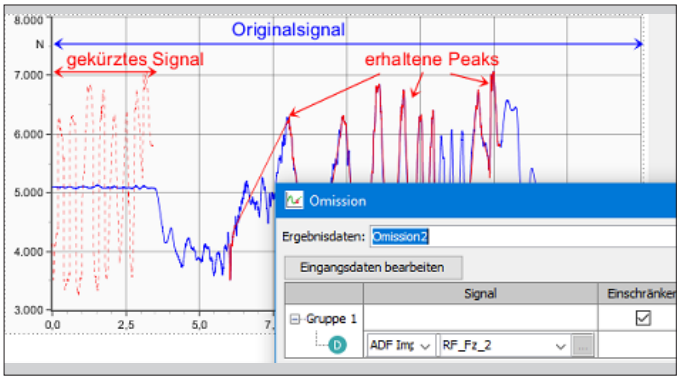
Visual signal editor



The visual editor clearly illustrates signals and permits the processing of areas of signals with a wide range of functions:

- Automatic definition of processing areas
- Arbitrary linking of several processing steps
- Diverse signal-processing functions: filtering, cutting, smoothing, etc.

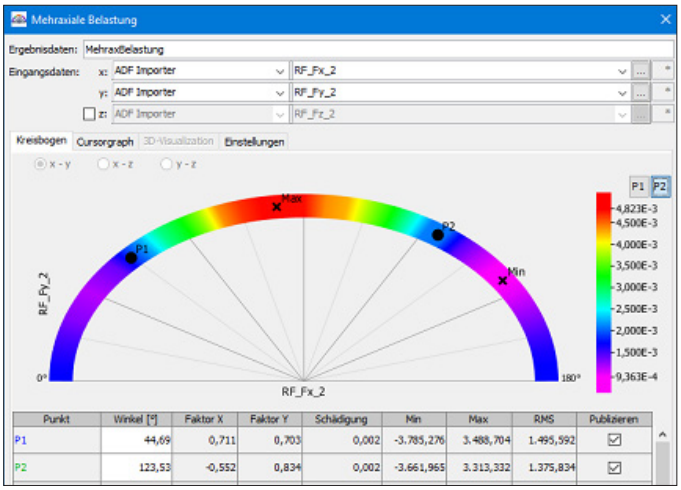
Omission



Convenient shortening of any number of measurement signals simultaneously,taking the damage and extremal values into consideration, as preparation for a test run on multi-axial test stands:

- Flexible parameterization of the minimum damage to be maintained and extremal values
- Grouping of channels with the same parameters
- Clear depiction of result statistics
- Rapid performance of the algorithm
- Diverse validation options with original data

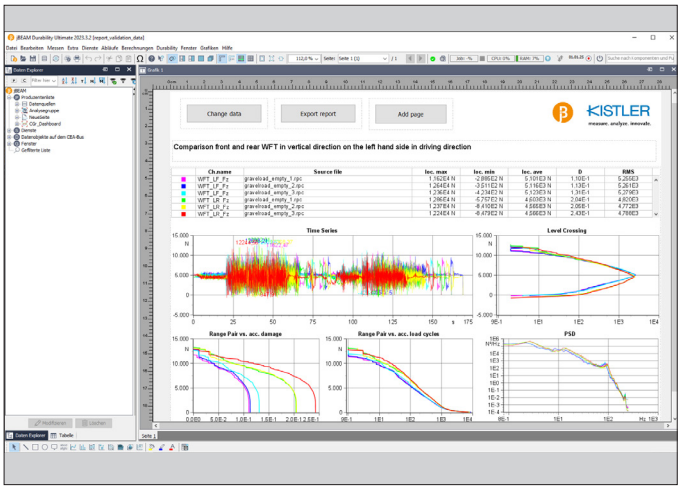
Multi-axial load data



Preparation of single-axial trials in which load signals are vectorially combined in two or three directions and assessed using the damage:

- Exact determining of the most severely damaging direction in a three-dimensional space
- Manual specification of up to two directions for the result data to take circumstances on the test stand into consideration
- Simple and understandable depiction of damage in a 2- and 3-dimensional space

Component templates



Flexible and powerful combination of calculations and graphic depictions of templates to adapt analyses and workflows for specific users and for the systematization of recurring tasks:

- Rapid creation of templates through easy summarizing of existing calculations and graphic depiction
- Effective cooperation through use of common templates
- High consistency and validation of data analysis and processing through bundling of know-how in a template

Advantages of the jBEAM design

Flexible modular principle for easy data processing, efficient report creation, and reusable templates

Free integration and compatibility
jBEAM is part of the Kistler software suite whose products can be combined using defined interfaces, enabling the realization of customized complete solutions from sensor to cloud. Thanks to its open structure, the analytical tool can also be embedded in customer architectures and can control and automate sequences and processes almost arbitrarily.

Data flow and processing without changing raw data
jBEAM is designed in accordance with a flexible modular principle made up of various function blocks – from simple addition all the way to complex Rainflow analyses. These function blocks can be flexibly combined and sequentially applied to achieve the desired data processing for every task.

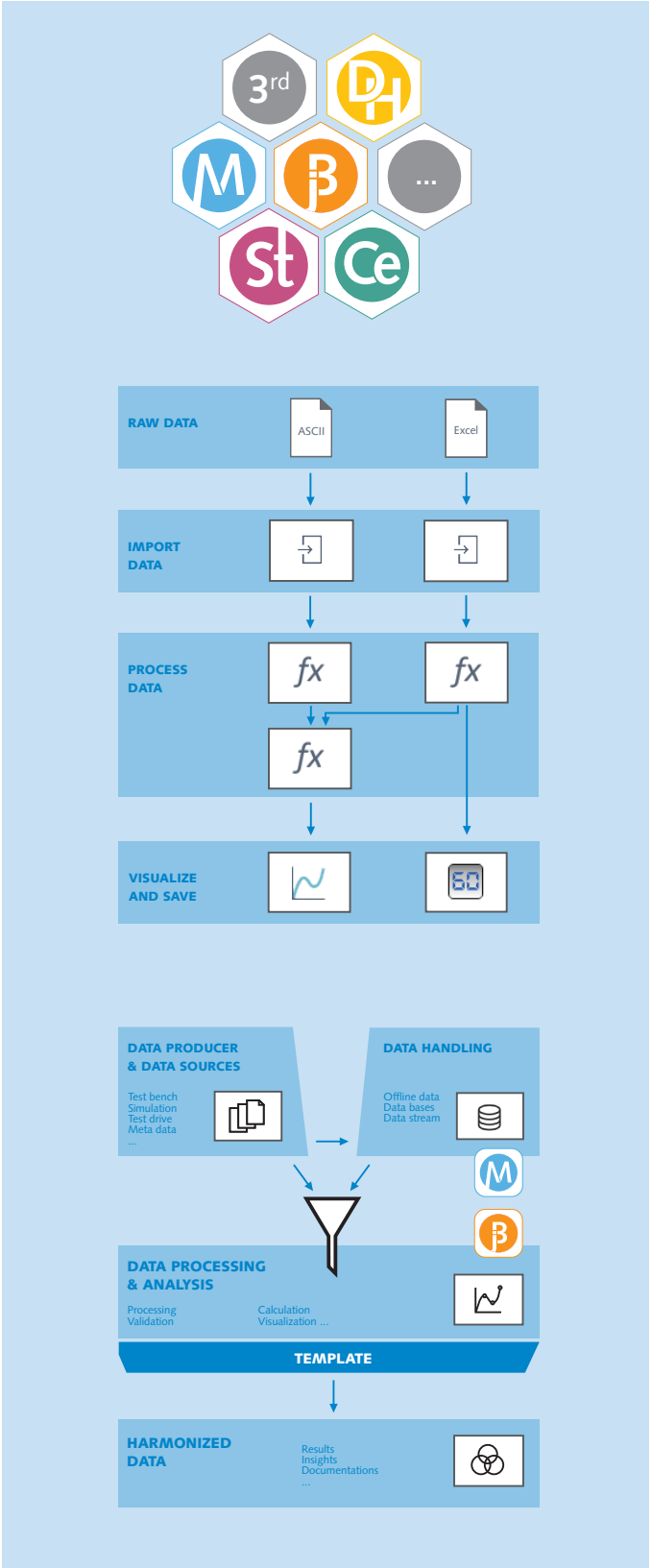
Every block can send its results as input to a downstream block as a data stream for further processing. The system automatically recognizes updates and recalculates the corresponding channels that will be affected by these changes. The individual blocks know the source of their data and can react to changes accordingly. This results in efficient processing, as the affected data channels and calculated results are rapidly made available without the need to realize any manual recalculations. The raw data remains unchanged in order to maintain traceability at all times.

Data harmonization as the key to increasing efficiency
Physical trials and simulations are realized using a variety of methods and equipment. This results in numerous measurement files formatted in different ways which are frequently supplemented by descriptive data. Several potential data sources therefore need to be taken into consideration in the case of evaluation tasks.

jBEAM allows you to create reports with ease and acquire new knowledge on your trials through

- comprehensive support of different data formats and data sources
- a simple merger (harmonization) of channel names and units through mapping rules
- the use of adapted data processing, calculation, validation, and visualization functions

You should preferably save the unique evaluation you create as a template which you can fill with new data or share with your colleagues, thus obtaining the most important knowledge automatically during the next evaluation.



More successful development: application examples

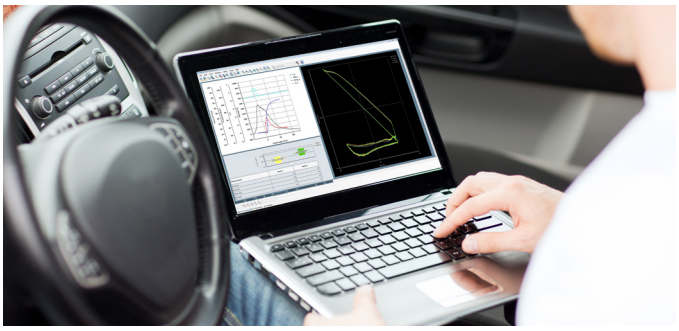
The concrete added value of every solution only becomes evident during a practical application. The objective is to find the optimum solution in an individual case or to make processes possible in the first place. Through the combination of comprehensive consulting, technology, and expert know-how, we are able to create customized solutions that offer you long-term benefits.

The seamless interplay of all system components is the key to success and the tool that allows you to achieve your goals efficiently and reliably. The following examples demonstrate how measurement technology that is properly deployed can be used to overcome challenges and achieve success.

- A quick, practical overview of sensors and channels ensures in an efficient manner that acquired data is valid
- Test stand signals are processed efficiently by user-specific components
- Efficient collaboration through standardized and automated evaluation, thanks to shared use of templates and analytical modules

1: Validation of measurement data – efficiency during load data acquisition

Load data acquisition as part of a measurement campaign with, for example, electric vehicles that are equipped with a large number of sensors is complex and requires a great deal of resources. In addition to placing the vehicle and measurement technology under enormous stress, employees responsible for testing are also subject to a great strain.If any missing or faulty sensor data is determined following the measurement campaign, this can result in considerable costs or suboptimal design. This is why it is so important to validate sensor data throughout the measurement process.



Automated, concurrent validation
With jBEAM Durability, you can create automated reports that show the status of every sensor channel according to predefined criteria on just a few pages. During this process, the jBEAM Template Engine allows you to run this validation for all measurements (e.g. for a single measurement day). You can therefore process all necessary data and make it available in just a few clicks, allowing you to concentrate on your core tasks.

2: Summarization of load spectra – efficiency on the test stand

Load data acquisition generates customer spectra. You need test spectra to validate your components on test stands. The customer spectrum and test spectrum may not differ significantly. When it comes to durability, pseudo damage is often used as a reference value. Pseudo damage is determined by the comparison of the load with a fictional S-N curve. jBEAM Durability allows for different types of summarization: removal of relevant non-damage areas, scaling of amplitudes, and extrapolation of the load-time row. In combination with the comprehensive visualization options, you are always on the safe side.

Preparing a test set-up
In addition to pure summarization of the load-time rows for the test spectra, it is also important to prepare the signals for use on the test stand. This involves taking new samples, adjusting the frequency, spike processing, and much more. Do you frequently use the same test stand with new measurement data? With jBEAM Durability, you only have to realize the adjustment process once. Afterwards, you can simply exchange the data – without any additional work and in compliance with the proven process.

3: Systematization and automation – efficiency in collaboration

Does this sound familiar? You start with a blank page when analyzing your measurement data for each new vehicle.
Now imagine that you share with your colleagues a pool of components for routine analyses that have been uploaded into jBEAM Durability and can be fed with data – regardless of the powertrain technology. The components deliver the required results, reports, and data as a standard feature. The quality of the components is enhanced every time someone uses and fine-tunes them. Or do you require a special function? Simply use the script interface in jBEAM!

Collaboration and security during measurement data analysis
Analysis and processing of measurement data often involves recurring tasks that, nevertheless, require a high degree of concentration. With jBEAM Durability, you can combine a series of component calculation and analytical steps that you can also make available to your colleagues. You benefit from concrete feedback as a result, while your team benefits from increased efficiency and a lower likelihood of errors during everyday work processes.

An overview of all application-specific features

jBEAM Durability (type no.: 2842A)

■ **Full range of functions**
□ **Limited range of functions**

	Functionality	Starter	Professional	Ultimate
Durability	1D and 2D Counting methods: Rainflow, Range pair counting, Level crossing, Overrolling, Dwell time, Range pair and more	□	■	■
	Damage accumulation with configurable S-N curve	■	■	■
	Iterative optimization regarding target damage (Ommision)		■	■
	Optimized creation of load spectra		■	■
	Load spectrum visualization with mixing function		■	■
	Spike detection and spike correction		■	■
Import	25+ file formats (more on request)	□	■	■
	Multiaxial loading		■	■
	Multimedia (images, audio, video)	□	■	■
Visualization	Descriptive presentation of data with about 30 types of charts	□	■	■
	User friendly signal overlays, X-Y-charts, Zoom	■	■	■
	Enriching reports with texts and spreadsheets	■	■	■
	Report export in different file formats	□	■	■
	Grouping of graphics, data and complex calculation processes into own components	□	■	■
Editing I	Offset & Drift correction	□	■	■
	Merge & Append	□	■	■
	Sampling rate transformation	□	■	■
	Transitions, Fade in and out	□	■	■

jBEAM Durability (type no.: 2842A)

	Funktionality	Starter	Professional	Ultimate
Editing II	Stretching, compression	□	■	■
	Filtration	□	■	■
	Data export of channels in arbitrary order (e.g. alphabetical)	□	■	■
	Interactive curve editor		■	■
Generation	Signal conditioning for use at test stands	□	■	■
	Formula editor	■	■	■
	Flexible creation of test signals (e.g. block programs)	□	■	■
	Sinus, Sweep	□	■	■
	Digital channels		■	■
	Input of organizational data (test meta data)	■	■	■
Analysis	Frequency analysis via FFT / Power density spectrum (PSD)	□	■	■
	Comprehensive determination of statistical parameters	□	■	■
	Stress analysis through Rosette calculation		■	■
	Differential and Integral calculus	□	■	■
Organization / Automation	Creation of templates for reusing and sharing of calculation sequences, complex graphics or even entire report pages	■	■	■
	Realization of complex calculations and processes with scripts (Groovy, Python)		■	■
	Collaborative working through the use of common components, projects and parameters		■	■
	Automatic, sequential processing of many data sets, including Folder / File watching		■	■
	Simultaneous processing of data sets with the Data source manager		■	■
	High interactivity of third-party systems via Java and Webservice API	□	■	■

Everything from a single source: software solutions from Kistler

The jBEAM editions expand our software portfolio through powerful interactivity. From KiCenter and CrashDesigner to KiBox Cockpit. Interested in more advanced concepts? Direct connection to our MaDaM measurement data management solution greatly increases your options.

APPLICATIONS

- KiStudio
- jBEAM
- KiReporter
- MaDaM
- LabAmp
- ComoNeo
- Akvisio
- KiBox Cockpit
- maXYmos
- KiCenter
- KiNova
- CrashDesigner

TECHNOLOGIES

- KiConnect TECHNOLOGY
- KiXact TECHNOLOGY

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