GRAS 45BB-11

KEMAR with Anthropometric Pinna for Low-noise Ear- and Headphone Test, 1-Ch LEMO



Connection: Traditional Power Supply (200 V/LEMO)
Channel(s): 1
ANSI: S3.36
Based on IEC 60318-7
Based on ITU-T Rec. P.58

The 45BB-11 KEMAR is an acoustic research tool with a built-in low-noise ear simulator for testing of ear and headphones and in-ear ear protectors with or without active noise cancellation. Its corresponding two-channel equivalent is GRAS 45BB-12 KEMAR with Anthropometric Pinnae for Ear- and Headphone Test, 2-Ch LEMO.

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Introduction

The KEMAR head and torso simulator was introduced by Knowles in 1972 and quickly became the industry standard for hearing-aid manufacturers and research audiologists (visit KEMAR.us to read the full story). It is based on worldwide average human male and female head and torso dimensions. It meets the requirements of ANSI S3.36/ASA58-2012 and IEC 60318-7:2011.

The GRAS 45BB KEMAR has the same dimensions and acoustical properties as the original KEMAR, but has been developed further by GRAS to meet the industry's demand for realistic measurements of hearing aids, headphones and headsets. It provides acoustic diffraction similar to that encountered around the median human head and torso, both in the proximity and in the far-field.

As all the preconfigured 45BB KEMARs consist of the same basic 45BB KEMAR Non-configured, plus a set of application-specific accessories, the full information about a given KEMAR configuration is obtained by combining the information about the 45BB KEMAR Non-configured and the information for a given configured version as found in the present text. Read about the non-configured KEMAR here.

Design

The 45BB-11 is a KEMAR head and torso for 1-channel low-noise test of ear and headphones.

It is delivered fully configured, individually calibrated and ready for use. In addition to a system calibration certificate, a USB flash memory with simulation data is included.

The main components of the 45BB-11 are the GRAS 43BB Low-noise Ear Simulator System and the KB5000/KB5001 anthropometric pinnae.

The 43BB Low-noise Ear Simulator System

Basically the 43BB consists of an IEC 60318-4 Ear Simulator and a 40HT Low-noise Microphone System.

The built-in microphone is the 40AH Low-noise Ext. Polarized Pressure Microphone which has a specially reduced noise floor in order to achieve a large dynamic range.

Below 10 kHz, the frequency response is identical to that of a standard IEC 60318-4 ear simulator. Above 10 kHz, the differences in the microphone diaphragm impedance result in substantial differences. The standard ear simulator has a high-Q resonance around 13.5 kHz related to the length of the ear canal and the diaphragm impedance. In the low noise version of the ear simulator the single high-Q resonance is replaced by two resonances. Part of the design of the low noise microphone is a filter unit that controls the mechanical resonance of the low noise microphone. The combination of the filter and the low damping of the diaphragm cancels out the high peak of the resonance in the simulator.

The preamplifier is the 26HG which is similar to the GRAS 26AC ¼" Standard Preamplifier, but with a 40 G input impedance to enable low-level noise measurements. It has an integrated lightweight cable terminated in a 7-pin LEMO connector that plugs into the 26HT Gain and Filter Unit.

To complete the system, a special power module is part of the delivery, i.e. the12HF 1-Channel Power Module for Low-noise Systems.

Read more about the 43BB Low-noise Ear Simulator System here.

The Anthropometric Pinna

Compared to the standardized pinna, the

anthropometric pinna embodies a number of improvements to the concha and ear canal, combined with increased collapsibility of the helix, and improved mounting. It is made of soft silicone, 35 Shore 00 hardness.

The external shape of the pinna is identical to that of the standardized KEMAR pinna, but concha and ear canal have been modified so that they closely mimic the properties of a real human ear. The ear canal has been extended and is now an integral part of the pinna which seals directly against the ear simulator. Like the human ear, the ear canal has the 1st and 2nd bend, and the interface with the concha is oval. Fit and insertion consistency are much improved over the cylindrically or conically shaped ear canal extensions that are used with the standard pinna.

The flexibility of the outer ear has been improved, and when mounting supra-aural and circum-aural headphones the pinna now collapses against the head very much like a human ear.

In addition to the traditional push mounting from the outside, the pinna is secured with two screws from the inside of KEMAR's head. These two screw ensure that the pinna is held firmly in place. Therefore, it seals perfectly against the ear simulator and the head, and it is, therefore, possible to mount and dismount DUTs repeatedly without compromising the seal.

Read more about the Anthropometric Pinnae here.

Typical Applications

45BB-11 is configured to meet the consumer electronics industry's need for R&D testing of ear and headphones, including in-ear headphones with Active Noise Cancellation.

The anatomical shape of the pinna makes it possible to achieve a very good fit and sealing with anatomically shaped in-ear transducers. Controlling the insertion depth is easy, leading to good insertion consistency and highly improved repeatability and accuracy of measurements. The improved fit and seal also means that the low-frequency response is improved. It will allow you to reproduce base notes, as well as effectively measure (active & passive) attenuation.

Because it can measure down to and below the threshold of human hearing, it can measure the influence of the electronics on the audio response of the earphones. Its low noise floor means that measurement results will have a strong correlation with the subjective feedback from test persons and users.

The low inherent noise of the system also means that THD and Rub & Buzz at very low levels can be investigated.

For these reasons, the 45BB-11 KEMAR is ideal for accurate and repeatable testing of headphones, earphones and in-ear hearing protectors. Also, the improved collapsibility of the pinna makes it well suited for testing of supra-aural and circumaural headphones.

Performance and warranty

KEMAR is made of components from our standard portfolio, all manufactured of high-quality material and branded parts that were chosen and processed to ensure life-long stability and robustness. This enables us to offer 2 years warranty against defective materials and workmanship.
Exceptions: Microphones included in KEMAR as for these our normal 5 year warranty apply. The warranty period for cables is 6 months.

Connector type		7-pin LEMO (FGG.1B.307)
Set sensitivity @ 250 Hz (±2 dB)	mV/Pa	800
Theoretical dynamic range lower limit with GRAS preamplifier	dB(A)	10.5
Theoretical dynamic range upper limit with GRAS preamplifier @ +28 V / ±14 V power supply	dB	113
Temperature range, operation	°C / °F	-30 to 60 / -22 to 140
Temperature range, storage	°C / °F	-40 to 65 / -40 to 149
Humidity range non condensing	% RH	0 to 95%
ANSI standard		S3.36
IEC standard		60318-7
ITU-T recommondations		P. 58
Weight	g / oz	11.45 k / 404

GRAS Sound & Vibration reserves the right to change specifications and accessories without notice.

Included items

GRAS 45BB	KEMAR Head & Torso, Non-configured
GRAS KB5000	Large Right Anthropometric Pinna 35 Shore OO
GRAS KB5001	Large Left Anthropometric Pinna 35 Shore OO
GRAS GR1874	Ear Simulator Holder
GRAS AA0035	BNC-BNC Cable, 3 m
GRAS 43BB-1	Low-noise Ear Simulator System, comprising:
GRAS GR0408	External Ear Canal
GRAS GR0409	Union Nut
GRAS RA0001	Right Angled Adapter for 1/2" Microphone and 1/4" Preamplifier (2 pcs)
GRAS RA0234	Low-noise Ear Simulator
GRAS 26HG	1/4" Preamplifier with 3 m Integrated Cable
GRAS 26HT	Gain and Filter Unit for 40HT
GRAS 12HF	1-Channel Power Module for Lownoise Systems
GRAS AA0059	LEMO 7-pin - LEMO 7-pin Cable, 1 m

Optional items

For Ear Simulator Calibration

GRAS 42AP	Intelligent Pistonphone (250 Hz or 251.2 Hz, 114 dB +/- 0.05 dB)
GRAS 42AA	Pistonphone (250 Hz, 114 dB +/- 0.08 dB)
GRAS RA0090	94 dB Pistonphone Coupler

Pinna Simulators

GRAS KB0060	KEMAR Small Right Ear 55 Shore OO
GRAS KB0061	KEMAR Small Left Ear 55 Shore OO
GRAS KB0065	KEMAR Large Right Ear 55 Shore OO
GRAS KB0066	KEMAR Large Left Ear 55 Shore OO

GRAS KB1060	KEMAR Small Right Ear, 35 Shore 00
GRAS KB1061	KEMAR Small Left Ear 35 Shore 00
GRAS KB1065	KEMAR Large Right Ear 35 Shore 00
GRAS KB1066	KEMAR Large Left Ear 35 Shore 00
GRAS KB0090	KEMAR Large Right Ear (VA-Style/SQ) 55 Shore 00
GRAS KB0091	KEMAR Large Left Ear (VA-Style/SQ) 55 Shore 00
GRAS KB1090	KEMAR Large Right Ear (VA-Style) 35 Shore 00
GRAS KB1091	KEMAR Large Left Ear (VA-Style) 35 Shore 00

Ear Mould Simulators

GRAS KB0110	Ear Mould Simulator for 2 mm Inner diameter tubing
GRAS KB0111	Ear Mould Simulator for 3 mm Inner diameter tubing

Ear Canal Extension and Microphone Holder Kits (kits with 2 pcs and O-rings)

GRAS RA0237	Straight Ear Canal Extension Kit for KEMAR
GRAS RA0238	VA-tapered Ear Canal Extension Kit for KEMAR
GRAS RA0239	Ear canal Extension Kit w. silicone lining for KEMAR
GRAS RA0240	Holder for long 1/2" microphone Kit for KEMAR
GRAS RA0241	Holder for short 1/2" microphone Kit for KEMAR
GRAS RA0243	Holder for 1/2" microphone Kit for KEMAR
GRAS RA0244	O-ring kit for KEMAR, 2 pcs.
GRAS RA0249	Straight Ear Canal Extension Kit for KEMAR, made of POM, for binaural hearing aid test
GRAS RA0250	Tapered Ear Canal Extension Kit for KEMAR, made of POM, for binaural hearing aid test

KEMAR Retrofit Kit for Binaural Hearing Aid Test

GRAS RA0251	KEMAR Retrofit Kit for Binaural Hearing Aid Test: The Kit includes Ear Holder Plates, mounting bolts and the RA0249 and RA0250 Ear Canal Extension Kits. Included items are made of POM, Nylon and Teflon.

KEMAR Retrofit Kit for Anthropometric Pinna

GRAS RA0311	KEMAR Retrofit Kit for Anthropometric Pinna. The Kit includes Ear Simulator Holder, 2 finger screws and a 3 mm Allen Key.

Extension Cables

GRAS AA0046	3 m LEMO 7-pin - LEMO 7-pin Cable for Low-noise measuring system
GRAS AA0047	10 m LEMO 7-pin - LEMO 7-pin Cable for Low-noise measuring system

Flight Case

GRAS KM0094	PELI Case for KEMAR

Simulation Model of KEMAR

GRAS KB3000	Simulation Model of KEMAR with large pinnae
GRAS KB3001	Simulation Model of KEMAR with small pinnae

Stand for KEMAR

GRAS AL0026	Loudspeaker stand for KEMAR, Ø 35 mm

Miscellaneous

GRAS KB0000	KEMAR Handbook
GRAS KB0010	T-Shirt for KEMAR

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About GRAS Sound & Vibration

GRAS is a worldwide leader in the sound and vibration industry. We develop and manufacture state-of-the-art measurement microphones and related equipment for industries where acoustic measuring accuracy and repeatability are of the utmost importance. This includes applications and solutions for customers within the fields of aerospace, automotive, audiology, consumer electronics and other highly demanding industries. GRAS microphones are designed to live up to the high quality, durability and accuracy that our customers have come to expect, trust and require.
GRAS Sound & Vibration is represented through subsidiaries and distributors in more than 40 countries and is part of Axiometrix Solutions, a leading test solutions provider comprised of globally recognized measurement brands. Read more at www.grasacoustics.com

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