

PRODUCT DATA

Ear Simulator Type 4157

Ear Simulator Type 4157 is primarily intended for measurements on earphones coupled to the ear by ear inserts such as tubes, ear moulds or eartips.

It has, therefore, been designed to fulfil the requirements of the IEC 60318-4, ANSI S 3.25 and ITU-T Rec. P57 standards for an ear simulator for measurements using insert earphones.

Type 4157 closely reproduces the acoustical parameters of the human ear, presenting the insert earphone under test with an impedance approximating that of the real human ear.



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Uses and features

Uses

- Frequency response, sensitivity and distortion measurements on insert earphones, for example, those used in hearing aids, operator headsets, etc.
- Servicing of hearing aids
- Production testing of earphones

Features

- Conforms to IEC 60318-4, ANSI S 3.25 and ITU-T Rec.P 57 Type 2 Artificial Ear
- Includes ½" microphone and preamplifier
- Simple and straightforward calibration procedure
- Well-defined measuring conditions
- Individually calibrated
- Wide range of accessories included

Description

The ear simulator consists of a main housing which contains a number of rings whose shapes form annular air volumes connected to the main volume of the housing by air passages.

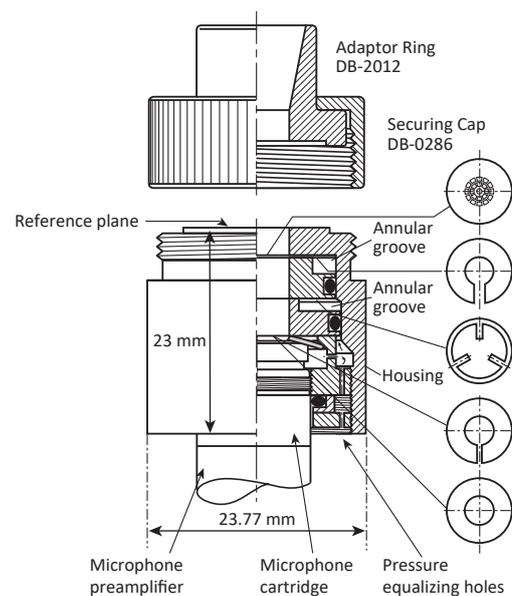
The main ear canal volume is of a similar shape and volume to that of the actual human ear and provides a similar acoustic impedance to the insert earphone being tested.

A ½" microphone is mounted in the housing of the ear simulator, terminating the main ear canal volume.

Preamplifier Type 2669 is supplied with the set.

To ensure that measurements are reproducible, a reference measurement plane is defined, see Fig. 1. The plane is perpendicular to the ear canal axis at the normal position of the tip of the ear mould.

Fig. 1 Sectional drawing of the ear simulator. The drawing includes Ear Simulator Type 4157 with Adaptor Ring DB-2012 and Securing Cap DP-0286



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Type 4157 is delivered in a ruggedized case with an individual calibration chart giving all parameters for its correct use, see Fig. 2.

Fig. 2 Type 4157 shown in case with accessories



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Accessories

A number of adaptors are delivered with the ear simulator, both for mounting a wide range of earphones and for special measurements on the ear simulator itself (see Fig. 3).

All adaptors can be mounted flush with the reference plane.

Fig. 3 The adaptors delivered with Type 4157 include ear mould adaptors, adaptor rings, ear mould holders and couplers



960017/3

Ear Mould Adaptor **DB-2012** is used for testing insert earphones. It simulates the whole of the external ear canal, and can be used to calibrate the measuring chain with Pistonphone Type 4228. When used for this purpose, the calibration level produced by the pistonphone is 0.7 dB lower than when calibrating a microphone because of the much larger volume of the ear simulator cavity.

Ear Mould Adaptor **DS-0541** is used to mount large ear moulds and CIC (completely-in-the-canal) hearing aids on the ear simulator.

Ear Mould Adaptor **DB-2015** is used for testing button-type insert earphones, see Fig. 4.

Ear Mould Adaptor **DS-0540** is similar to DS-0541 but is used for smaller moulds.

Ear Mould Adaptor **DP-0370** is used for testing behind-the-ear hearing aids.

Fig. 4 Mounting an insert earphone using Ear Mould Adaptor DB-2015

The adaptors are secured by an internally threaded collar, Securing Cap **DP-0286**.

Adaptor **DP-0530** should be used for testing ITE (in-the-ear) hearing aids.

Coupler **DP-0276** accepts a ¼" microphone to be used as a sound source for testing the ear simulator.

Tube Stud **DP-0368** is used for modular hearing aids.



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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</p> <p>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</p> <p>WEEE mark indicates compliance with the EU WEEE Directive</p>
Safety	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
EMC Emission	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 32: 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/IEC 61000-6-1: Generic standards – Immunity for residential, commercial and light industrial environments EN/IEC 61000-6-2: Generic standards – Immunity for industrial environments EN/IEC 61326: Electrical equipment for measurement, control and laboratory use – EMC requirements Note: The above is only guaranteed using accessories listed in this document
Temperature	IEC 60068-2-1 & IEC 60068-2-2: Environmental Testing. Cold and Dry Heat 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% RH (non-condensing at 40 °C (104 °F))
Mechanical	Non-operating: IEC 60068-2-6: Vibration: 0.3 mm, 20 m/s ² , 10 – 500 Hz IEC 60068-2-27: Shock: 1000 m/s ² IEC 60068-2-29: Bump: 1000 bumps at 250 m/s ²

Specifications - Type 4157

SPECIFICATION	TYPE 4157
Coupler Acoustic Equivalent Volume	1.26 cc
Typical Acoustic Sensitivity	12.6 mV/Pa
Resonant Frequency	13.5 kHz (±1)
Microphone Size	½" (built-in)
Preamplifier Included	Type 2669
Relevant Standards	IEC 60318-4 (2010) ANSI S 3.35 (2009) ITU-T Rec. P.57, Type 2 (2023)
Height	23 mm (0.91")
Diameter	23.77 mm (0.94")
Weight	0.878 kg (incl. case and accessories)

Ordering information

Type 4157 Ear Simulator

Includes the following:

- Type 2669: Microphone Preamplifier
- Type 4192: ½" Microphone (built-in)
- DB-2012: Ear Mould Adaptor
- DB-2015: Ear Mould Adaptor for testing button-type insert earphones
- DP-0276: Coupler, to use ¼" microphone sound sources
- DP-0286: Securing Cap, to secure adapter
- DP-0368: Tube Stud, for modular hearing aids
- DP-0370: Ear Mould Adaptor, for test behind-the-ear hearing aids
- DP-0530: Adaptor, for ITE hearing aids
- DS-0535: Dust Protector
- DS-0540: Ear Mould Adaptor, to mount small and CIC ear moulds
- DS-0541: Ear Mould Adaptor, to mount large ear moulds
- Calibration Chart

OPTIONAL ACCESSORIES

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|-----------|------------------------|
| Type 4228 | Pistonphone |
| Type 4231 | Sound Level Calibrator |