

# Product Data

## Ear Simulator — Type 4157

### USES:

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

### FEATURES:

- Conforms to IEC 60711-1981, ANSI S3.25-1979 (R 1986) and ITU-T Rec.P 57 (Type 2)
- Simple and straightforward calibration procedure
- Well defined measuring conditions
- Individually calibrated
- Wide range of accessories included

### Description

The Ear Simulator Type 4157 is primarily intended for measurements on earphones coupled to the ear by ear inserts such as tubes or ear moulds. It has therefore been designed to fulfil the requirements of IEC 60711 and ANSIS3.25 (ASA39/1979) standards for an ear simulator for measurements using insert earphones. The Ear Simulator Type 4157

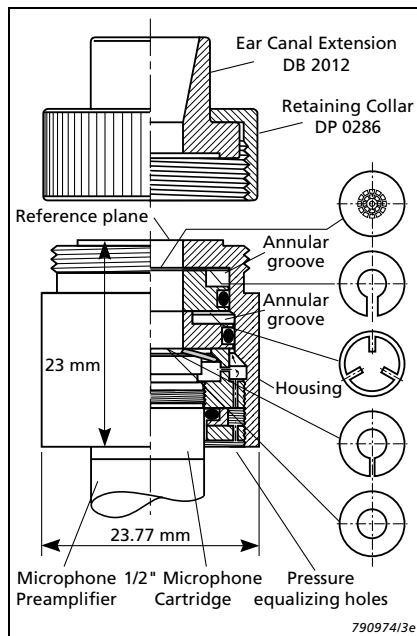


Fig. 1 Sectional drawing of the Ear Simulator showing external ear simulator DB 2012 and clamping collar



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.

The Ear Simulator consists of a main housing into which are assembled 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 1/2" Microphone is mounted in the housing of the Ear Simulator, terminating the main ear canal volume. Pre-amplifier Type 2669 is supplied with the set.

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

Type 4157 is delivered in a mahogany case with an individual calibration chart giving all parameters for its correct use (see Fig. 3).

## Accessories

A number of adaptors, which can be mounted flush with the reference plane, are delivered with the Ear Simulator, both for mounting a wide range of earphones in current use and for special measurements on the Ear Simulator itself. See Fig. 4.

The Ear Mould Simulator DB 2015 is for testing button-type insert earphones. The External Ear Simulator DB 2012 simulates the whole of the external ear canal, and may be used to calibrate the measuring chain with the 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. The Ear Mould Simulator DP 0370 is for testing behind-the-ear hearing aids. For testing ITE (in the ear) hearing aids, Adaptor DP 0530 may be used. The Ear Mould Holder DS 0540 is used to mount small ear moulds and CIC (completely in the canal) hearing aids on the Ear Simulator. DS 0541 is similar to DS 0540 but for larger moulds. The Tube Stud DP 0368 is for modular hearing aids.

Adaptor DP 0276 accepts a 1/4 inch microphone to be used as a sound source for testing the Ear Simulator. The adaptors are secured by an internally threaded collar DP 0286.

For customers already possessing a Preamplifier Type 2639, 2642 or a 2669, the Ear Simulator can be delivered without the Preamplifier Type 2669.

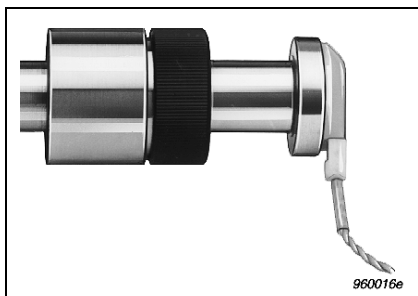


Fig.2 Mounting an insert Earphone using Ear Mould Simulator DB 2015

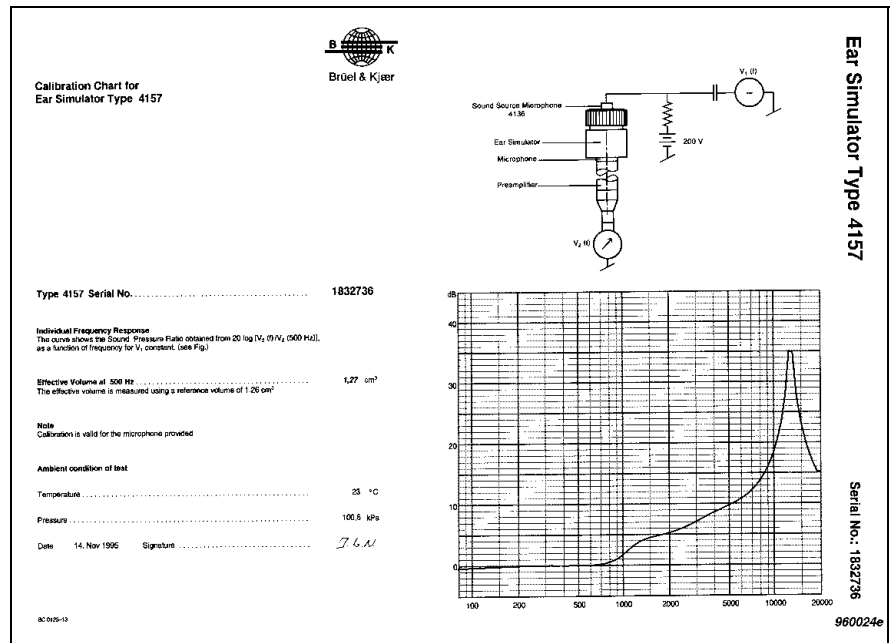





Fig.3 Individual calibration chart delivered with the Type 4157



Fig.4 Accessories delivered with the Type 4157. Top row, left to right: Ear Mould Simulator DB 2015, External Ear Simulator DB 2012, Ear Mould Simulator DP 0370, Ear Mould Holder DS 0540. Bottom row, left to right: Ear Mould Holder DS 0541, Tube Stud DP 0368, 1/4-inch Microphone Adaptor DP 0276, Ear Mould Holder DP 0530

# Specifications 4157

<p><b>DIMENSIONS OF HOUSING:</b> Height: 23 mm Maximum diameter: 23.77 mm</p> <p><b>EFFECTIVE VOLUME:</b> 1.26 ± 0.03 cm<sup>3</sup> at 500 Hz</p> <p><b>CALIBRATION TEMPERATURE RANGE:</b> 23 ± 3°C</p> <p><b>CALIBRATION AMBIENT PRESSURE:</b> 101.3 kPa ± 3 kPa (1013 ± 30 mbar)</p> <p><b>RESONANT FREQUENCY:</b> 13.5 ± 1.5 kHz</p>	<p><b>COMPLIANCE WITH STANDARDS:</b></p> <table border="1"> <tr> <td><b>Electrical</b></td> <td>IEC 60711: Occluded-ear simulator for the measurement of earphones coupled to the ear by ear inserts. ANSI S3.25/1979 (ASA39/1979): For an occluded Ear Simulator</td> </tr> <tr> <td></td> <td>CE-mark indicates compliance with: EMC Directive and Low Voltage Directive.</td> </tr> <tr> <td><b>Safety</b></td> <td>EN 61010-1 and IEC 1010-1: Safety requirements for electrical equipment for measurement, control and laboratory use.</td> </tr> <tr> <td><b>EMC Emission</b></td> <td>EN 50081-1: Generic emission standard. Part 1: Residential, commercial and light industry. CISPR 22: Radio disturbance characteristics of information technology equipment. Class B Limits. FCC Class B Limits.</td> </tr> <tr> <td><b>EMC Immunity</b></td> <td>EN 50082-1: Generic immunity standard. Part 1: Residential, commercial and light industry. Note: the above is guaranteed using accessories listed in this Product Data sheet only</td> </tr> <tr> <td><b>Temperature</b></td> <td>IEC 68-2-1 &amp; IEC 68-2-2: Environmental Testing. Cold and Dry Heat. Operating Temperature: 5 to +40°C Storage Temperature: -25 to +70°C</td> </tr> <tr> <td><b>Humidity</b></td> <td>IEC 68-2-3: Damp Heat: 90% RH (non-condensing at 40°C (104°F))</td> </tr> <tr> <td><b>Mechanical</b></td> <td>Non-operating: IEC 68-2-6: Vibration: 0.3 mm, 20 m/s<sup>2</sup>, 10-500 Hz IEC 68-2-27: Shock: 1000 m/s<sup>2</sup> IEC 68-2-29: Bump: 1000 bumps at 250 m/s<sup>2</sup></td> </tr> </table>	<b>Electrical</b>	IEC 60711: Occluded-ear simulator for the measurement of earphones coupled to the ear by ear inserts. ANSI S3.25/1979 (ASA39/1979): For an occluded Ear Simulator		CE-mark indicates compliance with: EMC Directive and Low Voltage Directive.	<b>Safety</b>	EN 61010-1 and IEC 1010-1: Safety requirements for electrical equipment for measurement, control and laboratory use.	<b>EMC Emission</b>	EN 50081-1: Generic emission standard. Part 1: Residential, commercial and light industry. CISPR 22: Radio disturbance characteristics of information technology equipment. Class B Limits. FCC Class B Limits.	<b>EMC Immunity</b>	EN 50082-1: Generic immunity standard. Part 1: Residential, commercial and light industry. Note: the above is guaranteed using accessories listed in this Product Data sheet only	<b>Temperature</b>	IEC 68-2-1 & IEC 68-2-2: Environmental Testing. Cold and Dry Heat. Operating Temperature: 5 to +40°C Storage Temperature: -25 to +70°C	<b>Humidity</b>	IEC 68-2-3: Damp Heat: 90% RH (non-condensing at 40°C (104°F))	<b>Mechanical</b>	Non-operating: IEC 68-2-6: Vibration: 0.3 mm, 20 m/s <sup>2</sup> , 10-500 Hz IEC 68-2-27: Shock: 1000 m/s <sup>2</sup> IEC 68-2-29: Bump: 1000 bumps at 250 m/s <sup>2</sup>
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## Ordering Information

<p>Type 4157 Ear Simulator</p> <hr/> <p><b>Accessories Included</b></p> <p>Calibration Chart UA 1305: IEC 711 Coupler</p>	<p>Type 2669: Microphone Preamplifier DB 2012: External Ear Simulator DB 2015: Ear Mould Simulator DP 0368: Tube Stud DP 0370: Ear Mould Simulator DS 0540: Ear Mould Holder DS 0541: Ear Mould Holder DP 0276: 1/4 inch Microphone Adaptor</p>	<p>DP 0286: Retaining Collar DS 0535: Dust Protector DP 0530: Adaptor for ITE (in the ear) hearing aids</p>
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Brüel&Kjær reserves the right to change specifications and accessories without notice



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Czech Republic 02-67021100 · Finland (0)9-755 950 · France (01)69907100 · Germany 06103/733 5-0 · Hong Kong 25487486 · Hungary (1)2158305  
Ireland (01)803 7600 · Italy 02 57 68061 · Japan 03-3779-8671 · Republic of Korea (02)3473-0605 · Netherlands (31)318 559290 · Norway 66771155  
Poland (22)858 9392 · Portugal (1)4711453 · Singapore (65) 377-4512 · Slovak Republic 421 2 5443 0701 · Spain (91)6590820 · Sweden (08)4498600  
Switzerland (0)1880 70 35 · Taiwan (02)7139303 · United Kingdom (0)1438 739 000 · USA 800 332 2040  
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