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**INTERFACING CLIO FW-01  
WITH MICROPHONES**

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by Daniele Ponteggia - [dp@audiomatica.com](mailto:dp@audiomatica.com)

## **INTRODUCTION**

The CLIO FW-01 hardware is capable to measure AC voltages with 24 bit resolution and a sampling frequency of 48, 96 or 192 kHz and can be interfaced to various transducers with AC output.

When taking acoustical measurements a proper pressure to voltage transducer (microphone) is required. The CLIO FW-01 hardware features a balanced input with XLR/combo connectors with the possibility to feed the microphone with a 24V phantom power supply.

In this application note we will measure the performance of a bunch of ¼ inch measurement microphones and preamplifiers interfaced to the CLIO FW-01 hardware.

## **TESTED MICROPHONES**

The microphones and preamplifiers used in this tests are:

- B&K 4939 capsule with B&K 2633 preamplifier and B&K 2609 measuring amplifier (200V polarization voltage)
- Gras 40BE capsule with preamplifier Gras 26CB and Gras CCP supply 12AL
- Gras 40BE capsule with preamplifier Gras 26CB powered with 24V CLIO FW-01 supply
- Earthworks M30 microphone capsule powered with 48V phantom power supply from an external power supply unit
- Earthworks M30 microphone capsule powered with 24V CLIO FW-01 supply

This above list of tested front ends is not intended to be exhaustive and is representative only on what is currently available on our bench. However the list includes very popular microphones between CLIO users.

## **MEASUREMENT PROCEDURE**

At the beginning of the test procedure we measured the sensitivity of each microphone using a Gras 42AB sound calibrator. Tests are carried out at 22 °C and 998 hPa. Results of the tests are reported in figure 1.

Note that the sensitivity of the B&K and the Gras is similar and quite low, while the Earthworks one is higher. This is representative of the SPL maximum handling of these microphones.

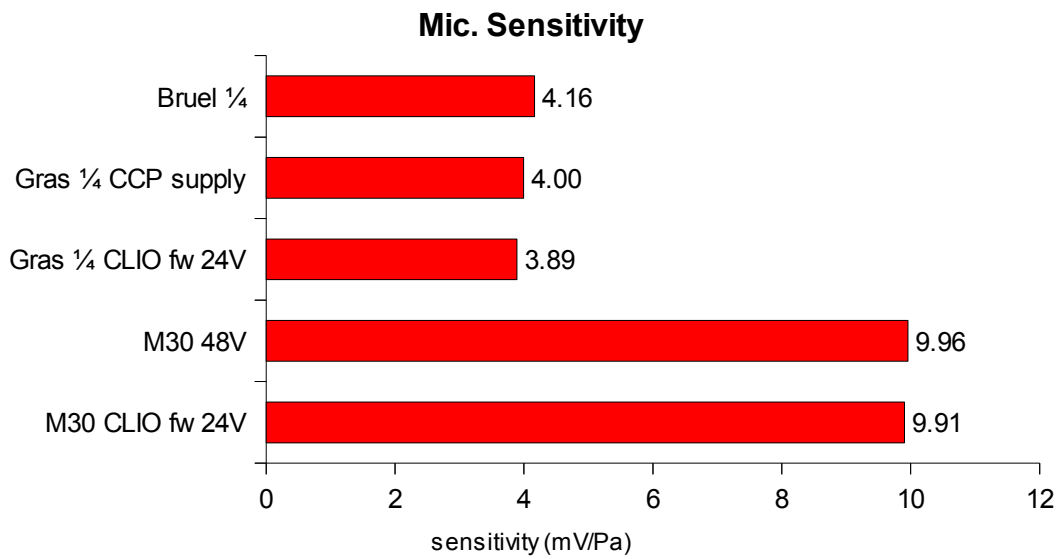


Figure 1 - Measured Mic. Sensitivity

The measured sensitivity values are in accordance to the manufacturer microphones specifications. Only in the case of the Earthworks M30 the calibration certificate supplied by the manufacturer shows a sensitivity that deviates more than 10% from the measured value. It must be noted that the certificate omits to specify what is the sensitivity measurement setup and this adversely affects the repeatability of this measurement.

To test the microphone performances we measured the sound pressure level at a distortion level of 1% and 3% at two frequencies: 100 Hz and 1 kHz. This is done placing the microphone in two custom built pressure chambers.

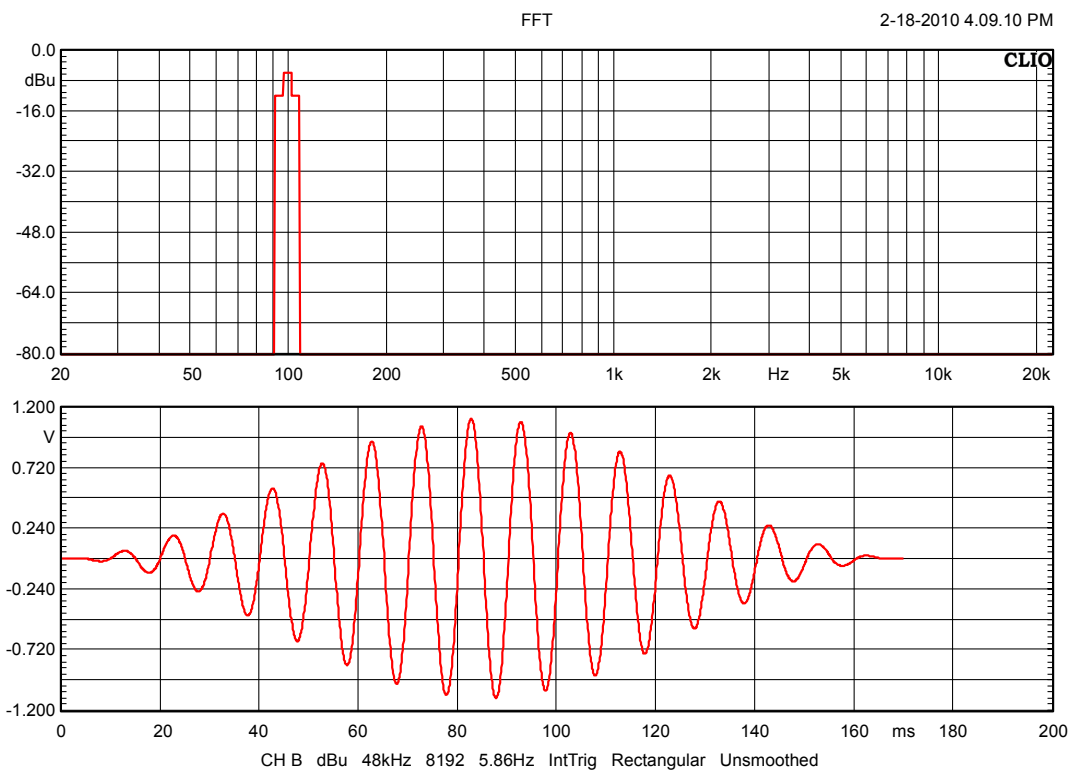


Figure 2 - Burst Test Signal

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To measure the SPL and the distortion we used the CLIO FFT and the Multimeter tools. We fed the pressure chamber with a sinusoidal burst stimulus windowed with an Hanning window (see figure 2).

The usage of the burst instead of the steady signal allows to create very high SPL into the pressure chambers without stressing too much the chambers transducers.

The burst output level is incremented until the distortion reaches a given level, then the measured sound pressure level is acquired.

The maximum sound level pressure SPL with distortion 1% and 3% is reported in figures 3 and 4.

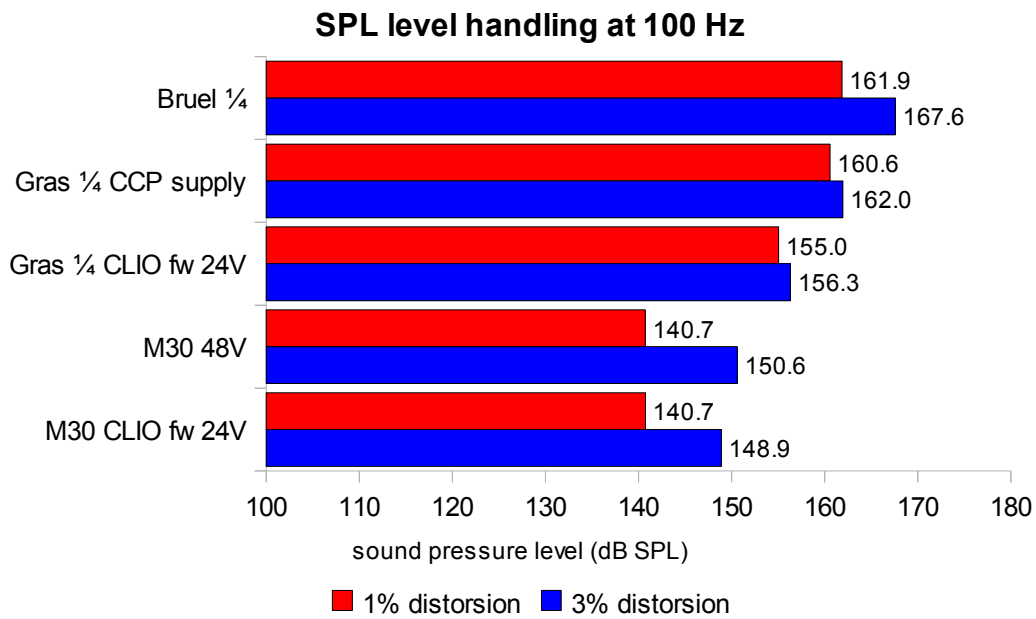


Figure 3 - Measured SPL Handling at 100 Hz

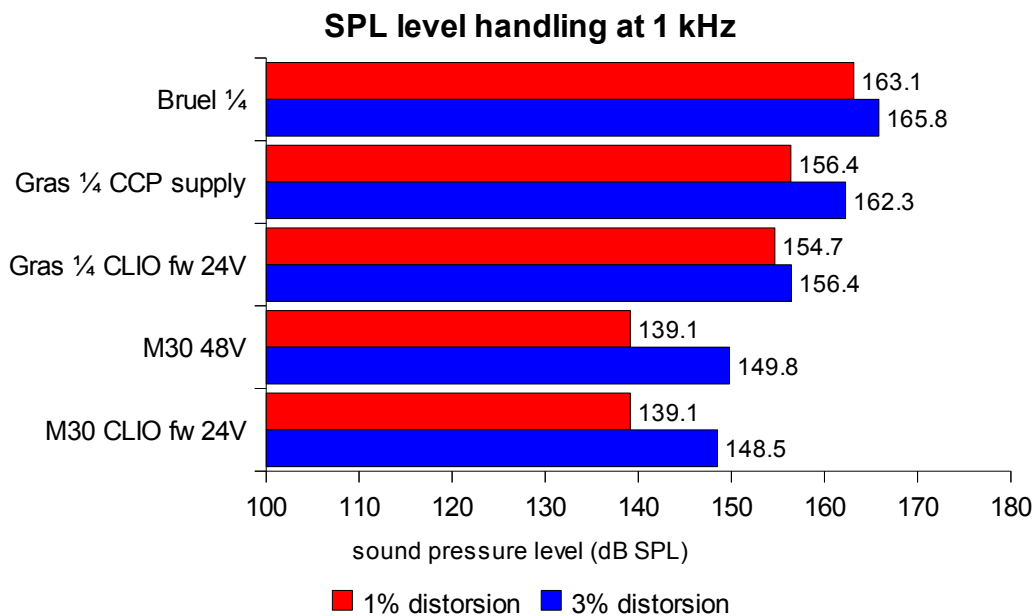


Figure 4 - Measured SPL Handling at 1 kHz

When comparing the results, please take into account that it is not known if the distortion is due to the pressure chamber transducer or to the microphone, obviously at very high SPL the transducer distortion may hide the microphone performance.

The above results are not surprising, the high quality and low sensitivity microphones are capable to reach very high SPL with low distortion.

**Note also that the Gras and the Earthworks M30 directly powered by the CLIO FW-01 24 V phantom power supply are working very well, with a maximum SPL drop for the Gras and with non noticeable differences for the Earthworks M30.**

It must also be noted that the Earthworks M30 is specified by its manufacturer for a maximum input of 142 dB SPL, thus the noticeable differences are outside the microphone working range.

### CONCLUSIONS

The CLIO FW-01 hardware with its internal +24V phantom power supply allow to directly connect measurement microphones as the Earthworks M30 or Gras 40BE capsule with preamplifier Gras 26CB.

While the B&K and the Gras are obviously high quality microphones with top notch performances, it must be noted that the Earthworks M30 seems to be a good tradeoff between performance and cost.