HEXAGON

Q-DAS QAE

Quality Assurance Essentials

Brief Introduction QAE

FAQ
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HxGN
Quality Assurance

Information about this document

Parts of this document may be automatically translated.

Document History

Version	Date	Author(s)	Modifications / Remarks
v-0.46	18.07.2023	GA	Initial Release
v-0.51	02.09.2023	GA	Correction: With version 14.0.3.3 and 14.0.4.1, an empty K1001 is allowed in the manual upload, not an empty K1002.
v-0.52	21.03.2023	SJ	Revision: Supported additional data fields and rules for manual upload (Chapter 4 and 5)

CONTENTS

1 Quality Assurance Essentials

The product "Quality Assurance Essentials" (hereinafter referred to as "QAE") is an entry-level product for the Q-DAS software. Simplified user rules, a defined evaluation strategy, basic but simple representations allow a quick start into the software.

The QAE is a stand-alone product. The sale together with other products of the HxGN Q-DAS product line is excluded. If there is interest in other products, or if the restrictions of the QAE are to be lifted, then it is necessary to switch to the classic full versions of the products qs-STAT and solara.MP.

In order to facilitate this changeover, the QAE is offered and sold exclusively in the subscription licence model.

The following document covers the basic configurations and default settings. This document is not a substitute for training. Detailed information on our training courses can be found on our home page.

Every user of the HxGN Q-DAS product line has access to the documentation on the homepage. It should be noted that the software documentation was created for the Q-DAS Product Line and does not address the limitations of the QAE.

2 Modules in QAE

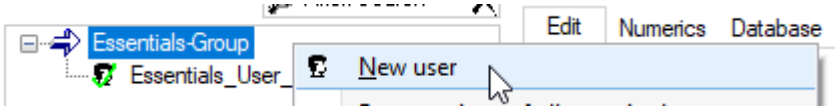
The available modules (with limited scope) are:

qs-STAT Sample Analysis	Execution of machine capabilities, as well as pre-run evaluations (1-Part / 5-Part - Prerun)
qs-STAT Process Capability Analysis	Carrying out process capability analyses
solara.MP	Measurement system analyses according to MSA

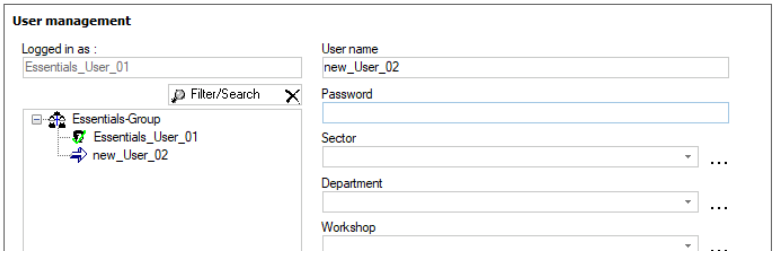
3 Users in QAE

The software is started for the first time with the available user "Essentials_User_01". When the software is started for the first time, no other users can be selected.

However, this user has the option under *File* | *Configuration* | *User Management* to create further users in the user group "Essentials-Group". This is done with a right mouse click on the user group:



The user names of all users can be customised.



3.1 User group rights „Essentials-Group“

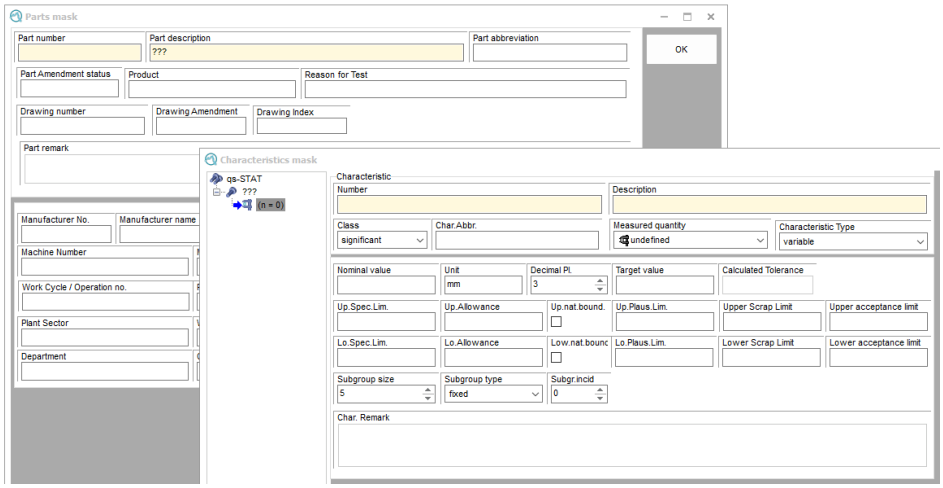
All users of the QAE product have the same permissions. It is not possible to change the user rights or the login behaviour (login with password / login with Windows login / ...).

The user group rights assigned in the standard allow all the options provided in QAE.

4 K-fields in QAE

To make it easier for new users to get started with the software, the number of available K-fields has been reduced.

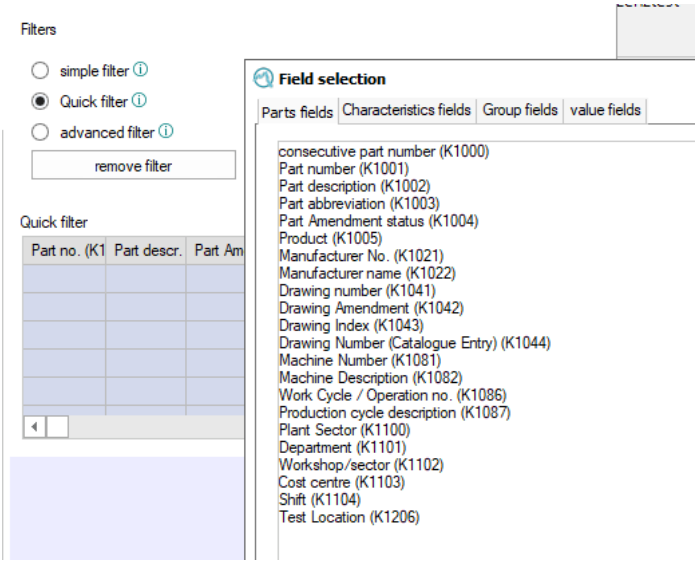
The parts and characteristics masks contain all important K-fields:



At the measurement level, the additional data fields have been reduced to the most important fields:

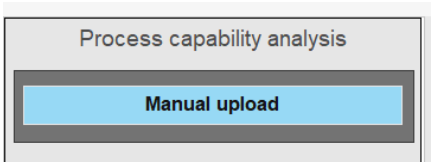
Additional data display	
attribute	K0060
Time	
Date	
Event	
Batch number	
Cavity number	
Operator name	
Machine number	
Gage number	
Part ID number	
Reason for test	
Production number	
Work piece fixture number	
Order	

The idea of a manageable set of K-fields is also reflected in the "Read from database" dialog. The number of K-fields that can be filtered is also reduced to the most important ones:

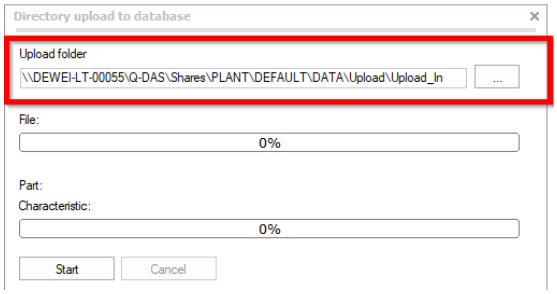


5 Manual Upload in QAE

In order to upload data written in DFQ format from measurement value generating systems (e.g. PC DMIS) into the database, a manual upload is available in the process capability analysis module. This can be called up via the integrated button bar:



The only configuration option here is the path where the files are stored:



If a path is selected here, it is saved locally for this workstation. Thus, even in server-client operation, the QAE is able to select a different path per workstation, depending on the writing system, and to save it.

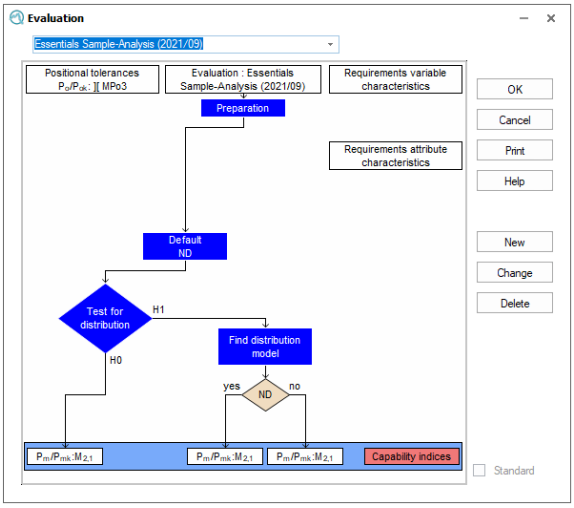
The following rules apply to manual upload and cannot be changed:

- The key fields used are K1001, K1002, K2001 and K2002.
  As of version 14.0.4.5, the K5003 is also a key field.
- The upload always takes the part measurement into account.
- Duplicate entries for key fields at the characteristic level are treated as errors.
- Handling of empty key fields
  - Up to version 14.0.4.4, empty key fields are treated as errors.
  - From version 14.0.3.3 and 14.0.4.1, if K1001 is empty, it is automatically filled with "n/a" (not available).
  - From version 14.0.4.5, empty key fields are no longer treated as errors. The quality of the data is the responsibility of the customer.
- All DFQ files in the selected folder and subfolders will be uploaded.
- Files with implausible k-field contents are treated as errors.
- Files that have been successfully uploaded will be deleted.
- Files that have not been uploaded due to an error will be retained.
- The overwrite rule always applies, both part data and characteristic data of existing records in the database will be overwritten.

6 Evaluation strategies in QAE

In all 3 modules of the QAE, a firmly defined evaluation strategy is available. These can neither be viewed nor changed. Therefore, they are briefly described here:

6.1 Sample Analysis



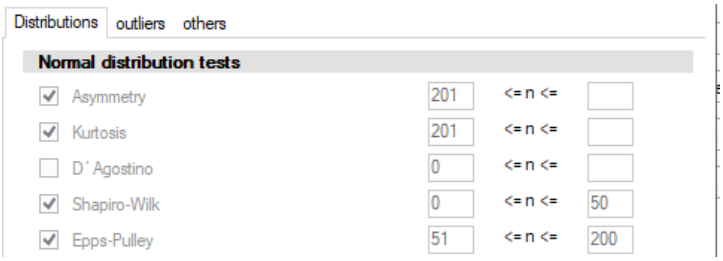
Explanation of the strategy in prose:

After preparing the data set (outliers using the plausibility limits), the normal distribution is first assumed. This is checked by various tests, depending on the number of measured values. If the normal distribution is rejected, a best-fitting, single-peaked distribution is selected according to the regression coefficient.

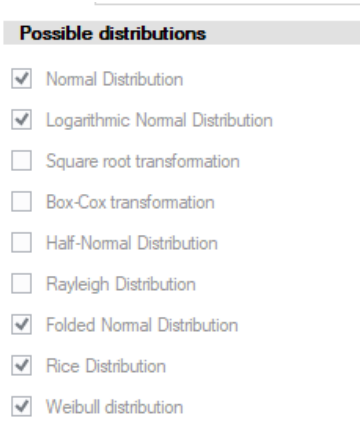
The capability indices are calculated according to the percentile method.

The target values of the capability indices are 1.67 for the charact. classes "unimportant" to "significant" and 2.00 for the charact. class "critical".

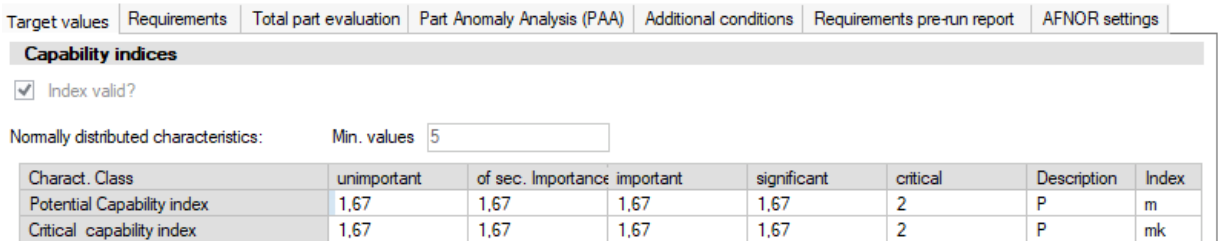
Tests of normal distribution, depending on the number of measured values



Possible distributions if the test for normal distribution was rejected



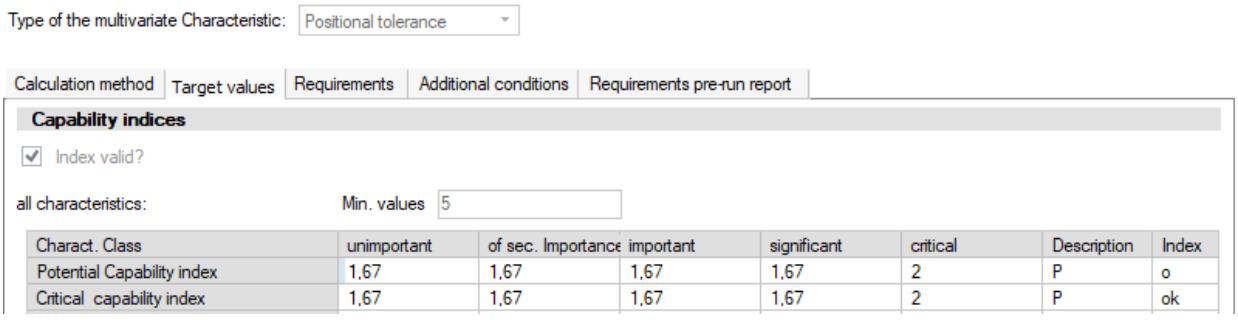
Target values of the different characteristics classes and name of the capability indices



Charact. Class	unimportant	of sec. Importance	important	significant	critical	Description	Index
Potential Capability index	1,67	1,67	1,67	1,67	2	P	m
Critical capability index	1,67	1,67	1,67	1,67	2	P	mk

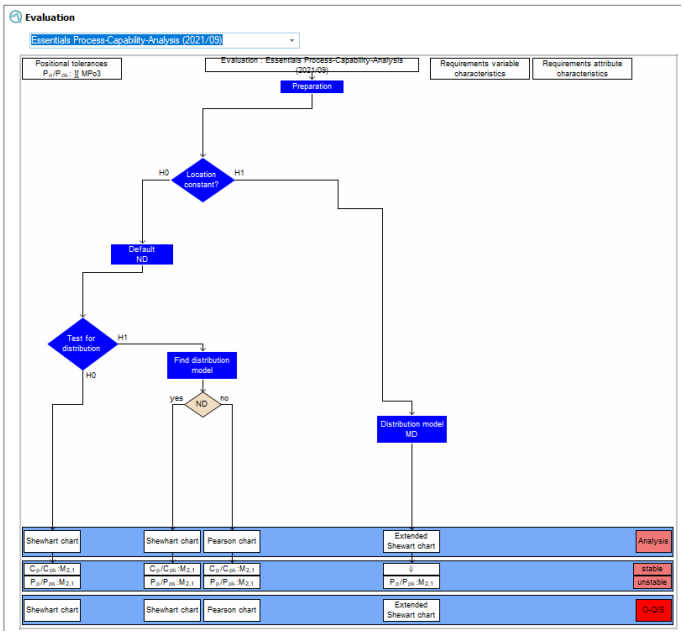
Positional tolerances

Positional tolerances are calculated according to the probability ellipse. The target values are the same, the names of the capability indices are different to visualise this on the report.



Charact. Class	unimportant	of sec. Importance	important	significant	critical	Description	Index
Potential Capability index	1,67	1,67	1,67	1,67	2	P	o
Critical capability index	1,67	1,67	1,67	1,67	2	P	ok

6.2 Process capability analysis



Explanation of the strategy in prose:

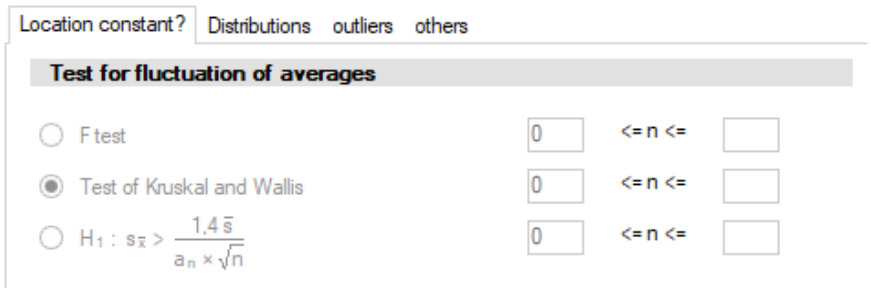
After preparing the data set (outliers using the plausibility limits), the location is first checked. If this is not constant, the mixed distribution is applied directly as the distribution form. If the location is assumed to be constant, the normal distribution is first assumed. This is checked by various tests, depending on the number of measured values. If the normal distribution is rejected, a best-fitting, single-peaked distribution is selected according to the regression coefficient.

The capability indices are calculated using the percentile method.

The target values of the capability indices are 1.33 for the charact. classes "important" to "critical" and 1.00 for the charact. class "unimportant".

Differences from sample analysis:

Location test according to Kruskal and Wallis



Target values of the different characteristics Classes and name of the capability indices

Stable processes

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

Unstable processes

Index valid?

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

Charact. Class	unimportant	of sec. Importance	important	significant	critical	Description	Index
Potential Performance index	1	1,33	1,33	1,33	1,33	P	p
Critical performance index	1	1,33	1,33	1,33	1,33	P	pk

Adjustment of the target values

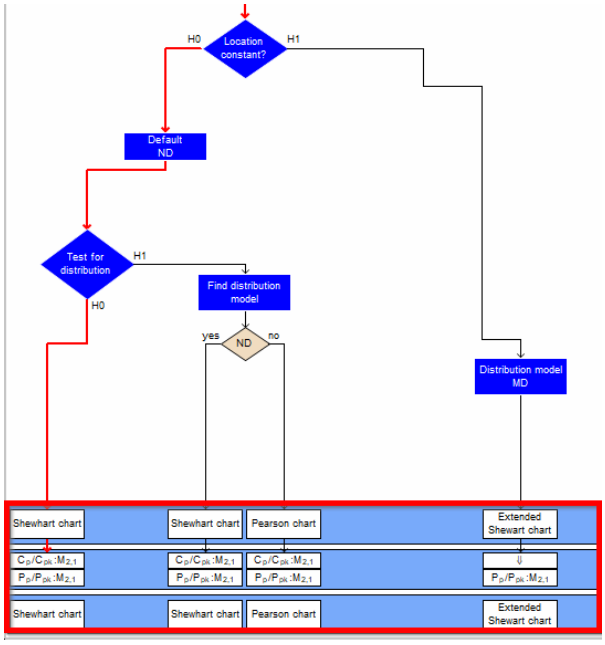
If less than 125 measured values are available, the target values are dynamically adjusted.

Automatic adaptation of target values Limit 125

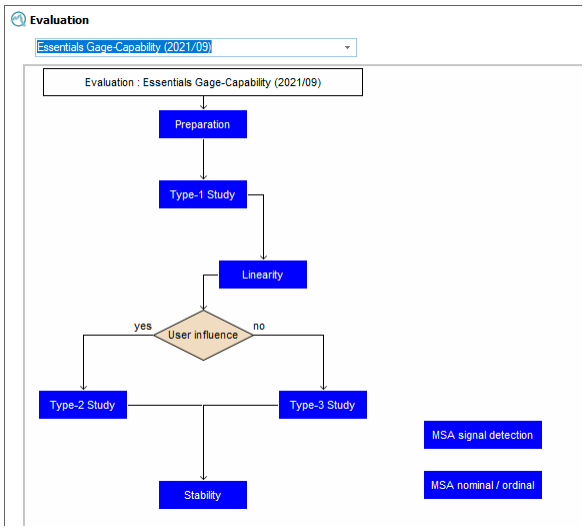
- not depending on Cp and Cpk
- Raise Cp to Cpk
- Reduce Cpk to Cp

Quality control chart

The quality control chart designed for each process type is determined and calculated.



6.3 Measurement System Analysis



In the Sample and Process capability analysis the evaluation strategy provides a flow chart to find the best suitable distribution model for the respective distribution time model. In Measurement System Analysis, the evaluation strategy allows the direct execution of the individual methods.

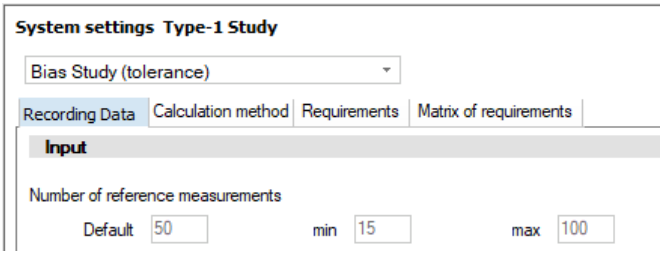
Available for use:

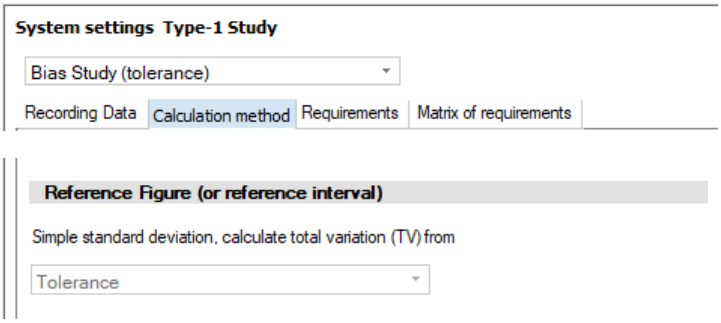
Type 1	2 sub methods for the BIAS-only study or for the calculation of Cg/Cgk.
Linearity	2 sub methods with the reference variables tolerance or process variation. Determination and testing of the t-test and %EV.
Type 2	2 sub methods with the reference quantities total variation or tolerance. Determination and testing of R&R(%GRR) and the ndc.
Type 3	2 sub methods with the reference quantities total variation or tolerance. Determination and testing of R&R(%GRR) and the ndc.
Stability	2 sub methods with the reference variables tolerance or process variation. Determination and testing of the stability of the QCC.
Signal detection	Method of signal detection. Variable reference values required, determination of the greyscale range R&R
Nominal/ordinal	Nominal or ordinal characteristics (from the class catalogue). Determination of effectiveness.

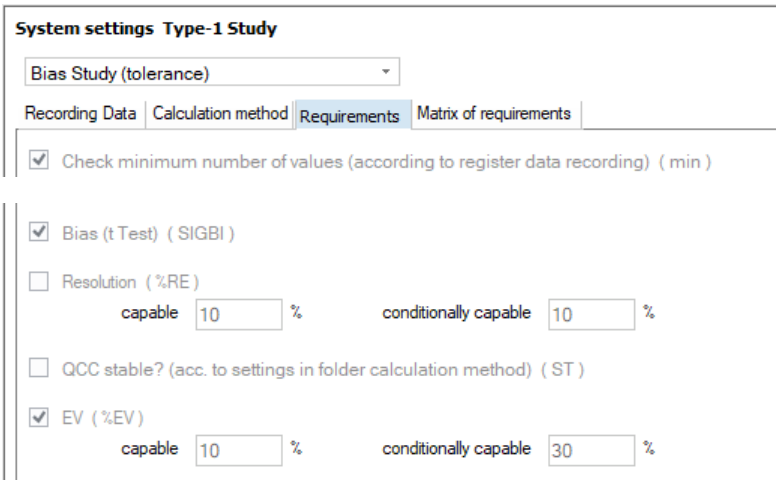
The following subchapter will briefly explain the requirements and used mathematics in the sub methods.

6.3.1 Type 1

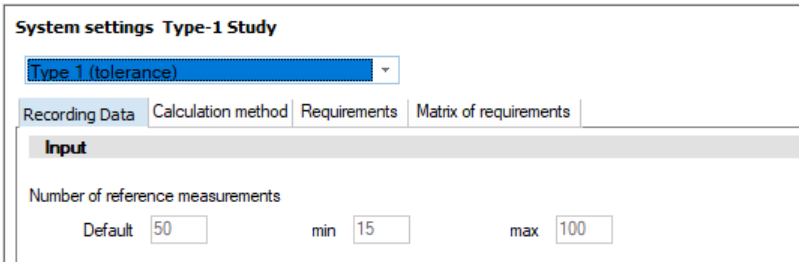
Requirements for “Bias Study (tolerance)”:

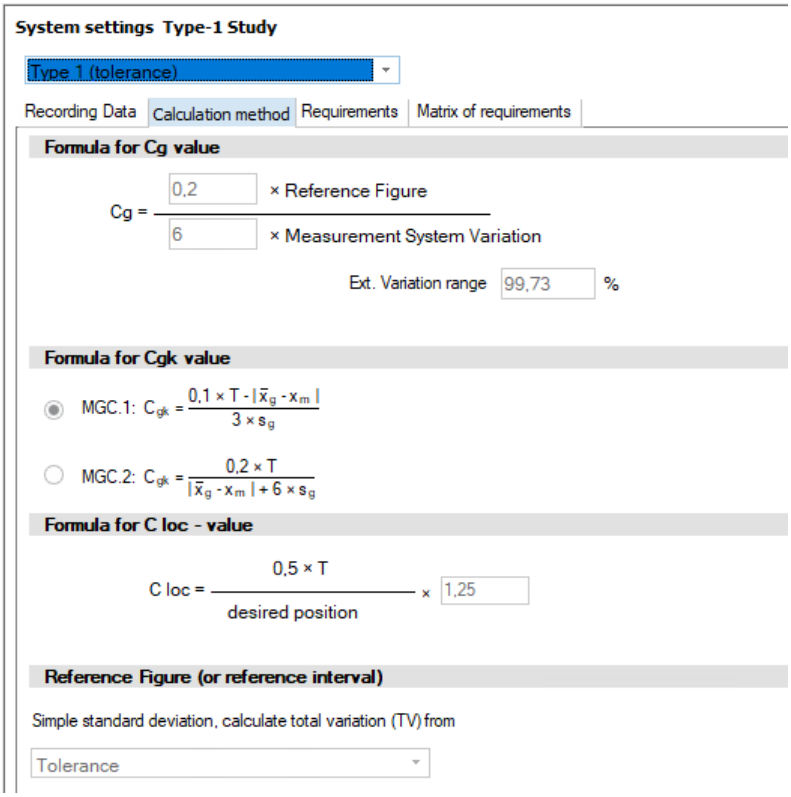


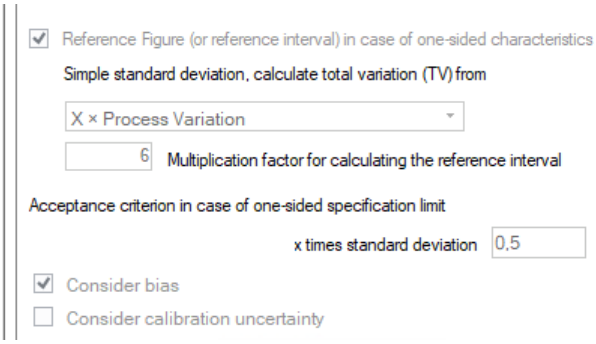


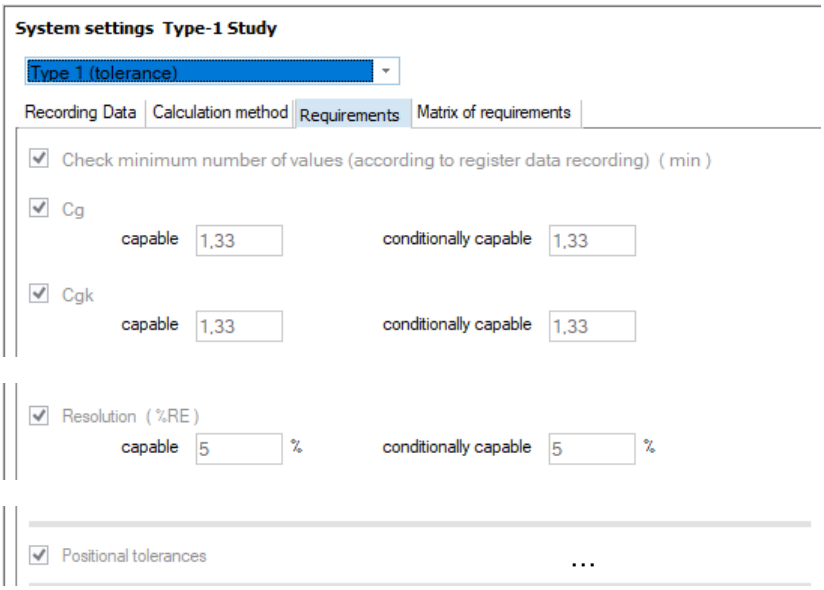


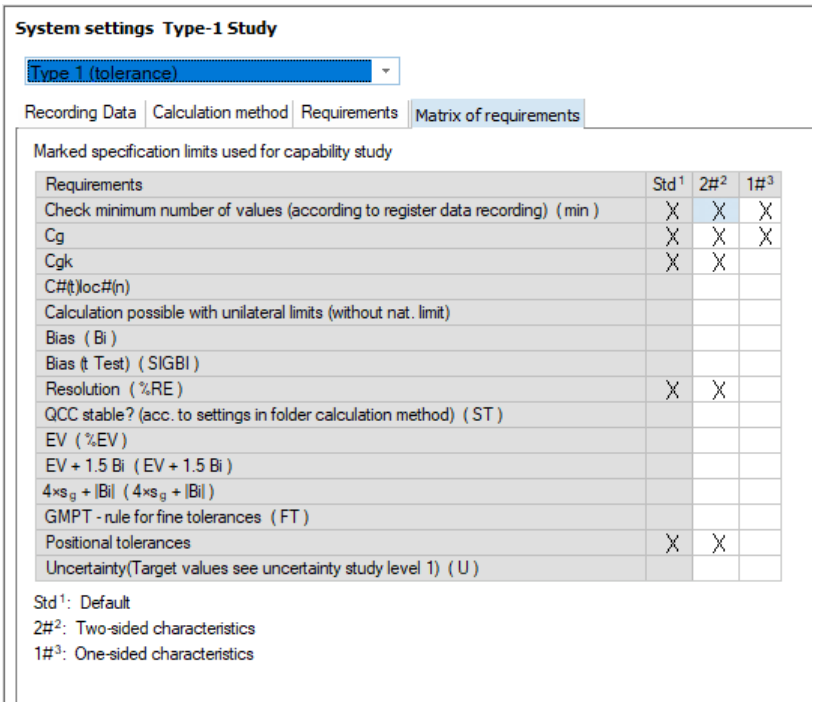
Requirements for “Type 1 (tolerance)”:









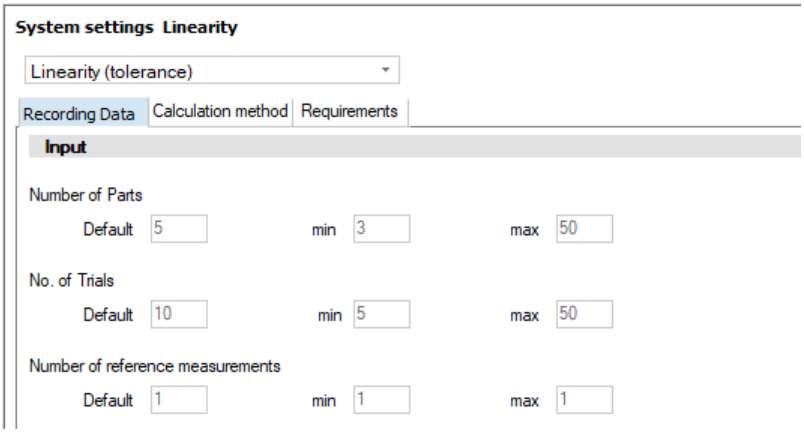


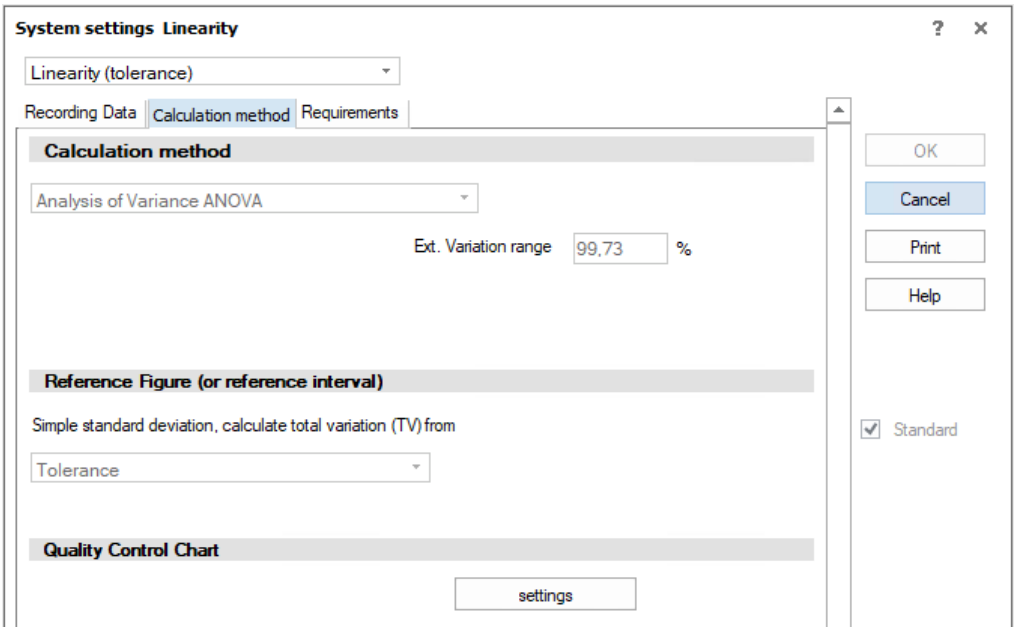
Requirements	Std[1]	2#[2]	1#[3]
Check minimum number of values (according to register data recording) (min)	X	X	X
Cg	X	X	X
Cgk	X	X	
C#(t)loc#(n)			
Calculation possible with unilateral limits (without nat. limit)			
Bias (Bi)			
Bias (t Test) (SIGBI)			
Resolution (%RE)	X	X	
QCC stable? (acc. to settings in folder calculation method) (ST)			
EV (%EV)			
EV + 1.5 Bi (EV + 1.5 Bi)			
$4 \times s_g + \lvert Bi \rvert$ ($4 \times s_g + \lvert Bi \rvert$)			
GMPT - rule for fine tolerances (FT)			
Positional tolerances	X	X	
Uncertainty(Target values see uncertainty study level 1) (U)			

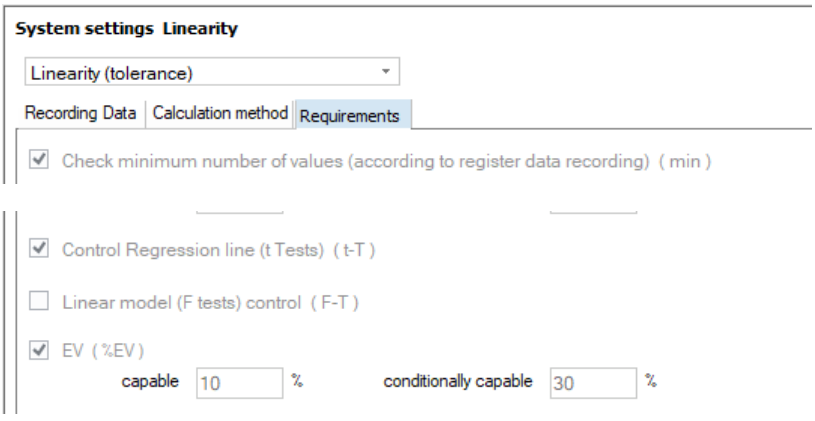
Std[1]: Default
2#[2]: Two-sided characteristics
1#[3]: One-sided characteristics

6.3.2 Linearity

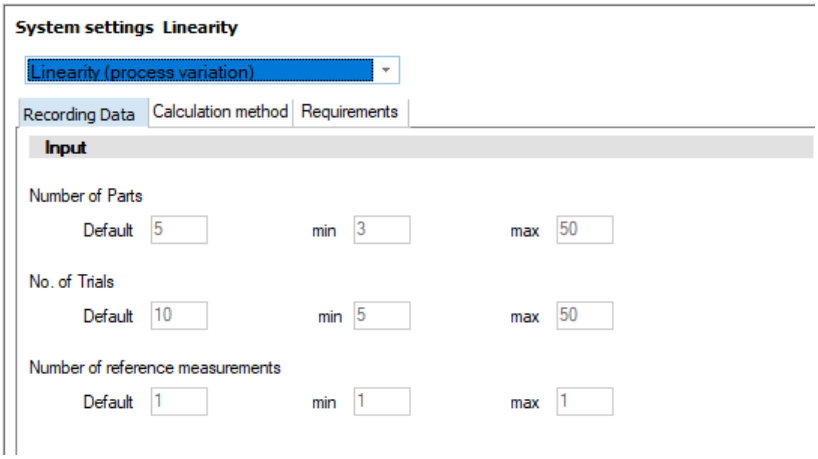
Requirements for “Linearity (tolerance)”:

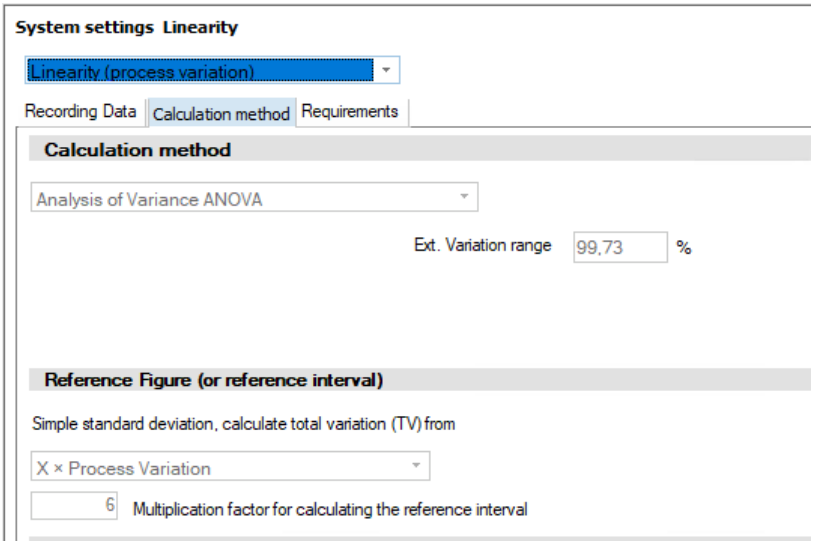


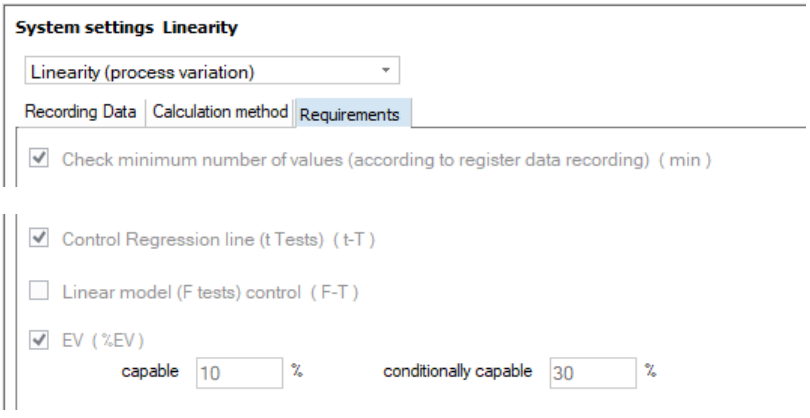




Requirements for “Linearity (process variation)”:

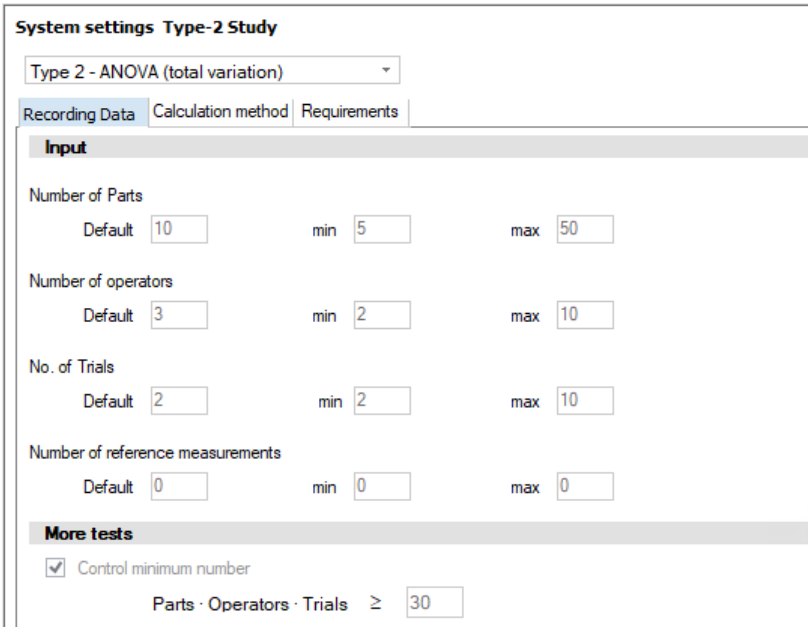


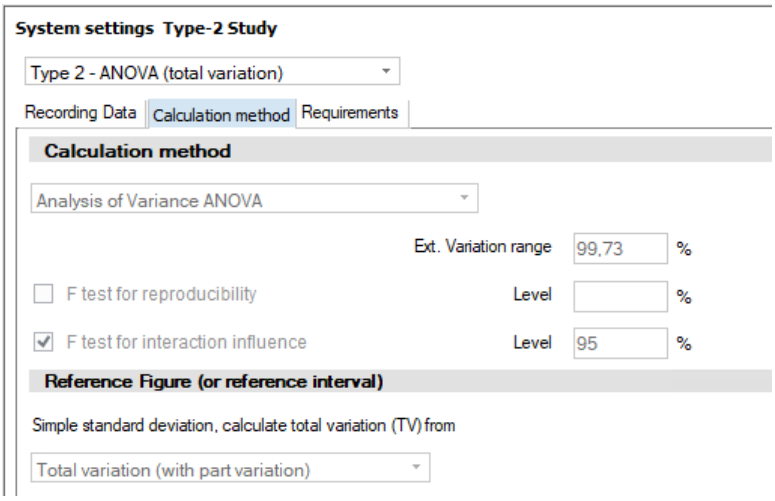


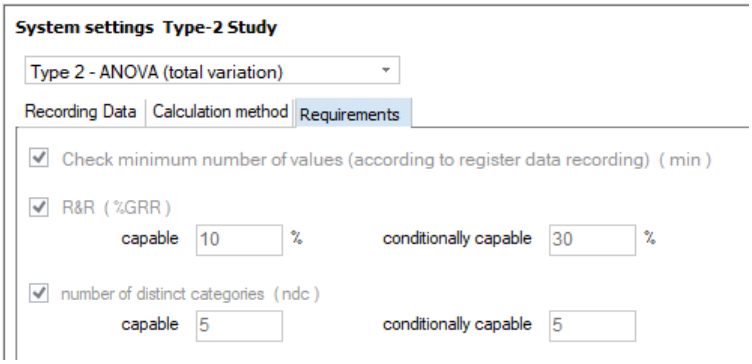


6.3.3 Type 2

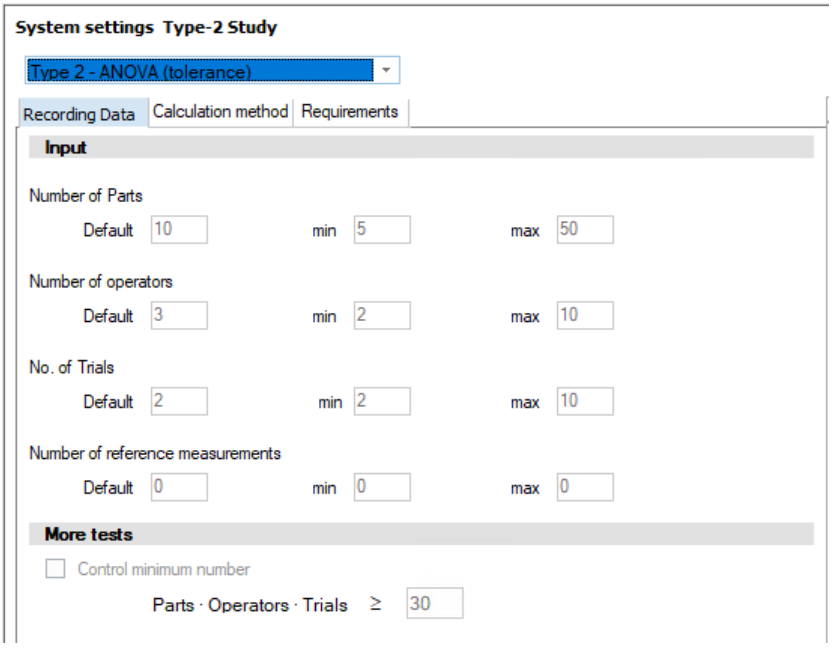
Requirements for “Type 2 – ANOVA (total variation)”

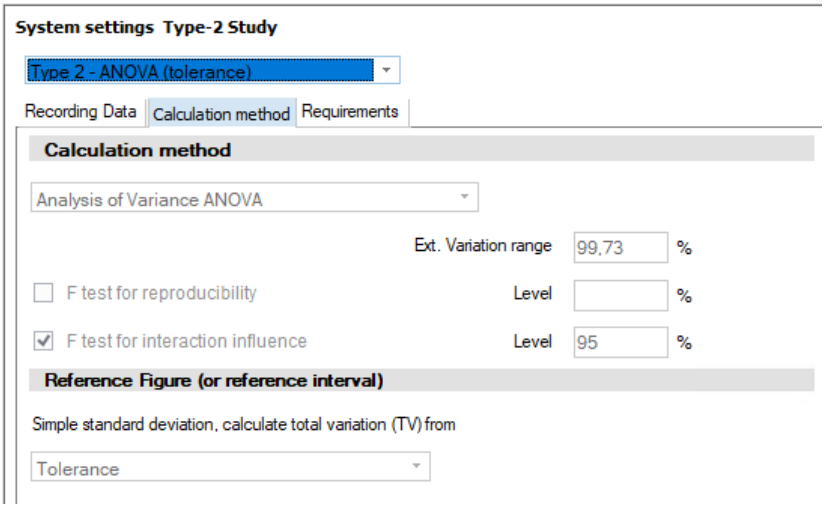


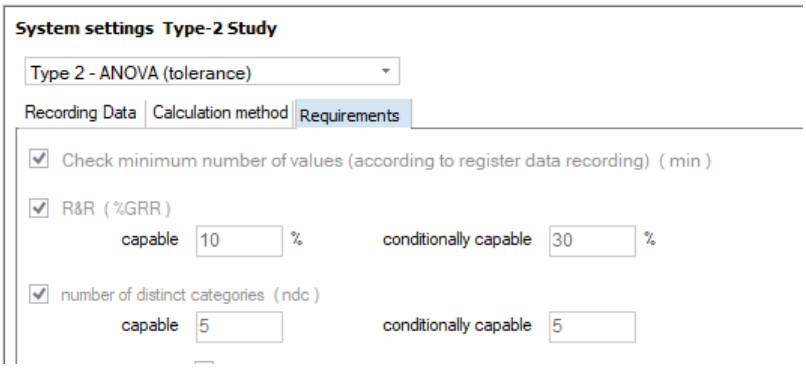




Requirements for “Type 2 – ANOVA (tolerance)”

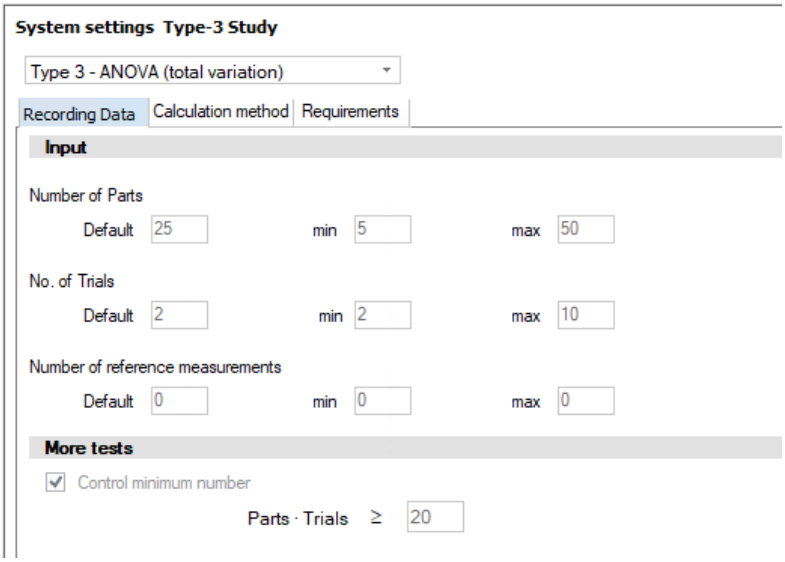


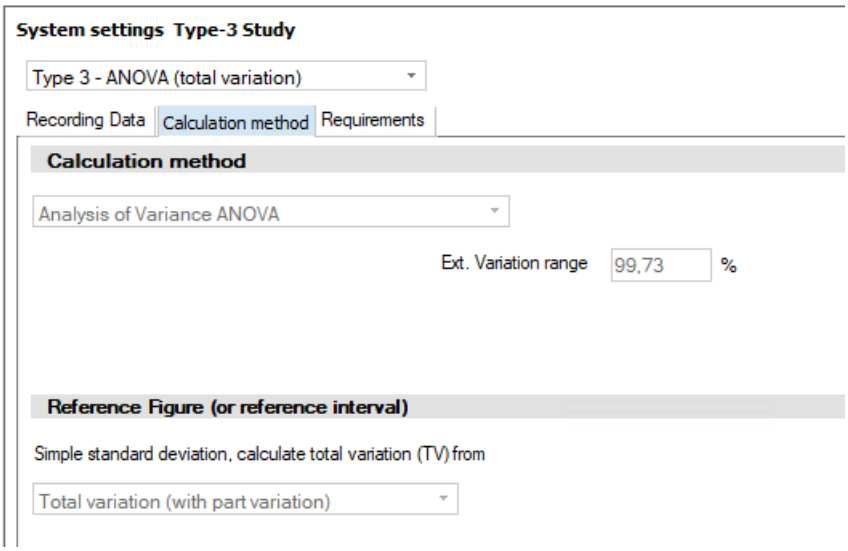


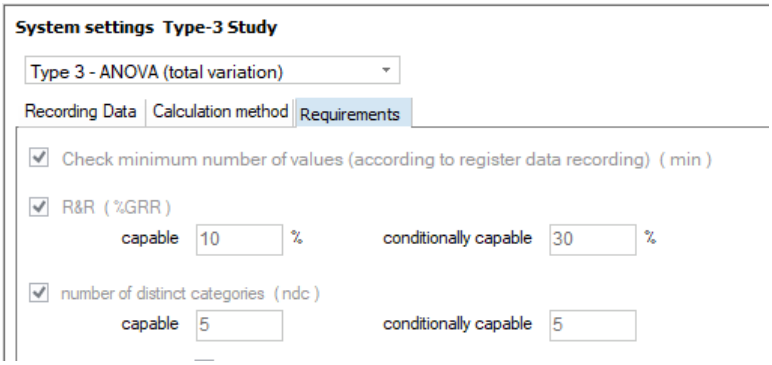


6.3.4 Type 3

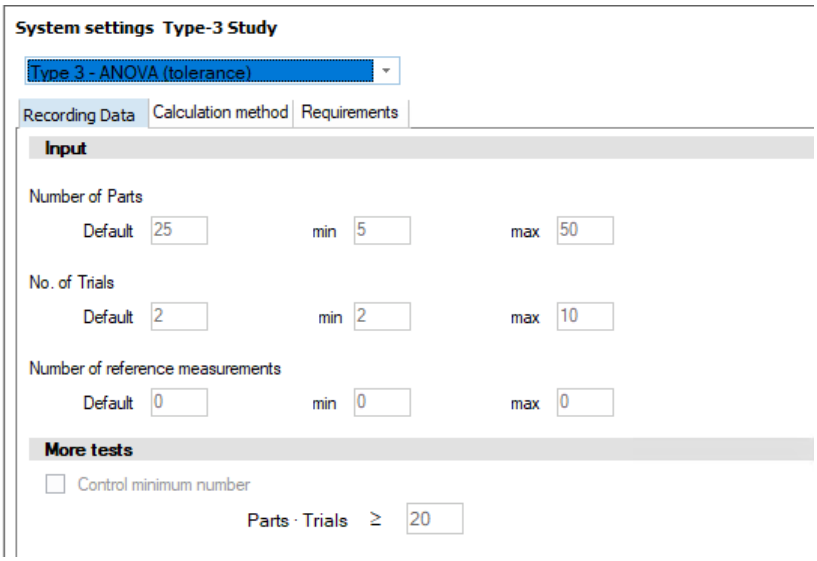
Requirements for “Type 3 – ANOVA (total variation)”

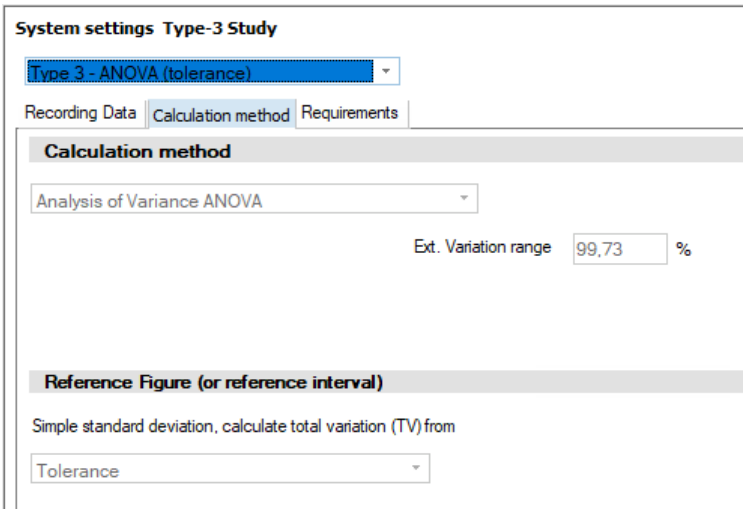


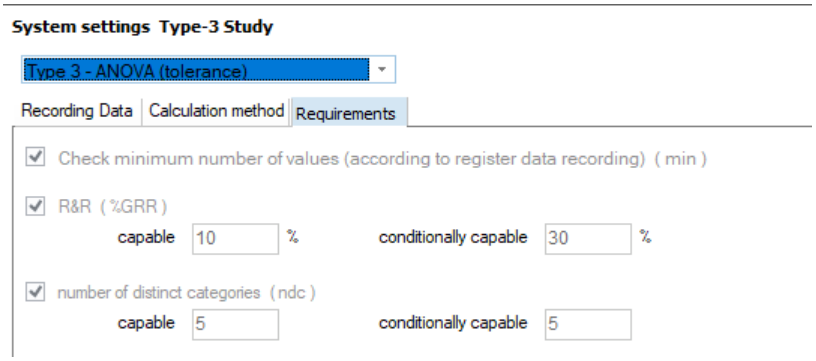




Requirements for “Type 3 – ANOVA (tolerance)”

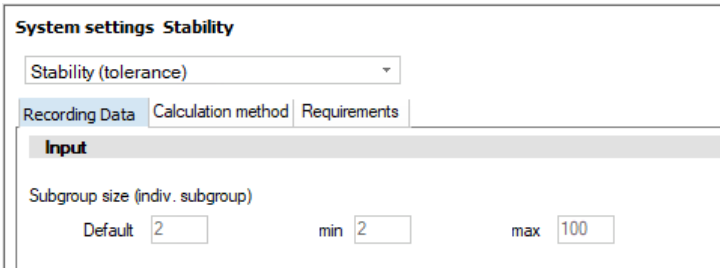


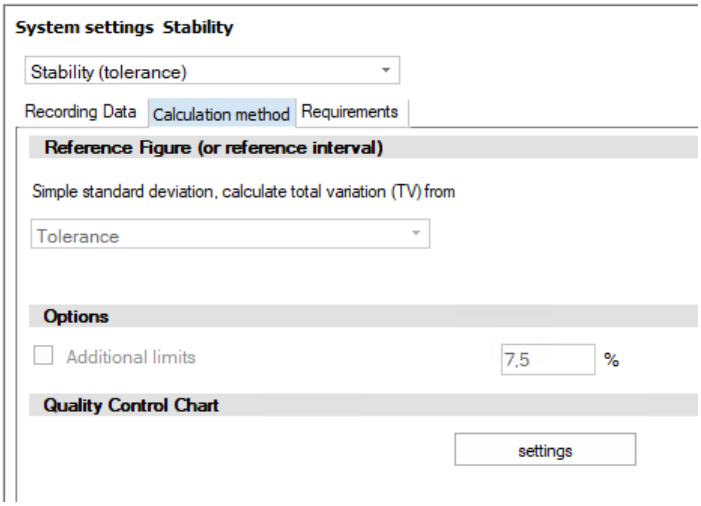




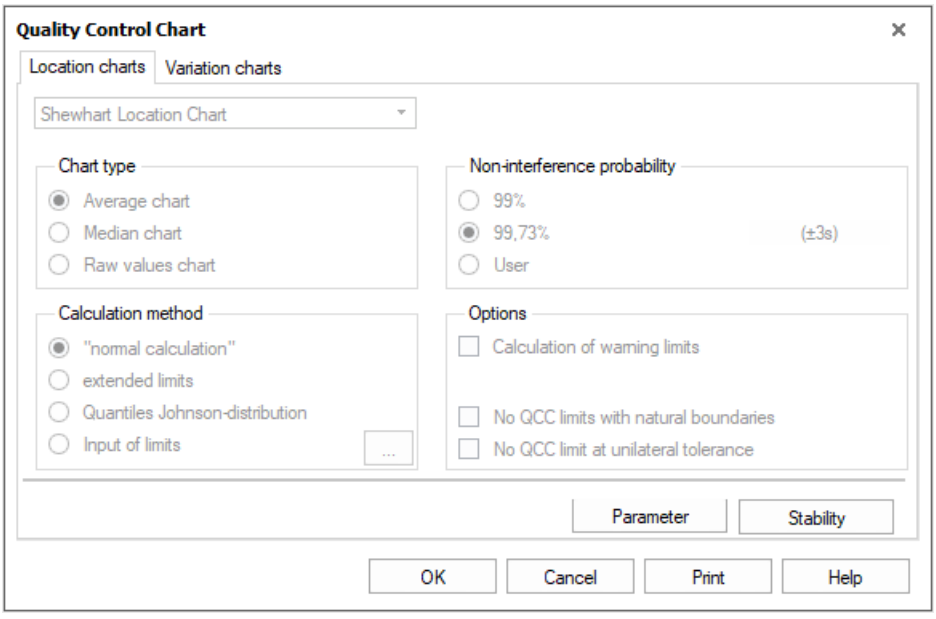
6.3.5 Stability

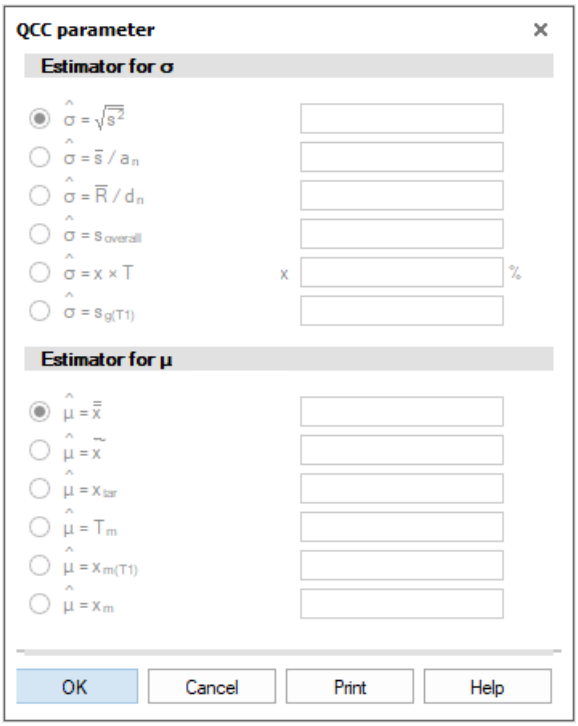
Requirements for “Stability (tolerance)”

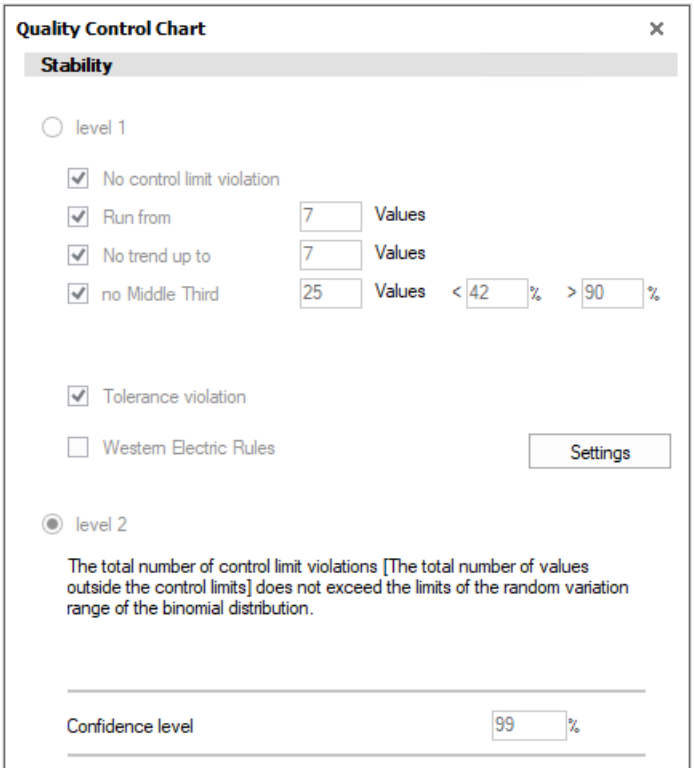


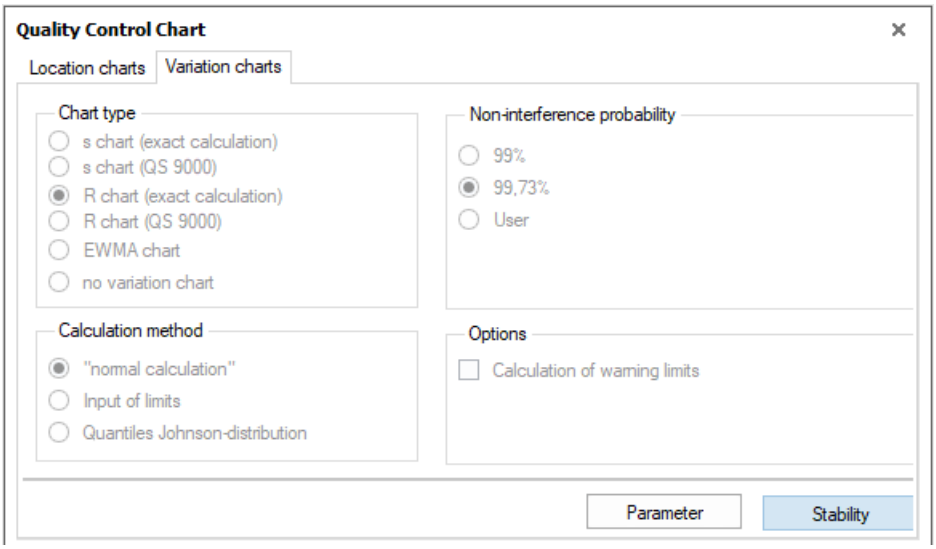


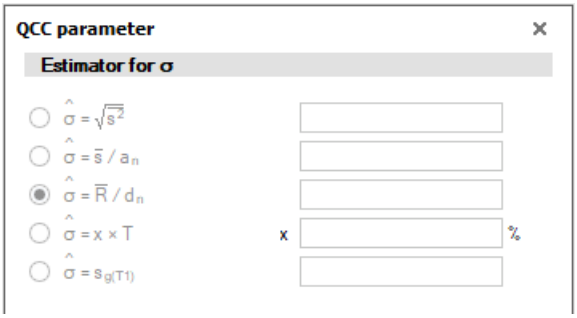
Quality Control Chart settings:

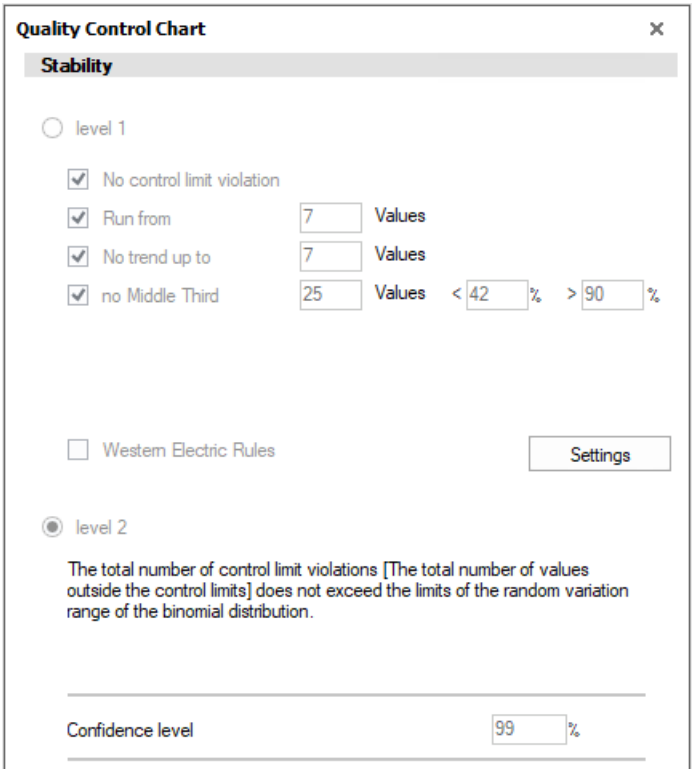


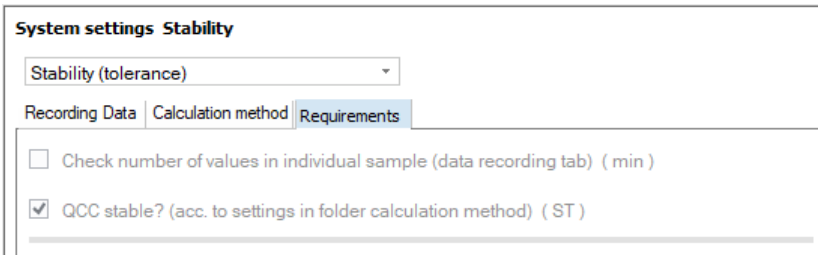

QCC parameter
Estimator for σ
σ̂ = √s²
σ̂ = s̄ / a_n
σ̂ = R̄ / d_n
σ̂ = s_overall
σ̂ = x × T
x
%
σ̂ = s_g(T1)
Estimator for μ
μ̂ = x̄
μ̂ = x̃
μ̂ = x_tar
μ̂ = T_m
μ̂ = x_m(T1)
μ̂ = x_m
OK
Cancel
Print
Help


Quality Control Chart
Stability
level 1
No control limit violation
Run from
7
Values
No trend up to
7
Values
no Middle Third
25
Values
< 42 %
> 90 %
Tolerance violation
Western Electric Rules
Settings
level 2
The total number of control limit violations [The total number of values outside the control limits] does not exceed the limits of the random variation range of the binomial distribution.
Confidence level
99
%

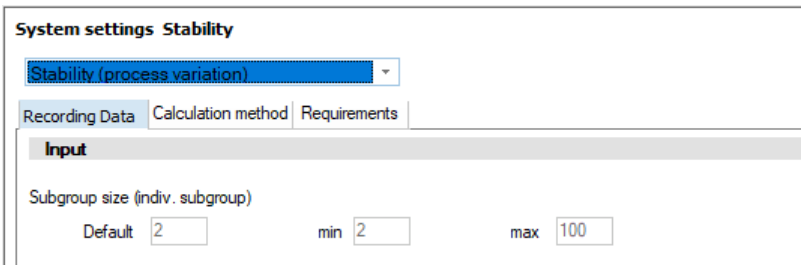

Quality Control Chart
Location charts
Variation charts
Chart type
s chart (exact calculation)
s chart (QS 9000)
R chart (exact calculation)
R chart (QS 9000)
EWMA chart
no variation chart
Non-interference probability
99%
99,73%
User
Calculation method
"normal calculation"
Input of limits
Quantiles Johnson-distribution
Options
Calculation of warning limits
Parameter
Stability

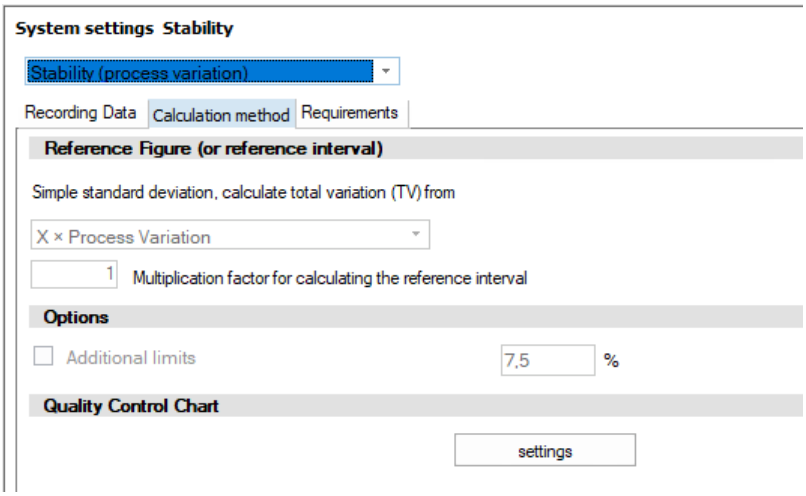

QCC parameter
Estimator for σ
x
%


Quality Control Chart
Stability
level 1
No control limit violation
Run from
7
Values
No trend up to
7
Values
no Middle Third
25
Values
< 42 %
> 90 %
Western Electric Rules
Settings
level 2
The total number of control limit violations [The total number of values outside the control limits] does not exceed the limits of the random variation range of the binomial distribution.
Confidence level
99
%

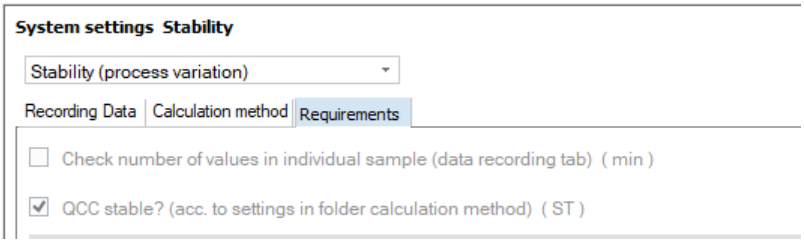

System settings Stability
Stability (tolerance)
Recording Data
Calculation method
Requirements
Check number of values in individual sample (data recording tab) (min)
QCC stable? (acc. to settings in folder calculation method) (ST)

Requirements for “Stability (process variation)”

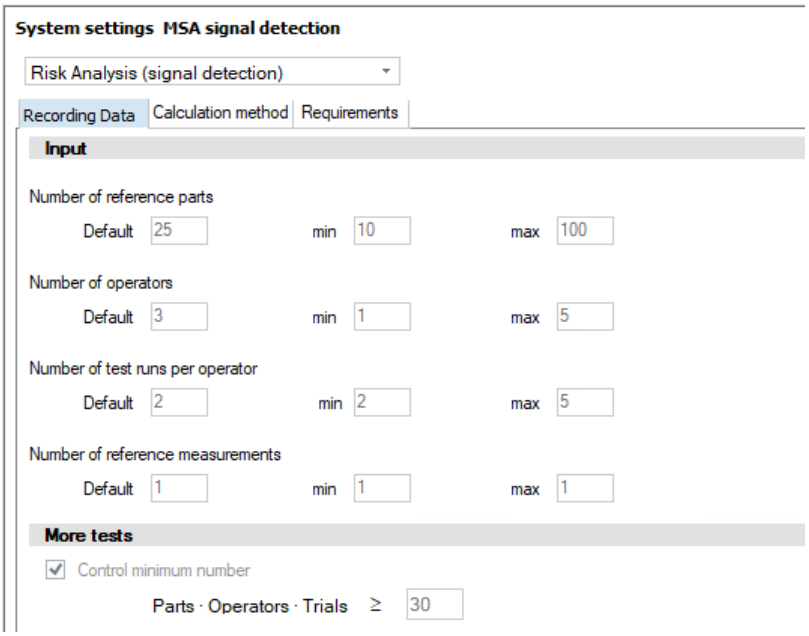


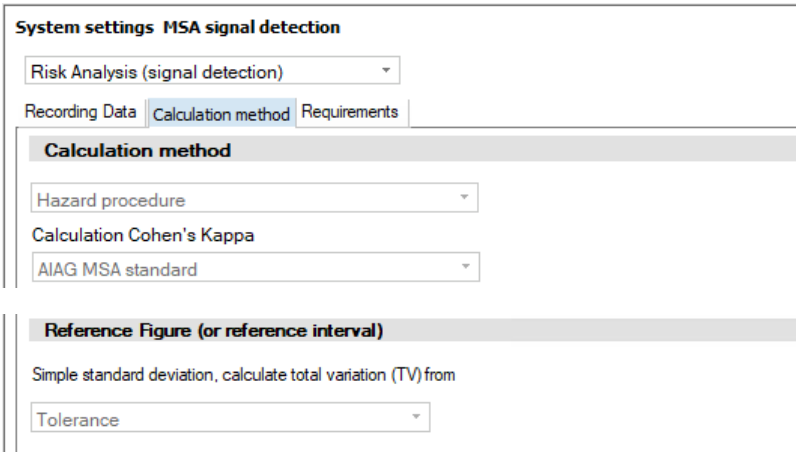


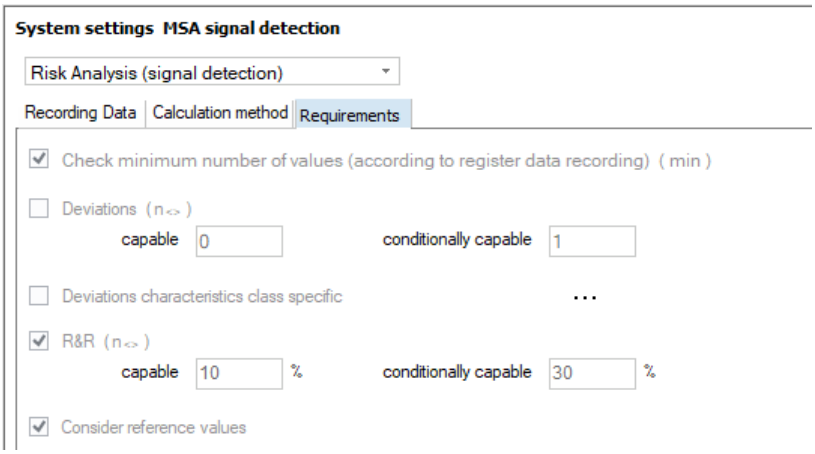
QCC settings are identically.



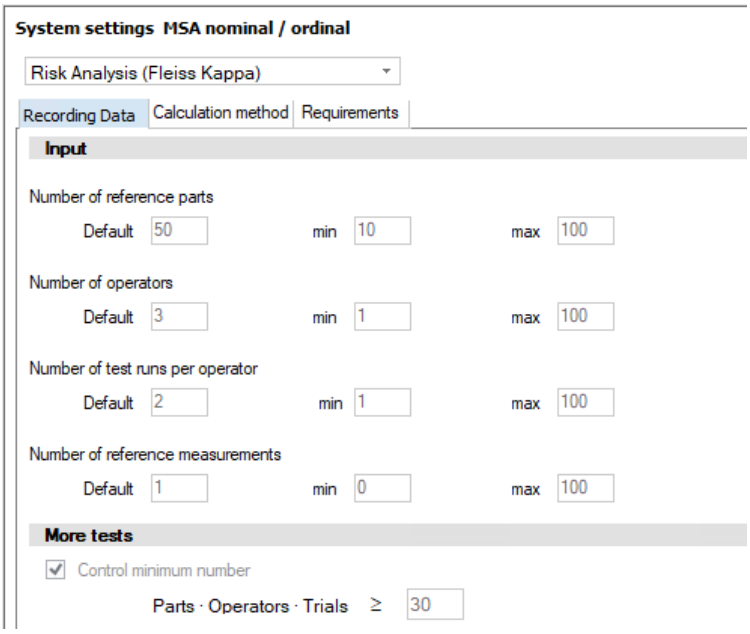
6.3.6 Signal detection

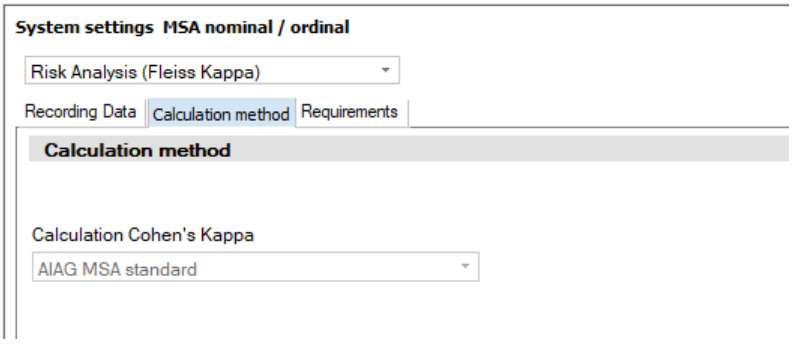


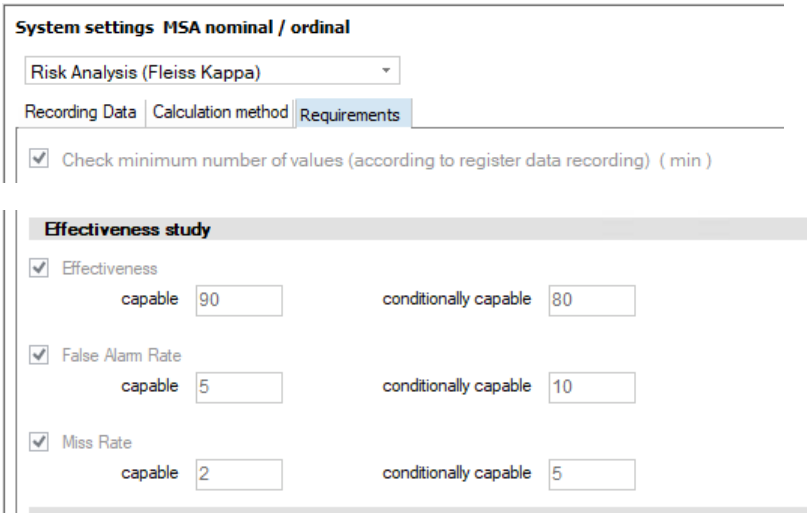




6.3.7 Nominal/ordinal







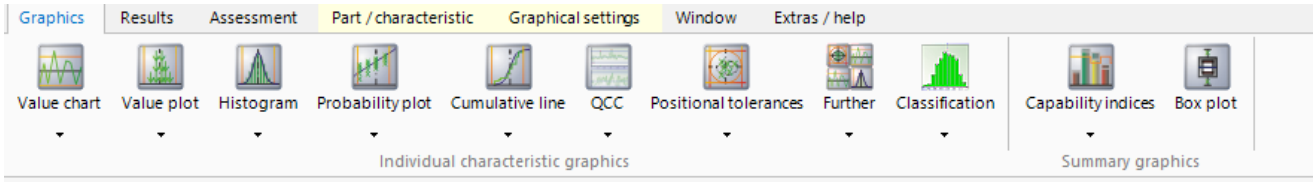
7 Graphics in QAE

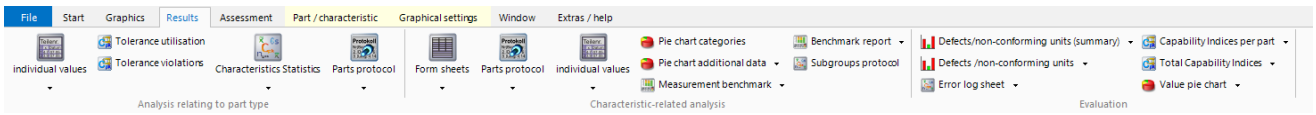
Various graphics are available on the different tabs. These are divided into individual characteristic graphics, overview graphics, as well as purely graphical representations or statistical results. Due to the number of graphics, they cannot be listed here.

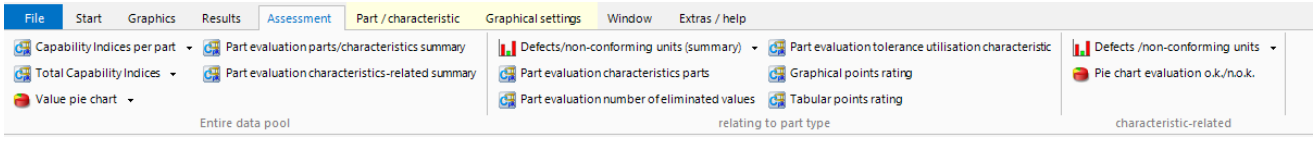
Detailed information on graphics and results can be found in the latest help:

Menu navigation (hexagonmi.com)

Note: It should be noted that the software documentation is prepared for the Q-DAS Product Line and does not address the limitations of the QAE in the individual documentation.



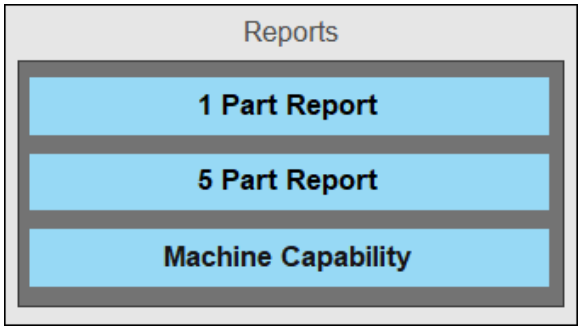




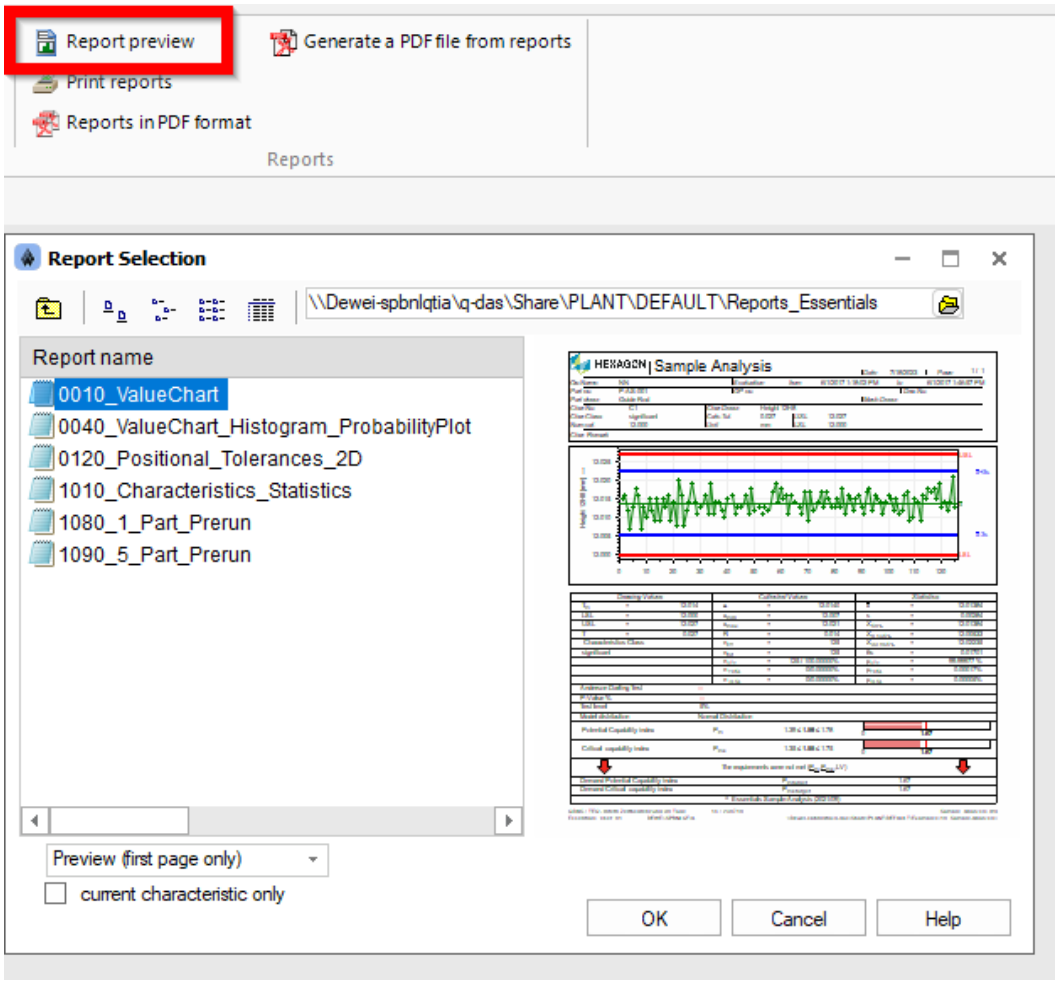
8 Reports in QAE

A selection of reports is available in all 3 modules. In addition to the options for direct report viewing via the button bars, the reports are available on the "Start" tab:

Example to open reports through the button bars.



Example to open more reports though the ribbon bar.



9 Button bars in QAE

All 3 modules are equipped with a button bar defined for this module, which should facilitate the new creation, loading or specific evaluation.

The handling of the button bars for the collection and evaluation of data is described in a separate FAQ.