

# QC Software Feature Overview

QC Version 1-6 | Rev 1.2 | 2018-08-01

## 1 QC System Feature Overview

Valid for QC Software Version 6 / dB-Lab version 210

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For details please see specifications under [www.klippel.de](http://www.klippel.de).

	QC STANDARD	QC BASIC	QC Stand-alone Software	QC tasks in R&D 210
<b>Measurements / Features of QC SYSTEM:</b>				
Amplitude frequency response	✓	✓	✓	opt.
Windowing of impulse response	✓	✓	✓	opt.
Phase response	✓	✓	✓	opt.
Mean level(s) in frequency band(s)	✓	✓	✓	opt.
Polarity	✓	✓	✓	opt.
Time delay	✓	✓	✓	opt.
Electrical impedance	✓	✓	-	opt.
Resonance frequency $f_s$	✓	✓	-	opt.
Loss factor $Q_{ts}$	✓	✓	-	opt.
Voice coil resistance $R_e$	✓	✓	-	opt.
Vented box parameters ( $Q_b, f_b$ )	✓	-	-	opt.
THD + Noise	✓	✓	✓	opt.
2 <sup>nd</sup> - 5 <sup>th</sup> order harmonics (IEC and IEEE standard)	✓	✓	✓	opt.
HOHD Higher Order Harmonics Distortion	✓	-	✓	opt.
Rub & Buzz, loose particle, loose connection & drop out detection	✓	✓	✓	opt.
Pass / Fail statistics	✓	✓	✓	✓
Limits calculated automatically	✓	✓	✓	✓
Flexible data export	✓	✓	✓	✓
Advanced limit algorithms (Jitter)	✓	✓	✓	✓
On- and Off-line statistics for yield and single value results, histogram analysis	✓	✓	✓	✓
External control of Klippel QC (IO-Monitor)	✓	✓	✓	✓
3 <sup>rd</sup> party audio interface in/output	✓	✓	✓	✓
Measurement without Klippel Analyzer hardware	-	-	✓	-
Real-time monitoring of microphone signal	✓	✓	✓	✓
IO Task (control digital interface, user interaction)	✓	✓	✓	-
Preconditioning Task (break-in, ferro-fluid conditioning)	✓	✓	✓	-
Klippel Analyzer hardware control (mic power supply, volt / current measurement)	✓	✓	-	✓

	QC STANDARD	QC BASIC	QC Stand-alone Software	QC tasks in R&D 210
Digital Interface (Results, Start switch)	✓	✓	-	✓
Ultra-fast testing (Speed Profile)	✓	-	✓	opt.
Stimulus shaping (Level Profile)	✓	-	✓	opt.
Input Signal Sharing using measured data from other tasks speeding up tests (KA3 only)	✓	-	✓	opt.
Ambient noise detection (2 <sup>nd</sup> microphone, considering test enclosure)	✓	-	✓	opt.
Measure noise attenuation of test enclosure	✓	-	✓	opt.
All linear T/S parameters	✓	-	-	opt.
Force factor Bl & moving mass M <sub>ms</sub> (added mass method)	✓	✓	-	-
Select golden reference units (on-line and off-line)	✓	-	✓	-
Manual sine sweep with waveform (fundamental and Rub&Buzz) and spectral analysis	✓	-	✓	opt.
Process indices C <sub>pk</sub> , P <sub>pk</sub> , p <sub>process</sub> control (Weco, Nelson rules)	✓	-	✓	opt.
Grading (multiple limits for grade classification)	✓	-	✓	✓

opt.: optional task; available with appropriate QC-task license

## 2 Optional Tasks and Features

	QC STANDARD	QC BASIC	QC Stand-alone Software	QC tasks in R&D 210
<b>Optional Task or Feature:</b>				
<b>HI-2 Option: Blat Distortion (Automotive)</b>				
Specially weighted harmonics distortion measure used in automotive industry	✓	-	✓	✓
<b>MHT Option: Meta-Hearing Technology</b>				
Isolated Defect Distortion (IDD) by active compensation of regular distortion	✓	-	✓	✓
<b>PNI Option: Production Noise Immunity</b>				
Full noise immunity (auto repeat + intelligent merging)	✓	-	✓	✓
<b>MSC Task: Motor-and-Suspension-Check</b>				
Voice coil offset $X_{off}$	✓	-	-	✓
Suspension asymmetry $A_{kms}$	✓	-	-	✓
Force factor limited displacement $X_{Bl}$	✓	-	-	✓
Compliance limited displacement $X_c$	✓	-	-	✓
<b>BAC Task: Balanced Armature Check</b>				
Armature offset	✓	-	-	✓
Linear parameters	✓	-	-	✓
High-speed testing < 1s	✓	-	-	✓
<b>ALD Task: Air Leak Detection</b>				
MODulated distortion - detect air leakage	✓	-	✓	✓
DETerministic distortion - detect driver defects	✓	-	✓	✓
Random distortion - detect loose particles	✓	-	✓	✓
Integration of MODulated and DETerministic distortion in SPL Task	✓	-	✓	✓
<b>ALS Task: Air Leak Stethoscope</b>				
Localize air leakage and other defects	✓	-	✓	✓
Auralization of defect symptoms	✓	-	✓	✓
<b>EXD Task: External Devices</b>				
High-level GPIB support (IEEE 488 & 488.2)	✓	-	✓	✓
Control and include external measurement instrumentation equipment	✓	-	✓	✓
Flexible test sequence	✓	-	✓	✓
<b>EQA Task: Equalization + Alignment</b>				
Automatic source equalization (level profile)	✓	-	✓	✓
Manual and automatic alignment of voltage / level	✓	-	✓	✓
Manual and automatic alignment of frequency response	✓	-	✓	✓

	QC STANDARD	QC BASIC	QC Stand-alone Software	QC tasks in R&D 210
<b>LST Task: Linear Suspension Test</b>				
Suspension part & passive radiator testing	✓	✓	-	✓
Resonance frequency of suspension part $f_0$	✓	✓	-	✓
Loss factor of suspension part $Q_0$	✓	✓	-	✓
Effective stiffness $k_0$ and compliance $c_0$	✓	✓	-	✓
Measure large parts using SPM hardware bench	✓	✓	-	✓
Mass deviation $\Delta m$ (LST Pro only)	✓	✓	-	✓
Stiffness deviation $\Delta k_0$ (LST Pro only)	✓	✓	-	✓
<b>MSP: Match-Speaker-Tool</b>				
Find best matching pairs from pool of speakers	✓	✓	✓	✓
Find best matching DUTs to target curve	✓	✓	✓	✓
<b>SYN Option: External Synchronization</b>				
Synchronize measurements with 3 <sup>rd</sup> party audio devices (e.g. Bluetooth)	✓	-	✓	✓
Measure stand-alone sound sources	✓	-	✓	✓
Cope with varying delays	✓	-	✓	✓
WAVE export of stimulus sequence	✓	-	✓	✓
WAVE import and analysis of recorded responses	✓	-	✓	✓
Use stimulus or unique noise ID for synchronization	✓	-	✓	✓
<b>TSX Option: Laser-based T/S Parameter Measurement<sup>1)</sup></b>				
Full T/S parameter set based on one-step laser displacement measurement	✓	-	-	✓
Force factor $Bl$ & moving mass $M_{ms}$	✓	-	-	✓
State of the art speaker modeling incl. advanced suspension creep fitting	✓	-	-	✓

<sup>1)</sup>This feature requires KA3 hardware

### 3 Version Overview for General QC Software Features

Always latest version of major QC version is considered.

Feature	QC Version				
	2	3	4	5	6
<b>OS / Database related</b>					
Windows XP compatibility	✓	✓	✓	✓	
Windows 7 compatibility		✓	✓	✓	✓
Windows 8 compatibility			✓	✓	✓
Windows 10 compatibility				✓	✓
New database format (kdbx based on SQL)			✓	✓	✓
<b>Tools / Help</b>					
Automatic Backup for test setups and configurations	✓	✓	✓	✓	✓
IO-Monitor Interface (external control interface)	✓	✓	✓	✓	✓
Performance log to check duration and distribution of test time	✓	✓	✓	✓	✓
Auto-detect & Auto-repeat		✓	✓	✓	✓
Flexible IO control / integration (trigger tests, assign verdicts to output pins)		✓	✓	✓	✓
German language support	✓	✓	✓	✓	✓
Spanish and Portuguese language support		✓	✓	✓	✓
Chinese language support			✓	✓	✓
Import Settings (on- /offline) and Limits			✓	✓	✓
Log of all changes on setup and reference history			✓	✓	✓
Collect Operations (merge many tests into one database)			✓	✓	✓
Additional Feature Library framework for customization				✓	✓
Live-monitoring of microphone signal				✓	✓
Manual Sweep: live analyzer w/ waveform, spectrum, signal characteristics				✓	✓
Online detection of new Golden DUT				✓	✓
Batch file execution after test (calling external software)*				✓	✓
Text file result logging (export of test results in plain text files)*				✓	✓
Validation of serial numbers*				✓	✓
Sequence control (conditional skip, repeat tasks)*				✓	✓
Batch execution comprising multiple QC operations, verdict collector for batch					✓
<b>Measurement Features</b>					
Input EQU in SPL and SPL-IMP task	✓	✓	✓	✓	✓
Save and reload captured signals as wave files		✓	✓	✓	✓
Check individual frequency points, Phase, SNR, U, I in impedance		✓	✓	✓	✓
User-defined, frequency dependent Rub&Buzz filter (high and low pass)			✓	✓	✓
Difference Task for stereo deviation tests			✓	✓	✓
Band level measure in SPL and SPL+IMP task				✓	✓
Vented box parameter fitting ( $f_b$ , $Q_b$ )				✓	✓

Feature	QC Version				
	2	3	4	5	6
Minimal impedance value				✓	✓
User defined windowing of frequency response				✓	✓
Resonance frequency from frequency response (e.g. piezo transducer) *				✓	✓
Square wave stimulus*				✓	✓
Stepped sine stimulus*					✓
Relative Rub&Buzz in %, dB or normalized to level or fundamental					✓
Normalized frequency response (level, Golden DUT, reference DUT average)					✓
Input Signal Sharing using measured data from other tasks speeding up tests					✓
Reprocess stored wave files with modified setup (batch)					✓
<b>Limit Features</b>					
Limit mode for frequency response: Best fit		✓	✓	✓	✓
Multiple limits for grading			✓	✓	✓
Limit mode for Rub & Buzz: Relative to average level				✓	✓
<b>Hardware</b>					
Production Analyzer hardware with USB only interface		✓	✓	✓	✓
Testing with 3rd party audio devices			✓	✓	✓
Klippel Analyzer 3 hardware					✓
<b>Statistics</b>					
Off-line / Yield Statistics (YST)		✓	✓	✓	✓
On-line production yield (overall and individual verdicts)				✓	✓
Process control: Nelson, Weco or customized rules				✓	✓

\*Feature Libraries, see manual for more info

## 4 Version Overview for Optional Tasks, Modules and Features

Feature	QC Version				
	2	3	4	5	6
MSC Motor an Suspension Check	✓	✓	✓	✓	✓
MHT Meta Hearing Module	✓	✓	✓	✓	✓
MST Match Speaker Tool	✓	✓	✓	✓	✓
PNI Noise Immunity Module	✓	✓	✓	✓	✓
ALD Leak Detection Module	✓	✓	✓	✓	✓
LST Linear Suspension Test		✓	✓	✓	✓
LST Linear Suspension Test update (with microphone, up to 18")				✓	✓
EXD External Devices		✓	✓	✓	✓
SYN External Synchronization (Bluetooth, Playback only devices)			✓	✓	✓
BAC Balanced Armature Check			✓	✓	✓
CST Curve Statistics			✓	✓	

ALS Air Leak Stethoscope				✓	✓
EQA Equalization and Alignment				✓	✓
STAT Statistics					✓
HI-2 Specially weighted harmonics distortion measure used in automotive industry					✓
TSX Laser based T/S Parameter (Bl, Mms)					✓

\*Additional Modules and Features are fee / license based