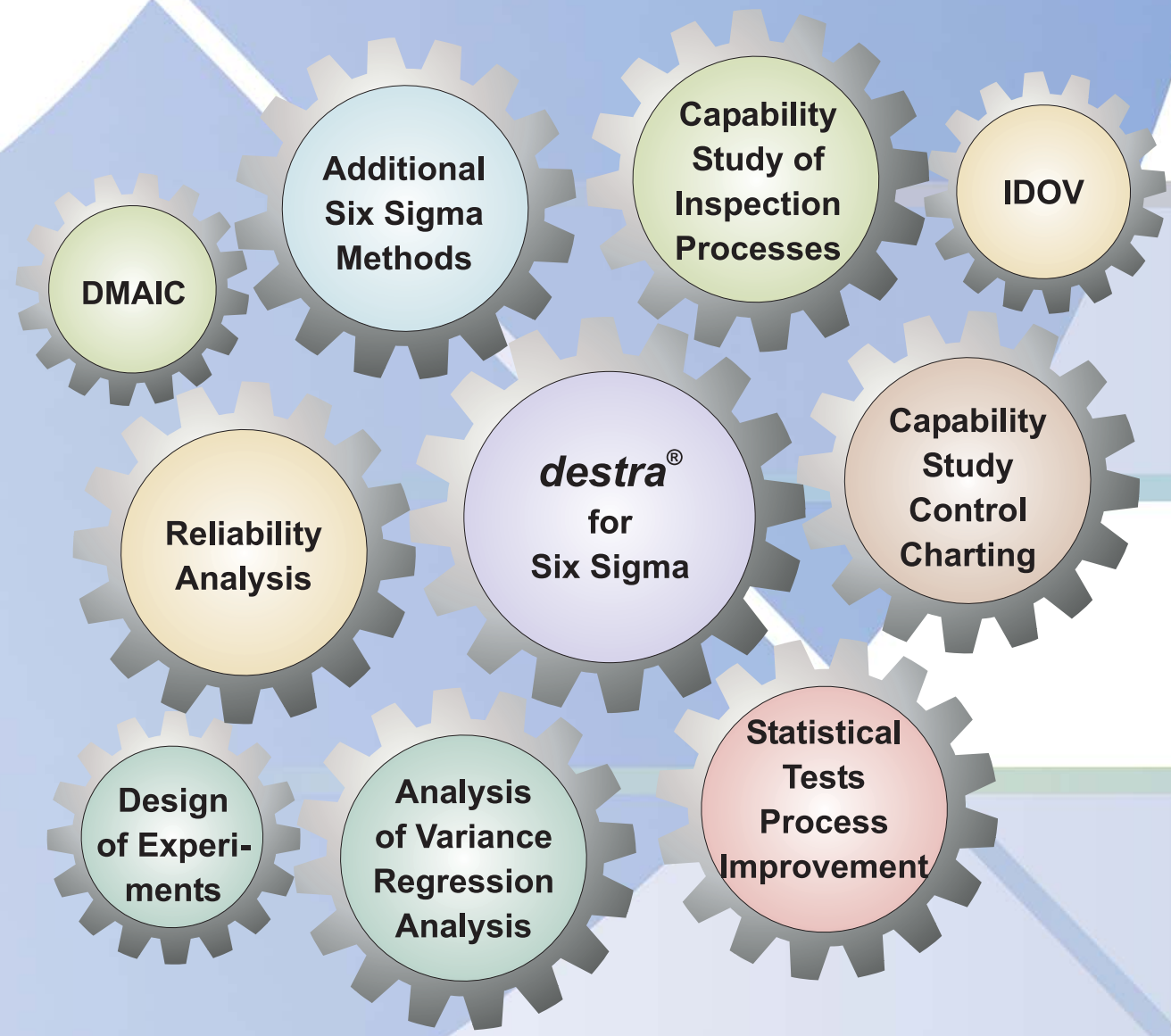
Q-DAS®

destra®

for Six Sigma



Process Improvement

Process improvement involves the targeted optimization of specific conditions within a given process. Our innovative q-STAT® module *destra*® is designed to achieve process improvement and optimization using both simple statistical methods - the Shainin methods - as well as more sophisticated studies. These statistical studies will enable the user to examine the correlation between existing processes and calculate quality levels in terms of their statistical significance.

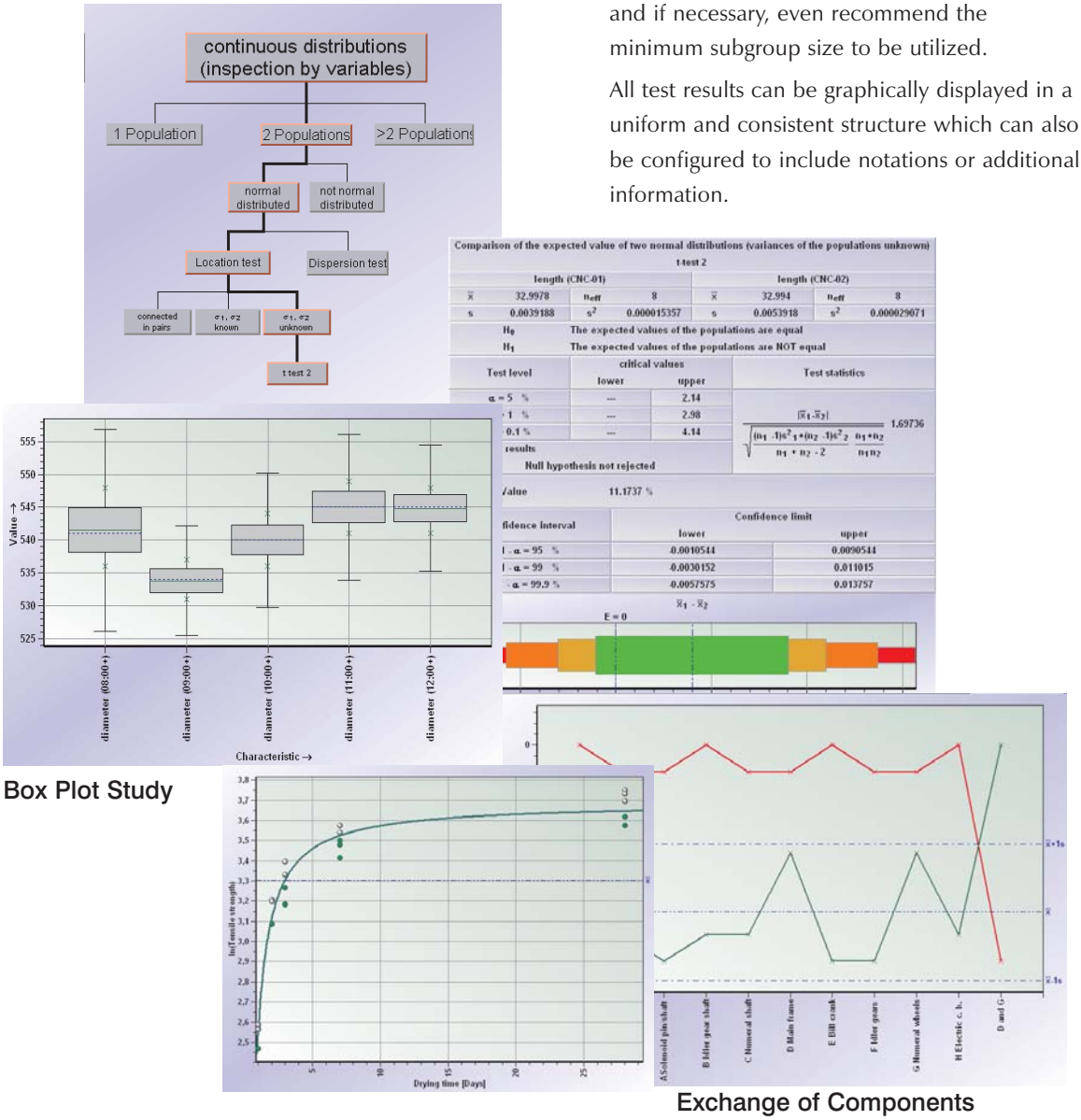
User Guidance for the Expert and the Layperson

destra® offers a wide range of statistical tests and studies which can be easily accessed through a simplified selection menu. *destra*® not only allows the expert to quickly select and utilize the most appropriate test but also provides an intuitive and easily navigated user interface for the statistical layperson to identify and implement the most relevant test.

Additional Tests and the Graphical Display of Test Results

destra® provides additional statistical procedures for process improvement such as box plots and the exchange of components. Moreover, *destra*® is useful in planning and preparing inspections and if necessary, even recommend the minimum subgroup size to be utilized.

All test results can be graphically displayed in a uniform and consistent structure which can also be configured to include notations or additional information.



Box Plot Study

Exchange of Components

Reliability Study

The Reliability Analysis is a helpful tool for testing whether a product meets its requirements under assumed conditions over a certain period of time. *destra*® enables the user to plan life span studies, evaluate data collected during the trial, and display the results graphically.

Typical Procedures

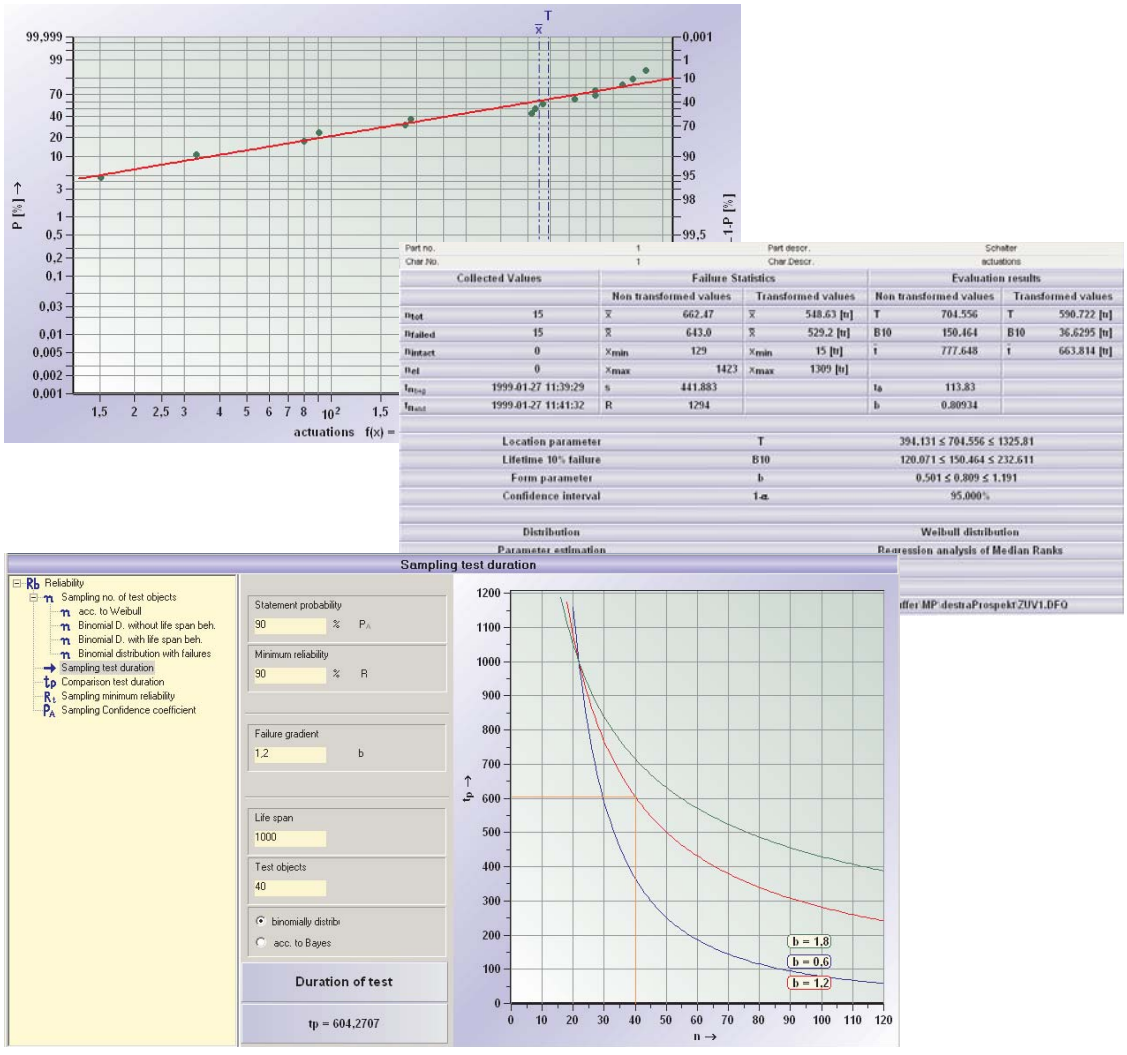
destra® includes a variety of failure analysis procedures ranging from the analysis of early failures to those caused by aging, wear and tear as well as fatigue. These procedures make it possible to evaluate both laboratory (controlled environment) data as well as field data.

Some of the procedures available are listed below:

- End-of-Life tests
- Censored tests (Type I and Type II as well as mixed models)
- Sudden-Death test
- Sudden-Death test for field failure
- Eckel procedure for field failures
- Success Run tests

Calculated values resulting from the evaluation deemed to be significant can be organized at the push of a button and made available in report format.

The *destra*® test planning module is useful in determining the required number of parts for any given test but also enables the user to pinpoint the most cost-effective inspection plans without sacrificing the integrity of inspection results.



Design Of Experiments

Design of Experiments is a tool used to examine cause - effect correlations between influence parameters and target values as well as for the optimization of products and processes. The innovative qs-STAT® *destra*® module provides structured data acquison capabilities to facilitate these studies.

Step by Step User Guidance

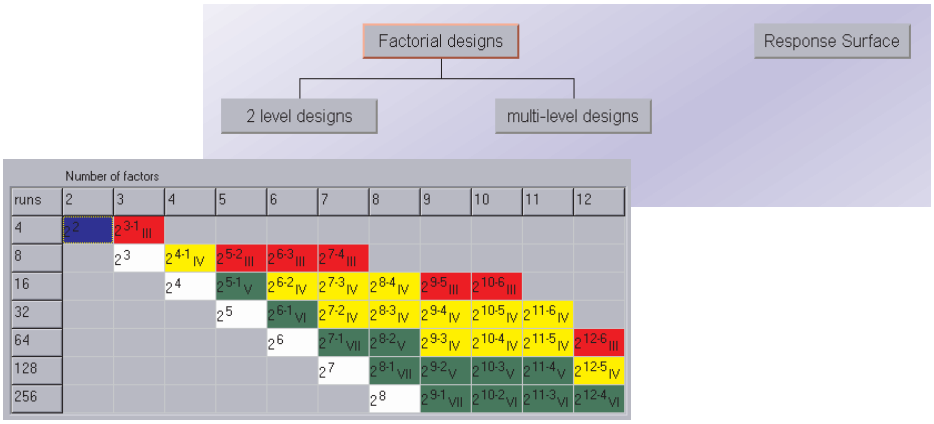
The user is guided every step of the way when creating a new evaluation procedure. He can design a process according to the requirements using a configurable flow chart. Once the user selects a design and determines the target and influence parameters, *destra*® takes over and automatically generates the process according to that design.

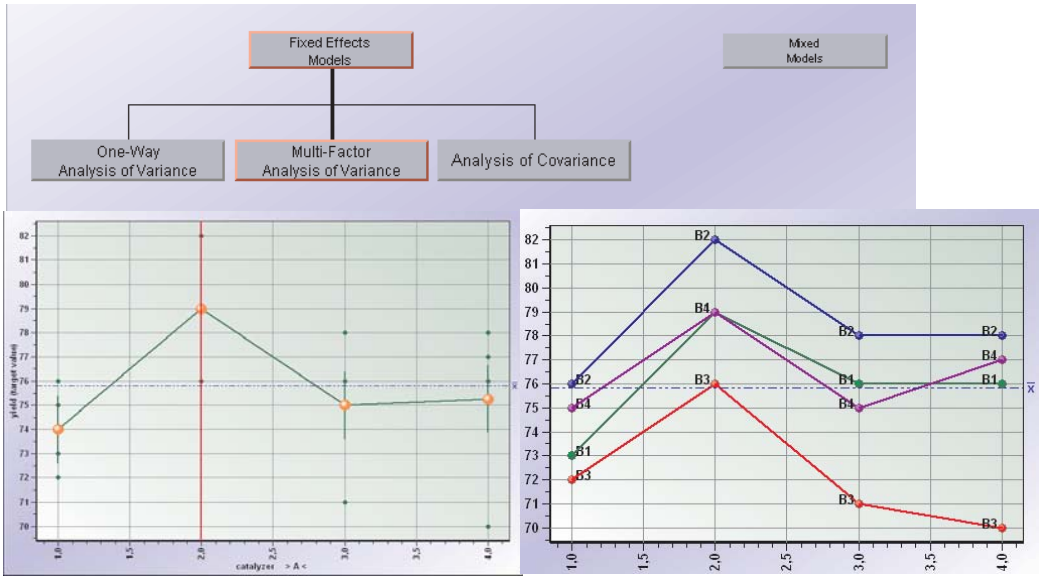
Meaningful Graphics

destra® automatically carries out the evaluation of data and displays the results as easy-to-understand graphics in the same format that users of other Q-DAS® products are used to.

Process Optimization Using Multiple Target Values

With *destra*® process optimization based on multiple target values is easily accomplished. The user determines the optimum to be reached for every target value and *destra*® will find the best solution.





Variance / Regression Analysis

Variance and Regression are used to adapt mathematical models to cause-effect correlations between influence parameters and target values.

Visualization of the Regression Model

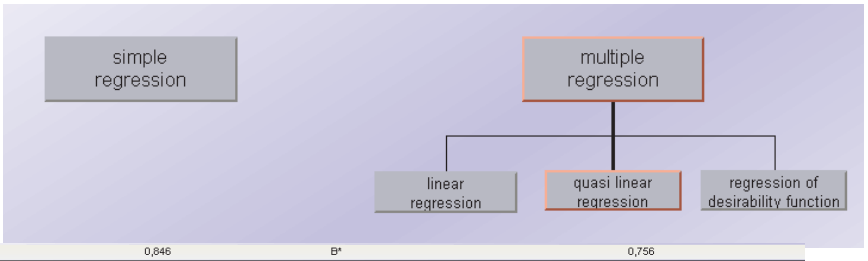
destra® provides a streamlined process for selecting an appropriate mathematical regression model. With the help of a clear graphical interface, the user can select model coefficients with a mouse click and immediately visualize the effects in a preview graphic. Even beginners will find it easy to visualize results and analyze their impact.

Designing Processes for Variance Analysis

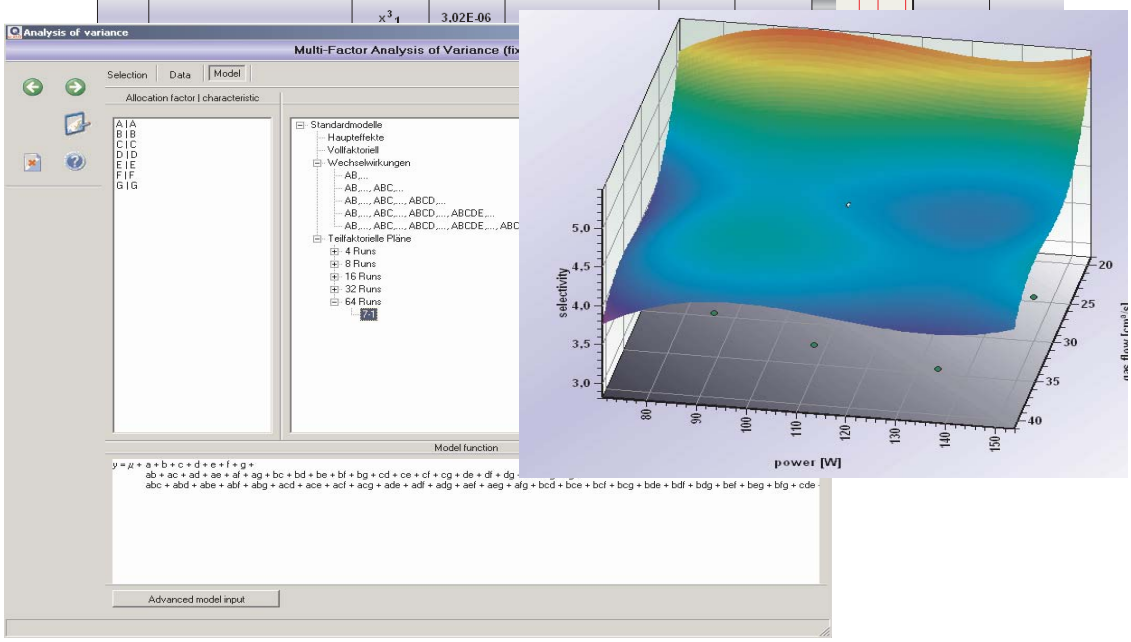
In *destra*® the beginner and the expert can design their analysis process with a just few mouse clicks. For the expert, a formula editor is also available to navigate through multiple design possibilities and create analysis processes incorporating mixed effects, hierarchically nested models, as well as models for unbalanced data.

Visual Analysis of Statistical Models

All of the traditional approaches used in statistical analysis such as Cook distances, Leverage values and Residues are available in *destra*® as graphical displays. These displays will enable a more comprehensive analysis which will in turn better facilitate appropriate diagnostics.



B		0,846		B*			0,756		
Merkm	Merkm.Bez.	x_i	b_i	b_i	s_{ci}	$\|t_i\|$	$\|t_i\|$	VIF	Red%
z4	Selektivität	$f(x_1..x_7)$							
		Konst.	71,60	-17,15...160,35	40,73	1,758			
x1	Druck ²	x_1	-0,593	-1,650...0,464	0,485	1,223		56107	1,919
x3	Gasfluss	x_3	-1,891	-3,773... -0,008	0,864	2,189*		7120	6,148
		x^2_1	0,00236	-0,00190...0,00661	0,00195	1,207		228238	1,868
		x^2_3	0,0600	-0,0039...0,1239	0,0293	2,047		29840	5,376
		x^3_1	3,02E-06						



Process Capability / QCC

Machines must be capable to produce the specified product characteristics with the required accuracy. A machine capability study provides this verification. After process run-off, additional parts are measured, as a basis for the determination of the preliminary process capability. For process evaluation over an extended period of time, process results are visualized with the help of distribution time models. In turn, those will be the basis for the calculation of the short and long term capabilities as well as the selection of capable quality control charts.

Using Distribution Time Models

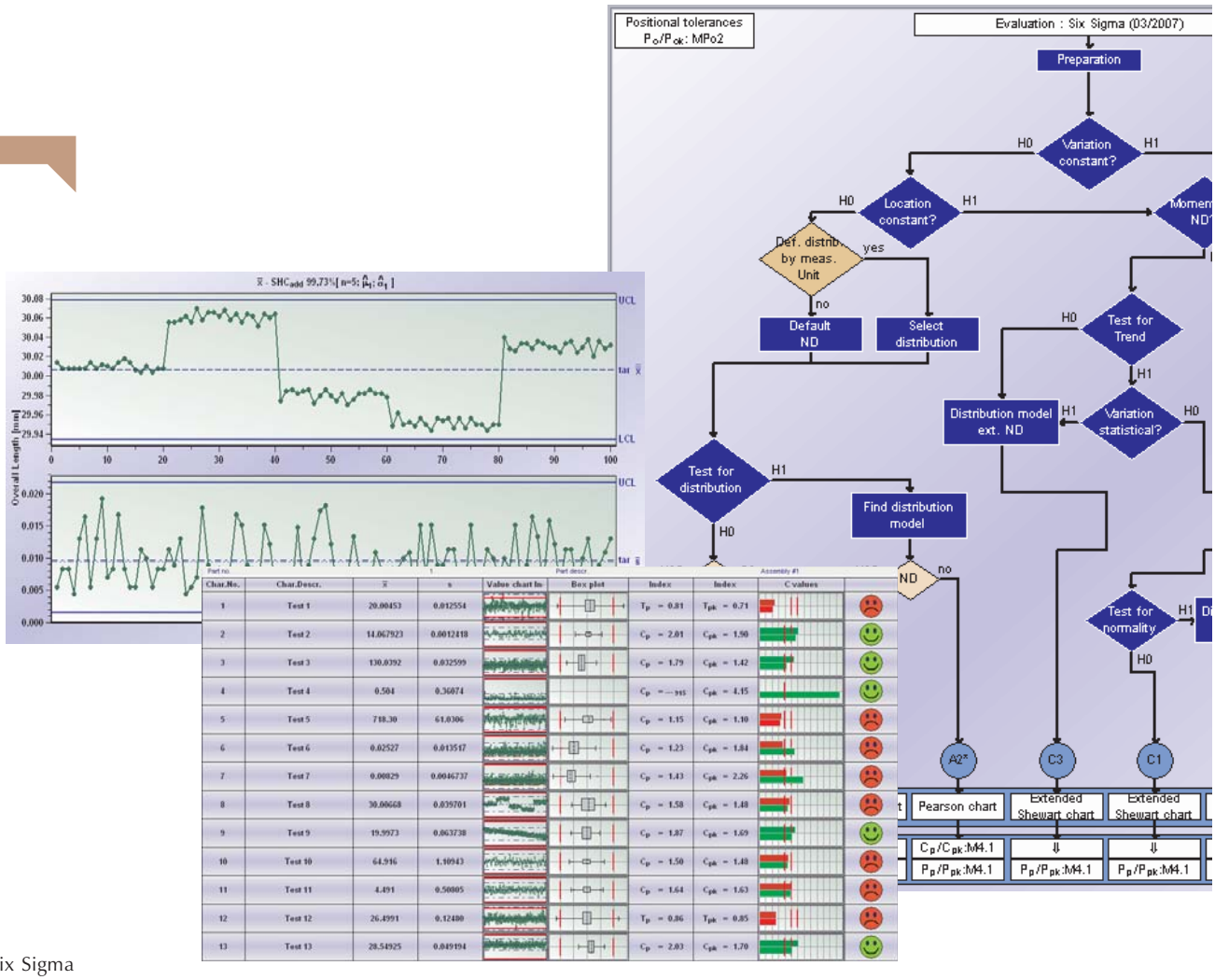
In order to determine the most appropriate distribution time model for a given process, *destra*® combines a number of test procedures and performance indices into a Six Sigma evaluation method which in turn enables a validated selection of a distribution time model.

Quality Control Charts

Both the Actual Value Chart and Bar Chart displaying capability indices can be used to compare multiple characteristics or to enable a comparison over different time periods. It is possible to evaluate the stability of specific characteristics using the QCC (quality control charts). The control limits which were determined to be suitable in the preliminary process capability study are taken over as control limits for statistical process control (SPC).

Evaluation of the Results

destra® offers a choice of freely configurable tabular views composed of graphical elements as well as numerical statistical values. Whether a characteristic meets the process requirements is immediately obvious through a visual indication (smiley, arrow, or bar) making it possible to quickly identify critical characteristics.



Inspection Process Capability

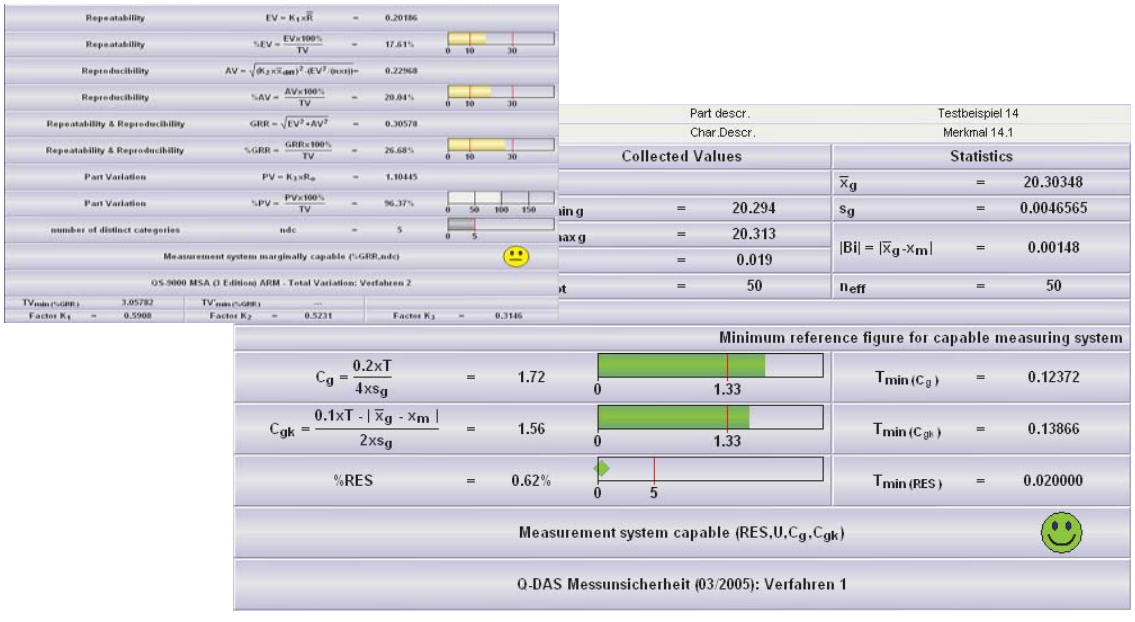
Process evaluation is based on the statistical analyis of characteristics data. This data is collected through a process of systematic inspections. In order to avoid misinterpretations, the collected data must reflect the actual status of the inspected process. *destra*® offers various procedures and methods to establish the capability of any given inspection process based on its intended purpose.

Included in destra® are various measurement system capability studies which take into account different interference factors depending on the procedure. The basic capability studies are described below:

Gage Resolution: %RE

Before a study can be carried out, it is necessary to verify that the resolution of the gage is sufficient to discriminate individual measurements within the tolerance band. The optimal gage should have no more than a resolution of 5% of the characteristics tolerance.

n	$\bar{x}_{gj}$	R_{gj}	$\bar{x}_{gj}$	R_{gj}	$\bar{x}_{gj}$	R_{gj}	$\bar{x}_{gn}$	s_{gn}
1	0,447	0,35	0,133	0,18	-0,073	0,19	0,1689	0,1356
2	-0,607	0,12	-0,790	0,75	-1,157	0,42	-0,8511	0,2429
3	1,260	0,17	1,157	0,40	0,880	0,42	1,0989	0,1864
4	0,537	0,17	0,413	1,02	0,150	0,09	0,3667	0,2411
5	-0,853	0,12	-1,013	0,72	-1,327	0,39	-1,0644	0,2316
6	-0,100	0,23	0,027	0,42	-0,483	0,38	-0,1856	0,1940
7	0,667	0,16	0,617	0,36	0,080	0,20	0,4544	0,1356
8	-0,227	0,14	-0,297	0,71	-0,503	0,10	-0,3422	0,1789
9	2,087	0,27	2,037	0,39	1,697	0,42	1,9400	0,2034
10	-1,307	0,11	-1,600	0,18	-1,807	0,67	-1,5711	0,1808



Type-1 Study: C_g, C_{gk}, Bias, Linearity

The Type-1 study for the evaluation of new and existing measurement systems is carried out prior to an Acceptance Study at the supplier's facility or at the customer's final installation site. The capability indices Cg and Cgk will be used as the basis to determine whether a measuring system is suitable for the planned operation under regular operating conditions using a given measurement standard.

Type-2 Study: %GR&R

The Type-2 study is used to determine user influence and device variation under real operating conditions. The statistical value %GR&R is used to determine whether a measuring device is suitable for the planned measuring task, taking into consideration all influence factors. Both ANOVA and ARM methods are available.

Type-3 Study: GR&R

The Type-3 study is an exception to the Type-2 study. This procedure is used mostly for measurement systems without user interference (i.e. automated or mechanized measurement systems for post-process, in-process measurement systems and fully automated measurement systems) in transfer lines, or semi-automatic measurement systems (i.e. three-coordinate measurement devices).

destra® also includes a number of procedures for the capability study of inspection processes.

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