



The 3 versions of Visual-XSel 20:

Standard (Home & privat)	Weibull & DoE	Analyzer
Entry-level version with statistics and Excel-extensions	Full statistics, Weibull-analyses, DoE and Process-Capability	Additionally up to 255 param. for data analysis and FTA

Detailed functions and price list: crgraph.de/downloads/software/Versions.pdf

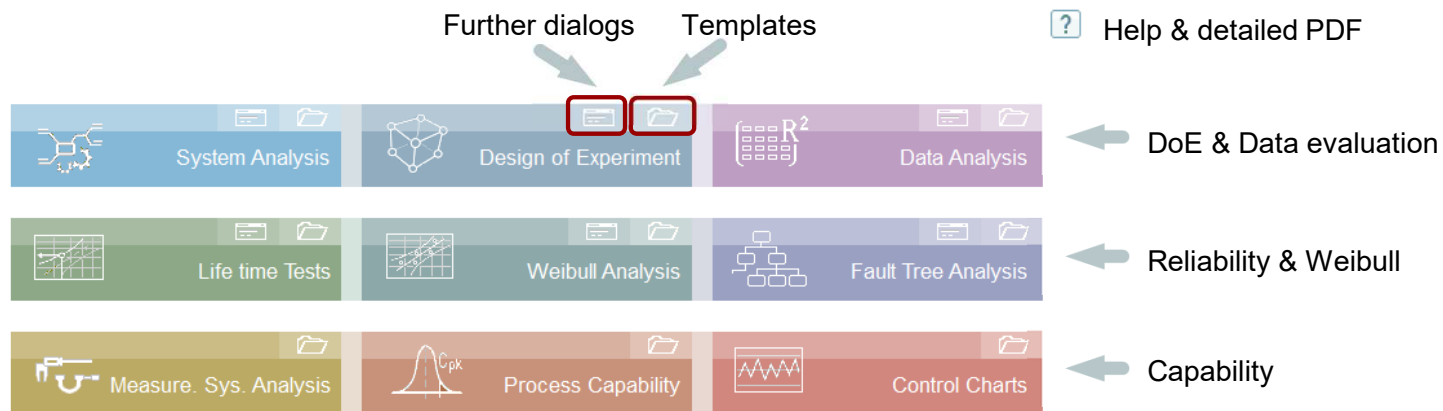
Main Guide

The Main Guide shows three important statistical methods: DoE, Reliability and Capability analyses. A pre investigation for DoE is to find the relevant parameters with the System Analysis.

Most of the methods are available as templates. The calculation methods are open source, can be viewed and easily modified.



← This icon starts the Main Guide



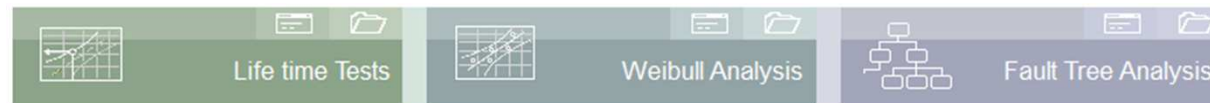
Detailed profiles with introduction to the methods and subsequent program descriptions can be found under the links shown



www.weibull.de/COM/System_Analysis.pdf

www.weibull.de/COM/Design_of_Experiment.pdf

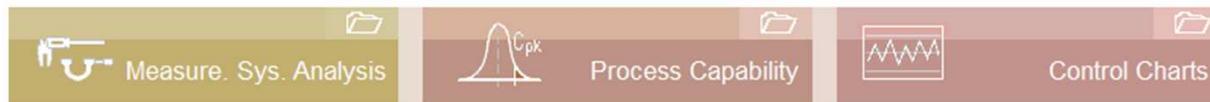
www.weibull.de/COM/Data_Analysis.pdf



www.weibull.de/COM/Life_Time_Tests.pdf

www.weibull.de/COM/Weibull_Analysis.pdf

www.weibull.de/COM/Fault_Tree_Analysis.pdf



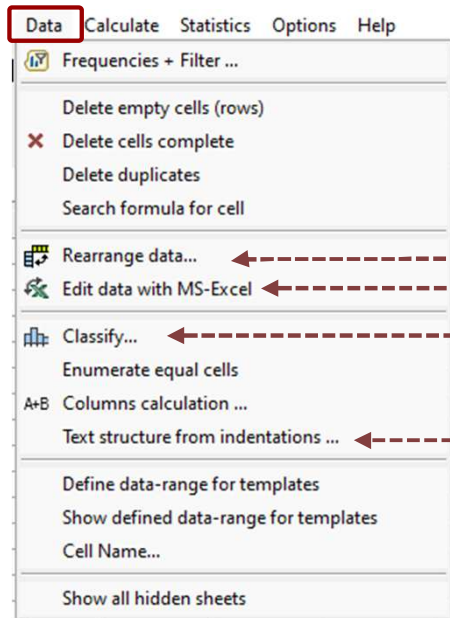
www.weibull.de/COM/Measurement_System_Analysis.pdf

www.weibull.de/COM/Process_Capability_Studies.pdf

www.weibull.de/COM/Control_Charts.pdf

Spreadsheet functions

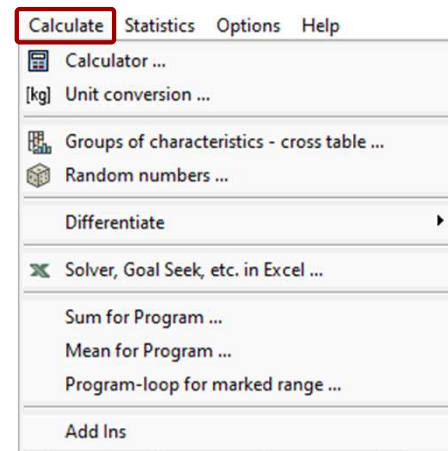
There are powerful editing functions for the table, for example for classifying data or building groups for characteristics



Quick data rearrangement, much easier than Pivot

You can easily switch between Excel and Visual-XSel in order to be able to use all the usual functions

Creates an outline from indented texts from which structure diagrams can be displayed



All of Excel's usual functions can simply continue to be used

Filter & quick statistics

Click on the first row, or mark the column, a filter symbol appears

D	E	F	G	H	I
:kPole	PistonPole	DampTube	Accel		
4750	210000	69000	9,49469		
4750	210000	69000	8,08628		
4750	210000	69000	7,23335		
4750	210000	69000	6,67517		
4750	210000	69000	6,28572		
4750	210000	69000	6,00264		
4750	210000	69000	5,78746		
4750	210000	69000	5,61431		
4750	210000	69000	6,18275		
4750	210000	69000	5,8643		
4750	210000	69000	6,67517		

Depending on the data, a frequency distribution is shown (numerical are classified here).

Accel
classified list

<input checked="" type="checkbox"/>	[all]	
<input checked="" type="checkbox"/>	3,5	4
<input checked="" type="checkbox"/>	4	2
<input checked="" type="checkbox"/>	4,5	3
<input checked="" type="checkbox"/>	5	4
<input checked="" type="checkbox"/>	5,5	6
<input checked="" type="checkbox"/>	6	10
<input checked="" type="checkbox"/>	6,5	12
<input checked="" type="checkbox"/>	7	6
<input checked="" type="checkbox"/>	7,5	2
<input checked="" type="checkbox"/>	8	2
<input checked="" type="checkbox"/>	9	1
<input checked="" type="checkbox"/>	9,5	2

Filter

Selection

Conditioned filter

= [all]

und oder

Statistics

Normal distrib. Log normal Weibull

n=54 Min = 3,3711 Max = 9,6533 Range = 6,2822

Mean = 6,0752 StDev = 1,3747 Median = 6,1647 classWdth = 0,5

Distribution "confirmed" (pval = 0,095)

The statistics below show the most important characteristic values as well as a statistical test for normal distribution.

click here to copy the results to the clipboard

Descriptive statistics

More extensive characteristic values also for several columns are possible via Statistics Summary

The screenshot shows the 'Statistics' menu with 'Statistik Summary' selected. A sub-menu is open, showing options like 'Col by col in new sheet ...' and 'Row by row mean+std-def. aside'. The 'Statistik Summary' dialog box is open, showing various statistical options. The 'Mean', 'Std-def.', 'Median', 'Min', 'Max', and 'Range' options are checked. The 'Confidence 95%' and 'Kurtosis centered with -3' options are unchecked. The 'Sample size n' option is also unchecked. The dialog box has 'OK', 'Exit', and 'Select all' buttons.

	A	B
1		Diameter
2	Mean	15,217
3	StdDef	0,025093
4	Median	15,22
5	Min	15,145
6	Max	15,245
7	Range	0,1

Special paste

When pasting data from the clipboard, data columns can be selected and or rearranged if there are more than 2 columns of data on the clipboard (equal to Edit / Paste contents / transform before paste)

A preview shows the contents of the clipboard

Wanted columns can be selected or omitted. Transfer is done in the order in which the check boxes are set

Clipboard

Take all

A	B	C	D	Pist
StiffnRod	DampRod	Stabi	TrackPole	
1000	B	5000	4750	
1500	B	5000	4750	
2000	B	5000	4750	
2500	B	5000	4750	
3000	B	5000	4750	
3500	B	5000	4750	
4000	B	5000	4750	
4500	B	5000	4750	

Select columns

- [1] StiffnRod
- [2] DampRod
- [3] Stabi
- [4] TrackPole
- [5] PistonPole
- [6] DampTube
- [7] Accel

To change the order, deselect all and select them one at a time

OK del top row ↑ higher
Exit empty col ↓ lower

Show content of clipboard if more than 2 columns

Rearrange

Transpose

Exchange columns

Rows to columns

Columns to rows

Columns to rows

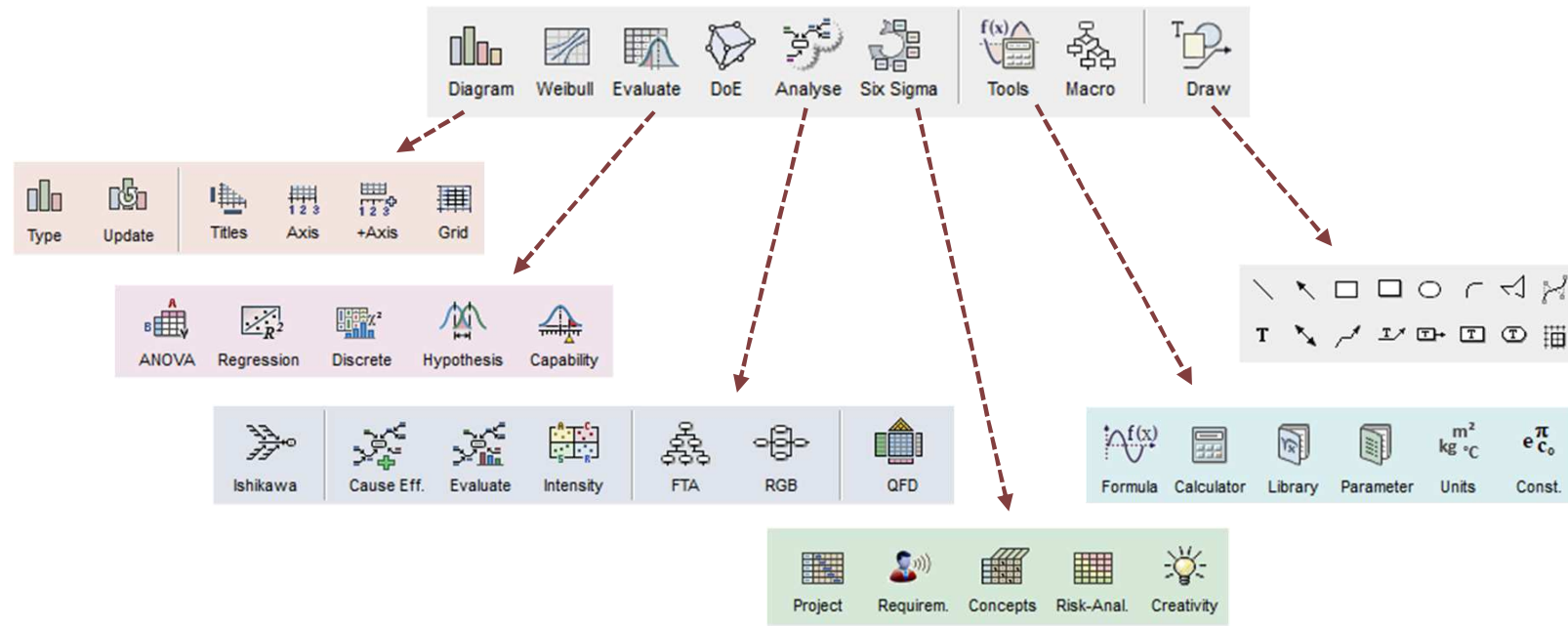
Rows to columns

Matrix to columns

Columns to matrix

The icon bar

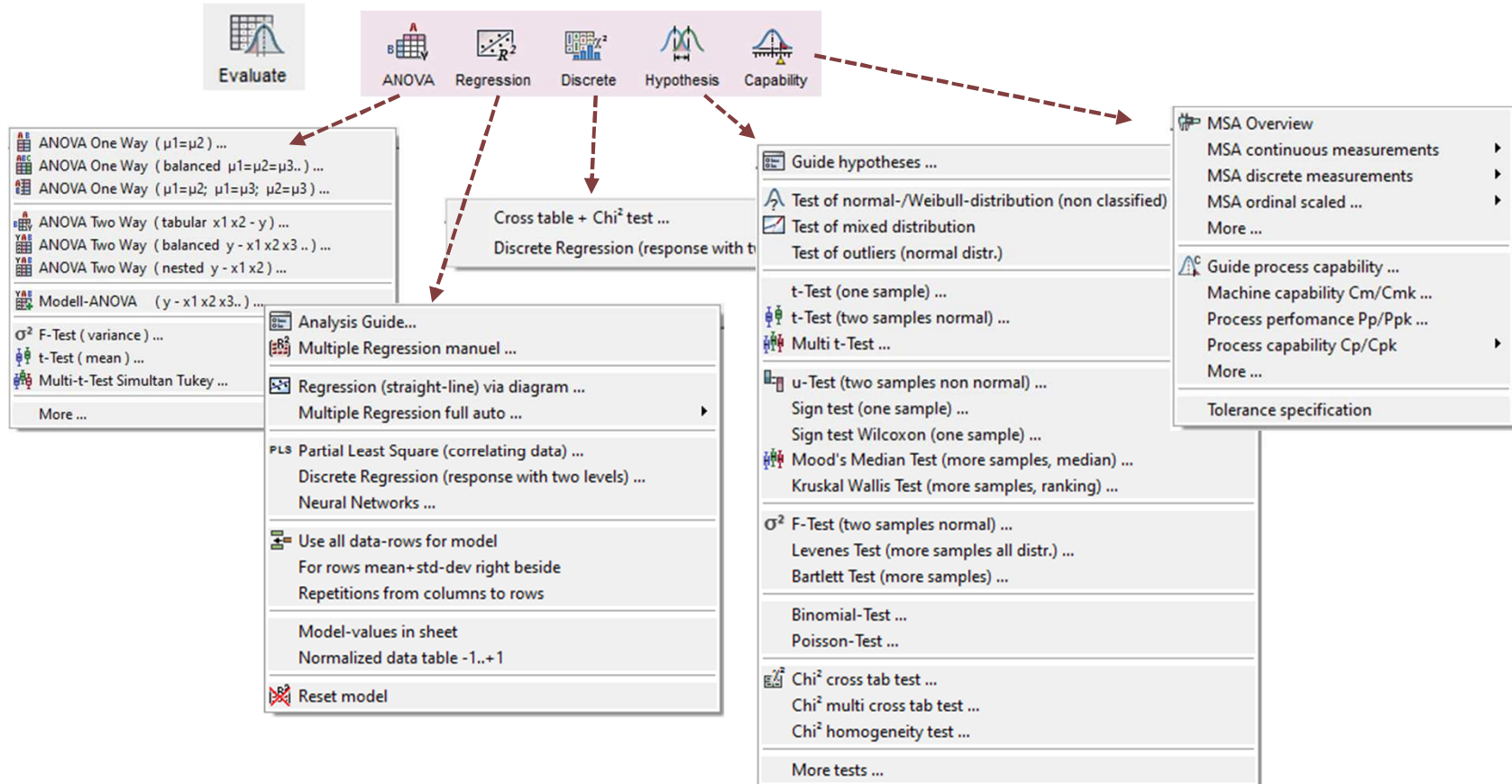
The most important statistical methods



The icons Weibull and DoE are described in separate sections

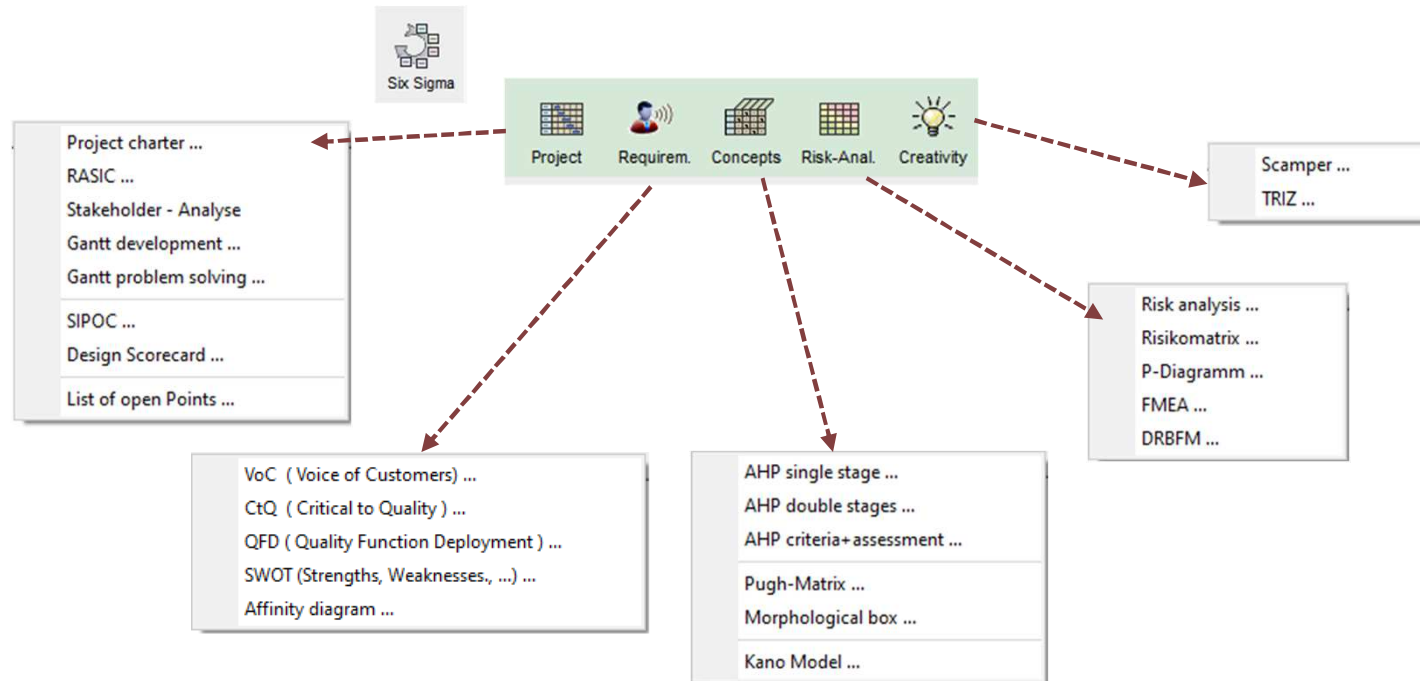
Icon bar Evaluation

Data evaluation



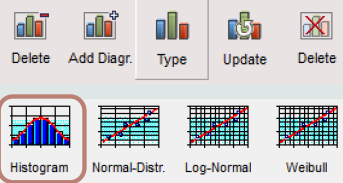
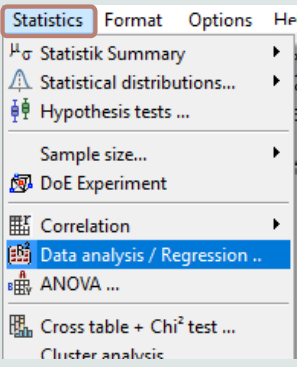
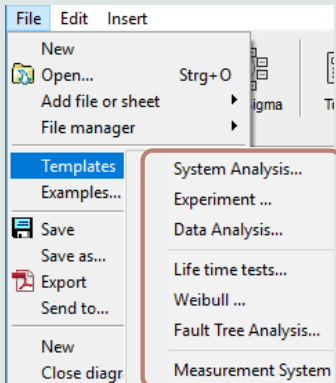
Icon bar Six Sigma

The most important Six Sigma and DFSS methods



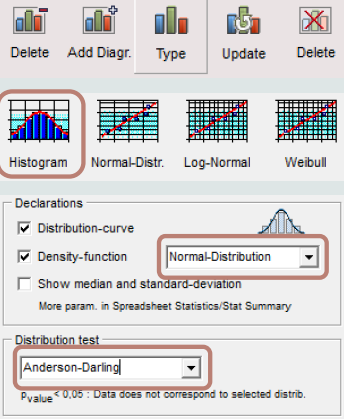
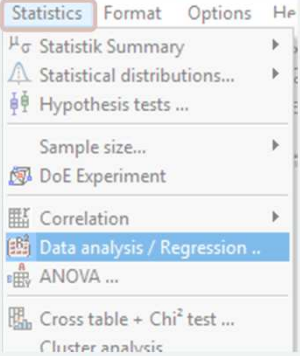
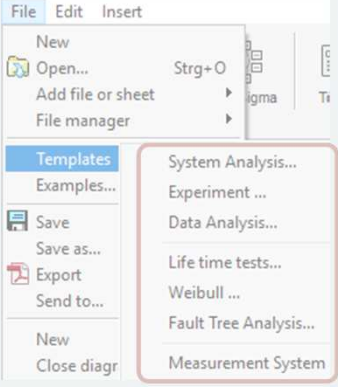
Statistical methods/functions

There are three ways to apply statistical methods.

Diagram-functions	Internal functions	Templates
<p>e.g. test of normality, hypothesis of equality with Boxplot or test of normality</p> <p>⇒ Select <i>Diagram</i></p>  <p>Declarations</p> <ul style="list-style-type: none"><input checked="" type="checkbox"/> Distribution-curve<input checked="" type="checkbox"/> Density-function (Normal-Distribution)<input type="checkbox"/> Show median and standard-deviation <p>Distribution test</p> <p>Anderson-Darling</p> <p><small>P-value < 0,05 : Data does not correspond to selected distrib.</small></p>	<p>e.g. calculation of distributions, DoE, regression, sample size, etc.</p> <p>⇒ Select menu <i>Statistics</i></p> 	<p>e.g. hypothesis-test, or Weibull-Analysis.</p> <p>⇒ Select menu <i>File/Templates</i></p> 

Examples for diagram functions

Examples from the diagram functions are shown first

Diagram-functions	Internal functions	Templates
<p>e.g. test of normality, hypothesis of equality with Boxplot or test of normality</p> <p>⇒ Select <i>Diagram</i></p>  <p>Declarations</p> <ul style="list-style-type: none"><input checked="" type="checkbox"/> Distribution-curve<input checked="" type="checkbox"/> Density-function Normal-Distribution<input type="checkbox"/> Show median and standard-deviation <p>More param. in Spreadsheet Statistics/Stat Summary</p> <p>Distribution test</p> <p>Anderson-Darling</p> <p>Pvalue < 0,05 : Data does not correspond to selected distrib.</p>	<p>e.g. calculation of distributions, DoE, regression, sample size, etc.</p> <p>⇒ Select menu <i>Statistics</i></p> 	<p>e.g. hypothesis-test, or Weibull-Analysis.</p> <p>⇒ Select menu <i>File/Templates</i></p> 

Creating a Histogram

A histogram can be made with various settings and representations

① Click in left area of the program to make visible the spreadsheet

② Input data beginning at 2nd row

③

④

⑤

move the mouse over the diagram

	A	B
1		
2	9,98	
3	9,99	
4	9,99	
5	10	
6	10	
7	10	
8	10,01	
9	10,01	
10	10,02	
11		

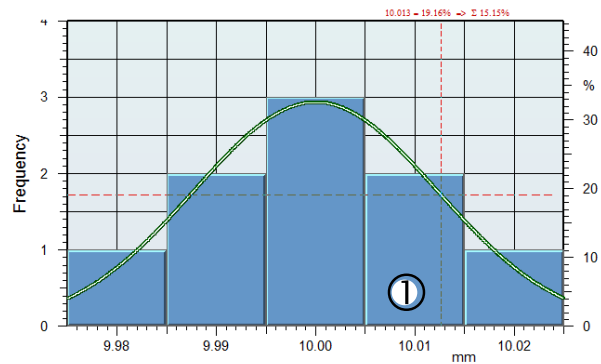
Frequency-distribution dialog box settings:

- Class-width: 1
- Declarations:
 - Distribution-curve
 - Gauss-function (dens) Normal distribution
 - Show median and standard-deviation
- Probabilities:
 - Determine frequencies from existing val; Calculated frequencies in #Chart
 - Define frequencies in second column
- Distribution test: Anderson-Darling
- Pvalue < 0,05 : Data is not normal-distributed

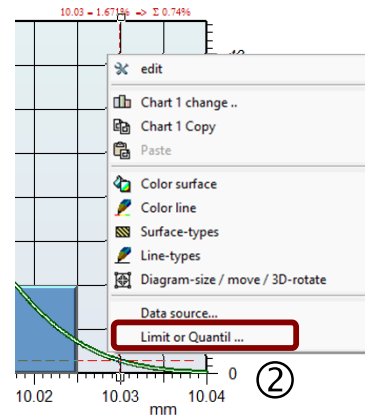
Histogram Data:

mm	Frequency	Relative frequency (%)
9.98	1	10
9.99	2	20
10.00	3	30
10.01	2	20
10.02	1	10

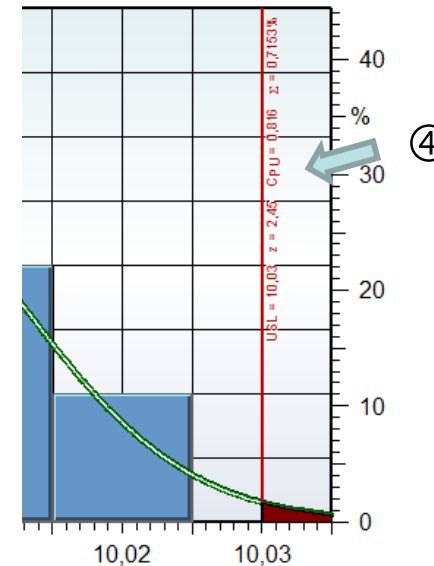
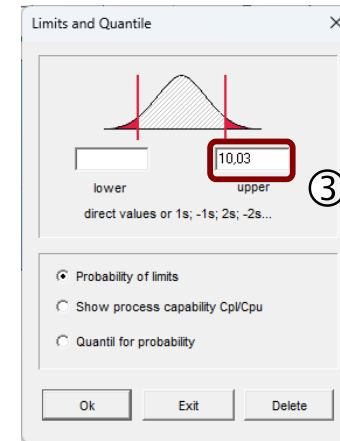
Set a limit, for example for process capability



move mouse along the gaussian curve

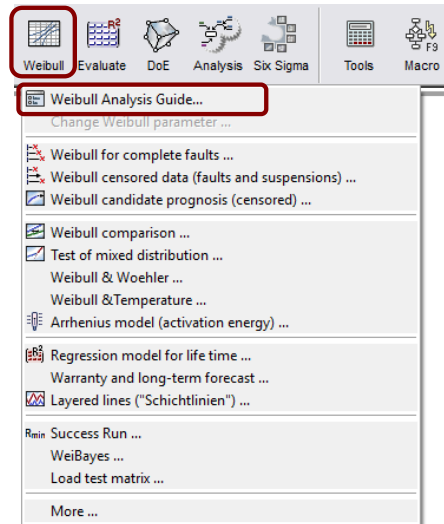


click the right mouse button and use Limit (hint: no element has to be clicked before and the mouse must be over the diagram)



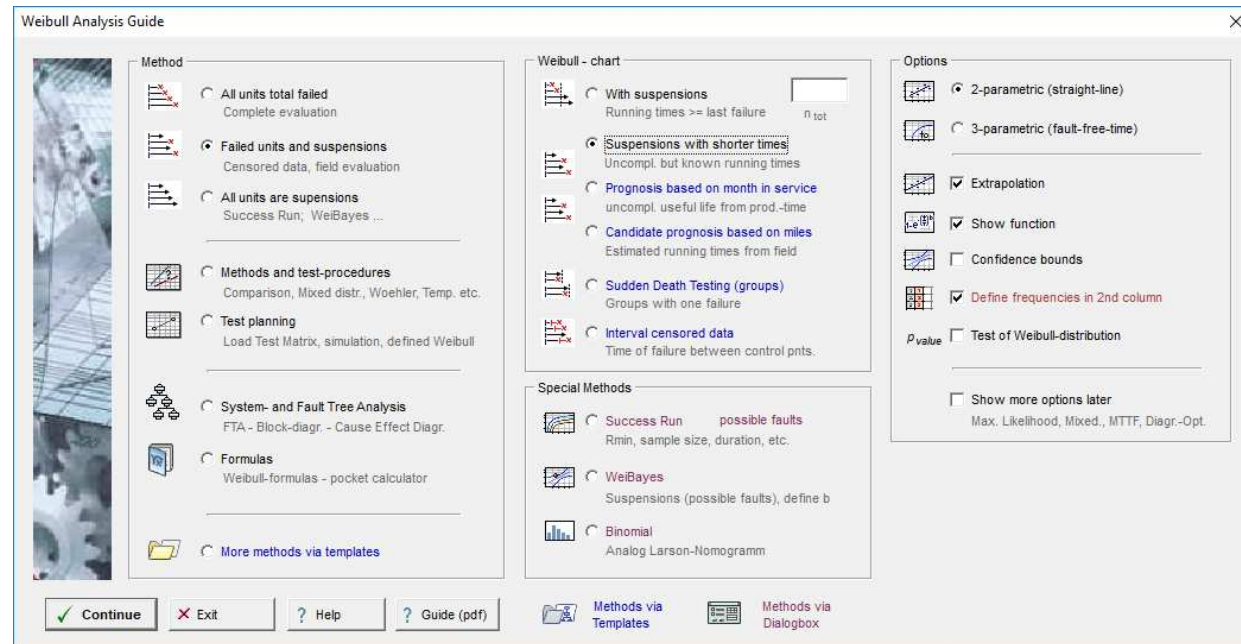
Reliability & Weibull

The most important reliability issues are available via the icon Weibull.
The Weibull Analysis Guide pilots you through more methods, especially for variants of the Weibull-chart.



More information

www.weibull.de/COM/Weibull_Analysis.pdf



Creating a Weibull-chart

	A	B
1		
2	1589	1
3	2934	1
4	4938	-1
5	5906	1
6	6958	1
7	8995	1
8	11293	1
9	13578	1
10	15000	-4
11		

1. Running times at second row (first row legend). The frequencies has to be defined in col. B. Suspensions must be marked with minus, e.g. "-1"
 File open Paste Paste Special

2. Choose chart Weibull or use icon on the right

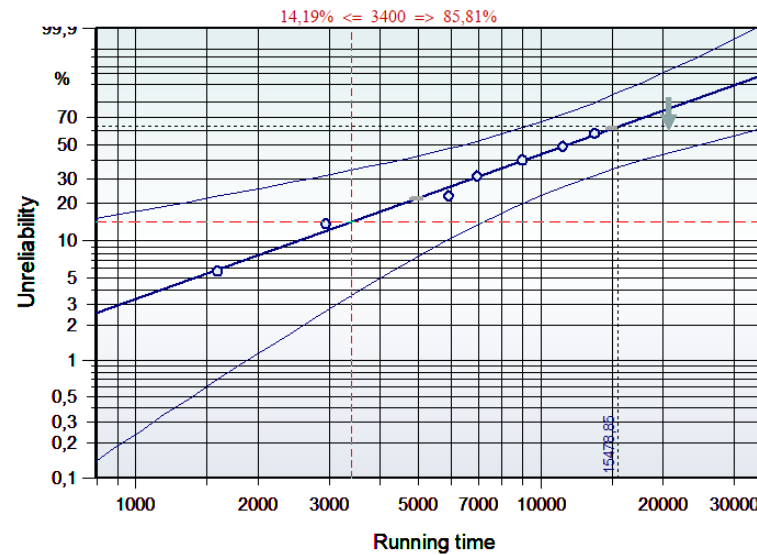
define here the number of faults and suspensions (marked with „-“).

define here the running times

Define running times (col A) and frequencies, (col B) or use *Paste*. Click the Weibull icon and define the axis titles.

More information
www.weibull.de/COM/Weibull_Analysis.pdf

Move with the mouse over the chart for crosslines



Move with the mouse over the formula, to get expert information

For the selected Weibull-Distribution a statistical test can be applied. The coefficient of determ. R²=0,99 for the fitted distribution is good (may be not for extrapolating)
[Change distribution or test](#)

T = 15478,85 b = 1,239

$$H = 100\% \cdot \left(1 - e^{-\left(\frac{t}{T}\right)^b} \right)$$

t₁₀ = 2515,6 R² = 0,9905

Boxplot with category „Cylinder“

The screenshot shows the Visual-XSel software interface. The main window displays a spreadsheet with columns labeled A through I. The 'Cons' column (H) contains numerical values for different cylinder categories. A red box highlights the 'Diagram' icon in the top toolbar (labeled 2). Below the spreadsheet, a 'Visual-XSel - Diagram-types - Diagram 1' dialog box is open, showing various chart types. The 'Boxplot' option is highlighted with a red box (labeled 3).

	A	B	C	D	E	F	G	H	I
	Weight	Fuel	Cyl	Capacity	Power	AxleRatio	Accel	Cons	
1									
2	1340	Gas	4	1599	90	3.64	10.1	5.8	
3	1350	Gas	4	1995	105	3.39	8.7	5.9	
4	1375	Gas	4	1995	125	3.73	7.7	6.4	
5	1460	Gas	6	2996	195	3.46	6	8.3	
6	1395	Dies	4	1995	105	3.07	8.9	4.5	
7	1450	Dies							
8	1495	Dies							
9	1670	Gas							
10	1730	Gas							
11	1780	Gas							
12	1810	Gas							
13	1R14	Dies							

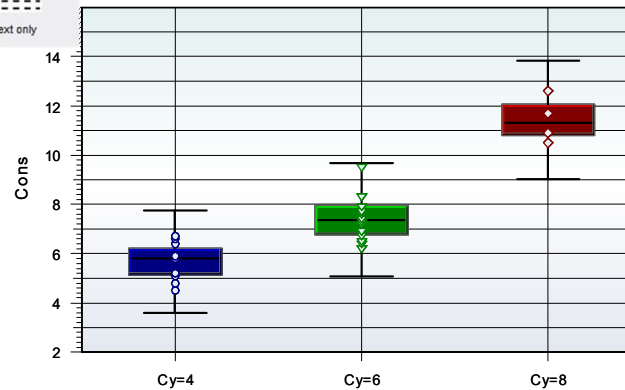
The 'Data selection' dialog box is shown. It has two main sections: 'Data columns (double-click)' and 'Represented data'. The 'Data columns' list includes [A] Weight, [B] Fuel - [Categorical], [D] Capacity, [E] Power, [F] AxleRatio, and [G] Accel. The 'Represented data' section shows [H] Cons. A red box highlights the 'Cons' entry in the 'Represented data' list (labeled 4). At the bottom, the 'Attributes for groups' section shows '[C] Cyl' (labeled 5).

The 'Boxplot' configuration dialog box is shown. It contains several settings:

- Mittlere Markierung:** Median (selected), Arithm. Mittelwert.
- Whisker:** 99%.
- Darstellung:** Gruppengröße: 1, Anzahl Boxplots mit gleicher Farbe, Breite: auto.
- Test auf Gleichheit:** kein Test, Signifikanz: 5%.
- Vorgabe für Bestimmung der Bereiche:** normalverteilt (selected), nicht normalvert.

 A red box highlights the 'Ok' button (labeled 6).

Menu Data/Spreadsheet and open file:
[Examples/Example_PLS_Consumption.xlsx](#)



2nd Boxplot with category Fuel

Open Data/Spreadsheet T1 and mark column H. Add diagram with symbol (+)

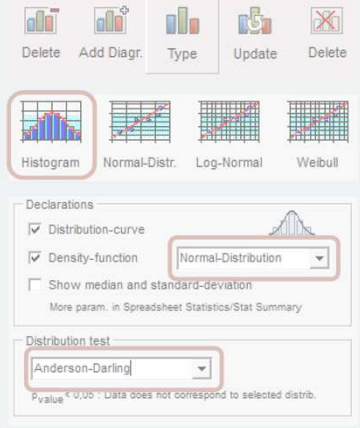
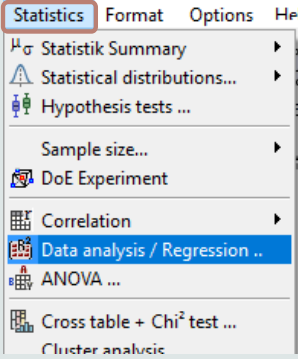
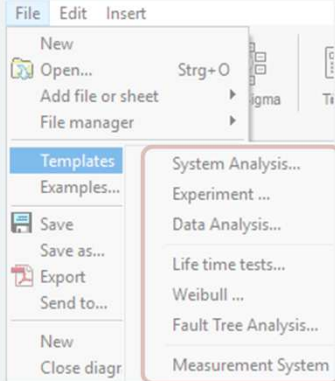
	A	B	C	D	E	F	G	H
1	Weight	Fuel	Cyl	Capacity	Power	AxleRatio	Accel	Cons
2	1340	Gas	4	1599	90	3.64	10.1	5.8
3	1350	Gas	4	1995	105	3.39	7.7	5.9
4	1375	Gas	4	1995	125	3.73	7.1	6.4
5	1460	Gas	6	2996	195	3.46	6.6	8.3
6	1395	Dies	4	1995	105	3.07	8.9	4.5
7	1450	Dies	4	1995	130	2.56	7.5	4.8
8	1495	Dies	4	1995	150	2.81	6.9	5.2
9	1670	Gas	4	1995	125	3.64	9.1	6.6
10	1730	Gas	6	2996	160	3.15	7.6	7.6
11	1780	Gas	6	2996	200	3.15	6.5	5.5
12	1810	Gas	6	2979	225	3.08	7.9	5.8
13	1815	Dies	6	2993	145	2.47	7.9	6.6

Green arrows between Boxplots means that there is no statistical difference in consumption (u-Test).

Red lines indicate a significant difference

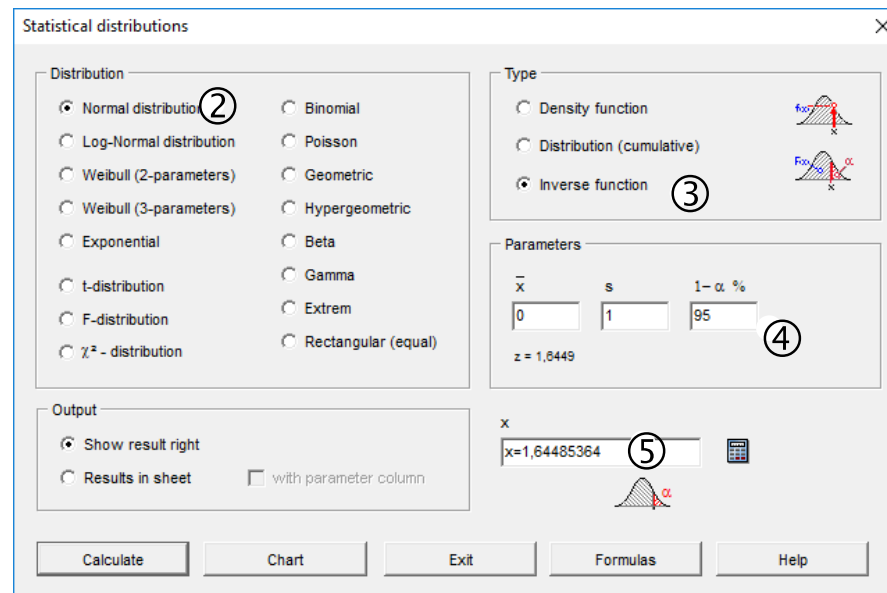
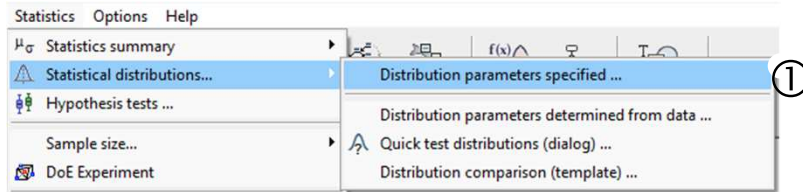
Examples for diagram functions

The following examples show internal functions

Diagram-functions	Internal functions	Templates
<p>e.g. test of normality, hypothesis of equality with Boxplot or test of normality</p> <p>⇒ Select <i>Diagram</i></p>  <p>Declarations</p> <ul style="list-style-type: none"><input checked="" type="checkbox"/> Distribution-curve<input checked="" type="checkbox"/> Density-function<input type="checkbox"/> Show median and standard-deviation <p>Distribution test</p> <p>Anderson-Darling</p> <p><small>P-value < 0,05 : Data does not correspond to selected distrib.</small></p>	<p>e.g. calculation of distributions, DoE, regression, sample size, etc.</p> <p>⇒ Select menu <i>Statistics</i></p> 	<p>e.g. hypothesis-test, or Weibull-Analysis.</p> <p>⇒ Select menu <i>File/Templates</i></p> 

How to calculate distribution values or the „z“-value

Statistical distributions - calculate values or display them as a graph



If using the Inverse normal distribution with mean = 0 and std-dev = 1, the result x (normally the quantile) has in this case the meaning of the so called „z“-value

Find the right distribution of data

The guide includes a distribution test and makes a suggestion which is the best (the one with the highest p-value, here the Weibull distribution)

	A	E
1	Diameter	
2	15,215	
3	15,210	
4	15,210	
5	15,180	
6	15,235	
7	15,200	
8	15,240	
9	15,240	
10	15,245	
11	15,220	
12	15,240	
13	15,195	
14	15,145	
15	15,230	
16	15,225	
17	15,220	
18	15,240	
19	15,220	
20	15,235	

Number values = 20 only positive values
different values = 14
Min = 15,145 Max = 15,245

Possible outlier at the beginning

Characteristic	Symbol	Dir
Lin. meas		
Straightness	-	
Levelness	∩	
Roundness	○	
Cylindrical shape	⊘	
Linear shape	∩	
Surface shape	∩	
Roughness	B1	
Imbalance	B2	
Parallelism	//	B1
Perpendicularity	⊥	B1
Slope/angularity	∠	B1
Position	⊕	B2
Coaxiality, concentricity	⊕	B2
Symmetry	∩	B1
Concentricity	∩	B1; B2
Linear movement	///	B1; LH*

Possible tolerances for Cpk= 1,33

Median = 15,22
LSL = 0 USL = 15,28
(15,28)*

* Estimated values for conf. 90%

Statistical tests check which distribution is suitable

Possible tolerances for the data are displayed here

Standard Regression

x-y regression can be realized via a line diagram

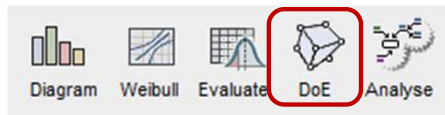
The screenshot illustrates the steps to perform a regression analysis in Visual-XSel 20.0:

- Data selection dialog:** Shows 'Data columns (double-click)' with 'Weight' selected as the 'Reference X-axis (empty if Y categor.)' and 'Cons' as the 'Represented data'.
- Regression dialog:** Shows 'Regression-type' with 'y = a * e^(b * x)' selected (34%). The 'Options' section has 'Show Regression-Function' checked (4).
- Main window:** Displays a scatter plot of 'Cons' (y-axis, 4 to 14) vs 'Weight' (x-axis, 1350 to 1900). A regression line is fitted to the data points. The regression equation is $y = 1.69580064 \cdot e^{0.0008773 \cdot x}$ and the correlation coefficient is $r = 0.579$.

Menu File/ Open/ Examples
and open file:
[Example_PLS_Consumption.xlsx](#)

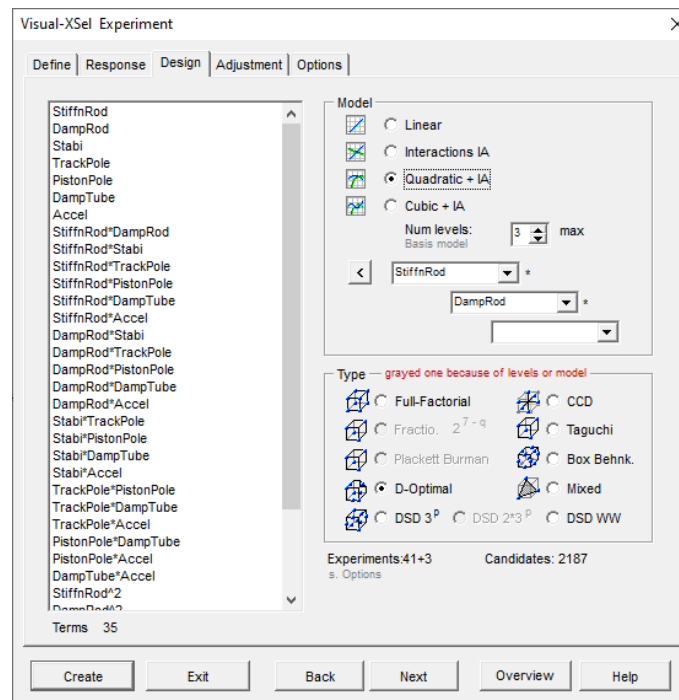
Design of Experiments - DoE

In Visual-XSel all important designs are available and new the DSD 2*3^P and DSD IA (extension for Definitive Screening Designs, e.g. for interactions)

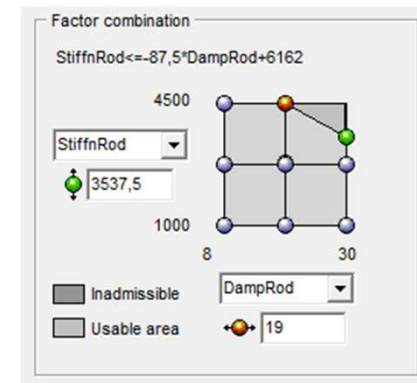


Detailed description under:

www.weibull.de/COM/Design_of_Experiment.pdf



- Import parameters from tables (other progr.)
- Derive DoE's from structure diagrams
- Up to 120 parameters and 16 responses
- Categorical parameters
- 3-times interactions
- Considering existing experiments
- Techn. constrains can be defined
- and much more ...



System analyses

In Visual-XSel there are a variety of analyses tools, like a cause effect diagram

③

The screenshot shows the 'Analyse' menu in the Visual-XSel software. The 'Analyse' menu is highlighted with a red box. Below it, the 'Cause Eff.' option is also highlighted with a red box. A context menu is open over 'Cause Eff.', listing options such as 'New Cause Effect Diagram - Guide ...', 'Create Cause Effect Diagram from text', 'Create Cause Effect Diagram from Fault Tree', 'Create text-structure from Cause Effect Diagram', and 'Basics-/Program-descriptions (pdf)'. The 'System analysis + further steps' dialog box is open, showing a 'Create structure diagram' section with an input title field and a 'Title' label. Below this, there are three icons representing a cause effect diagram, a Pareto chart, and a DoE diagram. The dialog box also has buttons for 'Case Effect / Evaluation', 'Pareto Evaluation', and 'Create DoE'. The 'Case Effect / Evaluation' button is highlighted with a red box. The 'Pareto Evaluation' button has sub-options: 'Icon Analyse' and 'Evaluate Case Effect'. The 'Create DoE' button has sub-options: 'Icon DoE' and 'Create from Pareto'. The dialog box has 'OK', 'Abbot', 'Main Effects...', 'Example...', and 'Help' buttons at the bottom.



Continuous functionality – from the cause effect diagram to Pareto evaluation to the experimental design.

A fault tree analysis can be derived from a cause effect diagram

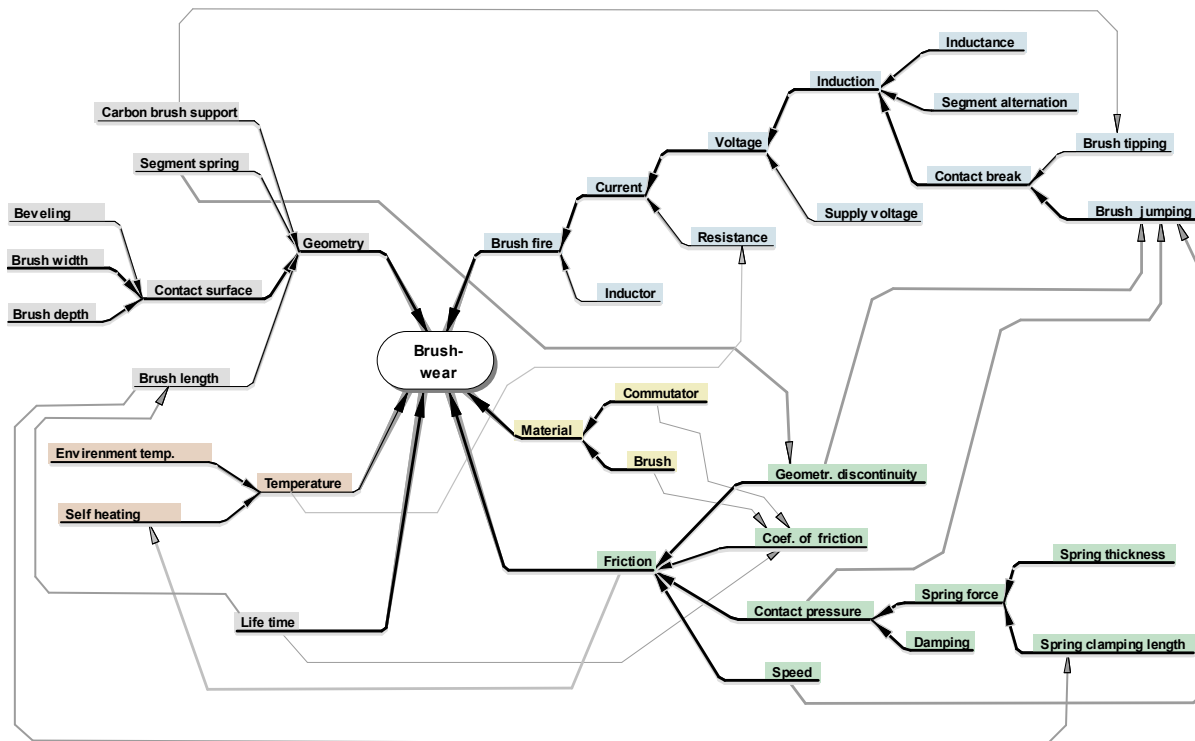
More information

www.weibull.de/COM/System_Analysis.pdf

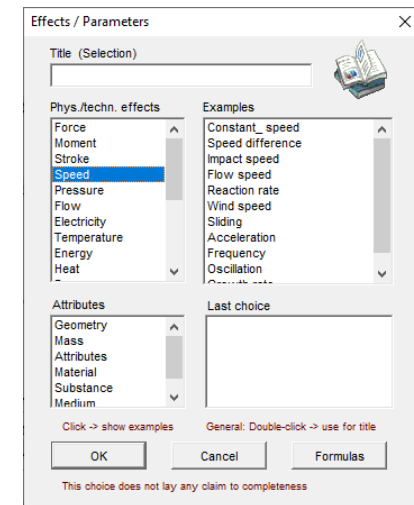
System analysis

The cause effect diagram can be evaluated and provides cross-links to the assessment of dependencies important to decide what needs to go into a design and what doesn't.

③



A parameter library helps to overlook anything



Fault-Tree-Analysis

The graphical FTA with powerful functions

The screenshot displays a graphical fault tree analysis (FTA) for an "Ignition fault". The tree structure is as follows:

- Ignition fault (Top Event)
 - Ignition energy too low
 - Resistance too great
 - Soldering point broken
 - Wrong material
 - Igniting duration too low
 - Control unit wrong signal (software)
 - Spark plug not optimal
 - Electrode too deeply screwed
 - Spark plug gap too big
 - Combustion chamber bad condition
 - Mixture too lean. Adaption inaccurate
 - Mixture temperature too high or wrong moment

See examples in menu *File, Templates, System-Analysis*

For more information read www.weibull.de/COM/Fault_Tree_Analysis.pdf



- All FTA elements also Vote-Gates
- Sub-Gates with layers
- Short-cuts
- Calculation of the critical path
- Probability from distribution or via a standardized FMEA table
- Import from text structure
- Export as FMEA form or cause-effect-diagram
- Supports new VDA/AIAG FEMA Handbook 2019

Context menu options:

- I Edit text (comment or hyperlink) ...
- P Define probability...
- Calculate (incl. file save) F9
- Top-Down berechnen ...
- Critical path
- Attach OR-Gate
- Attach XOR-Gate
- Attach AND-Gate
- Attach Basis-Event
- Attach Sub-Gate
- Sub-structure in own project window ...
- Attach Text-element

Occurrence probability dialog box:

Defined from FMEA occurrence: VDA/AIAG FMEA Handbook 2019

P	Occurrence O
P=0	0 ppm 1
P=1E-6	1 ppm 2
P=1E-5	10 ppm 3
P=1E-4	100 ppm 4
P=5E-4	500 ppm 5
P=0.002	2000 ppm 6
P=0.01	10000 ppm 7
P=0.02	20000 ppm 8
P=0.05	50000 ppm 9
P=0.1	100000 ppm 10

Probability: P: 0,001 for a particular time

P fix for Top-Down calculation

Distribution:

- none (see left)
- Exponential (fa)
- Log-Normal
- Weibull

Time: [] h for all equal

Buttons: OK, Abbruch, Help

* Analog FMEA handbook AIAG/VDA 2019 alternative table (A=1 => 0 ppm not in use)

Multiple Regression

The multiple regression is the most powerful analysis tool for the DoE results or historical data

①

②

C	D	E	F	G
abi	TrackPole	PistonPole	DampTube	Accel
5000	4750	210000	69000	9,49469
5000	4750	210000	69000	8,08628
5000	4750	210000	69000	7,23
5000	4750	210000	69000	6,67

Menu Data/Spreadsheet and open file:
Example_MulReg.xlsx

Data analysis Multiple Regression

Menu Data/Spreadsheet and open file:
Example_MulReg.xlsx

The screenshot shows three overlapping windows from the Multiple Regression software:

- Data Window:** Shows 'Spreadsh-T table' set to 'T1' and 'Data-columns' as 'Accel.'. It lists independent parameters: StiffnRod, DampRod, Stabi, TrackPole, PistonPole, and DampTube.
- Model Window:** Shows the 'Model' tab selected. The 'Model' section has 'Quadratic' selected. The 'Regression' section has 'MLR (standard for experiments)' selected.
- Regress Window:** Shows a table of regression terms with their coefficients and p-values. A red bar highlights the p-value for the 'StiffnRod*Stabi' term.

Speech Bubble 1 (Coefficient of determination):

Coefficient of determination $R^2 = 1 - \frac{SS_{Res}}{SS_{Total}}$
 Explanation quota of the model
 Further infos use Help-button

The coefficient of determination R^2 indicates, which quota the regression model can explain the data.

The actual value $R^2=0.9846$ shows, that there is only 1.5% unexplained rest of scattering. The result of the regression is good.

Speech Bubble 2 (p-Value):

p-Value
 Error probability
 Further infos use Help-button

The coefficient describes the importance in the model and the p-value is the error probability of this influence. It should be less than 0.05.

The actual p-value=0.265 means, that the model-term is not significant (bar is red) and should be excluded of the model

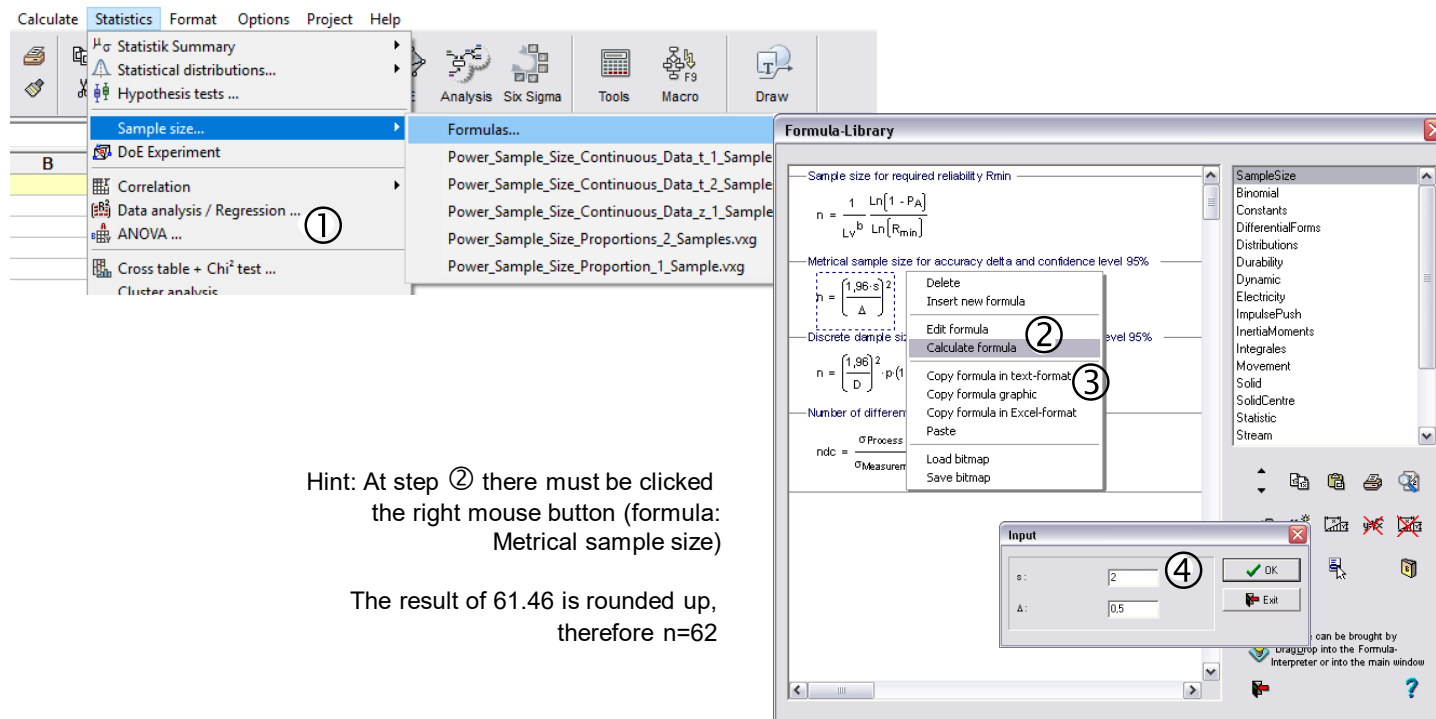
Detailed description under:

www.weibull.de/COM/Data_Analysis.pdf

Speech bubbles provide explanations of the properties and interpret the actual values

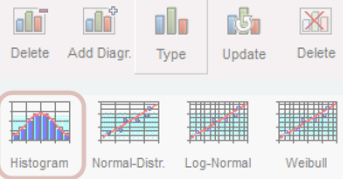
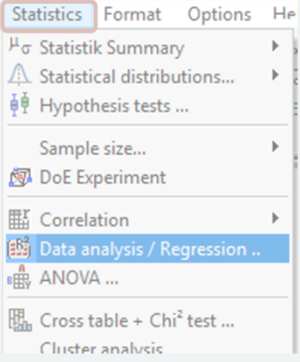
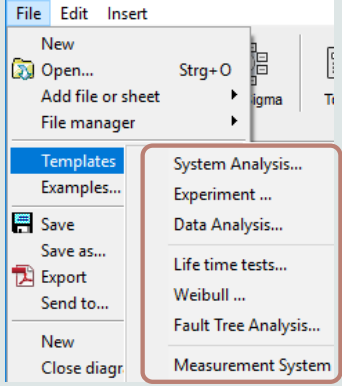
Calculation of a spot check size

Example car wash: The drying time of a varnish should be examined. It should be reached an exactness from $\pm 0,5$ hrs. The drying time has a standard deviation of 2 hrs. How big has to be the necessary sample size? The calculation can occur with the Calculator (view of the main window):



Examples for templates

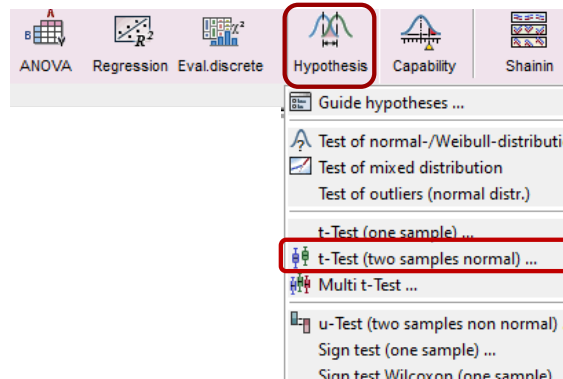
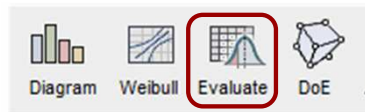
The other examples treat templates

Diagram-functions	Internal functions	Templates
<p>e.g. test of normality, hypothesis of equality with Boxplot or test of normality</p> <p>⇒ Select <i>Diagram</i></p>  <p>Declarations</p> <ul style="list-style-type: none"><input checked="" type="checkbox"/> Distribution-curve<input checked="" type="checkbox"/> Density-function (Normal-Distribution)<input type="checkbox"/> Show median and standard-deviation <p>Distribution test</p> <p>(Anderson-Darling)</p> <p><small>P-value < 0,05 : Data does not correspond to selected distrib.</small></p>	<p>e.g. calculation of distributions, DoE, regression, sample size, etc.</p> <p>⇒ Select menu <i>Statistics</i></p> 	<p>e.g. hypothesis-test, or Weibull-Analysis.</p> <p>⇒ Select menu <i>File/Templates</i></p> 

Statistical t-tests via templates

Hypothesis tests are available via templates

Open the Spreadsheet and the table where are the sub-groups of the Boxplots.
Mark column A and B.



Paste data in the yellow fields

	A	B	C	D
1	Data 1	Data 2		
2	167,2	184,1		t test
3				
4				
5				
6				
7				
8	188,9	193,3		beta-risk
9	192,4	196,5		power

Use "paste" for your data
(deletes the data from the example)
[Delete](#) [Paste](#) [Paste-Spec.](#)

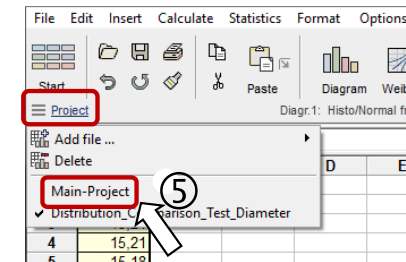


Start the macro for evaluation

t_test	4,71
t_crit	2,07
Significance	0,05
Mean 1	5,6667
Mean 2	7,3625
p-Value	0,000

The null hypothesis, that the means are equal, must be rejected!

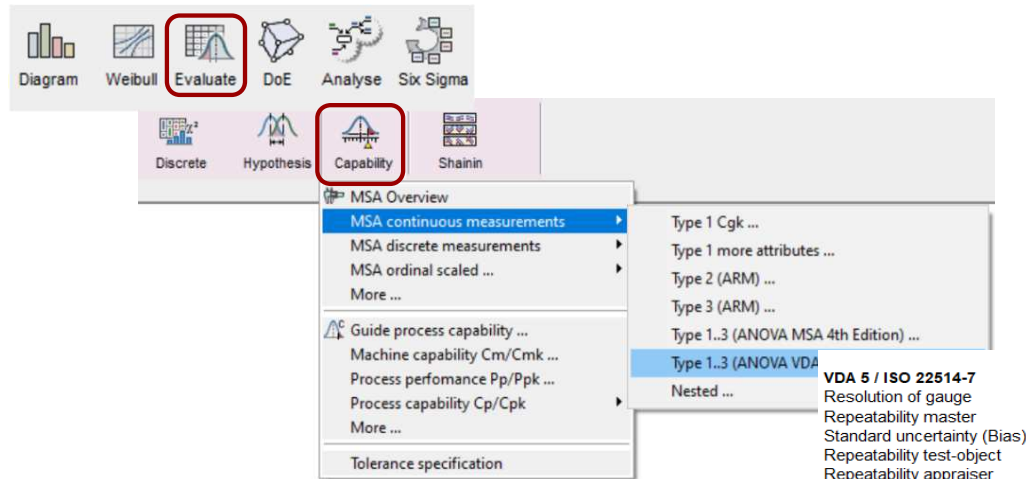
The null hypothesis, that the variances are equal, can not be rejected.



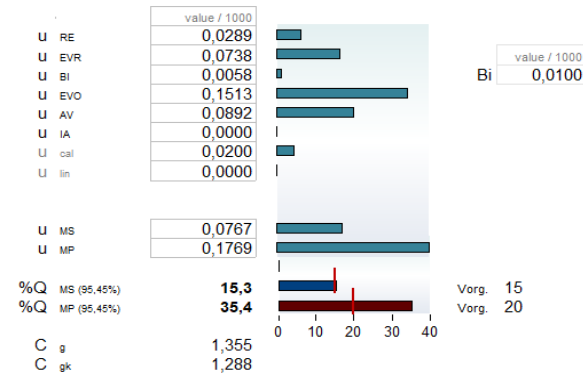
Note:

The template for the test is embedded in the actual project. To have a view to the previous representation and data select [Project](#) / [Main-Project](#)!

All important methods for continuous or discrete data are available



- Supports VDA 5 or MSA4th edition Type 1,2 and 3
- ANOVA or nested ANOVA
- One sided tolerances or natural limits
- Supports AQDEF format for import
- Gage R&R, Bowker, Fleiss-Kappa, Kendal



More information's:

www.weibull.de/COM/Measurement_System_Analysis.pdf

www.weibull.de/COM/Measurement_System_Analysis_discrete.pdf

Six Sigma - templates

For Six Sigma also powerful Excel and Visual-XSel templates are available

The screenshot shows the Visual-XSel 20.0 interface. The 'File' menu is open, and the 'Six Sigma (FMEA, QFD, SIPOC)' option is selected. A secondary menu lists various Six Sigma tools, with 'Cpk Sigma Table' highlighted. A preview window titled 'Table for Cpk - values + overstepping reference values' is displayed, showing a table of process capability metrics and a normal distribution curve.

Sigma	Cp	Cpk**	inside %*	outside %*	ppm*	ppm-SS**
1	0,33	-	84,13	15,87	158655	691462
1,5	0,50	0,00	93,32	6,68	66807	500000
2	0,67	0,17	97,72	2,28	22750	308538
2,5	0,83	0,33	99,38	0,621	6210	158655
3	1,00	0,50	99,87	0,135	1350	66807
3,5	1,17	0,67	99,98	2,33E-02	233	22750
4	1,33	0,83	99,9968	3,17E-03	32	6210
4,5	1,50	1,00	99,9997	3,40E-04	3,4	1350
5	1,67	1,17	99,99997	2,87E-05	0,287	233
5,5	1,83	1,33	99,999998	1,90E-06	0,019	32
6	2,00	1,50	99,9999999	9,87E-08	0,001	3,4

* one sided without mean displacement
 ** one sided with mean displacement of 1.5 s

More information's at

<https://crgraph.de/en/search-index>

and

<https://crgraph.de/en/download/>

Contact: info@crgraph.de