Distortion Analyzer 2 (Rev. >= 2.1) **H1**

Digital Processor Unit of the KLIPPEL R&D SYSTEM

FEATURES

- Two-channel line input (with Phantom or IEPE microphone power supply)
- Two channel line output (AC switch for DC blocking)
- Two channel voltage and current measurement for loudspeakers
- High performance SNR > 100 dB
- Sampling rate up to 96 kHz
- Platform for laser sensor heads
- Hosting various measurement modules
- Stand-alone operation
- Computer-controlled operation Fast, hot plug USB interface
- Automatic firmware update
- Memory for long-term measurements
- 19” / 1U rack mountable

Distortion Analyzer 2 is the hardware platform for the measurement modules performing the generation, acquisition and digital signal processing in real time. The analyzer can be operated as a stand-alone unit by using the key pad and the display. Connecting a computer via USB-interface the computer software dB-Lab can be used to control the unit and visualize the results. The hardware hosts a high performance digital signal processor for demanding calculations and a two channel accurate 24 Bit AD/DA converter with a sampling frequency up to 96 kHz. In addition two power signal lines for driving loudspeakers can be analyzed using current / voltage sensors for up to 240V / 50A. A variety of displacement sensors can be connected to the hardware to analyze excursion signals in parallel to voltage and current of the driver under test.

The Distortion Analyzer 2 has a built in microphone power supply for direct connection of Phantom or IEPE powered microphones. The current routing of the input circuit is visualized with LEDs on the front.

Article Number:	Device	Variants	Modifications
	2000-002	“Default”	-
		“High Power”	6000-110
		“High Current”	6000-111
		“High Sensitivity”	6000-112
		“Very High Sensitivity”	6000-113

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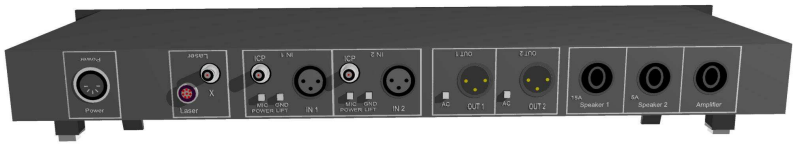
Front

Display	Alphanumeric LCD display (Back-lighted)
←, →, ↑, ↓	Arrow keys for cursor navigation (left, right, up and down)
ENTER	Key for starting an operation, confirming data, or going to a sub menu
ESC	Key for quitting a sub menu and loading the upper menu level
RED KEY	Key to stop the current measurement
USB	Connector to USB port of Windows compatible PC or hub.
Power Switch	Main power switch (switch off/on, hardware reset)

Rear



Power	Input from switching mode power supply
Laser	To the 8 pin-coax socket at the rear side a Laser Displacement Sensor can be connected. Power is provided by the Distortion Analyzer hardware.
X	The BNC connector at the rear side provides the displacement output signal if a Laser Displacement sensor is connected to the Distortion Analyzer 1.
IEPE 1,2	External Microphone input with built in IEPE compatible power supply. Microphone Power switch must be pressed. If any BNC plug is connected to the IEPE input, the routing is automatically changed to the IEPE input. IN 1 or 2 is switched off in this case.
IN 1,2	External analog line input 1 can receive signals by using pin 2 (+) and 3 (-) for symmetric signals and pin 1 for ground. For supplying an asymmetric input signal to one of the signal pins the other input pin must be connected to ground.
Mic Power switch	Press to power the input for connected microphones. If pressed, 48V phantom powered microphones may be connected to IN1 as well as IEPE powered microphones to the BNC socket. An indicator LED on the front side is representing the state of the Mic Power Switch and the routing to IN1 or to the IEPE input. Note: If a BNC plug is connected to the IEPE input, the input routing is automatically switched to the IEPE signal path. You must disconnect the BNC plug from the IEPE input to get the signal from a phantom powered microphone. Attention: Make sure that all equipment is capable of withstand 48V DC if using microphone power.
Ground Lift switch	If pressed, the ground (Pin1) is not connected to the system ground. This is good for breaking ground loops.
OUT 1,2	The XLR line output connector OUT 2 provides a symmetric analog output signal at pin 2 (+) and 3 (-) and ground at pin 1. If asymmetric output is required use pin 2 for signal (positive) and Pin 3 as ground. Short Pin3 to Pin1 to obtain the same output voltage as in balanced mode and for best noise suppression.
AC switch	Press AC switch for blocking DC output voltages. By default the outputs are DC coupled.
Fuse Speaker 1	Replaceable speaker channel 1 fuse according to the selected hardware version.
Speaker 1	The SPEAKON® output connector SPEAKER 1 is to be connected to the terminals of the first loudspeaker under test by using pins 1+ and 1- of the loudspeaker cable. The pins 2- and 2+ of the connector are used to sense the voltage at the loudspeaker terminals.
Fuse Speaker 2	Replaceable speaker channel 2 fuse according the selected hardware version.
Speaker 2	The SPEAKON® output connector SPEAKER 2 is to be connected to the terminals of the second loudspeaker under test by using pins 1+ and 1- of the loudspeaker cable. The pins 2- and 2+ of the connector are used to sense the voltage at the loudspeaker terminals. Speaker 2 channel is configured as sensitive current channel with a maximum rms current (continuously) of 5A.
Amplifier	The SPEAKON® input connector AMPLIFIER is to be connected with the output of the power amplifier. The signals supplied to pins 1- and 1+ will be provided to the Speaker 1 connector. The signal at the pins 2- and 2+ provide the signal to the Speaker 2 connector.

Electrical Characteristics

Parameter	Symbol	Min	Typ.	Max	Unit
Analog Inputs					
Input voltage (peak to peak, symm.)	U_{in}			16	V
Input voltage swing	$U_{in,\ sw}$	-4		4	V
Input impedance	R_{in}		10		kΩ
Input frequency range	f_{in}	DC		43.6	kHz
Frequency Response (at 40kHz)			-0.2	-0.3	dB
THD+Noise at 1 kHz (BW: 24 kHz)		94	100		dB
Input crosstalk attenuation		100			dB
Analog Outputs					
Output Voltage (peak to peak, symm.)	U_{out}			20	V
Output Voltage swing (peak)	$U_{out,\ sw}$	-5		5	V
Output Impedance	R_{out}		50		Ω
Output Frequency Range	f_{out}	DC		43.6	kHz
Frequency Response (at 22.05 kHz)			-0.4	-0.5	dB
THD+Noise at 1 kHz (BW: 24 kHz)		94	100		dB
Output Crosstalk Attenuation		100			dB
AC Switch –3 dB cutoff (-6 dB / octave)	$f_{AC,Out}$		0.15		Hz
Speaker 1 and Speaker 2 (default version)					Article 2000-002
Speaker 1: 50 A_p / 0 Ohm (15 A_{RMS})					
Recommended for Re	R_e		2..8	1)	Ω
Current, peak	$I_{peak,CH1}$			50	A
Current, rms 10s max. (sine)	$I_{rms,10s,CH1}$			25	A
Current, rms (sine, continuous)	$I_{rms,CH1}$			15	A
Fuse 15A (Manufacturer: Littelfuse)	*Type:* 313.015 = default (slow-blo®), 312.015 = alternative (fast acting)				
Fuse Resistance	R_{Fuse}	5.0 (default), 5.2 (alternative)			mΩ
Resistance primary (current sensor)	$R_{p,CH1}$			<0.5	mΩ
Noisefloor (20Hz..24kHz)	L_N *(re 1A)*		-50		dB
Dynamic Range (20Hz..24kHz)	$DR_{I,CH1}$		80		dB
THD, current (1.5A_{RMS} / 1 kHz)	$THD_{I,CH1}$		-75		dB
THD, current (15A_{RMS} / 1 kHz)	$THD_{I,CH1}$		-55		dB
Speaker 2: 0.5 A_p / 0 Ohm (0.5 A_{RMS})					
Recommended for Re	R_e		2..30	1)	Ω
Current, peak (best SNR below 0.5A_{peak})	$I_{peak,CH2}$		0.5	5	A
Fuse 5A (Manufacturer: Littelfuse)	*Type:* 313.005 = default (slow-blo®), 312.005 = alternative (fast acting)				
Fuse Resistance	R_{Fuse}	21.4 (default), 22.4 (alternative)			mΩ
Resistance primary (current sensor)	$R_{p,CH2}$			<12	mΩ
Noisefloor (20Hz..24kHz)	L_N *(re 1A)*		-66		dB
Dynamic Range (20Hz..24kHz)	$DR_{I,CH2}$		60		dB
THD, current (0.5A_{RMS} / 1 kHz)	$THD_{I,CH2}$		-70		dB
Speaker 1 & 2:					
Current accuracy (1kHz)				±0.1	%
Frequency response (DC … 10 kHz)				-0.2	dB
Frequency response (DC … 44 kHz)				-1	dB
Voltage, peak (balanced input)	U_{peak}			240	V
Frequency response (DC … 10 kHz)			-0.05	-0.1	dB
Frequency response (DC … 20 kHz)			-0.25	-0.3	dB
Frequency response (DC … 44 kHz)				-1	dB
SNR, voltage (20V / 1 kHz)	SNR_U	75	80		dB

Laser Interface					
Positive power supply voltage	U_{+DC}		12		V
Power current (12V laser supply voltage)	I_{DC}		50	250	mA
Analog output laser sensor	U_{analog}	-12		12	V
Intensity output laser sensor	U_{int}	-12		12	V
Output impedance	$R_{L,out}$	470		500	Ω

Distortion Analyzer Modifications (on request)	
High Power Version	Article 6000-110 (modification)
Recommended for High Power Woofers and Tweeters	
Speaker 1	**75 A_p / 0 Ohm (25 A_{RMS})** Voltage: 550 V_{peak} Current: 75 A_{peak} / 25 A_{RMS} Resistance: 0 Ohm
Speaker 2	**0.5 A_p / 0 Ohm (0.5 A_{RMS})** Voltage: 550 V_{peak} Current: 0.5 A_{peak} / 0.5 A_{RMS} Resistance: 0 Ohm
High Current Version	Article 6000-111 (modification)
Recommended for Standard Woofers and Tweeters as well as high power very low impedance drivers	
Speaker 1	**75 A_p / 0 Ohm (25 A_{RMS})** Voltage: 240 V_{peak} Current: 50 A_{peak} / 25 A_{RMS} Resistance: 0 Ohm
Speaker 2	**0.5 A_p / 0 Ohm (0.5 A_{RMS})** Voltage: 240 V_{peak} Current: 0.5 A_{peak} / 0.5 A_{RMS} Resistance: 0 Ohm
High Sensitivity Version	Article 6000-112 (modification)
Recommended for small Woofer, Tweeter and Microspeaker Measurements	
Speaker 1	**25 A_p / 0 Ohm (15 A_{RMS})** Voltage: 240 V_{peak} Current: 25 A_{peak} / 15 A_{RMS} Resistance: 0 Ohm
Speaker 2	**2 A_p / 1 Ohm (1 A_{RMS})** Voltage: 240 V_{peak} Current: 2 A_{peak} / 1 A_{RMS} Resistance: 1 Ohm
Very High Sensitivity Version	Article 6000-113 (modification)
Recommended for Microspeakers and Headphone Measurements (High Impedance Drivers)	
Speaker 1	**2 A_p / 0 Ohm (1 A_{RMS})** Voltage: 240 V_{peak} Current: 2 A_{peak} / 1 A_{RMS} Resistance: 1 Ohm
Speaker 2	**0.2 A_p / 10 Ohm (0.2 A_{RMS})** Voltage: 240 V_{peak} Current: 0.2 A_{peak} / 0.2 A_{RMS} Resistance: 10 Ohm

Specification of modified Speaker Channels

High Voltage Modification

Applicable to all available Speaker Channels

Voltage, peak (balanced input)	U_{peak}			**550**	V
75 A_p / 0 Ohm (25 A_{RMS})					
Recommended for Re	R_e		1..8	1)	Ω
Current, peak	I_{peak}			**75**	A
Current, rms 10s max. (sine)	$I_{rms,10s}$			**35**	A
Current, rms (sine, continuous)	I_{rms}			**25**	A
Above the current ratings of the default variant, higher rated clamps must be used! *Modified devices get an additional "Pair of Alligator Clips" Art. # 2300-020 according cable spec "A3".*					
Fuse 25A (Manufacturer: Littelfuse)	*Type:* 313.025 = default (slow-blo®), 312.025 = alternative (fast acting)				
Fuse Resistance	R_{Fuse}	1.7 (default), 2.4 (alternative)			mΩ
Resistance primary (current sensor)	R_p			<0.5	mΩ
Noisefloor (20Hz..24kHz)	L_N *(re 1A)*		-50		dB
Dynamic Range (20Hz..24kHz)	DR_I		80		dB
THD, current (1.5A_{RMS} / 1 kHz)	THD_I		-75		dB
THD, current (25A_{RMS} / 1 kHz)	THD_I		-55		dB
25 A_p / 0 Ohm (15 A_{RMS})					
Recommended for Re	R_e		2..16	1)	Ω
Current, peak (fused with 15A)	I_{peak}		25		A
Current, rms (continuous)	I_{rms}		15		A
Fuse 15A (Manufacturer: Littelfuse)	*Type:* 313.015 = default (slow-blo®), 312.015 = alternative (fast acting)				
Fuse Resistance	R_{Fuse}	5.0 (default), 5.2 (alternative)			mΩ
Resistance primary (current sensor)	R_p			1	Ω
Noisefloor (20Hz..24kHz)	L_N *(re 1A)*		-55		dB
Dynamic Range (20Hz..24kHz)	DR_I		80		dB
THD, current (1.5A_{RMS} / 1 kHz)	THD_I		-75		dB
THD, current (15A_{RMS} / 1 kHz)	THD_I		-60		dB
2 A_p / 1Ohm (1 A_{RMS})					
Recommended for Re	R_e		**8..100**	2)	Ω
Current, peak (fused with 1A)	I_{peak}		2		A
Current, rms (continuous)	I_{rms}		1		A
Fuse 1A (Manufacturer: Littelfuse)	*Type:* 312.001 = default (fast acting), 313.001 = alternative (slow-blo®)				
Fuse Resistance	R_{Fuse}	190 (default), 375 (alternative)			mΩ
Resistance primary (current sensor)	R_p		**1**		Ω
Noisefloor (20Hz..24kHz)	L_N *(re 1A)*		-80		dB
Dynamic Range (20Hz..24kHz)	DR_I		80		dB
THD, current (1A_{RMS} / 1 kHz)	THD_I		-80		dB
0.2 A_p / 10 Ohm (0.2 A_{RMS})					
Recommended for Re	R_e		**100..2000**	2)	Ω
Current, peak (fused with 0.5A)	I_{peak}		0.2		A
Current, rms (continuous)	I_{rms}		0.2		A
Fuse 0.5A (Manufacturer: Littelfuse)	*Type:* 312.500 = default (fast acting), 313.500 = alternative (slow-blo®)				
Fuse Resistance	R_{Fuse}	498 (default), 1260 (alternative)			mΩ
Resistance primary (current sensor)	R_p		**10**		Ω
Noisefloor (20Hz..24kHz)	L_N *(re 1A)*		-100		dB
Dynamic Range (20Hz..24kHz)	DR_I		85		dB
THD, current (50mA_{RMS} / 1 kHz)	THD_I		-85		dB

1) Max. Re values limited by LSI and PWT software module. Typical values will be reached even with LSI and PWT module.
2) Max. Re values limited by LSI and PWT software module. Typical values are higher than LSI and PWT limits. See LSI and PWT software specification.

General Specifications

Dimensions	483 mm x 252 mm x 44 mm (59 mm with feet) 19”/1U
Weight	3 kg
EMC	IEC 61326:1997 + A1:1998 + A2:2000 (EN 61326:1997 + A1:1998 + A2:2001)
Safety	IEC 61010-1:2001 (EN 61010-1:2001)

Recommended Operating Conditions

Parameter	Symbol	Min	Typ.	Max	Unit
Power supply voltage	V_{AC}	100		240	V
Power AC-frequency	f_{AC}	47		63	Hz
Operating ambient temperature	T_A	0	25	50	°C
Relative Humidity	*RH*		40	90[3)]	%
Input power	*P*		10	50	W

3) non-condensing conditions

Primary power supply connection with protective earth conductor is required!
Power supply connection with removed earth contact could cause high voltages at the enclosure of the device.

Components of Distortion Analyzer Package

The Distortion Analyzer Package (Art. # 2000-002) includes:

- 1 DISTORTION ANALYZER 2
- 1 High Precision Speaker Cable 2.2m (Art. # 2300-004)
- 1 Amplifier Cables: 1.5 m, crimped ferrule + 2 separate speakON connectors (Art. # 2300-017)
- 1 Signal Cable : XLR Cable (male – female), 1m (Art. # 2300-103)
- 1 USB-Cable : 3m (Art. # 2920-001)
- 1 Power Supply with country specific Power Cable (Art. # 2000-020)
- 1 User Handbook (Manual)

Find explanations for symbols at http://www.klippel.de/know-how/literature.html

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