

BRAINGASM

OCULA

USER MANUAL



TECHNICAL DOCUMENTATION

BRAINGASM – OCULA

Omnidirectional Diffuse-Field Microphone

1. OPERATING INSTRUCTIONS

1.1 Introduction & Acoustic Operating Principle

Capture the full essence of sound with OCULA, a unique omnidirectional microphone specifically designed for **diffuse-field recordings**.

Whether tracking classical ensembles, orchestral performances, or ambient soundscapes, OCULA offers unmatched accuracy and transparency—even in the most **complex acoustic environments**.

With its true sound pressure transducer and embedded 40 mm **acoustic equalizer**, OCULA delivers a rich, precise, and immersive auditory experience. It enhances your recordings by providing **increased presence, proximity, and on-axis clarity** in reverberant environments.

Whether recording the nuanced dynamics of a symphony orchestra or the subtle reverberations of a concert hall, OCULA's tailored frequency response ensures the **faithful reproduction of every detail**.

The OCULA system is available in **matched pairs and matched trios**. Frequency response matching is guaranteed within **± 0.5 dB** across the **entire** audio spectrum

1.2 Application Hints & Directional Characteristics

Omnidirectional Pattern & Diffuse-Field Optimization:

- **Acoustic Behavior:** True omnidirectional response with a wide bandwidth extending perfectly flat down to 20Hz. High-frequency presence is driven by pressure build-up on the equalizer sphere.

THE A.P.E. EQUALIZER

The 40 mm pressure equalizer sphere is a passive acoustic processor that functions as both a **spatial and spectral modifier**. It utilizes diffraction on the sphere's surface to modify the sound field near the microphone diaphragm.

The result is an **upper-midrange and high-frequency boost** (without altering the low end) driven by pressure build-up at specific frequencies, alongside increased directionality at higher frequencies for **enhanced directional focus**.

SENSITIVITY

OCULA is engineered to provide a **very high sensitivity** of -28dBV/Pa, suitable to minimize the gain needed on the microphone preamp, lowering the noise floor of the recording to the minimum.

1.3 Connection and Powering

OCULA features a genuine Neutrik 3-pin XLR output connector.

- **Phantom Power Requirements:** The microphone requires standard P48 Phantom Power ($48\text{ V} \pm 4\text{ V}$) conforming to IEC 61938.
- Ensure that the monitoring system volume/gain is fully attenuated before routing phantom power to the unit.
- After turning on P48 power, allow 5–10 seconds for the circuit to completely stabilize before commencing operation.
- **Pin Allocation:**
 - Pin 1: 0 V / Chassis Ground
 - Pin 2: Audio Signal + (Positive Phase / Hot)
 - Pin 3: Audio Signal - (Negative Phase / Cold)

1.4 Care and Maintenance

- **Rigging & Ergonomics:** Highly versatile and exceptionally easy to rig, configure, and angle precisely thanks to the specialized ultra-lightweight orbital mounts.
 - **Storage:** When not in use for extended periods, place the microphone and its orbital mount into its protective velvet pouch enclosure to minimize dust buildup.
 - **Cleaning:** Dust the chassis using exclusively a dry, lint-free fabric. Never let liquid cleaning solvents contact the acoustic equalizer or the internal capsule housing.
 - **Suppression of Stray RF and RF Interference:** Following strict high-frequency shielding principles:
 - Keep all microphone cabling paths as short as practically possible.
 - Do not route audio lines parallel to AC main supply lines; always cross them at 90-degree angles.
 - Avoid placing the active circuit near prominent electromagnetic fields.
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2. TECHNICAL SPECIFICATIONS

- Acoustic Principle: Pressure transducer
 - Active Electronics: Class-A Push-Pull BJT output stage
 - Directional Pattern: Omnidirectional
 - Frequency Range: 20 Hz – 20,000 Hz
 - Sensitivity at 1 kHz: -28 dBV/Pa (39.8 mV)
 - Self Noise: 14 dB (A-weighted)
 - Signal-to-Noise Ratio: 80 dBA (A-weighted)
 - Dynamic Range: 112 dB
 - Maximum SPL: 126 dB (for 0.5% THD)
 - Maximum Output Level: 1,5 V
 - Output Impedance: 40 Ω
 - Physical Dimensions: Diameter: 40 mm
 - Made in Italy
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3. ELECTRICAL SAFETY & OPERATING PRECAUTIONS

3.1 Phantom Powering Safety (IEC 61938 Compliance)

OCULA is an active solid-state microphone requiring a stabilized **P48 Phantom Power supply ($48\text{ V} \pm 4\text{ V}$)** via a balanced XLR connection, adhering strictly to the IEC 61938 standard.

- **Power Source Quality:** Never attempt to power this microphone using non-standard or unregulated voltage sources (e.g., T-power, unbalanced DC lines). Doing so may cause permanent thermal damage to the internal circuitry.
- **Hot-Plugging Prevention:** Always turn off the P48 phantom power source before connecting or disconnecting the microphone cable. Sudden voltage spikes caused by "hot-plugging" can induce severe inductive transients capable of damaging both the microphone's circuitry and the input stage of your console or audio interface.

3.2 Grounding, Cable Integrity, and Shielding

- **Pin 1 Connection (Chassis Ground):** The XLR connector utilizes Pin 1 for chassis grounding and shielding. Never lift, disconnect, or alter the ground connection on Pin 1. Proper chassis grounding is legally and functionally essential to shield the microphone from external Radio Frequency Interference (RFI) and Electromagnetic Interference (EMI).
- **Symmetrical Cable Requirements:** Use exclusively fully shielded, balanced microphone cables with a low capacitance rating. Defective shielding or asymmetrical wiring will lead to severe stray RF leakage, audible hum, and potential phantom power distribution imbalances.
- **Routing Layout:** Avoid routing the microphone cables parallel to high-voltage AC mains lines, digital data cables, or proximity to switching power supplies and wireless transmitters. If crossing is mandatory, always orient the cables at a strict 90-degree angle.

3.3 Environmental and Electrostatic (ESD) Precautions

- **Electrostatic Discharge (ESD) Hazards:** Avoid touching the capsule or inserting metallic objects through the headbasket. Electrostatic discharges transferred via external conductors can puncture or permanently damage the diaphragm.
 - **Moisture and Condensation:** High humidity levels or breath moisture condensation can cause temporary electrical leakage pathways across the high-impedance capsule resistors, leading to audible sputtering, crackling noises, or a temporary loss of sensitivity. Always employ an external studio pop shield during vocal tracking sessions to isolate the capsule from moisture.
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4. REGULATORY COMPLIANCE & EUROPEAN DIRECTIVES

4.1 CE Marking and Declaration of Conformity

This product bears the CE Mark, which legally certifies that the Braingasm FERRO microphone strictly complies with the essential health, safety, and environmental protection standards established by European Union legislation.

The device conforms to the requirements of the following European Directives:

- **EMC Directive (2014/30/EU):** Electromagnetic Compatibility Directive.
- **RoHS Directive (2011/65/EU):** Restriction of Hazardous Substances Directive.

4.2 RoHS Compliance Statement

Braingasm certifies that the OCULA hardware and its internal electronic component assembly are fully compliant with Directive 2011/65/EU (RoHS 2) and its subsequent amendments. This product does not contain lead, mercury, cadmium, hexavalent chromium, or restricted polybrominated flame retardants above the maximum tolerated threshold limits defined by EU regulations.

4.3 WEEE Disposal Instructions (Waste Electrical and Electronic Equipment)

In accordance with European Directive 2012/19/EU on waste electrical and electronic equipment (WEEE), this electronic device must not be disposed of with regular, unsorted municipal household waste.

The user is legally obligated to dispose of this hardware by delivering it to a designated municipal collection facility, local recycling center, or returning it to the retailer upon purchasing an equivalent new product. Correct disposal ensures that critical raw materials are safely recycled, mitigating potential adverse effects on public health and the environment caused by inappropriate waste handling.

5. MANUFACTURING

Braingasm Lab

Via Zenodossio 11, 00176 Rome, Italy

Handmade in Italy

Official Communications: www.braingasmlab.com

This product conforms to the standards listed in the Declaration of Conformity.

Please contact us if you want to order a free copy of the Declaration of Conformity.

Technical data subject to change without notice.



TECHNICAL GLOSSARY: CONDENSER MICROPHONE SPECIFICATIONS

1. Capsule Sensitivity

Definition: The efficiency with which a microphone capsule converts acoustic sound pressure into an electrical voltage. It is measured at a reference frequency of 1 kHz and expressed either in millivolts per Pascal (mV/Pa) or in decibels relative to 1 Volt per Pascal (dBV/Pa).

Formula: Sensitivity (dBV/Pa) = $20 * \log_{10} (\text{Sensitivity in mV/Pa} / 1000)$

*Example: 18 mV/Pa converts to $20 * \log_{10}(0.018) \approx -35 \text{ dBV/Pa}$.*

2. Self Noise (Equivalent Noise Level)

Definition: The residual electrical noise voltage generated solely by the microphone's internal circuitry and thermal air agitation on the diaphragm, expressed as an equivalent acoustic sound pressure level. It is measured in decibels using an A-weighting filter (dB(A)) to mimic human hearing sensitivity.

Formula: Self Noise (dB(A)) = 94 dB SPL - SNR (dB)

Example: Acts as the absolute floor of both the Signal-to-Noise Ratio and the Dynamic Range.

3. Signal-to-Noise Ratio (SNR)

Definition: The ratio between a standard reference speech level and the inherent self-noise floor of the microphone. By industry convention, the standard reference signal is 1 Pascal of air pressure, which equals 94 dB SPL at 1 kHz.

Formula: SNR (dB) = 94 dB SPL - Self Noise (dB(A))

Example: $94 \text{ dB} - 12 \text{ dB(A)} = 82 \text{ dB}$.

4. Maximum SPL (Sound Pressure Level)

Definition: The highest acoustic sound pressure level that the microphone can handle before its internal electronics or capsule clip, typically measured at the point where Total Harmonic Distortion (THD) reaches 0.5% or 1%.

Formula: Max SPL (PAD) = Max SPL (Standard) + PAD Value (dB)

Example: Engaging an input PAD (x dB) increases this limit by reducing the signal level before it overloads the impedance converter circuit.

5. Dynamic Range

Definition: The entire usable operational window of the microphone, stretching from the quietest audible sound it can capture above its own noise floor up to the loudest sound it can handle before distorting.

Formula: Dynamic Range (dB) = Maximum SPL (dB SPL) - Self Noise (dB(A))

Example: 130 dB SPL - 12 dB(A) = 118 dB.

6. Maximum Output Level

Definition: The maximum electrical voltage (expressed in Volts, V, or dBu) that the microphone's output stage can cleanly deliver to a preamplifier before clipping.

Formula: $\Delta\text{dB} = \text{Max SPL} - 94 \text{ dB}$

Voltage Gain Factor = $10^{(\Delta\text{dB} / 20)}$

Max Output Level (V) = Sensitivity (V/Pa) * Voltage Gain Factor

*Example: $0.018 \text{ V/Pa} * 10^{((130 - 94) / 20)} = 0.018 * 63.1 \approx 1.136 \text{ V} \rightarrow 1.1 \text{ V}$ (rounded).*

7. Rated Output Impedance

Definition: The internal electrical resistance of the microphone's output circuit looking back from the XLR connector, measured in Ohms (Ω).

Formula: $Z_{\text{in}} (\text{Preamplifier}) \geq 10 * Z_{\text{out}} (\text{Microphone})$

Example: For a 50Ω microphone, the preamplifier input impedance should be at least 500Ω (standard studio preamps are typically 1000Ω - 2400Ω).