

**KEMAR Head and Torso Simulators**



KEMAR is a head and torso simulator which is factory configured for hearing aid tests, ear- and headphone tests or sound quality recordings. Introduced in 1972 by Knowles Electronics and acquired by GRAS in 2005, it is the origin of all other head and torso simulators and thus the industry standard for in-situ anthropomorphic testing of all kinds of hearing instruments and head- and earphones.

Introduced in 2013, the new KEMAR generation is available with and without mouth simulator and fully backwards acoustically compatible with earlier KEMAR models. KEMAR meets the requirements of ANSI S3.36 and IEC 60318-7 and

can be configured with more sizes of standardized pinna simulators, the IEC 60318-4 Ear Simulator (former 60711) or various 1/2" and 1/4" pressure microphones for binaural recordings.

KEMAR accommodates for LEMO as well as CCP preamplifiers which are all electrically accessible from the connector panel on the back.

The preconfigured KEMAR models include ear simulators, microphones, preamplifiers and pinnae for specific applications. They are delivered fully assembled and tested in one box.



**GRAS 45BB**

**45BB KEMAR Head & Torso**

*A number of rubber pinnae (small and large, soft and hard, anthropometric and wide aperture) are available. 3D-simulation models (step files) of KEMAR with pinnae are also available. See page 96.*



**GRAS 45BC**

**45BC KEMAR Head & Torso with Mouth Simulator**

**KEMAR Configurations**

- 45BB**
  - 45BB-1** KEMAR Head & Torso for Hearing Aid Test, 1-Ch LEMO
  - 45BB-2** KEMAR Head & Torso for Hearing Aid Test, 1-Ch CCP
  - 45BB-3** KEMAR Head & Torso for Sound Quality Recording, 2-Ch LEMO
  - 45BB-4** KEMAR Head & Torso for Sound Quality Recording, 2-Ch CCP
  - 45BB-5** KEMAR Head & Torso for Ear- and Headphone Test, 2-Ch LEMO
  - 45BB-6** KEMAR Head & Torso for Ear- and Headphone Test, 2-Ch CCP
  - 45BB-7** KEMAR Head & Torso for Test of Binaural Hearing Aid, 2-Ch LEMO
  - 45BB-8** KEMAR Head & Torso for Test of Binaural Hearing Aid, 2-Ch CCP
  - 45BB-9** KEMAR with Anthropometric Pinnae for Ear- and Headphone Test, 2-Ch LEMO
  - 45BB-10** KEMAR with Anthropometric Pinna for Ear- and Headphone Test, 2-Ch CCP
  - 45BB-11** KEMAR with Anthropometric Pinna for Low-noise Ear- and Headphone Test, 1-Ch LEMO
  - 45BB-12** KEMAR with Anthropometric Pinna for Low-noise Ear- and Headphone Test, 2-Ch LEMO
  - 45BB-13** KEMAR for High Resolution Test of Ear- and Headphones, 2-Ch LEMO
  - 45BB-14** KEMAR for High Resolution Test of Ear- and Headphones, 2-Ch CCP
  
- 45BC**
  - 45BC-1** KEMAR Head & Torso with Mouth Simulator for Headset Test, 2-Ch LEMO
  - 45BC-2** KEMAR Head & Torso with Mouth Simulator for Headset Test, 2-Ch CCP
  - 45BC-3** KEMAR Head & Torso with Mouth Simulator for Telephone Test, 1-Ch LEMO
  - 45BC-4** KEMAR Head & Torso with Mouth Simulator for Telephone Test, 1-Ch CCP
  - 45BC-9** KEMAR with Mouth Simulator and Anthropometric Pinnae for Headset Test, 2-Ch LEMO
  - 45BC-10** KEMAR with Mouth Simulator and Anthropometric Pinnae for Headset Test, 2-Ch CCP
  - 45BC-11** KEMAR with Mouth Simulator and Anthropometric Pinnae for Low-noise Headset Test, 1-Ch LEMO
  - 45BC-12** KEMAR with Mouth Simulator and Anthropometric Pinnae for Low-noise Headset Test, 2-Ch LEMO
  - 45BC-13** KEMAR with Mouth Simulator for High Resolution Headset Test, 2-Ch LEMO
  - 45BC-14** KEMAR with Mouth Simulator for High Resolution Headset Test, 2-Ch CCP

## GRAS 45EA

### Handset Positioning System for KEMAR



45EA Handset Positioning System is made for the 45BC KEMAR Manikin with Mouth Simulator configured for telephone testing. The system is designed with maximum flexibility and acoustic performance in mind for laboratories & development environments that focus on the acoustic quality of their telephone handsets.

The finger grip is provided with adjustable positioning and scales which may be noted down for reproducible mounting and positioning.

The system is mounted on the KEMAR with no use of additional tools and can switch from right to left side setup with minimum alterations.

The Ear Reference Point of the preferred pinna type is determined by the supplied ERP-gauge and the applied handset pressure-force measured by use of the included force gauge RA0184.

## GRAS 45EB

### Ear-bud Positioning System for KEMAR



45EB Ear-bud Positioning System is made for the 45BB KEMAR Manikin and the 45BC KEMAR Manikin with mouth simulator.

This system is designed for positioning and holding ear-buds or ear-borne devices in the concha of the pinna simulator. The pressure force and position is adjustable and will with the preferred pinna secure proper mounting and repeatable measurements.

The applied pressure-force is measured by use of the included force gauge RA0184.

45EB can be retrofitted on all KEMAR versions.

## GRAS 45CA

### Headphone/Hearing-protector Test Fixture



45CA's robust design makes it ideally suited for binaural testing of active and passive earplugs, as well as circumaural hearing protectors. It is primarily intended for testing the performance of hearing-protection devices such as ear plugs and ear muffs (supra-aural and circum-aural) but can also be used for testing sound sources such as earphones and headphones. It is fitted with either microphones or ear simulators, depending on the device to test and the standard to comply with.

Compliance with ISO 4869-3, IEC 60318-1 and IEC 60318-4 assures technicians, decision makers, and authorities of repeatability and transparent data when developing and verifying hearing protectors.

The pinnae for 45CA are basically the same as the standardized KEMAR pinnae, but rounded to fit the large 45CA base plate. This large base plate reduces or eliminates the risk of leakage. 45CA includes two plugs for measuring the acoustic isolation in a closed ear.

The most common configurations can be ordered fully assembled, calibrated and tested from GRAS. These are listed below.



### 45CA Configurations

- 45CA-1** Headphone/Hearing-Protector Test Fixture, ISO 4869-3 1" Mic. LEMO - for test of ear muffs
- 45CA-2** Headphone/Hearing-Protector Test Fixture, ISO 4869-3 1/2" Mic. CCP - for test of ear muffs
- 45CA-3** Headphone/Hearing-Protector Test Fixture, IEC 60318-1 LEMO - for test of ear muffs and headphones
- 45CA-4** Headphone/Hearing-Protector Test Fixture, IEC 60318-1 CCP - for test of ear muffs and headphones
- 45CA-5** Headphone/Hearing-Protector Test Fixture, IEC 60318-4 LEMO - test of ear muffs, ear plugs, headphones, ear phones
- 45CA-6** Headphone/Hearing-Protector Test Fixture, IEC 60318-4 CCP - test of ear muffs, ear plugs, headphones, ear phones
- 45CA-7** Headphone/Hearing-Protector Test Fixture, IEC 60318-4 LEMO, with Anthropometric Pinnae - for test of ear muffs, ear plugs, headphones and ear phones
- 45CA-8** Headphone/Hearing-Protector Test Fixture, IEC 60318-4 CCP, with Anthropometric Pinnae - for test of ear muffs, ear plugs, headphones and ear phones
- 45CA-9** Headphone/Hearing-Protector Test Fixture, IEC 60318-4 LEMO, High Resolution with Anthropometric Pinnae, - for test of headphones and ear phones up to 20 kHz
- 45CA-10** Headphone/Hearing-Protector Test Fixture, IEC 60318-4 CCP, High Resolution with Anthropometric Pinnae, - for test of headphones and ear phones up to 20 kHz

Specifications	4CA
ISO standard	ISO 4869-3 (45CA-1 & 2)
ITU-T Recommendations	P.380
IEC standard	60318-1 (45CA-3 & 4) 60318-4 (45CA-5 to 45CA-10)
Self Insertion Loss, measured with closed ear simulators (45CA-1 and 45CA-2)	
80-250 Hz	>50 dB
350 - 4000 Hz	>65 dB
5000 - 20.000 Hz	>55 dB
Weight	11.6 kg
<i>For more specifications, visit <a href="http://gras.dk">gras.dk</a></i>	

## GRAS 45CB

### Acoustic Test Fixture According to ANSI S12.42



45CB is designed for standardized, binaural testing of passive and active earmuffs and earplugs. Besides a robust design made for field testing and high sound pressure levels (blasts), it has a very high self-insertion loss, body temperature regulated ear-canals with silicone lining and a huge pinna surround – all to provide the most realistic and repeatable fit.

45CB directly handles sound pressure levels up to 169 dB and, indirectly (using comparison methods), levels up to 190 dB. It has a self insertion-loss better than 65 dB.

The modified IEC 60318-4 ear simulator with a 1/4" microphone extends the frequency range as required by the standard. The 14-mm long ear canal extension is designed to let you also test all types of ear plugs.

The silicone-rubber lining of the extension enables leakage-free mounting of both foam plugs and customized molded types. The silicone-rubber lining of the plates ensures leakage-free mounting, as well as high repeatability and reliability.

## GRAS 67SB

### Blast Probe Microphone



The 67SB Blast Probe is designed as a reference microphone for impulse measurements according to the ANSI S12.42 standard.

The 1/8" reference microphone inside it is ideally suited for capturing impulsive signals with a very fine time resolution. This microphone has an upper limit of 174 dB in the dynamic range.

An adapter is included with the 67SB, so you can perform a verification of the microphone before each use.

67SB is provided with a 1/4" threaded hole for mounting directly on a tripod, e.g. AL0006.

Specifications	45CB	67SB
Sensitivity	1.6 mV	1 mV
Dynamic range	50 dB(A) - 169 dB	10 - 20 kHz
Self insertion Loss	100 Hz - 8 kHz: > 74 dB 80 Hz - 12.5 kHz: > 65 dB	52 dB(A) - 174 dB
Standard	ANSI S12.42	ANSI S12.42
Connector	7-pin LEMO	7-pin LEMO
Weight	14.75 kg	650 g