GRAS 45BC-15

KEMAR with Mouth Simulator and Hi-Res Simulators for Headset Test, 2-Ch LEMO



Connection: 200 V/LEMO
Channel(s): 2
ANSI: S3.36, S3.25
IEC: 60318-4, in accordance with 60318-7
Based on ITU-T Rec. P.57 Type 3.3 and ITU-T Rec. P.58
Special feature: Built-in power amplifier for mouth simulator

The 45BC-15 KEMAR is configured with Anthropometric Pinnae and externally polarized Hi-Res Ear Simulators. Due to its design, realistic measurements in a sound environment as experienced by a human being using a headset is possible. In addition, the 45BC-15 is provided with a mouth simulator for testing of the microphone in the headset. Its CCP equivalent is GRAS 45BC-16 KEMAR.

GRAS Sound & Vibration
Skovlytoften 33, 2840 Holte, Denmark
www.grasacoustics.com

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 60318-7:2017.

The current KEMAR Head and Torso 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 45BC KEMARs consist of the same basic 45BC 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 45BC 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 45BC-15 is a KEMAR for 2-channel headset test, with externally polarized hi-res ear simulators and anthropometric pinnae.

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 configuration-specific components of the 45BC-15 are the GRAS RA0403 Hi-Res Ear Simulator and the KB5000/KB50001 Anthropometric Pinnae.

The 44AA Mouth Simulator according to ITU-T Rec. P51 with built-in power amplifier

The maximum continuous signal the mouth can produce in 1/3-octave bands is 100dB re. 20µPa in the frequency range of 100Hz to 16kHz. Its loudspeaker accepts an external signal either directly or via its built-in power amplifier (when power is applied).

The Hi-Res Audio Ear Simulator

The acoustic input impedance of the RA0403 Hi-Res Ear Simulator closely resembles that of the human ear and, as a result, loads a sound source in very much the same way. It embodies a number of carefully designed volumes connected via well-defined and precisely tuned resistive grooves. In an equivalent electrical circuit, capacitors would represent the volumes, and inductance and resistance would represent respectively air mass and air flow within the resistive groves.

The RA0403 Hi-Res Ear Simulator mitigates the limited usefulness of the standard IEC60318-4 ear simulator above 10 kHz. The steep resonance at 13.5 kHz has been replaced by a damped resonance and the useful frequency range is now extended to 20 kHz. It complies with IEC60318-4 and its acoustic transfer impedance is within the tolerance band specified by IEC60318-4. From 10 to 20 kHz the transfer impedance is within ± 2.2 dB, from 20 kHz to 50 kHz it is within ±3.2 dB, resulting in much-improved repeatability. Also, realistic THD measurements are now possible.

It is measured and calibrated according to IEC60318-4 and ITU-T Recommendation P.57 and delivered with a calibration chart specifying its sensitivity and frequency response.

It is delivered with a built-in GRAS 40BP 1/2" externally polarized pressure microphone.

Read more about RA0403 here.

The Anthropometric Pinna
Compared to the standardized pinna, the anthropometric pinna embodies several improvements to the concha and ear canal, combined with increased collapsibility of the helix, and improved mounting of the pinna. 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 standardized 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 screws ensure that the pinna is held firmly in place. Therefore, it seals perfectly against the ear simulator and the head, and it is now possible to mount and dismount DUTs repeatedly without compromising the seal.

Read more about the Anthropometric Pinnae.

Typical Applications

The anatomical shape of the pinna makes it possible to achieve an excellent 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 bass notes, as well as effectively measure (active & passive) attenuation.

With the high-resolution ear simulator, it is now possible to make reproducible measurements up to 50 kHz. The 45BC-15 KEMAR is ideal for accurate and repeatable testing of headphones, earphones and in-ear hearing protectors. In addition to this, the built-in mouth simulator makes it ideal for accurate and repeatable testing of headsets. Read more about the advantages of the high-resolution ear simulator here.

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.

Specifications

Set sensitivity @ 250 Hz (±2 dB)	mV/Pa	1.6
Set sensitivity @ 250 Hz (±2 dB)	dB re 1V/Pa	
Theoretical dynamic range lower limit with GRAS preamplifier	dB(A)	44
Theoretical dynamic range upper limit with GRAS preamplifier @ +120 V / ±60 V power supply	dB	169
Resonance frequency	kHz	13.5
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, S3.25
IEC standard		60318-7
ITU-T recommondations		P. 58
Weight	g / oz	11.45 k / 404
MOUTH SIMULATOR		.
Output impedance	Ω	8
Maximum power, continuous	W	10
Maximum power, pulsed 2 sec.	W	50
Input impedance	kΩ	20
Gain	dB	10
Input signal, max.	Vrms	2
Power supply, external	Vdc	24

Included items

GRAS 45BC	KEMAR Head & Torso with GRAS 44AA Mouth Simulator, non-configured
GRAS KB5000	KEMAR Large Right Anthropometric Pinna 35 Shore 00
GRAS KB5001	KEMAR Large Left Anthropometric Pinna 35 Shore 00
GRAS GR0408	External Ear Canal (for calibration, 2 pcs)
GRAS GR0409	Union Nut (for GR0408, 2 pcs)
GRAS GR1874	Ear Simulator Holder (2 pcs)
GRAS RA0403	Hi-Res Ear Simulator (2 pcs)
GRAS 26AS-S3	1/4" Standard Preamplifier with 0.4 m cable, Short (2 pcs)
GRAS GR0010	Adapter for 1/2" Microphone and 1/4" Preamplifier (2 pcs)
GRAS AA0008	3 m LEMO 7-pin - LEMO 7-pin Cable (2 pcs)
GRAS 46BP-1	1/4" LEMO Pressure Standard Microphone Set (for calibration of mouth)

Optional items

Power Modules for Externally Polarized Ear Simulators and Microphones

GRAS 12AA	2-Channel Power Module with gain, filters and SysCheck generator
GRAS 12AR	2-Channel Power Module
GRAS 12AQ	2-Channel Universal Power Module with signal conditioning and PC interface

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 42AG	Multifunction Sound Calibrator, Class 1

Pinna Simulators

GRAS KB0060	KEMAR Small Right Ear 55 Shore 00
GRAS KB0061	KEMAR Small Left Ear 55 Shore 00
GRAS KB0065	KEMAR Large Right Ear 55 Shore 00
GRAS KB0066	KEMAR Large Left Ear 55 Shore 00
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 1/4" 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.

Extension Cables

GRAS AA0008	LEMO 7-pin - LEMO 7-pin Cable, 3 m
GRAS AA0009	LEMO 7-pin - LEMO 7-pin Cable, 10 m

Flight Case

GRAS KM0094	PELI Case for KEMAR

Simulation Model of KEMAR

GRAS KB3000	3D Simulation Model of KEMAR with large pinnae, stp file
GRAS KB3001	3D Simulation Model of KEMAR with small pinnae, stp file
GRAS KB3002	3D Simulation Model of KEMAR with anthropometric pinnae, stp file

Stand for KEMAR

GRAS AL0026	Stand for KEMAR, Ø 35 mm

Miscellaneous (included in 45BC)

GRAS KB0000	KEMAR Handbook
GRAS KB0010	T-Shirt for KEMAR

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

GRAS Worldwide

Subsidiaries and distributors in more than 40 countries

HEAD OFFICE, DENMARK
GRAS SOUND & VIBRATION
Skovlytoften 33
2840 Holte
Denmark
Tel: +45 4566 4046
www.GRASacoustics.com
gras@grasacoustics.com

USA
GRAS SOUND & VIBRATION
9290 SW Nimbus Avenue
Beaverton, OR 97008
Tel: 503-627-0832
Toll Free: 800-231-7350
www.GRASacoustics.com
sales-usa@grasacoustics.com

UK
GRAS SOUND & VIBRATION
Unit 115, Gibson House,
Ermine Business Park, Huntingdon,
Cambridgeshire, PE29 6XU
Tel: +44 (0) 7762 584 202
www.GRASacoustics.com
sales-uk@grasacoustics.com

CHINA
GRAS SOUND & VIBRATION
Room 315, RuiBo Center(T1)
Lane683, Shenhong Rd,
Minhang District,
Shanghai, China, 201107
Tel: +86 21 64203370
www.GRASacoustics.cn
cnsales@grasacoustics.com



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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