



# M23 G2

23 kHz Measurement Microphone

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EARTHWORKS AUDIO



## Description

The Earthworks M23 G2 is a high performance free-field reference microphone designed for acoustical measurement applications such as sound system tuning, room acoustics, loudspeaker design, and SPL measurement.

Exceptional audio performance, roadworthy stainless steel construction and XLR output have made Earthworks M-Series microphones the ideal reference for the Professional Audio world since 1995.

Each microphone comes with its own individual calibration chart showing frequency response curve, 1 kHz sensitivity and 250 Hz sensitivity.

## Inside The Box

- Microphone
- Protective Case
- Individual Calibration Chart
- MC1 Microphone Clip
- ADP1 1/2" Calibrator Adapter
- OMW2 Foam Windscreen

## M23 G2 Enhancements

### **REDUCED PHANTOM POWER CONSUMPTION**

48 Volt Phantom Power (P48) current consumption is now 7.2 mA (reduced from Gen 1's 10 mA). This increases wireless transmitter battery runtime, as well as adding compatibility with certain audio interfaces, especially when a large number of microphones are used.

### **REDUCED 1 KHZ SENSITIVITY**

1 kHz sensitivity has been reduced to -40 dBV/Pa (10 mV/Pa) for better compatibility with some commonly used audio interfaces that cannot handle higher input signal levels (above 10 dBV).

This is important for SPL measurement and monitoring, where the entire input signal chain (microphone, preamp, interface) should be able to handle 140 dB SPL without clipping.

### **MORE COMPACT FORM FACTOR**

M23 G2 is a little over an inch and a half (4 cm) shorter than Gen 1, taking up less storage space and weighing less. The iconic and proven tapered tip design remains the same as Gen 1, with the length removed from the body section.

### **CARRYING CASE AND WINDSCREEN INCLUDED**

M23 G2 microphones ship with a roadworthy carrying case and an OMW2 windscreen.



## Phantom Power

Earthworks microphones have active electronics and require phantom power to operate.

The most common phantom power voltage is 48V (known as P48). Using P48 allows M23 G2 to cleanly capture audio at up to 140 dB SPL.

Some devices such as wireless transmitters can also supply lower voltages, like 12V (known as P12). This can be a good way to increase wireless transmitter battery life, especially when using alkaline batteries.

At 12V, M23 G2's max SPL is reduced to 133 dB SPL, but audio performance is not otherwise affected.

### **A NOTE ABOUT HOT-PLUGGING:**

While it is rare for modern professional audio gear to be damaged due to hot-plugging (connecting or disconnecting the microphone with phantom power engaged), it is not completely unheard of, especially in unpredictable environments with complex setups and unreliable power (ie: live music festivals).

For the safety of your M-Series microphone (and the rest of the signal chain), Earthworks recommends that you avoid hot-plugging, and turn off phantom power before connecting or disconnecting.

## Audio Performance

### **EXTENDED FREQUENCY RANGE AND FLATNESS**

M-Series microphones are individually tuned for the flattest possible frequency response.

The rated flat portion (+/- 1dB) of the frequency range of M23 G2 is extremely wide, extending from 5 Hz to 23 kHz.

Below and above the flat portion, the microphone's response starts to roll off.

You can expect the following:

- The -3dB low-frequency cutoff will be 3 Hz or lower
- The -3dB high-frequency cutoff will be at least 30 kHz

### **1 KHZ SENSITIVITY**

Sensitivity refers to a microphone's output signal level when in the presence of a specific Sound Pressure Level (SPL).

A microphone's sensitivity typically is measured using a 1 kHz or 250 Hz sine wave at 94 dB SPL.

Because 94 dB SPL is equivalent to 1 Pascal of air pressure, a microphone's sensitivity is commonly specified in dBV/Pa (or mV/Pa).



## Audio Performance

### **1 KHZ SENSITIVITY**

M23 G2's 1 kHz sensitivity is specified as -40 dBV/Pa (10 mV/Pa), with a tolerance of +/- 2dB.

An M23 G2 microphone's actual measured sensitivity is included on its calibration chart.

### **POLAR RESPONSE**

Earthworks M-Series microphones have an omnidirectional polar pattern that is exceptionally consistent throughout the entire frequency range. This is especially beneficial for accurate room acoustics measurements, where sound reaches the microphone from all directions.

### **IMPULSE RESPONSE**

Every aspect of an Earthworks M-Series microphone, from its small and light diaphragm, to the physical and acoustical design of the tip and body, to its internal electronics, is designed and optimized for the fastest and cleanest possible impulse response.

This makes M-Series microphones especially good for time-domain measurements such as loudspeaker and PA system alignment and audio event identification and localization.

It also provides an unparalleled level of accuracy and realism in audio recordings.



Specifications

**MICROPHONE TYPE**

Pre-Polarized Condenser

**DIAPHRAGM SIZE**

6 mm

**POLAR PATTERN**

Omnidirectional

**FLAT FREQUENCY RANGE (+/- 1dB)**

5 Hz to 23 kHz

**LOW FREQUENCY CUTOFF (-3dB)**

$\leq 3$  Hz

**HIGH FREQUENCY CUTOFF (-3dB)**

$\geq 30$  kHz

**A-WEIGHTED SELF-NOISE**

23 dBA

**POWER REQUIREMENTS**

P48 (48V Phantom Power): 7.2 mA

P12 (12V Phantom Power): 4.8 mA

**MAXIMUM SPL (3% THD)**

P48: 140 dBSPL

P12: 133 dBSPL

**MINIMUM LOAD IMPEDANCE**

1 k $\Omega$

**IP RATING**

IP54

**CONSTRUCTION**

Machined Stainless Steel

**DIMENSIONS (L X W)**

5.5 x 0.86 Inches

(138.6 x 21.8 mm)

**WEIGHT**

0.28 lbs (0.13 kg)

**COLOR**

Silver

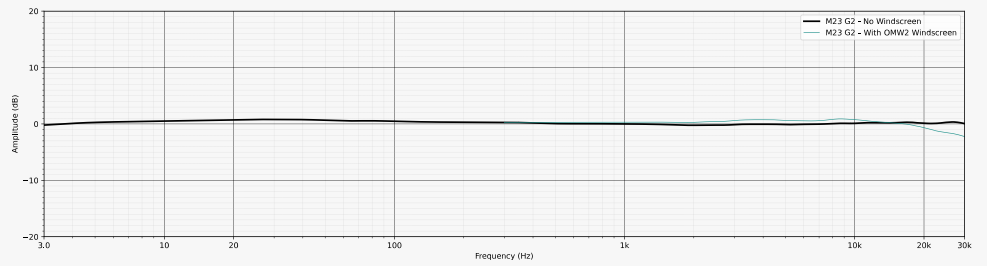
**INCLUDED ACCESSORIES**

- Carrying Case
- Calibration Chart
- MCI Microphone Clip
- OMW2 Windscreen
- ADP1 Calibrator Adapter
- Mic Stand Thread Adapter



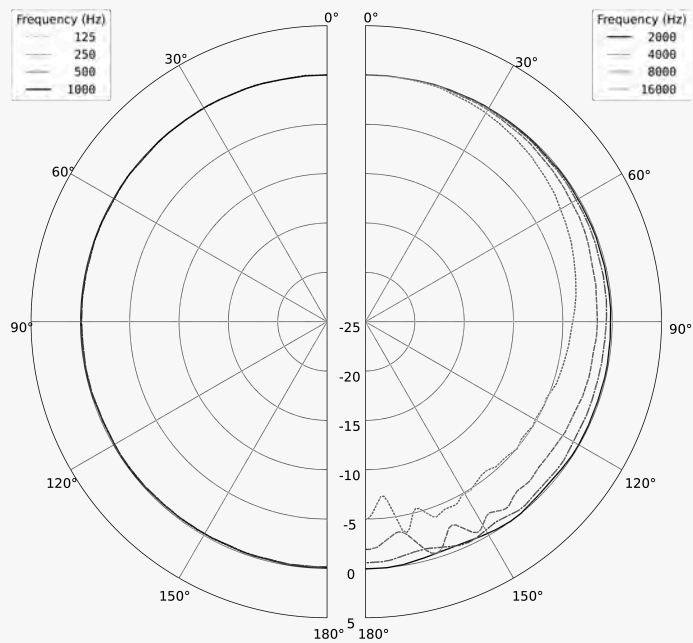
## Diagrams

### FREQUENCY RESPONSE DIAGRAM

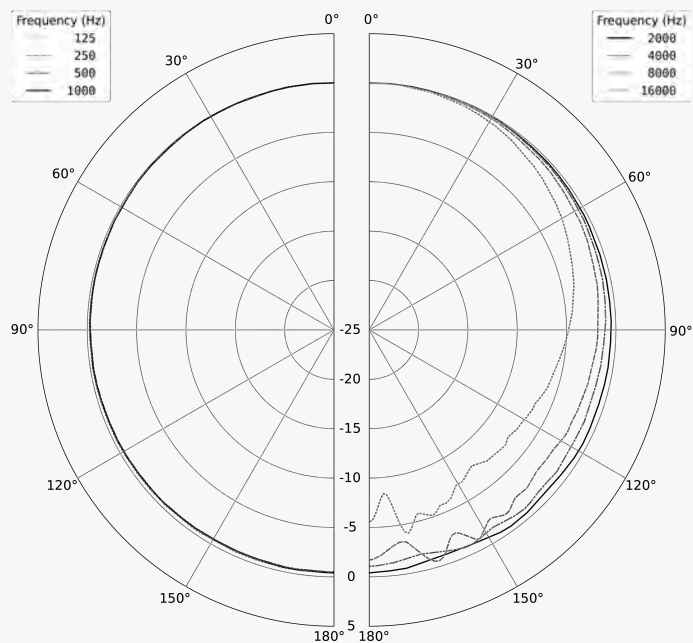


### POLAR RESPONSE DIAGRAM

Without Windscreen

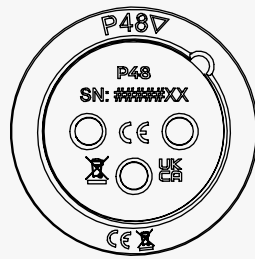
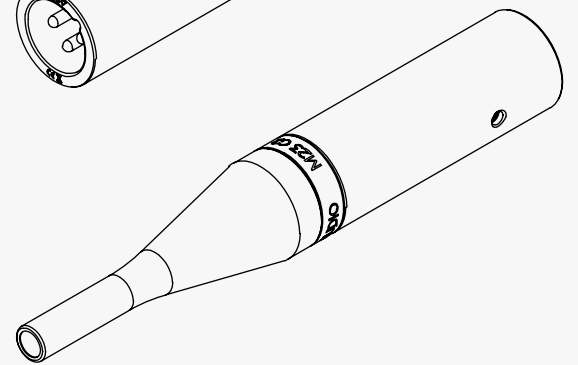
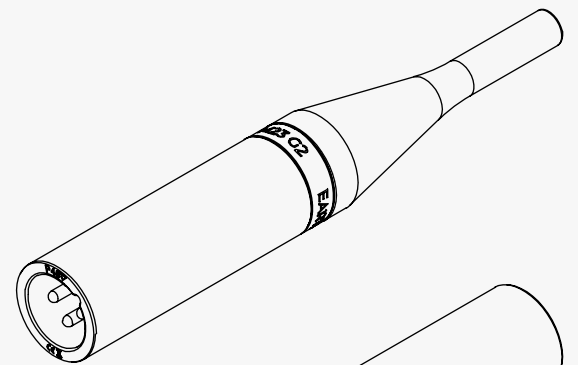
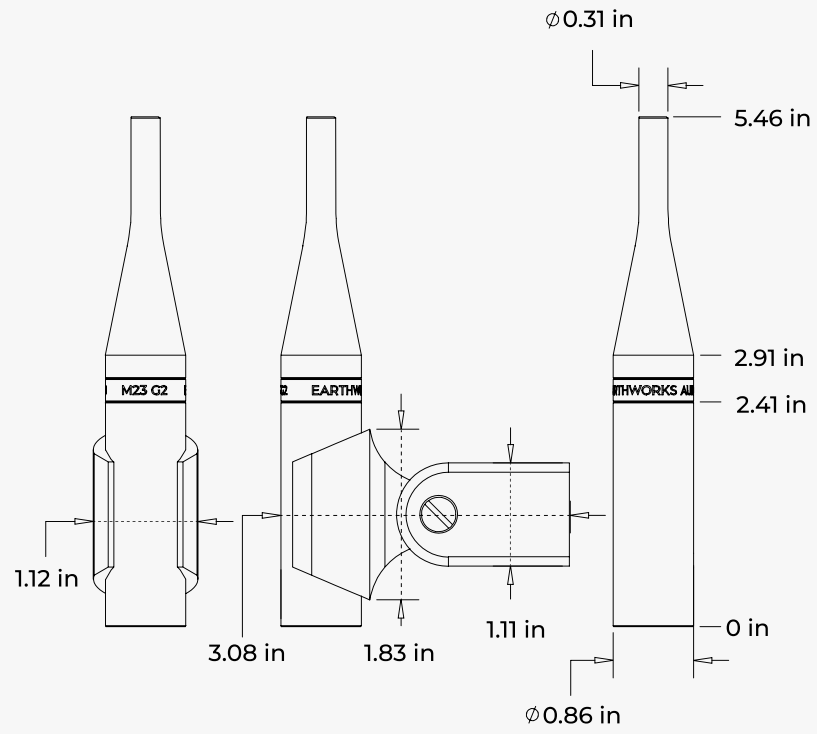


With OMW2 Windscreen





Physical Diagram





## Applications

### **LIVE SOUND**

- PA System Tuning and Alignment
- SPL Measurement and Monitoring
- Acoustical Measurement of Performance Spaces

### **PROFESSIONAL STUDIO**

- Acoustical Measurement for Control Rooms and Recording Spaces
- Monitor System Tuning and Alignment (especially for multi-channel and surround systems)

### **LOUDSPEAKER DESIGN AND TEST**

- Frequency-Domain Measurements (including frequency response and phase measurements)
- Time-Domain Measurements (including impulse response and time alignment)
- Distortion and Noise Measurements
- Production Floor and Quality Control Measurements

### **HOME STUDIO**

- Monitor System Measurement and Tuning
- Room Acoustics Measurement
- Instrument Recording and Room Miking

### **HI-FI AND AUTOMOTIVE AUDIO**

- Acoustical Measurement of Listening Spaces
- Audio System Tuning, Alignment and Analysis
- SPL Measurement

### **ACOUSTICS**

- Room Acoustics Measurements
- Ambient Noise Measurements
- SPL Measurement and Monitoring

### **SCIENTIFIC RESEARCH**

- Environmental Sound Capture and Measurement
- Infrasonic Capture and Analysis of Natural Sound Sources (ie: Elephants)
- Ultrasonic Capture and Analysis of Natural Sound Sources (ie: Birds, Bats, Insects)

### **INDUSTRY AND MANUFACTURING**

- Audio-Related Product Design and Development
- Product Noise Measurements
- Quality Control Measurements

### **MILITARY AND INTELLIGENCE**

- Audio Capture and Analysis for Object and Event Identification (especially with arrays of microphones)
- Distance, Direction and Localization of Sound Sources and Events



## Outdoor Usage

### **EXTREME TEMPERATURES**

When using the microphone in direct sunlight in a hot climate (ie: a daytime festival in the desert), the sun can heat the microphone to the point that it temporarily stops working. Bring the microphone into the shade and let it cool down and it should be fine.

A good rule of thumb is that if the rest of the gear at FOH needs shade, make sure your measurement microphone is in the shade too.

Likewise, if the microphone has been stored in a hot vehicle and its stainless steel body is hot to the touch, let it cool down before using.

If your microphone has been stored in a cold place and its stainless steel body is freezing to the touch, allow it to warm up before use.

### **WIND**

When wind is present, use the included OMW2 foam windscreen.

The OMW2 is made from high quality foam and is designed for acoustic transparency. Its effects on sensitivity, frequency response and polar response are extremely minimal.

### **IP RATING**

Earthworks M-Series microphones have an IP54 rating.

This means 5 out of 6 for dust ("Dust Protected"), and 4 out of 9 for water ("Protected from water splashing from any direction").

The stainless steel mesh that covers the microphone's capsule does a good job of keeping out most dust and moisture.

In general, if the environment is comfortable for people and safe for other audio gear, then the microphone will also be fine.

### **DUST**

When a lot of fine dust is present in the air, such as at a construction site, or if dust is being blown around at high velocity, use the included foam windscreen to protect the microphone capsule.

### **MOISTURE**

It is important to prevent the microphone capsule from getting wet.

A few drops of rain from an unexpected shower before you have a chance to get the microphone under shelter will likely be caught by the tip mesh, especially if the microphone is oriented horizontally so that water cannot pool.

However, continuous rain exposure or water immersion will likely result in permanent damage. The windscreen can be used to provide extra protection against splashes and rain, but be aware that once waterlogged it will become a source of damaging moisture located close to the capsule.



## Precautions and Best Practices

### **DO NOT TRY TO DISASSEMBLE THE MICROPHONE**

Earthworks M-Series microphones are not designed to be opened, and do not contain any user-serviceable components. Disassembly of your Earthworks microphone will void its warranty.

### **PHYSICAL IMPACT**

Use care when handling the microphone, and avoid dropping it.

Although the microphone's enclosure is machined from solid stainless steel, the narrow tip and the delicate capsule contained within can be damaged if the microphone is dropped on a hard surface.

Physical damage to the microphone will void its warranty.

### **FACTORY RECALIBRATION**

Earthworks recommends factory recalibration of M-Series microphones every 5 years.

Download the Return Merchandise Authorization Form at <https://earthworksaudio.com/support/service>, then fill it out and email to: [service@earthworkaudio.com](mailto:service@earthworkaudio.com)

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## Troubleshooting

### **PHANTOM POWER AND CABLES**

If you have trouble getting a signal from your Earthworks microphone, please verify the following:

- A high quality microphone cable is being used
- Phantom power is turned on
- All connections from microphone to the input device are securely made

If you think there's an issue with your microphone, please contact us via email at [service@earthworksaudio.com](mailto:service@earthworksaudio.com)

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## Warranty

All Earthworks products carry a warranty against manufacturing defects. If you believe your microphone is defective, or have any questions regarding its operation or performance, please email [service@earthworksaudio.com](mailto:service@earthworksaudio.com) or call 1 (603) 654-7051. For full warranty details visit <https://earthworksaudio.com/support/warranty>

### **PLEASE NOTE:**

The warranty only applies to Earthworks microphones purchased new. Please contact us about issues with microphones purchased or received second-hand.



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## Compliance Requirements

Earthworks Inc. declares that this product has been determined to be in compliance with CE (Conformité Européenne) requirements. The CE label indicates that the product has been assessed and meets the European Union's (EU) safety, health, and environmental requirements. The full text of our CE declaration of conformity is available at: <https://earthworksaudio.com/support/documents/eu>

Earthworks Inc. also declares that this product has been determined to be in compliance with UKCA (UK Conformity Assessed) requirements. The full text of our UKCA declaration of conformity is available at: <https://earthworksaudio.com/support/documents/uk>

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## Notes

- M-Series Gen 2 Microphones do not contain batteries.
- Earthworks Audio reserves the right to discontinue products and to update, correct, or change the contents of this document at any time, without prior notice, and without incurring any obligation or liability. Specifications and availability are subject to change without notice.