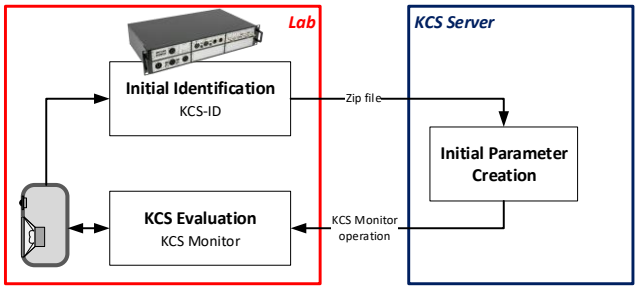
KCS-ID Parameter Identification S66

Document Revision 1.06

FEATURES

- Create a full parameter set required by *KLIPPEL Controlled Sound Technology (KCS)* comprising linear, nonlinear and thermal speaker parameters
- Automatic determination of the speaker's working range
- Support of electrodynamic transducers operated in free air or sealed, vented or passive radiator systems of any size



DESCRIPTION

The *KCS-ID Parameter Identification* is a measurement module which is required for creating initial speaker parameters for the ***KLIPPEL Controlled Sound Technology (KCS).*** *KCS-ID* uses a multi-tone stimulus to excite a loudspeaker and measures electrical voltage, current and optionally laser and microphone signals.

The signals recorded by KCS-ID are sent to the *KLIPPEL KCS Server* which automatically creates initial data for the particular KCS hardware platform. This data is provided via a *KCS Monitor* operation which is used in the dB-Lab framework. The *KCS Monitor* can connect to any supported KCS hardware platform and a control session can be started.

Article number	8001-140

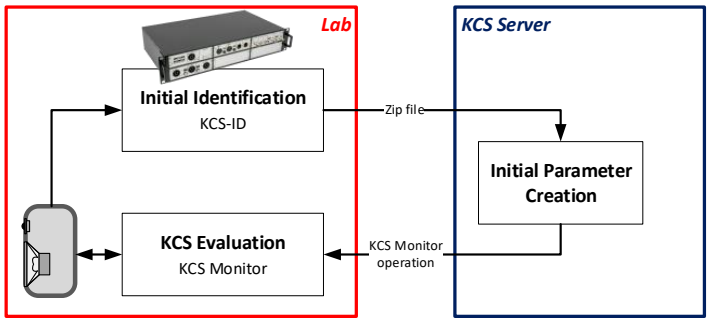
CONTENT

1 Overview

1.1 Components

KCS-ID Parameter Identification Software Module	Software module running on the PC in the *Klippel dB-Lab* framework.

1.2 Steps for creating Initial Data for KCS



1. Running *KCS-ID Parameter Identification*	Running the *KCS-ID* measurement to record sensor signals at the speaker's full working range.
2. Sending Data to KCS server	Uploading a zip file comprising measurement signals and setup parameters. The KCS Server creates initial data automatically. The calculation time is usually below 5 minutes.
3. Downloading initial data	Download a *KCS Monitor* operation from the KCS server.
4. Running KCS	The *KCS Monitor* software module running in the Klippel dB-Lab framework on a PC are used to connect to the KCS hardware device and to setup and start a KCS control session.

1.3 KCS-ID Measurement sequence

The *KCS-ID* module is performing multiple measurements consecutively to determine the maximum safe working range of the speaker and for creating the optimal stimulus for parameter identification.

1. LINEAR MODE	Small signal parameters are identified and the optimal settings for the following measurements are determined.
2. ENLARGEMENT MODE	The excitation level is incrementally increased to approach a user-defined limit such as peak excursion, impulsive distortion or voice coil temperature.
3. NONLINEAR MODE	The speaker is excited by a signal targeting a voice coil excursion which corresponds approximately to its maximum working range in the final application. The full parameter identification for running KCS is based on this measurement.
4. THERMAL MODE	If the voice coil heating was too low in the NONLINEAR MODE, a THERMAL MODE is performed to heat up the voice coil to identify thermal parameters.

1.4 Limits

The excitation voltage is incrementally increased in the ENLARGEMENT MODE until a limit parameter is reached. Following limit parameters are available:	
X target	*(Laser recommended)* Maximum absolute peak excursion which shall be achieved in the KCS on-line processing. If a laser is used, the peak displacement value is measured by a laser sensor. If no laser is used, it is calculated by a linear speaker model and a Bl(X=0) import. Note that in this case, the displacement value can differ significantly from the real voice coil excursion as it depends on a manual Bl(X=0) import and only uses a linear speaker model.
Impulsive Distortion	*(Microphone required)* Impulsive distortion is identified by exploiting out-of-band distortion in the sound pressure signal. Two parameters indicating excessive impulsive distortion/Rub&Buzz issues are used: The IDR_{MT} (*Impulsive Distortion Ratio* according to IEC 60268-21 for multi-tone stimuli) limit is the ratio between peak higher order distortion and mean SPL. To be sensitive to very audible short impulsive distortion peaks with low energy (such as beating wires), the crest factor CID_{MT} of the out-of-band distortion is calculated. High IDR_{MT} or CID_{MT} values indicate that the speaker is working above its safe working range.
Coil temperature	The measurement is stopped if a certain maximum voice coil temperature increase (relative to the voice coil temperature during the LINEAR MODE) is detected.

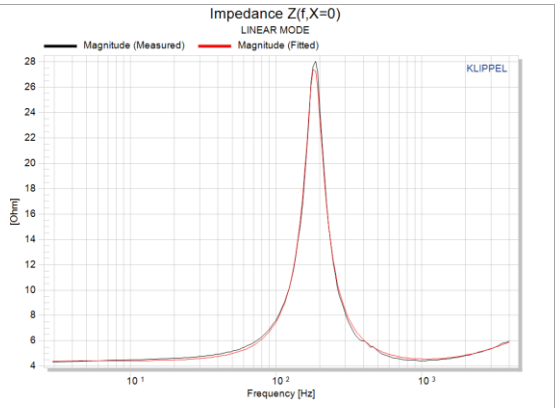
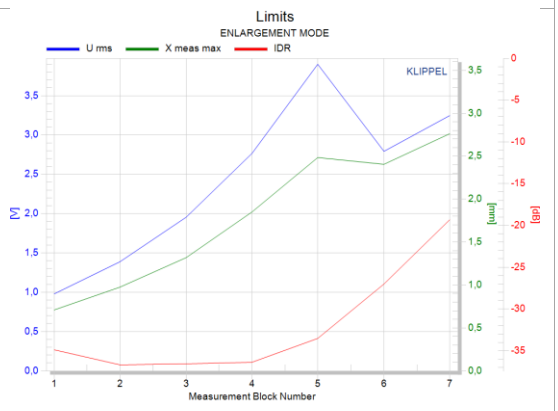
2 Customizing Setup

Driver	
Speaker System Type	sealed box / sidefire speaker
Target Bandwidth	fullrange
Bl(0)	
Stimulus	
Level	Automatic
• Start Voltage	1
Limits	
☐ X target	1
☑ Impulsive Distortion	Automatic Limits
• IDR max	-16
• CID max	20
Coil Temperature	90
Peripherals	
Laser Connected	☑
Microphone Connected	☑
KA3 Routing	
Output Channel	OUT 1
Speaker Channel	Speaker 1
Microphone Channel	IN 1
Advanced	
Save Intermediate Results	☐
Initial KCS Data Creation	
KCS Hardware Platform	Nuvoton NAU83G20
Path	
	Save KCS Server File
	Open KCS Server

Driver	Setting the correct speaker type and its target bandwidth is required for parameter identification. KCS-ID supports the most common loudspeakers covering free air, sealed, sidefire, vented and passive radiator systems. Bl(0) can be imported if no laser measurement is performed. If a laser is connected, Bl(0) is identified automatically on the KCS Server. If no Bl(x) can be determined, KCS-ID sets a default value of Bl(X=0) = 1 N/A.
Stimulus	Set the properties of the stimulus, such as bandwidth and voltage. Automatic modes for stimulus settings and voltage determination are available and recommended.
Limits	The Limit parameters define the maximum working range of the driver. If any limit is exceeded, the excitation voltage is not increased any more. It is recommended to never switch off the *Impulsive Distortion* limit.
Peripherals	Define which optional sensors are connected (Laser, Microphone). These settings influence available *Limits* options.
Routing	Set hardware routing settings for the KA3.
Advanced	This section provides features which are useful for performing faster experiments and for saving additional data.
Initial Data Creation	Select the target platform for which the KCS Initial Data shall be created. These options can be changed before or after the actual measurement, but must be set prior to exporting the KCS server file. KCS will not work if the incorrect platform is specified. Save the measurement data to a file and open the KCS Server to create initial data.

3 Results

The *KCS-ID* module is providing time signals and spectra of all measured signals (voltage and current; optionally sound pressure and displacement). In addition, it displays a small set of speaker parameters.

Impedance	This window displays the magnitudes of the measured electrical impedance at the speaker terminals and the fitted impedance. The latter is calculated using linear speaker model parameters which are automatically identified based on the measured impedance in the LINEAR MODE.	
Signals	Measured signals and spectra (voltage, current, sound pressure, displacement).	
Speaker Parame-ters	This table shows a selected set of linear parameters which are identified in the LINEAR MODE. All warnings and errors are shown in this window.	**Small Signal Parameters (LINEAR MODE)** R_e 3.68 Ω Voice coil resistance f_c 214.8 Hz Resonance frequency of sealed box system Q_{tc} 0.98 Total Q-factor at f_c, considering R_e and R_{mc}
States	This table displays the state of the measurement. This includes e.g. meas-urement mode overview, transducer states and sensor signal characteristics such as peak and RMS voltage, current, displacement and signal-to-noise ratios	**Measurement Status** 1 LINEAR MODE PASS 2 ENLARGEMENT MODE PASS 3 NONLINEAR MODE PASS 4 THERMAL MODE PASS ID 93F0-05A0 Identification number of this measurement **Subject to Limits** IDR_{MT} -26.42 dB Relative impulsive distortion ratio (IEC 60268-21) (ENLARGEMENT MODE) CID_{MT} 14.42 Crest Factor of impulsive distortion (IEC 60268-21) (ENLARGEMENT MODE) $X_{meas,max}$ 2.04 mm Maximum voice coil excursion measured by laser (NONLINEAR MODE) $\Delta T_{v,max}$ 29.5 K Maximum increase of voice coil temperature **Signals (NONLINEAR MODE)** P_{real} 1.886 W Real electrical input power u_{peak} 11.082 V Peak value of the electrical voltage at the transducer terminals i_{peak} 2.189 A Peak value of the electrical input current u_{rms} 3.274 V RMS value of the electrical voltage at the transducer terminals i_{rms} 0.642 A RMS value of the electrical input current $x_{peak,laser}$ 2.040 mm Positive peak value of voice coil excursion (laser) $x_{bottom,laser}$ -1.856 mm Negative peak value of voice coil excursion (laser) $x_{dc,laser}$ 0.030 mm Dc component of voice coil excursion (laser) $L_{i,SNR}$ 75.1 dB Signal-to-noise ratio of current signal $L_{u,SNR}$ 67.3 dB Signal-to-noise ratio of voltage signal $L_{x,SNR}$ 66.1 dB Signal-to-noise ratio of laser signal $L_{p,SNR}$ 60.6 dB Signal-to-noise ratio of microphone signal
Limits	This chart shows the history of the de-fined limits displacement, IDR and volt-age of the ENLARGEMENT MODE.	

4 Requirements

4.1 Hardware		
Analyzer	Klippel Analyzer 3 (KA3)	
Amplifier [optional]	External amplifier to drive the device under test. Note: The KA3 can be purchased with an internal amplifier card which can be used for smaller speakers.	
Microphone [optional]	Measurement microphone (XLR or BNC) to capture the sound pressure of device under test.	
Laser [optional]	Laser triangulation sensor measuring voice coil excursion	
4.2 Software		
dB-Lab (>210.710)	Project management software of the KLIPPEL measurement system.	
KCS Monitor	Software modules for connecting and communicating with a KCS platform.	

5 References

5.1 Related Products	[S73] KCS Monitor
5.2 Specification	[S73] KCS Monitor
5.3 Manuals	KCS Monitor