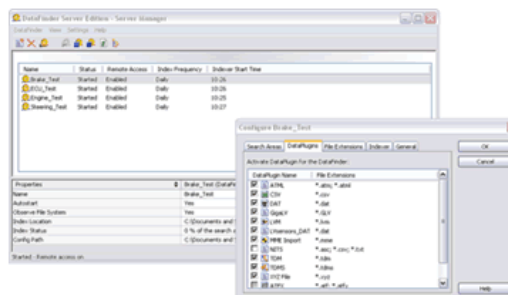
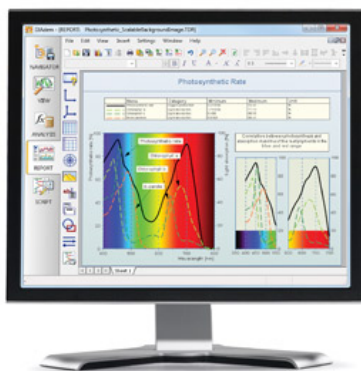


For user manuals and dimensional drawings, visit the product page resources tab on ni.com.

Last Revised: 2015-08-10 09:28:25.0

NI DIAdem

Technical Data Management Software



Application and Technology

The table below shows an overview of the functions in the various DIAdem packages. If you are reading this document at your computer, click on a function group in the first column to open the description.

	DIAdem ¹ Base Edition	DIAdem Advanced Edition	DIAdem Professional Edition	DIAdem ² Crash Analysis Toolkit	NI DataFinder Server Edition	DIAdem ³ DAC Kit	DIAdem ³ DAC Bundle
Data Management and Data Mining	X	X	X			X	X
Advanced Data Management		X	X				
Data Mining for Work Groups					X		
Graphical Interactive Data Evaluation	X	X	X			X	X
Videos and Measurement Data		X	X				
Embed User Dialog Boxes		X	X				
3D Display Contour		X	X				
Cascade			X				
Maps and Measurement Data			X				
3D Measurement Data Projection ⁴			X				
Bode Diagram			X				
Orbit and Shaft Centerline			X				
Report Generation	X	X	X				
Create Master Layouts	X	X	X				
3D Graphics	X	X	X				
Mathematical Data Analysis	X	X	X				
Calculator	X	X	X			X	X
Basic Mathematics Channel Functions	X	X	X				
Statistics Regression	X	X	X				
Units Catalog		X	X				
Calculation Manager ⁵		X	X				

Process Capability		X	X				
Approximation Splines Curve Fitting		X	X				
FFT Digital Filters Shock Response Spectrum		X	X				
Oscillation Analysis Frequency Weighting (A-, B-, C-Filtering)		X	X				
3D Mathematics		X	X				
Circle Approximation			X				
Frequency-Weighted Acceleration Order Analysis Shaft Centerline			X				
Extended Classification Rainflow Analysis			X				
Crash Analysis				X			
Scripting		X	X				
Create User Dialog Boxes		X	X				
Bar Manager and User Commands		X	X				
Measuring and Visualizing Data					X		X
Open- and Closed-Loop Control and Online Mathematics							X
Packet Processing							X
Alarm and Protocol System							X

DIAdem Functions by Package

¹ With the DIAdem Base Edition, you can display layouts and execute scripts and calculation templates that were created with DIAdem Advanced Edition, DIAdem Professional Edition, DIAdem Crash Analysis Toolkit, DAC Kit, and DAC Bundle.

² The DIAdem Crash Analysis Toolkit requires DIAdem Base, Advanced, or Professional Edition.

³ You can purchase the DIAdem DAC Kit and Bundle separately or with DIAdem Base, Advanced, or Professional Edition.

⁴ You can display the 3D measurement data projection with DIAdem Base Edition. You need DIAdem Professional Edition to create and manipulate the model with a script.

⁵ You can load and execute calculations from the Calculation Manager with DIAdem Base Edition. You need DIAdem Advanced Edition to create and distribute calculation sets.

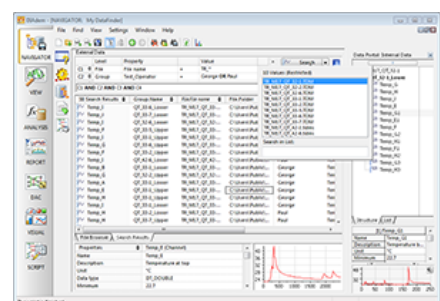
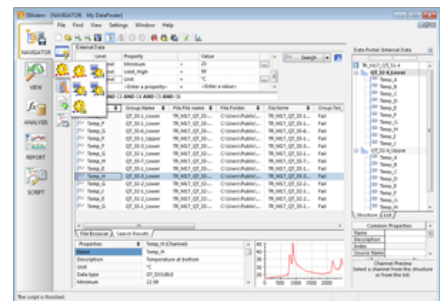
Data Management and Data Mining

Find and Browse Files with NI DataFinder. Navigate File Systems and Databases in DIAdem NAVIGATOR

Mining Data with NI DataFinder

- Entering a search term for a quick search
- Entering several search criteria for an advanced search
 - Wildcards (*,?)
 - Using selected properties for a structured search for files, channel groups, and channels
 - Connecting several search conditions with AND and OR
 - Using the suggestion list in the advanced search to select base property values and optimized custom property values
 - Using sorted loading of the search results
 - Displaying the files, channel groups, or channels found
 - Easy entering search conditions by dragging and dropping properties from the Data Portal or the file browser
- Searching for property values
 - Loading the result column as new channel into the Data Portal
- Suggestion list with previous queries
- Saving and loading queries including the column configuration of the result list
- Optimizing custom properties to accelerate queries
- Defining search areas
 - Automatically refreshing the index
 - Manually starting the indexing of files and folders
- Accessing NI DataFinder Server to index data for work groups (refer to [Data Mining for Work Groups](#))
- Configuring the search result list with file properties, channel group properties, and channel properties
- Transferring NI DataFinder configurations to other DIAdem computers

Navigating File Systems and Databases



- Browsing file systems down to channel level
- Dragging and dropping data sets, channel groups, and channels into the Data Portal; loading mass data when editing
- Registering large data files and channels to reduce memory load and processing time
- Reduced channel loading
 - Mean, minimum, maximum, or first value, for each interval
- Appending similar data to existing channels e.g. from serial evaluation
- Displaying properties of external data in the properties display
- Channel preview: Curve display of the selected channel

Supported File Formats

- DIAdem files (TDM format, TDMS format)
 - Hierarchical organization of the data in data sets, channel groups, and channels
 - Extensive documentation of the data model
 - Standard data format of NI LabVIEW and LabWindows™/CVI
- DIAdem 8.0 files (DAT format)
- Import wizard
- Binary files import
- LabVIEW text files (LVM format)
- ATF files and ATFX files (ASAM Transport Format)
- Importing and browsing all file formats for which a DataPlugin exists

DataPlugins

- DataPlugins are scripts for importing and searching data in ASCII format and binary format, and in spreadsheet calculations (XLSX)
- Various character encodings for text files (automatic, ASCII, Unicode, Shift-JIS)
- Many DataPlugins can be downloaded free of charge from ni.com/dataplugins
- Easy DataPlugin exchange as self-registering URI file
- Encrypting DataPlugin scripts to protect know-how
- User-defined file symbols for display in the DIAdem file browser
- DataPlugin Finder
 - Listing all the available DataPlugins for a certain file extension from the DataPlugin website
 - Installing on demand
- DataPlugin Updater
 - Finding later versions of the installed DataPlugins
 - Updating on demand

Note: You need the DIAdem Advanced Edition with Scripting to create DataPlugins.

Supported Databases

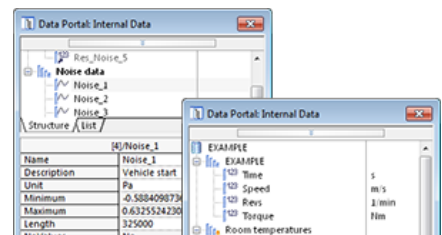
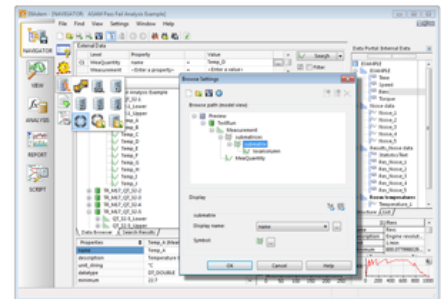
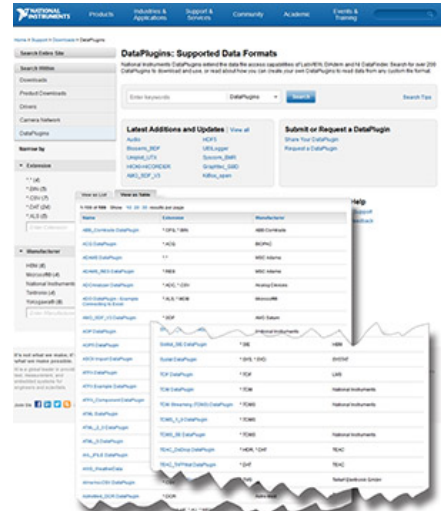
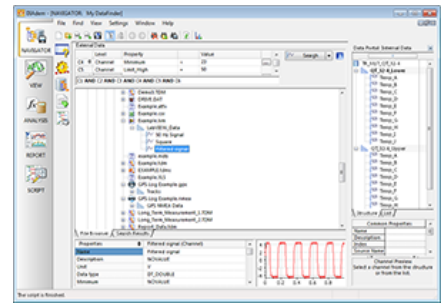
- ASAM ODS databases
 - Interface with data browser, search input area, search results list, and properties display
 - Configurable browser setting
- LabVIEW DSC databases
- VI Logger databases
- Lookout databases
- SQL table reader for accessing databases such as Access and Oracle through ADO

Scripting Capabilities

- Data navigator controls with methods and properties
- Navigator object for opening external data stores including ASAM-ODS, mining, selecting, and loading data
- BusLogToTDM object for importing logfiles and for saving in TDM format
- Data object for editing, deleting, and re-creating data loaded in the Data Portal
- DataFileHeader object for reading, editing, and deleting channel, group, and file properties of TDM and TDMS files
- Portal object for specifying the view of the Data Portal, displaying channel groups, and selecting channels
- Context menu object for user commands

Data Portal for Managing the Loaded and Registered Data

- Organizing data hierarchy in data sets, channel groups, and channels
- Managing numeric channels, waveform channels, time channels, text channels, and assignment channels
 - Implicit and explicit numeric channels
 - Moving, copying, renaming, and deleting channels and channel groups
 - Creating new channels and groups including properties
 - Creating assignment channels with [channel functions](#)
- Filtering channel groups and channels to be listed

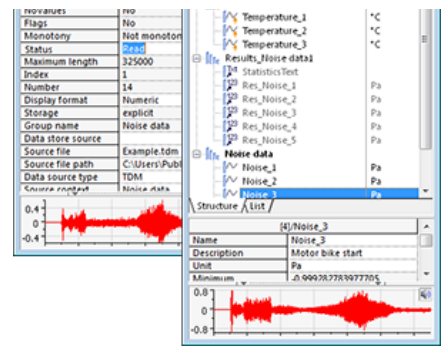


- Pinning channel groups and channels to be listed permanently
- Channel preview: Curve display of the selected channel

- Playing audio data

Data Properties

- Displaying data set properties, channel group properties, and channel properties
- Editing the properties
- Adding and deleting user-defined custom properties
 - Data sets, channel groups, and channels
 - Integer, numeric, date/time, and text formats
 - Template for custom properties
 - Editing event-related assignments
- Managing and converting the channel units by using the units catalog (refer to [Units Catalog](#))



Internal Data Handling

- Dynamic data area that automatically enlarges for the data loaded in the Data Portal
- Data reference by the names or index of the channel groups and the channels
- Unicode characters, such as Asian and Cyrillic, in channel groups, channels, and properties
- Optimized DIAdem storage management for handling large data sets
- DIAdem supports the reduced loading of TDM or TDMS files in sections of channels that contain more than 2^{31} values

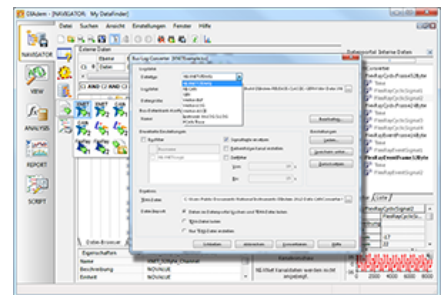
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Advanced Data Management

Bus Log Converter and Scripting Functions

Bus Log Converter for Importing Log Files

- Supported formats: NI-XNET, NI-CAN, GIN Multilogger, Vector Binary Log Format, Vector LOG, Vector ASCII, Ipetronik-M-LOG/S-LOG, KVASER-LOG, PCAN-Trace, IOSix (GPS, CAN log files), SoMat-SIE, and Vector MDF4
- Different database files
 - NI-CAN
 - Vector-CAN
 - Fibex
 - LIN (Local Interconnect Network)
 - Database mode J1939
- Defining bus number and bus type



DataPlugins

- Code completion and syntax coloring in the script editor
- DataPlugin wizard
 - Analyzing text-based data files
 - Analyzing Excel spreadsheet files
 - Creating DataPlugins using VBS
 - Creating and editing objects including methods, events, and properties

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Data Mining for Work Groups

NI DataFinder Server Edition (DFSE): A Search Engine for Technical Data in the Company Network

Installing search engines for work groups on a server computer to offer access to several DIAdem and LabVIEW clients.

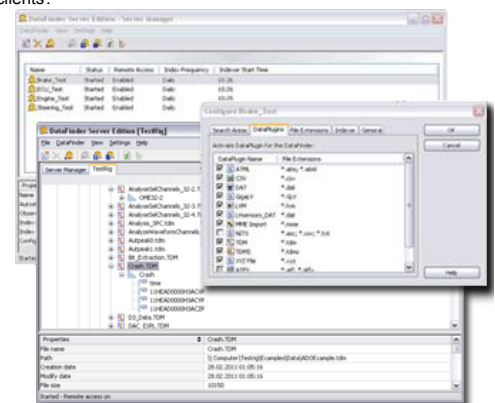
NI DataFinder Manager

- Creating and configuring NI DataFinder servers
- Starting and stopping NI DataFinder servers
- Pausing indexing
- Creating indexing schedules for every search area
- Optimizing user-defined custom properties

NI DataFinder Federation

- Combination of several DataFinder servers on different computers
- Accessing up to 100 NI DataFinder servers simultaneously
- Clients' connection via URF file
- DataFinder Federation returns the query results from all DataFinder servers as one
- **Note:** Requires a suitable license

Access for Several Clients on one NI DataFinder Server



- Exporting the connection settings as a URF file, including necessary DataPlugins
- Clients install the connection by double-clicking a URF file
- NI DataFinder Server as Windows service
- **Note:** *Number of simultaneous connections depends on license*

NI DataFinder as ASAM ODS Server

- Accessing the NI DataFinder Server via the ASAM ODS Corba interface
- Providing ASAM model hierarchies for your data
- Combining the TDM data model with user-defined test hierarchies and predefined unit models
- **Note:** *Requires a suitable license*

Index Data Files in the Network

- Reading data properties
- Specifying folders to be indexed
- Automatically refreshing the index
- Manually starting indexing files and folders
- Client access via sharing folders
- Index archived data files

DataPlugins Extend the Indexable File Formats

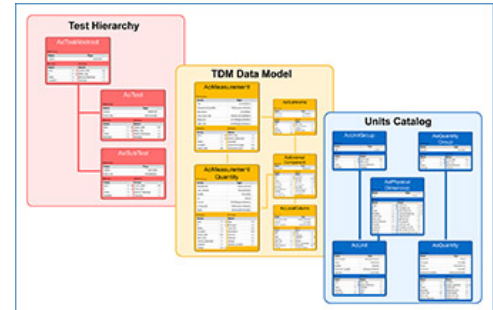
- Depending on the DataPlugin, the NI DataFinder server provides file properties, channel group properties, and channel properties for the data search
- Optimizing user-defined custom properties to accelerate queries
- Adding user-defined file formats
- Browsing to channel level in indexed files

Security Settings

- Clients mine and browse only in shared search areas for the current user
- Based on Windows share and security settings

Software Requirements

- Windows Server 2008 R2 SP1 (64-bit)
- Windows Server 2012 incl. R2



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Graphical Interactive Data Evaluation

Viewing and Editing Data in Axis Systems and Tables in DIAdem VIEW

Loading and Saving VIEW Layouts

- Creating, saving, and adding layouts
- Several worksheets in one layout
- Partitioning worksheets manually
- Labeling areas
- Transferring VIEW worksheets to DIAdem REPORT

Scripting Capabilities

- Viewing object with subobjects and collections
- Context menu object for user commands
- Inserting text and graphics as decoration
- Creating and editing objects using methods, events, and properties
- **Note:** *You need the DIAdem Advanced Edition with Scripting to create scripts.*

Defining Areas as Channel Tables, as 2D, Polar, Bode, Orbit, and Shaft Centerline Axis Systems, as Contours, 3D Models, and Maps, as Dialog Boxes, Images, and Text Boxes

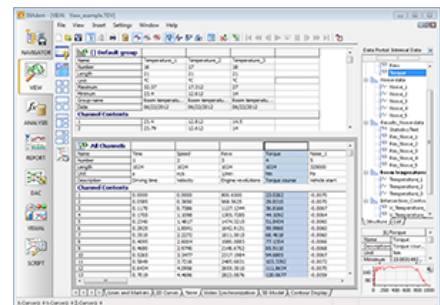
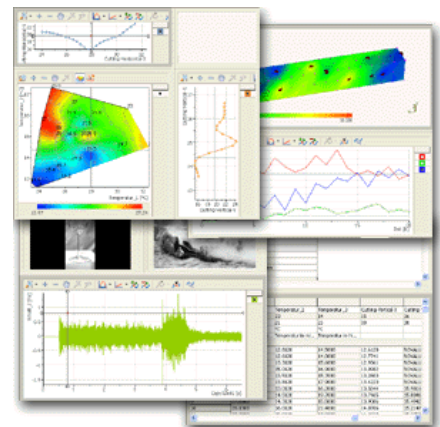
Switching between channel table view and 2D axis system view of the same channels

Channel Tables

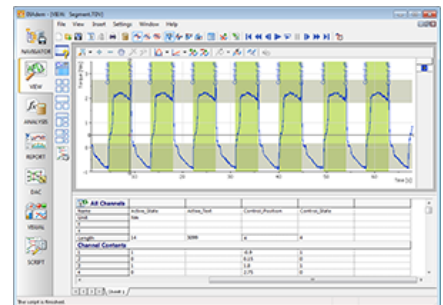
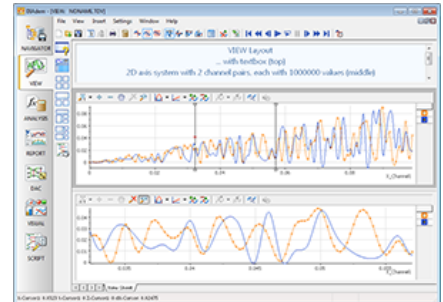
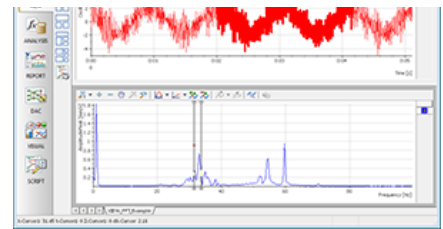
- Displaying all channels or specific channels or channel groups of the Data Portal
- Dragging and dropping channels and channel groups from the Data Portal
- Displaying and editing numeric channels, waveform channels, time channels, and text channels
- Locking channels for permanent display during scrolling
- Block operations
 - Deleting, cutting, and copying data blocks over several channels
 - Overwriting and appending channel values
- Creating channels

2D Axis Systems

- Defining curves by dragging and dropping channels and channel groups from the Data Portal

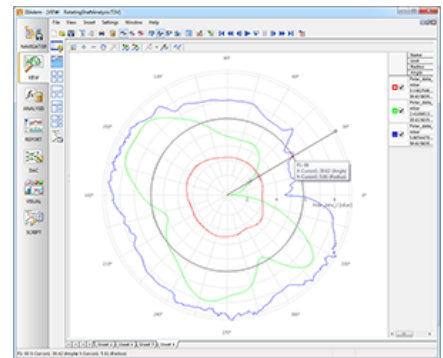


- Displaying numeric channels, waveform channels, and time channels
 - Lines, spikes, or stair curves
 - Channel pairs freely selectable
 - Waveform channels using their x-part
 - Numeric channels and time channels using their index
 - Deactivating and activating the display of curves
- Displaying coordinates and constants
- Scaling
 - Linear, percent, or logarithmic
 - Automatic or manual
 - Several y-axes in one axis system
 - Several axis systems
 - Assigning individual axis scalings to curves in one axis systems with multiple y-axes
- Evaluating curves with a crosshair cursor, a band cursor, or a frame cursor
 - Harmonic and sideband cursors
 - Automatically following the curves with the player functions
 - Manually positioning the cursor
 - Cursor can be moved freely or on curve points, curve minimum values, or curve maximum values
 - Displaying the point number and the coordinates as a cursor tooltip and in the coordinates window
- Zooming, scrolling, and moving curve sections
 - Band zoom and frame zoom
 - Zooming with the mouse wheel
- Graphical data editing
 - Copying, deleting, and interpolating curve points or curve sections
- Background segments for event display parallel to the x-axis or the y-axis
- Curve labeling
 - Symbols or markers
 - Free text or text from text channels
 - Enumerations from custom properties
- Labeling axis with channel name and channel unit
- Configurable legend
- Playing audio data



Polar Axis System

- Defining curves by dragging and dropping channels and channel groups from the Data Portal
- Displaying angle and radius as curves
- Full circle axis system
- Angle direction clockwise and counter clockwise
- Variable zero-point position
- Displaying the radius and angle of the current cursor position
- Curve labeling
 - Symbols or markers
 - Free text or text from text channels
 - Enumerations from custom property



Cursor Synchronization

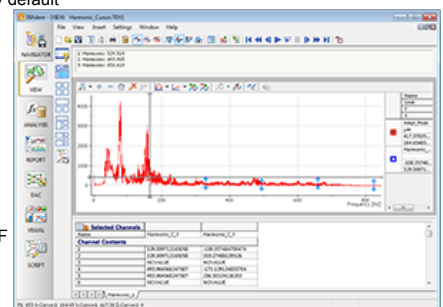
- The axis systems, channel tables, contour displays, 3D models, videos, and maps of a worksheet are synchronized by default
- Defining cursor dimensions
 - Separately for each area
 - Synchronizing individual areas through the same cursor dimensions

Graphics Areas

- Graphics for illustrations
- Zooming the graphic
- Supported graphic formats: BMP, EMF, EPS, JPG, GIF, PCX, PNG, PSD, RAS, RLE, TGA, TIFF uncompressed, WMF

Text Boxes

- Entering and displaying multiline text to comment on evaluations and display results
- Embedding DIAdem variables and data properties
- Dragging and dropping data properties from the Data Portal

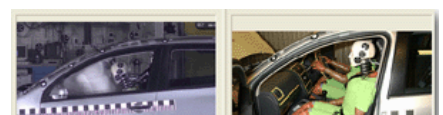


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Videos and Measurement Data

Creating Areas with Videos

Evaluating videos in AVI format, MPEG format, and MPG format



Zooming video sections

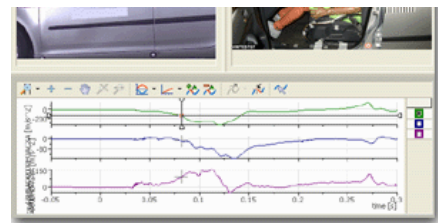
Using player functions

Supporting of Media Foundation

Synchronizing evaluation of Curves and Videos

- Synchronization using index, or start time and frame rate
- Limiting the synchronization to curve sections

Note: You only need the DIADEM Base Edition to display layouts that contain a video.



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Embed User Dialog Boxes

Creating Areas with User Dialog Boxes

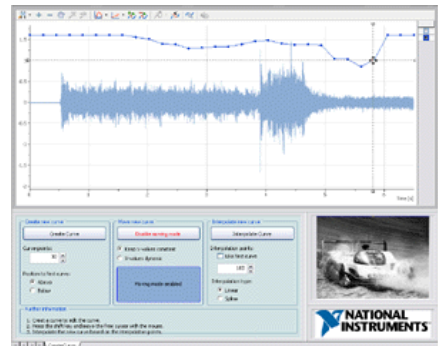
Inserting SUD dialog boxes

- VIEW-Connector control

Controlling other areas of the layout with properties and methods of the user dialog box

- Entering values
- Requesting settings
- Starting functions

Note: You only need the DIADEM Base Edition to display layouts that contain a user dialog box.



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3D Display Contour

Creating Areas with 3D Displays as Color Shading and Isolines

Displaying 3D data as color shading

- Color legend

Isolines

- Dynamic display of the isolines at the cursor position
- Creating individual isolines at the current cursor position
- Generating multiple isolines
- Labeling isolines with z-values
- Isoline display without color shading

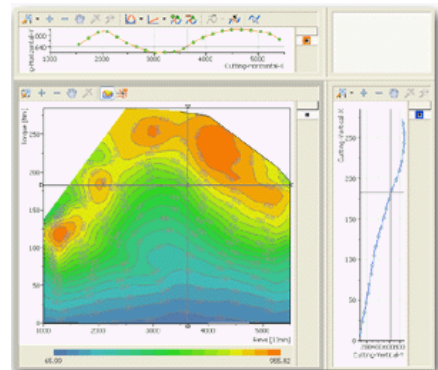
Boundary curve limits the displayed surface

Calculating intersection curves in x direction and y direction at the current cursor position and saving them as channels

- Display in 2D axis systems

Evaluating curves and contour displays synchronously through cursor dimensions

Note: You only need the DIADEM Base Edition to display layouts that contain a contour display.



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Cascade

Creating Areas with Cascading Curves and Order Lines

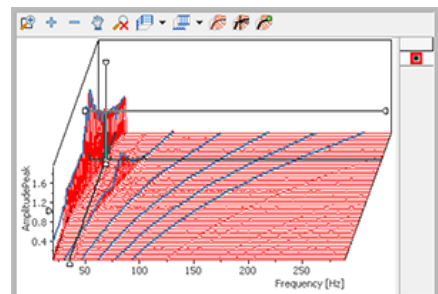
Waterfall display

- Displaying 3D data as cascading curves
- Data structured as xy channel pair, one x and multiple y channels, or as matrix

Order lines

- Dynamic display of the order lines at the cursor position
- Creating individual order lines at the current cursor position
- Generating multiple order lines

Note: You only need the DIADEM Base Edition to display layouts that contain a cascade.



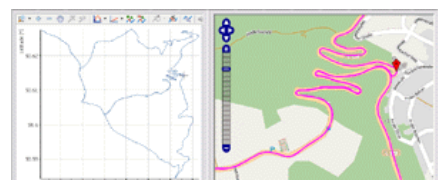
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Maps and Measurement Data

Creating Areas with Maps

GPS data in GPX and NMEA format

Maps from OpenStreetMap and Microsoft MapPoint

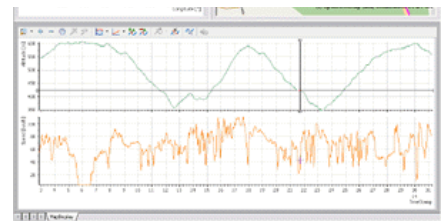


- Loading OpenStreetMap maps directly from the Internet
- Microsoft MapPoint only in DIAdem 32-bit
- Saving maps for offline evaluation
- Zooming in and out of a map section and moving a map section
- Displaying the recorded circuit as a line

Evaluating curves and maps synchronously

- Synchronizing via longitude, latitude, and time track
- Using player functions

Note: You only need the DIAdem Base Edition to display layouts that contain a map.



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3D Measurement Data Projection

Creating Areas with 3D Projections of Measured Data

Displaying measured data on 3D models in VRML2 and STL format

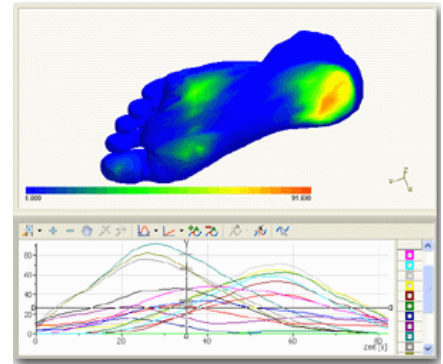
- VRML2: Visual Reality Modeling Language, Version 2
- STL: Stereo Lithography

Linking the grid points on the model to channels

Displaying measured data as color shading and deformation

Moving, rotating, and zooming the model during a presentation

Note: You only need the DIAdem Base Edition to display layouts that contain a 3D model. You need the DIAdem Professional Edition to manipulate the 3D model both manually and with a script.



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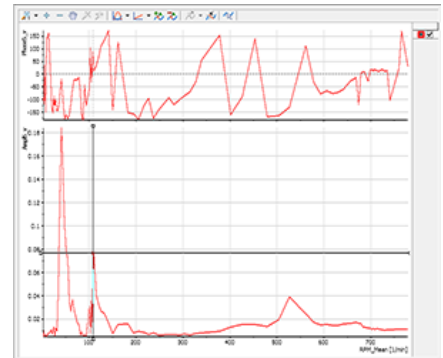
Bode Diagram

Creating Areas with two Super-Imposed 2D Axis Systems

Displaying the phase and the amplitude of a complex transfer function as curves in super-imposed axis systems

- Scaling automatically or manually
- Variable size of the super-imposed axis systems
- Synchronizing via phase, amplitude, and x-channel

Defining curves by dragging and dropping channels and channel groups from the Data Portal



Orbit and Shaft Centerline Axis Systems

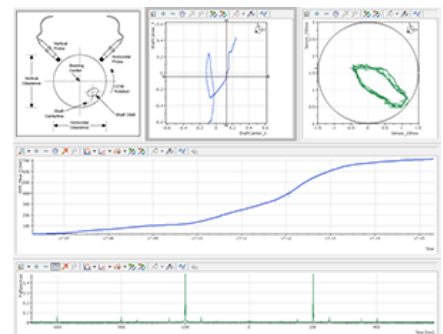
Creating Areas with Orbit and Shaft Centerline Axis Systems

Orbit Axis System

- Displaying the movements of a rotating shaft as a curve
- Defining curves by dragging and dropping channels and channel groups from the Data Portal
- Square axis system
- Identical scaling of x and y axes for the values of the two sensors
- Rotation direction either clockwise or counter-clockwise
- Displaying sensor positions and maximum bearing clearance
- Curve labeling
 - Symbols or markers
 - Free text or text from text channels
 - Enumerations from custom properties

Shaft Centerline Axis System

- Displaying the deflection of a rotating shaft as a curve from the idle position
- Defining curves by dragging and dropping channels and channel groups from the Data Portal
- Square axis system
- Identical scaling of x and y axes for the values of the two sensors
- Rotation direction either clockwise or counter-clockwise
- Displaying sensor positions and maximum bearing clearance
- Curve labeling
 - Symbols or markers
 - Free text or text from text channels
 - Enumerations from custom property



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Report Generation

Loading and Saving REPORT Layouts

- Uniform page size for all worksheets
- Page format with relative scaling or scaled in centimeters or inches
- Adding layouts
- Exporting as HTML document, PDF document, or PowerPoint presentation

Worksheets

- Several worksheets in one layout
- Active table of contents with multipage reports
- Specifying landscape format or letter format for each worksheet
- Optical highlighting of graphical objects under the mouse cursor
- Positioning the graphics objects anywhere
- Defining any order for overlapping graphic objects
- Grouping graphic objects
- Exporting individual worksheets as a graphics file in the formats BMP, EMF, EPS, JPG, PCX, PNG, GIF, PSD, RAS, RLE, TGA, TIFF uncompressed, WMF
- Transferring REPORT worksheets to DIAdem VIEW
 - Converting 2D axis systems, 2D tables, and graphics

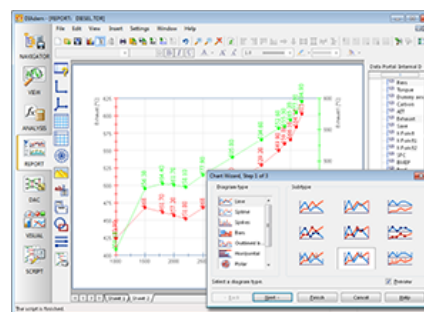


Chart Wizard

- Creating and modifying 2D axis systems and polar axis systems in three steps:
 - Diagram type selection
 - Channels definition
 - Display configuration

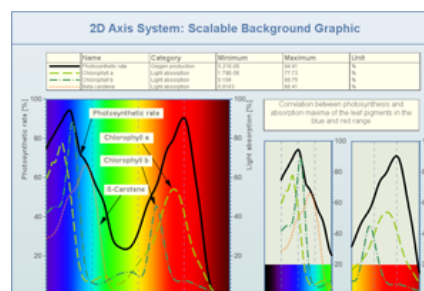
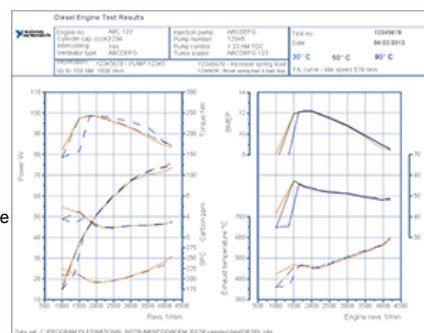
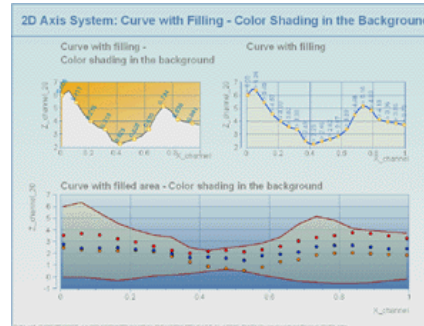
Scripting Capabilities

- Report object with subobjects and collections
- Creating and editing objects using methods, events, and properties
- Note:** You need the DIAdem Advanced Edition with Scripting to create scripts.



2D Axis Systems

- Displaying numeric channels, waveform channels, and time channels
 - XY-channel pairs freely selectable
 - Labeling the axes with text channels
 - Waveform channels using their x-part
 - Numeric channels and time channels using their index
- Displaying one or more signals in one axis system
 - Manual selection of the displayed signals
 - Displaying constants
 - Displaying all channels of one physical quantity in the same unit, and hiding channels that are a different quantity (refer to [Units Catalog](#))
- Interactive setting of coordinates
 - At certain curve points or at any position
 - X- and y-value and free comment
- Defining several y-axes in one axis system
 - Dragging and dropping channels and channel groups to subaxes
- Separate scaling for x-axis and y-axis
 - Interactively with the mouse
 - Autoscaling, DIN-conform scaling, manual scaling
 - Scaling modes: linear, inverted, logarithmic, third, octave, probability, date/time, square, square root, and percentage for y-axis
- Transferring the scaling of a selected x-axis or y-axis or of the curve legend to a different 2D axis system of a layout
- Configurable, multicolumn curve legend
- Free axis labeling
- Transforming curves with user commands
- Background
 - With color shading
 - Linking background graphics to a value range to adapt the graphic to the scalings and units of the axes
 - Background segments for event display parallel to the x-axis or the y-axis



Display Modes for 2D Data

Combining various display types in one axis system

- Curve
-

- Bars, differential bars, spikes, outlined bars
- Curve display with color palette and color legend
- Labeling curves with markers, text from text channels or text file, enumerations from custom channel properties
- Filled area under a curve or between two curves
 - Transparency can be specified for overlapping areas
- Single-sided or double-sided, horizontal and vertical error bars
 - Error calculation: percentage, standard deviation, standard error
 - Fixed value for all curve points or point wise from channel
- Configurable line attributes
- Smoothing curves

Polar Axis Systems

- Complete and partial circle display
- Labeling in degrees or radians
- Interactive scaling of the radius with the mouse
- Curve legend
- Angle direction either clockwise or counter-clockwise

2D Tables

- Displaying numeric channels, waveform channels, time channels, text channels, variables, and formula expressions
- Dragging and dropping channels from the Data Portal
- Sorting values
- Displaying table contents on several pages
- Text list with static and dynamic texts independent of channels and scripts
- Horizontal or vertical alignment
- Formatting table columns and the heading, wordwrap
- Background with color shading

Text

- Multiline text with DIAdem variables and data properties
- Creating text by dragging and dropping data properties from the Data Portal
- Comments with rotated text, separately configured frames, and arrows
- Text objects with paragraph format and character format, graphics and tables
- Formula graphics with frames and arrows
- Inserting special characters, symbols, and curve snippets

Decorations

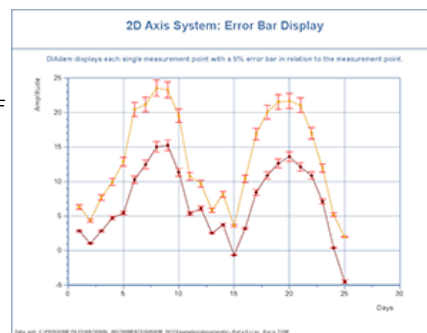
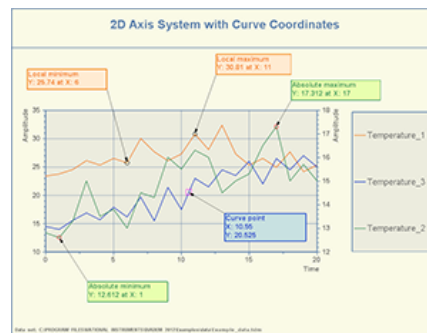
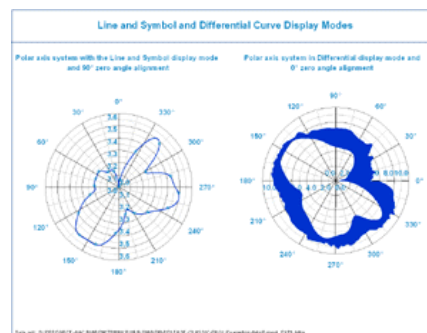
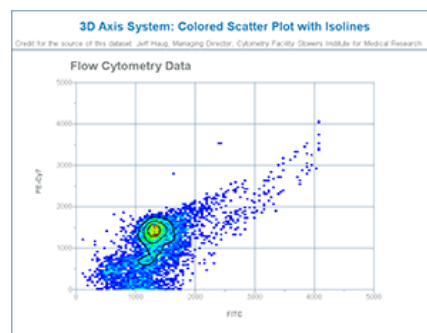
- Circles, ellipses, rectangles
 - Background transparent or with color shading
 - Rectangles with shadows and separately configured frames
- Lines, arrows, dividing lines
- Date, time, title, file name, page number
- Active table of contents for multipage reports

Background Graphics, Illustrations, Company Logos

- Supported graphic formats: BMP, EMF, EPS, JPG, GIF, PCX, PNG, PSD, RAS, RLE, TGA, TIFF uncompressed, WMF
- Supports transparency of GIF, PNG, and TIFF graphics
- Embedding graphics or references to graphic files

Formatting Numbers in Text and Axis Scales

- DIAdem format instruction
 - List of standard formats
 - Editing chosen standard
- Calling a user command
- Format bar for interactive formatting of text, lines, and surfaces
- User commands for automatic preprocessing and post processing of a report
- Undoing editing steps
- Displaying Unicode characters, such as Asian and Cyrillic



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Create Master Layouts

Creating and Using Master Layouts

Loading and saving master layouts

Separate layouts for portrait format and landscape format

Refreshing the linked master layout when a report is loaded



Exchange by loading another master layout

3D Graphics

Creating 3D Axis Systems and 3D Tables in Reports

3D Axis Systems

- Dragging and dropping the x-channels, y-channels, and z-channels from the Data Portal into axis systems
- Surface definition
 - Based on several channels structured as a matrix (matrix structure)
 - Based on three channels (triplet structure)
- Defining 3D curves with three channels
- Separate scaling for x-axis, y-axis, and z-axis
 - Interactively with the mouse
 - Automatic or manual
 - Linear, date/time, logarithmic
- Configuring a plane's grid lines separately
- Transferring the scaling of a selected axis or of the curve legend to a different 3D axis system
- Free axis labeling
- Configurable curve legend
- Color palette display with color legend
- Rotating 3D axis system in worksheet

Display Modes for 3D Data

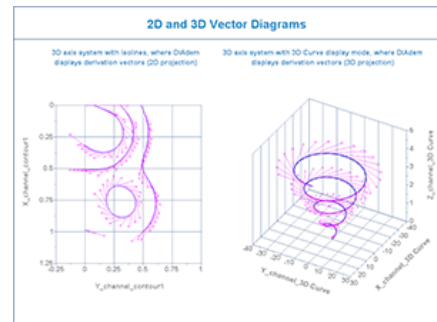
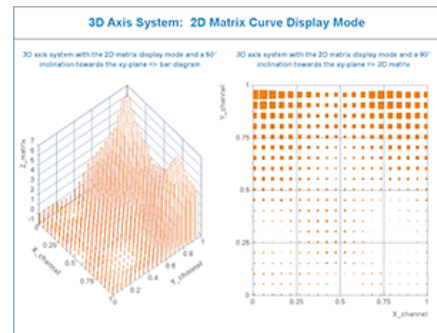
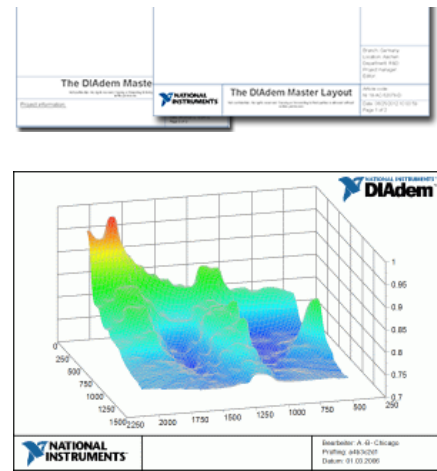
- Surface
- Waterfall in x-direction or y-direction
- 3D curve
- Lines in x-direction and y-direction
- Filled bars, spikes, 2D matrix
- Various symbols, markers, point labels
- Characteristic diagrams with labeled extreme values, boundary curves, and isolines
- Isolines with labeling along an imagined line

2D and 3D Vector Diagrams

- Displaying a vector with the specified length and direction in each curve point
- Position in Cartesian coordinates or spherical coordinates
- Scalable vector length

3D Tables

- Dragging and dropping the x-channels, y-channels, and z-channels from the Data Portal into a table
- Horizontal or vertical orientation
- Formatting table contents automatically or manually



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Mathematical Data Analysis

Calculating Channels and Single Values in DIAdem ANALYSIS with the Calculator and the Function Libraries

The mathematical functions in DIAdem ANALYSIS can process numeric channels, waveform channels, and time channels

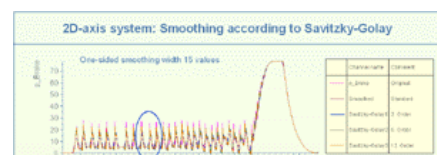
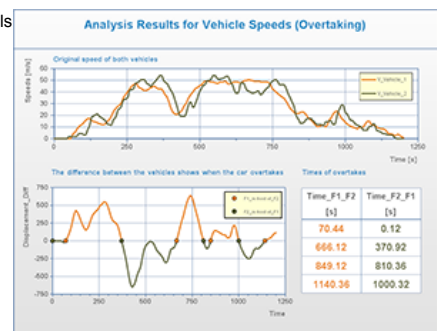
- In waveform channels, DIAdem uses the x-values defined as a generation instruction
- Calculations with different settings and preview of the results in the dialog box

Result Storage Depending on Function

- Creating new result channels
- Overwriting the input channels
- Copying single values to the clipboard
- Saving single values in DIAdem variables
- Saving characteristic values as custom properties of channels

Curve Fitting

- Smoothing
 - Savitzky-Golay filter
 - Smoothing width and polynomial order
 - Weighting channel
- Linear mapping
 -

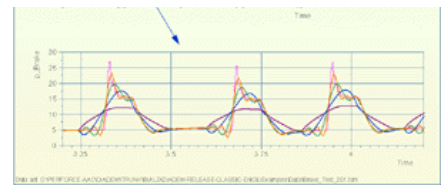


Analog, spike, or stair display modes

- Extrapolation
- Calculating the upper and lower envelope curves

MathScript

- Registering and calling scripts with LabVIEW MathScript for mathematical analysis
- **Note:** This functionality requires NI LabVIEW with MathScript.



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Calculator

Defining User-Defined Formulas to Calculate Channels and Single Values

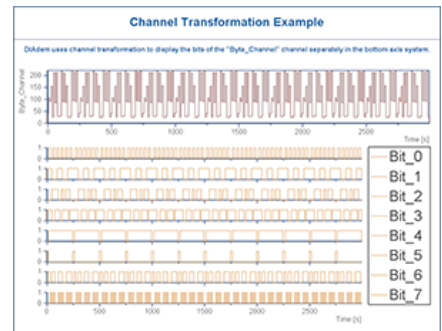
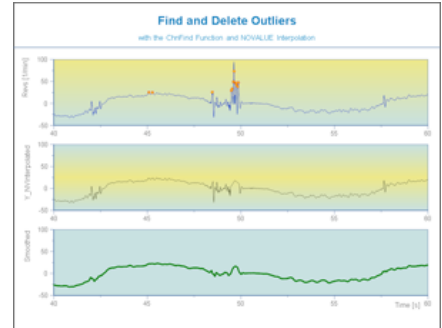
- The Calculator is also available in DIADEM VIEW and DIADEM SCRIPT
- Operations, channels, and variables can be selected directly
- Formulas can be recalled
- Creating formulas in VBS syntax
- Find function for numeric event isolation
- Folder and file functions
- Data Portal functions

Mathematical Operations

- Basic mathematics and random values
- Comparison operations and Boolean operations
- Trigonometric, logarithmic, and exponential functions
- Bit calculations and shifts
- Absolute value, sign function, factorial, rounding
- Filtering partial time formats
- Converting degree to radian and vice versa

Text Operations

- Adding text, comparison operations
- Converting text into upper/lower case and into numeric types
- Copying and deleting text
- Determining text lengths and character positions



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Units Catalog

Managing Channel Units in the Units Catalog

Units Catalogs

- Unit sets, such as SI units
- Physical quantities, such as length
- Units, such as meter
- Symbols, such as m
- Adding user-defined unit sets, quantities, units, and symbols to the units catalog
- Loading and saving units catalogs
- Importing new units

Converting Units

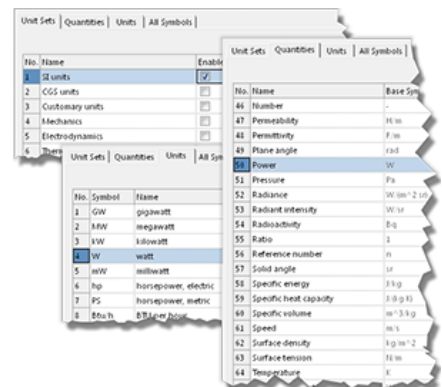
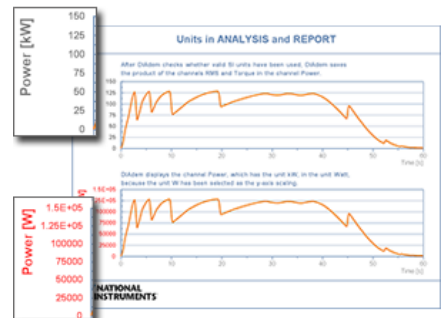
- Converting a channel to a different unit of the same quantity
- Converting several channels into the units of a specified unit set

Quantity-Based Calculations

- Can be enabled for all calculations
- Available in the Calculator and all DIADEM ANALYSIS functions
- Automatic units adjustment in the calculation
 - $5 \text{ m} + 3 \text{ cm} = 5.03 \text{ m}$
 - $1 \text{ ft} + 3 \text{ in} = 1.25 \text{ ft}$
- Specifying the result quantity and result unit
 - $0.01 \text{ N}/10 \text{ mm}^2 = 1000 \text{ Pa}$

Scripting Capabilities

- Unitcatalog object with methods and properties
- Creating and editing unit sets, physical quantities, and units



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Calculation Manager



Creating and Managing Calculation Templates

Calculation Templates Contain the Calculation Instruction and the Data References

- Calculations with simple formulas, calculator functions, user commands, and ANALYSIS functions
- Calculating with single values, channels, channel lists, variables, and properties
- Graphical formula display
- Defining dependencies where calculations require the results of other calculations
- Validating the data references of the calculations

Creating and Managing the Calculations in the Calculation Manager

- Organizing in calculation groups
- Saving and encrypting the calculation instructions in a calculation set
- Loading and appending calculation sets
- Executing repeatedly to evaluate measurement sequences

Scripting Capabilities

- Calculation set object with methods and properties
- Creating and processing calculations, calculation groups, and calculation sets
- Assigning input data and result data

Note: You only need the DIADEM Base Edition to execute calculation templates.

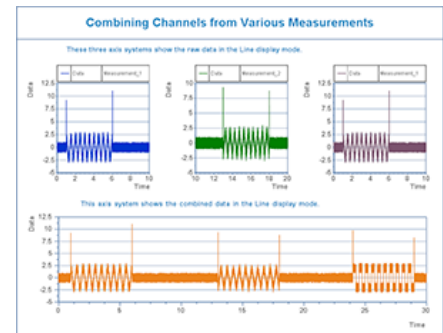


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Basic Mathematics

Basic Mathematical Functions

- Adding, subtracting, multiplying, and dividing channels
- Scaling channel values
- Offset correction
- Calculating reciprocal values
- Normalizing channel values to 1
- Relativizing channel values to the sum of the channel values
- Calculating differences between consecutive channel values
- Calculating the sum of channel values
- Differentiating
- Integrating with the trapezoidal or the Simpson rule
- RMS
- Rounding



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Channel Functions

Generating and Calculating Channels

- Generating numeric channels and time channels
- Converting numeric channels into waveform channels and vice versa
- Converting numeric channels, waveform channels, and text channels into assignment channels and vice versa
 - Editing and saving assignments in the channel properties
- Calculating mean values of several channels
- Calculating linear mapping to convert signals with different x-values to a common x-range

Sorting Channel Values

- Sorting channels in ascending or descending order
- Sorting case sensitive
- Sorting values from additional channels in the same order
- Referring one or more control channels

Finding Peaks

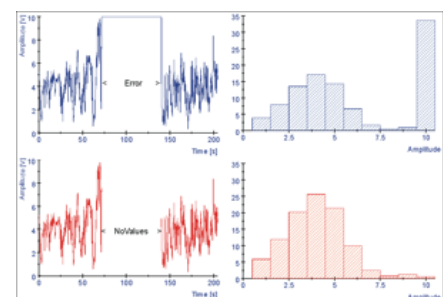
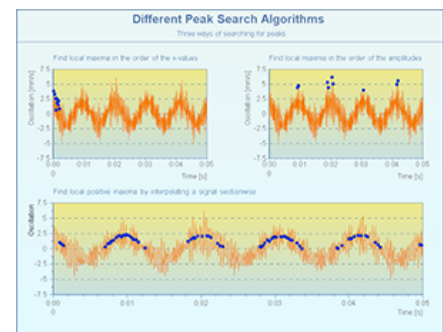
- Determining local minimum values and maximum values

Calculating Peaks

- Determining the minimum or maximum signal values by adjusting a quadratic function
- Interpolating a signal sectionwise
- Especially suited to determine peaks in distorted signals

Event Search

- Checking channels for specific events
- Defining free formulas
- Using operators such as < and >, and Boolean operations such as AND and OR



NoValue Handling

- Interpolating, deleting, or replacing outliers

Quantizing

- Mapping channels on the integer data types 8-bit, 16-bit, or 32-bit

Optimize Data Type

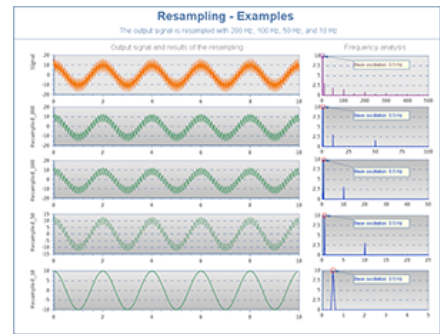
- Rounding channel values in order to save memory space

Wrap and Unwrap Phase

- Wrapping or unwrapping phases in a signal
- Determining the channel value range
- Preparing the phase display for the Bode diagram

Resampling

- Mapping channels onto a new time channel
- Referring to an interpolation channel or a sampling rate
- Reducing or increasing the sampling rate
- Synchronizing data from different files



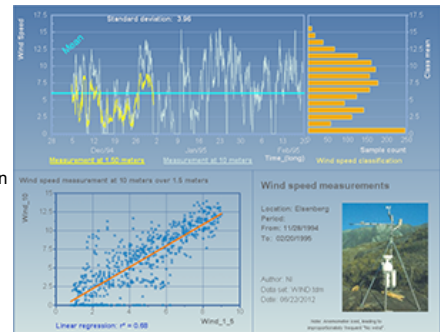
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Statistics

Calculating Statistical Characteristic Values and Frequency Distribution

Descriptive Statistics

- Minimum, maximum, sum of measured values and measured value squares
- Lower/upper quartile (0.25/0.75 quantile), median (0.5 quantile)
- Arithmetic mean, geometric mean, harmonic mean, and quadratic mean
- Average absolute deviation from mean and from median
- Dispersion: range, quartile distance, standard deviation, standard error, variance, variation coefficient, relative variation coefficient
- Form: skewness, kurtosis
- Calculating channelwise or rowwise over several channels
- Formatted display of the characteristic values as text in a report
- Saving characteristic values in DIAdem variables and in the custom properties of the input channels



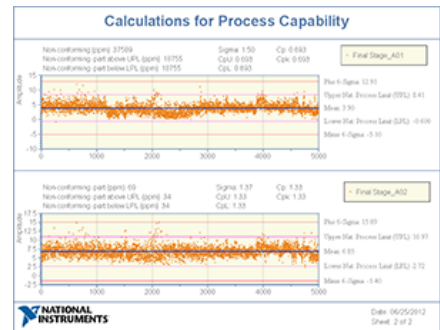
Method for Data Reduction and Classification

- Data reduction within defined classes to minimum, maximum, number of values (histogram), sum, or mean
- Classification with simultaneous analysis of dependent channels
- Histogram classification

Process Capability

Calculating the Statistical Process Capability

- Process capability indexes Cp, Cpk, Cpl, and Cpu
- Mean values and standard deviations of the process
- Estimations of the number of parts with errors
- Saving process characteristic values in DIAdem variables and in channel properties of the input channels

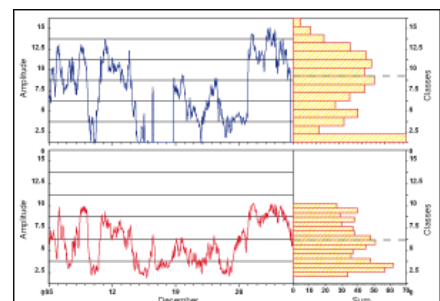


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Extended Classification

Classification Method with one Parameter in Accordance with DIN 45667

- Sample counting, time-at-level counting, level crossing counting, maximum value memory, range counting, range pair counting, peak value counting
- Compound classification
 - Sample counting, maximum value memory counting, and time-at-level counting
- Relative or absolute class frequency calculation
- Parameters depend on the selected method
 - Hysteresis
 - Single frequency or cumulative frequency
 - Reference line and clock specification

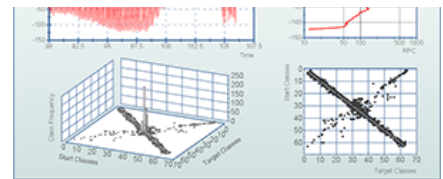


Rainflow Analysis

2D Classification of Signals According to Directives from the Research Association for Drive Engineering (FVA), www.fva-net.de



- Calculating rainflow matrix and transition matrix
 - Closing or including residues
- Extracting single-parameter classifications from the result matrices
 - Level crossing counting, range and range pair counting
 - Single frequency or cumulative frequency
- Hysteresis



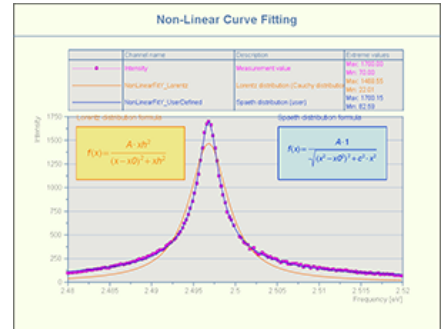
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Curve Fitting

Approximating a Set of Points with a Nonlinear Function or a Gaussian Curve

Nonlinear Curve Fitting

- Specifying a setup function in VBS syntax
- Calculating the coefficients with the Levenberg-Marquardt algorithm
- Calculate mean squared error
- Save coefficients and errors in DIAdem variables
- Save curve values
- Weighting
- Displaying the coefficients and calculated curve in the dialog box preview

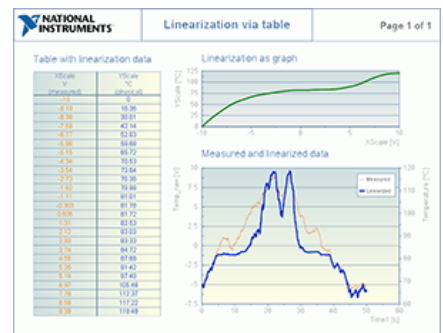


Gaussian Curve Fitting

- Calculating the center, amplitude, and standard deviation of the Gaussian curve
- Least squares method
- Least absolute residual method
- Bisquare method
- Weighting
- Displaying the coefficients and calculated curve in the dialog preview

LS Linear Fitting

- Calculating a k-dimensional curve by minimizing error squares
- Calculating coefficients using SVD, Givens, Cholesky, Householder, or LU decomposition methods
- Calculating covariance matrix
- Weighting
- Displaying the mean squared error and fitted curve in the dialog preview



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Regression

Calculating Regression Functions with Selectable Setup Functions

- Setup Functions
 - Linear, exponential, logarithmic, and power terms
 - Exponential setup function and power setup function with and without weight adjustment
- Calculating Coefficients and Coefficient of Determination
- Displaying the coefficients and calculated curve in the dialog box preview

Splines

Calculating Parametrical Splines, Non-Parametrical Splines, and Akima Subsplines

Non-Parametrical Splines

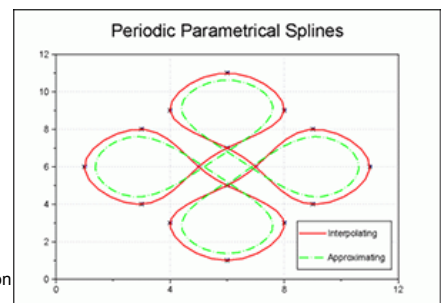
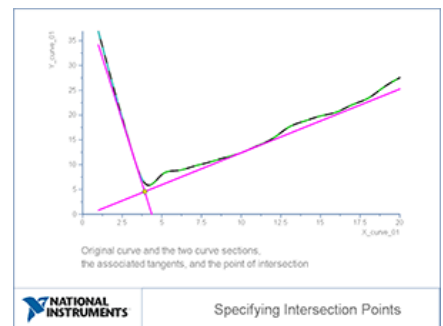
- Natural, approximating, periodic, and rational spline types
- Weighting factor for approximating and rational splines

Parametrical Splines

- Natural, approximating, and periodic spline types
- Weighting factor for approximating splines

Akima Subsplines

- Approximating and interpolating spline types
- Regression calculation for approximating splines depends on the number and weighting of the neighboring interpolation points and the compensation range



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Approximation

Calculating Approximation Functions with Configurable Setup Functions

- Setup functions



- Polynomial and rational functions
- Exponential and root functions
- Logarithmic functions
- Calculating the coefficients of the setup functions using the Gaussian least squares method
- Calculating the coefficient of determination
- Saving results in DIAdem variables and in the custom properties of the result channels
- Specifying evaluation points of the approximation curve to be generated
- Displaying the coefficients and calculated curve in the dialog box preview

Circle Approximation

Calculating Circles and Q-values

- Calculating regression circles
- Calculating maximum incircles and minimum circumcircles
- Calculating extremal concentric incircle and circumcircle
- Q-values as a degree of radical dispersion of measured values around an approximated circle

FFT

Fast Fourier Transform of One Time Signal or Two Time Signals

- Input channels of any length, which means the channel length does not need to be a power of two

FFT of One Time Signal

- Real/imaginary part, phase, cepstrum
- Amplitude calculation with averaging
- Third/octave analysis
- Multiple FFT
 - Defining intervals
 - Using multiple channels

Inverse FFT

- Phase shift for Hilbert transformation

FFT of Two Time Signals

- Cross spectrum
- Coherence
- Transferring frequency response: H0, H1, H2 spectrum
- Amplitude calculation with averaging
- Multiple FFT
 - Defining intervals
 - Using multiple channels

Full Spectrum FFT

- Calculating single spectra from the two vibration signals
- Connecting both spectra to a full spectrum FFT
- Diagnosing damage on rotating shafts
- Synchronous and equidistant sampling

Autocorrelation

- Normalized and non-normalized
- Calculating in the frequency domain or the time domain

Cross Correlation

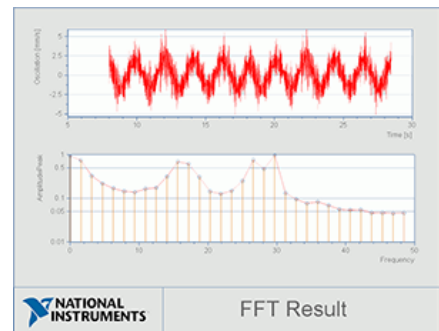
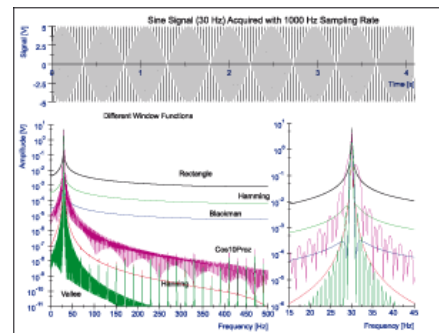
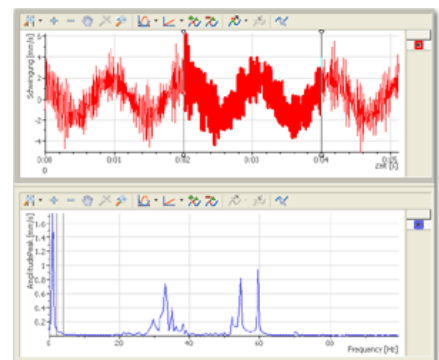
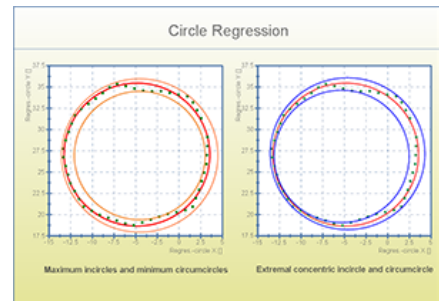
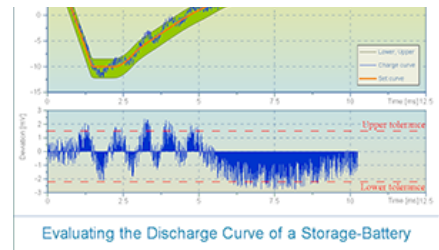
- Calculating in the frequency domain or the time domain
- Normalized and non-normalized
- One-sided and two-sided calculation

Window Functions

- Rectangle, Hanning, Hamming, Blackman, Flat-Top, Cos10Percent, Welch, Parzen, Bartlett, de la Vallee, Riemann, Kaiser, Cauchy, Gauß, Exponential
- Freely definable window function
- Amplitude damping correction of the window function for periodic and random signals

Oscillation Analysis

Analyzing the Oscillations of Signals



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Characterize Oscillation

- Single tone analysis
- Calculating the single frequency of the greatest amplitude
- Complete or limited frequency domain
- Displaying the frequency, amplitude, and associated phase as the result

SINAD Analysis

- Signal-to-noise and distortion ratio
- Calculating the ratio of the total signal power to the interference signal power
- Returning a measurement value for the transmission quality of a signal in decibel, to calculate the distortion

AC/DC Coupling

- Removing the DC part from a signal
- Using FFT window function
- Returning the AC part of a signal and the removed bias as the channel property

Pulse Detection

- Evaluating analog tachometer signals
- Signals measured with sensors at a shaft
- Threshold and hysteresis settings prevent that noisy tachometer signals lead to incorrect pulses
- Returning pulse start times, indexes of the start times, pulse start status, RPM, and number of pulses used for the calculation

Shaft Centerline

Calculating the Movement of a Rotating Shaft in the Bearing Box

- The Shaft Centerline is the path of the averaged shaft center point
- Averaging measurement values of two sensors at the shaft
- Evaluating how the position of the shaft center changes over several revolutions
- Specifying reference point
- Dividing measured values in time intervals

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Digital Filters

Attenuating or Amplifying Selected Frequencies with IIR and FIR Filter Methods

Filter Types

- Highpass, lowpass, bandpass, bandstop, allpass

Infinite Impulse Response (IIR) Filters

- Filter type: Bessel, Butterworth, and Chebyshev
- Ripple for Chebyshev between 0.01 and 3 dB
- Filter degree 1 to 16
- Phase shifting and offset can be eliminated

Finite Impulse Response (FIR) Filters

- Window functions: Rectangle, Hanning, Hamming, Blackman, Bartlett, modified rectangle

Shock Response Spectrum

Describing the Response of Multiple Single-Degree-of-Freedom Systems to an Acceleration Signal

- Calculating the acceleration
- Calculating the relative velocity
- Calculating the relative displacement
- According to ISO-Norm 18431-4:2007
- Logarithmic display over the frequency
- Calculating the entire acceleration signal or a section
- Attenuating of the single-degree-of-freedom systems

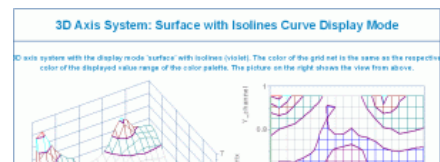
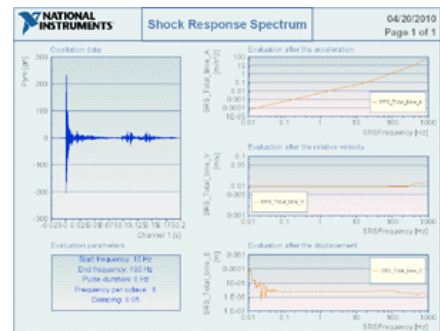
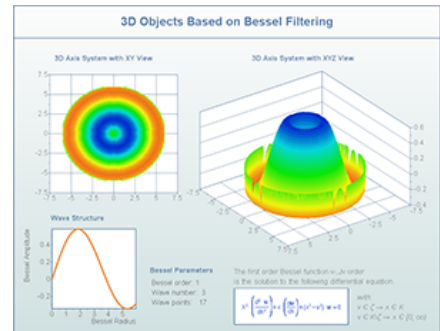
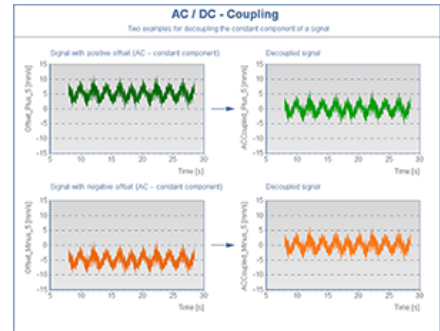
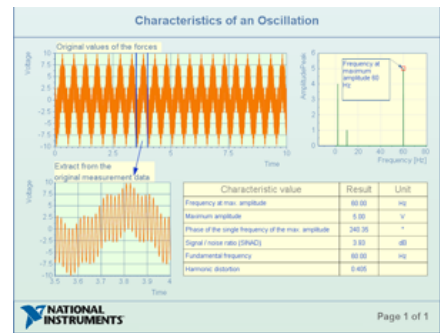
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3D Mathematics

Order, Conversion, and Copying Functions for Matrices; Generating and Analyzing Surface Data

3D Basic Functions

- Processing data in a matrix structure or a triplet structure
- Creating partial matrices and appending matrices
-



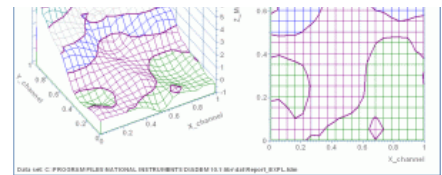
Sorting and transposing

Mathematical 3D Functions

- Relativizing, normalizing, extreme values
- Calculating the integral under a surface
- Calculating sums of matrix elements
- Arithmetic matrix operations

Generating and Analyzing Surfaces

- Calculating convex and non-convex boundary curves
- Multidimensional approximation from matrix or triplet structure
 - Setup functions from polynomial, rational, exponential, radical, and logarithmic functions
 - Calculating the coefficients of the setup functions using the Gaussian least squares method
- Multidimensional interpolation
 - Interpolation method: inverse distance, multiquadrite, ThinPlate, bicubical splines, Smart Interpolating Spline
- Calculating isolines



Frequency Weighting (A-, B-, C-Filtering)

Analyzing Frequencies Regarding the Sensitivity of the Human Ear

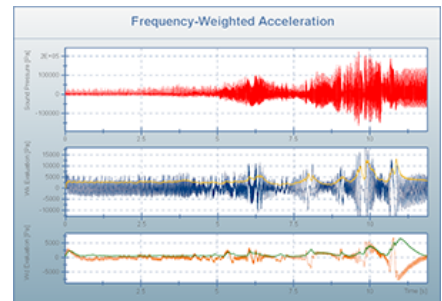
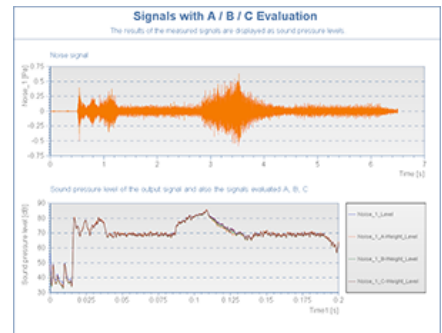
- Attenuating or amplifying specific signal frequencies to take account of the frequency-related sensitivity of the human ear
- According to IEC 61672-1:2003 and DIN EN 61672-1:2003-10
- Average filter results using a floating RMS with data reduction

Frequency-Weighted Acceleration

Analyzing the Effects of Mechanical Vibration on the Human Body in Accordance with ISO 2631 and ISO 5349

- Evaluation types
 - Wk: Vertical whole-body vibration z-axis (ISO 2631-1)
 - Wd: Horizontal whole-body vibration x-axis or y-axis (ISO 2631-1)
 - Wc: Horizontal whole-body vibration x-axis (ISO 2631-1)
 - Wf: Low-frequency vertical whole body vibration z-axis (ISO 2631-1)
 - We: Rotating whole-body vibration (ISO 2631-1)
 - Wb: Vertical whole-body vibration z-axis (ISO 2631-4)
 - Wj: Vertical head vibration (ISO 2631-1)
 - Wh: Hand-arm vibration (ISO 5349-1)
- Average filter results using a floating RMS with data reduction

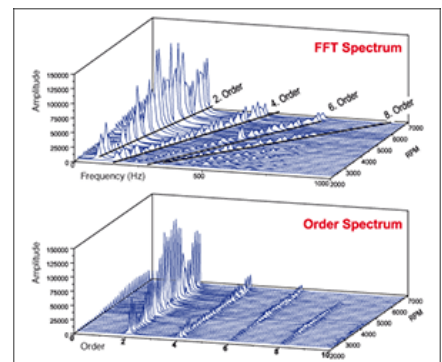
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Order Analysis

Order Analysis in the Time Domain or the Frequency Domain

- Order analysis in the time domain through digital filtering (tracking analysis)
 - Third/octave analysis
 - Sum level calculation
 - In accordance with DIN 45651 and DIN 45652
- Order analysis in the frequency domain
 - Calculating the amplitude and phase for specific orders from the signals of the vibration sensors
 - Orders are a multiple of the revolution of the shaft and are the basis for the evaluation of vibrations in and at a machine in relation to the RPM
- Evaluation: linear, dB, dB(A), dB(B), dB(C)
- Data reduction in relation to time or RPM
- Order analysis for Bode diagram
 - Calculating amplitude and phase for specific orders from the signals of the vibration sensors



Crash Analysis

Crash Test Analysis for Vehicle Safety According to SAE, ISO Specifications, and Statutory Directives (For Example, FMVSS and ECE)

- Calculating the resultant acceleration from the acceleration values in the x-, y-, and z-directions
- Filtering with CFC60, CFC180, CFC600, CFC1000, FIR100
- In accordance with ISO/TC22/SC12/WG3 N 260 and SAE J211 (12.2003)



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- * Supporting exchange formats such as ISO-MME for crash data

HIC Calculation (Head Injury Criterion)

- Either HIC, HIC36, or HIC15 including start/end time of the time interval
- In accordance with SAE J2052
- In accordance with ISO/TC22/SC12/WG3 N 282 (Issued 1990-03-16)

HCD Calculation (Head Contact Duration)

- HCD value, HCD36 value, HCD15 value, or HCD XY value
- In accordance with SAE J2052
- In accordance with ISO/TC22/SC12/WG3 N 282 (Issued 1990-03-16)
- In accordance with TRANS/SC1/WP29/GRSP/R.48/Rev.1, page 19, Annex 4, Appendix 1

BrIC Calculation (Rotational Brain Injury Criterion)

- Takhounts, 2013
- In accordance with NHTSA, Draft 2013-11-15

HPC Calculation (Head Performance Criterion)

- HPC value, HPC36 value, HPC15 value, or HPC XY value
- In accordance with SAE J2052
- In accordance with ISO/TC22/SC12/WG3 N 282 (Issued 1990-03-16)
- In accordance with E/EC/E/24; E/EC/E/TRANS/505; Regulation No. 95; page 34; Annex 4, Appendix 1

NIC Calculation (Neck Injury Criterion)

- In accordance with ECE R94 and EuroNCAP

NIC Rear Impact Calculation

- In accordance with ISO/TC22N2071 and ISO/TC22/SC10

NIJ Calculation (Normalized Neck Injury Criterion)

- In accordance with FMVSS

VC Calculation (Viscous Criterion)

- In accordance with ECE 94: directive 96/79/EG (16th 12 96)
- In accordance with SAE J1727: n. SAE J1727 (8.96)

TTI Calculation (Thorax Trauma Index)

- Maximum rib acceleration
- Peak acceleration of the spine (T12)
- In accordance with FMVSS No. 214, §571.214
- In accordance with SAE J1727 3.5

CWV Calculation (Chest Wall Velocity)

- Speed of the pressure wave that crushes the chest wall

DRI Calculation (Dynamic Response Index)

- Crushing chest and lumbar spine

FFC Calculation (Femur Force Criterion)

- In accordance with ECE R94 and EuroNCAP

TI Calculation (Tibia Index)

- Inclusion of bending moments around the x-axis and the y-axis
- Inclusion of axial force of pressure in z-direction
- In accordance with directive 96/79/EG (16th December 96); Amendment 2; 5.2

Xms Value: Maximum Amplitude Value of X Milliseconds

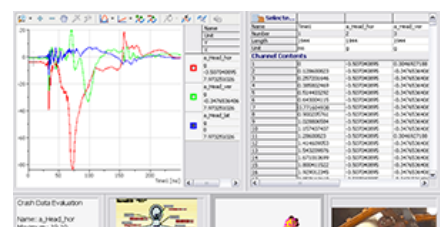
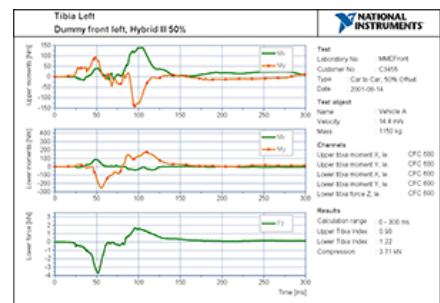
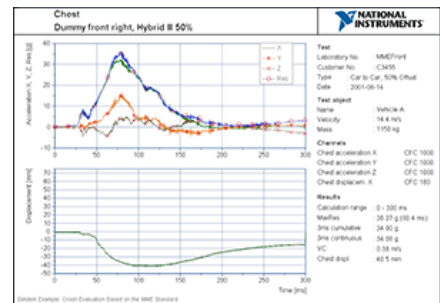
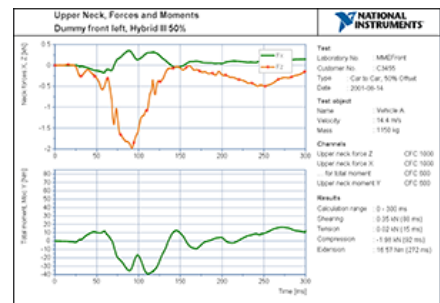
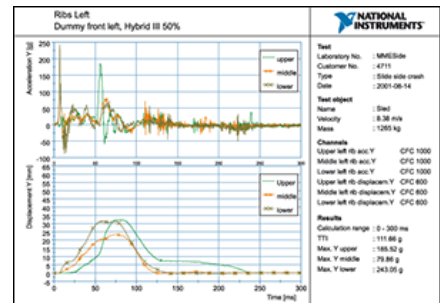
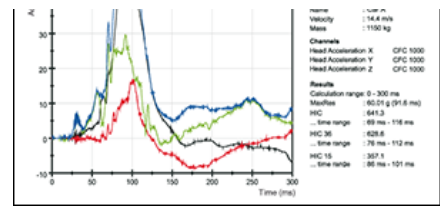
- Saving the start time of the x ms value
- Partitioned or complete time intervals

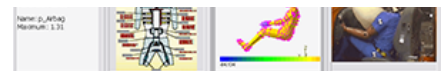
Xg Value: Total Time during Which the Acceleration Exceeds X[g]

- Partitioned or complete time intervals

Guardrail Criteria in Accordance with 1317-1(7.98)

- ASI calculation (Acceleration Severity Index)
- THIV calculation (Theoretical Head Impact Velocity)
- PHD calculation (Post-Impact Head Deceleration)
- OIV calculation (Occupant Impact Velocity)
-





Calculating the Minimum Values and Maximum Values with the Related Times

Calculating the Pulse Limit

AComp Calculation (acceleration during compression phase)

Copying Time Domain

Offset Correction

Inverting Channel Values

Dividing a Channel at a Limit Value

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Scripting

Automate Processes with VBS in DIAdem SCRIPT

Script Functions

- DIAdem functions, commands, and variables
- All VBS commands, including ActiveX and global variables
- Procedures, functions, and classes
- Control structures with branches, loops, and pauses
- User-defined variables
- Interaction: interrupting a script for interactive operation of DIAdem
- Communication via OLE, ODBC/SQL, ASAM-ODS, and ActiveX interface
- Start LabVIEW VIs
 - Object-oriented interface
 - DIAdem installs LabVIEW run-time engine
- Commands for accessing databases (SQL/ODBC, ADO)
- Commands for the download of FTP servers
- DataPlugin wizard
 - Analyzing text-based data files
 - Analyzing Excel spreadsheet files
 - Creating DataPlugins in VBS

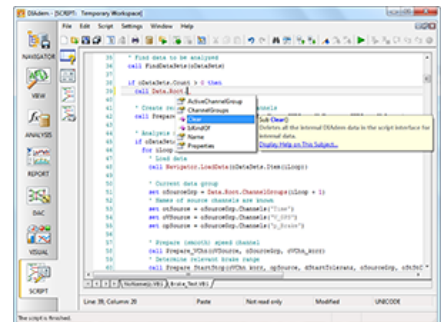


Script Profiler

- Measuring and analyzing the runtime of a script, or the execution times of individual script statements
- Analysis tool for detecting time-consuming commands and statements to optimize the script

Script Editor with Debugger

- Creating scripts in the recording mode
 - Path variable records all used folders
- Syntax coloring
- CodeCompletion offers the available objects, commands, and procedures for selection
 - Supporting user-defined VBS classes (Class) and parameters transferred to functions
 - Supporting registered type libraries
- SmartInfo with syntax, type, short description, and link to the Help for commands, properties, methods, and variables
- Debugging for testing and detecting errors
 - Breakpoints, bookmarks, jumps
 - Displaying variable contents and errors
- Collapsing and expanding code blocks



Note: You do not need to install the Visual Basic Scripting Host to create and execute scripts. DIAdem uses an integrated script engine. You must install the Microsoft Windows Script Debugger to debug scripts.

Note: You only need the DIAdem Base Edition to execute scripts.

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Create User Dialog Boxes

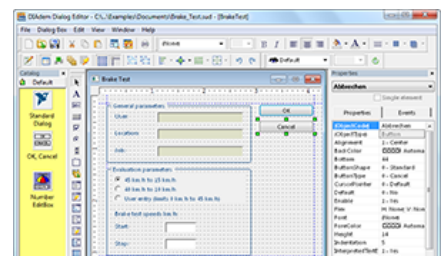
Create Modal and Non-Modal Dialog Boxes using VBS

Dialog Boxes

- User must close modal dialog boxes for script to continue
- Non-modal dialog boxes can remain open while a script is running

Graphical Dialog Box Editor

- Catalog with dialog box modules
- Tabs for multipage dialog boxes
- Selection fields, input fields, list fields, and marking fields

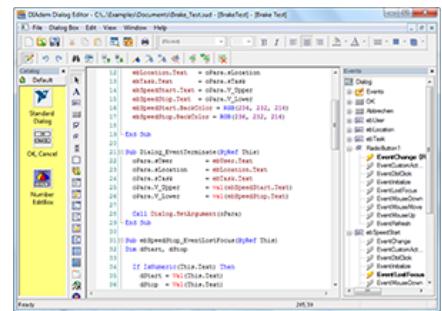
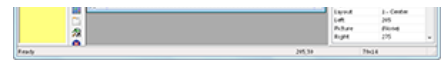


- Checkboxes and radio buttons
- Spinboxes and comboboxes
- Listboxes with multiple selection
- Curve 2D preview
- Dragging and dropping channels to channel combobox and channel listbox
- Text and buttons
- Graphics and frames
- Tables for displaying and entering variable contents
- Extended tables for displaying and using controls such as radio buttons, checkboxes, comboboxes, editboxes, listboxes, channel comboboxes, and channel listboxes
- Embed ActiveX elements
- Minimizing, maximizing, and hiding in title bar
- Preview and test functions

Editor Functions

- Syntax coloring, CodeCompletion, and SmartInfo in the script editor
- Transferring variable contents
- VBS for defining logical operations
- Saving several dialog boxes of a project in one file
- Encrypting scripts and dialog boxes

Note: You only need the DIAdem Base Edition to execute user dialog boxes.



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Bar Manager and User Commands

Extending the Program Interface and the Command Stack

Adding Functions and Function Groups to the User Interface

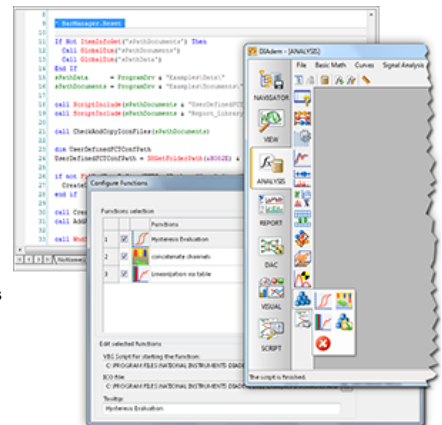
- Showing and hiding the toolbar, the panel bar, the group bar, and the function group
- Changing the display of the bars and the function groups
- Creating and removing function groups
- Adding buttons to the function groups and the toolbars
- Assigning user-defined functions to the buttons

User Commands

- Definition in VBS scripts
- User-defined, permanent extensions to the DIAdem range of functions, for example, for special calculations or formats
- Daisy chaining: Assign multiple user commands to one event

Modifying Standard Menus and Adding User-Defined Menu Items

Note: You only need the DIAdem Base Edition to execute user-defined program interfaces and user commands.



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Measuring and Visualizing Data

Defining Measurement Tasks in DIAdem DAC and Designing Visualizations in DIAdem VISUAL

Single-Point Processing: Acquisition and Processing of Signals "Value-By-Value"

- Acquisition rates are limited by measurement hardware or computer performance
- Defining various sampling rates for simultaneous or sequential partial measurements
- Real-time kernel for data acquisition, calculation, and output of values
- Multicore timing for computers with several processor kernels

Graphical Definition of a Measurement Task with Function Blocks and Buses

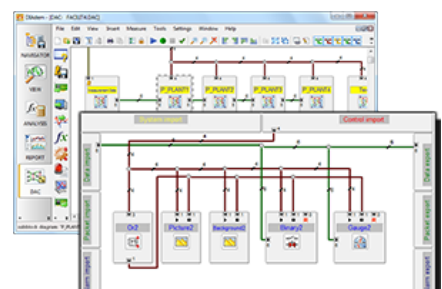
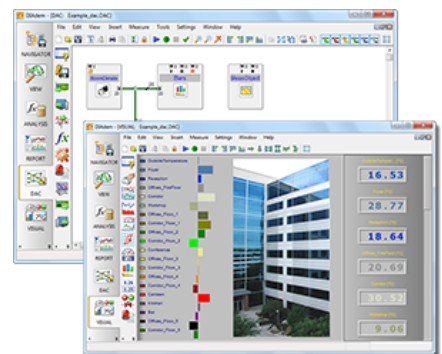
- Bus technology allows several signals on one bus
- System buses, control buses, data buses, packet buses, alarm buses, and text buses
- Saving the block diagram in ASCII or Unicode format

Subblock Diagrams

- Grouping block diagram sections into a function block
- Several block diagram levels
- Exporting and importing as a file
- User-defined libraries

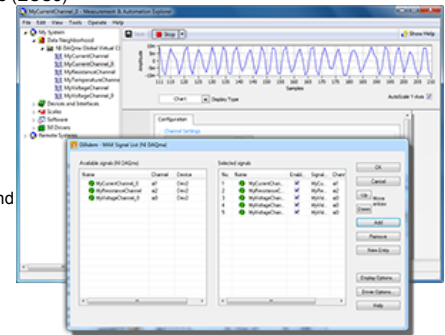
Measuring with and without Data Storage

- Saving measurement values in the Data Portal, in a TDM file, or in a DAT file
- Defining channel comments and custom properties
- Start trigger, stop trigger (trigger sequences)
- Trigger sequences with data reduction (minimum value, maximum value, mean value, first value)



Communicating with Measurement Hardware via Driver Library or Interface

- Using several different hardware components, even from different manufacturers, in one measurement
- Supporting NI DAQ hardware and NI CAN hardware with RTSI synchronization
- Supporting NI-XNET hardware to access CAN, LIN, and FlexRay
- Supporting the NI ECU Measurement and Calibration Toolkit for data acquisition and calibration of engine control units (ECUs)
- Script driver for communicating with measurement devices via VBS
- Supporting RS232, GPIB, TCP/IP
- Integrating external driver software such as ActiveX
- OPC client supporting OPC1.0A, 2.0
- GPI: user-programmed drivers in C++ (on request)
- Windows XP support for all shipped drivers
- Windows Vista, Windows 7, Windows 8/8.1: support for NI-DAQmx, NI-CAN, Script driver, sound board, Timer DLL and HBM measurement devices (DMC 9012A, DMCPlus, MGC, UPM-100, UPM-60)



Generated Signals and Events

- Sine signals, triangle signals, rectangle signals; optionally in interrupt
- Random signals, noise signals
- Switches, push buttons, dials, slider controls, keys
- Radio button for the selection of predefined values for data signals at run time
- Reading out data from the Data Portal and from files
- Measurement time, stopwatch, counter, system time, and system date
- System buffer monitor controls the system load
- Buffering data from non real-time sources using this data later as a real-time signal

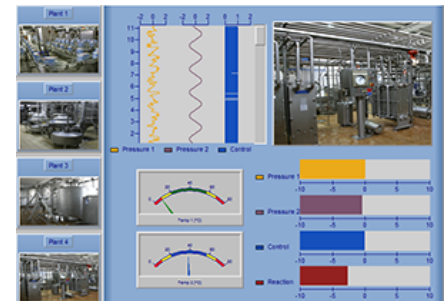


Signal Scaling

- Linear or 2-point scaling
- Calibration measurement for calibrating measurement chains
- Multipoint scaling
- Free linearization via channels
- Offset correction
- Linearization for thermocouple types B, E, J, K, N, R, S, and T according to IEC 584-2: 1982 (HD 446.2 S2: 1990) or according to IEC 584-1: 1995 (EN 60584-1: 1995)
- Linearization for thermoresistance PT100 according to IEC 751/10.85 (DIN 43760) or according to IEC 751: 1983 + Amd.1: 1986 + Amd.2: 1995 (EN 60751: 1995 + A2: 1995)
- Compensating external, linear preamplifiers
- Using unit symbols from units catalog (refer to [Units Catalog](#))

Conditions for Event Control

- Windows, slopes, signal changes
- Time range, absolute time, delay
- Number of values
- Push button and switch
- Radio button for activating one of several control signals at run time
- Selection field for activating one of several control signals at run time
- Status of partial measurements
- Formulas with Boolean results
- Logical operations (AND, OR, NOT)
- Toggle switch
- Mono flop, RS flip flop, and JK flip flop
- User commands for the automatic preprocessing and postprocessing of measurements

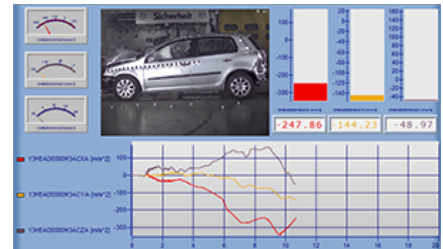


Display

- Curves, spikes, wiper
- Horizontal and vertical wipers with adjustable view range
- XY display as line, symbol, graphic, recorder
- Scatter plot
- Video for integrating the live image of a video camera into the visualization
- Map display
 - Showing measured geographical data with a cursor and a line
 - Maps from OpenStreetMap and Microsoft MapPoint
 - Note:** Requires DAC-Bundle
- Polar coordinates
- Gauges, analog instruments, tachometers, cylinder tachometers
- Horizontal and vertical bars
- Color matrix display
- Digital displays, rolling tables
- Messages with text display and sound
- Binary display
- Status display with sound and graphics



- Container display
 - Switch, push button, slider control, dials, keys, and option and selection fields
 - Text block for formatting display of static and dynamic text
 - Event-controlled instrument display, hide, and reset
 - Warning and alarm display
 - Automatic legend
 - Grid lines
 - Fixed, rolling, or absolute reference axes
 - Background graphics
 - Various y-display modes
 - Automatic scaling for curve, wiper, spike, and recorder displays
 - Interactive y-scaling with the mouse
 - Specifying font size for labels automatically or manually
 - Background
 - Color definition
 - Color shading
 - Background graphics
- Specifying size and alignment of display area for each block diagram
- Defining and managing user accounts with various access rights for confirming alarms (refer to [Alarm and Protocol System](#))



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Open- and Closed-Loop Control and Online Mathematics

Calculating and Displaying Signal and Control Values

Online Mathematics

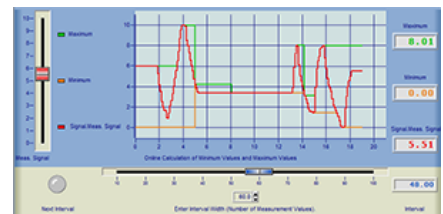
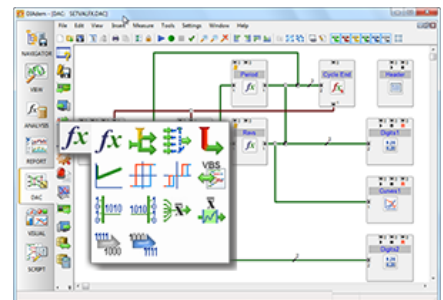
- Defining formulas and assigning unit symbols of the units catalog (refer to [Units Catalog](#))
- Numeric, Boolean operations
- Bit operations
- Accessing variables and constants
- Integrating user-programmed GPI processing functions

Software-Clock Real-Time Control

- 2- and 3-point controller with hysteresis
- PID controller
- Simultaneous closed-loop control of several values using different controllers

Signal Output to Measurement Hardware and Interfaces

- Calculated data, Data Portal data, and data file data as signal sources
- Using several different hardware components, even from different manufacturers, in one measurement
- NI DAQ hardware and NI CAN hardware support
- Hardware drivers must support output
- Script drivers
- OPC client



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Packet Processing

Dataflow-Controlled DAQ, Calculation, and Signal Output

Communication with Measurement Hardware

- Driver library for converter boards and processor boards
- Integrating user-programmed drivers
- Serial interface

Data Packet Control

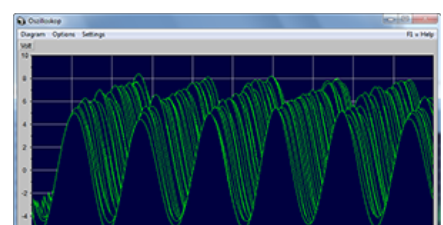
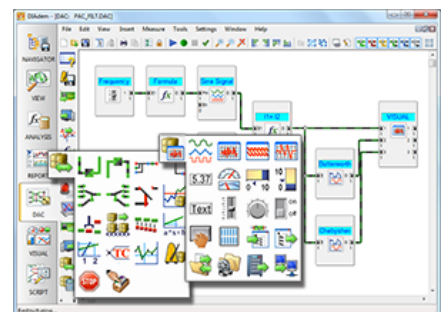
- Slope and window trigger, and pretriggering
- Data packet extracts

Generated Signals and Data Sources

- Rectangle, triangle, sine, noise, impulse, constants
- Counting values, data packets, and time
- Selecting data packets
- Reading out a file
- Manual input using switches, push buttons, slider controls, dials, keys

Online Data Packet Calculation

- Formulas
- Mathematical functions library: basic functions, arithmetic, trigonometry
-



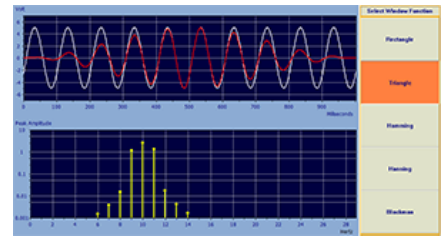
Window function: rectangle, triangle, Hamming, Hanning, Blackman, user-defined

- Spectral analysis: FFT, inverse FFT, FFT with two time signals
- Digital filters: Butterworth, Bessel, and Chebyshev
- Characteristic curves
- Characteristic statistical values: mean, maximum value, minimum value, variance, standard deviation, root mean square, sum
- Averaging data and data blocks
- Classification: sample range, time at level, level crossing, peak counting
- Logical operations



Visualizing Data Packets

- Curves, recorders, bars, 3D waterfall display
- Gauge, analog display, horizontal and vertical bars, digital display, text



Combining Single-Point Processing and Packet Processing

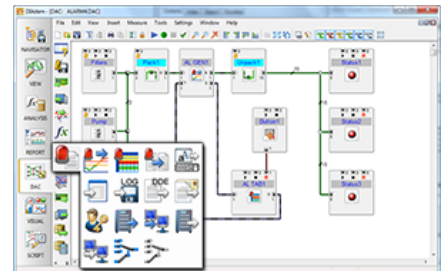
- Unpacking data packets and packing single values
- Data transfer in intranet and internet
- Noise measurement and output via sound card

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Alarm and Protocol System

Defining and Recording Alarms

- Defining alarms
 - Statistical attributes such as signal numbers, alarm types, alarm groups, limits, delay
 - Priority and quit level for alarm confirmation
 - Dynamic attributes such as time stamp, trigger value, counter, unit and alarm status
- Monitoring alarms
 - Checking where signals overshoot limits
 - Generating alarm attributes
 - Displaying alarms by priority
 - Confirming alarms
- Documenting alarms
 - Displaying alarms
 - Saving alarms as ASCII or HTML text
 - Messages via DDE, fax, email, or paging software
 - Inputting online text



Time	Channel	Description	Group	Priority	Operator	Status
7/10/2012 1:09:24 PM	1	Overhaul	Water	Warning	Operator	OK (not confirmed)
7/10/2012 1:09:24 PM	1	Water status	Water	Warning	Operator	OK (not confirmed)
7/10/2012 1:09:24 PM	2	Critical overheat	Water	Error	Operator	OK (not confirmed)
7/10/2012 1:09:24 PM	2	Water status	Water	Warning	Operator	OK (not confirmed)
7/10/2012 1:09:24 PM	3	Critical overheat	Water	Error	Operator	OK (not confirmed)
7/10/2012 1:09:24 PM	3	Water status	Water	Warning	Operator	OK (not confirmed)

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System Requirements

Software Requirements for DIAdem (64-bit)

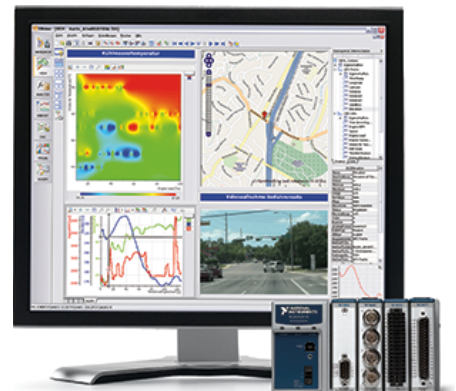
- Windows 7 64-bit with Service Pack 1
- Windows 8.1 64-bit
- Windows Server 2008 R2 with Service Pack 1
- Windows Server 2012 R2
- Internet Explorer: For the map display in DIAdem VIEW and DIAdem DAC you need the Internet Explorer from version 10.
- Recommended: Adobe Reader and Adobe Flash Player for Microsoft Internet Explorer

Software Requirements for DIAdem (32-bit)

- Windows XP Pro 32-bit Service Pack 3 or later
- Windows Vista 32-bit or 64-bit with Service Pack 2 (as 32-bit application)
- Windows 7 32-bit or 64-bit with Service Pack 1 (as 32-bit application)
- Windows 8.1 32-bit or 64-bit (as 32-bit application)
- Windows Server 2003 R2 32-bit with Service Pack 2
- Windows Server 2008 R2 64-bit with Service Pack 1 (as 32-bit application)
- Windows Server 2012 R2 64-bit (as 32-bit application)
- Internet Explorer
- Recommended: Adobe Reader and Adobe Flash Player for Microsoft Internet Explorer

Hardware Requirements

- CPU: x86 compatible processor, at least 1.6 GHz or more
- Memory: at least 1 GB
- Hard disk: at least 2.8 GB free memory space of which at least 1.8 GB are on the system partition
- Graphics card: color depth at least 16-bit (High Color), recommended 24- or 32-bit (True Color)
- Screen resolution: at least 1024x768



Support and Services

Technical Support

Get answers to your technical questions using the following National Instruments resources.

- **Support** - Visit ni.com/support to access the NI KnowledgeBase, example programs, and tutorials or to contact our applications engineers who are located in NI sales offices around the world and speak the local language.
- **Discussion Forums** - Visit forums.ni.com for a diverse set of discussion boards on topics you care about.
- **Online Community** - Visit community.ni.com to find, contribute, or collaborate on customer-contributed technical content with users like you.

Repair

While you may never need your hardware repaired, NI understands that unexpected events may lead to necessary repairs. NI offers repair services performed by highly trained technicians who quickly return your device with the guarantee that it will perform to factory specifications. For more information, visit ni.com/repair.

Training and Certifications

The NI training and certification program delivers the fastest, most certain route to increased proficiency and productivity using NI software and hardware. Training builds the skills to more efficiently develop robust, maintainable applications, while certification validates your knowledge and ability.

- **Classroom training in cities worldwide** - the most comprehensive hands-on training taught by engineers.
- **On-site training at your facility** - an excellent option to train multiple employees at the same time.
- **Online instructor-led training** - lower-cost, remote training if classroom or on-site courses are not possible.
- **Course kits** - lowest-cost, self-paced training that you can use as reference guides.
- **Training memberships** and training credits - to buy now and schedule training later.

Visit ni.com/training for more information.

Extended Warranty

NI offers options for extending the standard product warranty to meet the life-cycle requirements of your project. In addition, because NI understands that your requirements may change, the extended warranty is flexible in length and easily renewed. For more information, visit ni.com/warranty.

OEM

NI offers design-in consulting and product integration assistance if you need NI products for OEM applications. For information about special pricing and services for OEM customers, visit ni.com/oem.

Alliance

Our Professional Services Team is comprised of NI applications engineers, NI Consulting Services, and a worldwide National Instruments Alliance Partner program of more than 700 independent consultants and integrators. Services range from start-up assistance to turnkey system integration. Visit ni.com/alliance.