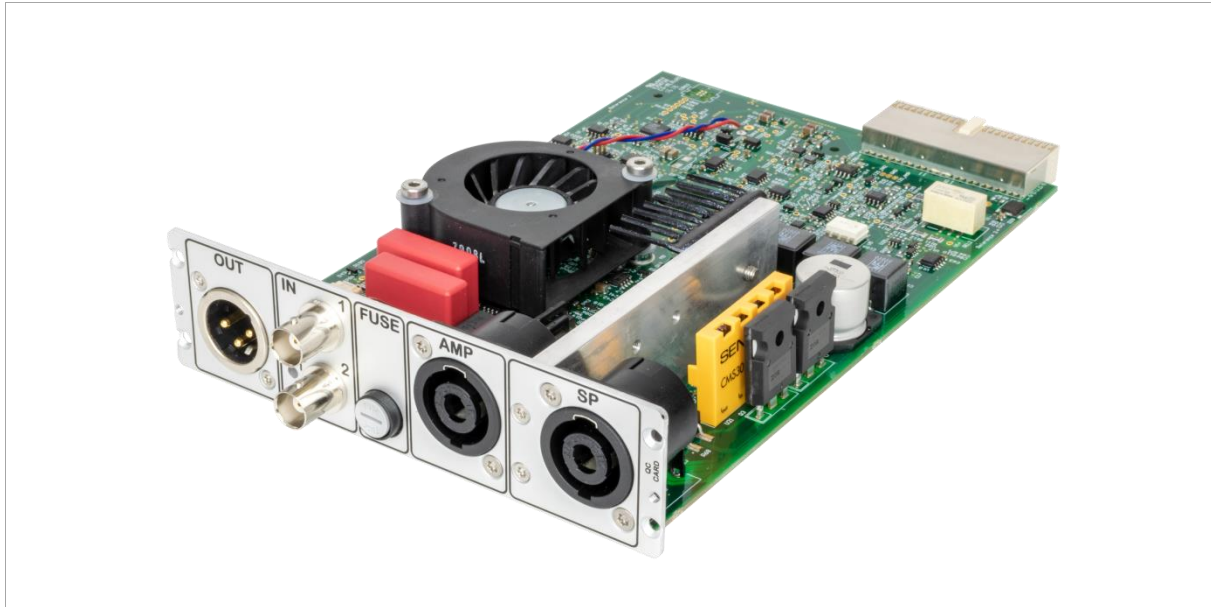


Hardware Extension for the Klippel Measurement System (Revision 1.0)



## 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.

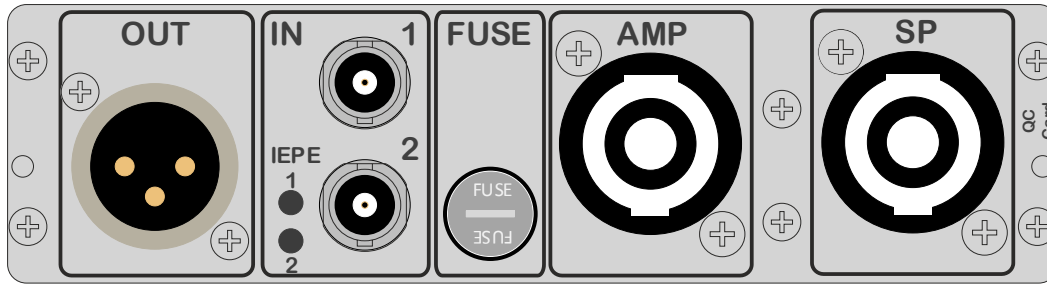
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## 1 Introduction



QC-Card

<b>OUT</b>	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).
<b>IN 1 / 2</b>	Unbalanced BNC input with switchable IEPE compliant power supply. The power supply can only be switched via dB-Lab software.
<b>Fuse</b>	The Speaker channel is fused with 6.3 x 32 mm 8 A fast blow fuse (Littelfuse 313008).
<b>AMP (optional)</b>	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.
<b>SP</b>	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 <sup>1</sup>		240	V <sub>peak</sub>
Speaker Current	t < 10 ms, Low Sense	80	A <sub>peak</sub>
	t < 100 ms, High Sense	8	A <sub>peak</sub>
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 <sub>rms</sub> , all Sample rates		±0.02	±0.2	%
Noise Level	BW = 20 kHz		1.4		mV <sub>rms</sub>
	BW = 40 kHz		2		
	BW = 80 kHz		35		
SNR <sup>3</sup>	175 V <sub>rms</sub> 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
<b>Low Sense Path</b>					
Continuous Current <sup>2</sup> See Section Limitations	@ room temperature, one channel driven			12	A <sub>rms</sub>
Path Impedance	Including SpeakON connectors		100		mOhm
Accuracy	1 kHz, 1 A <sub>rms</sub> , all Sample rates		±0.02	±0.2	%
Noise Level	BW = 20 kHz		1.4		mA <sub>rms</sub>
	BW = 40 kHz		2		
	BW = 80 kHz		11		
SNR <sup>3</sup>	1 A <sub>rms</sub> Sinusoidal signal, BW = 20 kHz		57		dB
THD	1 A <sub>rms</sub> (1 kHz, noise limited)		-60		dB
	5 A <sub>rms</sub> (1 kHz, noise limited)		-68		
	10 A <sub>rms</sub> (1 kHz)		-72		
	20 A <sub>rms</sub> (1 kHz)		-64		
	20 A <sub>rms</sub> 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		
<b>High Sense Path</b>					
Continuous Current <sup>2</sup> See Section Limitations	@ room temperature			1.4	A <sub>rms</sub>
Path Impedance	Including SpeakON connectors		1.1		Ohm
Accuracy	1 kHz, 1 A <sub>rms</sub> , all Sample rates		±0.02	±0.2	%
Noise Level	BW = 20 kHz		140		μA <sub>rms</sub>
	BW = 40 kHz		350		

	BW = 80 kHz		1.1		$\text{mA}_{\text{rms}}$
THD	0.1 $\text{A}_{\text{rms}}$ (1 kHz, noise limited)		-60		dB
	1 $\text{A}_{\text{rms}}$ , 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 <sup>3</sup>	0.1 $\text{A}_{\text{rms}}$ Sinusoidal signal, BW = 20 kHz		59		dB

Internal Amplifier					
Parameter	Conditions	Min	Typ	Max	Unit
Frequency Range		0		20k	Hz
THD <sup>5</sup>	15 W, 4 $\Omega$ load, 1 kHz sinusoid, $f_s = 48$ kHz		-68		dB
IMD	SMPTE, 4 $\Omega$ load, Ch. 1 total output power = 15 W		-53		dB
Offset Voltage (absolute)	at 0 digital input signal		100		$\mu\text{V}$
Output Noise	BW = 20 kHz		70		$\mu\text{V}_{\text{rms}}$
Power Stage Switching Frequency			384		kHz
$P_{\text{Out}}$ <sup>5</sup>	4 $\Omega$ load			45	W
	2 $\Omega$ load			80	
$V_{\text{Out}}$ <sup>6</sup>	-40 dB (1 %) THD at 1 kHz sinusoid, $f_s = 48$ kHz	4 $\Omega$ load		20	$V_{\text{peak}}$
		2 $\Omega$ load		18	
Load Impedance		2			$\Omega$
Short Circuit Duration			infinite		s

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

<b>BNC Inputs</b>					
<b>Parameter</b>	<b>Conditions</b>	<b>Min</b>	<b>Typ</b>	<b>Max</b>	<b>Unit</b>
IEPE supply current			7.3		mA
Max IEPE voltage		28			V
Accuracy			±0.03	±0.2	%
Sensitivity range (gain-controlled)	Input voltage for 0 dBFs	0.5		15.7	V <sub>peak</sub>
Noise level (@ nom sensitivity)	Shorted input, BW = 20 kHz		15		μV
Nominal sensitivity (0 dB)	Input voltage for 0 dBFs		5		V <sub>peak</sub>
SNR <sup>4</sup>	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		

<sup>1</sup> each speaker terminal is limited to a maximum of 200 V<sub>peak</sub> against earth potential

<sup>2</sup> thermally limited

<sup>3</sup> SNR refers to signal levels instead of power levels

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

<sup>5</sup> See section 3.2 Internal Amplifier and details

<sup>6</sup> This is specified at the Amplifier-Card output. Therefore, the voltage at the load may be lower for the given distortion depending on the connection between the Amplifier-Card output and the load.

### 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 <sub>rms</sub>
Speaker current High Sense Path	-	1.4	0.4	A <sub>rms</sub>

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**Note:** The given current limitations are only valid for a Klippel Analyzer 3 containing only one QC-Card.

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#### 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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