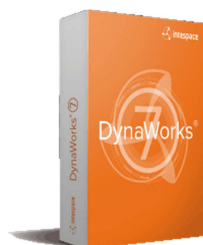# DynaWorks®

> V 7.9.4.0 - PRODUCT SPECIFICATIONS

Integrated test and simulation data management and analysis for demanding professionals

**AIRBUS** DynaWorks

GENERAL DESCRIPTION

DynaWorks® is a comprehensive integrated software suite for test and simulation professionals. Thousands of engineers worldwide rely on DynaWorks to process, exchange and manage their test data.

The DynaWorks® software suite is built upon a flexible database system, allowing users to easily and quickly find, share and analyze their data. The integrated analysis environment includes a complete library of arithmetic, signal processing and visualization tools. Whether you need to analyze data in real-time, or in post-process, DynaWorks® will improve the productivity of your organization.

DynaWorks® streamlines the entire test and validation process. Creating reports, automating analysis and managing the entire process are easier.

Expert modules are available to support a wide range of applications including: mechanical, thermal, acoustic, rotating machines, test tailoring, etc.

Organizations using DynaWorks® report significant improvements in productivity, cycle time, accuracy, quality and technical memory. Designed by test experts for test experts, DynaWorks® brings over 35 years of experience and know-how to streamline the entire test and validation process.
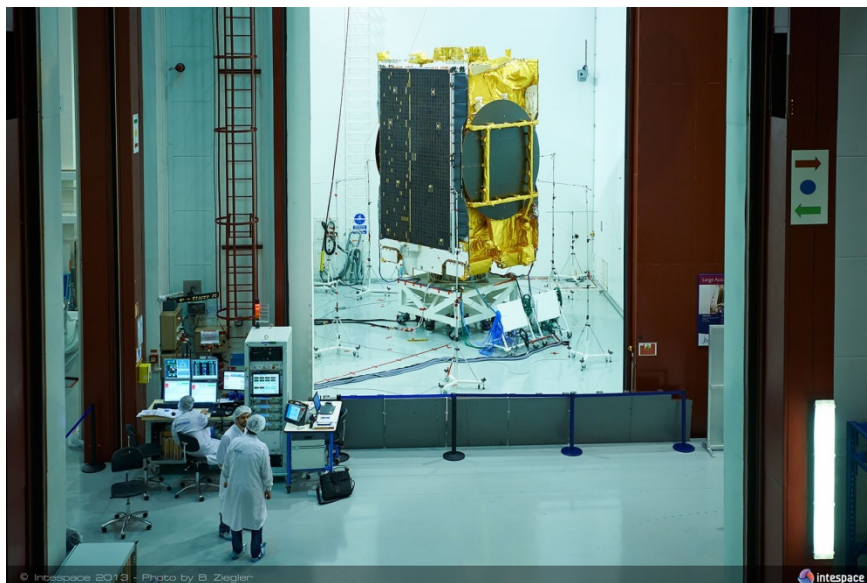
KEY FEATURES

- **Collaborative database :** data sharing, complete import/export tools, easy automation and self-customization capabilities
- **Complete toolbox** with more than 400 signal processing / functions
- **All in One** and **End to End** solution
- **Central node** to environmental test and simulation
- **Automation and self-customization tools**

KEY BENEFITS

- **Reduce test duration** and improve engineering phases
- **Durability** already experimented for many years by our industry leader customers. Long term data repository and traceability
- **Rationalize and Standardize** software tools for testing activities
- **Multi skills analysis**. Integration of legacy code or applications

A WIDE RANGE OF TOOLBOXES

DynaWorks® software solution is the only product in the market that offers advanced data management capabilities, advanced viewers, advanced signal analysis toolboxes, advanced report edition and automatic report generation, advanced hosting and support for all in house and legacy tools.

The DynaWorks® range is expandable and fits perfectly your applications using a combination of toolboxes managed as licenses:
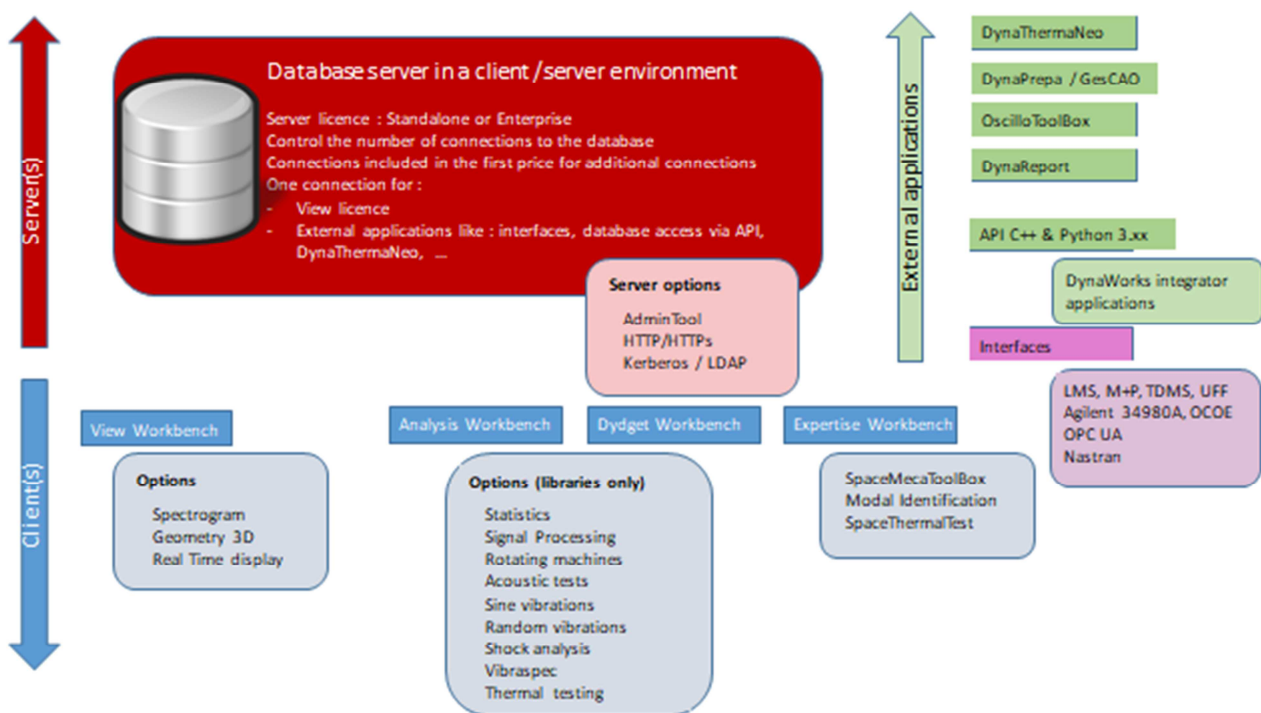
PACK CONTENTS OF BASIC LICENSE

- View Workbench: Database content, 2D, Digital Data, Image, Text, Script
- Standard Interfaces: csv, xls, xlsx, txt, uff58, matlab
- Resources database
- Preferences
- Print, Sessions, Pairing
- Portfolio
- User Menu

EXPERTISE MODULES (IN OPTION)

- Analysis Workbench: up to 400 functions, scripting, variables
- Dydget Workbench: graphical processing tasks design
- Acoustic tests
- Sine Vibrations
- Random vibrations & Vibro-Acoustics
- Shock analysis
- Vibraspec® feature
- Signal processing
- Statistics
- Rotating machinery, Spectrogram
- Real-time display and Alarm Tool

DATA ANALYSIS TOOLS (IN OPTION)

- Advanced database administration tool
- Authentication tool (LDAP / Kerberos)
- Audit
- Archiving

DYNAWORKS COMMON FEATURES

ANALYSIS TOOLS

DynaWorks® provides an exhaustive and powerful range of analysis capabilities. It also integrates a simple and complete command language which enables experts to extend the capabilities without any limits.

Database is directly accessed through graphical or simple man machine interfaces which enable users to focus on their objectives; database operation does not require any specific skill.

DynaWorks® state of the art signal processing functions complies with high standard requirements. It addresses all signal processing needs such as processing on spectra and waveform, identification, filtering, checking waveform signal, statistics processing. Size of files or data to be processed is unlimited.

DynaWorks® proposes a new concept for performing graphically and easily processing by sequences of macro commands: the Dydgets
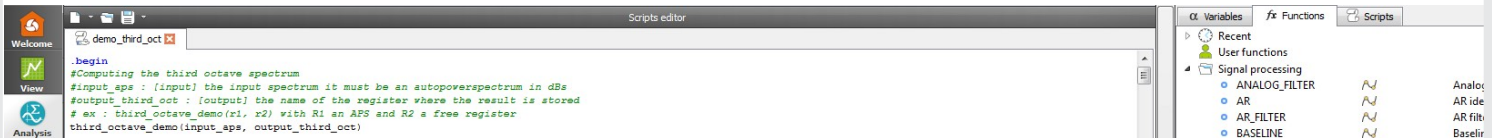

ANALYSIS TOOLS / BASICS

FUNCTIONS

- Works on high level objects and strong object typing: 2D curves f(x), 3D curves (f(x, y), test specifications (Random, Sine, Sine On Noise, Noise On Noise), Logical (width from 1 to 64 bits), Calibration, Text
- Each object is physically typed, ie Spectrum, Transfer, Waveform …
- Parallel computation to shorten calculation time
- Coherence checks on operations based on curve types, units, sampling
- Manual and automated session saving (complete current user environment can be recover)
- Interactive online help & PDF version
- Interactive auto-completion function (macro, object, variable, script)
- Interactive help when calling an analysis function (syntax help, user input dialogs)
- Last functions recall with keyboard arrows
- Calculator mode: calculations are performed directly in the analysis window without using variables
- Element creation using predefined object type
- Invalidate points to replace an inconsistent value by NaN
- Drag and drop mechanism to move or copy data from one window to an other
- Easy functions call back with keyboard arrows or mouse scrolling button
- No modification of the data in the database, all the processing is made on a copy paste into object in the portfolio
- Unlimited number of variables / objects

- All variables / objects can be called in functions and macros
- Automated unit conversion using DynaWorks® customizable unit dictionary for objects and variables
- Complex or Real arithmetic
- Double precision calculation
- Creation of editor pages with specific layout
- NaN value to represent a measurement hole
- Error messages with 3 levels and 3 colors
- Logs in the shell and optionally a file
- Dedicated scripts editor, with syntax highlighting
- Variable type: global, 64 bits integer, double, complex, string, tuples list, object, option
- Sampling rate: even, even by interval, linear, logarithmic, uneven
- Specific signal generation modification with equation or point by point
- Direct access to standard signals
- Automatic resampling strategy
- Description of the accessibility of each function (variable, matrix, array, logical, specific array, tuple)
- Array to matrix analysis
- User function C/C++
- User scripts Python 3.4, 3.7, 3.9

• PORTFOLIO

- Manager of displayed and calculated objects, detachable NEW
- Traceability view
- Group / Folder creation
- Modification of dynamic properties
- Temporary data, Trash
- File Explorer
- Import from the file explorer
- Go To sensor NEW
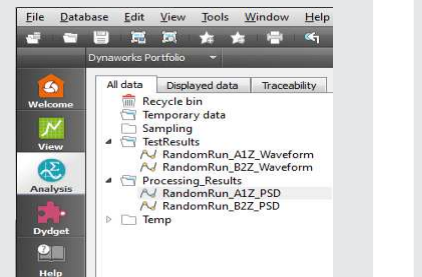
DYDGETS

- Manager of calculation chains project
- Save, Open, Run a project
- Add notes
- A Dydget is a unitary function
- 2 Dydgets are linked by a connector
- All analysis functions are accessible
- Dydget FORM to input data
- Dydget MACRO to launch existing script
- Dydget IF_ELSE to manage conditions
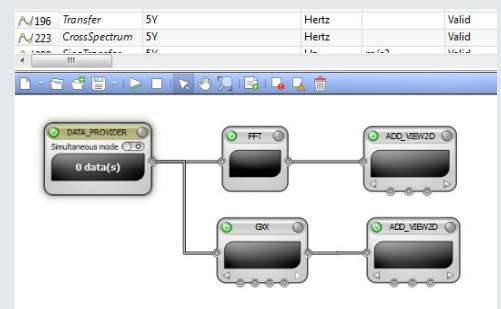
OBJECT EDITION

- Display / Edit / Save / Delete and Print object content
- Copy / Paste value from one object to an other
- Copy / Paste part of a register to the clipboard
- Create object: pages, 2D, 3D, array, matrix, text…
- Index of an object
- Add, remove or replace columns, lines, values
- Link an object to a database
- Delete line, Insert value in an array
- Search value in a register or sort using abscissa, columns
- Read / Write label on X, Y or Z axis
- Get first free object
- Create a n columns matrix from n mono-column
- Sophisticated input data dialog box
- Typed variable, «what is» function returns the variable type
- Binary import and export to file function
- View 2D, numerical, database, spectrogram function
- Plot 2D, numerical function
- Add/Delete user sequence or interval on 2D view
- Add legends on 2D view
- Displayed pages export to PDF file
- Displayed pages export to array
- File and Dir selection box function
- Automatic object's fields update
- Stop Dynaworks processing button
- Direct drag & drop from the data base panel
- Add/Delete link object (qualifier, limit, uncertainty)
- Extract informations about sampling object
- Group management for Portfolio
- Current date
- Current database informations
- 2D curve settings

OPERATORS

- Arithmetic operators:!=, &, *, **, +, -, /, //, <, <<, <=, ==, >, >=, >>, ^
- Logical operators : AND, AND_NOT, NOT, OR, XOR,
- Mathematical library : sin, cos, tan, asin, acos, atan, sinh, cosh, tanh, asinh, acosh, atanh, neperian and decimal logarithm, exponential, exponential base 10, square root, log_decrement NEW
- Smoothing: linear, exponential, logarithmic, polynomial, power, spline smoothing, polynomial surface smoothing of a matrix, cluster of points smoothing
- Signal: decayed sinusoid, ascending / descending sawtooth, gaussian noise, rectangle, trapezoid, triangle, half sine, swept sine, versed sine
- Matrix: product of matrix, solve linear systems, matrix transpose, identity square matrix, inverse and pseudo-inverse, matrix of zeros, unit matrix
- Miscellaneous : sprintf, extract_string, type conversions (atof, atoi, datetof, datetoi, logicaltomatrix, matrixtoarray, matrixtological ...)
- Highest value of the upper integers in a real, complex or scalar
- Condition number with respect to inversion of a real matrix
- Complex conjugate of a matrix or a complex scalar
- Linear / quadratic integration, scalar linear / quadratic integration
- Maximum / mean envelope, standard deviation between curves
- Re-sampling, interpolation, decimation
- Replace NaN value with values from another signal
- Assign values under a threshold to zero
- Tracking zeros
- Peaks detection
- Slope on signal
- Column sum

STATISTICS

- Chi2 test for a normal or log-normal distribution
- Value of the chi2 statistic
- Value of an F distribution
- Normal / Log normal distribution
- Gaussian distribution
- Value or signal m+ns assuming a (log) normal distribution and confidence level
- Geometric mean of a distribution
- Test for a normal or log-normal distribution using Henry criterion
- Histogram
- Harmonic mean of a distribution
- Multivariate linear smoothing of a real signal
- Median of a distribution
- Unbiased / Biased moment
- First 4 moments and the RMS value of a signal

- Poisson distribution
- Cycle counting using Rainflow counting method
- Cycle counting using average and alternative amplitudes
- Eliminates points of a signal
- Sliding / mean value / RMS Value standard deviation / skewness/ kurtosis
- Value of the Student statistic
- Uniform distribution
- Weibull probability density / probability distribution

SIGNAL PROCESSING

Processing on Spectra and Waveforms
- Auto-regressive identification
- Coherence function
- Estimates coherence function
- Convolution of two series
- Discrete Fourier Transform of a real or complex signal
- Estimates energy spectral density
- Fast Fourier Transform (Cooley-Tuckey Method)
- Singleton direct FFT
- Spectrum shift around a null frequency
- Unwrapped FFT
- Estimates power spectral density
- Estimates cross-spectrum
- Cross-spectral matrix
- Harmonic spectrum
- Hilbert transform
- Inverse Fast Fourier Transform (Cooley-Tuckey method)
- Singleton inverse FFT
- Calculates the first 4 moments and the root mean square value
- Overflow / Underflow test of a vibration signal (Sine, Random, Acoustic, Transient)
- Partial Coherence Matrix
- Concatenates a signal over a given number of periods
- Waveform synthesis
- RMS value from a power spectral density
- Calculates the RMS value of a power spectral density and other signals
- Estimates auto-correlation
- 2D auto-correlation
- Estimates cross-correlation
- 2D cross correlation
- Sliding, mean, RMS value, standard deviation, skewness, kurtosis
- Breaks down a signal into time segments
- Fourier spectrum
- Spectrum format conversion: linear, PSD, ESD
- Estimates transfer function
- Underflow test of a vibration signal (Sine, Random, Acoustic, and Transient).
- Window detection
- Applies or compute observation window
- Zero padding

Identification functions
- Complete identification using Prony method
- Partial identification using Prony method
- Synthesis of frequency response
- Prony Multi-Pulse
- Circle fit

Filtering
- Filters a signal using a finite impulse response filter
- Filters a signal using a finite impulse response filter, with linear phase difference cancelling out.
- Filters a signal using an infinite impulse response filter
- Filters a signal using an infinite impulse response filter, with linear phase difference cancelling out.
- Infinite impulse response filter synthesis
- Finite impulse response filter synthesis
- FIR synthesis (Remez)
- Auto-regressive filtering
- Interactive signal filtering (filter_scale)

Checking waveform signal
- Stationary test of signal
- Moments

Time-Frequency analysis
- Wigner-Ville transform
- Sliding FFT (Singleton and Cooley)

DISPLAY TOOLS

DynaWorks® offers extensive graphical capabilities, and a one-click display of data stored in the database. A complete list of display formats is available: 2D, Array, State words.

Curves are displayed with a very high level of quality and accuracy which is of utmost importance for users looking for details.
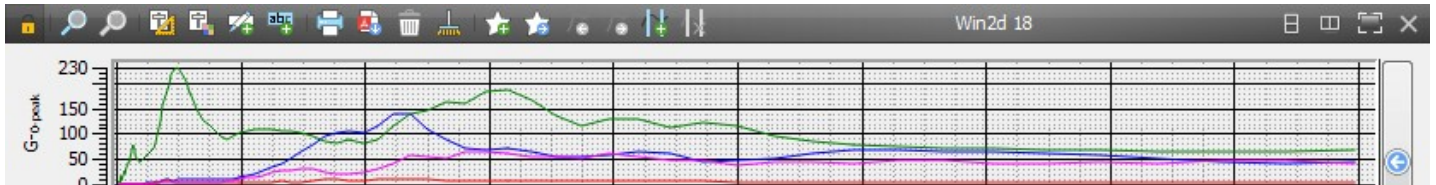
DISPLAY TOOLS

BASICS 2D DISPLAY

- Intuitive GUI to define all options and apply it to all visualizations
- Add / Remove visualization pages
- Move pages from one screen to another
- Rename pages
- Page layouts customization
- Duplicate / Modify visualization layout
- Magnify to full screen
- Contextual menu, Options, Favorites, Association Action / Object, open grouped data according to favorites
- y=f(x) display for real, complex, set of curves, test specification (sine on noise, noise on noise, sine, random), matrix, calibration law, and logical functions
- Display state words
- Decimal or scientific axes graduation (automatic with a number of significant digits)
- X axis displayed as real values, time or date
- Multiple Y axis, one axis per unit or one axis per quantity with automatic unit conversion and spectrum format conversion
- Optional axis title
- Units displayed on the axes with homogeneous unit management
- Choice of number of decade, automatic or manual scale (on X, Y or both), choice of fonts, symbols, dashes
- Complex curves: module-phase, module, real-imaginary, real, imaginary, Nyquist, Polar
- Lissajou curves (XY mode)
- Linear, logarithmic axes
- Graduation options: primary, secondary
- Axes centered with a specified intersection point
- Display spectrum in a same matrix, step by step
- Qualifiers, Limits/Alarms and uncertainties management
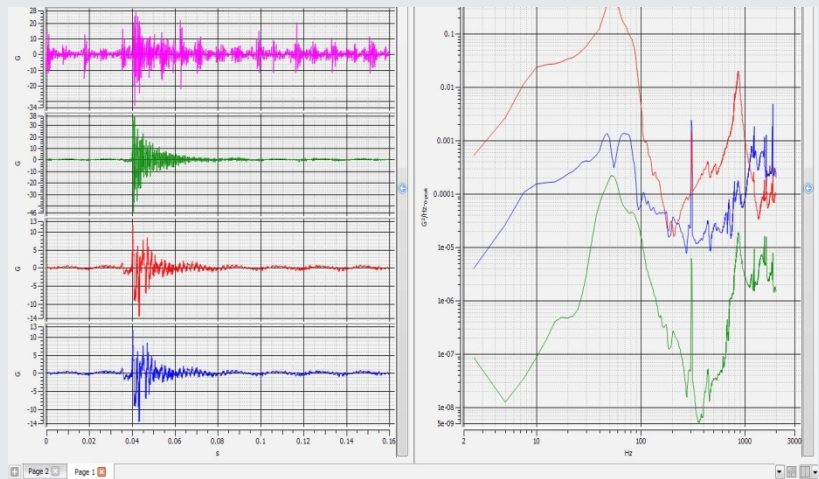
- Signal listening
- Direct 2D display of data from opened database view or files opened from Portfolio
- Unlimited number of curves in a single window with automatic unit conversion
- Measurement holes management
- Dynamic link with database
- Logical data displayed in analog or digital modes
- Customizable display format: colors, display mode wired, wired + symbols, scatter plot, bar reason for filling style dashed, 17 symbols and three different sizes
- Bars mode display
- Selection of interval to be processed (deletion, calculation…)
- Graphic curve selection with the mouse
- Zoomed area displacement
- Wheel based quick zoom, on X, Y and XY
- Secure display with lock / unlock curves edition
- Copy / Paste, Drag and drop
- Coordinates display: vertical cursor, horizontal cursor, slope
- Automatic update of displayed data on an object modification
- Display sequences (event and phase)
- Capture clipboard

- Drag and drop to MSOffice
- Legend editor allows fully user custom legends (database field, user property, calculated variable i.e. RMS value, logo…); several legends can be defined (one for each side of the graph and several inside the graph)
- Legends saved in the database & linked to the concerned signal
- Configurable user menu
- Print in Postscript, PDF Export from one editor, or from all editors
- Spectrum scaling conversion: 0-Peak, Peak-Peak, RMS for frequency signals
- Spectrum conversion: acceleration, velocity, displacement
- Juxtaposition of numeric values in slave mode
- Undo / Redo
- Anti-aliasing
- Invalidate values
- Display of curves built from two columns of an array
- Repositionable coordinate label
- Excel export
- Display logical signals with labels
- Peak extraction on frequency signals, amplitude signal, smoothed data
- Access & display original signal

SPECTROGRAM DISPLAY

- Max envelop calculation, thresholding on color scale NEW
- Campbell order extraction (linear or RMS correction with frequency tolerance)
- Vertical and horizontal cursor addition
- Pointer addition
- Display order by interval
- Zoom & automatic updates of all the plots
- Scales : lin/log, grid, font, color, significant digit, automatic / manuel / decade
- Unit & quantity management
- Acceleration, speed, displacement, 0-peak, peak-peak, RMS
- Order line display
- Display in standard plot
- Max legend of the spectrogram
- Handling optional display areas
- Open extraction display areas
- Open extraction curves in 2D view
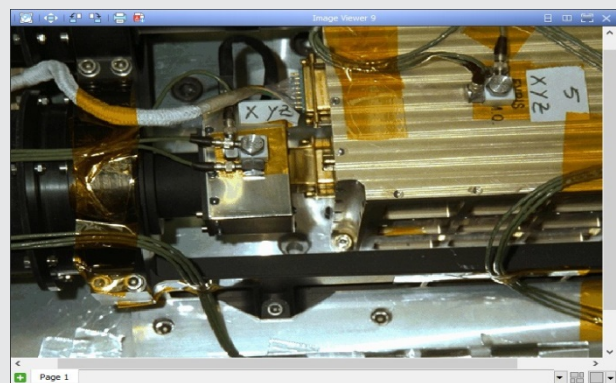- Possible Drag & Drop of 2D curves from current database to the extraction bottom area

Spectrogram Display
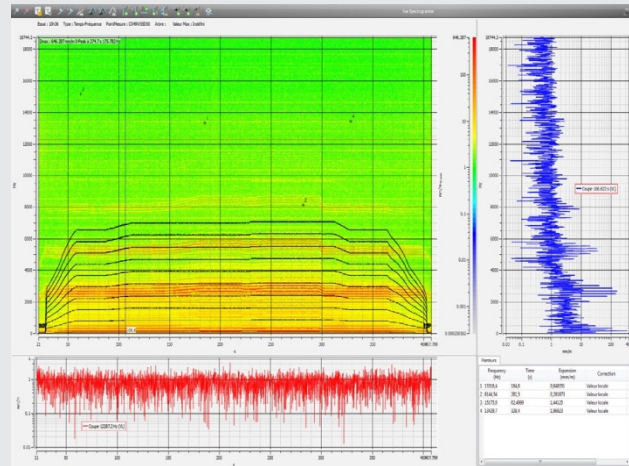
DIGITAL DATA DISPLAY

- Digital display of data from opened database view or files opened from Portfolio
- Open grouped data according to favorites
- NaN management, Invalidate values
- Lines or columns display of matrix, array, logical
- Decimal,scientific or automatic axes graduation (with a number of significant digits)
- Format management per unit or global
- Complex: module-phase, module, real imaginary, real part, imaginary part
- X values as real values, time or date
- Dating accuracy up to 1 millisecond
- Copy / Paste, Drag and Drop
- Direct edition of values
- Find function
- Contextual menu, Options, Favorites, Association Action / Object
- Font size modification
- Spectrum scaling conversion: 0-Peak, Peak-Peak, RMS for frequency signals
- Undo / Redo
- Excel export
- Print on multiple pages
- Last n values display mode
- Qualifier and Limits/Alarms management

PICTURE DISPLAY

- Image files stored in the database
- Supported image file formats : .jpeg, .gif, .tiff, .bmp, .png, .ppm.
- Zoom in, Zoom out
- Rotations
- Legend under the image (from scratch or saved into the database)
- Display in real size or fit to frame
- Clockwise and counter-clockwise rotation
- Copy displayed image to applications of Microsoft Office Package
- Printing displayed image
- Export displayed image to PDF file

TEXT DISPLAY

- Text editor integrated in DynaWorks 7
- Text files stored in the database
- Edit/Create/Modify from the Text Viewer
- Quick search
- Printing displayed text file
- Font size modification

INTEGRATED POWERFUL DATA MANAGEMENT

DynaWorks® is the only product of the market able to provide an integrated data management solution. The database allows users to manage and archive all types of data formats used in the test and engineering process. The database model is customizable to the customers need and process. It provides the user transparent integration with the display and analysis tools. High performance database makes it the leader in the technical data management market.

DynaWorks® is delivered with a complete suite of database administration tools as well as access rights management and authentication mechanisms able to comply with the more demanding needs.

DynaWorks® includes an advanced database engine to answer the needs of the most demanding customer in test and simulation. It manages a large single database spread over several systems (local to a computer, on a centralized server, on or off line). It has been design for high security run requirements and can run with multiple connections made by physical users or softwares.

The extended enterprise option is dedicated to the multi-site or multi-partner projects. It guarantees data availability at anytime and anywhere in the world with the highest security control (VPN).

PROFESSIONAL DATABASE

STANDARD DATABASE

- Favorites databases and server connections
- HTTP and HTTPS protocols for database connections on Linux
- Create, Open, Close a database
- Quick search of a volume or a database
- Select, Read, Write data
- Modify data (objects and fields)
- Possibility to propagate keys values modifications for data consistency
- Client-server model through Local Area Network
- Filter (standard or advanced) and sort, advanced data extraction
- Add/remove columns, add new columns calculated by formula
- Direct edition of field within a mouse click
- Multiple editions of data fields
- Display and sort a list variable in a database window
- Transactions - record begin and end, cancel a transaction
- Relational database model with object extensions - class, sub class - prede-fined database models to address dedicated skills (mechanical, thermal..)
- Field types : characters, integer, short integer, float, double, date and time (precision: second), high precision date (nanosecond) time, version, id, bit stream, fixed precision decimal numbers
- Individual definition of column format (date, real values digits, width)
- Fields qualifiers : mandatory, optional, non-used, non-editable, linked to an engineering unit, validity domain, with a default value, calculated.
- Display accreditation level NEW

- Objects type: Curve matrix -c=f(x,y),array, calibration law, picture, logical value from 1 to 64 bits wide, text, video, MS office document, open office, pdf
- Possibility to store raw un-calibrated data
- Display RAW or calibrated data
- Configuration management of calibration
- Automatic client reconnection
- User-defined intervals of interest, allows to automatically cut large records when data is read from the database
- Measurement stored in 16 bits integer, real single/double precision or complex format. Constant, by interval or any sampling
- Virtual class for a better organization of the data
- Data model management tool (updating, database configuration, compatibility with previous DynaWorks® Data models…)
- Powerful integrated database engine allows to manage all items related to test/prediction/simulation activities
- Max database record size (2GBytes)
- Raw data stored as 16 bits integer, 32 bits integer, single or double precision real values
- Engineering data stored as 32 bits or 64 bits floating point real or complex values
- Telemetry data management and on the fly high-performance de-commutation and calibration to display curves in engineering values
- Compensation for sensor orientation
- Local database cache mechanisms
- Databases with different models can be opened in the same session
- Big Data system integration, capability to index, display & process data from SILO

- Configurable user menu
- Font size modification
- Excel export of the database view
- Tree view for business oriented data display
- Details view for quick access to all fields values
- Connection to other kind of databases (on demand)

REQUEST TO THE DATABASE

- Unlimited opened and displayed database simultaneously (license connection required)
- Data retrieval by simple click and browse engineering approach: i.e. from Program to Test and Measurement, from Program to Calculation and Results
- Double click class to class browsing
- Configurable reading range for display and export (between 2 dates, event, phases, last phases & duration), Current Phases is refreshed in realtime
- Filters on columns with textual filters, numerical filters, chronological filters
- Favorites database queries
- Quick preview
- Interactive form request (showing the field defined in the database model)
- Request by browsing from one class to another - the criteria is built automatically by DynaWorks®
- Quick search feature accross all fields of the table
- Sorting by clicking on the top of the column (field name)
- Selection of field to be displayed, including calculated field from equation, other field or signal value.

- Request by language using test operators (=, !=, <, >, <=, >=, =~, !~), combination operators (and, or, not, min, max), join operators between class, numerical operators (+,-,/,*,^,sin, cos, tan, asin, acos, atan, log, exp, exp10, sqrt, power, minval, maxval, rmsval, sigma, meanval, sizeof) on whole curve
- Request between dates, on phases, on last phases, on duration, on a percentage of an event
- Color definition to highlight data matching a criterion (ie invalid measurement)
- Lossless Data compression tools included; reduces data size and increase network performance, improves global performance
- Data validity control using domains or list of values
- Unix / Linux / Windows automated database conversion
- Delete, Add or Modify access mode by class
- Automatic recovery after a software or hardware crash
- Preferences, tooltips
- Access rights management by users and profile
- Access rights management on the data itself (Credentials)
- Favorites order customizable NEW

DATABASE ADMINISTRATION

- Specific administration tools dedicated to server, volume or database
- Administration of local or remote database server
- Server and databases logs consultation
- Scan server to find databases (all server or part of it)
- Defragment database
- Users access management
- Index management High performance database engine with multi-core 64 bits technology; > 400 simultaneous users and several terabytes database
- High performance storage of short objects in blobs
- More than one billion records per relational database table (and up to 32 000 tables)
- Scalable design allows taking benefit of many processor cores and memory size
- Authentication with local database passwords
- Authentication mechanism: interface with Active Directory and LDAP, NIS+
- Authentication mechanism with SAML in Dyna / HTTP / HTTPS protocol NEW
- Users administration
- Table space management allows to separate database storage pools on different hardware units
- Fine access control per table, per record or per field granularity; access controls can be specified by physical criteria
- Database table partitioning based on hash field
- Fine parameters tuning to achieve maximum performance

- Monitoring tool tracks all the server parameters (free space, fragmentation…), send alerts by emails to administrator…
- Duplicate, Rename, Delete database
- Change status of database
- Zfs file system integration (Solaris server only) Snapshots allow to back up a database in a couple of seconds
- Data model reconfiguration
- Integrity checks
- More than several Tera-bytes of attached objects
- Low overhead (4 octets + 4 octets per index) Ultra high reading/writing performances: several thousands of writing transactions per seconds
- Multi-threads architecture - allows to have a better performances sharing increasing the number of processors
- Conversion 32bits (old version) to 64 bits
- Conversion from PC database to UNIX, from UNIX to PC
- Database creation from old API, always transformed in 64 bits creation
- Rotative database log files NEW
- Archive a Windows database NEW
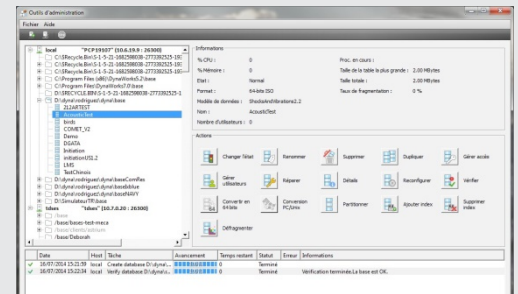
EXTENDED ENTERPRISE (OPTION)

This special edition includes an advanced database engine to meet the needs of the most demanding customer in test and simulation. Beside its standard capabilities, it can deal with a number of values stored in the relational part of the database (instead of objects).

DynaWorks® manages a large single database spread over several systems (local to a computer, on a centralized server, on or off line). It has been designed for high security run requirements and can run with multiple connections made by physical users or softwares.

This edition is ideal for companies that need a centralized data center to deal with all aspects of the product cycle life, and/or complex measurement and design processes.

DynaWorks® extended enterprise capabilities are dedicated to the multi-site or multi-partner projects. It guarantees data availability at anytime and anywhere in the world. It allows sharing all data with the highest security control (VPN). Engineers and technicians can work on test and design directly from their office or in remote access.

- DynaWorks® remote access and operations
- VPN between the different nodes of the networks (server, and client computer)
- Connection to common resources database

- Same data access features as a LAN operation; for security reason no administration is allowed through this access mode
- Volumes list and databases description

AUTOMATION AND SELF CUSTOMIZATION TOOLS

DynaWorks® design allows users to integrate their own know-how.
DynaWorks® includes four customization modes.

Macro Commands/Scripts
Macros: Processing procedures or in-house processes can be automated using macros or user defined functions.

Menu: DynaWorks® GUI can be customized to fit perfectly the company's existing process.

A SDK (Software Development Kit) is also available for advanced users who need to go further in customization.
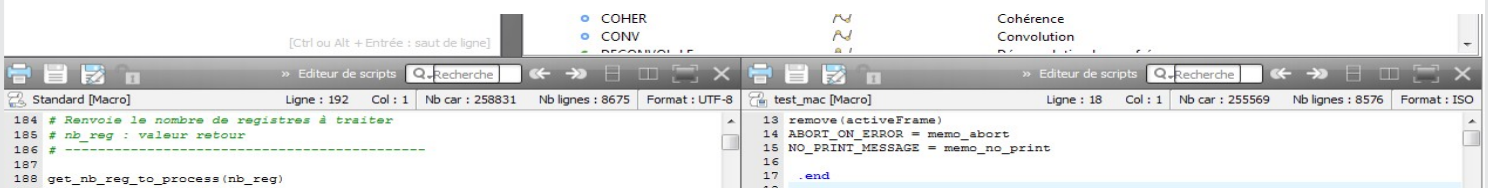

AUTOMATION AND SELF CUSTOMIZATION TOOLS

COMMON RESOURCES DATABASE

- Database to share resources like units, macros, default values, legends, templates, calculated field, predefined views among users
- Personal resource and shared
- Unit manager, preferred Unit, Dimension, Quantity, IS Unit
- Scripts / Dydgets configuration management
- Recent database, Model translation
- Action / object association
- Naming rules of the Portfolio object
- User profile selected at start-up allows configuring loaded modules as well as removing unneeded functionalities
- Profile management
- Quick access through "Organize" menus

MACRO COMMANDS / SCRIPTS

- Automated process generation with scripts (standard language and functions delivered with DynaWorks®)
- Variable declaration in the function protocol or in the macro
- Local or global variable
- Sub routine - one macro can call others
- Standard macro can be run by all the users
- Personal macro (not shared with others)
- Interactive functions – display message, ask for a choice in a predefine menu, run a routine
- Display the list of available macro (content and the syntax also displayed)
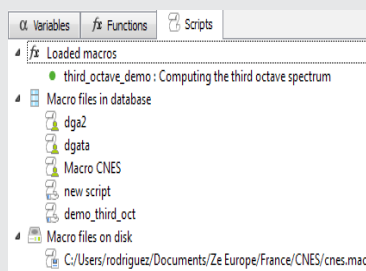

- Full access to the DynaWorks mathematical library
- Easy and user-friendly integration in DynaWorks GUI
- Display the list of available functions with syntax via tooltips
- Dedicated editor, highlight of keywords
- Run a macro on displayed objects (all or selected, curve or point)

SOFTWARE DEVELOPMENT KIT - OPTION

- A SDK in C++ language is available for advanced functions or application development like interfaces with other systems or run-time application
- DynaWorks GUI and configuration can be completely customized
- Compatibility with application developted with older version of the SDK
- User scripts Python supported

OTHER FEATURES

- Session save / recover
- Session activity record
- Session layout preparation with DataDispatch workbench for quick data repartition on pages (support of custom layout, multi-screen …)
- Multi screen support
- Data import by simple drag and drop file
- Dedicated installer
- French / English version
- Possible foreign language (option)
- Pairing data to display graphics to generate automatic report
- Only one framework, with different skill workbench
- New skill oriented icons and ergonomic
- Customization of icon size
- Tool tips on icons
- Data model viewer workbench (*Beta version) to consult and modelize the data model structure (classes, fields and links)

DYNAWORKS EXPERTISE MODULES
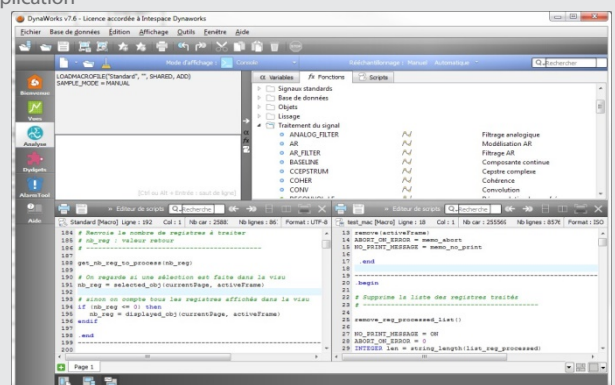
ROTATING MACHINES

This Expertise Module has been designed in cooperation with major European engine manufacturers and improved for many years. It provides a very high results and display quality thanks to a state of the art analysis of vibration tools. The main goal of this module is to improve the efficiency and performance of unbalanced rotating parts analysis.
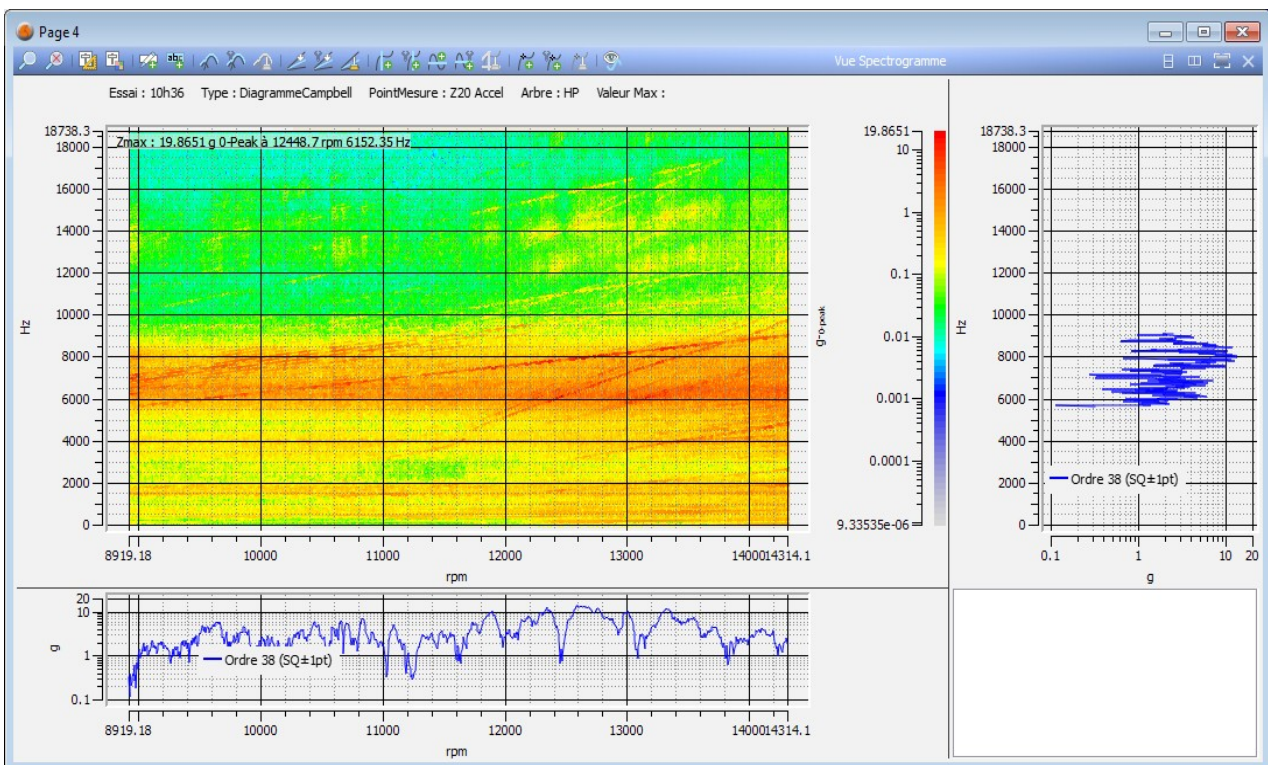
- Tracks frequencies
- Global spectrum
- Order(s) tracking
- Extract order from a Campbell
- Overall level processing on segmented waveform
- Resample one/several rating(s) signal
- Segmentation on round top (time deviation)
- Segmentation on round top (rating deviation)
- Engine rating from tachometric signal
- Thresholds a Campbell diagram
- Conversion between time of segment and associated rating value

ACOUSTIC TESTS, SINE VIBRATIONS, RANDOM VIBRATIONS AND VIBROACOUSTICS

DynaWorks® vibration modules include a complete range of standard tools dedicated to vibration analysis as well as more advanced capabilities.
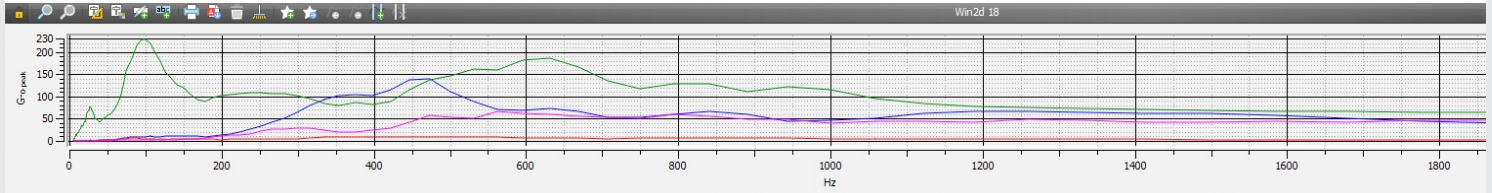
SINE VIBRATIONS

- Discrete or fast Fourier transform
- Complete identification using Prony method
- Partial identification using Prony method (amplitude and phase)
- Synthesis of a waveform impulse response from modal characteristics
- Sine signal truncation into frequency sweep bands
- Compute the global/harmonic frequency response function of a swept sine test time response
- Re-Sampling of a sine measurement channel
- Fourier spectrum

RANDOM VIBRATIONS & VIBROACOUSTICS

- Power Spectral Density, PSD by maximum entropy
- Energy spectral density
- Fourier transform
- Fourier spectrum
- Coherence
- Cross spectrum
- Auto and cross correlation
- Transfer function
- Random response spectrum
- Power spectral density RMS value
- RMS value of a signal
- Overflow / Underflow test of a vibration signal
- Moments
- Sliding mean value, RMS value, standard deviation, skewness, kurtosis
- Break down a signal into segments of constant width
- Stationary test of vibration signal
- Application of an observation window

to a time domain signal – Hanning – Hamming – Flattop – Kaiser – Laplace – Gauss – Blackmann – Triang – Parzen
- Adds points with a null value to the end of a matrix - zero padding
- Resolution reduction for narrow bands
- Gaussian distribution
- Cumulative RMS value from PSD NEW

ACOUSTIC TESTS

- Linear interpolation of a spectral band
- Acoustic power radiated
- Frequency diagram for A, B, C, D or E acoustic filters
- Global level of one or more spectrum
- Switches from narrow band acoustic spectra (Pa/Hz) to wideband spectra dBs of pressure
- Cumulated acoustic spectrum
- Acoustic field transposition according to specific atmospheric conditions including absorption models (ARP860, Sutherland)
- Power spectral density
- Noise recover from a signal, eliminate peaks, depend on threshold
- Convert acoustic spectra from dB to Noys
- Narrow band spectrum to wideband spectrum, normalized acoustic frequencies
- Overflow / Underflow test of a vibration signal
- Perceived noise level
- RMS spectrum
- Global RMS value
- RMS value
- Sliding mean value
- Sliding RMS value
- Sliding standard deviation
- Sliding skewness

- Sliding kurtosis
- Break down a signal into segments of constant width
- Fourier spectrum
- Stationary test of vibration signal
- Third of octave spectrum from narrow bands
- Corrected perceived noise level
- Application of an observation window to a time domain signal – Hanning – Hamming – Flattop – Kaiser – Laplace – Gauss – Blackmann – Triang – Parzen
- PNL/TPNL/EPNL computation
- Tones separation
- Broad band separation
- Engine order conversion
- Narrow band spectrum resolution conversion
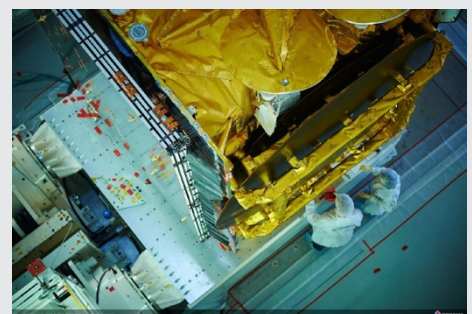
SHOCK ANALYSIS

More than a standard shock analysis toolbox which includes all required tools, this expertise module includes a test computer assisted design function which allows to define the minimum shaker characteristics.

SHOCK ANALYSIS

- Fast Fourier transform
- Inverse fast Fourier transform
- Shock response spectrum
- Inverse shock response spectrum
- Fourier spectrum
- Filter a signal by convolution with a filter's impulse response
- Impulse response of a finite impulse
- Response filter
- Quantification of error between 2 waveform signals according to the Geers criterion
- Fall and rebound portions of a free fall or forced fall test
- Overflow test of a vibration signal
- Periodisation of signal
- Break down a signal into segments of constant width
- Compensation of a signal for a shaker shock
- Overflow / Underflow test of a shock test

- Application of an observation window to a time domain signal – Hanning – Hamming – Flattop – Kaiser – Laplace – Gauss – Blackmann – Triang – Parzen
- Add points with a null value to the end of a matrix - zero padding
- Synthesis of a single shock by cursors (shock_scale)
- Piersol Criterion

THERMAL TESTING

DynaWorks® experts work for many years in close cooperation with "ex-Intespace" thermal testing team with a common goal of test quality and duration improvement.
DynaWorks® Thermal testing module includes all functions used in thermal tests as well as advanced methods to accelerate thermal qualification of tested specimen.

All Airbus test engineers know-how has been introduced in DynaWorks® in order to reduce the time generally needed to reach thermal balance in vacuum tests

THERMAL TESTING

- Signal re-calibration according to a new calibration law
- Dew point
- Thermal balance for thermocouples

REAL-TIME

DynaWorks experts work for many years in close cooperation with Airbus Defence and Space thermal testing team with a common goal of test quality and duration improvement.

The Real-time DynaWorks option expands the DynaWorks core capabilities with some monitoring features dedicated to critical test systems like thermal, static and fatigue.

In conjunction with the simultaneous real-time data collection in multiple DynaWorks databases, the real-time option provides graphical monitoring capabilities of the measurements, alarms configuration and overlay, multi-screen management with measurement grouping and data processing for prediction and model correlation.

Providing state of the art features, DynaWorks Real-time is the best add-on to a test and simulation environment to reduce test duration, facilitate test and simulation correlation and guarantee 24/7 data availability on test campaign of any size and duration.

DynaWorks offers the capabilities to complement the real time option with our OPC UA client/server to collect the information published by the compatible equipment (like the command and control systems) and to publish variable stored with DynaWorks.
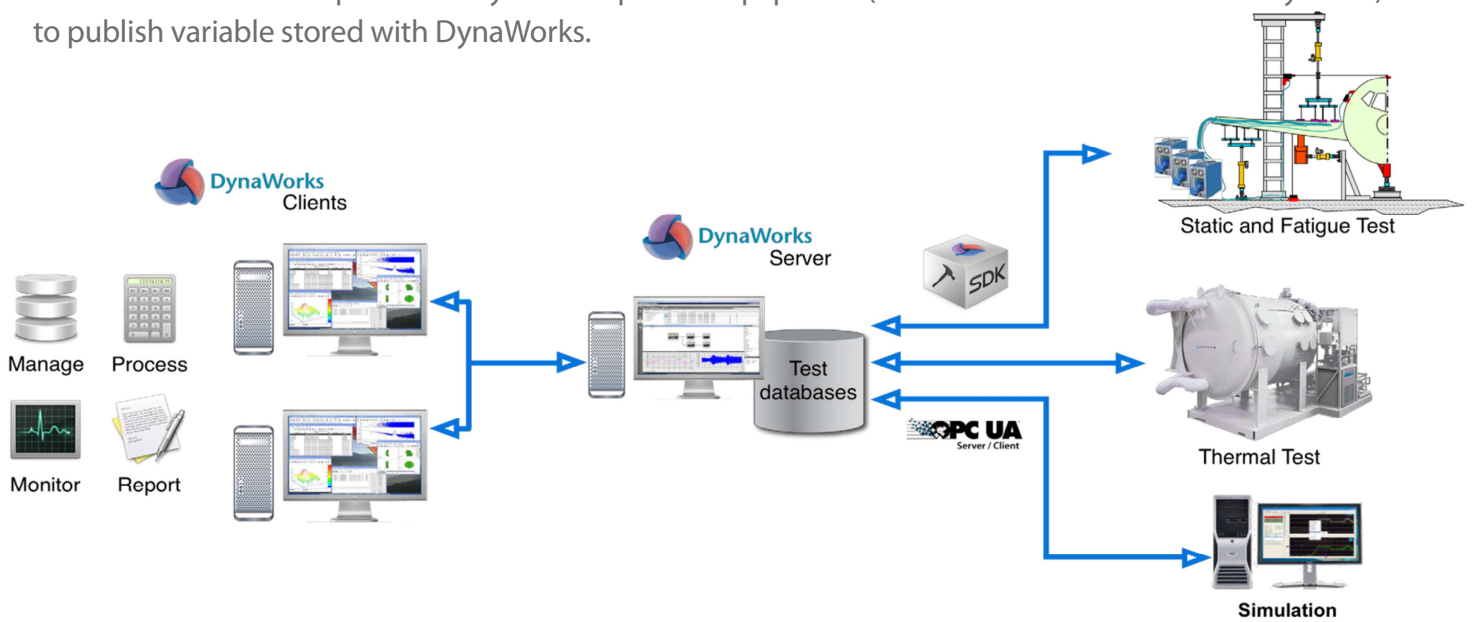
MEASUREMENT VISUALIZATION

- 20 clients can monitor the test with 80 tabs and 80 curves by tab
- 2D or array real-time visualization of multiple signals
- 2D sliding abscissa scale, automatic scale, or manual
- Logical display
- Display the last n values in numerical viewer
- Display curves/Apply on displayed curves a specific time range : upon date interval, phases, event, from a date, …
- Superposition of limits, alarms and objectives in 2D & numerical viewer with color
- Indicators in case of violation
- Multiple display pages with multiple layouts per page
- Unit management (X and Y)
- Sliders and pointers, phases display
- Access to processing routines from the signal displays
- Advanced display options (scales, colors, graph type…)
- Design of favorite views

- Export and print capabilities
- Processing are updated automatically after each acquisition
- Test replay
- Slope calculation
- Easy switch between database reading range and full curve
- Balance and convergence status export to excel
- Basic temporal extrapolation NEW

DATA MANAGEMENT

- Manage in real time up to 20 000 channels sampled by minute for 3 months
- Data recording by curves, by phases, or by key-value (parameter, date, value)
- Centralized and unique data repository for multiple data sources with Thermal 8 data model NEW
- Synchronize data coming from multiple test and simulation systems
- User management and Access control management
- Sorting, filtering, search capabilities
- Measurement validity management channel by channel or by groups
- Design of configurable favorite views

- Display test results by drag and drop or double click
- Export Excel with date NEW

SESSION

- Session layout preparation with DataDispatch workbench for quick data repartition on pages (support of custom layout, multi-screen …) with time offset NEW
- Save (automatically or manually) current working environment
- Open older session
- Keep user configuration on restart

ALARM MANAGEMENT

- Alert operators of a unexpected test behavior
- Different audible alarms according to limit overflows
- Up to 3 low and 3high alarm values for each channel
- Table representation with levels, alarms, alarm history. Color tagged according to alarm severity
- Indicator of the levels considered
- Displaying the history of changes of alarm status: Acknowledgement, ON/OFF, change the threshold, new threshold.
- Traceability of the alarm validation Real-Time update of limits & objectives

TEST TAILORING

Test tailoring module allows to define random test specification taking into account all shocks and vibrations situations that a system is expected to undergo during its life from the factory delivery up to the destruction. Test tailoring methodology (aeronautic, transportation, energy, ...) was mainly used for critical military systems few years ago but is now also used by several industries in order to define a test specification which is representative for the whole life of the system in term of fatigue and damage.

DynaWorks® test tailoring module is in a continuous improving process for 20 years. It is still improved in close cooperation with internationally recognized test tailoring experts.

DynaWorks® test tailoring module complies with former GAM EG-13, AFNOR X50-144 -1 to 6 leaflets and MIL STD 810-D/E/F. Computation speed has been optimized and it probably provides the best performances on the market.

Furthermore, this module can be delivered with a graphic wizard in order to design the life cycle profile step by step. In addition to this graphic wizard, life cycle profile can be designed using DynaWorks® macro tool. This has been useful for example for aeronautic applications with heterogeneous measurement points for a
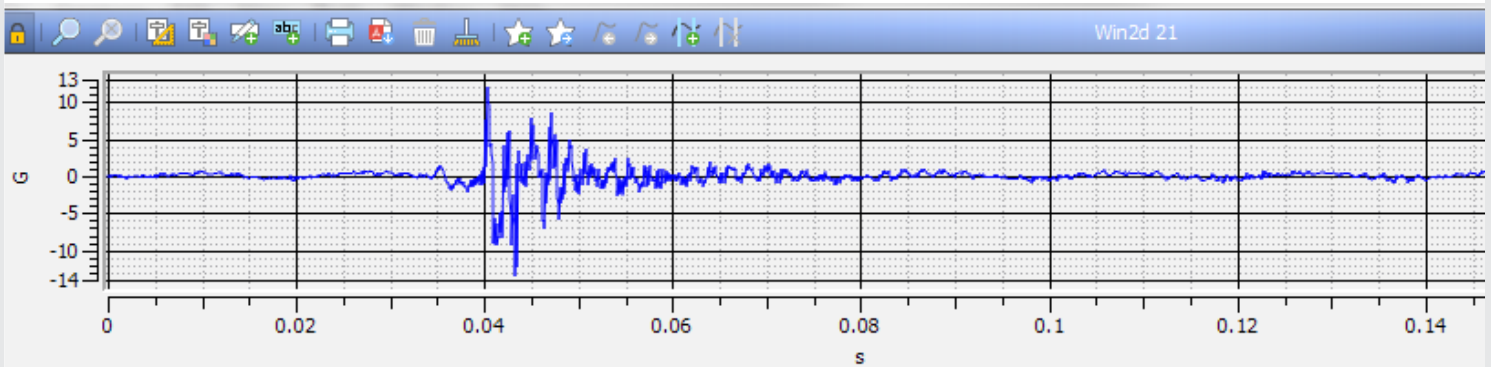
COMPUTATION PARAMETERS

- Compliant with vibration test specifications according to the MIL-STD-810-D/E/F and GAM-EG-13, AFNOR X50 -144- 1 to 6 leaflets standard
- Material and structure characteristics
- Linear / logarithmic frequency sampling
- Fatigue and damage calculation method on DSP: Rayleigh law, complete formulation, automatic
- Extreme response, maximax spectrum parameters
- Guarantee coefficient parameters

VIBRASPEC FEATURE

- This module includes the mathematical function developed in cooperation with CEA CESTA:

  - Fatigue and damage spectrum,
  - Test specification equivalence,
  - Guarantee coeffcient,
  - Extreme response or maximax spectrum,
  - PSD of reduced duration equivalent in terms of FDS or ERS
  - Reconstruction of an undersampled time signal,
  - Randomized Fatigue Damage Spectrum,

  - Randomized Maximax Spectrum,

SIGNALS PROCESSING AND TEST SPECIFICATION

- Process the signal compensation for a shaker shock test
- Process fall and bounce for drop test (free or accelerated)
- Generate the test specification depending on the Fatigue and Damage spectrum or maximax spectrum
- Manual or automatic selection of the processing frequencies in a specific window. Possibilities to modify, delete, edit a frequency
- Automatic processing of the fatigue and damage spectrum and maximax spectrum for the new test specification
- Display of the test specification
- Damage and Extreme response spectrum for Acoustics NEW

DYNAWORKS, SUPPORTED FILE FORMATS

DynaWorks® allows importing data coming from a wide range of data acquisition systems, prediction tools or standard file formats. Microsoft Excel can be imported or exported directly from all displayed windows.

IMPORT

- Text files (.txt, .csv)
- DynaWorks Neutral File (ASCII or binary format) on each platform (Windows, Linux, Sun)
- Excel files (.xls .xlsx)
- "As is": Microsoft office
- PDF, Video (.avi), all other native formats
- UFF151, UFF58 & UFF58b
- Structured Matlab file
- Import binary from script
- Image file : gif, jpg, tiff, png, ppm, bmp
- Batch mode import

Other import or export routines are possible on demand.

EXPORT

- Text files (.txt, .csv)
- DynaWorks Neutral File (ASCII or binary format)
- Excel file (.xls, .xlsx)
- Excel file according to a template(.xlsx)
- Export to file from script
- UFF151 and UFF58
- Batch mode export

HARDWARE CONFIGURATION

DATABASE SERVER /
64 BIT

LICENSES

- FlexLM server 11.18 – Tool to get information on the different licenses NEW
- FlexLM client 11.12
- Node locked or floating licenses
- Multi server license management NEW
- Dongle

UNIX - SUN

- All Sun workstation or server based on processor UltraSparc3 or higher
- OS: Solaris 10
- CPU: 2 dual-core processors 2.15 GHz
- SPARC64 VI with 5 Mo cache
- RAM Memory module including 4 DIMM of 1 Go
- Disk RAID 5 or RAID 0/1

LINUX

- All PC with Intel 64 bits or AMD 64 bit processor
- CPU: Processor 2.66GHz
- RAM: Memory module including 4 Go
- Red Hat Linux enterprise 8   Kernel 4.18 NEW
- Ubuntu 20.04 LTS NEW
- Suse Linux Enterprise Server 15 SP2 Kernel 5.3 NEW

WINDOWS

- CPU: Processor 2.66GHz
- RAM: Memory module including 4 Go
- Windows server 2016
- Windows server 2019 NEW

CLIENT/
64 BIT

CLIENT WINDOWS

- Any PC with Intel 64 bits or AMD 64 bit processor
- CPU: Processor 2.66GHz
- RAM: Memory module including 4 Go
- Pack MS Office 2003, 2007, 2010,2019
- Internet Explorer
- Windows Ten (10)

DYNAWORKS SERVICES

DynaWorks® is fully customizable to the user needs. Processing procedures or in-house processes can be automated using macros or user defined functions. DynaWorks® GUI can be personalized to fit perfectly the company's existing process.

DATABASE CUSTOMIZATION

- Interface development
- Data model corresponding to the company skills
- Specific user functions
- Migrating of databases
- Database assistance
    > Architecture
    > Database model
    > Expertise / Engineering

SPECIFIC ADD-ON APPLICATIONS

- Analysis of skill process
- Specification and architecture
- Models and performance validating
- Development Site installation and support
- Optimization

USER ASSISTANCE FOR DEPLOYED SOLUTIONS (ON OR OFF SITE)

- User training
- Database management or assistance to IT manager
- Anomalies management
- Operational validation
- User group management and experience exchange
- Macros development on demand

NOTES

TOULOUSE
31 rue des Cosmonautes
31402 TOULOUSE Cedex 4 - FRANCE
Tél: +33 (0) 5 31 96 79 00
Email: marketing.dynaworks@airbus.com
Website: https://www.airbus.com/en/products-services/space/customer-services/test-services

TELSPAN DATA

7002 South Revere Parkway, Suite 60
Centennial, CO 80112
Phone & FAX: 1-800-381-3305
Sales Related: sales@telspandata.com
Support Related: support@telspandata.com
Website: www.telspandata.com

ABLEMAX
ableMAX Inc.
CAE Total Solution
6th Floor Samick Lavied'or building, 234, Teheran-ro Gangnam-Ku
Seoul
South Korea
Email : info@ablemax.co.kr
Website : www.ablemax.co.kr

ECCITARETECH
734, Ground floor, 13th Cross, Jayanagar 7th Block, Bengaluru - 560070
Phone : +91-80-26941291
Email : info@eccitaretech.com
Website : www.eccitaretech.com