BRÜEL & KJÆR® Transducers

1/8-inch Pressure-field Microphone Type 4138

Type 4138 is designed for high-level and very high-frequency measurements and measurements in confined spaces. Being externally polarized, Type 4138 must be used with a classical preamplifier.

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Uses

- High-level and very high-frequency measurements
- Pulse measurements
- Applications which require a high degree of spatial resolution or where space is limited, for example, model testing

Features

- Sensitivity: 1 mV/Pa
- Frequency: 6.5 Hz to 140 kHz
- Dynamic Range: 52.2 to 168 dB
- Temperature: −30 to +100 °C (−22 to +212 °F)
- Polarization: 200 V (external)

Use of Pressure-field Microphones

Type 4138 is a pressure-field microphone. Pressure-field microphones are optimised to have a flat frequency response in a pressure field, making them ideal for measurements in small, closed couplers or close to hard, reflective surfaces. Because of its small size, Type 4138 can also be used for random-incidence measurements at audio frequencies, where its frequency response is less dependent on angle of incidence.

Polarization Voltage

Type 4138 requires an external polarization voltage; therefore, it requires the use a classical Brüel & Kjær preamplifier such as Type 2670 together with 1/8- to 1/4-inch Adapter UA-0160.

TEDS Microphones

Type 4138 is available in TEDS combinations with the classical preamplifier Type 2669 or 2670 and a suitable adapter. The TEDS microphone is considered one unit and has been sealed in a clean environment. TEDS is programmed with the loaded sensitivity of the actual cartridge and the data is readily available. The default TEDS template is to IEEE P1451.4 but TEDS to IEEE 1451.4 is available on request.

Fig. 1 *TEDS combination Type 4138-A-015, which comprises Type 4138 (**left**), Adapter UA-0160 (**middle**) and Preamplifier Type 2670 (**right**)*

210068

Calibration

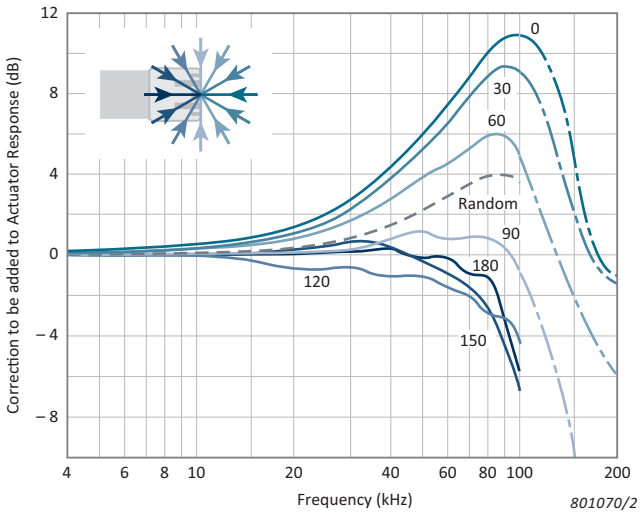
The sensitivity of Type 4138 can be calibrated at 250 Hz using Pistonphone Type 4228, or at 1 kHz using Sound Calibrator Type 4231, in both cases using Adapter DP-0774. The pressure-field response can be measured using Electrostatic Actuator UA-0033 with Actuator Adapter DB-0900.

Each Type 4138 comes with an individual calibration chart with information about the open-circuit sensitivity and the electrostatic actuator response.

Free-field Correction

Free-field corrections must be added to the pressure (actuator) response of the microphone in order to obtain the free-field response at a particular angle of incidence. The free-field correction represents the increase of sound pressure caused by diffraction of the sound waves around the microphone and is only significant at very high frequencies where the wavelength is comparable with the external dimensions of the microphone.

Fig. 2 *Free-field correction curves for various angles of incidence for Type 4138 (with protection grid)*



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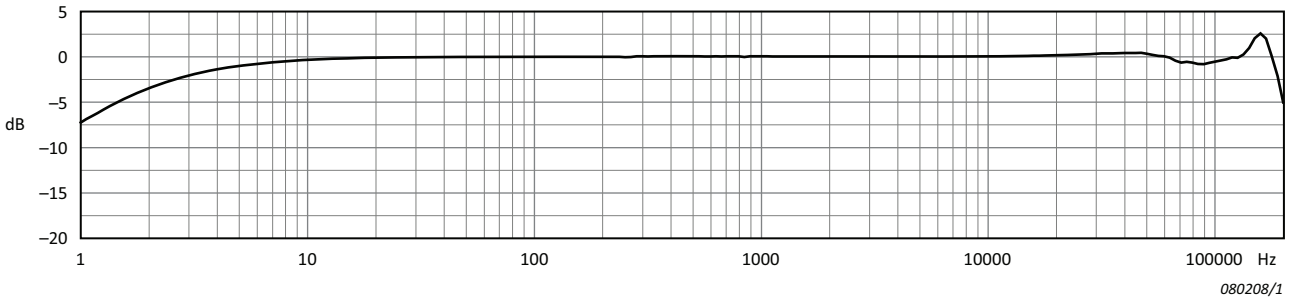
Manufacturing and Stability

Due to its small dimensions, an 1/8-inch microphone should be treated more carefully than, for example, a robust, 1/2-inch microphone. When not in use, the microphone should be kept on the adapter/preamplifier, preferably in the microphone box.

All Brüel & Kjær measuring microphones are assembled in a clean room. This ensures that the microphones maintain their inherent low noise floor and high stability, even when used in environments with a combination of high humidity and at high temperature.

Fig. 3 Typical frequency response of Type 4138 recorded by means of the electrostatic actuator method



Specifications – Type 4138

Note:

- All values are typical at 23 °C (73.4 °F), 101.3 kPa and 50% RH unless otherwise specified
- From serial number 3277807, the diaphragm material was changed from nickel to a stainless steel alloy, which is much more resistant to corrosion than nickel

DYNAMIC CHARACTERISTICS	
IEC 61094–4 Type Designation	N/A
Polarization Voltage	200 V (external)
Open-circuit Sensitivity (250 Hz)*	–60 dB ±3 dB re 1 V/Pa, 1 mV/Pa
Random-incidence and Pressure-field Response*	6.5 Hz to 140 kHz: ± 2 dB
Lower Limiting Frequency (–3 dB)*	0.05 – 5 Hz
Pressure Equalization Vent	Side vented
Diaphragm Resonance Frequency	160 kHz (90° phase shift)
Cartridge Capacitance* (Polarized)	3.5 pF at 250 Hz
Equivalent Air Volume	0.1 mm^3 (250 Hz)
Cartridge Thermal Noise	43 dB(A)
Upper Limit of Dynamic Range (3% Distortion)	>168 dB SPL
Max. Sound Pressure Level	171 dB (peak)
ENVIRONMENTAL CHARACTERISTICS	
Operating Temperature Range	–30 to +100 °C (–22 to +212 °F)
Storage Temperature (in Microphone Box)	–30 to +70 °C (–22 to +158 °F)
Temperature Coefficient (250 Hz)	–0.0054 dB/°C (–10 to +50 °C, 14 to 122 °F)
Pressure Coefficient	–0.01 dB/kPa, typical
Influence of Humidity	< 0.1 dB (without condensation)
Vibration Sensitivity (< 1000 Hz)	58 dB equivalent SPL for 1 m/s^2 axial vibration
Magnetic Field Sensitivity	40 dB SPL for 80 A/m, 50 Hz field
PHYSICAL CHARACTERISTICS	
Diameter with Grid	3.5 mm (0.14 in)
Diameter without Grid	3.175 mm (0.12 in)
Height with Grid	6.7 mm (0.26 in)
Height without Grid	6 mm (0.23 in)
Thread for Preamplifier Mounting	M3 × 0.2

* Individually calibrated

Ordering Information

Type 4138 **1/8-inch Pressure-field Microphone**

TEDS COMBINATIONS	
4138-A-015	1/8-inch Pressure-field Microphone Type 4138, UA-0160, Type 2670
4138-B-006	1/8-inch Pressure-field Microphone Type 4138, UA-0036, Type 2669-B
4138-C-006	1/8-inch Pressure-field Microphone Type 4138, UA-0036, Type 2669-C
4138-L-006	1/8-inch Pressure-field Microphone Type 4138, UA-0036, Type 2669-L
OPTIONAL ACCESSORIES	
Type 2670	1/4-inch Microphone Preamplifier
UA-0160	1/8-inch to 1/4-inch Adapter
Type 2669-B	1/2-inch Microphone Preamplifier, cable with proprietary B & K 7-pin connector
Type 2669-C	1/2-inch Microphone Preamplifier, no cable
Type 2669-L	1/2-inch Microphone Preamplifier, cable with LEMO connector
UA-0036	1/8-inch to 1/2-inch Adapter
UA-0355	1/8-inch Nose Cone
DB-0900	Adapter for Electrostatic Actuator UA-0033
UA-0033	Electrostatic Actuator
Type 4228	Pistonphone (for calibration)
Type 4231	Sound Calibrator (for calibration)
DP-0774	1/8-inch Calibration Adapter for Types 4228 and 4231
EW-9004	Removal Tool for Flush Mounted 1/8-inch Microphone
SECONDARY CALIBRATION SERVICES	
MIC-CAI	Initial Accredited Calibration
MIC-CAF	Accredited Calibration
MIC-CFF	Factory Standard Calibration
MIC-TEDS-CAI	Initial Accredited Calibration, for TEDS microphones
MIC-TEDS-CAF	Accredited Calibration, for TEDS microphones
MIC-TEDS-CFF	Factory Standard Calibration, for TEDS microphones

For information on microphone calibration equipment and microphone accessories, please refer to the relevant product data sheets

COMPLIANCE WITH STANDARDS

HBK HOTTINGER BRÜEL & KJÆR