

## Artificial Ear Types 4152 and 4153

Artificial Ear Types 4152 and 4153 have been designed for measurements in audiometry and related fields. They enable electroacoustical measurements on either insert earphones or headphones to be carried out under well-defined acoustical conditions, which are of great importance for the comparability of different designs and the reproducibility of measurements.

Artificial Ear Types 4152 and 4153 consist of an acoustic coupler, a main housing containing the sockets for the connection of a Brüel & Kjær pressure-field microphone and a base plate with a mechanism for clamping the device under test (DUT).

The clamping mechanism is spring loaded and provides a force that can be adjusted from 2 N (approximately 0.2 kg) to 10 N (approximately 1 kg) as recommended by the relevant ANSI standards. The actual force value is set on a scale engraved on the clamp holder.

To minimize the effects of vibration during the measurements, each artificial ear is isolated from shock and vibration by means of three soft rubber feet.



### Uses and Features

#### Uses

- Frequency response and sensitivity measurements on insert earphones and headphones
- Calibration of audiometers

#### Features

- Conform to IEC and ANSI standards
- Complete reproducibility of results
- Well-defined measuring conditions
- 2 cm<sup>3</sup> and 6 cm<sup>3</sup> couplers
- Adjustable clamping force

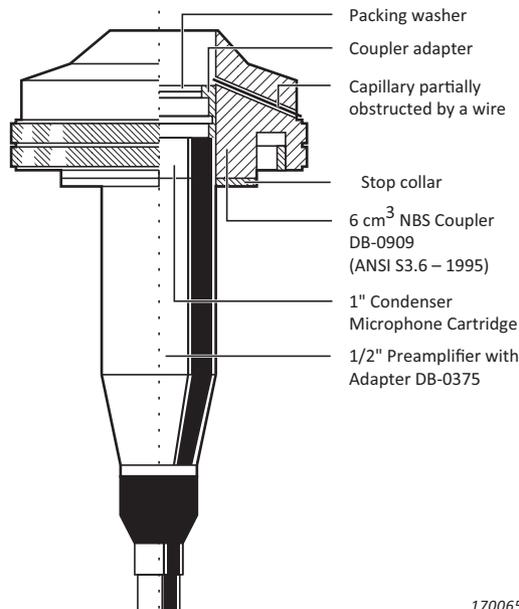
In Artificial Ear Type 4152, the socket for mounting the measuring microphone permits use of 1" Pressure-field Microphone Type 4144 with 1/2" Preamplifier Type 2669-L and Adapter DB-0962. The couplers supplied with the artificial ear are:

- 2 cm<sup>3</sup> Coupler DB-0138 in accordance with IEC 60318-5 (formerly IEC 126 and IEC 60126) and ANSI S3.7-1995 for measurements on hearing aid earphones (see Fig. 1)
- 6 cm<sup>3</sup> Coupler DB-0913 that fulfils the requirements of the NBS 9A coupler (United States National Institute of Standards and Technology, formerly the National Bureau of Standards) and the ANSI S3.6-2018 and IEC 60318-3 (formerly IEC 303 and IEC 60303) coupler for measurements on headphones
- If required, a special 6 cm<sup>3</sup> coupler, DB-0161, which is designed according to the requirements of ANSI S3.7-1995 Type 1 coupler, is also available

**Fig. 1**  
Couplers and their respective adapters and stop collars used with Type 4152



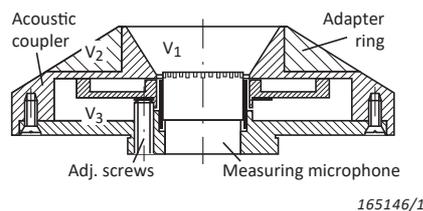
**Fig. 2**  
Diagram showing how a 6 cm<sup>3</sup> coupler is mounted directly on a 1" microphone



**Mounting**

The 2 cm<sup>3</sup> coupler may be used directly on the microphone with the preamplifier. In this manner, an artificial ear is obtained that is very small and useful for measurements on, for example, spectacle-type hearing aids. The arrangement still being in agreement with the IEC publication. A typical example of this type of application is the testing of hearing aids in Anechoic Test Box Type 4232. The 6 cm<sup>3</sup> couplers may also be mounted directly on the microphone with the aid of Stop Collar YO-2340 delivered with DB-0161 or DB-0909, which are ordered separately.

**Fig. 3**  
Sectional view of the acoustic coupler used with Type 4153



Artificial Ear Type 4153 fulfils the requirements of IEC 60318-1 (formerly IEC 318 and IEC 60318) and has an acoustical impedance basically similar to that of the human ear. The acoustic coupler (Fig. 3) contains three volumes acoustically connected in parallel by means of a narrow annular slit and four parallel holes:  $V_1 = 2.5 \text{ cm}^3$ ,  $V_2 = 1.8 \text{ cm}^3$ , and  $V_3 = 7.5 \text{ cm}^3$ . Type 4153's coupler fits 1/2" Pressure-field Microphone Type 4192, and may also be used with 1/2"

Microphone Preamplifier Type 2669-L mounted in the housing or by means of the supplied Adapter Ring DB-0742. The coupler is shaped to fit the headphone under test. Adapter DB-0843 is supplied for testing circum-aural headphones. For calibration purposes, a well-defined high-acoustic impedance sound source is supplied with the artificial ear. It consists of Earcap YJ-0305 and Adapter AQ-0015 for use with a 1/2" microphone used as the sound transmitter. Fig. 4 shows all available adapters.

**Fig. 4**  
The adapters used  
with Type 4153



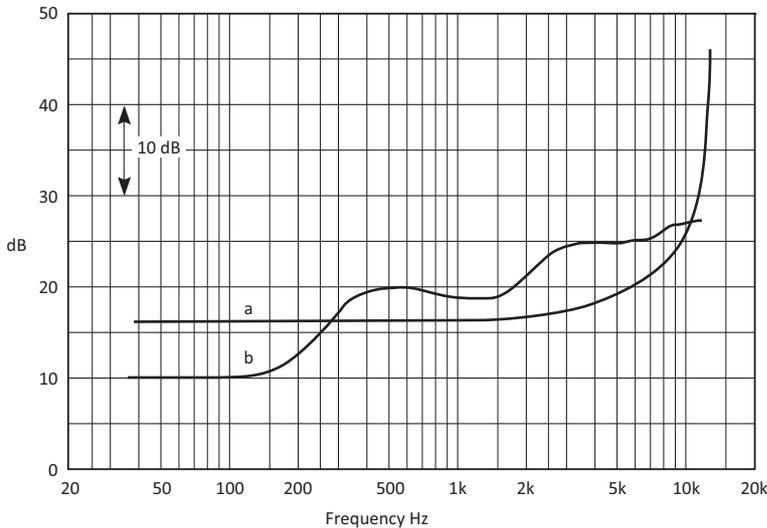
**Prepolarized Version**

A modified version of Type 4153 is available for audiometer calibration using sound level meters with no polarization voltage. This version includes Prepolarized Pressure-field 1/2" Microphone Type 4947.

Frequency Response of the Artificial Ears

Fig. 5 shows the pressure frequency response of Artificial Ear Type 4153 measured with Microphone Type 4192 and Artificial Ear Type 4152 with the 6 cm<sup>3</sup> Coupler DB-0913 measured with a 1" Pressure-field Microphone Type 4144. The sound pressure is produced by the high impedance sound source, described above, which is fed from a constant AC voltage generator. The acoustical coupling between the transmitting microphone and Type 4153 is established by pressing the earcap against the ear.

**Fig. 5**  
Typical frequency  
response curves for  
the artificial ears:  
**(a)** Pressure response  
of Type 4152  
**(b)** Pressure response  
of Type 4153



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Compliance with Standards

Artificial Ear Types 4152 and 4153 comply with the following standards:



**SAFETY**

EN/IEC 61010-1  
ANSI/UL 61010-1

**EMC EMISSION**

EN/IEC 61000-6-3  
EN/IEC 61000-6-4  
CISPR 32  
FCC Rules, Part 15

**EMC IMMUNITY**

Only guaranteed using accessories listed in this Product Data sheet  
EN/IEC 61000-6-1

EN/IEC 61000-6-2  
EN/IEC 61326

**TEMPERATURE**

IEC 60068-2-1 & IEC 60068-2-2  
**Operating Temperature:** +5 to +40 °C (+41 to +104 °F)  
**Storage Temperature:** -25 to +70 °C (+13 to +158 °F)

**HUMIDITY**

**IEC 60068-2-78:** Damp Heat: 93% (±3) RH (non-condensing at 40 °C (104 °F))

**MECHANICAL**

Non-operating:  
• IEC 60068-2-6: Vibration: 0.3 mm, 20 m/s<sup>2</sup>, 10 – 500 Hz  
• IEC 60068-2-27: Shock: 1000 m/s<sup>2</sup>  
• IEC 60068-2-29: Bump: 1000 bumps at 250 m/s<sup>2</sup>

## Specifications – Artificial Ear Types 4152 and 4153

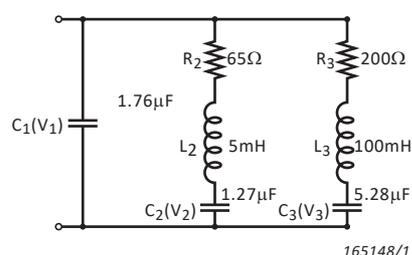
	Type 4152	Type 4153
<b>Max. Force Applied to Top of Acoustic Coupler</b>	10 N (1 kg)	N/A
<b>Coupler Acoustic Equivalent Volume</b>	2 and 6 cc	4.2 cc
<b>Supported Microphone Size</b>	½ and 1"	½"
<b>Preamplifier Included</b>	No	No*
<b>Relevant Standards</b>	IEC 60318–3 and ANSI S3.7 (1995)	IEC 60318–1
<b>Pinna Type</b>	Simplified	Simplified
<b>Coupler Volumes</b>	V <sub>1</sub> : 2 or 6 cm <sup>3</sup> = 1% V <sub>2</sub> : 1.8 cm <sup>3</sup> = 1% V <sub>3</sub> : 7.5 cm <sup>3</sup> = 1%	V <sub>1</sub> : 2.5 cm <sup>3</sup> = 1% V <sub>2</sub> : 1.8 cm <sup>3</sup> = 1% V <sub>3</sub> : 7.5 cm <sup>3</sup> = 1%
<b>Height</b>	104 mm (4.1")	104 mm (4.1")
<b>Max. Diameter</b>	123 mm (4.85")	123 mm (4.85")
<b>Weight</b>	1.5 kg (3.3 lb)	1.5 kg (3.3 lb)

\* Type 4153-W-001 includes Prepolarized ½" Pressure-field Microphone Type 4947

### TYPE 4153 CONNECTIONS

	Acoustic Resistance	Acoustic Inductance
<b>Annular Slit</b>	$6.5 \times 10^6 \text{ Ns/m}^5$	$5 \times 10^2 \text{ Ns/m}^5$
<b>Four Parallel Holes</b>	$20 \times 10^6 \text{ Ns/m}^5$	$10^4 \text{ Ns/m}^5$

**Fig. 6** The electrical equivalent of the acoustic circuit



### Ordering Information

#### Type 4152 Artificial Ear

includes the following accessories:

- DB-0138: 2 cm<sup>3</sup> Coupler
- DB-0913: 6 cm<sup>3</sup> Coupler, without stop collar
- DB-0111: Coupler Adapter Ring
- DB-1021: Guard Ring Adapter
- DB-0962: Adapter for Sound Level Meters

#### Type 4153 Artificial Ear

includes the following accessories:

- DB-0742: ½" Adapter Ring
- DB-0843: Adapter Plate for Headphones
- AQ-0015: Transmitter Adapter
- YJ-0305: Earcap

#### Type 4153-W-001 Artificial Ear with Prepolarized ½" Pressure-field Microphone Type 4947

includes the following accessories:

- DB-0742: ½" Adapter Ring
- DB-0843: Adapter Plate for Headphones
- AQ-0015: Transmitter Adapter
- YJ-0305: Earcap

#### OPTIONAL ACCESSORIES FOR TYPES 4152 AND 4153

- |             |   |
|-------------|---|
| Type 4144   | 1" Pressure-field Microphone (for Type 4152)        |
| Type 4192   | ½" Pressure-field Microphone (for Type 4153)        |
| Type 2669-L | Microphone Preamplifier                             |
| DB-0161     | 6 cm <sup>3</sup> Coupler, with Stop Collar YO-2340 |
| DB-0909     | 6 cm <sup>3</sup> Coupler, with Stop Collar YO-2340 |
| DB-0375     | Adapter for Preamplifier                            |

#### OPTIONAL ACCESSORIES FOR TYPE 4153-W-001

- |           |  |
|-----------|--|
| Type 2671 | ½" CCLD* Microphone Preamplifier, with BNC connector                   |
| Type 2695 | ½" CCLD Microphone Preamplifier, short version with microdot connector |

\* Constant current line drive, also known as DeltaTron®, (ICP and IEPE compatible)

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