HEXAGON

Strategies

Short explanation, adaptions

FAQ
9 December 2021
Created with Version 13.0.5

Information about this document

Document History

Version	Date	Author(s)	Modifications / Remarks
	20.10.2021	GA	Initial release
	20.10.2021	GA	Translation

HEXAGON

CONTENTS

1 Evaluation strategies

With the menu *File* | *Configurations* | *Evaluation Strategy,* a defined strategy for calculating the data sets is available in all modules of the main products. Depending on the module, these are flow charts (in sampling or process analysis) or blocks to be considered individually (e.g. in solara.MP).

The evaluation strategies are the heart of the Q-DAS software. All mathematical statements and most graphics are based on the calculations defined by the strategy.

This documentation deals exclusively with the core questions on the strategies! Basic parts are explained. A comprehensive description of all parts of the strategy is NOT possible.

Chapter 2 briefly explains how to create your own strategies. A strong recommendation, however, is to secure this in a workshop.

Various products do not include the possibility to switch between strategies or to create own strategies. These include destra and essentials.

This documentation therefore assumes the products qs-STAT as well as solara.MP.

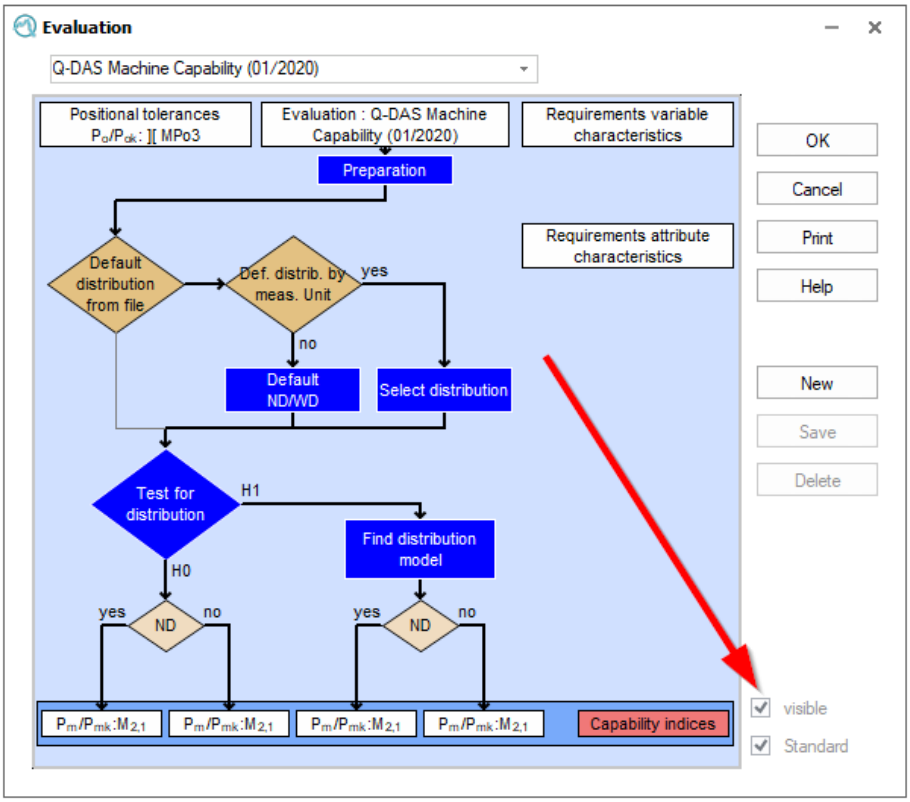
1.1 Company standards

Various company standards and strategy proposals from Q-DAS are stored in the delivery status. The delivered standards are protected and can therefore neither be changed nor deleted. As soon as a change is made, a dialogue box prompts you to enter a new name for the evaluation strategy.

Company strategies are not interpretations of Q-DAS, but were created by the companies themselves and handed over to Q-DAS for delivery. Therefore, this document cannot provide detailed explanations of how exactly these company strategies work.

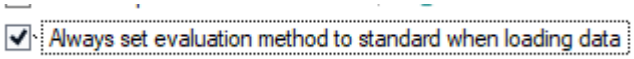
1.2 Visibility and standard strategy

After starting the software or after a module change, the strategy is selected that has the tick set at *Standard.* In change mode (*Change* button), the respective strategy can be changed. As soon as the *Standard* check box is activated for another strategy, it is deactivated for the previous standard strategy.



With the status *visible,* strategies can be activated/deactivated for normal selection. User groups with the right "Select strategy" can only select between strategies that are switched to visible. In change mode, all strategies can be selected and, if necessary, switched visible again.

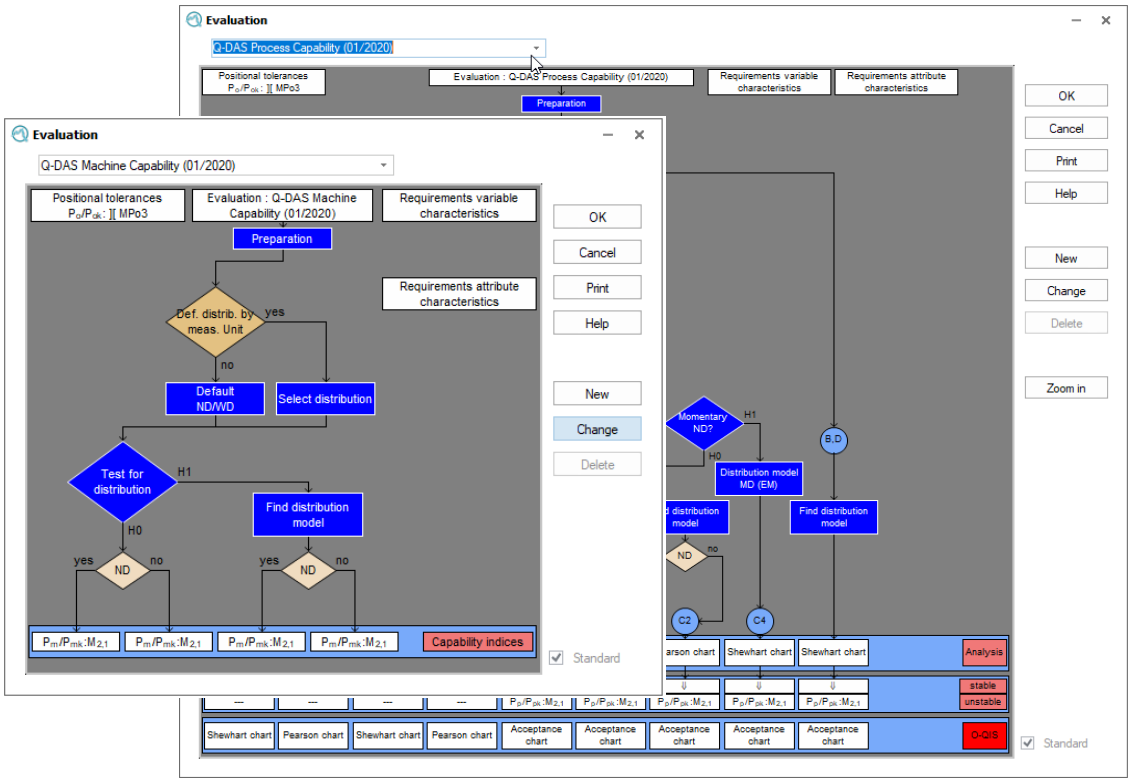
In the general settings, it can be specified that even when opening a new record, if a different strategy was previously selected, this is reset to the default.



1.3 Special features

1.3.1 Evaluation - Sample Analysis / Process Capability Analysis

The entire evaluation procedure for the sampling and process analysis modules can be controlled via a configuration menu. For better understanding, the processes are shown as a flow chart. In addition to some standardised or company-defined standards, the configuration suggested by us is available under Q-DAS Process/Machine Capability.

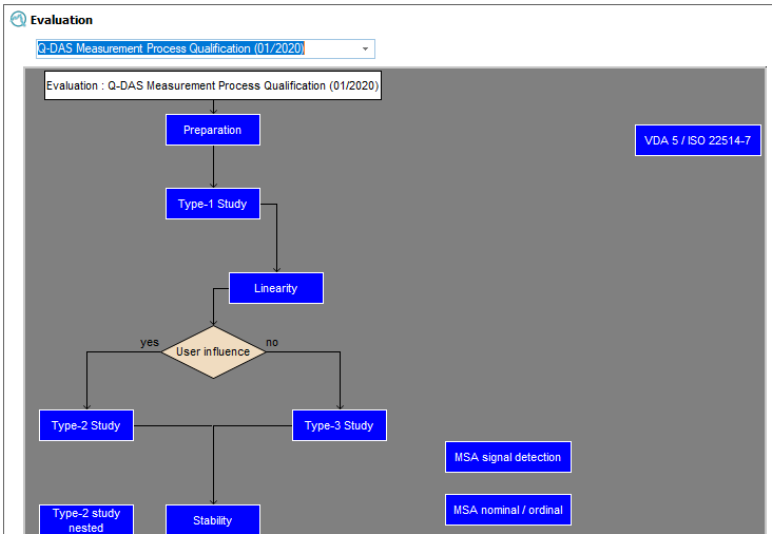


Chapter 2 briefly explains how to create your own strategies. A strong recommendation, however, is to secure this in a workshop.

The Q-DAS strategies were created with the aim of calculating meaningful results for most applications. In no way are the Q-DAS strategies "the measure of things", but rather the compromise to provide a large proportion of clients with an analysis that takes into account current standards and guidelines.

1.3.2 Evaluation - solara.MP

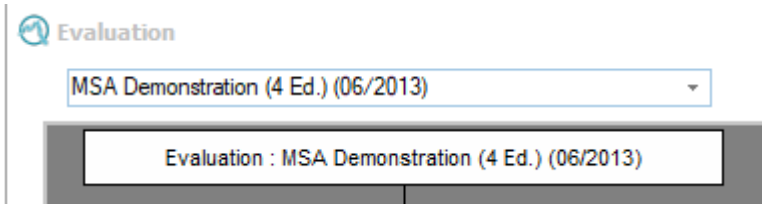
The evaluation strategy in solara.MP does not follow a flow chart, the drawn scheme is more of a suggestion. Furthermore, the strategies are divided into the different "strategic orientations" MSA, VDA 5 and GUM



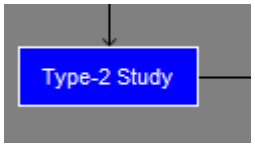
Under "Preparation", general settings are made that apply to all procedures (e.g. general calculation according to MSA 3rd Edition). Otherwise, all settings are made per procedure.

1.3.2.1 Sub-strategies of the procedures

A special feature of solara.MP is the use of sub-strategies. To explain this, the evaluation strategy "MSA Demonstration (4 Ed.) (06/2013)" is selected:



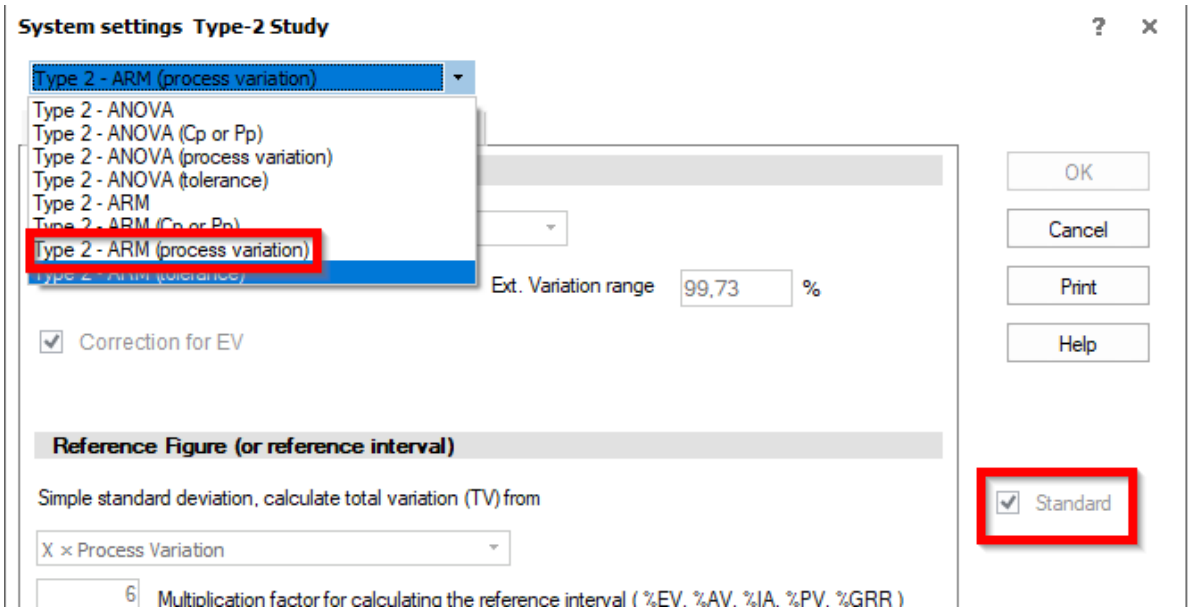
The procedure 2 is considered:



The MSA provides various options.

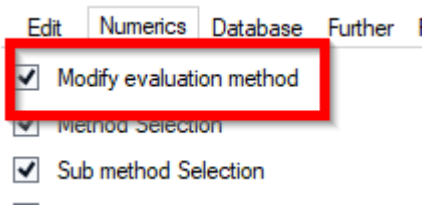
- Calculation according to ARM or Anova (Anova is to be preferred)
- Reference value Tolerance / Total Variation / Process Variation / C-value specifications

In order to accommodate all or the desired variants in one strategy, sub-strategies have been created. In the drop-down menu of each procedure, one of the created sub-strategies can be selected. Again, a sub-strategy is to be defined as the "standard" as the first one selected after starting the software:



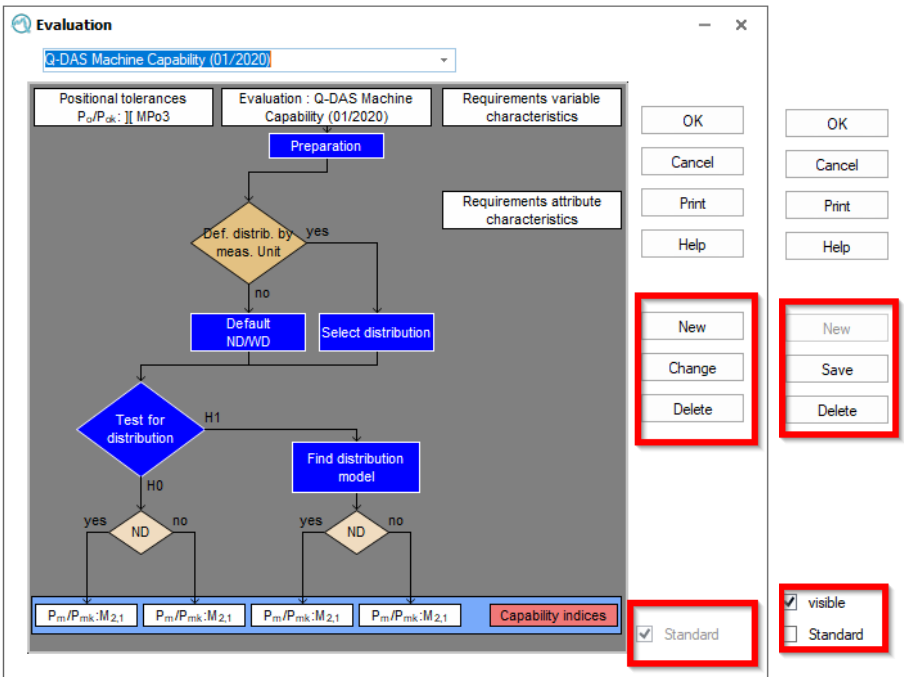
2 Modify strategies

If the user group right "Modify evaluation strategy" is given, own strategies can be created or further processed. In a delivered configuration, this right is only available to the system administrators SuperUser and ConfigurationUser.



This chapter deals with the purely technical preparation. Brief explanations of the most important areas of the strategies are given in subsequent chapters.

The following illustration shows the buttons in the basic state and in the editing state.



New

To create a new evaluation configuration, select one of the standards from the drop-down menu as a template. Selecting the *New* button opens a dialogue window in which the user name and password are requested ("**superuser**" when the programme was delivered). If you log in successfully, you will be asked to enter a new name for the evaluation strategy in another dialogue window. Duplicate or similar names are not possible!

Change

If you want to change an evaluation configuration, first select a template from the drop-down menu and then click on the *Change* button. The user name and password are requested (on delivery of the programme "***superuser***" for the users SuperUser and ConfigurationUser).

Note: If the template is one of the delivered standards, you will be prompted to enter a new name in a dialogue box when making a change, as no changes can be made to the delivered standards!

Delete

To delete the selected evaluation, select this button. You will be asked to confirm the deletion again.

Save

This allows you to save your settings.

Important note: If you want to change the settings for several evaluation strategies, you must press the *Save* button before selecting a new system configuration in order to apply the changes you have made. Only the configuration of the currently selected evaluation is saved.

Print

You can print the flow chart of the active evaluation strategy by selecting *Print.*

Cancel

To exit the evaluation configuration without making any changes, select *Cancel.*

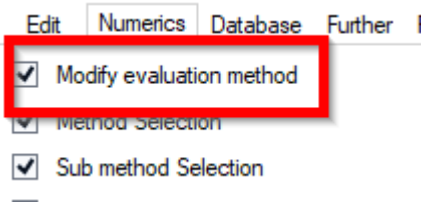
OK

The dialogue can be exited with the *OK* button. If the changes to the strategy have not yet been saved, a confirmation prompt appears. If this is negated, all adjustments are lost.

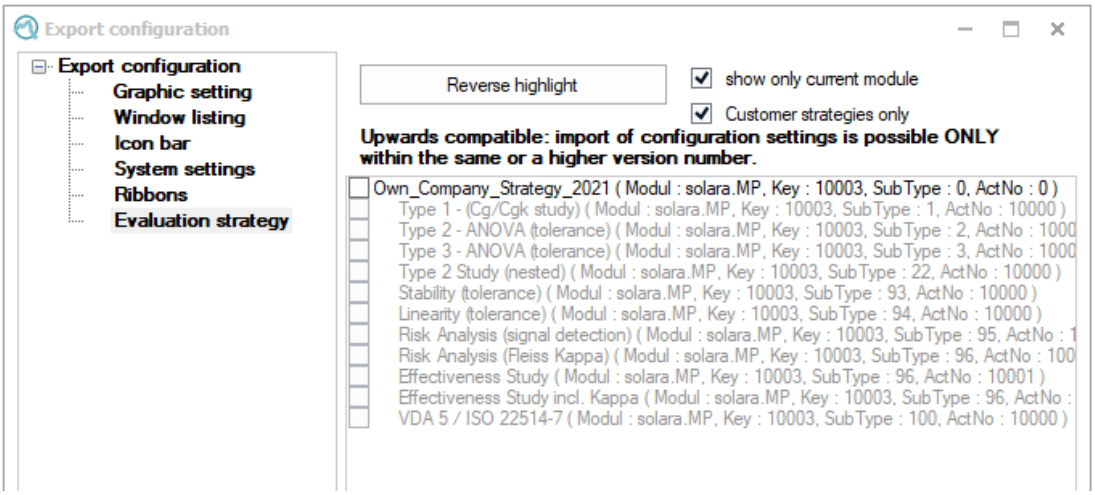
The only editing that is allowed in the standard strategy is to activate / deactivate the "Visible" option.

3 Export / import strategies

If the user group right "Modify evaluation strategy" is given, strategies can be exported and imported.



Under *File* | *Configuration* | *additional Settings* | *Configuration Export/Import,* the tab of the evaluation strategies is then available. With the option "Only customer strategies", the view can be reduced to self-created and thus not protected strategies during export:

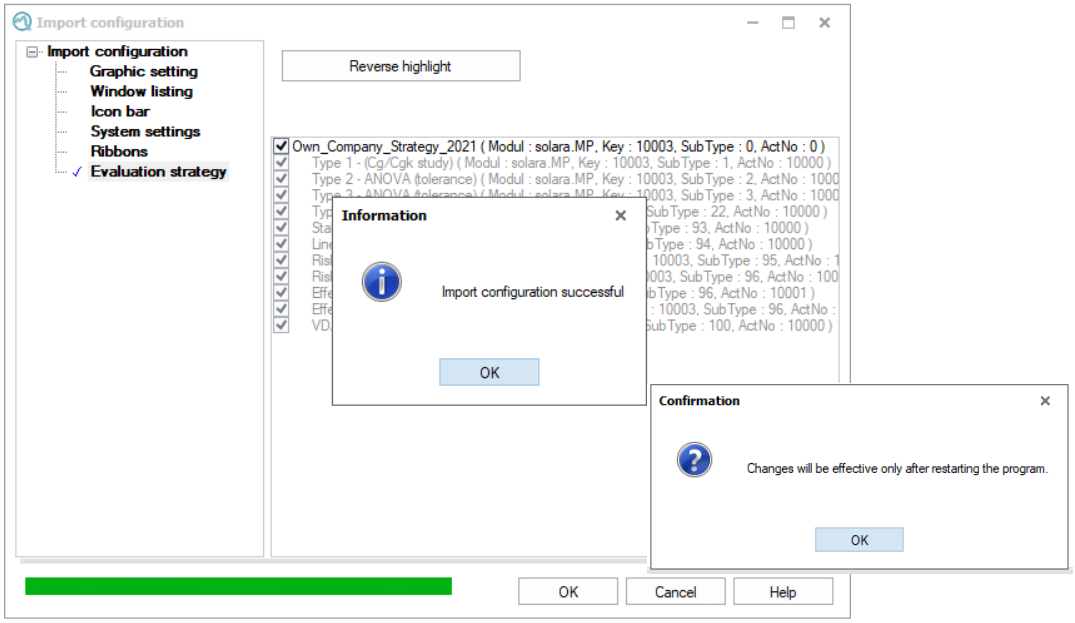


In the special case of solara.MP, all sub-strategies are selected after selecting the main strategy.

The export is done in a ConfExp.IEF file (file name can be given as desired).

Strategies are imported via the IEF file selection. It is possible to import strategies from older versions, but own strategies from older versions must be checked / validated by the person responsible after the import.

After the import, a restart of the software is required.

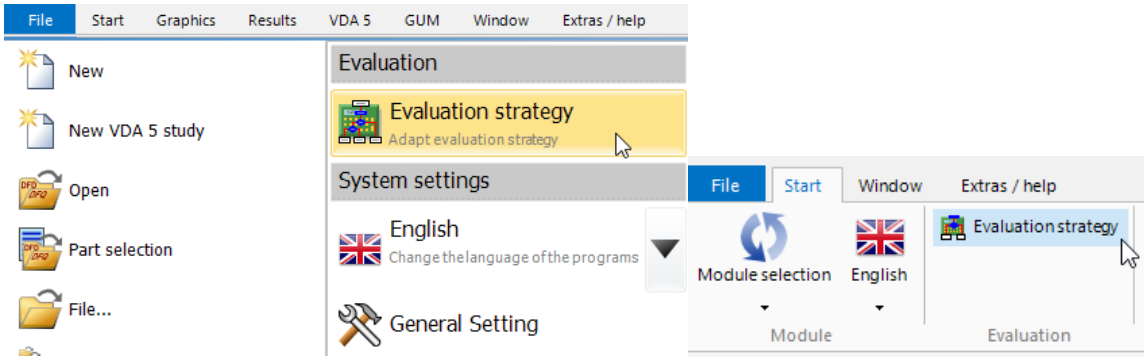


4 Selection of strategies in the interface of the software

The selection of other strategies that are not defined as standard can be done in different ways. In order to give the user the possibility to select strategies at all, the user groups must have the right "Method Selection" or, in the case of solara.MP, the right "Sub method Selection".

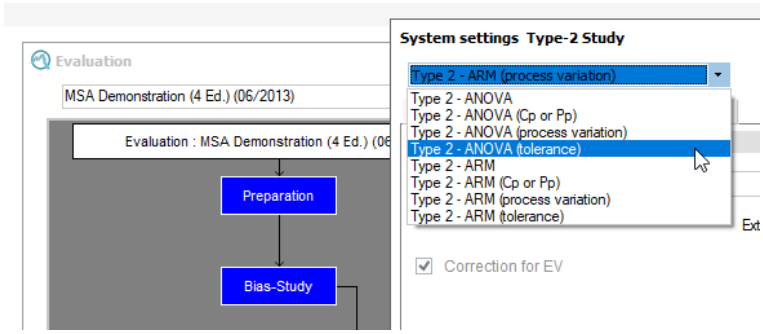
4.1 Selection in the ribbon

Provided the menu items are active, the strategy selection is available in 2 places in the ribbon:

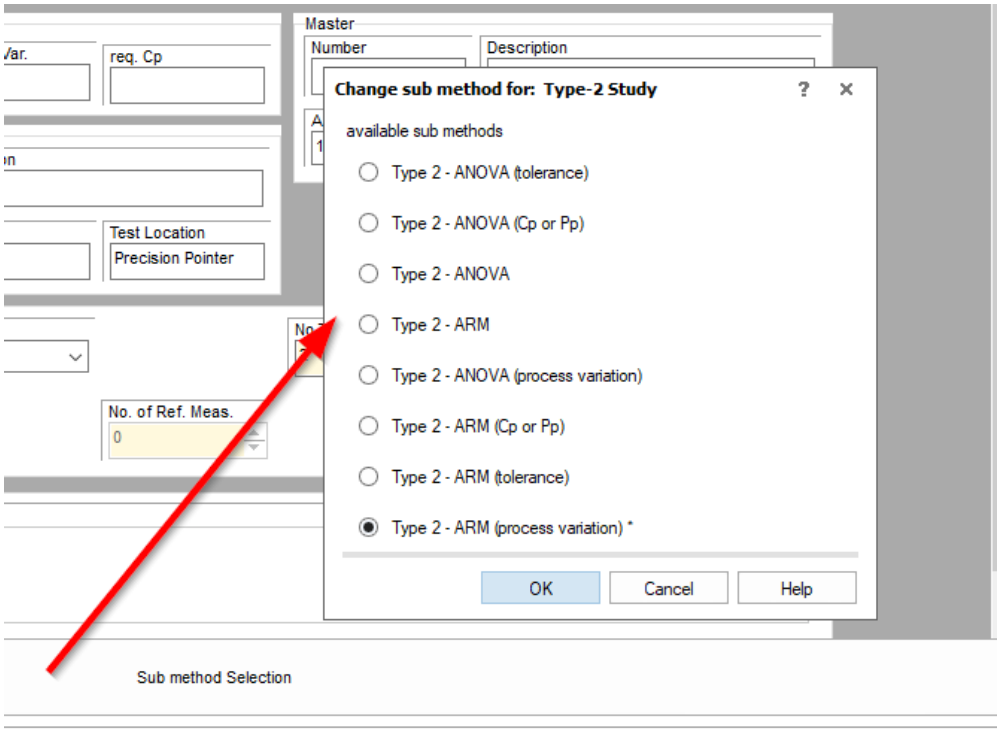


4.2 Selection of substrategy via the characteristics mask in solara.MP

Sub-strategies can be selected directly in the strategy in solara.MP:

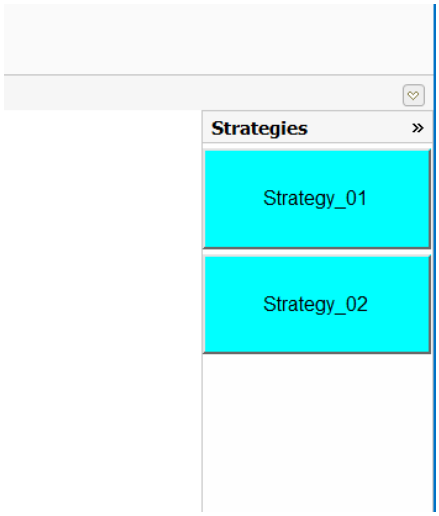


In addition, this is also available as a button on the characteristics mask, which displays all possible sub-variants of the current evaluation type and offers them for selection:



4.3 Selection via buttons / script commands

The button bar designer can be used to create a button bar that is integrated in the paths or the wizard.



With the script commands QDasSetStrategy or QDasSetSubStrategy, defined evaluation strategies can be selected here at the touch of a button.

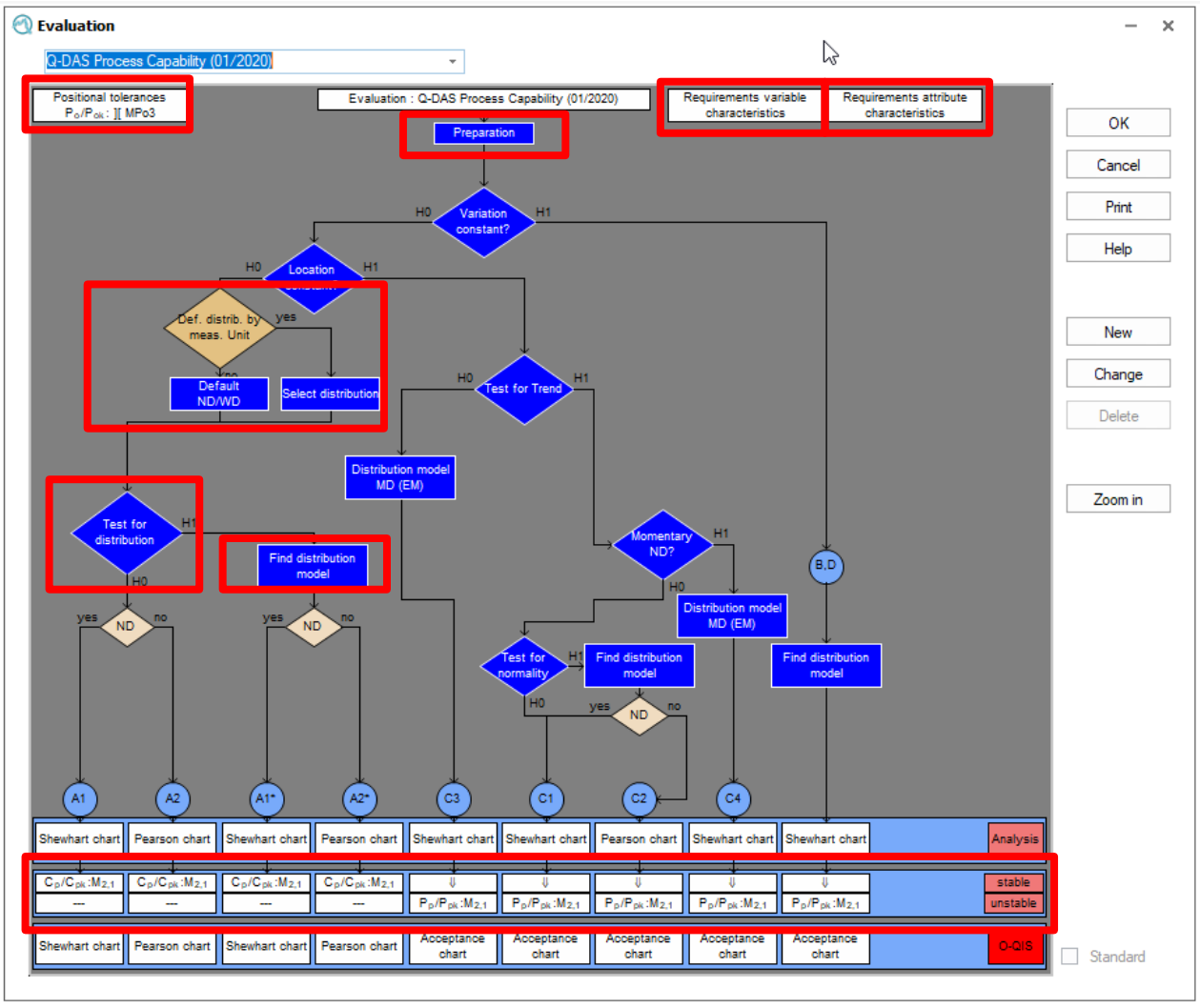
The form and button bar designer is an additional purchase option. The description of the button bar designer and the script commands can be found in the download area of the homepage.

Excerpt from the Q-DAS Script Commands Manual:

QDasSetStrategy Temporary change of the evaluation strategy via the evaluation strategy designation. After, for example, a restart of the Q-DAS application or a module change, there is an automatic switch back to the standard evaluation strategy.	**QDasSetStrategy('StrategyName')** *'StrategyName'* Alphanumeric parameter. Required. By specifying the evaluation strategy name, a temporary change to this evaluation strategy takes place. The evaluation strategy name is case-sensitive. By specifying an empty parameter (''), the switch to the evaluation strategy defined as standard is made. **Example:** QDasSetStrategy('MyEvaluationStrategy') - Switch to a self-created evaluation strategy.

5 Tabs of the strategies qs-STAT

As described above, it is not possible to describe all the options for evaluation strategies in full. In the following chapters, the basic options will be addressed.



The creation of own strategies should always take place in a workshop. The interplay of strategies from test process suitability to long-term evaluation must be taken into account.

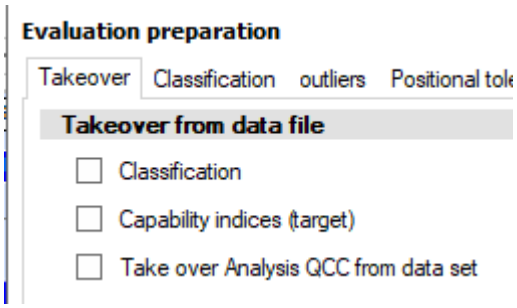
Likewise, this document is not an explanation of the exact mathematical possibilities! These are deliberately not mentioned in this document. Only the technical points should be explained here for a better understanding.

5.1 Preparation

The settings that can be made under "Preparation" apply to all characteristics that are evaluated.

5.1.1 Takeover tab

In the *Takeover* tab, you can select which information is to be transferred from the file when it is read in. To do this, activate the desired checkbox(es).



You will be offered the following options:

- Classification

The classification from the file is adopted if it was saved by the save options for the data set. The classification setting in the programme (*Classification* tab) is then not adopted.

- Capability indices (target)

The set values (limit values) for the capability indices are taken from the file. In this case, the default values set in the programme are not used.

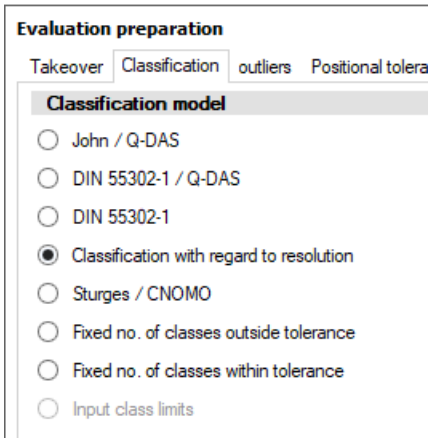
- Analysis QRK from data set

The analysis QRK is taken from the file.

It is recommended not to take over any information from the data set, unless this is necessary in special projects.

5.1.2 Classification tab

This tab sets which method is to be used for classifying the data.



- John/Q-DAS

The number of classes is between the square and cube root of n (n = sample size). Class boundaries are formed as smoothly as possible.

- DIN 55302-1/Q-DAS

Classification model in which the requirement for the minimum number of classes is only met from n = 100. If the sample size is smaller, the number of classes results from the square root of n.

- DIN 55302-1

The minimum number of classes is fixed at 10 even with a sample size of n < 100.

- Classification with regards to resolution

In this classification model, the class width is an integer multiple of the resolution.
This is important when using the CHI² test.

- Sturges/CNOMO

Model according to the French CNOMO standard

- Fixed number of classes within / outside tolerance

With this model you can define how many fixed classes are outside and inside the specification limits. After selecting the model, the section "Class limits" appears. Here you can specify the fixed number of classes within/outside the specification limits.

In addition, you still have to select an alternative classification model if the fixed number of classes cannot be used.

- Enter class boundaries

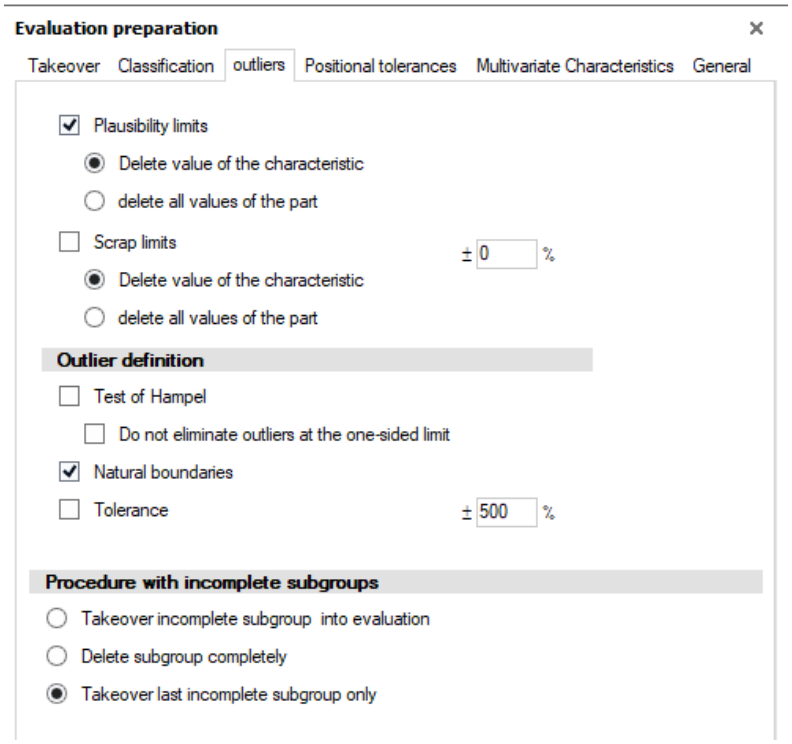
Although this option is executed in the strategy, it cannot be used here because the entry of class limits is only allowed elsewhere.

To enter class boundaries, you must select *Classification* | *Classification Model in the Graphics* tab in the Single Feature Graphics group

It is recommended to use only the classification form "Classification with regards to resolution", because in almost all new strategies the CHI² - tests are active, which are based on this classification!

5.1.3 Tab Outliers

You can define the conditions according to which the outliers are recognised here by activating the corresponding checkboxes.



5.1.3.1 Detect outliers via plausibility and scrap limits

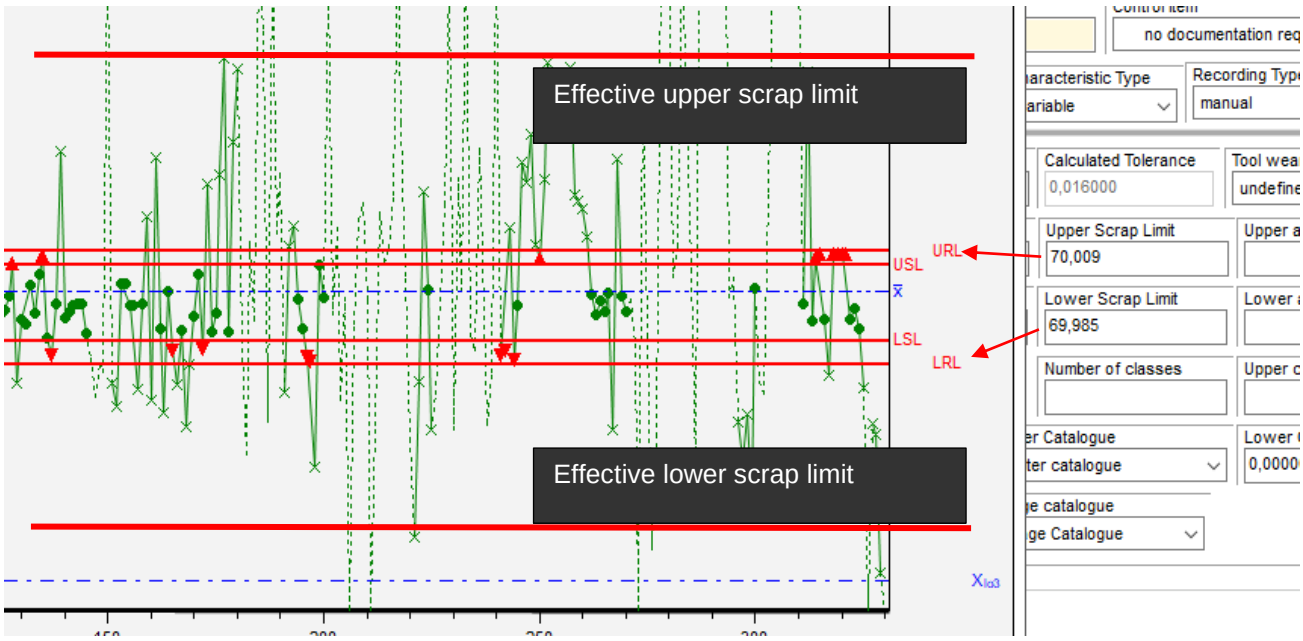
With the options *Plausibility limits* and *Scrap limits it* can be selected whether only this respective value or the entire part measurement across all characteristics of the part are excluded from the calculation. If the option *delete all values of the part is* selected, it must be noted that only complete part measurements are loaded.

- **Plausibility limits**
  All values that lie above the upper or below the lower plausibility limit are automatically excluded from the evaluation as outliers, but are not removed from the data set.
- **Scrap limits**
  All values above the upper or below the lower scrap limits are automatically excluded from the evaluation as outliers, but not removed from the data set.

For the scrap limits, there is also the option of specifying a percentage range. Here in the example 200%

This % range is NOT an automatic setting of scrap limits to this value! The rule still applies that the scrap limits must be entered on the characteristics mask.

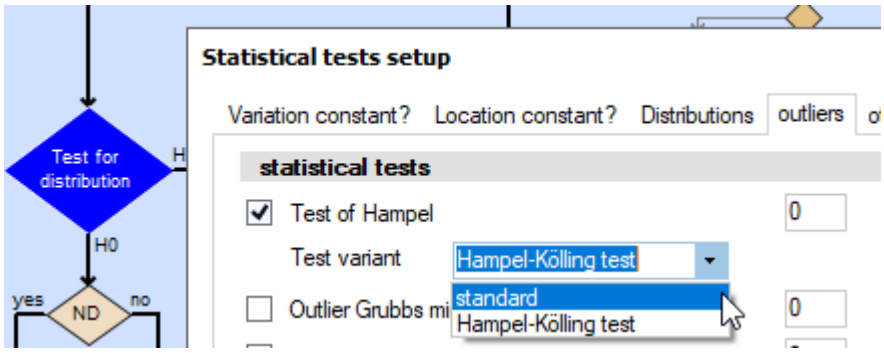
However, if scrap limits are set which are too close to the specification limits, or which are set to a value which is illogical for this characteristic due to the copying of characteristics, this option can be used to expand the effective scrap limit to 200% of the tolerance in order to remove invalid values by mistake:



5.1.3.2 Test of Hampel

Hampel's test is an outlier test that does not require the distribution model normal distribution. All values that do not fulfil the above condition are excluded from the evaluation. However, the values are not deleted from the data set.

The Hampel test must also be activated in the test procedures in addition to this option in order to have an effect here.



5.1.3.3 Outliers by natural limit

All values that lie above the upper or below the lower natural limit are automatically excluded from the evaluation as outliers, but not removed from the data set.

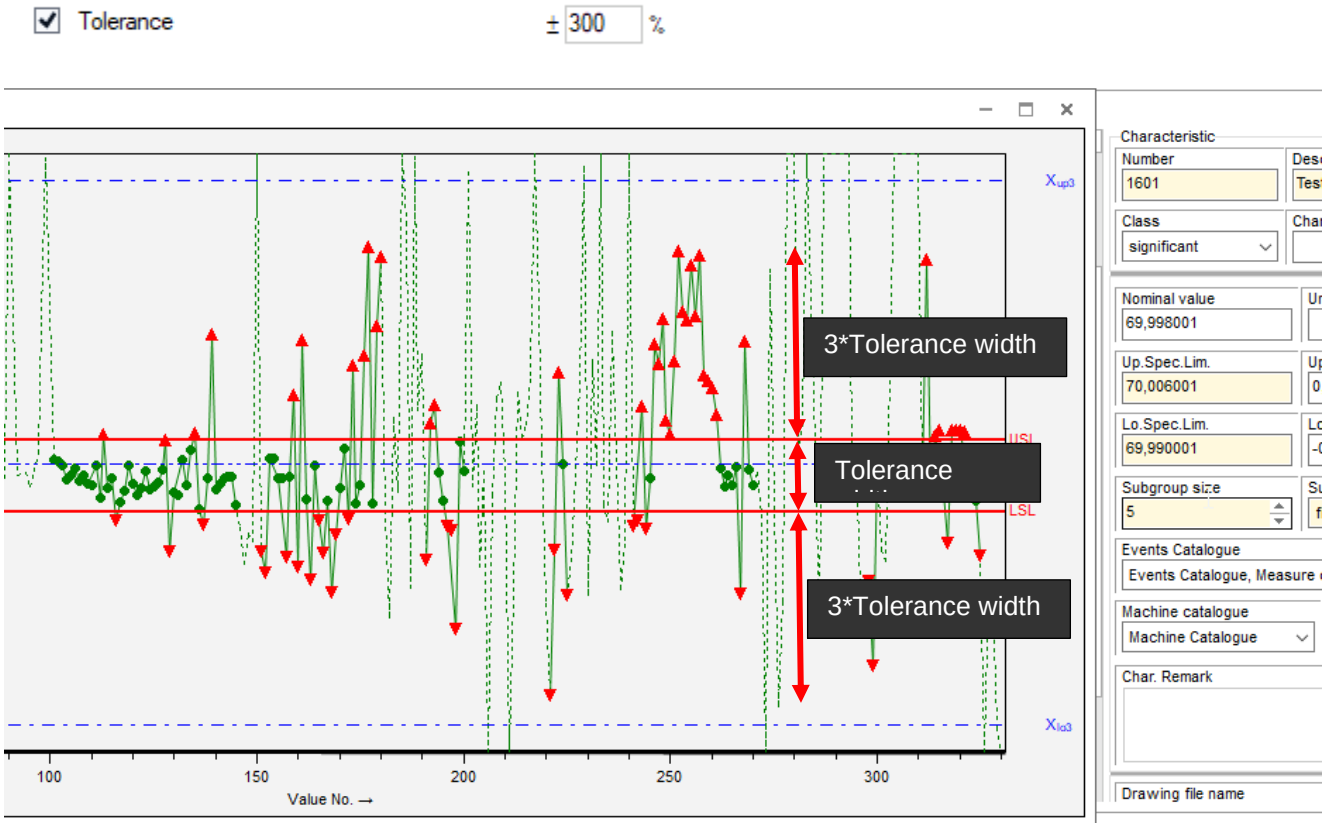
5.1.3.4 Outliers according to tolerance

With the tolerance width as a 100% reference, "outlier limits" are counted towards the specification limits.

$$upper\ Outlierlimit = upper\ specification\ limit + x\%\ tolerance$$

$$lower\ Outlierlimit = lower\ specification\ limit - x\%\ tolerance$$

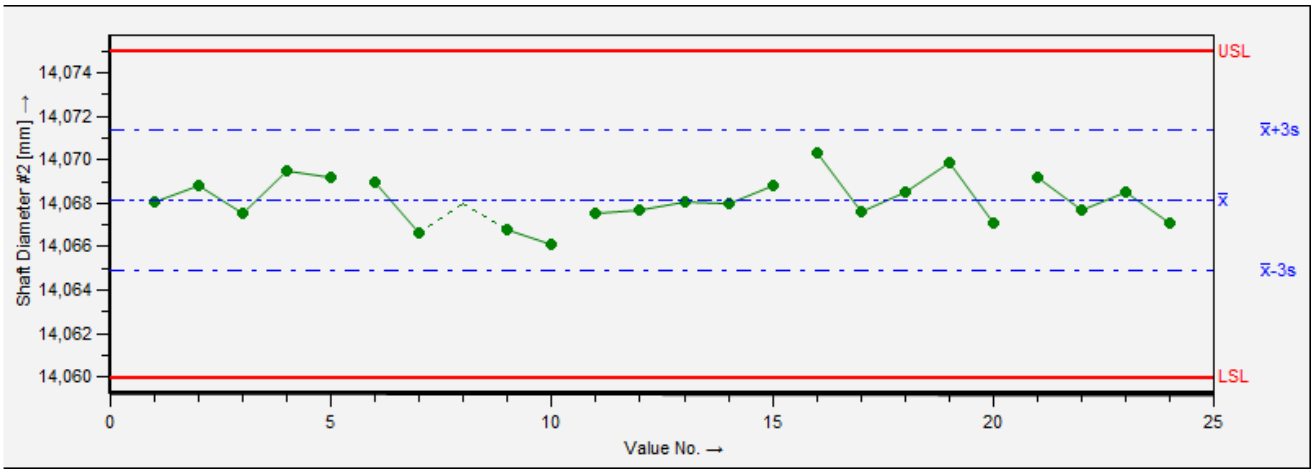
Using the example with the 300% setting



5.1.3.5 Procedure for incomplete subgroups

An example has been created to illustrate these options.

Given a data set with 24 measured values, sample size is 5, measured value number 8 was set as not valid, the subgroup at the end is incomplete

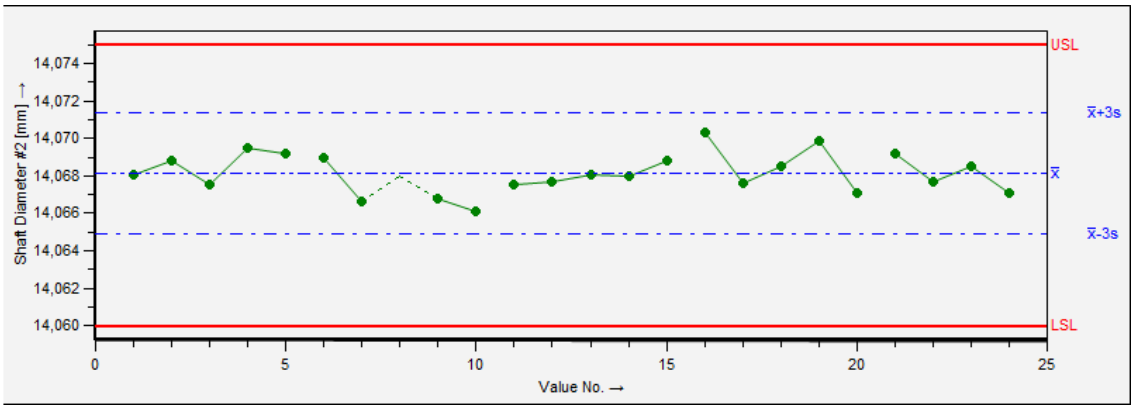


In this data set, there is therefore an incomplete subgroup in the middle of the data set, as well as a started subgroup at the end of the data set, which has not yet been completed.

This example explains the different options

Include incomplete subgroup in evaluation

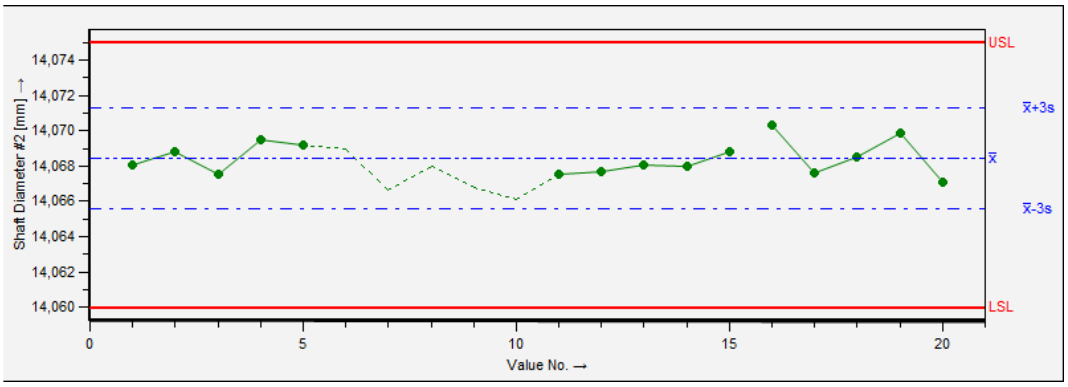
All incomplete subgroups, in the middle of the data set or at the end are included in the calculation:



Delete subgroup completely

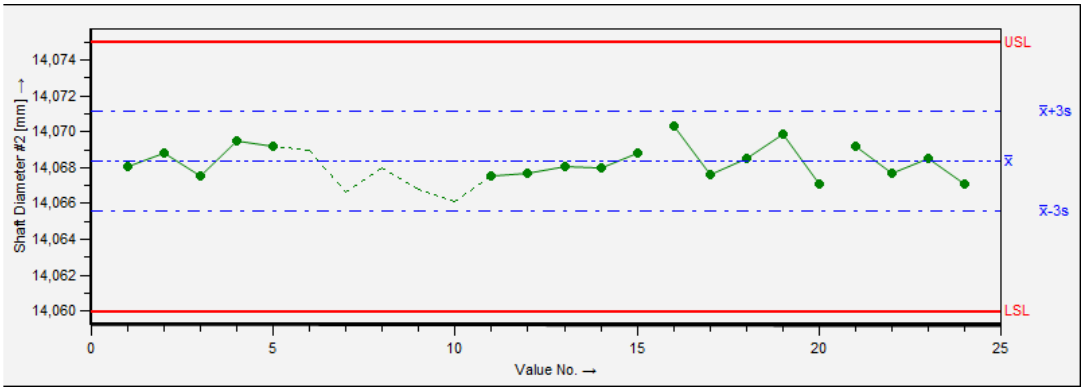
All incomplete subgroups, in the middle of the data set or at the end, are not included in the statistics.

The value progression is also graphically reduced and does not show the last, not yet finished subgroup at all.



Only take incomplete subgroup at the end

The most frequently used option. Incomplete subgroups in the middle of the data set are completely removed, but the incomplete subgroup at the end is included in the calculation.



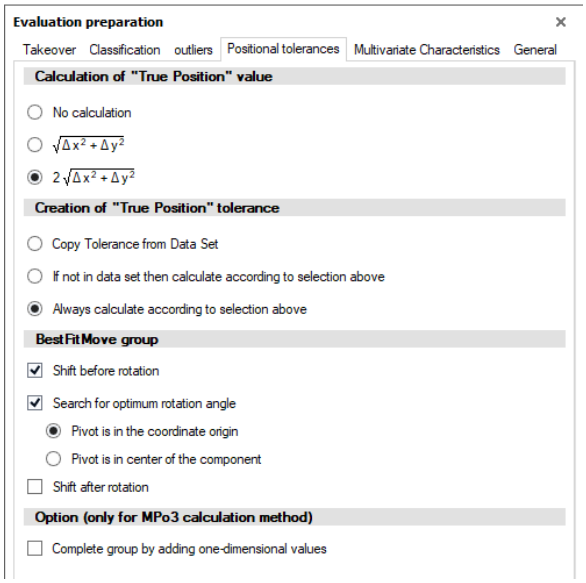
The reason for this is as follows: incomplete subgroups in the middle of the data set are therefore not included in the calculation, as the smaller subgroup size could falsify the result, or within these subgroups the "deactivation" of a measured value suggests a problem of the entire subgroup.

The incompletely recorded subgroup at the end, however, does not yet allow any conclusion to be drawn, so this is included in the mathematics.

All O-QIS products **ALWAYS** use the option **Only accept incomplete subgroup at the end,** regardless of the setting in the evaluation strategy**!**

5.1.4 Position Tolerances Tab

The settings on the *Position Tolerances* tab are used to calculate the deviation amounts for graphical display, but have **no influence** on the calculation of the capability characteristic values.



5.1.4.1 Calculation of “true position” value

- **No calculation**
  The programme does not calculate position deviation.
- $\sqrt{\Delta x^2 + \Delta y^2}$
  The programme calculates the amount of position deviation as the length of the vector from the target position to the actual position.
- $2\sqrt{\Delta x^2 + \Delta y^2}$
  The programme calculates the position deviation as a circle diameter so that direct comparison with the permissible tolerance circle is possible.

5.1.4.2 Creation of “True Positon” tolerance

- **Take over from data set**
  The programme takes over the position tolerances from the data set.
- **According to the above calculation (if not in the data set).**
  The programme takes the position tolerances from the data set. If there is no position tolerance in the data set, the programme calculates it.
- **Always according to the above calculation**
  The programme calculates the position tolerance from the individual tolerances for the coordinates x and y in each case.

Hint: The programme calculates the position tolerances from the individual tolerances for the x and y coordinates. If the tolerances for the x and y coordinates are different, the result is a tolerance ellipse as the position tolerance. If the tolerances for the x-coordinate and the y-coordinate are the same, the result is a tolerance circle.

5.1.4.3 Best Fit Move Group

The programme can calculate proposals for a position correction of the part for which several positions are tolerated. The actual positions are compared with the nominal positions and a correction value is output for the displacement of the part in x- and y-direction and another correction value that compensates the rotation angle of the part to the nominal position.

- **Displacement before rotation**

The programme first calculates the deviations in x and y direction. Then the programme calculates the angle of rotation.

- **Search for the optimum angle of rotation**
    - **Pivot point is in the coordinate origin**

The angle of rotation is calculated with reference to the coordinate origin.

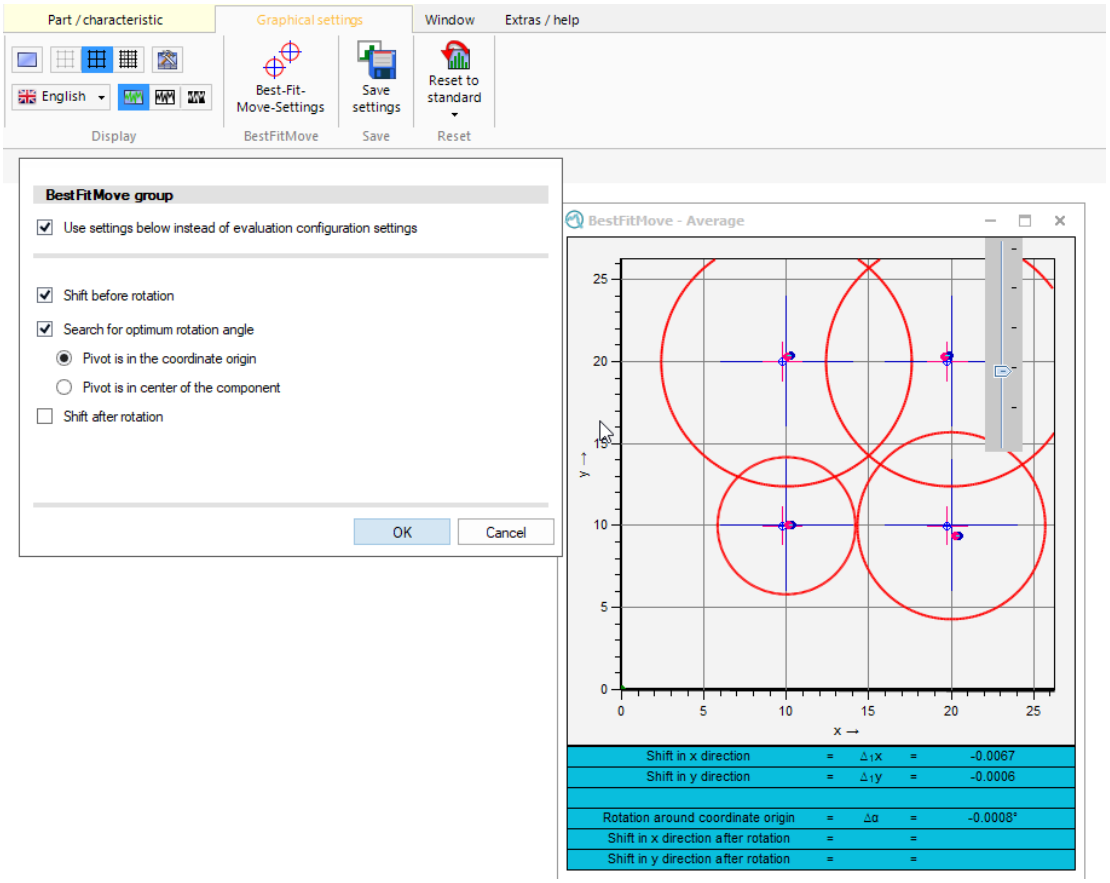
- **Pivot point is in the centre of the component**

The angle of rotation is calculated with reference to the calculated centre of gravity from the target positions of all x and y positions.

- **Displacement after rotation**

The programme first calculates the angle of rotation and then the remaining displacements in x and y direction.

Regardless of the default setting of the strategy, however, these settings can be changed at any time in the Best Fit Move:



5.1.4.4 Complete group one-dimensionally

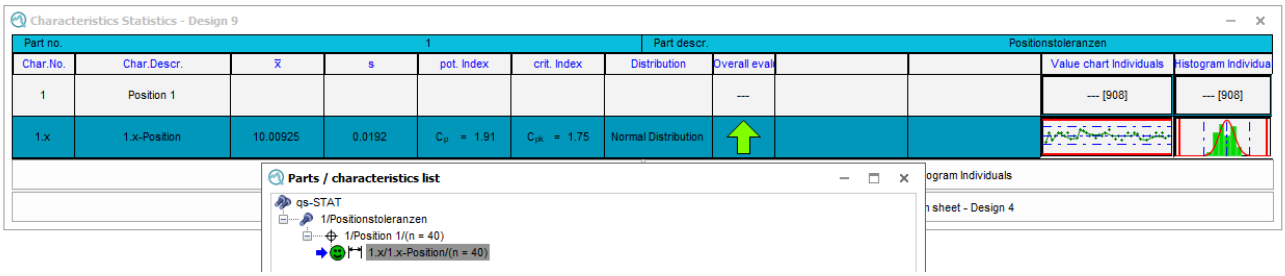
This option was created to correct **FALSE** written data records! In the field of statistics, one-dimensional position tolerances do not exist. This is a misinterpretation by measuring device manufacturers, as the wording "position" is used inflationarily in the field of surveying technology from the point of view of statistics.

It is not advisable to use this option, even if it was created by Q-DAS!

The reason for their existence lies in the urgency of evaluations, and the time needed to rewrite all existing measurement programmes and ready existing data sets into the correct format.

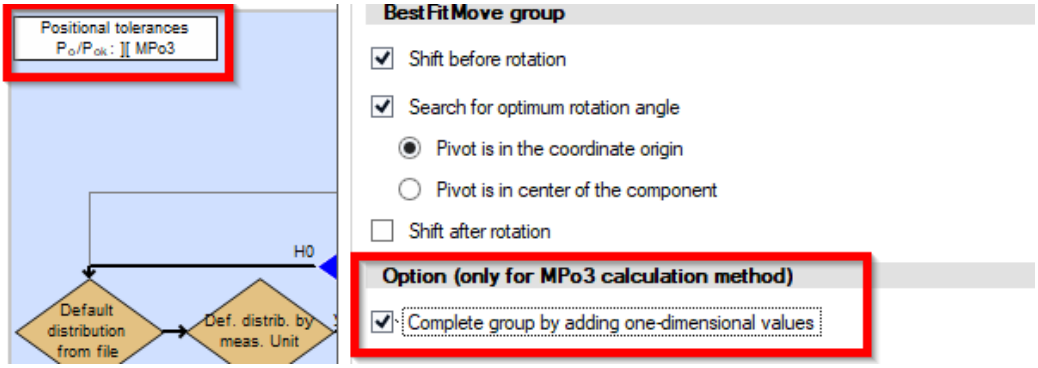
This option only has an effect if the calculation of the capabilities of the positions on the MPo3 hardware ellipse is set.

Given a data set that is defined as a 2D position tolerance, but has only one axis instead of the required 2 axes:



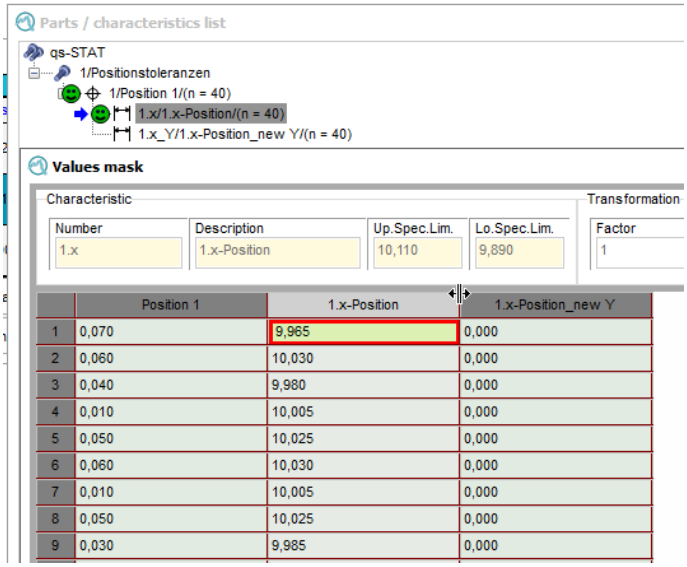
The calculation of the axis as a "characteristic" is available. In the position, however, only an error message is output: "908 : Error in subordinate elements". This is because the mathematics of the positions requires at least 2, and a maximum of 3 axes (2D or 3D).

Now the option "Complete groups one-dimensionally" can be set next to the MPo3 calculation.



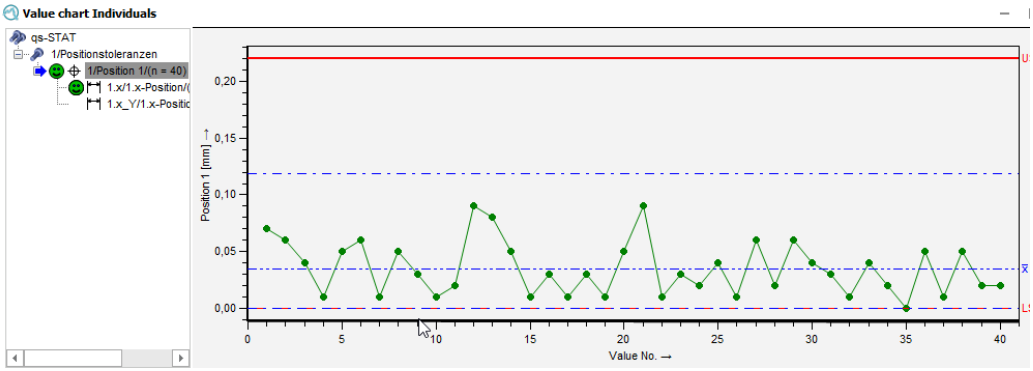
Now this is what happens:

A virtual 2nd axis is created whose values are always 0. (Only created virtually, this is not saved back.



	Position 1	1.x-Position	1.x-Position_new Y
1	0,070	9,965	0,000
2	0,060	10,030	0,000
3	0,040	9,980	0,000
4	0,010	10,005	0,000
5	0,050	10,025	0,000
6	0,060	10,030	0,000
7	0,010	10,005	0,000
8	0,050	10,025	0,000
9	0,030	9,985	0,000

For the higher-level position tolerance, the "deviation amount of the one effective axis" is calculated for visual representation:



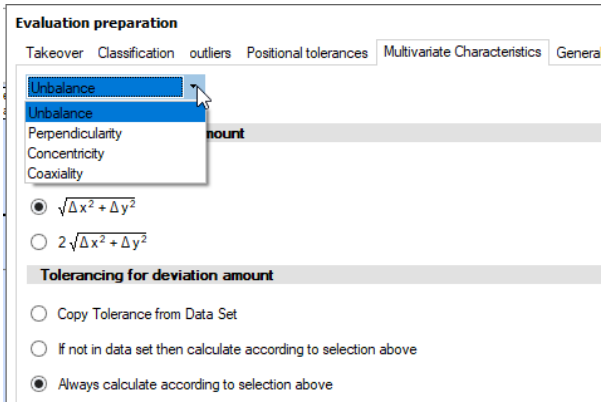
The capability characteristic values of the effective axis are transferred as "capabilities" of the "position tolerance":

Characteristics Statistics - Design 9

Part no.			1		
Char.No.	Char.Descr.	$\bar{x}$	s	pot. Index	crit. Index
1	Position 1	0.03500	0.0239	P_o = 1.91	P_{ok} = 1.75
1.x	1.x-Position	10.00925	0.0192	C_p = 1.91	C_{pk} = 1.75
1.x_Y	1.x-Position_new Y	0.00000	0.000		

5.1.5 Multivariate Characteristics Tab

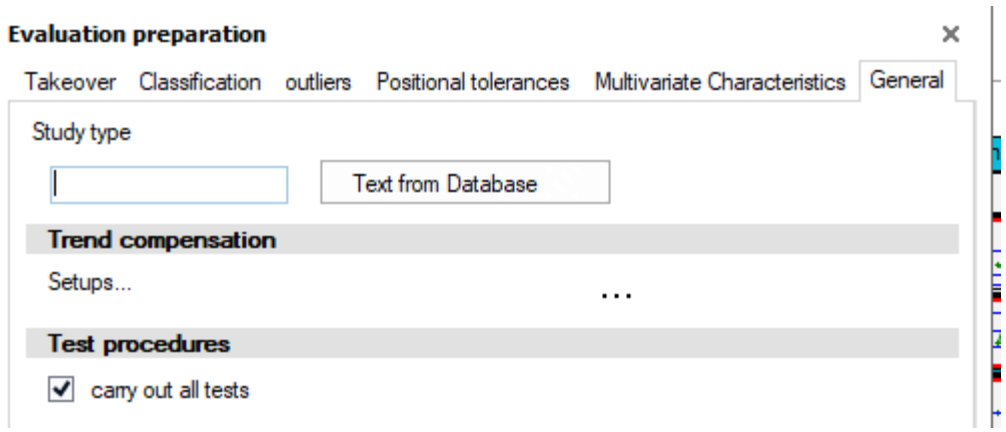
As of version 13, groups have been created for further multivariate characteristic types, for which other calculations of the "deviation amount" can be set. These are preset in the strategy "Q-DAS Process Capability (01/2020)". The difference lies in the K field K2008 "Group type".



As an example, the set "amount calculations" for the new group types in the strategy "Q-DAS Process Capability (01/2020)".

Designation	Amount calculation	K2008
Unbalance	$\sqrt{\Delta x^2 + \Delta y^2}$	K2008/x 18
Perpendicularity	No calculation	K2008/x 19
Concentricity	$\sqrt{\Delta x^2 + \Delta y^2}$	K2008/x 20
Coaxiality	$\sqrt{\Delta x^2 + \Delta y^2}$	K2008/x 21

5.1.6 General tab

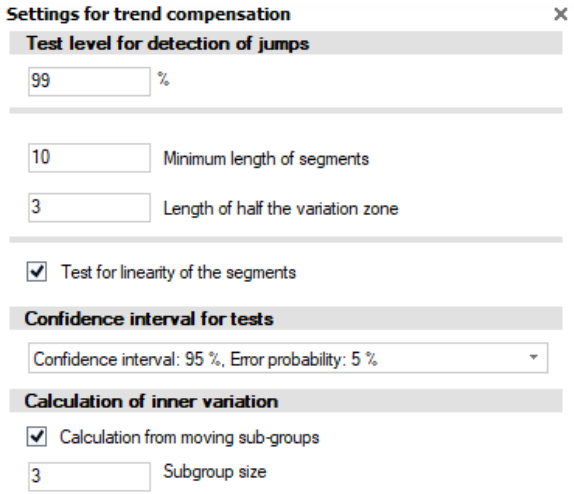


5.1.6.1 Study type

In the input field *Examination type* you can enter any text as additional information on the evaluation strategy.

The examination type entered here can be displayed in the status line or shown as output point 6041 in graphics.

5.1.6.2 Trend compensation



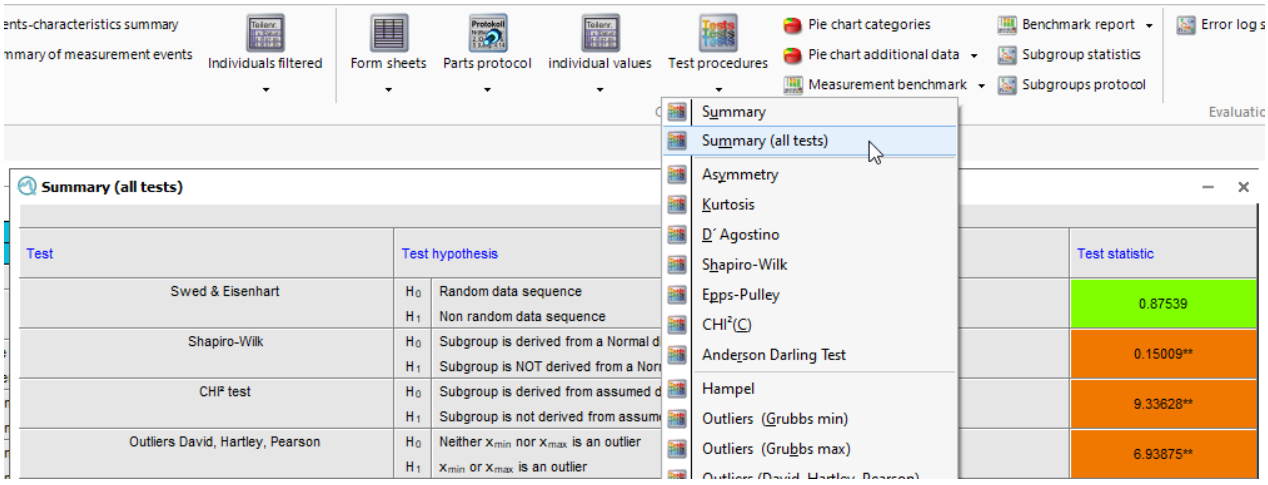
Trend compensation is a tool for assessing trend processes that makes a statement about what capability **could be** achieved if the existing trend **were** remedied. The associated settings can be made here to determine the percentage difference between the capability index and the trend.

The trend-compensated capability index calculated in this way is not an assessment of the real process. For this reason, it cannot be used to assess the capability of a feature and cannot be calculated automatically.

The preset settings correspond to the standard, but can be changed. They define the automatism for trend compensation that can be carried out in the course of values.

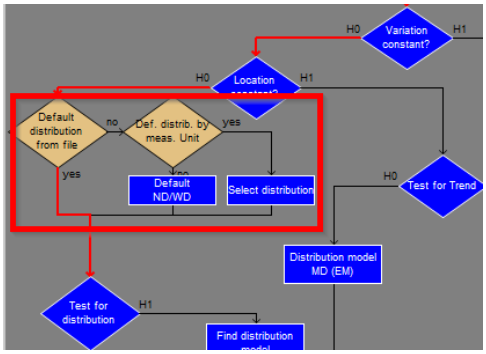
5.1.6.3 Test procedure

With the *Carry out all tests* option, all tests are displayed in the "Summary (all tests)" graphic under *Results* | *Test procedures,* even if they are not activated in the strategy.



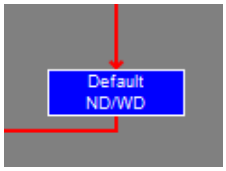
5.2 Define distribution

In the sample and process analysis, a distribution is specified at various points or various distributions are offered for selection. The first step exists in the sample analysis directly after the tab "Default", in the process analysis after the confirmation of dispersion and location:

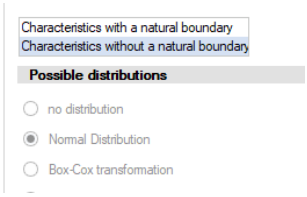


5.2.1 Default based on two-sided / one-sided feature

The simplest of the specifications is based on the types of specification limits.



The only distinction is whether the feature is bilateral or whether a natural boundary is present

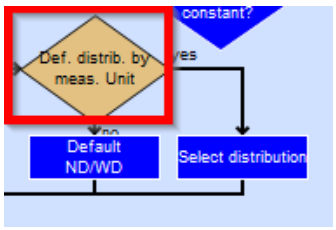


Using the example of the "Q-DAS Process Capability (01/2020)" strategy

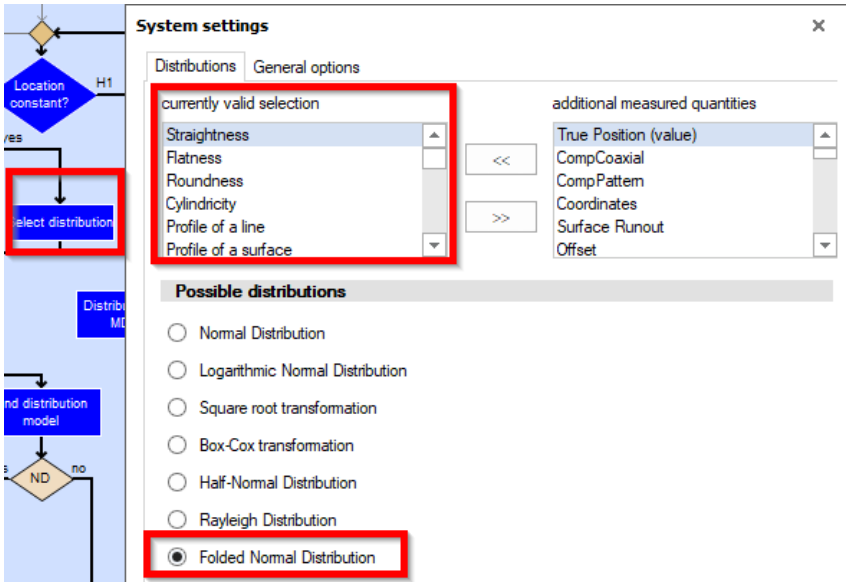
Two-sided	Up.Spec.Lim. 20,200 / Up.Allowance 0,200 / Up.nat.bound. ☐ / Lo.Spec.Lim. 19,800 / Lo.Allowance -0,200 / Low.nat.bounc ☐	Normal distribution
One-sided	Up.Spec.Lim. 0,400 / Up.Allowance 0,400 / Up.nat.bound. ☐ / Lo.Spec.Lim. 0,000 / Lo.Allowance 0,000 / Low.nat.bounc ☑	Weibull distribution (3-parametric)

5.2.2 Default based on the measured Unit

As an additional option, a second path can be activated in the change mode by clicking on "Default by measured unit":



Under "Select distribution", a desired distribution can now be specified for the respective desired measured variables (K2009).

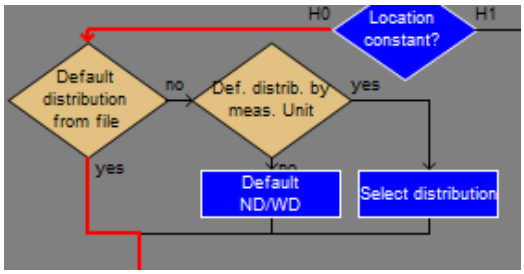


The rule is:

If this path is active and a characteristic has a measurand that has a defined default here, this is used as the default. If the characteristic has no defined measurand or a measurand that has not been defined here, then the default is made on the basis of a two-sided / one-sided characteristic.

5.2.3 Default by distribution from the data set

As a third option, a distribution already stored in the record can be used before the other two defaults by clicking on "Distribution predefined? If the distribution existed in the K-field, this would skip the other two default options:



The use of this option is not recommended! In various customer scenarios, the use of this option was tested and discarded, even though the theoretical option would have its advantages.

The reasons for this were:

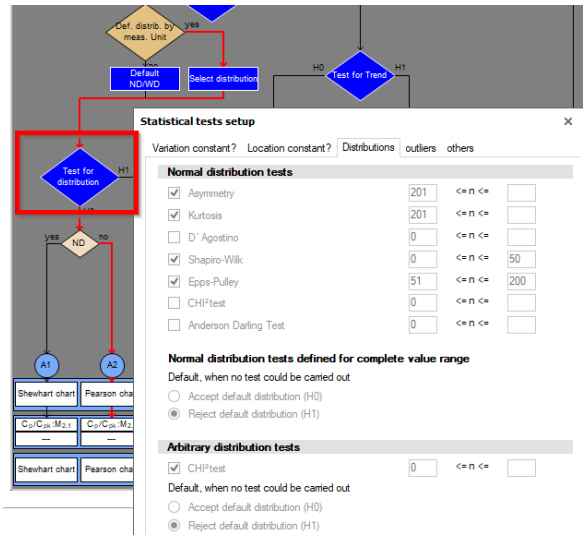
- In order to work with this option, the saving of the distribution after each calculation must be activated in the saving options. Means: even without conscious changes to the data set, the user is prompted to "save the changes made", which has led to user confusion.
- The use of diverse strategies, as the same data sets sometimes need to be assessed for many end users has saved a mix of distributions
- Copying inspection plans to create new inspection plans on the basis of existing ones copies all K-fields, including the stored distribution. This resulted in incorrect information about historical distributions for completely new characteristics.

5.3 Distribution Testing

In the various paths of the distribution time models, there are paths in which only one distribution form can be firmly specified. In these paths, all tests are done in advance by running the strategy.

Only the tests of the given distributions will be discussed here.

Regardless of the specification, distributions must be tested to see if they apply. According to the specifications, this is done in the tests of the distributions



As already mentioned, no mathematical description of the test is shown in this document.

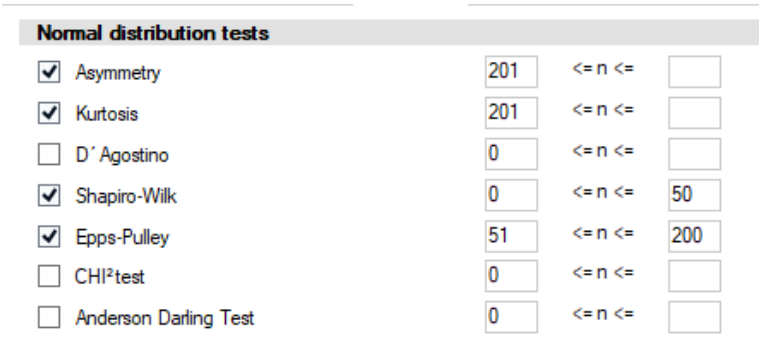
The dialogue is divided into 2 sections:

- Tests when the specification was the normal distribution
- Test if the default was a different single-peaked distribution

The settings of the tests must therefore be adapted to the selected specifications. In both areas there is the possibility to specify what should happen to the preset if the tests were not carried out either for mathematical reasons or for reasons of the measured value ranges.

An urgent recommendation is to then activate the discard of the default and thus run into the distribution search.

By specifying the measured values, it is possible to define which test is to be carried out for which number of values:



Each test has its strengths in certain numbers of readings. Activating all tests for any number of readings would only be an artificial increase in test severity, so this is not recommended.

In the strategy "Q-DAS Process Capability (01/2020)", the common tests for normal distribution are activated for the measured value ranges:

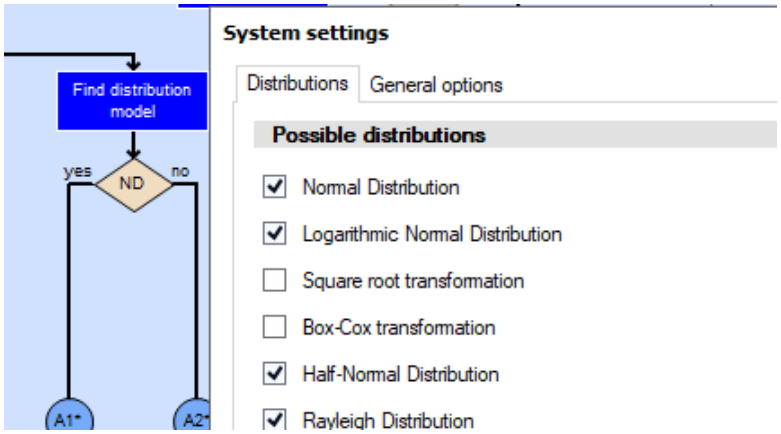
Number of measured values	Test / Remark
0-50	Shapiro-Wilk The Shapiro-Will test is only defined up to 50 values and is considered a stable test with a low number of readings.
51-200	Epps-Pulley The Epps-Pulley test is only defined up to 200 values.
201-	Asymmetry / Kurtosis If there are more than 200 measured values, the pairing Asymmetry and Kurtosis is used as a test. These two tests are always to be used together.

For **non-normal distributions,** only the CHI² test is available. Therefore, it should not be restricted in its range of measured values.

It is important to note that if distributions other than the normal distribution are specified, the CHI² test must be activated, but this requires classification taking into account the natural resolution, which is then a mandatory setting.

5.4 Search distribution

If the given distribution was discarded, but also in other paths of the distribution time models, the dialogue of the search for the best-fitting distribution is then available.



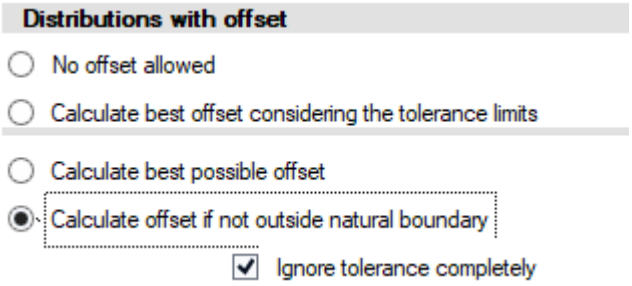
5.4.1 Distribution selection

In the distribution selection, all distributions that are to be checked for best fit are selected. For each distribution, a minimum number of measured values can be specified from which this distribution is to be included in the search.

As an emergency setting, it is possible to specify which distribution should be used if the tests could not be carried out, for mathematical reasons or if all selected distributions do not contain enough measured values.

5.4.2 Offset settings

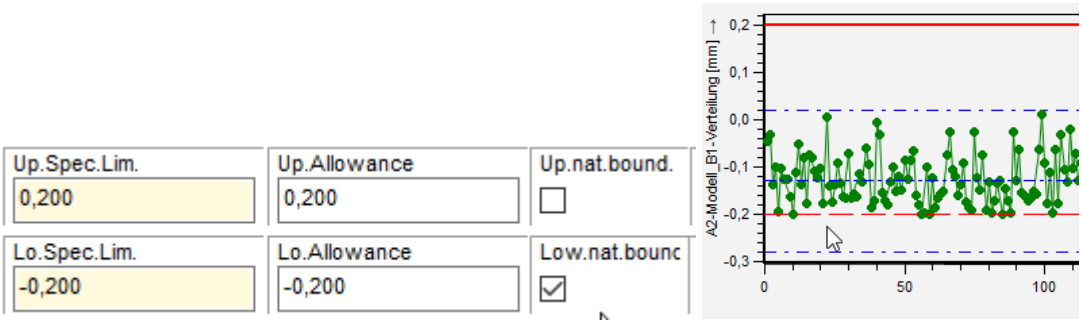
The exact mathematical procedures for the various offset settings are not considered here. Only a basic description will be given here.



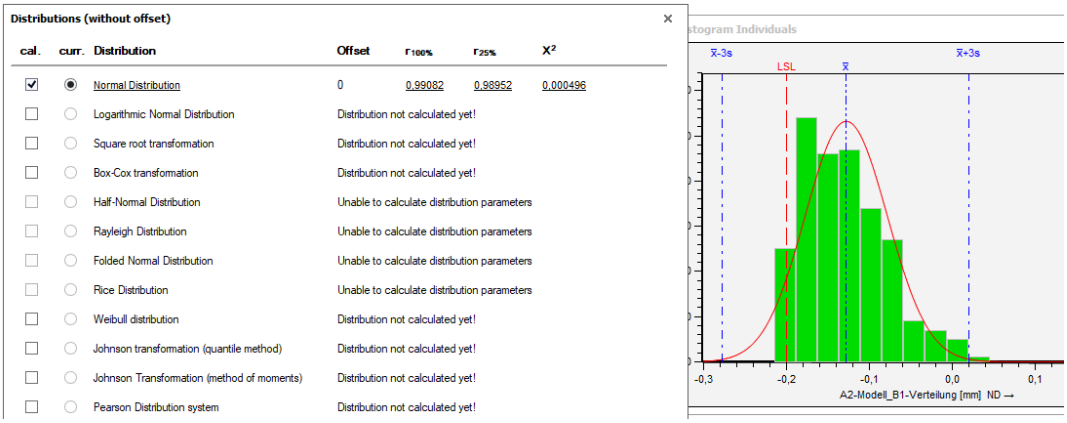
An offset setting "shifts" the dataset including the specification limits on the value scale.

An **illogical** example to explain this clearly:

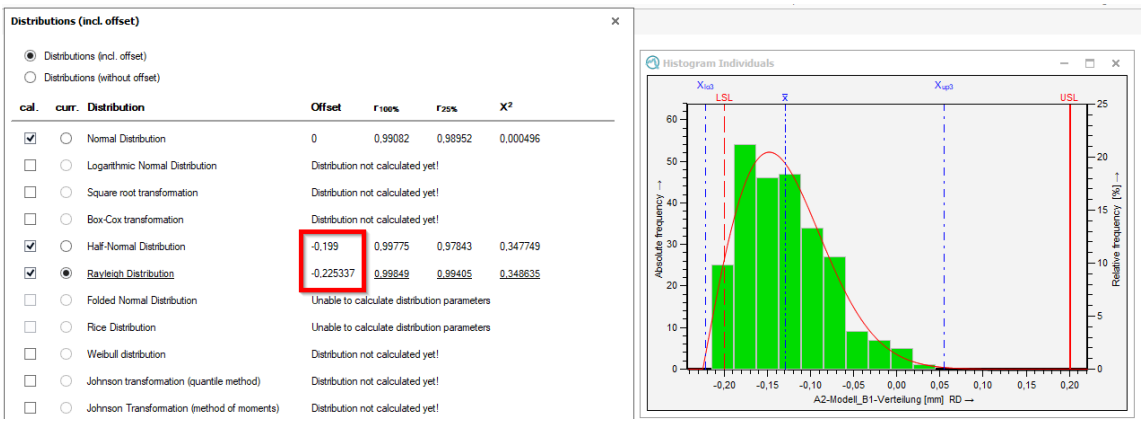
Given a characteristic with a negative lower specification limit, naturally limited. Measured values also exist that start at this "natural limit".



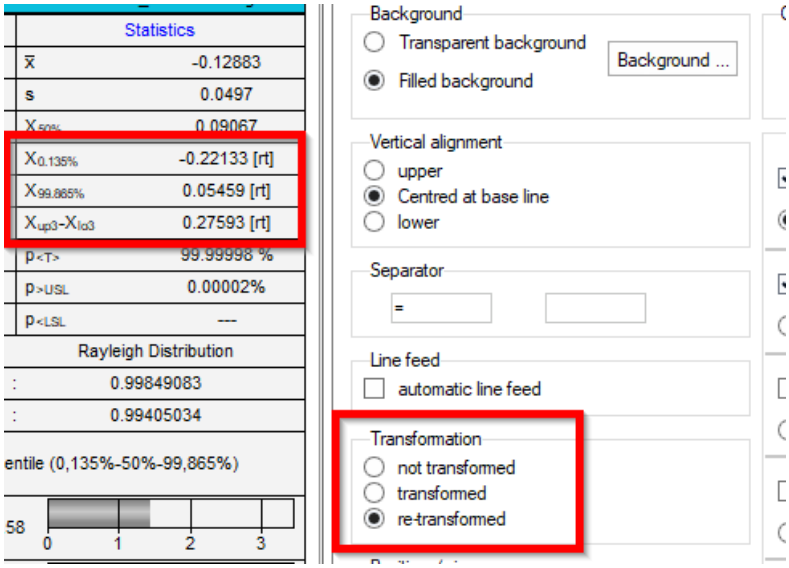
Without an offset setting, specification limits and measured values must be used exactly as described. In this case, however, this would mean that the classical distribution forms for such processes (absolute distributions) cannot be used, as they cannot calculate with negative values.



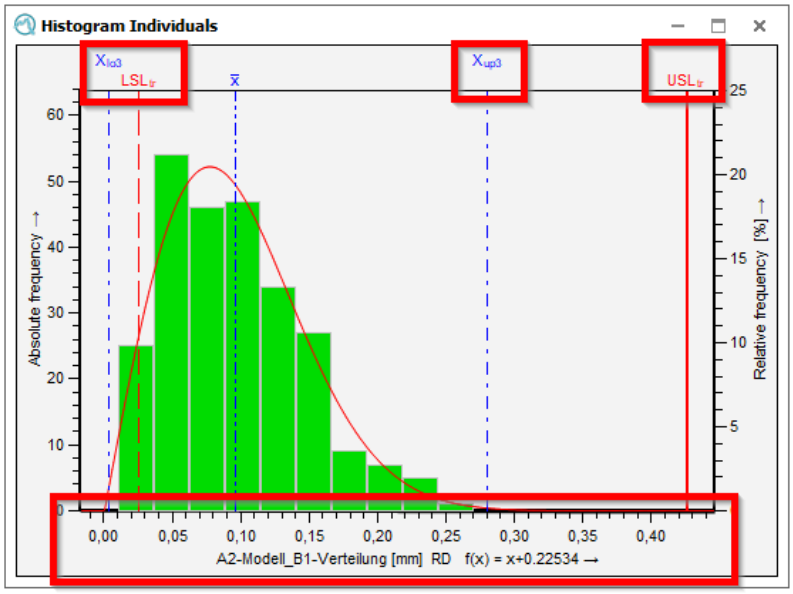
If the offset option "Offset taking into account specification limits" is now selected, values as well as specification limits are shifted by the offset in order to move all data into a range in which the calculation can take place. In the menu item "Select distributions" the size of this offset is then also shown



The offset is part of the "value transformation". Since the calculation of the distribution characteristics has taken place in a "transformed area", all statistical data, e.g. on the forms, are "re-transformed" data, which transform these statistical values back according to the same rules for presentation:

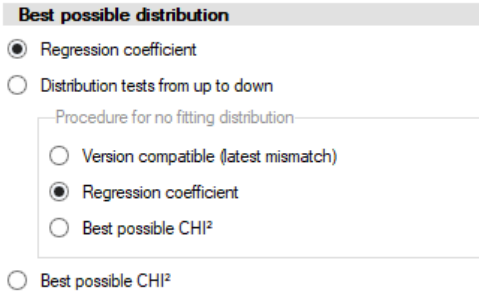


The histogram can also visualise this transformation. With the buttons not transformed / transformed the state can be visualised in the histogram

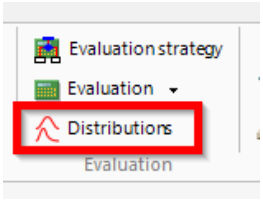


5.4.3 Best possible distribution

In the classical sense, 3 different distribution searches are available



The visualisation can be done via the menu item "Distributions":

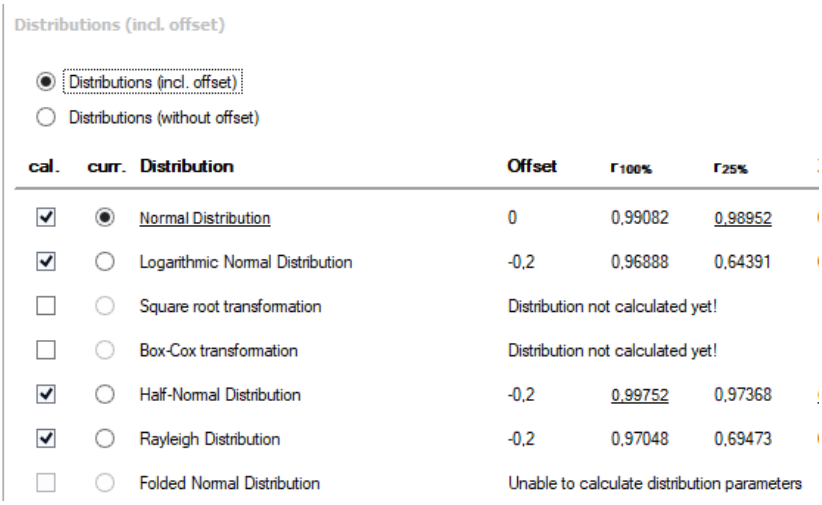


5.4.3.1 Regression coefficient

Basically, the software calculates 2 regression coefficients:

- r 100% →the regression coefficient over all measured values
- r 25% →the regression coefficient over the 25% of the measured values towards the critical limit

both values can be viewed under "Distributions



cal.	curr.	Distribution	Offset	$r_{100\%}$	$r_{25\%}$
☑	◉	Normal Distribution	0	0,99082	0,98952
☑	○	Logarithmic Normal Distribution	-0,2	0,96888	0,64391
☐	○	Square root transformation	Distribution not calculated yet!		
☐	○	Box-Cox transformation	Distribution not calculated yet!		
☑	○	Half-Normal Distribution	-0,2	0,99752	0,97368
☑	○	Rayleigh Distribution	-0,2	0,97048	0,69473
☐	○	Folded Normal Distribution	Unable to calculate distribution parameters		

The underlined value would be the one with the best fit. The highest sum of both values is decisive for the choice of distribution.

As the search for the regression coefficient is the most common, the regression coefficients were included on the standard forms

Model distribution			Normal Distribution
Distr.regress.coeff.	r_{tot}	:	0.99081605
Distr.regress.coeff.	$r_{25\%}$	:	0.98951555

5.4.3.2 Distribution tests from up to down

The distribution models selected under "Search distribution model" are searched from up to down. The first suitable distribution model is adopted. In the event that no suitable distribution could be found, three options are available under "Procedure if no suitable distribution" as a fallback level

5.4.3.3 Best CHI²

The search for the best CHI² follows the same rules as for the regression coefficient, except that the CHI² value is used instead of the two regression coefficients.

5.4.4 Mixing distribution settings (EM)

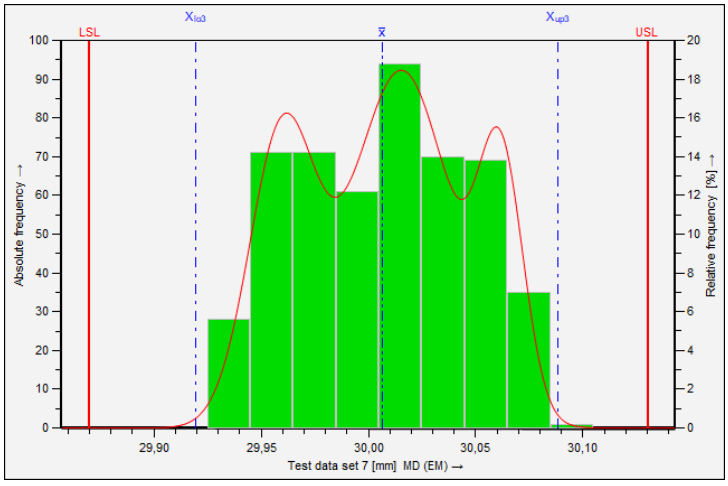
For the new mixing distribution (EM), the minimum and maximum cores can be specified here

Mixed distribution (EM) minimum/maximum number of cores

Minimum number of cores: 2

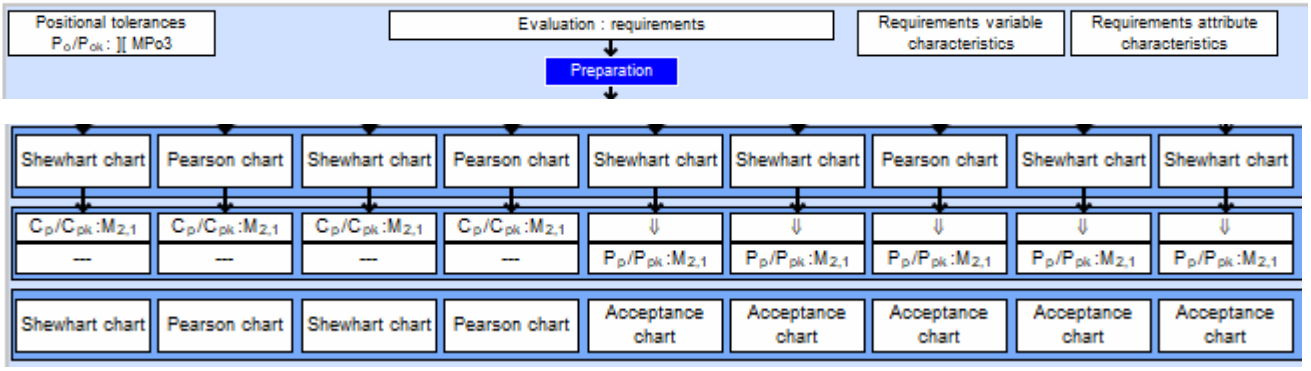
Maximum number of cores: 3

With "maximum 3", this would mean that a maximum of 3 expressions are also searched for and displayed in the histogram:



5.5 Requirements and calculations

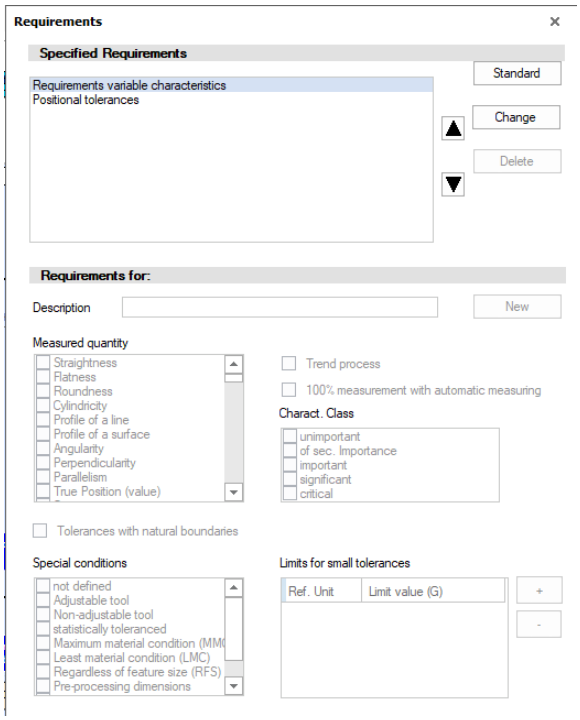
The registers of the requirements as well as the calculation play together here. A comprehensive explanation is not possible, here the interaction is explained using the example of the Q-DAS strategies.



5.5.1 Requirements of variable characteristics

Before explaining the individual tabs, a brief explanation of the application:

Behind the tab of the "Requirements of variable characteristics" there are various "Requirements" in the change mode, with which a specification of the requirements is made possible.



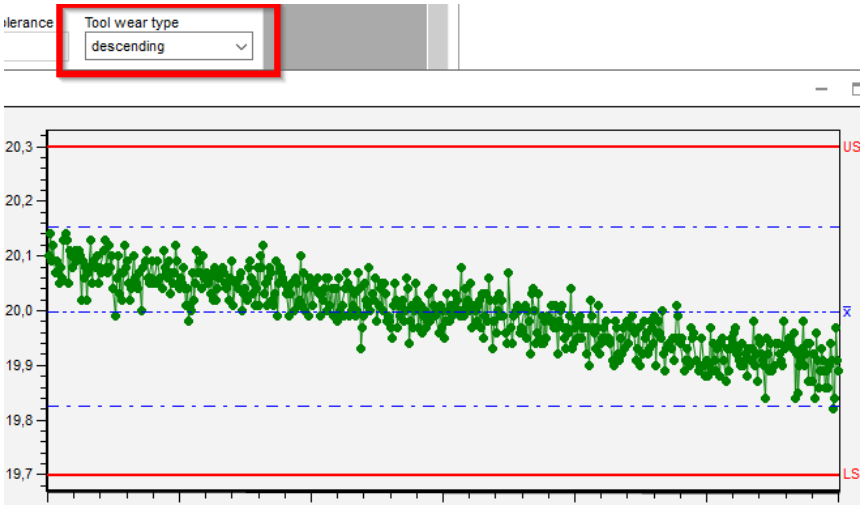
Directly visible are the two registers "variable characteristics" and "position tolerances" which are available in the standard system and will be discussed in the following chapters.

Here, however, further requirements can be defined depending on the information in the characteristics mask.

One of the most common requirements will be discussed here. All other "requirements" are to be applied analogously.

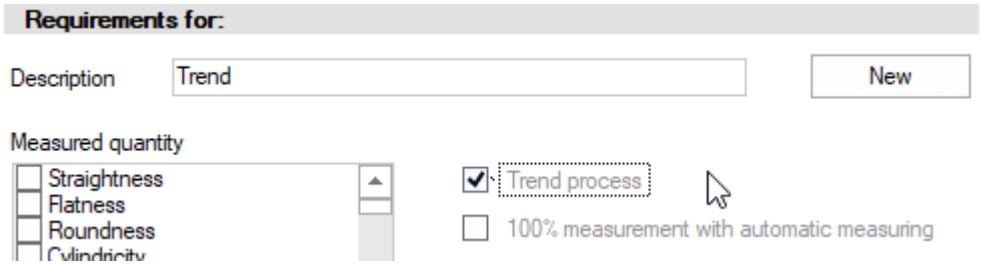
Trend processes

If there is a known technical trend, the trend behaviour can be indicated on the characteristics mask:



Now a separate requisition tab is created for this:

In change mode, a new name of a requirement is given and the option "Trend process" is activated.



With a click on "New", the requirements are now displayed for all characteristics that show a falling or rising trend.

Especially here at the Trend: Another requirement is added, the "Non-Critical Capability Index".

Selection of acceptance criteria

Marked specification limits used for capability study

Charact. Class	unimportant	of sec. Importance	important	significant	critical
Potential Capability index					
Critical capability index	X	X	X	X	X
Intrinsic capability index					
Location chart stable (STL)					
Variation chart stable (STV)					
No outliers were automatically removed (AR)					
Tolerance violation? (LV)					
Non critical capability index	X	X	X	X	X
Single value inside n% of a bilateral tolerance					
Single value inside n% of a tolerance with natural boundary					
Average inside n% of a bilateral tolerance					

This is also added to the setpoints tab:

☑ Index valid?

Normally distributed characteristics: Min. values 10 Min. subgroups 2

Charact. Class	unimportant	of sec. Importance	important	significant	critical	Description	Index
Potential Capability index	1	1,33	1,33	1,33	1,33	C	p
Critical capability index	1	1,33	1,33	1,33	1,33	C	pk
Intrinsic capability index	2	2	2	2	2	C	pi
Non critical capability index	1	1	1	1	1	C	pnk

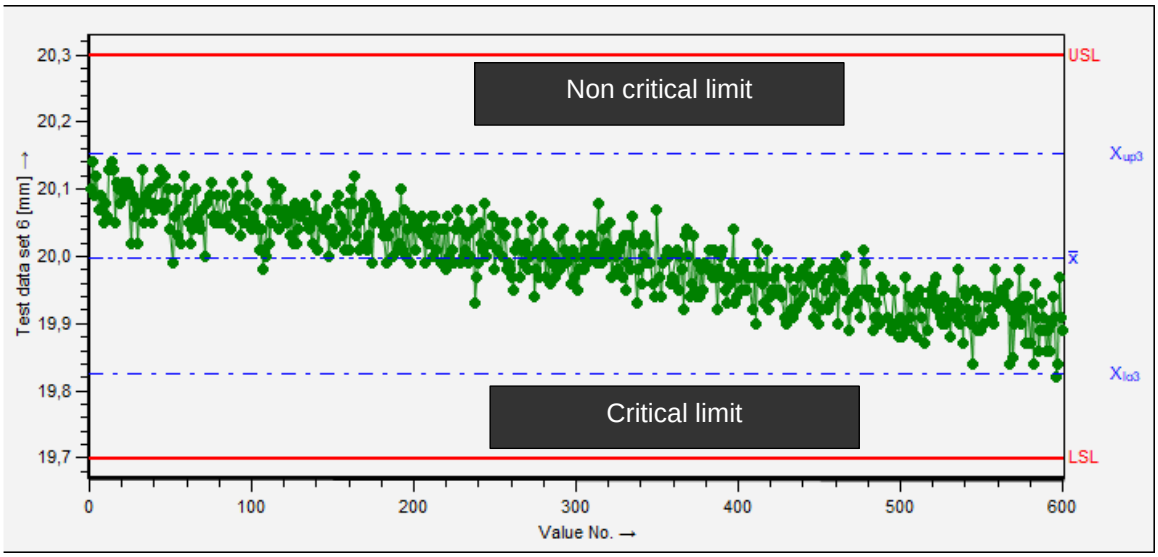
The setting shown above is also typical for trend processes, since here the tolerance must be technically utilised. The addition of further requirements is also only present in the trend process.

Rationale for the new index:

The "Cpk" in the conventional sense is the smallest of the two values Cpk_upper and Cpk_lower. In the case of a trend process, however, this theory can be overruled.

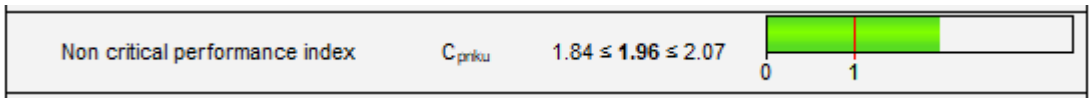
The boundary you move away from is the non-critical boundary

The limit towards which one is moving is the critical limit



For this reason, both characteristic values, the Cpk_upper and the Cpk_lower, must be assessed depending on the trend behaviour (ascending / descending).

With output item 5230, the non-critical capability index can be viewed on views / reports.



The following table shows the dependencies on K-fields

Requirement for	K-Field and Comment
Trend process	K2015 Drop-down field on the characteristics mask
100% Measurement	K2016 Checkbox on the characteristics mask
Measured quantity	K2009 Drop-down field on the characteristics mask
Characteristic class	K2005 Drop-down field on the characteristics mask
Tolerances with natural boundary	K2120 oder K2120 Checkbox on the characteristics mask
Special conditions	K2020 Drop-down field on the characteristics mask (not included in the standard, must be added with the mask designer, or shown in the characteristics table)
Limits for small tolerances	K2152 (calculated tolerance) in combination with K2142 (Unit)

5.5.1.1 Target values (stable / unstable)

Here you can set target values for the capability index (potential / critical / non-critical / intrinsic, depending on the module) for different feature classes as well as its designation / formula symbol. A distinction is made between normally distributed and non-normally distributed characteristics (not for position tolerances). In addition, the required minimum scope of measured values or samples for an output of the capability index can be specified.

5.5.1.1.1 Procedure with few measured values

Automatically adjust setpoints

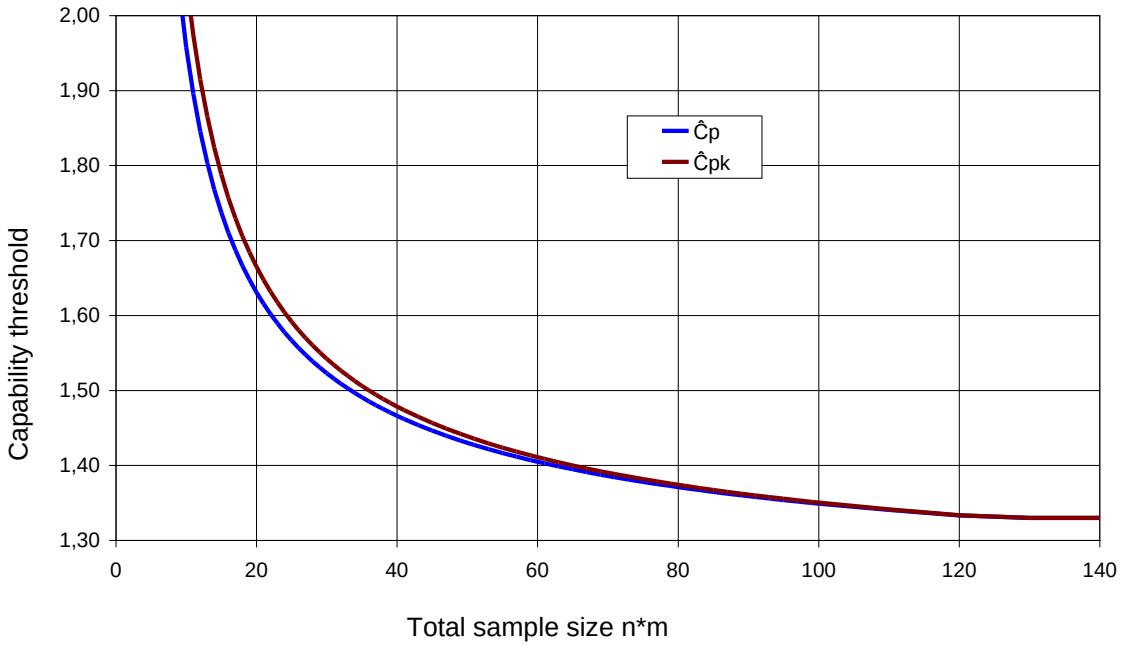
In order to allow a calculation even with very few measured values, but to increase the certainty of the statement "capable / not capable", the setpoint can be adjusted dynamically.

If this field is activated, the conditional ability (L3) can also be selected.

If the number of measured values exceeds the limit specified here, the setting under "Capability indices" or "Preliminary capability indices" applies. If the measured value falls below the limit, the target value is increased dynamically according to the formula below, based on the requirement according to "Capability indices" or "Preliminary capability indices".

Since Cp and Cpk increase independently of each other, the Cp can also be increased to the Cpk, or the Cpk can be decreased to the Cp

Example of adjustment with a confidence level of 95% and a set point of 1.33



Calculation formulas:

$$c^* = c_{(target)} \frac{\sqrt{\frac{(n_{eff}-1)}{\chi^2_{n_{eff}-1;\,1-\alpha}}}}{\sqrt{\frac{(n_{limit}-1)}{\chi^2_{n_{limit}-1;\,1-\alpha}}}}$$

$$c_k{}^* = c_{k(target)} \frac{\left(1+\frac{1}{2n_{eff}}\right)\sqrt{\frac{(n_{eff}-1)}{\chi^2_{n_{eff}-1;\,1-\alpha}}}}{\left(1+\frac{1}{2n_{limit}}\right)\sqrt{\frac{(n_{limit}-1)}{\chi^2_{n_{limit}-1;\,1-\alpha}}}}$$

The long text for the output of the characteristic values and the demand is extended by an (A), the output fields for the demand contain the reference value in parentheses.

Potential Capability index (A)	C_p	1.73 ≤ **2.01** ≤ 2.29	0 1.37
Critical capability index (A)	C_{pk}	1.63 ≤ **1.90** ≤ 2.17	0 1.37

Demand Potential Capability index (A)	$C_{p\,target}$	1.37 (1.33)
Demand Critical capability index (A)	$C_{pk\,target}$	1.37 (1.33)

Warning limit for insufficientvalues
When falling below a certain number of values, a conditional ability can be issued by selecting the conditional ability (L4)

If the conditional ability (L4) is not selected, the "warning limit for too few values" is not observed.

5.5.1.2 Tab AIAG Pp/Cp

If the calculation of the inner capabilities is activated in the calculation, the target values as well as the identifiers can be defined here.

AIAG_Cp_Pp

output AIAG_Cp_Pp

all characteristics: Min. values 125 Min. subgroups 25

Charact. Class	unimportant	of sec. Importance	important	significant	critical	Description	Index
Process capability index AIAG	1	1,33	1,33	1,33	1,67	P_in	pi
smallest process capability index AIAG	1	1,33	1,33	1,33	1,67	P_in	pki
AIAG Pp/Cp	0,75	0,8	0,8	0,8	0,833	Ppi/Cp	

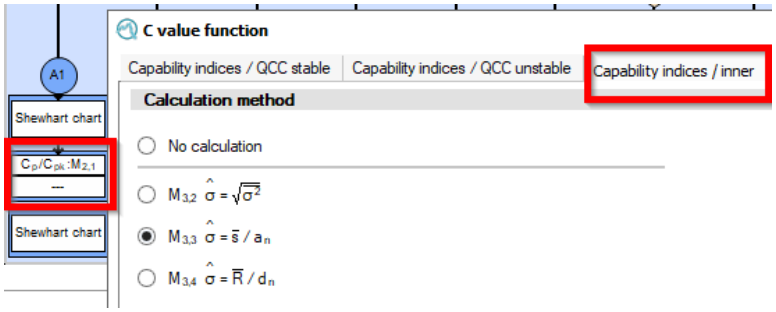
prel. AIAG_Cp_Pp

output prel. AIAG_Cp_Pp

all characteristics: Min. values 10 Min. subgroups 2

Charact. Class	unimportant	of sec. Importance	important	significant	critical	Description	Index
Process capability index AIAG	1,33	1,67	1,67	1,67	2	C_in	pi
smallest process capability index AIAG	1,33	1,67	1,67	1,67	2	C_in	pki
AIAG Pp/Cp	0,75	0,8	0,8	0,8	0,833	Ppi/Cp	

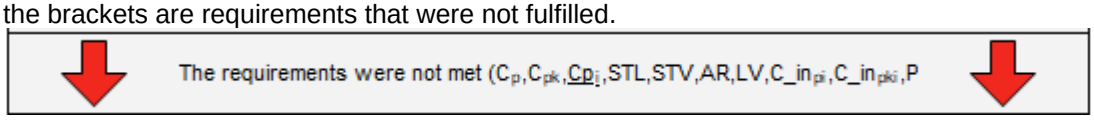
Exemplary setting of the C-value function in a path:



5.5.1.3 Requirements tab

Criteria for capability analysis

In the *Requirements* tab, you can select for each feature class - independently of each other - the conditions that will be used for the overall assessment.
When evaluating, it is possible to see in the brackets on the form, next to the statement whether the requirements are fulfilled or not, what the requirements were for this characteristic. The elements underlined in the brackets are requirements that were not fulfilled.



Marked specification limits used for capability study

Charact. Class	unimportant	of sec. Importance	important	significant	critical
Potential Capability index	X	X	X	X	X
Critical capability index	X	X	X	X	X
Intrinsic capability index					
Location chart stable (STL)					
Variation chart stable (STV)					
No outliers were automatically removed (AR)					
Tolerance violation? (LV)	X	X	X	X	X
Single value inside n% of a bilateral tolerance					
Single value inside n% of a tolerance with natural boundary					
Average inside n% of a bilateral tolerance					
Average inside n% of a tolerance with nat. limit					
Range smaller than n% of a bilateral tolerance					
Process capability index AIAG					
smallest process capability index AIAG					
AIAG Pp/Cp					

The abbreviations of the capability characteristics depend on the designations and indices set in the setpoints.

Potential and critical capability index are the basic requirements of almost all strategies. Here, the other requirements will be briefly explained:

- Non-critical capability index
  If a strategy has been created for trend processes and a trend type has been set for the characteristic, the non-critical index is the index at the boundary from which the process moves away.

- Intrinsic Capability Index
  The intrinsic index is based solely on the internal dispersion of the process.

- Position / dispersion stable
  Here the stability of the analysis QRK for position and/or dispersion can be set as a requirement.

- Automatically remove outliers
  If automatic outlier detection is active in the *Preparation|Outliers* tab, the process can be output as incapable as soon as a value has been defined as an outlier.

- Tolerance violations
  With 100% measurements, for example, a tolerance violation of a value can generally lead to the process no longer being capable.

- Single value within n% of a two-sided tolerance
  If a value exceeds the percentage of the tolerance range set here, the process is output as not capable. The percentage range is placed around the centre of the tolerance.

- Single value within n% of a tolerance with natural limit
  If a value exceeds the percentage of the tolerance range set here, the process is output as not capable. The percentage range starts from the natural limit.

- Mean value within n% of a tolerance with natural limit
  If the mean value exceeds the percentage of the tolerance range set here, the process is output as not capable. The percentage range starts from the natural limit.

- Range smaller than n% of a two-sided tolerance
  If the span exceeds the percentage of the tolerance width set here, the process is output as not capable- The percentage range is placed around the centre of the tolerance.

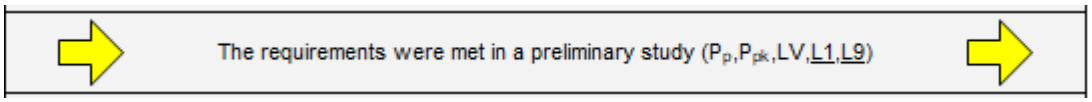
- Process capability index AIAG
  If the calculations of the internal capabilities have been activated, they can be set as a requirement. These options cannot be activated alone, with the activation of these indices, potential and critical index are automatically set as requirements.

- AIAG Pp/Cp
  in rare cases the fraction Pp/Cp is desired as a requirement. This refers to the difference between the overall index (Pp) and the inner index (Cp).

5.5.1.4 Limited capabilities skills

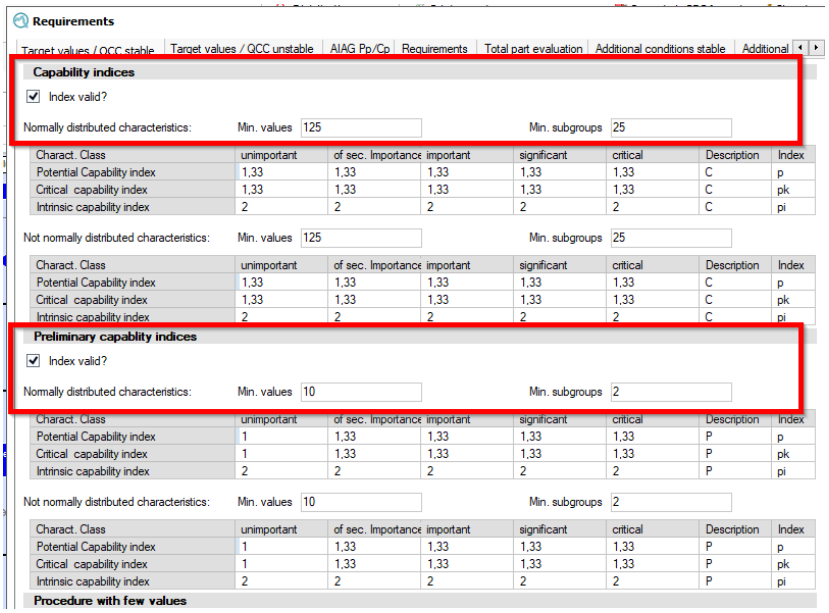
With the conditional capabilities, theoretically capable characteristics can be reset to the state "conditionally capable", provided that the conditions shown here are not fulfilled.

If a feature is only conditionally capable, this is marked in yellow and the condition that was violated is indicated with "Lx":



5.5.1.4.1 (L1) Conditional capability if provisional C-value was used

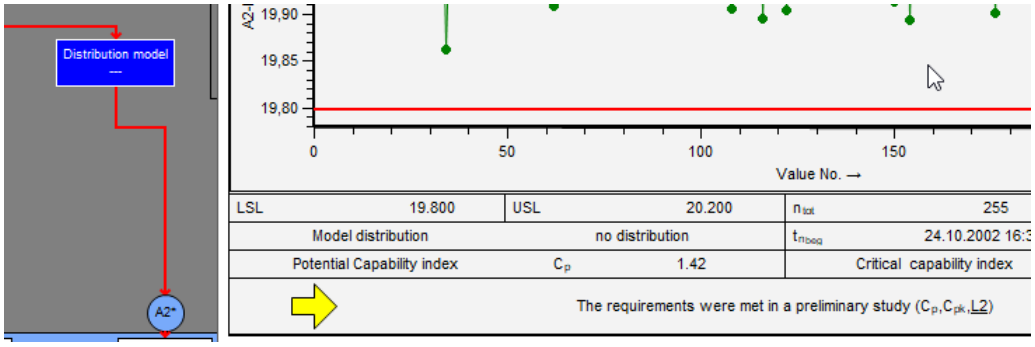
This only has an effect in process analysis. In older strategies, before DIN ISO 22514, a distinction was made in strategies between capabilities (then called Cp/Cpk) and preliminary capabilities (then called Pp/Pk).



With condition (L1), all preliminary abilities could then be issued as only conditionally able.

5.5.1.4.2 (L2) Conditional capability if no distribution model found

Special case of the VW/Audi strategy. If a distribution is discarded in the VW / AUDI 10131 (10/2015) strategy, no best-fit distribution is selected, but a VW-specific distribution-free method is used for the calculation. In this case, only a conditional ability is output.

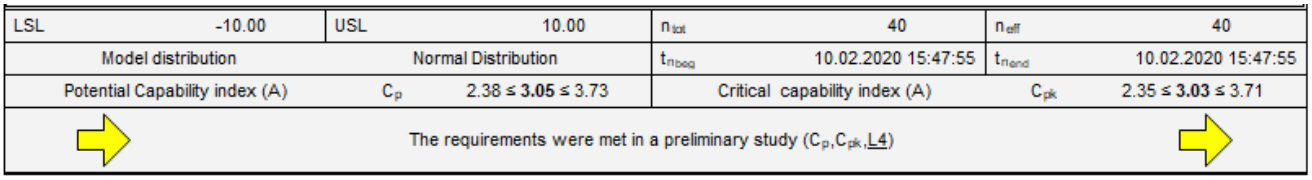


5.5.1.4.3 (L3) Conditional capability when the only problem is adjusting the C-values

As soon as the number of values is below the limit specified under "Procedure with few values", the C-values are adjusted as desired and an "(A)" for "adjustment" is placed behind the designations of the capability indices. With the condition (L3) these characteristics can only be output as conditionally capable

5.5.1.4.4 (L4) Conditional capability if warning limit for too few values is undershot

Provided that a warning limit for too few values has been entered and the box is activated, only a conditional ability is output when (L4) is activated.



5.5.1.4.5 (L5) Conditional capability if outliers are automatically removed and outlier proportion is larger

If the ability would be above the specified limit value, but outliers have been automatically removed for this purpose and this proportion is greater than "x" %, only a conditional ability is output.

The desired percentage is to be entered.

5.5.1.4.6 (L6) Conditional capability if test responds to trend

Only in the sample analysis. If such a trend is detected by the activated test for linear sectional trend, then a conditional ability can be output here in the sample analysis:

5.5.1.4.7 (L7) Conditional capability if outliers automatically removed and number of consecutive outliers greater than

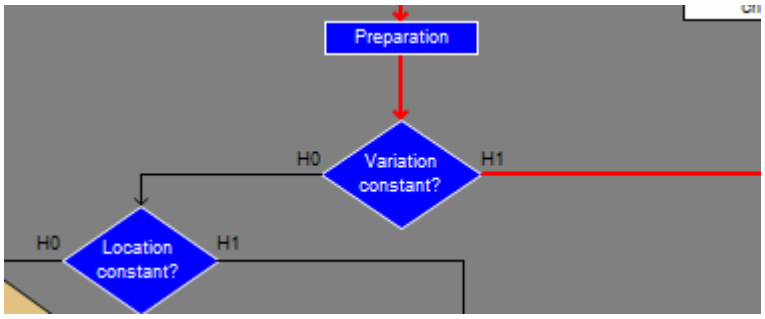
This option only accesses outliers that were removed by the Hampel test. If more than the number of consecutive measured values set here are removed from the evaluation by the Hampel test, only a conditional capability can be output with option (L7).

5.5.1.4.8 (L8) Conditional capability if mixed distribution was found as distribution model

If the classical mixing distribution has been selected via the software, such a process can be output as Conditionally capable with the option (L8).

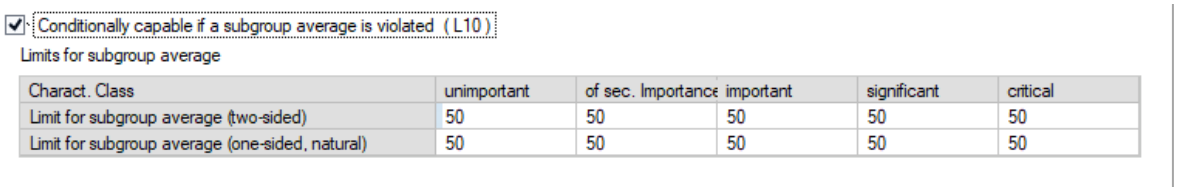
5.5.1.4.9 (L9) Conditional capability when H0 of the test for dispersion has been discarded.

With the condition (L9), all characteristics for which the test for dispersion detects a dispersion problem would be output as conditionally capable.



5.5.1.4.10 (L10) Conditional caability when a subgroup average is violated

A new condition from version 13. If a sample mean value in the process analysis violates the set tolerance range , a conditional capability can be output.



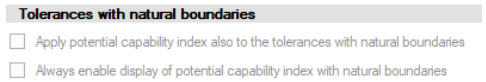
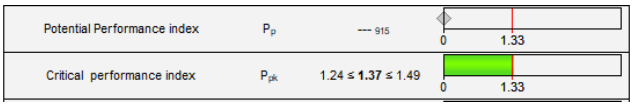
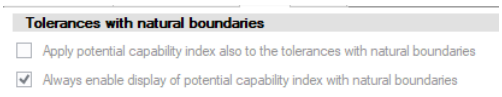
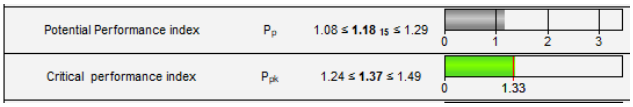
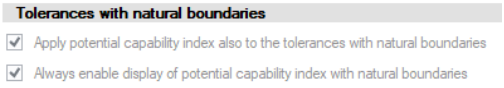
Charact. Class	unimportant	of sec. Importance	important	significant	critical
Limit for subgroup average (two-sided)	50	50	50	50	50
Limit for subgroup average (one-sided, natural)	50	50	50	50	50

5.5.1.5 Other requirements

5.5.1.5.1 Tolerances with natural limits

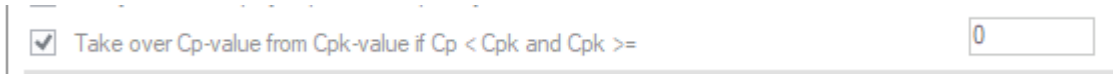
With natural limits, there are many opinions as to whether a potential capability index should be calculated, output, or assessed.

The following options are provided with the 2 options.

No option set 	Cp/Pp is not displayed 
Option set to display the potential index 	Cp/Pp is displayed but not rated 
Additionally option set to also consider the potential index as a requirement 	Cp/Pp is also assessed 

Transfer of the Cp value from the Cpk

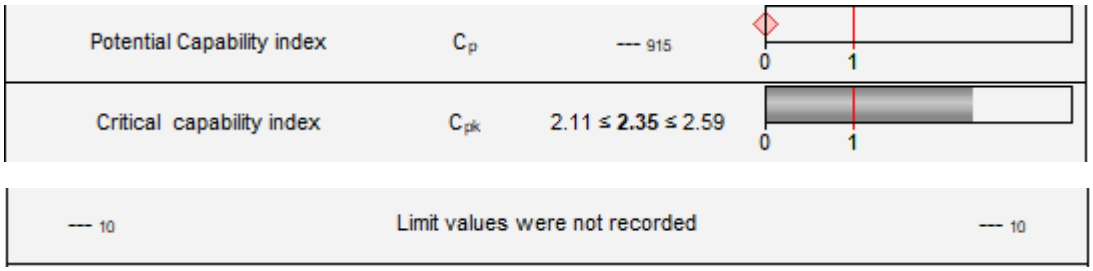
If the Cp value is smaller than the Cpk (which can only happen with one-sided characteristics), but the Cpk value is larger than the set value, then the Cpk value is taken over as the Cp value.



5.5.1.5.2 unilateral tolerances

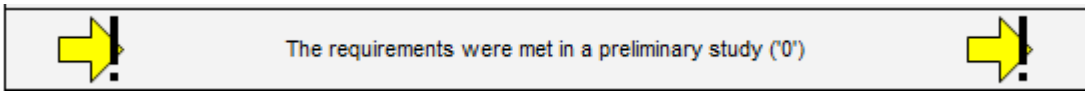
If the option *Accept one-sided tolerance without natural limit is* active *for the overall assessment*, the critical index is output towards this limit for characteristics with only one specification limit, but the potential index is not a requirement.

If this option is deactivated, the index is calculated and output, but no overall assessment is given due to the missing second limit.

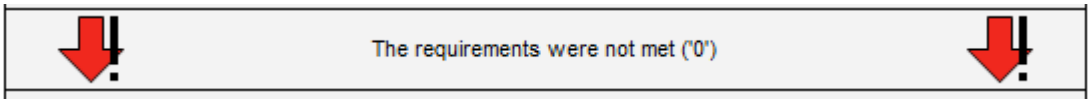


5.5.1.5.3 Procedure if R=0

If the option *Assessment is possible is* activated, an assessment is made for data sets without scatter, which is provisionally fulfilled if the value is within the specification limit.



If the mean value is outside the specification, the requirements are output as not fulfilled.



5.5.1.5.4 Condition for intrinsic capability index

If this option is activated, the intrinsic capability index (based on the mean value of the individual scatters) must be greater than the characteristic value calculated with the formula M14 (DIN 55319).

5.5.1.5.5 Symbol drawing options

A new option as of version 13. Features that have no requirements are output as "capable" in the standard. With this new option, the output of the capability is suppressed for features that have no requirements.

5.5.1.6 Total Part Evaluation tab

Due to the complexity, this description is separated into a separate documentation.

5.5.1.7 Additional Conditions Tab

With the additional conditions, characteristics that were only issued as conditionally capable according to the *Requirements* tab can be assessed as capable again from a certain achieved value.

Only certain "conditional capabilities" can be issued as "capable" again with this additional option! A listing in this documentation is not possible, detailed questions must be discussed in the strategy creation workshop.

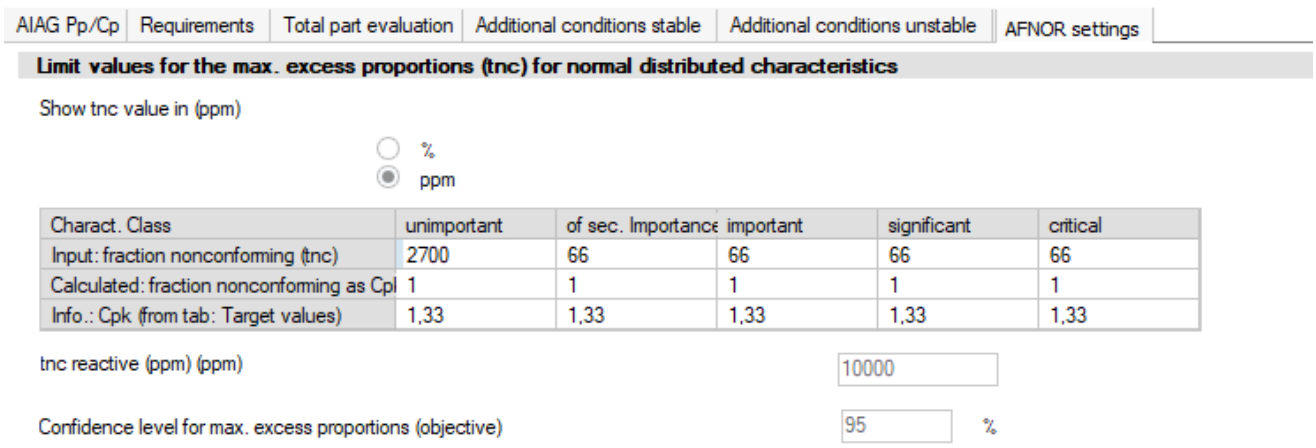
5.5.1.8 Requirements pre-run Tab

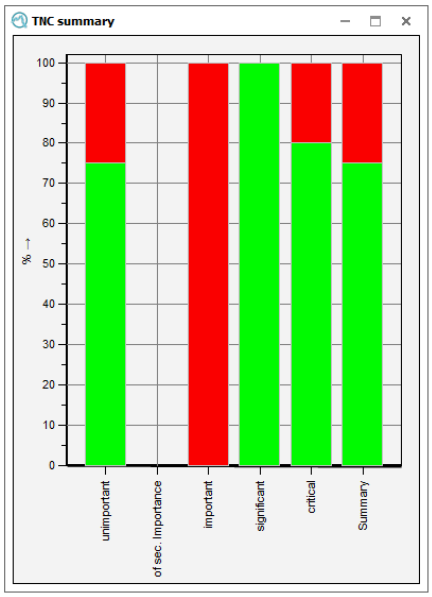
The assessment of one or five parts serves as a criterion for setting or readjusting the machine, especially during machine/process start-up. The requirements for this can be defined herewith.

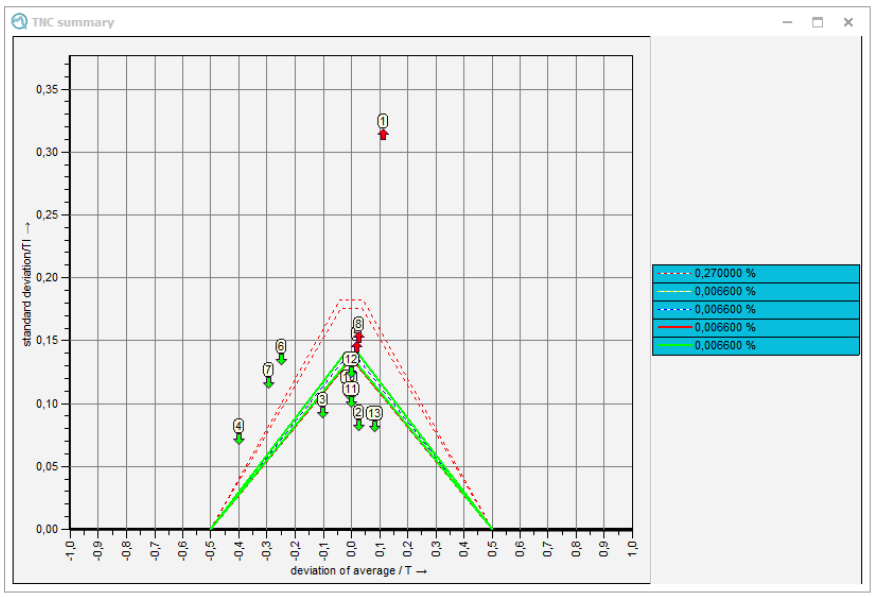
Due to the complexity, this description is separated into a separate documentation.

5.5.1.9 AFNOR tab

For the TNC graphics and their evaluation, the Afnor requirements can be set here:

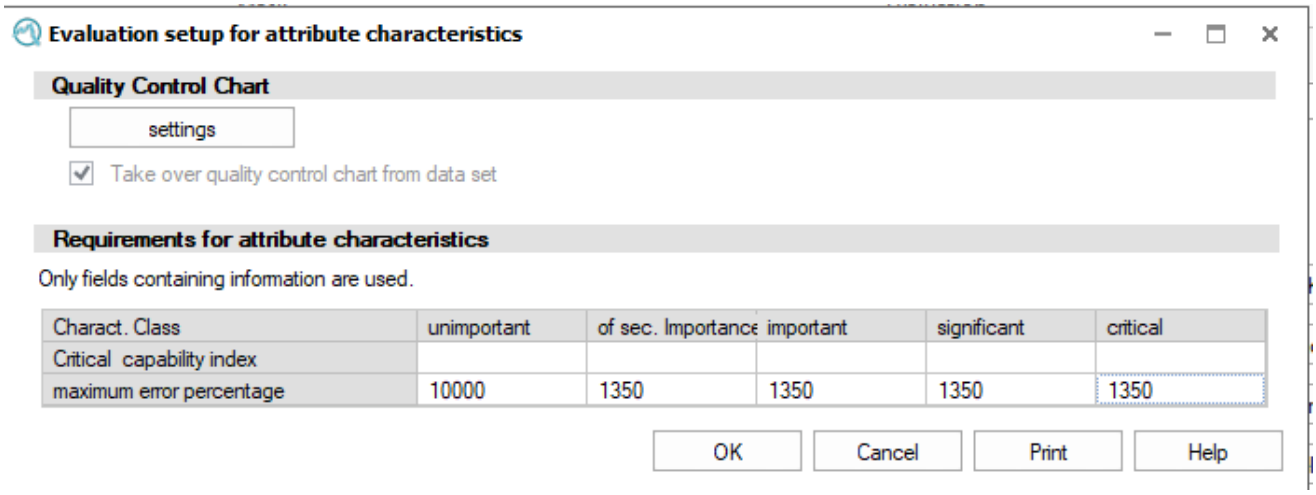



TNC summary
100
90
80
70
60
50
40
30
20
10
0
% →
unimportant
of sec. importance
important
significant
critical
Summary


TNC summary
0,35
0,30
0,25
0,20
0,15
0,10
0,05
0,00
standard deviation/TI →
deviation of average / T →
0,270000 %
0,006600 %
0,006600 %
0,006600 %
0,006600 %

5.5.2 Requirements attributive characteristics

In this tab, all settings for control charts and requirements for attributive characteristics are made.



Quality control chart

The settings for the control charts apply simultaneously to analysis and SPC QRKs. With the option *Take over control chart from data set,* the saved QRK is taken over as analysis and as SPC QRK.

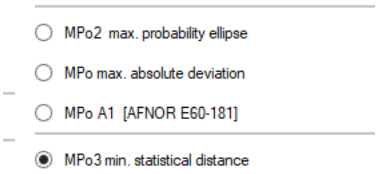
Requirements for discrete features

Here you can set target values for the critical capability index or the failure rate in ppm for different feature classes.

Note:Only the completed fields are taken into account in the evaluation.

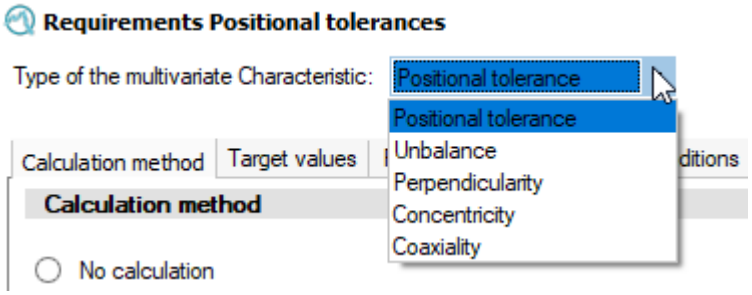
5.5.3 Position tolerances

The requirements as well as the special C-value calculation are defined in one place in the tab of the position tolerances. The following calculation types are available specifically for position tolerances:



Due to the complexity of the calculations of position tolerances, this is described in a separate documentation.

As of version 13, groups were created for further multivariate characteristic types, for which other calculation formulas of the capabilities can be set. In the strategy "Q-DAS Process Capability (01/2020)" these are preset. The difference lies in the K field K2008 "Group type".



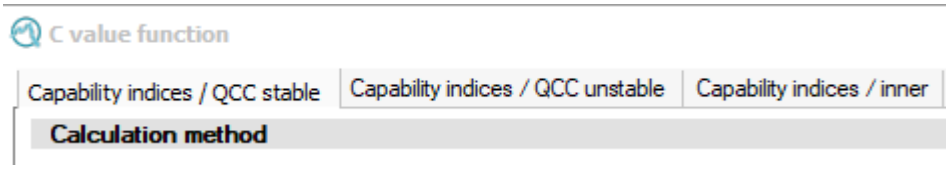
As an example, the set capability calculations for the new group types in the strategy "Q-DAS Process Capability (01/2020)".

Designation	Amount calculation	K2008
Unbalance	MPo3 min. statistical distance	K2008/x 18
Perpendicularity	M4.2 Percentile (0.135%-50%-99.865%)	K2008/x 19
Concentricity	MPo3 min. statistical distance	K2008/x 20
Coaxiality	MPo3 min. statistical distance	K2008/x 21

5.5.4 C-value calculation

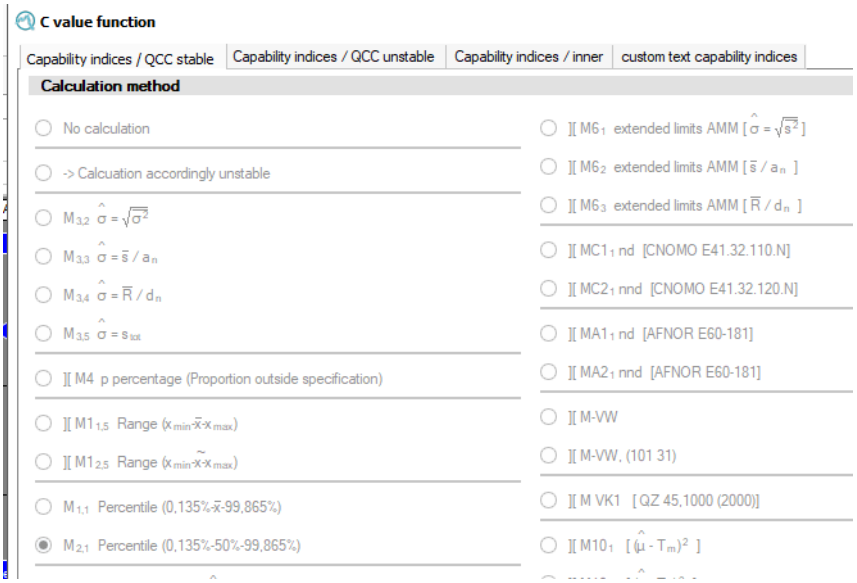
The calculation of the C-values and the deviating texts of the capability indices are to be specified individually for each branch of the scheme. Thus, the individual calculation and, if desired, an individual designation can be output for each distribution time model.

There are 3 tabs available in the process analysis for the calculation of the C-value:



5.5.4.1 Stable / unstable processes

For each path of the distribution time models, a separate calculation formula of the capability parameters could be specified here.



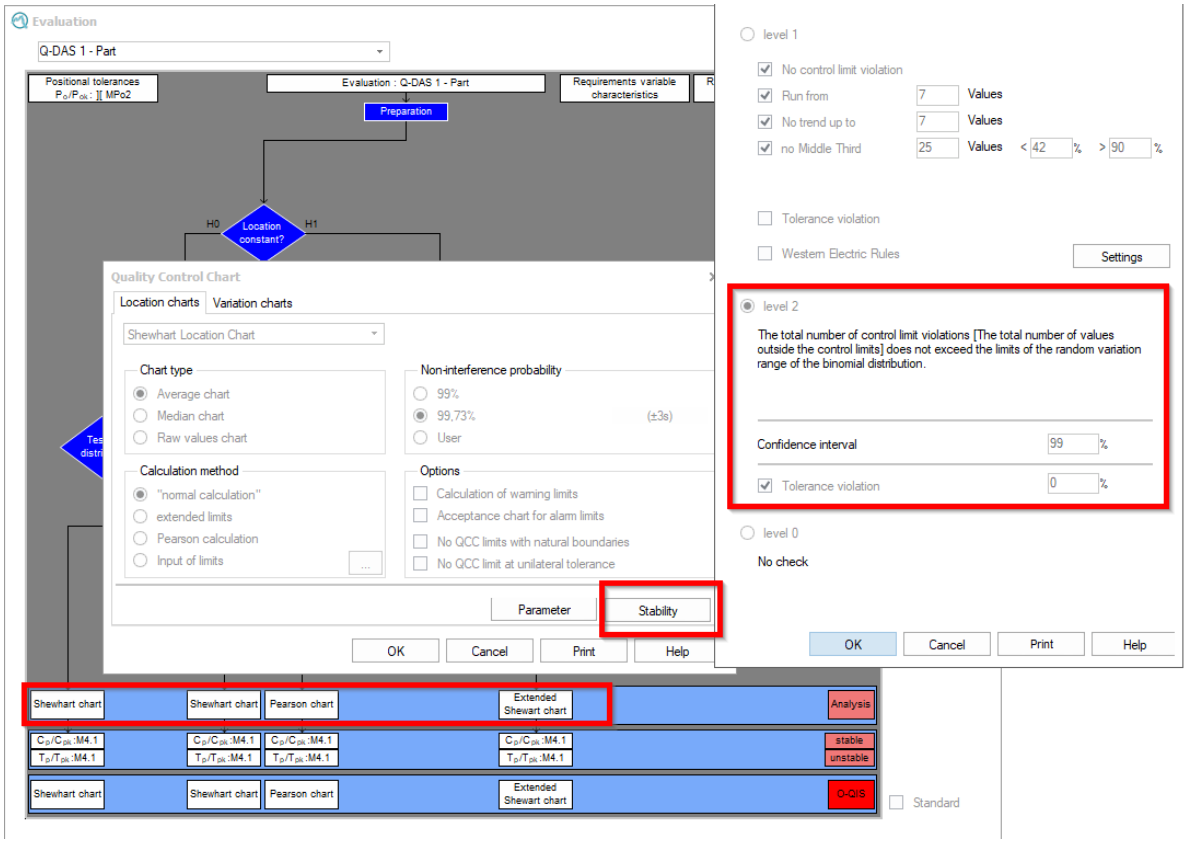
Due to the current standard situation and the recommendation to use only the percentile method, a detailed description of the individual calculations will not be given.

A question to be explained is: When does the tab "stable" take effect in the process analysis, and when does the tab "unstable"?

The explanation is attempted using the example of 2 Q-DAS strategies. A very old "Q-DAS 1 Part", as well as the current "Q-DAS Process Capability (01/2020)".

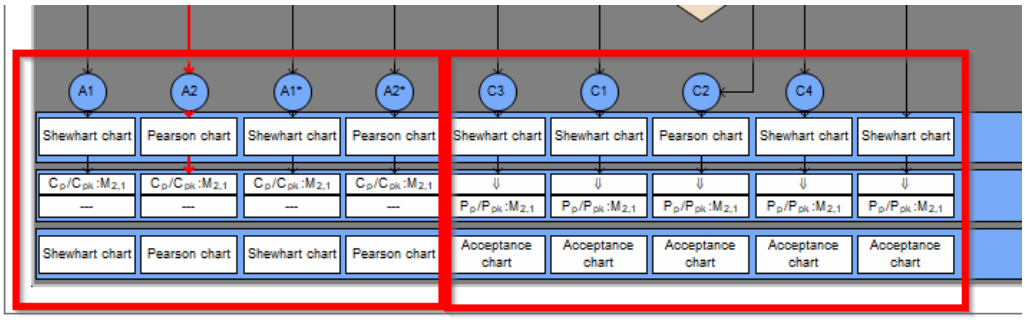
Q-Das 1 Part:

Before each C-value calculation, the analysis QRK is calculated. In this, a stability level is activated, level 2, the number of intervention boundary violations.



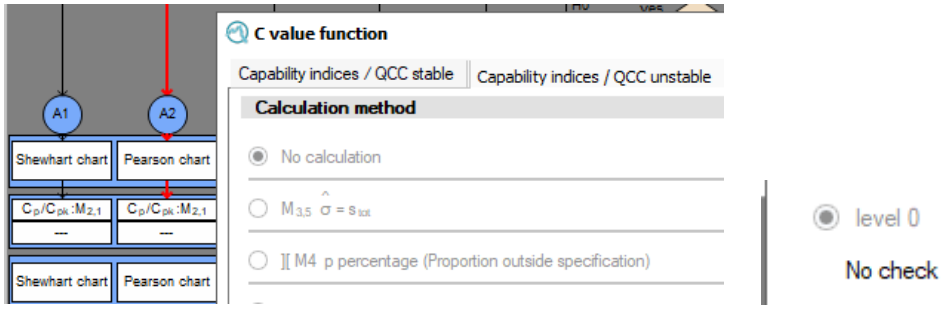
Thus, in each path, in each calculation, it was defined again whether it was a stable or an unstable process.

Q-DAS Process Capability (01/2020)

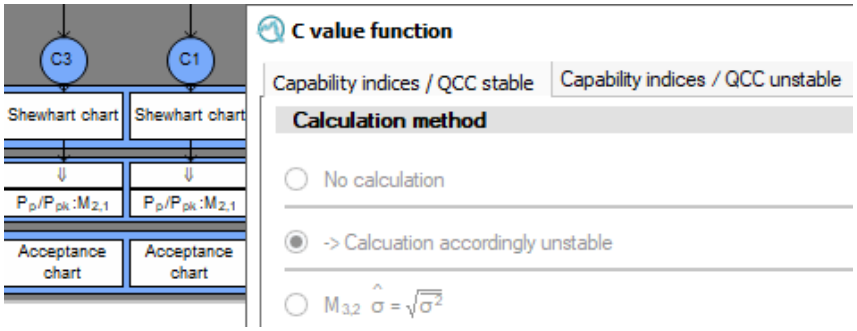


In the new strategies, also taking into account the current standards situation, this theory was rejected. The distribution time models "A" are considered stable, since location and dispersion have already been checked by the strategy, the other distribution time models per se as unstable, since location and/or dispersion problems have already been determined.

Therefore, no calculation of unstable processes is active in the A-models, as well as no check of stability in the analysis QRK.

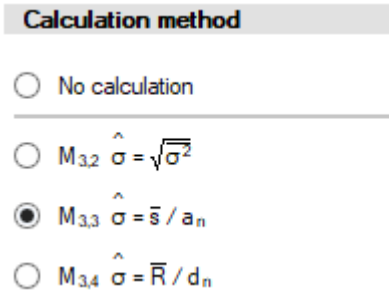


In all other distribution time models, the calculation "stable" is redirected to the calculation according to "unstable".

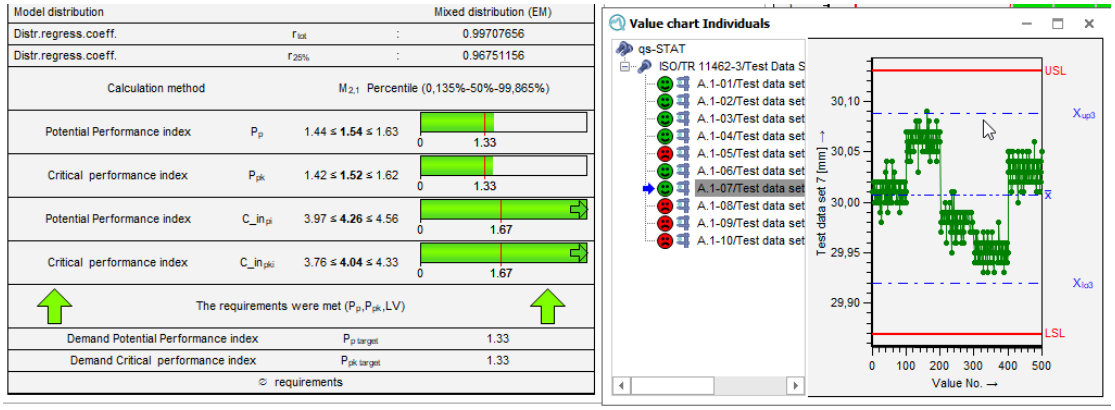


5.5.4.2 Inner calculation

In order to calculate the inner abilities parallel to the normal abilities, the calculation formula can be activated here per path

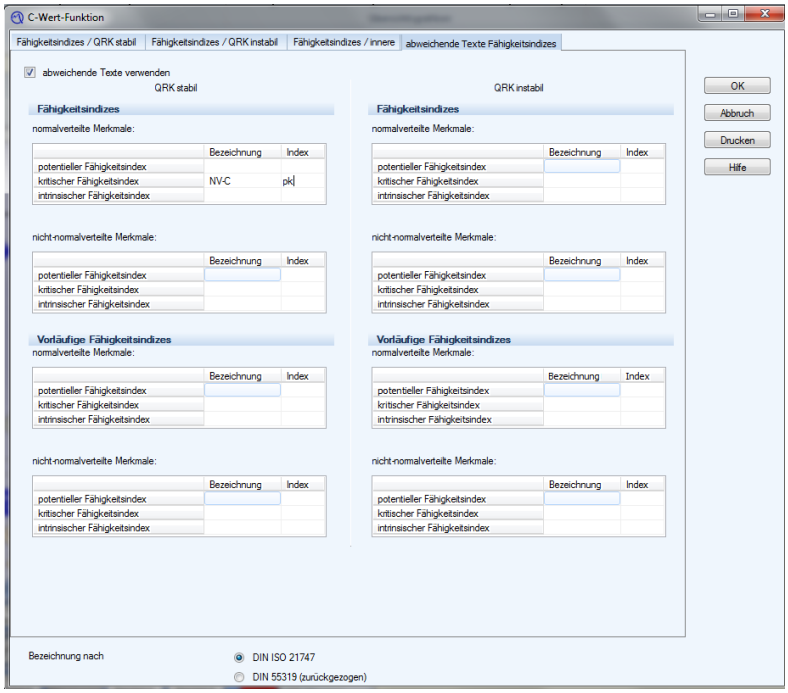


The additional output points for this are 5450 as well as 5420

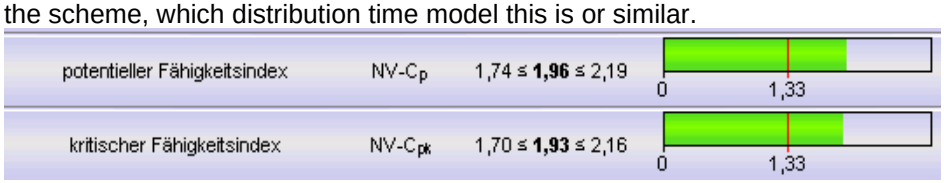


5.5.5 Custom text Capability indices

The option *Use custom texts* activates the tab. If, despite the activated option, no deviating designation is given for the corresponding index, the standard designation is used.
As with the setpoints, a separate designation can be specified for each combination of normally distributed/non-normally distributed, provisional/non-provisional and stable/instable.



Thus, it could be directly recognised on the forms by the designation how the characteristic has run through the scheme, which distribution time model this is or similar.

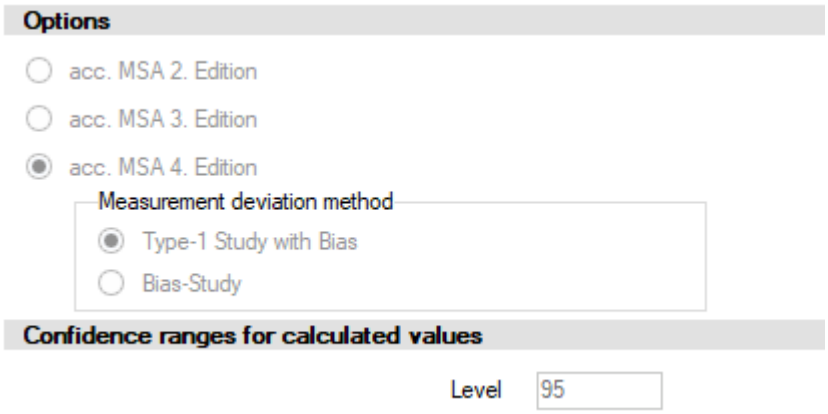


6 Tabs of the solara.MP strategy

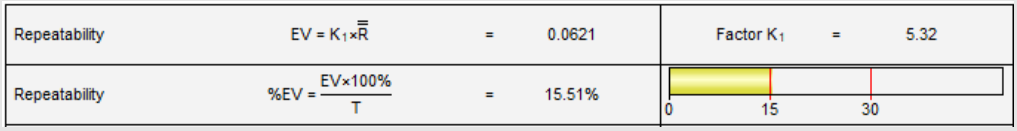
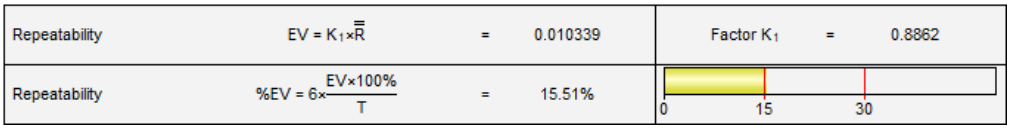
Also for solara.MP there will be no detailed description of all options of all procedures. As for qs-STAT, this document is intended to answer most questions only in outline.

6.1 Preparation

Here, the calculation according to the various MSA conditions can be activated for all procedures.



Explained using the example of procedure 2 and the calculation method ARM, the characteristic value EV:

Calculation	Result with explanation
Acc. MSA 2nd Edition	 The K-factor has already taken into account the extended scattering range.
Acc. MSA 3rd Edition Acc. MSA 4th Edition	 From the 3rd edition onwards, the extended scatter range was only taken into account in the calculation of %EV.

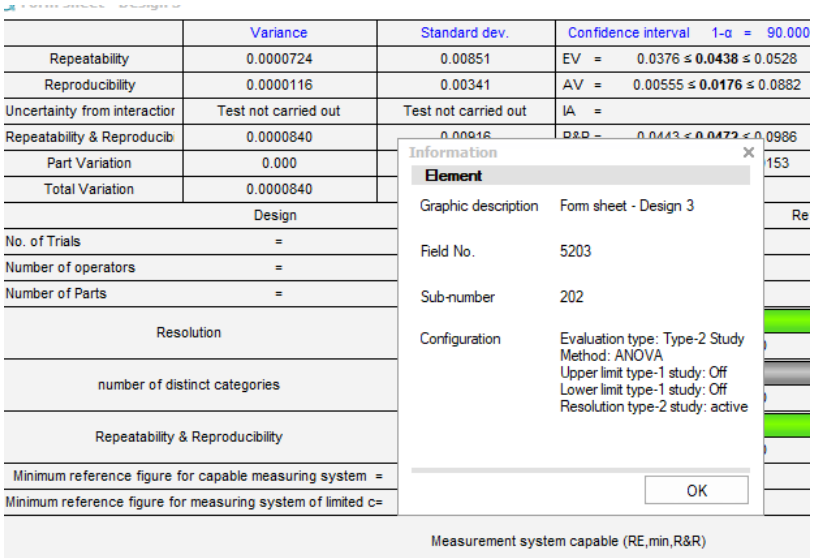
It must also be taken into account that all forms of the software exist for all procedures per MSA type and also depend on the calculation method.

Explained using the example of procedure 2 on a form:

In the background of the software, the form "Form 3" exists for these variants (rough list):

Type 2 / MSA 2nd edition / ANOVA Type 2 / MSA 3rd Edition / ANOVA	Sub-number 202
Type 2 / MSA 4th Edition / ANOVA	Sub-number 4202
Type 2 / MSA 2nd Edition / ARM Type 2 / MSA 3rd Edition / ARM	Sub-number 102
Type 2 / MSA 4th Edition / ARM	Sub-number 4102

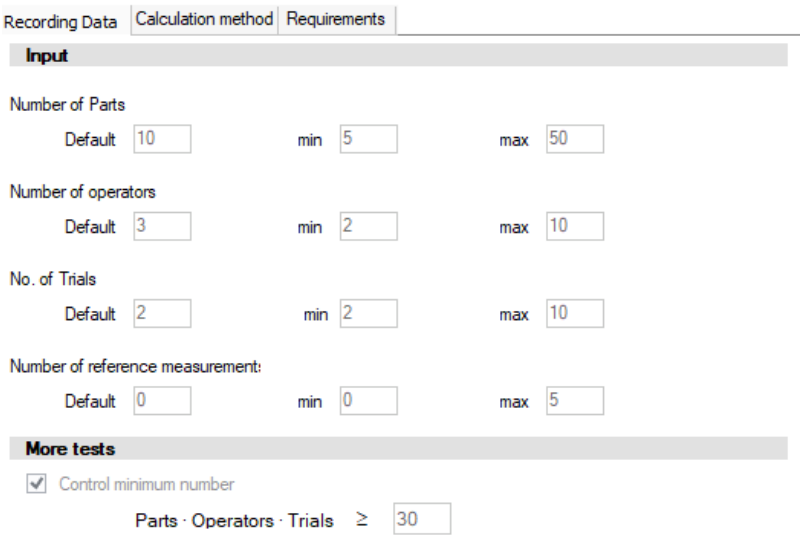
With a right click on the form, the sub-number as well as its dependency can be seen



The dependencies of the forms go even further through various other calculation variants as well as dependencies on specification limits. Only the basic dependency should be explained here

6.2 Data collection" tab of the procedures

In each individual procedure, the data collection tab is available. Depending on the procedure, more or fewer options are available here.



The standard to be entered here is the one that defines the default in "File - New", as well as a minimum and maximum number of inspectors, measurements, repetitions, reference measurements.

6.3 Reference value of the procedures

In all procedures, one of the basic settings is the reference value. Here again, the massive dependence of the MSA analyses on the desired / made settings becomes apparent.

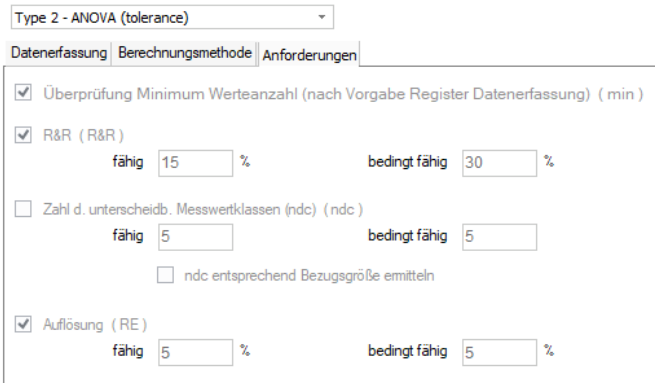
The reference value is to be selected on the "Calculation method" tab. These would be as an example for the classical methods:

Procedure	Possible reference values
Type 1 Stability Signal detection	Tolerance X times the process dispersion
Type 2 Type 3 Linearity	Tolerance X times the process dispersion Extended process dispersion Total dispersion (with partial dispersion) Required CP value

Together with the extended scatter range, this is the central element of the calculation when comparing evaluation strategies.

6.4 Requirements" tab of the procedures

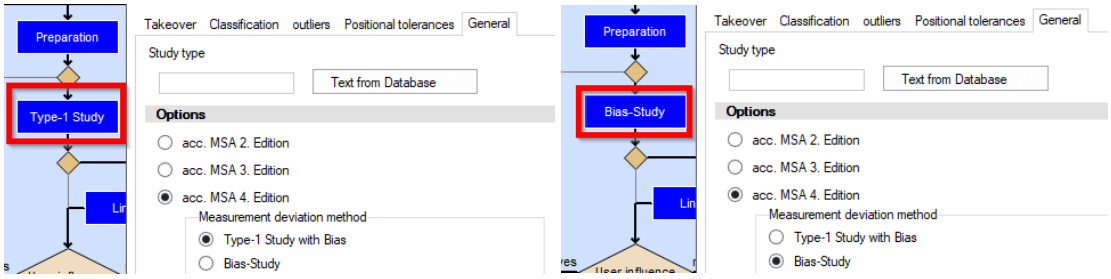
The requirements tab defines when a procedure is to be issued as capable / conditionally capable / not capable. Depending on the procedure, more or fewer requirements are available here.



Not all individual requirements are explained in this document. This would only be possible in training courses and workshops. In the coming chapters, only the specific handling of the individual procedures will be explained.

6.5 Special feature type 1 / bias study

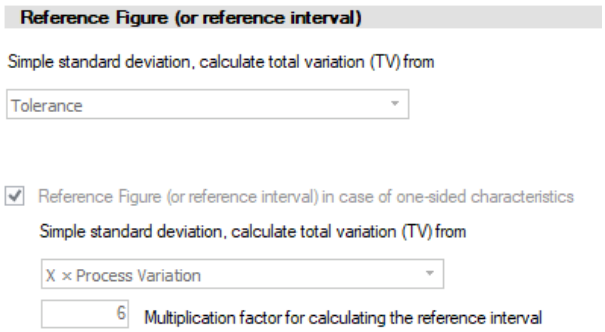
In "Procedure 1", depending on the setting under "Preparation", either the classic procedure 1 (Cg/Cgk) can be carried out or, according to the MSA, only the BIAS study is permitted



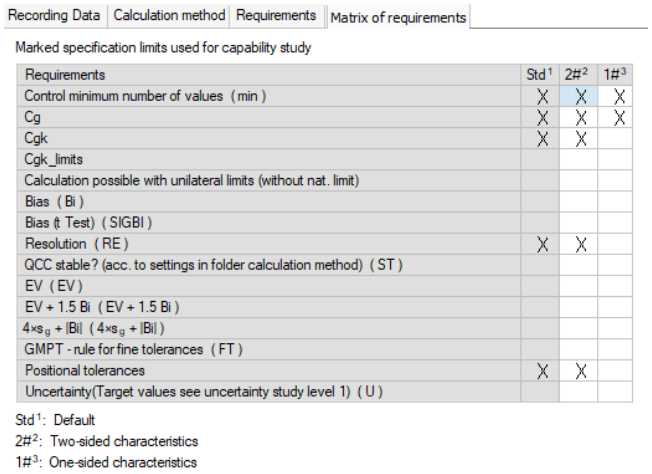
Special features of type 1

With type 1, requirements can be set which cannot be calculated for one-sided characteristics.

In the calculation method, a deviating reference value can therefore be defined for unilaterally limited characteristics



In addition to the requirements tab, there is also the requirements matrix.



The column Std (Standard) shows what is basically set as requirements. In the other columns, only parts of the general requirements can now be selected for two-sided and one-sided characteristics.

As a basic rule:

If NO requirement is selected in one of the columns, the standard requirements apply.

If a requirement is selected in one of the columns, only the requirements of this column are valid, i.e. all requirements must be activated.