

## Binaural Microphone Types 4101-B and 4965-B

*Binaural Microphone Type 4101-B has been designed specifically for binaural sound recordings where testing on a human subject is preferred and/or where the use of the traditional head and torso simulator (HATS) method is precluded. These microphones are lightweight, do not affect normal hearing capabilities and, consequently, do not influence test results.*

*Type 4965-B consists of Type 4101-B together with a Bluetooth®-enabled headset for replaying recordings.*



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### Uses and Features

#### Uses

- Binaural recordings near the entrance of the human ear canal
- Sound recordings where a vehicle driver wears the binaural microphone
- Binaural recordings where the influence of the test subject's head and torso is important
- Sound recordings of a helmeted test subject, such as a motorcycle driver
- Psychoacoustic experiments requiring binaural sound recording on human subjects
- Binaural recordings where the use of a traditional HATS, for example, Sound Quality Head and Torso Simulator Type 4100, is impossible
- Evaluation of headphones and earmuffs on a human subject
- Benchmarking vehicles for reference or processing into simple PULSE™ NVH Vehicle Simulator models
- Capturing vehicle behaviour during on-road evaluation or while using DTS On-Road Simulator
- Cabin noise measurements
- As general-purpose two-channel data recorders (replay with Type 4965-B only)

#### Features

- Easy-to-use with a lightweight and compact design
- Miniature, prepolarized condenser microphones that are positioned at the entrance to the ear canal and do not affect normal hearing capabilities
- Able to record two channels of sound
- Low equivalent noise level of 23 dB(A)
- Powered from constant current line drive (CCLD) input channel via BNC plug
- Free-field and diffuse-field correction data tables included and built into Sonoscout™ NVH Recorder
- Calibration adapter for use with Sound Calibrator Type 4231
- Transducer electronic data sheet (TEDS)
- Multi-country power supply
- Bluetooth-enabled headset for replay of recordings (Type 4965-B only)

The strength of binaural recording lies in capturing sound exactly as it is heard by the human test subject in order to recreate a 3D stereo sensation – thus allowing every listener the chance to play back the recording and experience sound, again and again, as if from the best seat in the house.

Binaural Microphone Types 4101-B and 4965-B are designed to be worn comfortably by a test subject for the purpose of making binaural recordings. Together, they provide a complete listening and playback solution for use with Brüel & Kjær's Sonoscout™ NVH Recorder. However, with CCLD conditioning, they can also be used in other sound recording scenarios.

### Configurations

The binaural microphones are available in two configurations:

#### Type 4101-B Configuration

Type 4101-B is an in-ear microphone set designed with flexibility in mind. It comprises miniature condenser microphones that are mounted in moisture-resistant, gold-plated capsules.

**Fig. 1**  
Type 4101-B's microphone capsules rest in the concha of the ear, cushioned by foam windscreens. This makes for a comfortable fit inside a helmet



It comes with an ergonomic mount that wraps around the back of the user's head and ears. This mount can be easily adapted to suit any ear size and/or head shape for a secure yet comfortable fit. The individual microphone capsules sit in the concha of the ear, cushioned by the included foam windscreens (these are available in two different sizes to fit most users).

Compact and slim, Type 4101-B can be comfortably worn under a driver's or pilot's helmet. It features professional-grade cables and includes a cable clip that can be attached to the user's clothing to relieve pressure on both the cable's upper section and the user's ears, eliminating any unnecessary weight or stress from the remaining cable.

#### Type 4965-B Configuration

Type 4965-B includes Binaural Microphone Type 4101-B plus a pair of bone-conducting, Bluetooth-enabled headphones. This configuration is focused on NVH testing, where a person's perception of sound is investigated. The headphones are designed to be positioned next to the ears, thus giving the driver/passenger a perfect impression of the vehicle experience.

**Fig. 2**  
Type 4965-B – which includes Binaural Microphone Type 4101-B and bone-conducting, Bluetooth-enabled headphones – for easy monitoring of captured data



As the headphones are separate from the microphone headset, they can be effortlessly removed to perform measurements while the test subject is wearing a helmet and/or is exposed to high gravitational forces.

Use of the headphones is optimal in combination with Sonoscout Type 3663. Measured sound data can be played back to the headphones via Bluetooth, which makes the user completely wire-independent from the measurement solution.

They are also ideal for obtaining data for use with PULSE™ NVH Vehicle Simulator Type 3644, as you can simultaneously record audio and vehicle performance data with Sonoscout and export it to an NVH Vehicle Simulator model for processing.

The binaural microphones incorporate transducer electronic data sheets (TEDS). This means that the actual identity and loaded sensitivity of the left and right microphones are programmed into the TEDS memory, making set-up very easy and fool-proof.

Calibration

The microphones are selected based on matching frequency responses. Operating in the test subject’s open ear canal, the binaural microphone set is calibrated with Head and Torso Simulator Type 4128, which also has an open ear canal.

In a diffuse sound field, the binaural microphone set is measured for its diffuse-field response mounted on Type 4128. The free-field response at zero-degree frontal incidence is measured in the same way but in an anechoic room. In both cases, the results are averaged over several mountings of the microphones on Type 4128.

The resulting data are included in Sonoscout. The free-field and diffuse-field responses, as well as the individual factory sensitivity calibration data, are available at [www.bksv.com](http://www.bksv.com) for download.

**Fig. 3**  
Calibration of the binaural microphone using Adapter DP-0893 and Sound Calibrator Type 4231



In-use level calibration of the binaural microphone set is performed using the supplied calibration adapter together with Sound Calibrator Type 4231. Using the adapter, the output level from the calibrator will be increased by 0.35 dB ±0.2 dB.

Compliance with Standards

	<p>The CE marking is the manufacturer’s declaration that the product meets the requirements of the applicable EU directives                  RCM mark indicates compliance with applicable ACMA technical standards – that is, for telecommunications, radio communications, EMC and EME                  China RoHS mark indicates compliance with administrative measures on the control of pollution caused by electronic information products according to the Ministry of Information Industries of the People’s Republic of China                  WEEE mark indicates compliance with the EU WEEE Directive</p>
<p><b>Safety</b></p>	<p>EN/IEC 61010–1: Safety requirements for electrical equipment for measurement, control and laboratory use                  ANSI/UL 61010–1: Safety requirements for electrical equipment for measurement, control and laboratory use</p>
<p><b>EMC Emission</b></p>	<p>EN/IEC 61000–6–3: Generic emission standard for residential, commercial and light industrial environments                  EN/IEC 61000–6–4: Generic emission standard for industrial environments                  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</p>
<p><b>EMC Immunity</b></p>	<p>EN/IEC 61000–6–1: Generic standards – Immunity for residential, commercial and light industrial environments                  EN/IEC 61326: Electrical equipment for measurement, control and laboratory use – EMC requirements                  RF field sensitivity: &lt;1.2 mV  <b>Note:</b> The above is only guaranteed using accessories listed in this document</p>
<p><b>Temperature</b></p>	<p>IEC 60068–2–1 &amp; IEC 60068–2–2: Environmental Testing. Cold and Dry Heat                  Operating Temperature:                  Type 4101-B: –40 to +45 °C (–40 to +113 °F)                  Type 4965-B: 0 to +45 °C (+32 to +113 °F)</p>
<p><b>Humidity</b></p>	<p>IEC 60068–2–78: Damp Heat: 90% R.H. Non-condensing</p>

**Table 1** Typical diffuse- and free-field response for Type 4101-B when mounted on HATS Type 4128 with incidence directly from the front

1/3-octave (Hz)	Free-field (dB)	Diffuse-field (dB)
100	-0.24	0.37
125	-0.12	0.26
160	-0.03	0.41
200	0.11	0.56
250	0.30	0.65
315	0.54	0.88
400	0.90	1.86
500	1.06	1.34
630	0.90	1.79
800	1.82	1.41
1000	1.23	1.97
1250	1.76	2.89
1600	2.47	3.25
2000	4.83	4.49
2500	6.02	4.43
3150	5.50	3.89
4000	7.96	6.38
5000	9.31	8.69
6300	6.94	9.01
8000	-1.61	3.44
10000	-2.29	1.37
12500	-1.23	-0.20
16000	+1.58	-3.01
20000	-9.67	-2.26

**Microphone**

**CARTRIDGE TYPE**

Prepolarized, gold-plated condenser element with vertical diaphragm

**FREQUENCY RANGE**

20 Hz – 5 kHz, ±2 dB re 1 kHz, 3 dB soft boost at 5 – 20 kHz when measured in a free field for individual microphones at 0° incidence

**SENSITIVITY**

Nominally 20 mV/Pa ±3 dB at 1 kHz

Ordering Information

**Type 4101-B Binaural Microphone with TEDS**

Includes the following accessories:

- DP-0893: Calibration Adapter
- 2 × JP-0145: UNF 10–32 to BNC adapter
- 2 × WA-1705: UNF 10–32 to SMB adapter
- 2 sets of foam windscreens
- Zip Case

**Type 4965-B Binaural Microphone with TEDS and Headphones**

Includes Type 4101-B plus the following items:

- HT-0025: Bluetooth-enabled bone-conducting headphones
- ZG-0473: Multi-country power supply for headphones
- Transport Box

**EQUIVALENT NOISE LEVEL, A-WEIGHTED**

Typically, 23 dB(A) re 20 µPa

**TOTAL HARMONIC DISTORTION**

<3% at 120 dB SPL (sine)

**PREAMPLIFIER OUTPUT IMPEDANCE**

30 – 40 ohms

**CABLE DRIVE CAPABILITY**

Up to 3 m (9.84 ft)

**CABLE LENGTH**

2.30 m (7.54 ft) from capsule to connector

**WEIGHT**

<10 g (0.35 oz) (down to cable clip)

**Headphones (Type 4965-B only)**

**SPEAKER TYPE**

Bone-conducting transducers

**FREQUENCY RESPONSE**

20 Hz – 20 kHz

**BLUETOOTH VERSION**

4.1

**COMPATIBLE PROFILES**

A2DP, AVRCP, HSP, HFP

**WIRELESS RANGE**

10 m (33 ft)

**BATTERY**

Rechargeable lithium ion

**CONTINUOUS PLAY**

6 hours

**STANDBY TIME**

10 days

**CHARGING TIME**

1.5 hours

**WEIGHT**

36 g (1.26 oz)

**Supported Brüel & Kjær Hardware**

Type 4231 Sound Calibrator

**Brüel & Kjær Services**

**TRACEABLE CALIBRATION**

4101-CFF Binaural Microphone with TEDS, Factory Standard Calibration\*

\* Calibration of sensitivity at 1 kHz for both channels

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