



## SAS/QC® Software

Powerful tools that support quality improvement across entire organizations

### What does SAS/QC® software do?

SAS/QC software provides a wide range of specialized tools that will help you improve products, optimize processes and increase levels of customer satisfaction. It includes tools for process management as well as process control.

### Why is SAS/QC® software important?

SAS/QC provides a depth and breadth of tools for statistical quality improvement not found in other software packages. With sophisticated quality improvement tools that run across multiple computing platforms, it enables organizations to go beyond basic process control to incorporate more advanced statistical analyses for additional insights into processes and product improvements.

### For whom is SAS/QC® software designed?

SAS/QC software is designed for process and manufacturing engineers, directors of quality improvement, directors of manufacturing and directors of customer satisfaction.

Organizations everywhere seek to improve the quality of products and services they provide and to maintain consistent quality standards across the enterprise. In most instances, this means monitoring many processes from disparate sources and integrating the information to gain a complete view of quality improvement efforts. However, there is a need to go beyond monitoring processes to improving them.

The goal is not just identifying problems but finding solutions to correct the problems. With many complex processes, it is necessary to understand how the output from one step affects the next, and ultimately how it affects overall quality.

Unfortunately, in complicated manufacturing environments, standard control chart methods and traditional statistical quality improvement methods do not always apply. Complex environments call for more integrated and sophisticated analyses.

SAS/QC software delivers a wide range of specialized tools that help you identify and understand the sources of variation in your processes, which enables you to improve products, optimize processes and increase customer satisfaction. The tools in SAS/QC software support statistical quality improvement efforts across entire organizations, from understanding processes to control charting and assessing product reliability. A specialized interface for the design of experiments is also included, enabling you to manage each stage of the experimental design process.

### Key Benefits

- Quality improvement tools designed to handle large volumes of data from multiple processes.** SAS/QC can operate on virtually any data source and runs across most computing platforms. With the ability to monitor multiple processes and integrate a wide variety of data, you gain a more complete picture of enterprise-wide quality improvement efforts. This enables you to maintain consistent standards and use all information that is collected to make better decisions.
- Ability to go beyond monitoring to identifying the root causes of problems.** It's not enough to simply recognize that you have a quality problem. You have to find the cause of the problem to determine how to fix it. SAS/QC provides powerful tools and a guided user interface for designing experiments and managing the experimental process. SAS/QC enables users to discover root causes of problems and goes beyond basic process control to provide more complex statistical analyses—all enabling you to create more efficient, cost-effective processes.
- A wide range of specialized tools for different users.** SAS/QC provides a depth and breadth of tools for statistical quality improvement not found in other software packages. From interfaces that guide users through the experimental design process to sophisticated tools for product reliability analysis, SAS enables you to go beyond the basics to create insights that drive competitive advantage.



## Product Overview

SAS/QC software provides extensive statistical quality improvement capabilities. In addition to running across a wide variety of platforms, no other software offers such a wide range of specialized quality improvement tools. It supports the entire quality improvement process, helping you:

- Understand processes.
- Pinpoint critical problems.
- Establish controls and reduce variation.
- Determine process capabilities.
- Evaluate measurement processes.
- Perform analysis of means.
- Design experiments for improving products, services and processes.
- Determine product reliability.

There are two main types of tools in SAS/QC software: point-and-click interfaces and procedures. The point-and-click interfaces are complete, full-screen oriented environments for statistical quality improvement applica-

tions. The procedures offer extensive flexibility and greater power than the interfaces. They require a basic knowledge of the SAS language and the procedure syntax.

## Key Capabilities

### Basic problem solving

SAS/QC provides procedures for implementing the “basic seven QC tools” for analyzing data and presenting the results of problem-solving activities, including check sheets, Pareto charts, Ishikawa diagrams, flow diagrams, histograms, scatter plots and control charts.

### Statistical process control

Manufacturing engineers concerned with managing the variability of a process often use control charts. With control charts, the natural variability in a manufacturing process is quantified with a set of control limits. Variations that exceed the limits signal a change in the process. SAS/QC delivers flexible, comprehensive tools for implementing statistical process control. With SAS/QC software, users can create all commonly encountered

Shewhart charts for variables and attributes, cumulative sum control charts and moving average charts.

### Process capability analysis

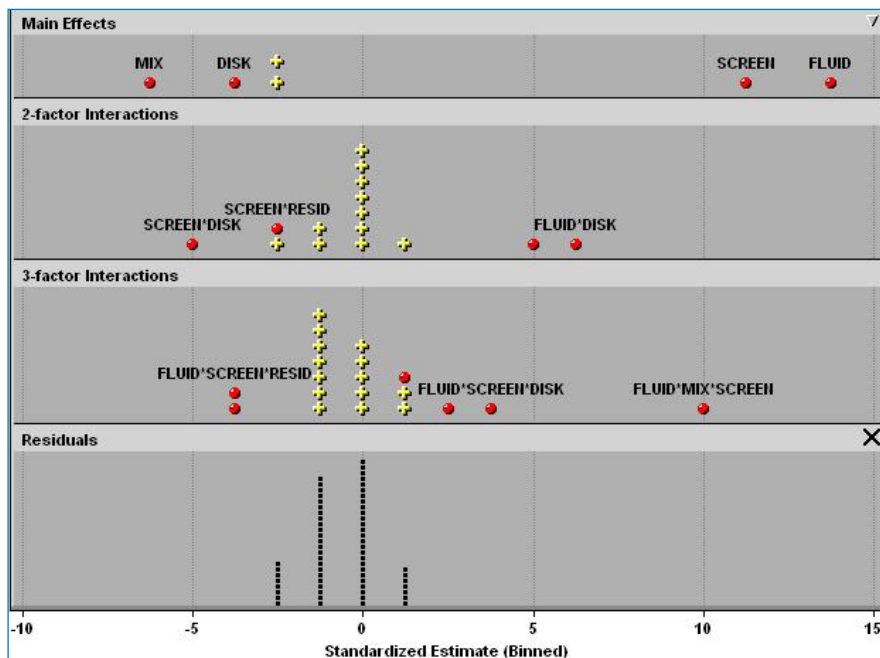
Process capability analysis compares the distribution of output from an in-control process to its specification limits to determine the consistency with which the specification limits can be met. A variety of graphical displays and statistical measures are available for comparing the distribution of an in-control process to its specification limits. SAS/QC software also provides a menu-driven interface for standard statistical quality control applications. It is intended for quality analysts, quality control managers and other nonstatisticians. The SQC Menu System provides a syntax-free environment for process capability analysis, control charts, Pareto charts and Ishikawa diagrams.

### Reliability analysis

SAS/QC software includes both graphical and statistical tools for performing reliability analysis for lifetime and repair data. Users can construct probability plots and fit life distributions with right- and interval-censored lifetime data, analyze regression models and analyze data from repairable systems. These tools benefit reliability engineers and industrial statisticians working with product life data and system repair data. They also aid workers in other fields, such as medical research, pharmaceuticals, social sciences and business, where survival and recurrence data are analyzed.

### GAGE repeatability and reproducibility

Measurement systems are essential to the quality of a manufacturing process. The measurement process itself is subject to variation, and excessive variation in the measurement instruments, referred to as gages, can mask critical variations. One type of measurement variation is caused by conditions inherent



The SAS ADX Interface for Design of Experiments lets you analyze fitted models using the new graphical ANOVA.

in the gages. This variation, known as repeatability, occurs when one person measures the same characteristic several times with the same gage. Another type of measurement variation, known as reproducibility, occurs when different individuals measure the same characteristic with the same gage. Other sources of measurement variation include part-to-part variation and lack of accuracy, stability and linearity. SAS/QC provides a point-and-click interface for assessing gage repeatability and reproducibility. It provides range charts and average charts, which are commonly used in the semiconductor and automotive industries, as well as more flexible variance component methods. The GAGE application is designed for easy modification to suit local requirements.

### Analysis of means

SAS/QC provides a procedure for conducting an analysis of means. This procedure provides graphical and statistical methods for determining which treatment group yields the best/worst outcome.

### Design of experiments

Many quality-conscious manufacturers are taking advantage of experimentation to systematically improve a product or process. Factorial experimental designs are useful for studying the effects of various factors on a response. SAS/QC provides procedures for generating factorial, fractional factorial and mixed-level experimental designs.

### ADX Interface for Design of Experiments

Included in SAS/QC software is the ADX Interface, a point-and-click environment for designing experiments. This is intended for use primarily by engineers and researchers who require an interface for each stage of the experimental design process, from building designs and determining significant effects to optimization and reporting. It guides users through each stage of the process.

## Key Features

### Basic quality problem solving

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- Pareto charts.
- Ishikawa diagrams.

### Statistical process control (SPC)

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- Shewhart charts:  $\bar{X}$  and R charts,  $\bar{x}$  and  $s$  charts, box charts,  $p$  charts,  $np$  charts,  $c$  charts,  $u$  charts, individual measurements and moving range charts, tests for special causes.
- Cumulative sum control charts.
- Moving average charts.
- Nonstandard control charts:
  - Trend charts for time-dependent data.
  - Start charts for multivariate process data.
- Multivariate process monitoring.

### GAGE application

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- Measurement system evaluation: range charts, average charts.
- Variance components method.

### Process capability analysis

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- Comparative histograms.
- CDF plots, probability plots, Q-Q plots, P-P plots.
- Capability indices.
- Confidence, tolerance and prediction intervals.
- Descriptive statistics.

### Reliability analysis

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- Accelerated life test models for censored data.
- Maximum likelihood estimation.
- Asymptotic normal and likelihood ratio confidence intervals.
- Weibayes analyses.
- Nonparametric estimates and confidence intervals.
- Analysis of multiple failure models.
- Probability plots.
- Life vs. stress plots.
- Nonparametric plots of mean cumulative function.

### Analysis of means

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- Simultaneously compare  $k$  treatment means with their overall mean.
- Single or multiple response variables.
- Compute decision limits from data.
- Adjust decision limits for unequal sample sizes.
- Means charts,  $p$  charts,  $u$  charts, box charts.

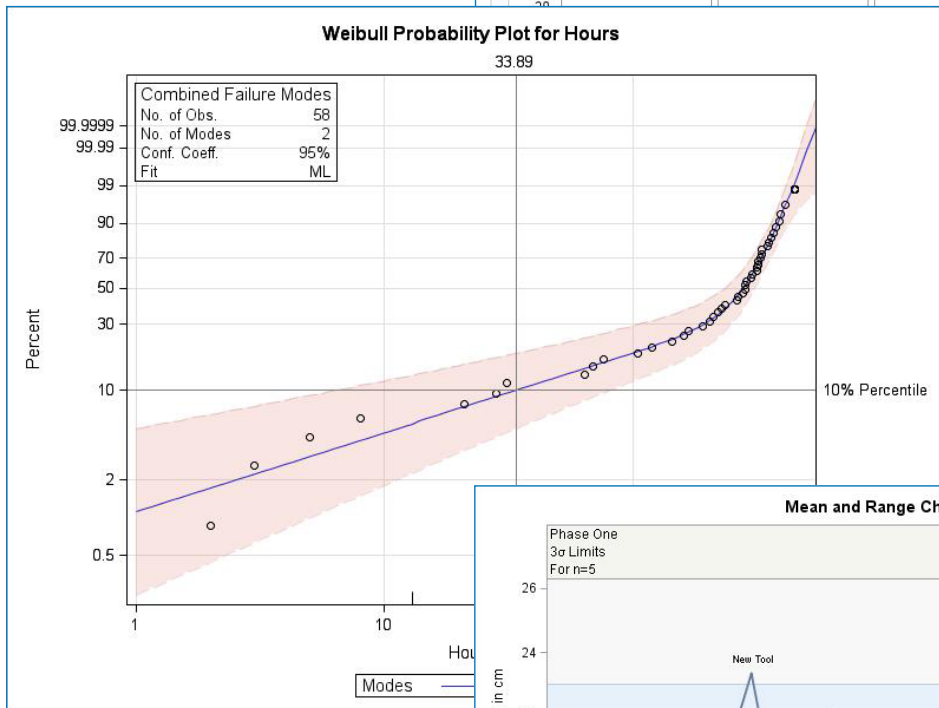
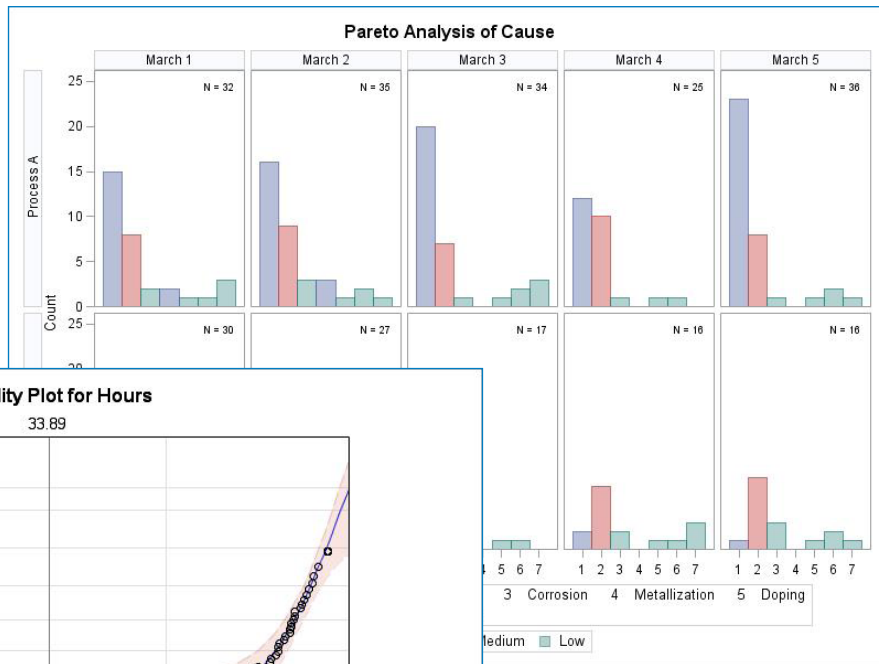
### Design of experiments

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- Full and fractional factorial designs.
- D-optimal and A-optimal designs.
- ADX Interface for Design of Experiments:
  - Two-level, response surface, mixture and mixed-level designs.
  - Split-plot and fractional factorial split plot designs.
  - Orthogonal arrays for mixed-level designs.
  - Analysis of unstructured experiments.
  - Main effect, interaction, cube and factorial plots.
  - Statistical analyses including regression, ANOVA, residual and outlier analysis.
  - Graphical optimization.
  - HTML report generation.

## SAS/QC® Software System Requirements

To learn more about SAS/QC system requirements, download white papers, view screenshots and see other related material, please visit [www.sas.com/qc](http://www.sas.com/qc).



SAS/QC includes a wide range of graphics and reporting capabilities to support the entire quality improvement process.

