

Ear and Cheek Simulator Type 43AG

Product Data

Typical Applications

- Earphone testing, both concha and insert types
- Headphone and headset testing, both circum-aural and supra-aural types
- Hearing-aid testing, all common types
- Telephone handset testing

Special Features

- Applicable for both right and left KEMAR pinnae
- Spring-loaded clamp applying adjustable force to the device under test - for clearly defined test conditions
- Two devices supplied for securely holding test objects in their prescribed positions:
 - Standardized disc for large objects such as headphones
 - Index finger simulator for in-the-ear devices such as earphones

Standards

- IEC 60959
- IEC 60318-4 (former IEC 60711)
- ITU-T Rec. P.57 Type 2 Artificial Ear
- ITU-T Rec. P.57 Type 3.3 Pinna Simulator

Description

The design philosophy of Ear and Cheek Simulator Type 43AG (Fig. 1) is to give the user the opportunity to use the artificial KEMAR ear without having to purchase the complete head and torso simulator. Type 43AG combines the standardized IEC 60959 KEMAR Pinna Simulator and the IEC 60318-4 (former IEC 60711) Ear Simulator with a cheek-plate of dimensions similar to those of the headphone-plate known from the IEC 60318-2 Ear Simulator (extended frequency-range coupler).

This configuration enables the user to realistically test circum- and supra-aural headphones as well as concha-type earphones with the same setup.



Fig. 1 Ear and Cheek Simulator Type 43AG

To improve the repeatability of measuring these types, a finger simulator (Fig. 2) has been added. For headphone testing, the larger, standardized disc (Fig. 3) is very useful as it makes it easier to mount and exactly position earphones in the pinna.

Due to Type 43AG's design, it is of course also suitable for table-testing of hearing aids (BTE, ITE, CIC) and telephone handsets (according to ITU-T Rec. P.57, Type 3.3) using the optional accessories found on the back of this sheet. These include a wide range of pinnae in various sizes and hardnesses.

G.R.A.S.' artificial ear systems are highly modular and can easily be upgraded to measure according to any electroacoustical standard. Besides the cheek and ear functionality, Type 43AG can also be set up for standardized IEC 60711 measurements without the pinna and cheek simulator but with various ear-canals and moulds.

Type 43AG is delivered with a traditional, externally polarized (200 Vdc) 1/2" microphone integrated into the IEC 60711 Ear Simulator and a 1/4" preamplifier with an integrated cable terminating in a 7-pin LEMO plug.

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Type 43AG is also available in a version with a pre-polarized microphone integrated in the IEC 60711 Ear Simulator and CCP preamplifier for use with ICP® input modules.



Fig. 2 Testing an earphone: The spring-loaded clamp with the finger simulator mounted allows well-defined test conditions.



Fig. 3 Testing a headphone: The finger simulator of Fig. 2 replaced by the default-mounted disc. Both cheek simulator and clamp with disc are essential for well-defined test conditions.

The Artificial Ear System

The artificial ear system was originally developed for the KEMAR Manikin. It consists of the three parts:

- KEMAR Pinna
- Ear-canal Extension
- IEC 60711 Ear Simulator.

The KEMAR Pinna

Eight different KEMAR pinnae are available for Type 43AG: small/large, left/right, and hard/soft - examples shown in Fig. 4.

IEC 60959 specifies the Large Right Pinna 55 Shore 00 (hard) to be used. Type 43AG also allows an ITU-T Type 3.3 pinna with a Shore-00 hardness of 35 (soft).

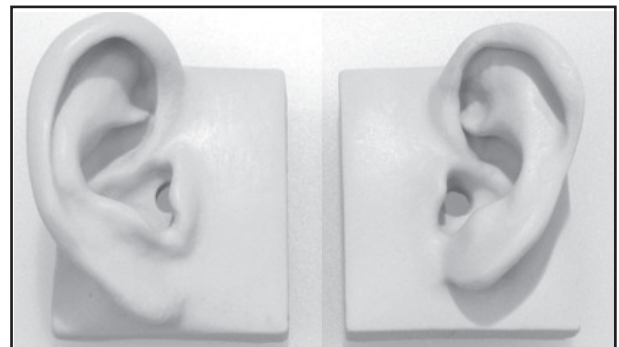


Fig. 4 A large and a small KEMAR pinna

The Ear-canal Extension (internal outer ear)

The ear-canal extension (Fig. 5) ensures an ultimate interface to the IEC 60711 Ear Simulator resulting in a high degree of repeatability - owing to its fixed, standardized dimensions: 7.5 mm diameter and 8.30 mm length.

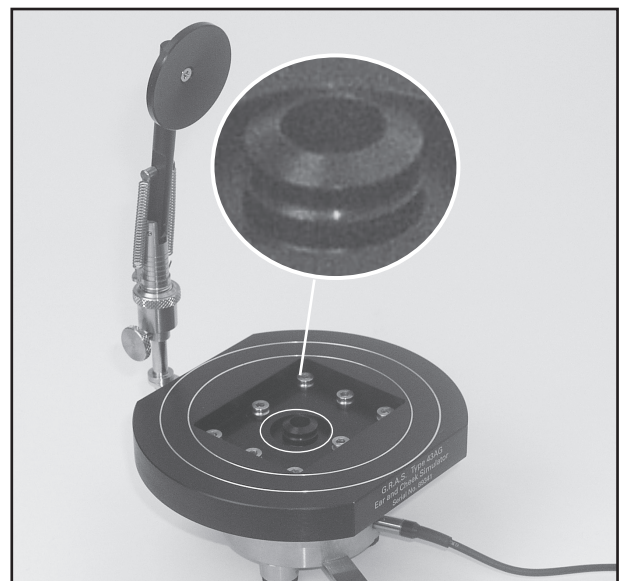


Fig. 5 Pinna removed for viewing the Ear-canal Extension

IEC 60711 Ear Simulator (inner ear)

The Ear Simulator (Fig. 7), complies with the following international requirements:

- IEC 60711 Ed. 1.OB: *Occluded-ear simulator for the measurement of earphones coupled to the ear-by-ear inserts.*
- ITU-T Recommendations P.57 (08/96) Series P: *Telephone transmission quality, Objective measuring apparatus: Artificial ears.*

The acoustic input impedance of the ear simulator closely resembles that of the human ear and, as a result, loads a sound source in very much the same way. Fig. 7 shows its coupler frequency response.



Fig. 6 IEC 60711 Ear Simulator

The Cheek Simulator

The plate of cheek simulator has been designed according to IEC 60318-2. It is required for testing in particular headphones and headsets.

In order to precisely center headphones, circles are engraved in the cheek simulator plate.

the Ear and Cheek Simulator Type 43AG incorporates the spring-loaded clamp with adjustable force - as shown in Fig. 8.

The default-mounted springs allow the force to be adjusted in the range 1 - 8 N (approx.). If 8 N is insufficient, you can order a set of high-tension springs (6 - 12 N), and for measuring the actual force, you can purchase a force gauge from - all parts available from G.R.A.S (see *What to Order*).

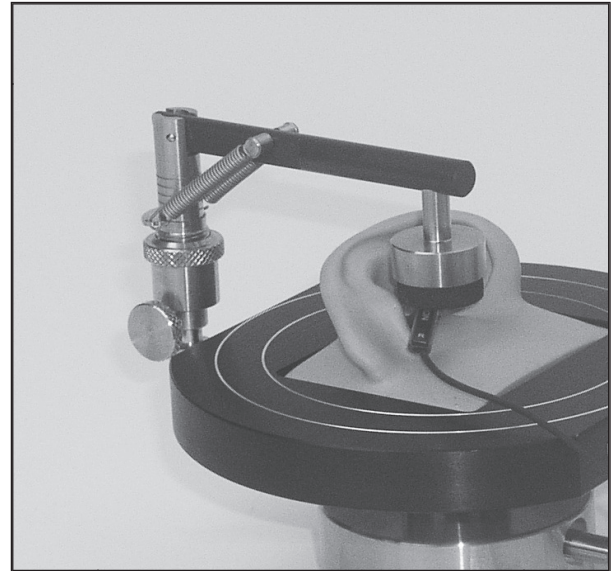


Fig. 8 Spring-loaded clamp with adjustable force

The Spring-loaded Clamp

It is commonly known that the amount of force applied to e.g. an earphone against the ear greatly influences the acoustical properties. To simulate this - and to ensure a high degree of reproducibility -

Calibration

The Ear and Cheek Simulator Type 43AG is calibrated using either Pistonphone Type 42AP (recommended due to its built-in precision barometer) or Pistonphone Type 42AA.

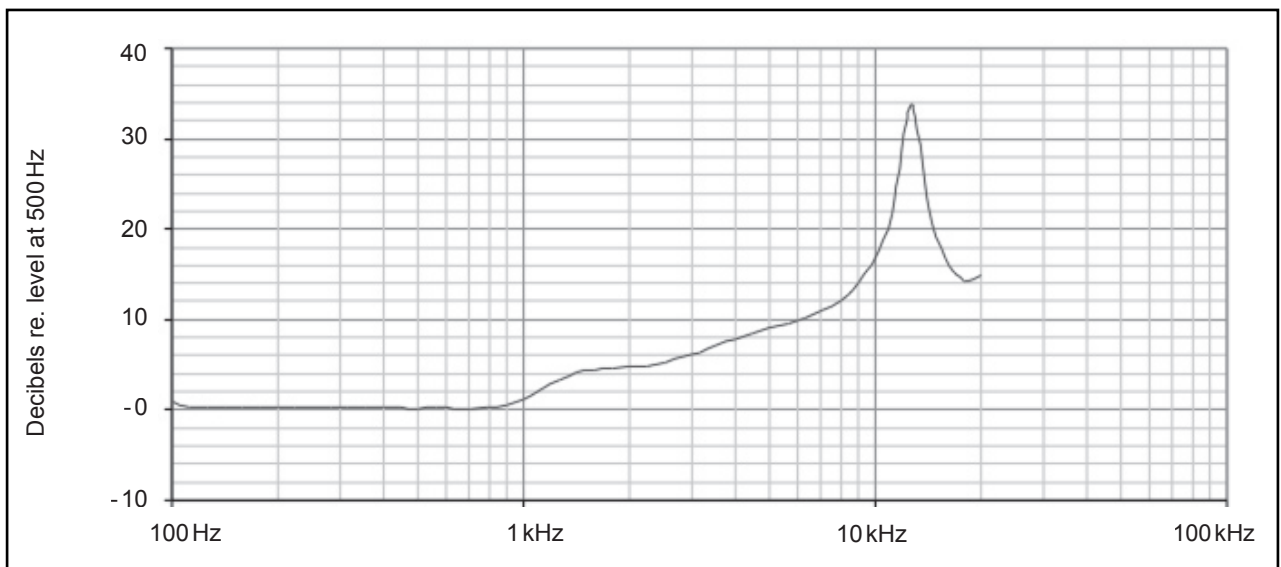


Fig. 7 IEC 60711 Ear Simulator RA0045 - typical coupler frequency response re. 500 Hz

Specifications

<p>Dimensions: Height, max. 136 mm (5.35") Diameter of cheek plate: 120 mm (4.72") Weight: 850 g</p> <p>Spring-loaded clamp, approximate force range: Factory-mounted springs..... 1 - 8 N Optional high-tension springs 6 - 12 N</p> <p>RA0045: IEC 60711 (1981): Occluded-ear simulators for the measurement of earphones ced to the ear by ear inserts. ITU-T Recommendation P.57 (08/96) "Series P: Telephone transmission quality, Objective measuring apparatus : Artificial ears"</p>	<p>Resonant frequency: 13.8 kHz \pm 1 kHz</p> <p>Effective volume: 1.26 cm³ \pm 0.03 cm³</p> <p>Environmental calibration conditions: Temperature: 23 °C \pm 3 °C Relative humidity: 60 % \pm 20 % Barometric pressure: 101.3 kPa \pm 3 kPa</p> <p>Separate data sheet is available for IEC 60711 Ear Simulator RA0045</p>
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What to Order

<p>Ear and Cheek Simulator Type 43AG includes: IEC 60711 Ear Simulator (with integrated 1/2" pressure microphone) * RA0045 1/4" Preamplifier * Type 26AC Right KEMAR Pinna with hardness 55 Shore 00 (hard) KB0065 Cheek plate RA0150 Test Jig with mounting base and adjustable force clamp RA0052 Right-angle adapter RA0001 Finger Simulator: RA0199</p> <p>* Items included when ordering Type 43AG. When ordering the pre-polarized version, Type 43AG-S1, these will be replaced for: IEC 60711 Ear Simulator (with integrated 1/2" pressure-field microphone) .. RA0045-S1 1/4" Preamplifier Type 26CB</p> <p>Accessories</p> <p>Power Supply & Signal Conditioning For both externally and pre-polarized config.: Power Module, dual-channel Type 12AQ</p> <p>For externally polarized configurations only: Power Module, single-channel Type 12AK Power Module, two-channel Type 12AA Power Module with built-in power amplifier Type 12AP</p> <p>For pre-polarized configurations only (Type 43AG-S1): Power Module, dual-channel Type 12AL</p>	<p>KEMAR Pinnae</p> <p>Hardness 55 Shore 00 (hard) Small Right Pinna: KB0060 Small Left Pinna: KB0061 Large Right Pinna (supplied): KB0065 Large Left Pinna: KB0066 Large Right Pinna (VA-style): KB0090 Large Left Pinna (VA-style): KB0091</p> <p>Hardness 35 Shore 00 (soft) Small Right Pinna: KB1060 Small Left Pinna: KB1061 Large Right Pinna: KB1065 Large Left Pinna: KB1066 Large Right Pinna (VA-style): KB1090 Large Left Pinna (VA-style): KB1091</p> <p>Calibration Equipment Pistonphone, built-in precision barometer (250 Hz or 251.2 Hz, 114 dB \pm 0,05 dB): (recommended) Type 42AP or Pistonphone (250 Hz, 114 dB \pm 0,08 dB): Type 42AA Required for the IEC 60711 Configuration: 1/2" Calibration Adapter for KEMAR pinnae ... RA0157 Force Gauge (0 - 25 N) RA0184</p> <p>Cables 3-m Microphone Extension cable, 7-pin LEMO to 7-pin LEMO (for Power Modules Types 12AA, 12AK, and 12AP) AA0008 2-m Extension Cable BNC to BNC, 50 Ω (for Power Module Type 12AL) AA0034</p> <p>Additional Accessories High-tension springs (set of two): RA0196</p>
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G.R.A.S. Sound & Vibration reserves the right to change specifications and accessories without notice.

G.R.A.S.
SOUND & VIBRATION

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