



BENEFITS

- long lifetime due to solid-state speaker relay
- dB-Lab integrated health monitoring
- wide application range from microspeaker to woofer
- updateable for future Klippel algorithms

FEATURES

- enables Klippel LSI and CTR applications
- dual speaker channels
- selectable current sensitivity on both channels
 - hall-sensor
 - shunt-resistor
- 500 V_{pp}/160 A_{pp} measurement range

DESCRIPTION

The Speaker-Card extension for the Klippel Analyzer 3 allows for two channel voltage and current sensing. Hence it is a key hardware product for most of the Klippel Software Modules. It features a Low- and High-Sensitivity current measurement path in both speaker channels to cope with many different applications. The required hardware for real time processing is also hosted by the Speaker-Card to allow for nonlinear analysis and control.

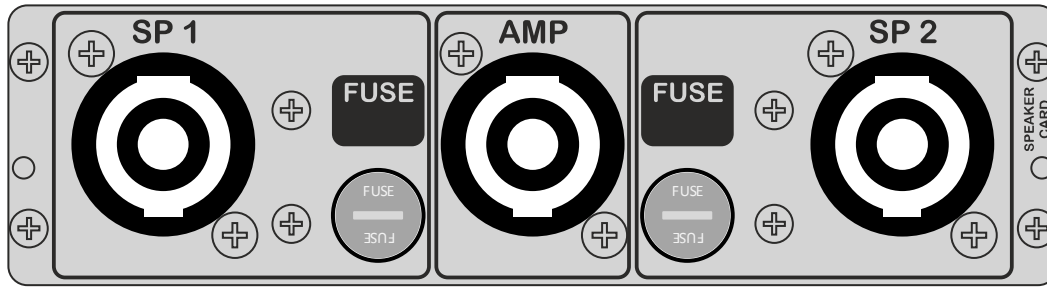
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1 Introduction



Speaker-Card

SP 1 / 2	The SPEAKON output connectors can be connected to the terminals of the loudspeaker under test by using pins 1+ and 1- of the special loudspeaker cable. The remaining pins 2- and 2+ of the SPEAKON connector are used to sense the voltage close to the loudspeaker terminals.
Fuse 1 / 2	Each speaker channel is fused with 6.3 x 32 mm, 8 A slow-blow fuse by default. It can be replaced with 15A type according to the Limitations. If the High-Sensitivity current measurement is used, it is recommended to replace the fuse with 1A type for increased protection. See the hardware manual for details on recommended fuse-types.
AMP	The SPEAKON input connector AMPLIFIER should be connected to the output signal of the power amplifier. The signals supplied to pins 1- and 1+ will be provided at the Speaker 1 connector. The pins 2- and 2+ at the Amplifier connector correspond with the Speaker 2 connector.

Attention: High Voltages and / or currents may occur at the Amplifier / SPEAKON connectors. Risk of electrical shock! Use isolated wires, connectors and clamps only. Do not touch metal conductors.

Warning: Pay extra attention to the Limitations when replacing the standard fuse. See hardware Manual for details.

2 Specification

2.1 Maximum Ratings

Parameter	Conditions	Max	Unit
Speaker Voltage ¹		240	V _{peak}
Speaker Current	t < 10 ms, Low Sense	80	A _{peak}
Speaker Current	t < 100 ms, High Sense	8	A _{peak}

2.2 Electrical Specification

Voltage Measurement					
Parameter	Conditions	Min	Typ	Max	Unit
Accuracy	10 V _{rms} , all Sample rates		±0.02	±0.2	%
Noise Level	BW = 20 kHz		1.4		mV _{rms}
	BW = 40 kHz		2		
	BW = 80 kHz		35		
SNR ³	175 V _{rms} Sinusoidal signal, BW = 20 kHz		102		dB
Frequency Response	0.1 Hz...20 kHz, Fs = 48 kHz		-0.06		dB
	0.1 Hz...38 kHz, Fs = 96 kHz		-0.35		
	0.1 Hz...50 kHz, Fs = 192 kHz		-0.8		
	0.1 Hz...66 kHz, Fs = 192 kHz		-3		

Current Measurement					
Parameter	Conditions	Min	Typ	Max	Unit
Low Sense Path					
Continuous Current ² See Section Limitations	@ room temperature, one channel driven			12	A _{rms}
Path Impedance	Including SpeakON connectors		75		mOhm
Accuracy	1 kHz, 1 A _{rms} , all Sample rates		±0.05	±0.2	%
Noise Level	BW = 20 kHz		1.4		mA _{rms}
	BW = 40 kHz		2		
	BW = 80 kHz		11		
SNR ³	1 A _{rms} Sinusoidal signal, BW = 20 kHz		57		dB
THD	1 A _{rms} (1 kHz, noise limited)		-60		dB
	5 A _{rms} (1 kHz, noise limited)		-72		
	10 A _{rms} (1 kHz)		-72		
	20 A _{rms} (1 k Hz)		-68		
	20 A _{rms} 20 Hz-20 kHz		-64		
Frequency Response	0.1 Hz...20 kHz, Fs = 48 kHz		-0.1		dB
	0.1 Hz...38 kHz, Fs = 96 kHz		-0.3		
	0.1 Hz...50 kHz, Fs = 192 kHz		-1.4		
	0.1 Hz...59 kHz, Fs = 192 kHz		-3		
High Sense Path					
Continuous Current ² See Section Limitations	@ room temperature, one channel driven			1.4	A _{rms}
Path Impedance	Including SpeakON connectors		1.1		Ohm
Accuracy	1 kHz, 1 A _{rms} , all Sample rates		TBD	±0.2	%
Noise Level	BW = 20 kHz		110		μA _{rms}
	BW = 40 kHz		170		
	BW = 80 kHz		1.1		mA _{rms}
THD	0.1 A _{rms} (1 kHz, noise limited)		-60		dB
	1 A _{rms} , 20 Hz-20 kHz, noise limited		-60		
Frequency Response	0.1 Hz...20 kHz, Fs = 48 kHz		-0.1 +0.2		dB
	0.1 Hz...40 kHz, Fs = 96 kHz		-0.1 +0.3		
	0.1 Hz...50 kHz, Fs = 192 kHz		-0.6 +0.3		
	0.1 Hz...65 kHz, Fs = 192 kHz		-3 +0.3		
SNR ³	0.1 A _{rms} Sinusoidal signal, BW = 20 kHz		59		dB

¹ each speaker terminal is limited to a maximum of 200 V_{peak} against earth potential

² thermally limited

³ SNR refers to signal levels instead of power levels

3 Limitations

Maximum Speaker current is thermally limited, hence influenced by ambient operating temperature.

Speaker current derating is as follows:

Parameter	Max @ room temperature 12 min ON / 48 min OFF	Max @ room temperature	Max @ 60° ambient temperature	Unit
Speaker current Low Sense Path	15	12	5	A _{rms}
Speaker current High Sense Path	-	1.4	0.4	A _{rms}

Note: The given current limitations are only valid for a Klippel Analyzer 3 in standard configuration, namely equipped with Laser-, Speaker- and XLR-Card, running one of the available Speaker-Channels.

Find explanations for symbols at:

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

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