

Digital Processor Unit of the KLIPPEL R&D SYSTEM for enhanced power testing

(Hardware Revision. >=2.0)

Document Revision 1.5

## FEATURES

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| <ul style="list-style-type: none"> <li>• Special hardware for power testing</li> <li>• Eight channel speaker monitoring</li> <li>• Voltage and current measurement</li> <li>• Stand-alone operation</li> <li>• Computer-controlled operation</li> <li>• High performance SNR &gt; 100 dB</li> <li>• Automatic firmware update</li> </ul> | <ul style="list-style-type: none"> <li>• Fast, hot plug USB interface</li> <li>• Internal memory for long term tests</li> <li>• 19" / 2U rack mountable</li> </ul> |
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Power Monitor 8 is a special hardware platform for the long term testing of up to 8 speakers simultaneously. The hardware hosts a high performance digital signal processor for demanding calculations and accurate 24 Bit AD/DA converters with a sampling frequency up to 96 kHz<sup>1</sup>. The Power Monitor 8 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 and several measurement modules can be used to control the unit and visualize the results. In addition to the 8 channel speaker monitoring the hardware provides a two channel line (XLR) in- and output.

Modified versions for different measurement ranges are available.

Article Number:	Device	Variants	Modifications
	2000-101	“Default”	-
		“High Power”	6000-114
		“High Current”	6000-115
		“High Sensitivity”	6000-116
		“Very High Sensitivity”	6000-117

<sup>1</sup> the maximum usable sampling frequency depends on the used software

## CONTENTS:


1	Front .....	3
2	Rear .....	3
3	Electrical Characteristics .....	4
4	Power Monitor Modifications (on request) .....	5
5	Specification of modified Speaker Channels .....	6
6	General Specifications .....	7
7	Recommended Operating Conditions .....	7

8 Components of Power Monitor 8 Package ..... 7

## 1 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)

## 2 Rear

	
Power	Input from switching mode power supply
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.
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...8	Replaceable speaker channel 1...8 fuse according to the selected hardware version.
Speaker 1...8	The SPEAKON <sup>®</sup> output connector SPEAKER 1...8 has 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.
Amplifier 1,2 ... 7,8	The SPEAKON <sup>®</sup> 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, 3, 5, 7 connector. The signal at the pins 2- and 2+ provide the signal to the Speaker 2, 4, 6, 8 connector.

### 3 Electrical Characteristics

Parameter	Symbol	Min	Typ.	Max	Unit
<b>Analog Inputs</b>					
Input voltage (peak to peak, symm.)	$U_{in}$			16	V
Input voltage swing	$U_{in,sw}$	-4		4	V
Input impedance	$R_{in}$		10		k $\Omega$
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
<b>Analog Outputs</b>					
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		$\Omega$
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
<b>Speaker 1 - 8 (default version)</b>	Article 2000-101				
<b>Speaker 1 - 8: 50 Ap / 0 Ohm (15 ARMS)</b>					
Recommended for Re	Re		2..8		$\Omega$
<u>Current</u> , 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
Current accuracy (1kHz)				$\pm 0.1$	%
Frequency response (DC ... 10 kHz)				-0.2	dB
Frequency response (DC ... 44 kHz)				-1	dB
Noisefloor (20Hz..24kHz)	$L_N$ (re 1A)		-50		dB
Dynamic Range (20Hz..24kHz)	$DR_{I,CH1}$		80		dB
THD, current (1.5ARMS / 1 kHz)	$THD_{I,CH1}$		-75		dB
THD, current (15ARMS / 1 kHz)	$THD_{I,CH1}$		-55		dB
Fuse 15A (Manufacturer: Littelfuse)	Type: 313.015 = default (slow-blo <sup>®</sup> ), 312.015 = alternative (fast acting)				
Fuse Resistance	$R_{Fuse}$	5.0 (default), 5.2 (alternative)			m $\Omega$
Resistance primary (current sensor)	$R_{p,CH1}$			<0.5	m $\Omega$
<u>Voltage</u> , 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

## 4 Power Monitor Modifications (on request)

<b>High Power Version</b>		Article 6000-114 (modification)
<i>Recommended for High Power Woofers and Tweeters</i>		
Speaker 1 - 8	<b>75 A<sub>p</sub> / 0 Ohm (25 A<sub>RMS</sub>)</b> Voltage: 550 V <sub>peak</sub> Current: 75 A <sub>peak</sub> / 25 A <sub>RMS</sub> Resistance: 0 Ohm	
<b>High Current Version</b>		Article 6000-115 (modification)
<i>Recommended for Standard Woofers and Tweeters as well as high power very low impedance drivers</i>		
Speaker 1 - 8	<b>75 A<sub>p</sub> / 0 Ohm (25 A<sub>RMS</sub>)</b> Voltage: 240 V <sub>peak</sub> Current: 50 A <sub>peak</sub> / 25 A <sub>RMS</sub> Resistance: 0 Ohm	
<b>High Sensitivity Version</b>		Article 6000-116 (modification)
<i>Recommended for Microspeaker Measurements</i>		
Speaker 1 - 8	<b>2 A<sub>p</sub> / 1 Ohm (1 A<sub>RMS</sub>)</b> Voltage: 240 V <sub>peak</sub> Current: 2 A <sub>peak</sub> / 1 A <sub>RMS</sub> Resistance: 1 Ohm	
<b>Very High Sensitivity Version</b>		Article 6000-117 (modification)
<i>Recommended for Microspeakers and Headphone Measurements (High Impedance Drivers)</i>		
Speaker 1 - 8	<b>0.2 A<sub>p</sub> / 10 Ohm (0.2 A<sub>RMS</sub>)</b> Voltage: 240 V <sub>peak</sub> Current: 0.2 A <sub>peak</sub> / 0.2 A <sub>RMS</sub> Resistance: 10 Ohm	

## 5 Specification of modified Speaker Channels

<b>High Voltage Modification</b>					
Voltage, peak ( balanced input)	$U_{peak}$			<b>550</b>	V
Applicable to all Current Sensor Modifications below. Typically combined with "75 A <sub>p</sub> / 0 Ohm (25 A <sub>RMS</sub> )", enhancing "High Current" to "High Power" variant.					
<b>75 A<sub>p</sub> / 0 Ohm (25 A<sub>RMS</sub>)</b>					
Recommended for Re	$R_e$		1..8		Ω
Current, peak	$I_{peak}$			<b>75</b>	A
Current, rms 10s max. (sine)	$I_{rms,10s}$			<b>35</b>	A
Current, rms (sine, continuous)	$I_{rms}$			<b>25</b>	A
Fuse 25A (Manufacturer: Littelfuse)	Type: 313.025 = default (slow-blo <sup>®</sup> ), 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 <sub>RMS</sub> / 1 kHz)	$THD_I$		-75		dB
THD, current (25A <sub>RMS</sub> / 1 kHz)	$THD_I$		-55		dB
<b>2 A<sub>p</sub> / 10hm (1 A<sub>RMS</sub>)</b>					
Recommended for Re	$R_e$		<b>8..100</b>		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 <sup>®</sup> )				
Fuse Resistance	$R_{Fuse}$	190 (default), 375 (alternative)			mΩ
Resistance primary (current sensor)	$R_p$		<b>1</b>		Ω
Noisefloor (20Hz..24kHz)	$L_N(re\ 1A)$		-80		dB
Dynamic Range (20Hz..24kHz)	$DR_I$		80		dB
THD, current (1A <sub>RMS</sub> / 1 kHz)	$THD_I$		-80		dB
<i>Modified devices get 8 "Pairs of Micro-Speaker Clips" Art. # 2300-024 according cable spec "A3".</i>					
<b>0.2 A<sub>p</sub> / 10 Ohm (0.2 A<sub>RMS</sub>)</b>					
Recommended for Re	$R_e$		<b>100..2000</b>		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 <sup>®</sup> )				
Fuse Resistance	$R_{Fuse}$	498 (default), 1260 (alternative)			mΩ
Resistance primary (current sensor)	$R_p$		<b>10</b>		Ω
Noisefloor (20Hz..24kHz)	$L_N(re\ 1A)$		-100		dB
Dynamic Range (20Hz..24kHz)	$DR_I$		85		dB
THD, current (50mA <sub>RMS</sub> / 1 kHz)	$THD_I$		-85		dB
<i>Modified devices get 8 "Pairs of Micro-Speaker Clips" Art. # 2300-024 according cable spec "A3".</i>					

## 6 General Specifications

<b>Dimensions</b>	483 mm x 300 mm x 88 mm (103 mm with feet) 19" / 2 U (Units)
<b>Weight</b>	5 kg
<b>EMC</b>	IEC 61326:1997 + A1:1998 + A2:2000 (EN 61326:1997 + A1:1998 + A2:2001)
<b>Safety</b>	IEC 61010-1:2001 (EN 61010-1:2001)

## 7 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 <sup>1)</sup>	%
Input power	$P$		10	50	W

1) 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.

## 8 Components of Power Monitor 8 Package

The Power Monitor 8 Package (Article # 2000-101) includes:

- 1 Power Monitor 8,
- 4 Amplifier cables: 1.5 m, crimped ferrule + 2 separate speakON connectors (Art. # 2300-017)
- 8 Extended Temperature Range Speaker Cables: 2,2 m (Article # 2300-025)
- 1 USB-Cable : 3m (Art. # 2920-001)
- 1 Power Supply with country specific Power Cable: (Art. # 2000-020)
- 1 User Handbook (Manual)
- 1 Signal Cable: XLR Cable (male – female), 1m (Art. # 2300-103)
- (3 Signal Cables: typ. TRS-Jack – XLR male, 0.5 m, only if amplifiers are supplied by Klippel) (Art. # 2300-104)

Find explanations for symbols at:

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

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