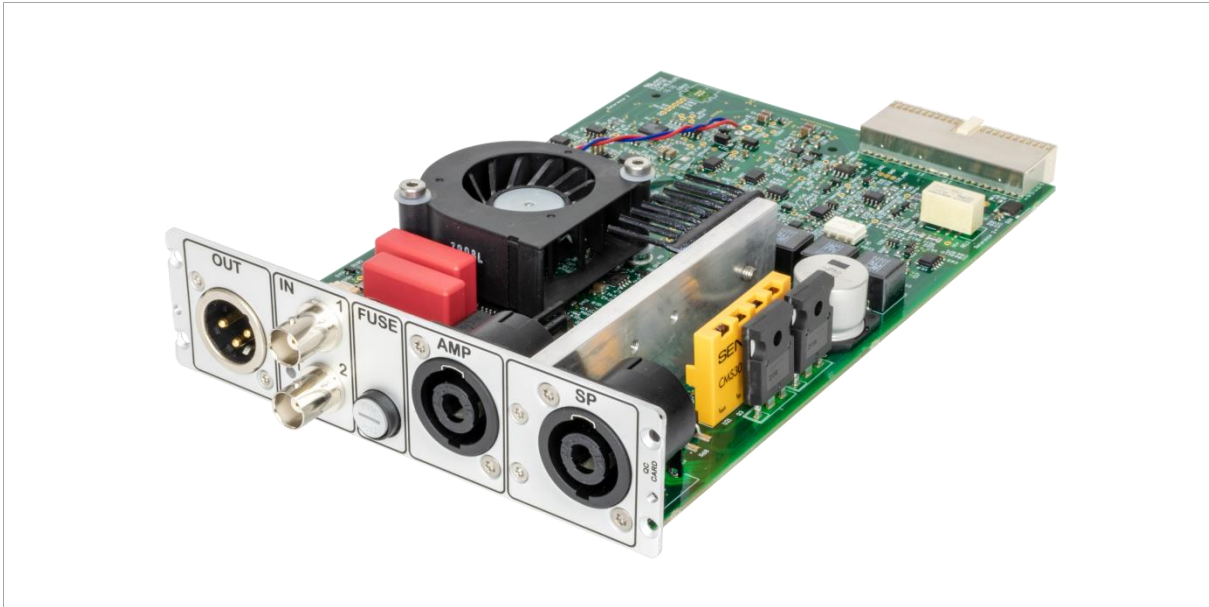


Hardware Extension for the Klippel Measurement System (Revision 1.2)



BENEFITS

- Allows Complete Single Channel Measurements
- Cost efficient single card
- All-in-one solution for EOL testing

FEATURES

- Internal amplifier
- Line output (XLR)
- Dual microphone input (including IEPE power)
- Voltage and current sensing

DESCRIPTION

The QC-Card is a hardware extension for the Klippel Analyzer 3 to form a simple, single channel measurement setup. It features built in microphone power, single speaker impedance measurement, a line output as well as an internal amplifier.

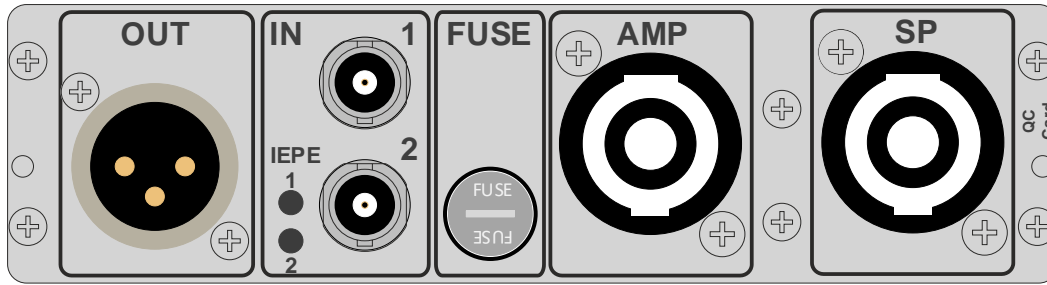
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1 Introduction



QC-Card

OUT	The XLR output connector OUT provides a balanced analog output signal at pin 2 (hot/+), pin 3 (cold/-) and pin 1 (ground). If asymmetric output is required use pin 2 (hot/+) and short pin 3 (cold/-) with pin 1 (ground).
IN 1 / 2	Unbalanced BNC input with switchable IEPE compliant power supply. The power supply can only be switched via dB-Lab software.
Fuse	The Speaker channel is fused with 6.3 x 32 mm 8 A fast blow fuse (Littelfuse 313008).
AMP (optional)	The Amplifier connector can be connected to an external power amplifier using the pins 1+ and 1-. Pins 2+ and 2- are not connected and should be left floating. This feature is only available on request. In standard shipping configuration the internal amplifier is enabled.
SP	The SPEAKON output connects to the terminals of the loudspeaker under test, driving it via pin 1+ and 1- of the Klippel speaker cable. Power will be delivered from the internal amplifier offered by the QC-Card. The remaining pins 2- and 2+ of the Klippel speaker cable are used to sense the voltage close to the loudspeaker terminals. For details on cable connection, see chapter <i>Cables</i> in the <i>Hardware Manual</i> .

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 with 15 A type (Littelfuse 313015). 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}
	t < 100 ms, High Sense	8	A _{peak}
Input voltage	any BNC / XLR pin	50	V
Input current (DC)	any BNC / XLR pin	20	mA
Transient input current	t < 1 ms, any BNC / XLR pin	6	A

2.2 Electrical Specification

Speaker 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		

Speaker 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		100		mOhm
Accuracy	1 kHz, 1 A _{rms} , all Sample rates		±0.02	±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)		-68		
	10 A _{rms} (1 kHz)		-72		
	20 A _{rms} (1 k Hz)		-64		
	20 A _{rms} 20 Hz-20 kHz		-58		
Frequency Response	0.1 Hz...20 kHz, Fs = 48 kHz		+0.4		dB
	0.1 Hz...40 kHz, Fs = 96 kHz		+0.5		
	0.1 Hz...58 kHz, Fs = 192 kHz		-1.0 +0.5		
	0.1 Hz...67 kHz, Fs = 192 kHz		-3.0 +0.5		
High Sense Path					
Continuous Current ² See Section Limitations	@ room temperature			1.4	A _{rms}
Path Impedance	Including SpeakON connectors		1.1		Ohm
Accuracy	1 kHz, 1 A _{rms} , all Sample rates		±0.02	±0.2	%
Noise Level	BW = 20 kHz		140		μA _{rms}
	BW = 40 kHz		350		

	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, $F_s = 48$ kHz		+0.1		dB
	0.1 Hz...40 kHz, $F_s = 96$ kHz		-0.1 +0.1		
	0.1 Hz...52 kHz, $F_s = 192$ kHz		-1.0 +0.1		
	0.1 Hz...64 kHz, $F_s = 192$ kHz		-3 +0.1		
SNR^3	0.1 A_{rms} Sinusoidal signal, BW = 20 kHz		59		dB

Internal Amplifier					
Parameter	Conditions	Min	Typ	Max	Unit
Frequency Range		0		20k	Hz
THD ⁵	15 W, 4 Ω load, 1 kHz sinusoid, $f_s = 48$ kHz		-75		dB
IMD	SMPTE, 4 Ω load, Ch. 1 total output power = 15 W		-62		dB
Offset Voltage (absolute)	at 0 digital input signal		100		μV
Output Noise	BW = 20 kHz		70		μV_{rms}
Power Stage Switching Frequency			384		kHz
P_{Out}^5	4 Ω load			45	W
	2 Ω load			80	
V_{Out}^6	-40 dB (1 %) THD at 1 kHz sinusoid, $f_s = 48$ kHz	4 Ω load		20	V_{peak}
		2 Ω load		18	
Load Impedance		2			Ω
Short Circuit Duration			infinite		s

XLR Output					
Parameter	Conditions	Min	Typ	Max	Unit
Accuracy	1 kHz, 1 V_{rms}		± 0.02	± 0.2	%
Differential output voltage	High-Range setup		14		V_{peak}
	Low-Range setup		2.1		V_{peak}
Common-Mode-Range ⁴			± 13		V
Differential Offset Voltage (absolute)	w Offset-Compensation		100		μV
	w/o Offset-Compensation		10		mV
Differential output impedance			30		Ohm
Shortcircuit duration			infinite		s
Output noise	BW = 20 kHz		24		μV_{rms}
THD @ 1kHz	All Sample-Rates, HiRange, -1 dBFS		-95		dB
Lower Frequency limit (-3 dB)	Offset compensation active		1		Hz

BNC Inputs					
Parameter	Conditions	Min	Typ	Max	Unit
IEPE supply current			7.3		mA
Max IEPE voltage		28			V
Accuracy			±0.03	±0.2	%
Nominal sensitivity (0 dB)	Input voltage for 0 dBFs		5		V _{peak}
Sensitivity range (gain-controlled) ⁷	-10 dB setting		15.7		V _{peak}
	+10 dB setting		1.5		
	+20 dB setting		0.5		
Noise level (@ nom sensitivity)	Shorted input, BW = 20 kHz		15		μV
SNR ⁴	sinusoidal signal, BW = 20 kHz		108		dB
THD @ 1 kHz (all Sample-Rates)	-1 dBFs		-88		dB
Input impedance			10		kOhm
Input capacitance			100		pF
Lower Frequency limit (-3 dB)	AC-coupling enabled		1.6		Hz
Upper Frequency limit	Fs = 48 kHz, +/-0.1 dB		19		kHz
	Fs = 96 kHz, +/-0.3 dB		34		
	Fs = 192 kHz, -1 dB		49		
	Fs = 192 kHz, -3 dB		66		

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

⁴ Pin voltage (common mode + signal) has to be below 14.3 V absolute to avoid clipping

⁵ See section 3.2 Internal Amplifier for details

⁶ This is specified at the amplifier output. Therefore, the voltage at the load may be lower for the given distortion due to series resistance introduced by V/I sensing.

⁷ Gain control is limited to certain values defined by software module

3 Limitations

3.1 Speaker-Current

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 containing only one QC-Card.

3.2 Internal Amplifier

Amplifier output power is thermally limited, hence influenced by ambient temperature and KA3 configuration.

Stated values are only valid for a KA3 equipped with QC-Card only, operated at room temperature.

Find explanations for symbols at:

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

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