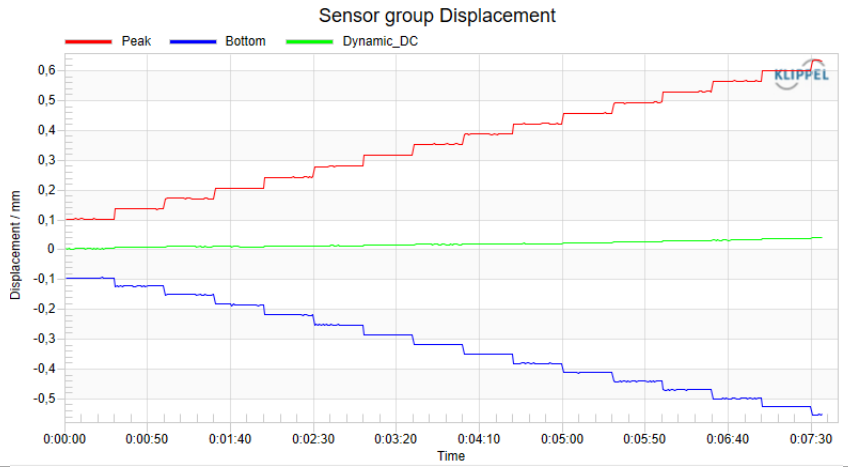
Using Laser Sensors with KET AN83

Application note for the KLIPPEL ANALYZER SYSTEM (Document Revision 1.0)

FEATURES AND BENEFITS

- Monitoring of displacement envelope with long-term, power, and accelerated life tests
- Correlate power, excursion, and other sensors (e.g. temperature, humidity)
- Automated export file for fast analysis



DESCRIPTION

The *KLIPPEL Endurance Test* (KET) provides an effective hardware and software solution for conducting multi-channel long-term, power, and accelerated life tests. The application note describes an enhancement to KET by adding laser-based monitoring of driver displacement. Integration is achieved easily by using an external script, which enables KET measurements with peak, bottom, and dynamic DC offset displacement over time.

CONTENT

1 Overview 2

2 Requirements 3

3 General Work Flow 4

4 Troubleshooting 6

5 References 7

1 Overview

1.1 Principle

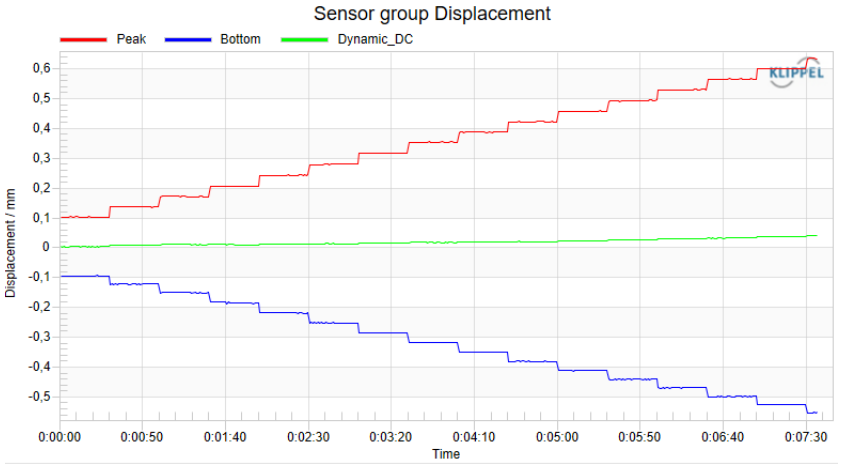
KET is a multichannel test system for monitoring long-term tests. The module has support for external sensors via an API. The application note describes a script that uses the API to provide displacement measurements of a loudspeaker. In this context, peak displacement refers to the maximum measured displacement over a one-second interval, while bottom displacement refers to the minimum measured displacement over the same period. Dynamic DC offset, representing a shift in the rest position during the measurement, is calculated as the numerical mean of the peak and bottom values.

$$DC = \frac{peak + bottom}{2}$$

1.2 Results

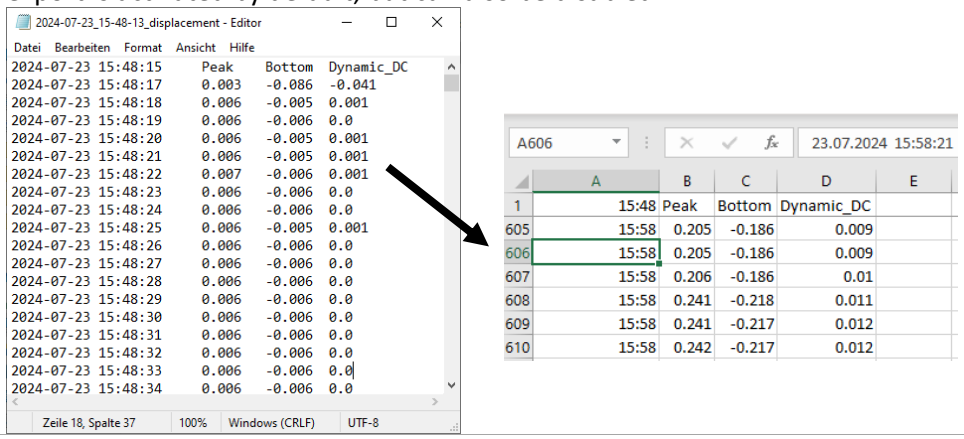
Displacement - KET

Peak, Bottom displacement and dynamic DC offset of the voice coil are displayed together in one axis.



Displacement - Excel-compatible text file

Displacement values are exported to a text file in an excel-compatible format. The export is activated by default, but can also be disabled.



2024-07-23_15-48-13_displacement - Editor

Datei Bearbeiten Format Ansicht Hilfe

	Peak	Bottom	Dynamic_DC
2024-07-23 15:48:15			
2024-07-23 15:48:17	0.003	-0.086	-0.041
2024-07-23 15:48:18	0.006	-0.005	0.001
2024-07-23 15:48:19	0.006	-0.006	0.0
2024-07-23 15:48:20	0.006	-0.005	0.001
2024-07-23 15:48:21	0.006	-0.005	0.001
2024-07-23 15:48:22	0.007	-0.006	0.001
2024-07-23 15:48:23	0.006	-0.006	0.0
2024-07-23 15:48:24	0.006	-0.006	0.0
2024-07-23 15:48:25	0.006	-0.005	0.001
2024-07-23 15:48:26	0.006	-0.006	0.0
2024-07-23 15:48:27	0.006	-0.006	0.0
2024-07-23 15:48:28	0.006	-0.006	0.0
2024-07-23 15:48:29	0.006	-0.006	0.0
2024-07-23 15:48:30	0.006	-0.006	0.0
2024-07-23 15:48:31	0.006	-0.006	0.0
2024-07-23 15:48:32	0.006	-0.006	0.0
2024-07-23 15:48:33	0.006	-0.006	0.0
2024-07-23 15:48:34	0.006	-0.006	0.0

Zeile 18, Spalte 37 100% Windows (CRLF) UTF-8

A606 23.07.2024 15:58:21

	A	B	C	D	E
1	15:48	Peak	Bottom	Dynamic_DC	
605	15:58	0.205	-0.186	0.009	
606	15:58	0.205	-0.186	0.009	
607	15:58	0.206	-0.186	0.01	
608	15:58	0.241	-0.218	0.011	
609	15:58	0.241	-0.217	0.012	
610	15:58	0.242	-0.217	0.012	

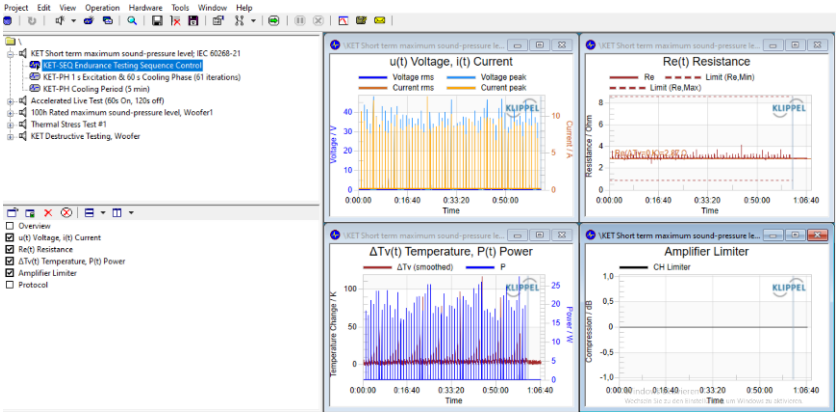
2 Requirements

2.1 Hardware

KET installation	See TN16-Klippel Endurance Test HW setup or KET-Manual for details.
Laser Sensor	Laser head and laser controller from Keyence® LKG5000 laser-series. See A2 Laser Displacement Sensors for details. Lasers of a different type are currently not supported. 

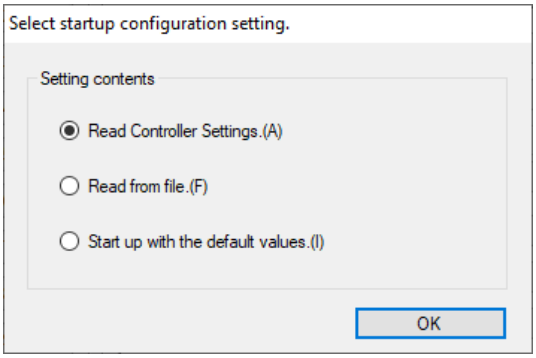
PC / Network	A Windows PC is required to operate the KLIPPEL software. See separate KLIPPEL PC Requirements for further information. The following options are available for connecting the laser controller:
	USB Connection (recommended):
	• USB-Type-B-cable
	Ethernet Connection (optional):
	• One-to-One connection with Ethernet crossover cable, Category 5
	• Connection with a Hub:
	  ○ Support of 100BASE-TX or 10BASE-T required
	  ○ Ethernet cable for connection between controller and hub or PC and hub

2.2 Software

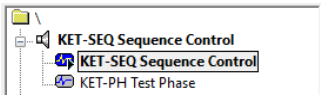
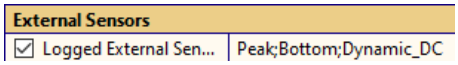
dB-Lab / KET	Klippel Frame Software executing tests, included in KET-solution 
Dante® Interface	A virtual or physical Dante® compatible soundcard is required. A license for the DVS (Dante® Virtual Soundcard) is included in the KET package by request.
KET Dashboard	Overview and control of all running tests, included in KET-solution
License	A software license enables the operation of a defined number of channels that can be operated in parallel.
LK-Navigator 2 software	LK-Navigator 2, Configuration Software for configuration of LK-G5000 Series laser controller. The LK-Navigator 2 is not included with LK-G5000 Lasers Sets bought from Klippel. It has to be ordered separately.

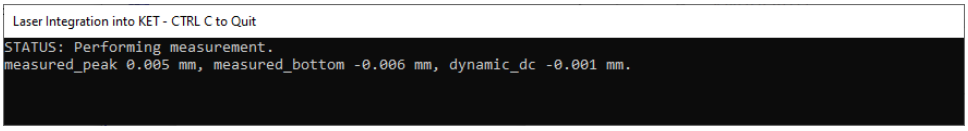
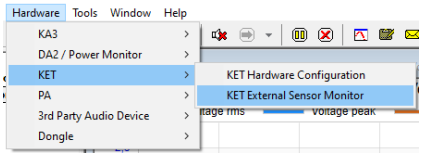
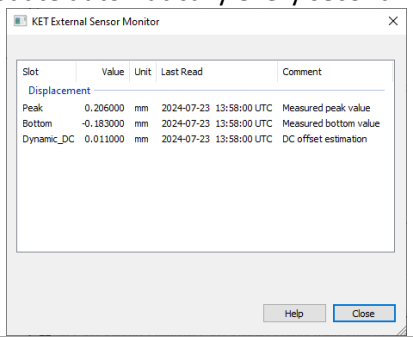
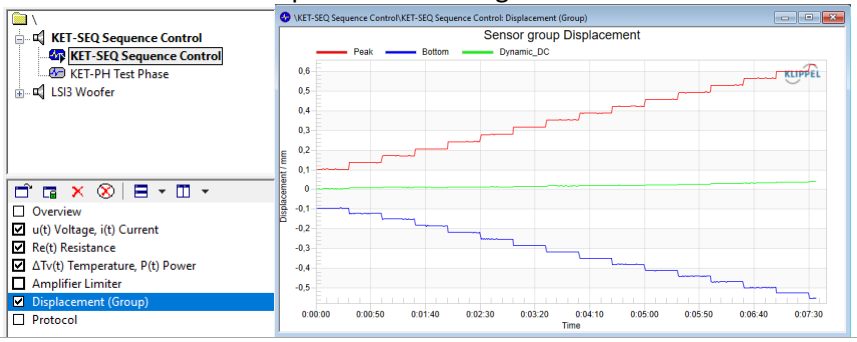
3 General Work Flow

3.1 Setup

Laser Unit	The laser head must be connected to the “Head 1” port on the controller. After switching on the controller, the distance between the laser head and the driver must be adjusted until the LED on the laser head turns green.
General	LK-Navigator 2 software from Keyence® allows users to check and modify the network settings of a laser head. The following steps are required to configure the network settings: **Connect the laser:** • Connect a USB cable between PC and the controller **Read Controller Settings:** • Start the LK-Navigator 2 software • Ensure that "Read Controller Settings (A)" confirms that the settings have been received from the controller • If the reading of the settings is successful, no further setup is required  It is recommended to configure the laser setup via USB mode. Alternatively, the laser setup can be set via a crossover Ethernet cable. Details can be found in the Troubleshooting section.

3.2 Measurement Configuration

KET Sequence	Prepare KET sequence, as described in the KET-Manual 
KET External Sensor	The laser is registered in KET as an external sensor group, comprising three sensors: peak displacement, bottom displacement, and dynamic DC offset. For each corresponding test phase of the KET sequence, enable the logged external sensors in the properties window by the following: *Peak; Bottom; Dynamic_DC* 

Start laser_ket.exe script 	The *laser_ket.exe* script adds laser support to KET via External Sensor Storage interface. It performs the following functions: • Initializes, configures the laser and manages the measurement process • Updates KET with measured peak, bottom, and dynamic DC offset values every second • Exports measurement data to a log file To start measurement, simply double-click the executable file. Additionally, following command-line options can be specified when launching the script from a terminal: --noLogFile • Suppresses the creation of a debug log file in the log folder --noExport • Prevents the export of measurements (peak, bottom, and DC offset) to an external file in the log folder --noOverwrite • Prevents overwriting the LKG5000 settings on program number 0 at startup --ip_address "XXX.XXX.XXX.XXX" • Specifies IP address of the control unit for an Ethernet connection. If not provided, the script will attempt to connect via USB After execution following screen should be obtained after a few seconds: 
Check KET External Sensor	If everything is set up correctly, user should be able to find the laser sensor group in the KET External Sensor interface within dB-Lab at Hardware -> KET -> KET External Sensor Monitor. The screen should update automatically every second.  
Sequence control	After start of measurement sequence, the window “Displacement (group)” should be available and will update itself during the measurement. 

4 Troubleshooting

Limitations	• Supports only one laser head on a controller, so only one script can be opened. Both processing blocks on the controller are used for one channel (peak, bottom) calculation. • An alert occurs during offset measurement when the peak-to-peak displacement is high. Possible causes include a running measurement when initiating the *laser_ket* script or vibrations. • Dynamic DC offset is a numerical mean of peak and bottom, not an averaged calculation of time signal • No dedicated calibration of the laser sensor
Cautions	• The LKG5000 laser supports different programs for settings. The script overwrites program number 0 with the Klippel base settings for LKG5000 series. • If script is not terminated properly, the KET-specific settings may persist and affect other measurements. To resolve this, use the Keyence Laser Settings tool of dB-lab and select the desired settings.

Ethernet Mode	The following describes the procedure for configuration via Ethernet cable. Certain IP settings are changed in the process. Please consult your IT team so that you do not overwrite the IP addresses of your Mezzo amplifiers and your setup no longer works!
	• Connect a crossover Ethernet cable and cable between PC and the controller
	• Modify Network Settings:
	  ○ Navigate to Controller Environment settings
	  ○ Take note of the controller's IP adress, Subnet and Gateway
	  ○ Configure the Windows IP settings for the Ethernet port used to connect with the controller. IPV4 Settings should match between PC and controller. Refer to Network Settings below if you need assistance with settings.
	• Configure Communication Settings:
	  ○ Navigate to Communication settings (O) -> PC Communication settings (C)
	  ○ Select Communicate with Ethernet and specify the controller's IP address, as defined in the Network Settings below
	• Press OK to establish the connection

Network Settings	• On the PC, open settings for Ethernet port used for connection with the controller:
	  ○ Go to Control Panel -> Network and Sharing Center -> Change adapter settings.
	  ○ Right-click on the Ethernet connection and select Properties.
	  ○ Select Internet Protocol Version 4 (TCP/IPv4) and click Properties.
	• Select Manual assignment to IPV4, and configure the following settings:
	  ○ IP address: Enter IP address similar to the controller's IP, but with a different last number.
	  ○ Subnet mask: Enter the same subnet mask as the controller (e.g. 255.255.255.0).
	Default gateway: Enter the same gateway as the controller.

5 References

5.1 Manuals	• KET – Klippel Endurance Test – Online Manual
5.2 Specifications	• TN16 – KET-Klippel Endurance Test HW Setup • A2 – Laser Displacement Sensors • LK-Navigator 2, Configuration Software

Find explanations for symbols at:

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

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