

# Windchill® ALT (Accelerated Life Testing)

ANALYZE ACCELERATED LIFE TESTING DATA TO PREDICT PRODUCT RELIABILITY

Windchill ALT (formerly Relex ALT), or Accelerated Life Testing, enables the statistical methods used to identify characteristic failure behavior from products exposed to higher than normal stresses.

Designed to streamline product development and testing activities, Windchill ALT enables engineers to analyze data from testing procedures that accelerate stress conditions for parts or systems, causing them to fail more quickly than they would under normal operating conditions. With powerful, built-in mathematical models, Windchill ALT assists in the extrapolation of test results to real-world product failure behavior, shortening analysis time and helping to identify product weaknesses earlier than otherwise possible.

## Key Benefits

### Analyze the Impact of Various Product Stresses Sooner

- Analyze data from overstress acceleration tests, which submit products to increased levels of environmental stresses to stimulate the product to fail more quickly than normal
- Stresses may include temperature, humidity, vibration, voltage, or a combination of up to ten different stresses
- From accelerated testing data, predict failure behavior under normal operating conditions at a given age and stress level
- Identify and resolve component weaknesses early in the design process, when design changes are less costly
- Save time by accurately predicting the failure behavior of highly reliable products in a shorter time frame than otherwise possible



Flexible, powerful graphing tools specific to accelerated life testing provide a wide range of options for data visualization and analysis in Windchill ALT.

### Powerful Statistical Analysis Capabilities

- Define stress profiles for each test item, to describe changing levels of stress over time, and both time and stress level at failure
- Best fit distribution analysis recommends a model for characteristic product failure behavior
- Intuitive summary calculator outputs product reliability or unreliability at a given product age and stress level
- Also calculate warranty times, time to failure, conditional probability, and mean life

### Comprehensive Data Plotting Tools

- Standard LDA plots: probability, reliability vs. time, unreliability vs. time, PDF, and failure rate vs. time
- ALT-specific plots: life vs. stress, standard deviation vs. stress, acceleration factor vs. stress
- Residual plots show the difference between fitted and observed values: standardized residual, Cox-Snell, standard vs. fitted
- Other plots: 3D Likelihood Function, 3D Surface
- View plot of Stress Profiles specified for items under test
- View multiple data sets together on the same plot, or view multiple plots side by side for easy comparison

### Accelerated Test Planning Functionality

- Specify 1 - 2 stresses, stress types and values, typical usage stress, highest stress experienced, number of units, and test duration
- Several available test plan models based on number of stresses
- Results include recommended stresses and stress combinations for test, allocation of test units proportional to each stress, sample size, expected total time on test, and standard deviation

### Features and Specifications

#### Life-Stress Relationship Models

- Time-Varying (CEM) and Constant, 1-Stress
  - Arrhenius
  - Eyring
  - Inverse Power Law
- Constant, 2-Stress
  - Temperature-Humidity
  - Temperature-NonThermal
  - Generalized Eyring
- Constant, 1 to 10 Stresses
  - Proportional Hazards
  - General Log-Linear

### Supported Calculations

- Standard Probability
- Conditional Probability
- Failure Rate
- Warranty Time
- Time to Failure
- Mean Life
- Acceleration Factor
- Parameter Bounds
- Inverse Fisher Matrix

### Supported Distributions

- Weibull
- Exponential
- Lognormal

### Supported Data Types

- Exact Times
- Interval
- Suspensions
- Grouping

### Supported Estimation Method

- Maximum Likelihood Estimation (MLE)

### Supported Confidence Method

- Fisher Matrix

### Supported Confidence Types

- Lower confidence
- Double confidence
- Upper confidence
- Upper and Lower confidence

### Supported Plot Types

- Probability
- Reliability vs. Time
- Unreliability vs. Time
- PDF Plot

- Failure Rate vs. Time
- Life vs. Stress
- Standard Deviation vs. Stress
- Acceleration Factor vs. Stress
- Standardized Residuals
- Cox-Snell Residuals
- Standard vs. Fitted Value
- 3D Likelihood Function
- 3D Surface Plot

#### Supported Conversion Capabilities

- Celsius
- Fahrenheit
- Kelvin
- Rankine
- User-defined factor
- Stress transformations
  - Exponential
  - Power
  - Arrhenius

#### Input and Output Data in a Variety of Formats

- Easily import from or export to commonly used formats like Microsoft Excel, Microsoft Access, XML, and plain text files
- Create reports in Microsoft Word, Microsoft Excel, Adobe PDF, and Rich Text Format (RTF)
- User-definable, wizard-driven custom graphs and reports
- Dynamically link to other Windchill Quality Solutions modules, such as Windchill RBD and Windchill Prediction

#### Available Enterprise-Class Features

- Multi-user environment with login permissions, security features, administrator control, and audit trail functionality
- Database integration at enterprise level supports Microsoft SQL Server 2000, SQL Server 2005, SQL Server 2005 Express, SQL Server 2008, SQL Server 2008 Express, Oracle 9i, Oracle 10g, or Oracle 11g

- Feature-rich FlexNet license management tool
- Available integration with the Windchill PDMLink bill-of-materials ensures a single, up-to-date version of the product BOM

#### Supported Languages

- English, French, German, Japanese, Korean, Russian, Simplified Chinese

#### For More Information

For more information on Windchill ALT, please visit: [PTC.com/products/windchill/ALT](http://PTC.com/products/windchill/ALT)

© 2011, Parametric Technology Corporation (PTC). All rights reserved. Information described herein is furnished for informational use only, is subject to change without notice, and should not be construed as a guarantee, commitment, condition or offer by PTC. PTC, the PTC Logo, Windchill, and all PTC product names and logos are trademarks or registered trademarks of PTC and/or its subsidiaries in the United States and in other countries. All other product or company names are property of their respective owners. The timing of any product release, including any features or functionality, is subject to change at PTC's discretion.

6507-Windchill-ALT-DS-EN-0411