

Product Data

Pistonphone — Type 4228

USES:

- Laboratory standard
- Calibration of sound level meters and other sound measurement equipment
- Field and laboratory use

FEATURES:

- 124 dB SPL at 250 Hz

Pistonphone Type 4228 is a small, battery-operated, high-precision sound source. Each pistonphone is individually calibrated and comes complete with adaptors, allowing calibration of 1", 1/2", 1/4" and 1/8" microphones.

Pistonphone Type 4228 provides quick and accurate calibration of sound measuring equipment including sound level meters. With the included barometer, it satisfies IEC 942 (1988) Class 1L while, with an external barometer, it is capable of satisfying Class 0L of IEC 942 (1988). It also satisfies ANSI S1.40-1984. It can be used in the field over a wide range of temperature, humidity and pressure while still maintaining high accuracy. It is extremely useful for supplying a standard sound pressure level.

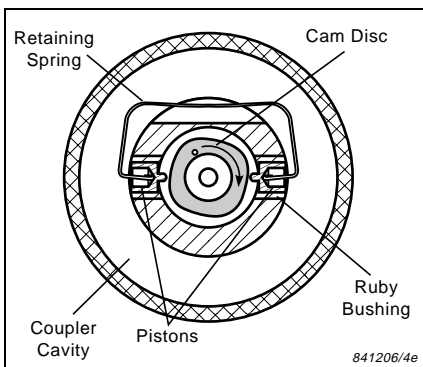


Fig.1 Cross-sectional view showing the principle of operation

- Satisfies IEC 942 (1988) Class 1L or Class 0L (with external barometer) and ANSI S1.40-1984
- High frequency and level stability
- Individually calibrated to within ± 0.12 dB (including effects of specified microphones)
- Fits 1", 1/2", 1/4" and 1/8" microphones
- Battery operated



The calibration frequency, nominally 250 Hz, is $251.2 \text{ Hz} \pm 0.1\%$ as defined by ISO 266. The sound level produced by the pistonphone is nominally $124 \pm 0.2 \text{ dB re } 20 \mu\text{Pa}$ at the reference conditions. Each pistonphone, however, is individually calibrated with an uncertainty of less than 0.09 dB and delivered with a calibration chart. When loaded with a microphone of one of the specified types, the uncertainty is less than

0.12 dB. The high sound level from the pistonphone allows correct calibration to be made in the field, even in very noisy surroundings.

The piston arrangement (see Fig.1), based on an original Brüel & Kjær design, consists of two pistons mounted on opposite sides of a cam disc. The rotation of the cam disc forces the pistons to move, in phase, in and out of the coupler cavity. The design reduces cam disc ec-

centricity and harmonic distortion, and ensures maximum level stability.

The pistonphone is very simple to operate with only one control switch. It can be held in one hand in any position, while, with the free hand, the sensitivity of the sound measuring equipment is adjusted until a reading corresponding to the sound pressure level produced is obtained.

The pistonphone fits Brüel & Kjær 1", 1/2", 1/4" and 1/8" Microphones, and microphones having the same standard diameter (e.g. types WE 640AA, MR 103). Fig. 2 shows its use with 1" and 1/2" microphones.

A barometer supplied with the pistonphone gives the ambient pressure correction in dB, in the range 650 to 1080 hPa, provided it is checked annually to maintain its accuracy.

The pistonphone is delivered with six alkaline batteries mounted in Battery Container DH0597. When fitted with alkaline batteries, the pistonphone operates in the temperature range -10 to +50 °C (14 to

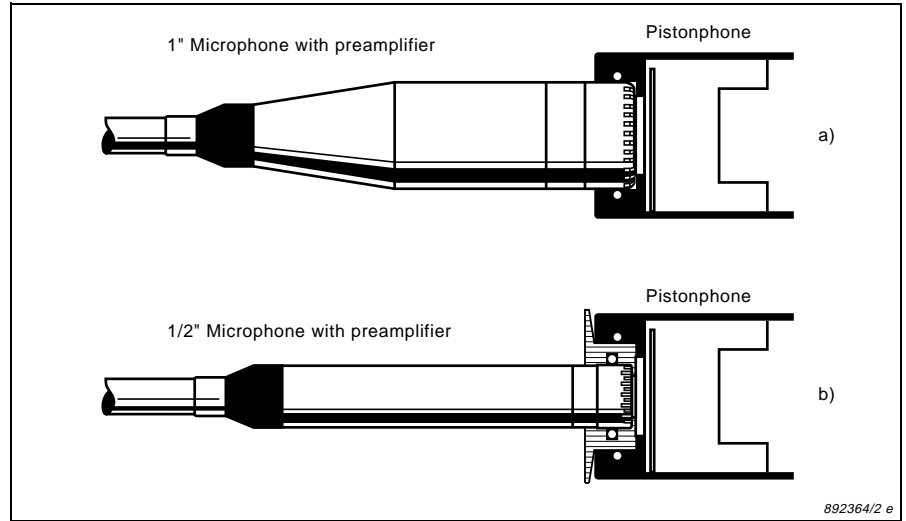


Fig. 2 Mounting B&K microphones on the pistonphone

a) 1" microphone

b) 1/2" microphone. The total volume of the cavity is the same in both cases

122 °F). The "250 Hz" light beside the control switch monitors the frequency. When the pistonphone is switched on, the light flickers for a second or so until the frequency reaches

251.2 Hz. The light then remains on until the pistonphone is switched off. If the light flickers at other times, the batteries should be replaced.

Specifications 4228

SATISFIED STANDARDS:

IEC 942 (1988) Class 1L (Class 0L with suitable external barometer)
ANSI S1.40-1984

NOMINAL SOUND PRESSURE LEVEL:

124 dB re 20 μ Pa \pm 0.2 dB at reference conditions:

Ambient Pressure: 1013 hPa

Ambient Temp.: 20 °C (68 °F)

Ambient Humidity: 65% RH

Effective Load Volume: 1.333 cm³

FREQUENCY:

Nominal: 250 Hz

Actual: 10^{2.4} Hz (ISO 266) or 251.2 Hz \pm 0.1%

SPECIFIED MICROPHONE TYPES:

Brüel & Kjær (and similar types) 1", 1/2", 1/4" and 1/8" microphones (see calibration chart for more details)

INDIVIDUAL CALIBRATION ACCURACY:

At Reference Conditions: \pm 0.09 dB

At Ambient Reference Conditions:

\pm 0.12 dB with specified microphone types

Within Range of Ambient Conditions:

With External Barometer:

\pm 0.15 dB — IEC 942 (1988) Class 0L

With Included Barometer:

\pm 0.30 dB — IEC 942 (1988) Class 1L

NOMINAL EFFECTIVE COUPLER VOLUME:

19.733 cm³ (at 250 Hz) including Nominal Effective Load Volume 1.333 cm³

TOTAL HARMONIC DISTORTION: <3%

AMBIENT CONDITIONS:

Ranges:

Pressure: 650 hPa to 1080 hPa

Temperature: -10 to +50 °C (14 to 122 °F)

Relative Humidity: 5% RH to 95% RH

Required Measurement Accuracy:

Pressure: \pm 0.3% (IEC 942 Class 0L)

\pm 2.0% (IEC 942 Class 1L)

Temperature: \pm 5 °C

Relative Humidity: \pm 15% above 35 °C (95 °F) (measurement is not necessary below 35 °C (95 °F))

Power Supply

Batteries: 6 \times 1.5 V IEC Type LR6 ("AA" size)

Lifetime: Typically 40 hours with alkaline batteries (continuous operation at 20 °C)

Check: Constant check via "250 Hz" light

Environmental

Ambient Pressure: SPL is proportional to the ambient pressure (correction read from the barometer supplied)

Ambient Temperature: -0.0005 dB/°C (estimated)

Ambient Humidity: -0.0001 dB/% RH at the reference conditions

Effective Load Volume: See calibration chart

Dimensions and Weight

Length: 224 mm (8.7")

Diameter: 36 mm (1.4")


WEIGHT:

Pistonphone with batteries: 0.7 kg (1.5 lb)

Case containing pistonphone, adaptors and correction barometer: 1.6 kg (3.5 lb)

Note: All values are typical at 25 °C (77 °F), unless measurement uncertainty or tolerance field is specified. All uncertainty values are specified at 2 σ (i.e. expanded uncertainty using a coverage factor of 2)

COMPLIANCE WITH STANDARDS:

	CE-mark indicates compliance with: EMC Directive.
Safety	EN 61010-1 and IEC 1010-1: Safety requirements for electrical equipment for measurement, control and laboratory use.
EMC Emission	EN 50081-1: Generic emission standard. Part 1: Residential, commercial and light industry. EN 50081-2: Generic emission standard. Part 2: Industrial environment. CISPR 22: Radio disturbance characteristics of information technology equipment. Class B Limits. FCC Rules, Part 15: Complies with the limits for a Class B digital device.
EMC Immunity	EN 50082-1: Generic immunity standard. Part 1: Residential, commercial and light industry. EN 50082-2: Generic immunity standard. Part 2: Industrial environment. Note 1: The above is guaranteed using accessories listed in this Product Data sheet only.
Temperature	IEC 68-2-1 & IEC 68-2-2: Environmental Testing. Cold and Dry Heat. Operating Temperature: -10 to +50 °C (14 to 122 °F) Storage Temperature: -25 to +70 °C (-13 to +158 °F), without batteries
Humidity	IEC 68-2-3: Damp Heat: 90% RH (non-condensing at 40 °C (104 °F))
Mechanical	Non-operating: IEC 68-2-6: Vibration: 0.3 mm, 20 m/s ² , 10-500 Hz IEC 68-2-27: Shock: 1000 m/s ² IEC 68-2-29: Bump: 1000 bumps at 250 m/s ²

Ordering Information

Type 4228 Pistonphone

Includes the following accessories:

6 \times QB 0013: 6 \times 1.5 V Alkaline Battery, IEC

Type LR6 ("AA" size)

DH 0597: Battery Container

DP 0776: Adaptor (for 1/2" microphones)

DP 0775: Adaptor (for 1/4" microphones)

DP 0774: Adaptor (for 1/8" microphones)

UZ 0004: Correction Barometer

Brüel & Kjær reserves the right to change specifications and accessories without notice