# STAT Statistics (Beta)   S48

FEATURES

- Statistics for Klippel RnD and QC data
- Visualization of variances
- Cross section view of curve data
- Pool-based test object organization
- Manual or automatic assignment to pools
- Limit calculation + export
- Optional: Automatic Defect Classification ADC (not yet available)

BENEFITS

- Visualize curve and scalar data statistics
- Compare individual test objects
- Compare batch differences or design choices
- Define limits intuitively by point-and-click
- Sort test objects in pools by limit-thresholds
- Create/export
- Identify the needle in the haystack
- Create regular statistic reports
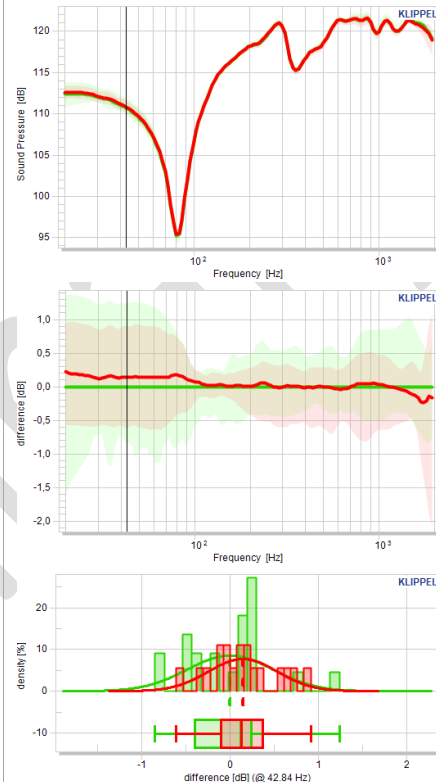
DESCRIPTION

The statistics module (STAT) reads Klippel curve and scalar results and displays the measures' statistics in charts and tables. Test objects are organized in pools to visualize the statistics of all measures depending their grouping. The pool assignment can be perfromed manually, semi-automatically (by limit thresholds) or automatically (optional plugin ADC).

The measures of all (non-hidden) pools are displayed in a common chart for direct comparison. The visualization may be normalized to a reference to show the absolute or relative variation.

Limits may be calculated by definition (e.g. 6 dB shift definition) or interactively via point & click. The feedback to Klippel QC is closed by exporting the limits in a compatible format.

| Article number	

CONTENT

1 Overview

1.1 Introduction

The STAT module is a sophisticated statistics tool dedicated to measurement data of the KLIPPEL Analyzer System. All curve and single value data may be processed for statistical analysis.

The measurement data of several test objects is assumed to be alike, with respect to active measures, measurement conditions and data organization.

In the statistic the test objects are organized in pools (e.g. "good", "bad", "borderline"). The measures of the test objects are strictly connected to the test objects – when a test object is assigned to a pool, all measures of this test object are displayed in the style of the pool.

The definition what a "test object" is depends on the data organization. A test object may be one of the followings:
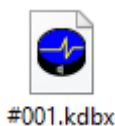
- A single operation in a KLIPPEL database
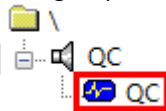
- A driver object in a KLIPPEL database
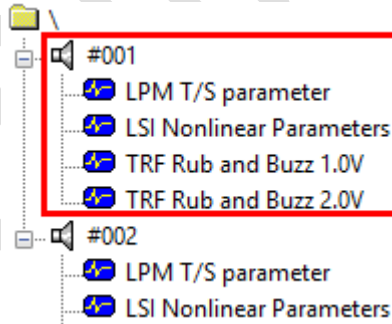
- A complete KLIPPEL database

#001.kdbx

1.2 Principle

The measurement data is extracted from Klippel databases and imported to the STAT operation. This extraction requires *db extract* version 3.

The setup of the extraction and the statistical calculations are all defined and stored in the STAT operation.

2   Requirements

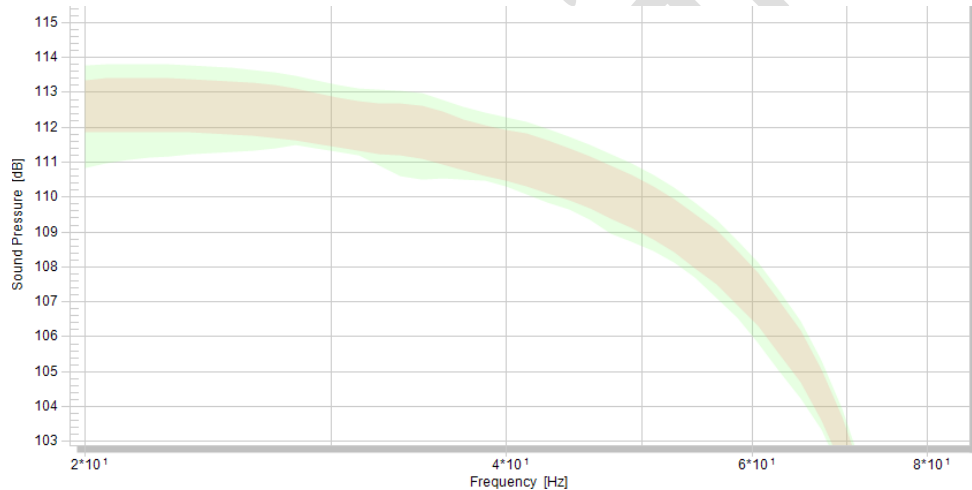| 2.1 **License**	
License Device	A Klippel license dongle or *Klippel Analyzer 3* is required to issue the license for the *STAT*.
2.2 **Software**	
	• Klippel RnD v210 or Klippel QC v6 • Klippel *db extract* v3.x

3   Statistical Results

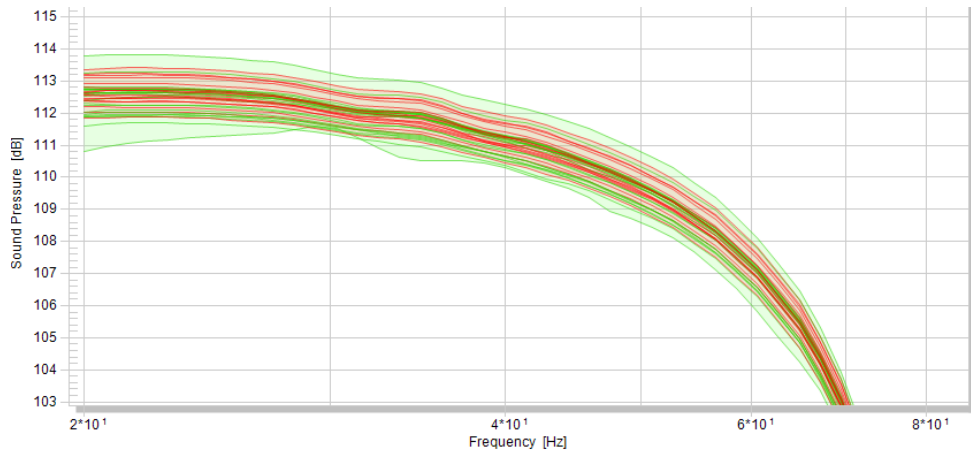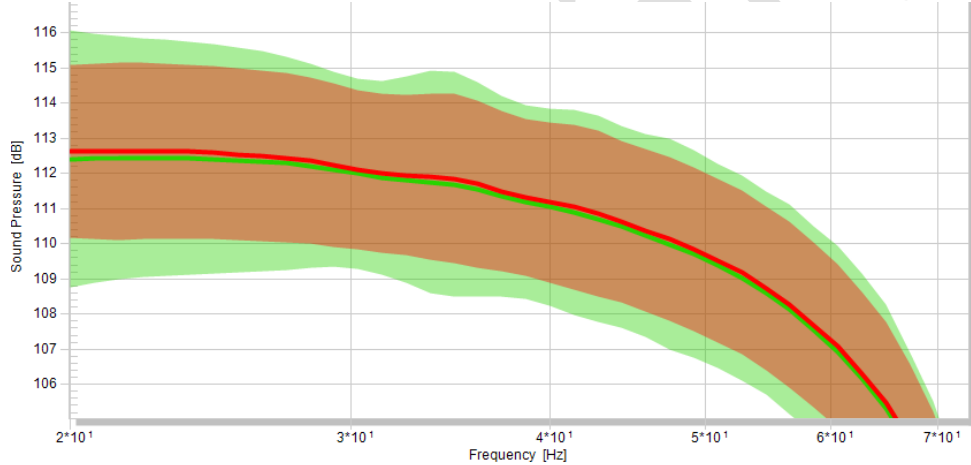| 3.1 **Curve Measures**	
Minimum Maximum	The minimum and maximum of the measurement data is displayed for every pool. If both, maximum and minimum are active, the area between is displayed to illustrate the actual spread of each pool.
Mean	The mean curve represents the average curve of each pool for each measure. The calculation is performed independent of the measure's unit (e.g. dB, Ohm), hence the mean represents the "optical" mean, not necessarily the physical mean – for example: the mean calculated from frequency responses dB does not represent the physical average level, but the average curve in the dB scale.
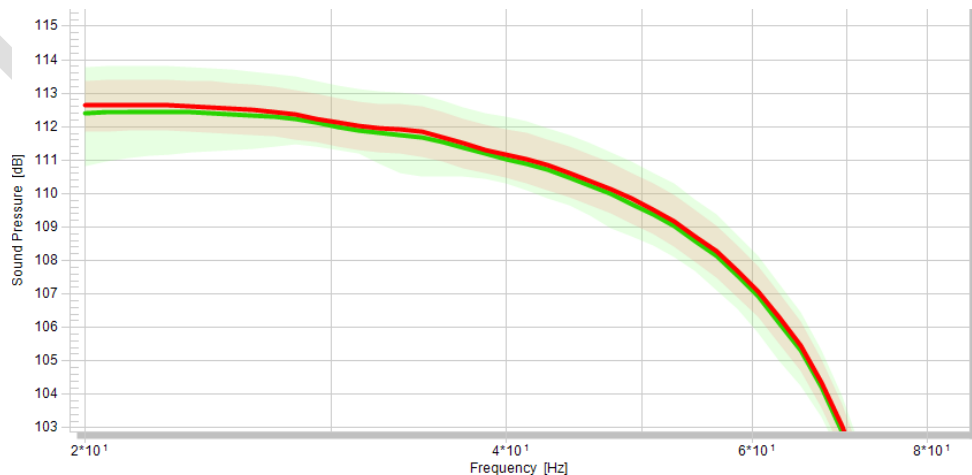
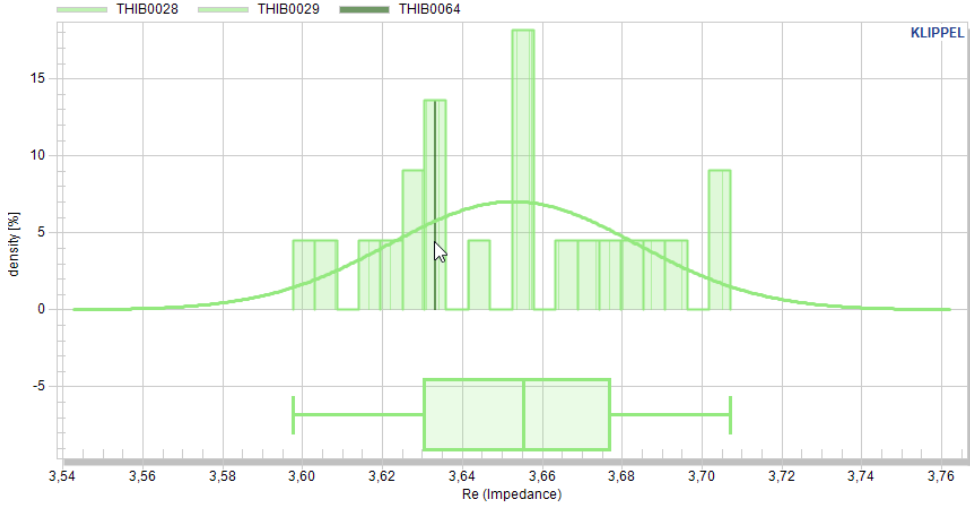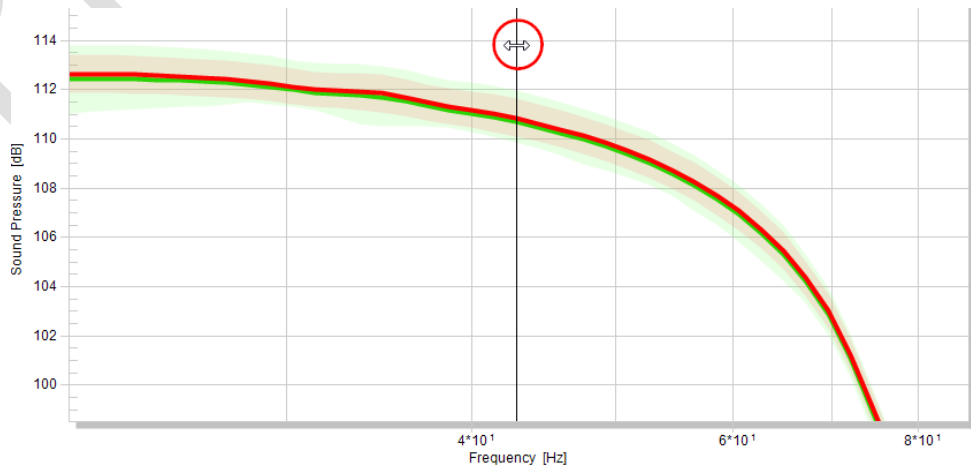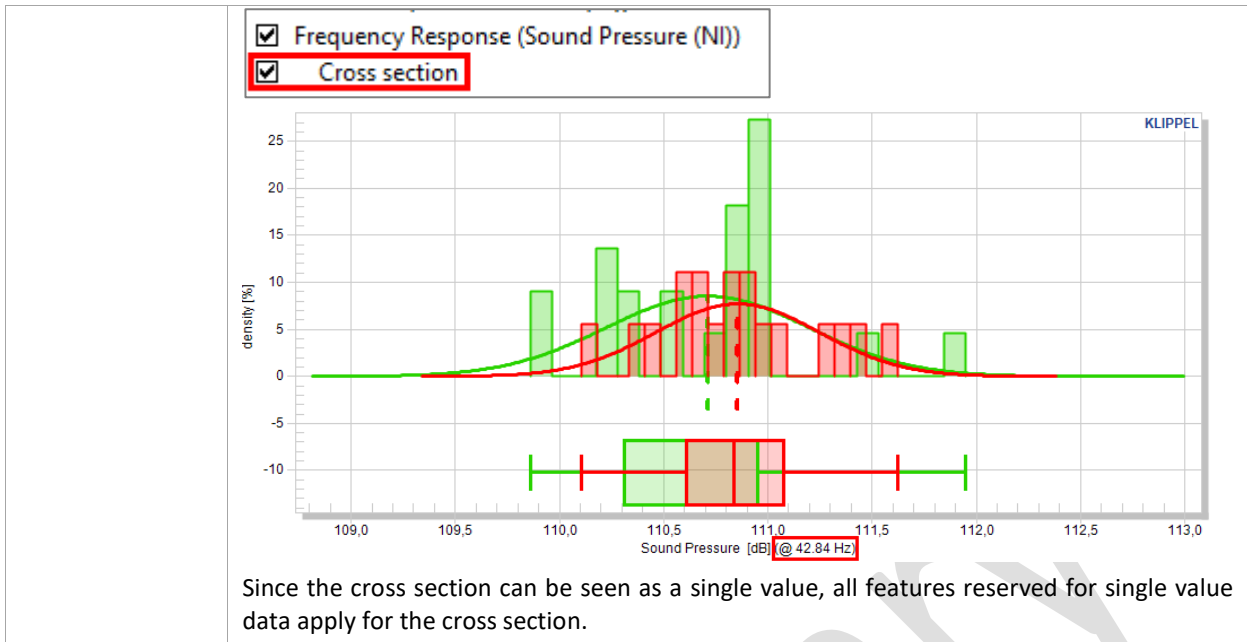| Base Data	The curves of the measurement data for all test objects can be visualized with this option. This enables the user to identify a test object (e.g. serial number) by clicking on a curve.
	It is not recommended to enable this feature if more than approximately 200 curves are displayed. The limit depends the system performance and the number of data points of each curve.
Standard Deviation	This option displays the factorized standard deviation (e.g. 6σ) around the mean curve.
	The factor may vary over the abscissa.
	This feature assumes a normal distribution of the measurement data.
Cross Section	This feature activates a movable cursor in the chart. At the cursor's position, the cross section of the data is displayed in an additional chart.

Since the cross section can be seen as a single value, all features reserved for single value data apply for the cross section.
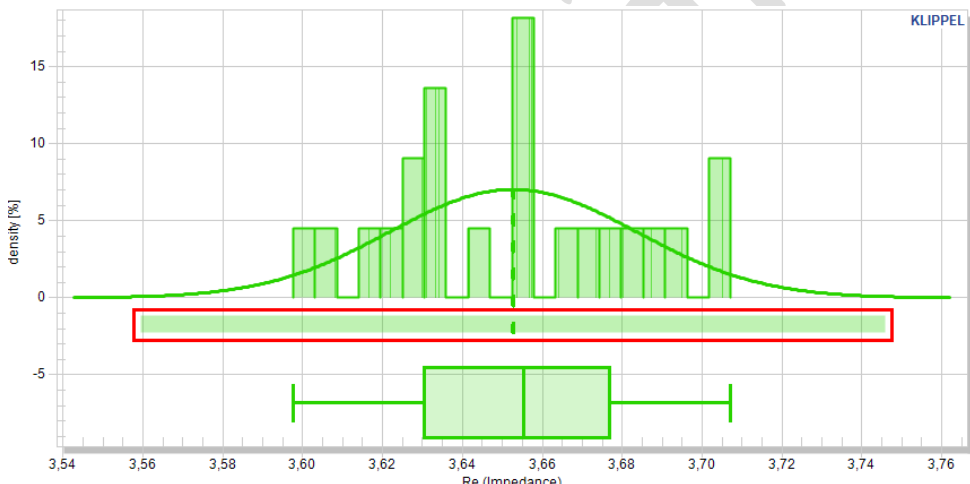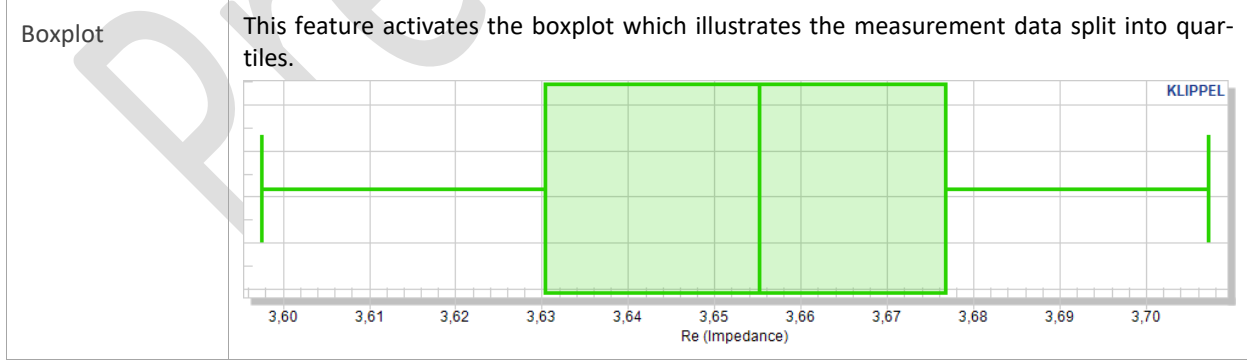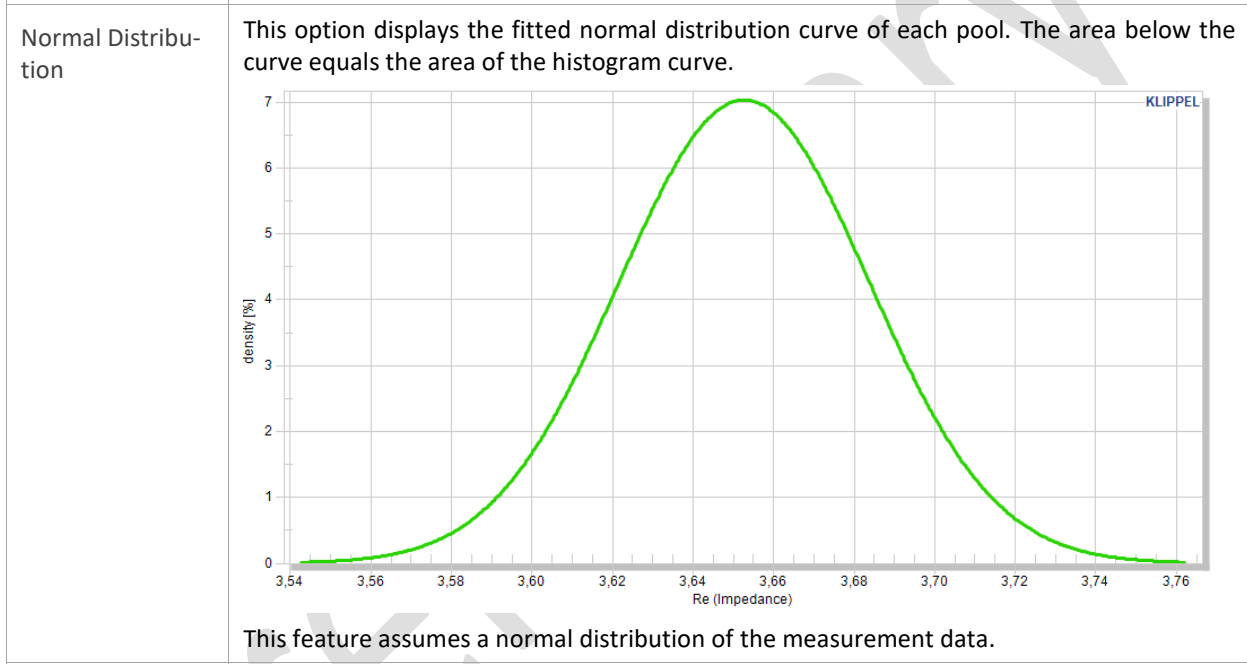
3.2   Single Value Results
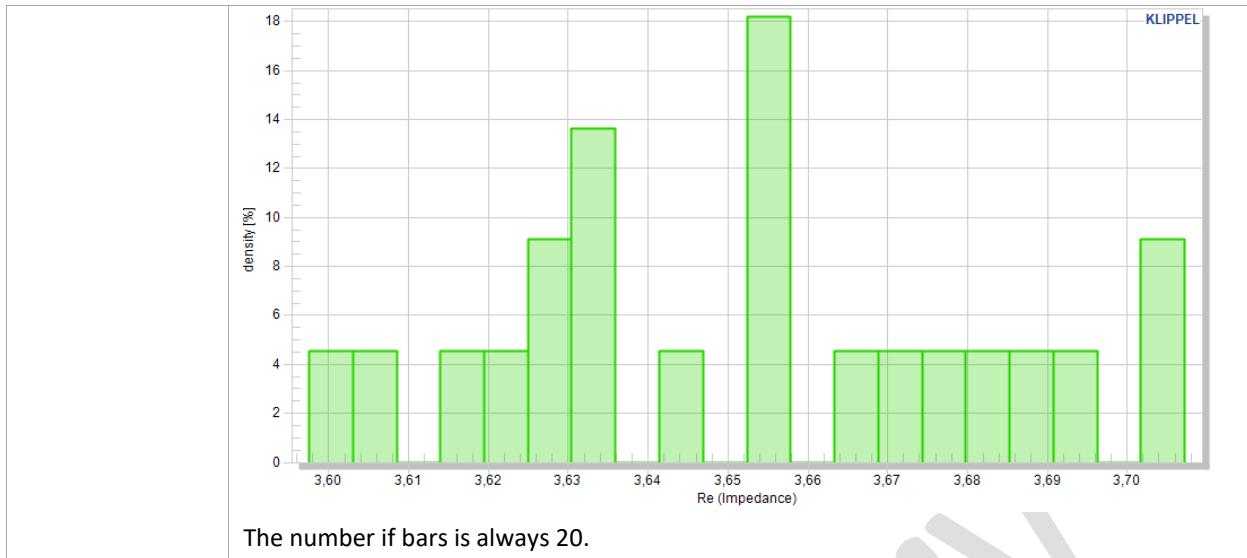
Mean	The mean value of the measurement data. If the normal distribution is active, the mean value is illustrated up to the top of the normal distribution. Otherwise it is shown below the zero axis.
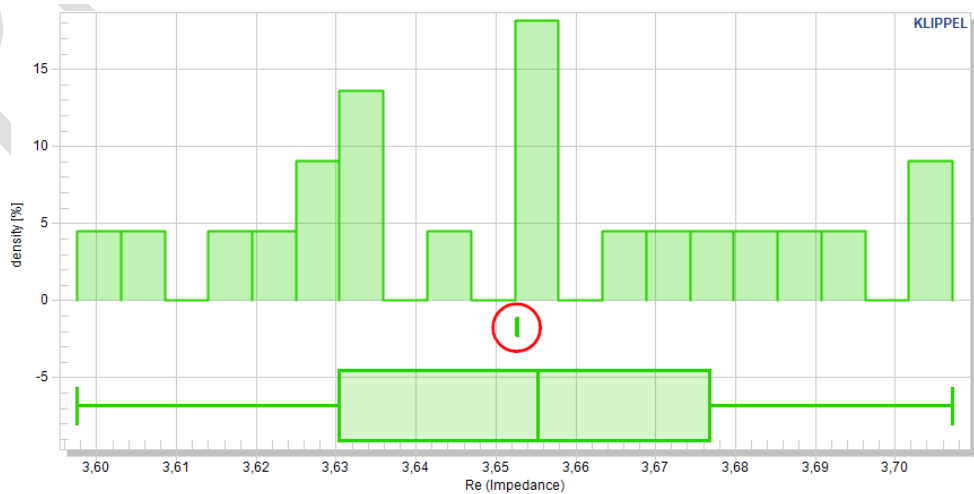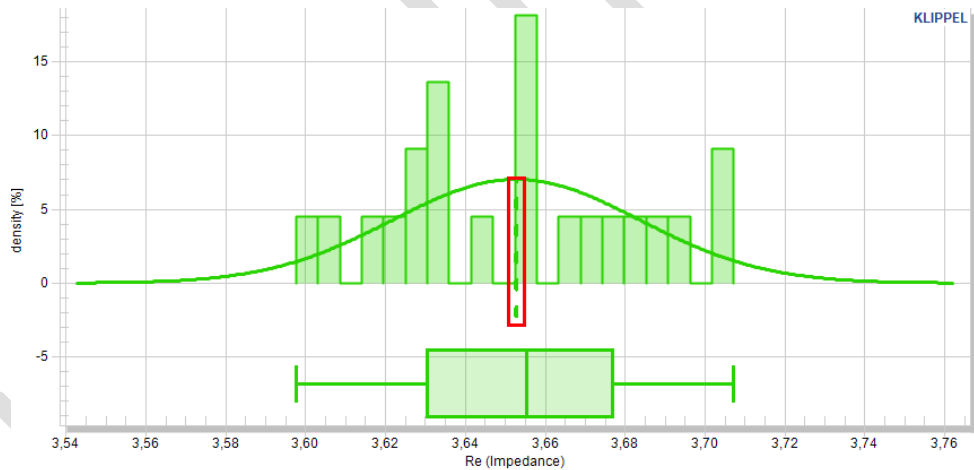
Base Data	This option displays the individual measurement data of all test objects to provide point & click identification of the serial number.

If the histogram is active, the height of the individual data corresponds with the histogram bar. If the histogram is not active but the normal distribution is active, the height corresponds to the maximum of the normal distribution curve. If the normal distribution is also deactivated, the height corresponds to 100% or 1.

Standard Deviation	The factorized standard deviation may be displayed. This feature assumes a normal distribution of the measurement data.
Histogram	The bar representation of the histogram can be activated with this option. The type may either be "absolute count" (the height of a bar represents the number of test objects in a bar) or "density" (the height of the bars is displayed relatively to the actual number of test objects in a pool). Comparing distribution plots of different pools with different number of test objects might require displaying the density type.

The number if bars is always 20.

Normal Distribution	This option displays the fitted normal distribution curve of each pool. The area below the curve equals the area of the histogram curve. This feature assumes a normal distribution of the measurement data.
Boxplot	This feature activates the boxplot which illustrates the measurement data split into quartiles.

3.3 Other Result Windows

Information	Displays general information and warnings.
Pool Assignment	This window shows all pools with their color, their name and the serial number of the assigned test objects (maximal 500).

Pool 0 general	Pool 1 Pool A	Pool 2 Pool B	Pool 3 New Pool
0 objects	22 objects	18 objects	11 objects
	THIB0012	THIB0001	THIB0004
	THIB0013	THIB0002	THIB0031
	THIB0014	THIB0003	THIB0063
	THIB0015	THIB0005	THIB0092
	THIB0016	THIB0007	THIB0128
	THIB0017	THIB0010	THIB0129
	THIB0018	THIB0011	THIB0130
	THIB0023	THIB0066	THIB0133
	THIB0024	THIB0081	THIB0134
	THIB0025	THIB0091	THIB0135
	THIB0026	THIB0094	THIB0138
	THIB0027	THIB0121	
	THIB0028	THIB0122	
	THIB0029	THIB0123	
	THIB0058	THIB0124	
	THIB0059	THIB0125	
	THIB0060	THIB1012	
	THIB0061	THIB1125	
	THIB0062		
	THIB0063		
	THIB0064		
	THIB0065		

Measure Overview Table	This table shows the overview of the measures and their pools.

Pool	Coil Offset (Motor + Suspension)	fs (Impedance)	Re (Impedance)	Impedance (Impedance)
general	$\bar{x}$: - Min: - Max: - σ: - N: 0	$\bar{x}$: - Min: - Max: - σ: - N: 0	$\bar{x}$: - Min: - Max: - σ: - N: 0	N: 0
Pool A	$\bar{x}$: 0.263657 Min: -0.199856 Max: 0.883667 σ: 0.321618 N: 22	$\bar{x}$: 126.039 Min: 96.7033 Max: 527.068 σ: 89.971 N: 22	$\bar{x}$: 3.65267 Min: 3.59753 Max: 3.70719 σ: 0.0311027 N: 22	N: 22

For single values (and cross sections) the mean value ($\bar{x}$), minimum (Min), maximum (Max) and standard deviation (σ) are calculated. The number of test objects (N) with data is displayed for curve and single value measures.
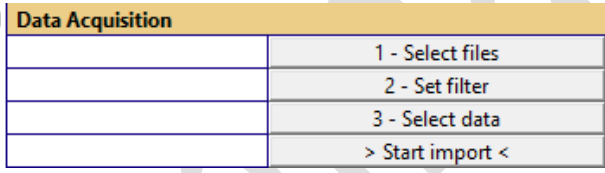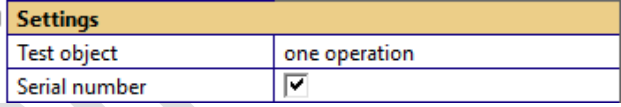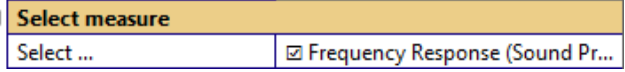
4 Limits

4.1 Limit Calculation

Limit Types	For each measure it is possible to select the limit types: • None (no limits) • Min+Max (minimum and maximum limit) • Max (only maximum limit)
Calculation Mode	The following modes are available to generate the limits: • Shift mask a shift is defined and applied to the mean curve • Sigma factor mask a factor for the standard deviation is applied to the mean curve

	• Absolute limits the limits are defined without further calculatio • Factor mask (mul) – only available for data not in dB or % a factor is applied to the mean curve Each calculation mode provides entry masks to input the limit definition. If the limit mode is not "None", the limit definition can also be entered graphically by using the CTRL (minimum limit) or SHIFT (maximum limit) with the left mouse button (LMB). The data points are automatically filled into the definition matrix.
Jitter	If jitter (horizontal widening) is active, the curve before the jitter is applied is also displayed to identify the impact of the jittering.

5   Parameters

5.1   Source Data

Data Acquisition	The buttons call *db extract* to select/define • input database files, • filtering options • result selection and All settings are stored in the STAT operation. No separate file is needed. **Data Acquisition** 1 - Select files 2 - Set filter 3 - Select data > Start import <
Settings	The parameters define the entity of a test object (please refer to section Introduction) and if the serial number shall be used, if it is found (currently only QC operations). **Settings** Test object — one operation Serial number — ☑

5.2   Processing

Apply settings…	**Refresh charts** Triggers a chart update. The button is frozen, if no update is required. **Apply settings…** > Refresh charts <
Select measure	Defines the measure for which the following settings, statistics definitions and limit setup are changed. **Select measure** Select … — ☑ Frequency Response (Sound Pr… The list of measures depends on the definition of the test object.
Settings	Defines general settings for a measure: • Activation/deactivation of a measure • Normalization (referring the data to a reference), for measures not in dB or % a relative normalization is available (display of deviation in percent) • Definition of reference pool – the reference pool is used for normalization and limit calculation • Resolution reduction

	Settings
	Activate ☑
	Normalize ☐
	Reference pool general
	Reduce resolution
Statistics	The category defines statistical settings. The content is depending on the data type (curve data with/without cross section, single value data).
	Statistics
	Minimum ☑
	Maximum ☑
	Mean ☑
	Base data ☐
	Standard deviation ☐
	Cross section ☑
	Histogram ☑
	• Type Density
	Normal distribution ☑
	Boxplot ☑
Limit Calculations	The limit calculation is activated and defined in this category.
	Limit calculation
	Limits … Min + Max
	Calculation mode Absolute limit
	Absolute min limit
	Absolute max limit
	Jitter

Find explanations for symbols at:

http://www.klippel.de/know-how/literature.html

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