

# GRAS 45BC-2

KEMAR Head & Torso with Mouth Simulator for Headset Test,  
2-Ch CCP



Connection: CCP  
Channel(s): 2  
ANSI: S3.36, S3.25  
IEC: 60318-4  
ITU-T Rec. P.57 Type 3.3 based on ITU-T  
Rec. P.58  
Special feature: Built-in power amplifier for  
mouth simulator

The 45BC-2 Head & Torso with Mouth Simulator and TEDS for Headset Test, 2-Ch CCP is configured with pinnae and with IEC 60318-4 Ear Simulator and ear canal extension in both ears. Due to the design of KEMAR, realistic measurement in a sound environment as experienced by a human being using a headset is possible. In addition, the 45BC-2 is provided with a mouth simulator for testing of the microphone in the headset. Its LEMO equivalent is [GRAS 45BC-1 KEMAR Head & Torso with Mouth Simulator for Headset Test, 2-Ch LEMO](#).

## 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](http://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 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](#).

## TEDS Compatibility

All CCP-based KEMAR configurations are IEEE 1451.4 TEDS v. 1.0 compliant. If your measurement platform supports Transducer Electronic Data Sheets (TEDS), you will be able to read and write data like properties and calibration data.

## Design

The 45BC-2 is a KEMAR for 2-channel headset test, with prepolarized ear simulators and large straight 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-2 are the GRAS mouth simulator, the RA0045-S1 Ear Simulator According to 60318-4 and the KB0065/KB0066 Large Straight Pinnae.

### *GRAS 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 own built-in power amplifier (when power is applied).

### *The 60318-4 Ear Simulator*

The acoustic input impedance of the RA0045-S1 Ear Simulator closely resembles that of the human ear and, as a result, loads a sound source in very much the same way.

It complies with IEC 60318-4 and is measured and calibrated according to ITU-T P.57. 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 grooves.

Read more about the [RA0045-S1 Ear Simulator](#).

### *The KB0065/KB0066 Pinnae*

The KB0065 and KB0066 are large straight pinnae for use with a straight ear canal extension. The

hardness is 55 Shore 00. They comply with the IEC and ITU-T recommendations.

Other accessories for this configuration are listed in the Ordering Info tab.

## **Performance and warranty**

KEMAR is made of components from our standard portfolio, all manufactured of high-quality material and branded parts chosen and processed to ensure life-long stability and robustness. This enables us to offer a two-year warranty against defective materials and workmanship.

Exceptions: Microphones included in KEMAR as for these our normal five-year warranty applies. The warranty period for cables is six months.

# Specifications

**GRAS 45BC-2 KEMAR Head & Torso with Mouth Simulator for Headset Test, 2-Ch CCP**

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|  |             |                        |
|--|-------------|------------------------|
| Connector type   |             | 3 m 7-pin LEMO         |
| Set sensitivity @ 250 Hz ( $\pm 2$ dB)   | mV/Pa       | 12.5                   |
| Set sensitivity @ 250 Hz ( $\pm 2$ dB)   | dB re 1V/Pa | -38.5                  |
| Theoretical dynamic range lower limit with GRAS preamplifier                                   | dB(A)       | 25                     |
| Theoretical dynamic range upper limit with GRAS preamplifier @ +28 V / $\pm 14$ V power supply | dB          | 151                    |
| Theoretical dynamic range upper limit with GRAS CCP preamplifier                               | dB          | 146                    |
| 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 recommendations  |             | 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                     |

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

## Included items

|                                |  |
|--------------------------------|--|
| <a href="#">GRAS 45BC</a>      | KEMAR Head & Torso with GRAS mouth simulator, non-configured               |
| <a href="#">GRAS KB0065</a>    | KEMAR Large Right Ear 55 Shore 00  |
| <a href="#">GRAS KB0066</a>    | KEMAR Large Left Ear 55 Shore 00   |
| GRAS RA0237                    | Straight Ear Canal Extension Kit for KEMAR (2 pcs)                         |
| <a href="#">GRAS RA0045-S1</a> | IEC 60318-4 Ear Simulator, (Prepol.version, 2 pcs)                         |
| <a href="#">GRAS 26CS</a>      | 1/4" CCP Standard Preamplifier with Microdot Connector, Very Short (2 pcs) |
| <a href="#">GRAS RA0001</a>    | Adapter for 1/2" Microphone and 1/4" Preamplifier (2 pcs)                  |
| GRAS GR0408                    | External Ear Canal (2 pcs)   |
| GRAS GR0409                    | Union Nut (2 pcs)  |
| <a href="#">GRAS AA0018-S</a>  | Microdot-BNC Cable, 35 cm (2 pcs)  |
| <a href="#">GRAS AA0035</a>    | 3 m BNC - BNC Cable (2 pcs)  |
| <a href="#">GRAS 46BD</a>      | 1/4" CCP Pressure Standard Microphone Set                                  |
| <a href="#">GRAS AA0070</a>    | Microdot-BNC Cable, 3 m  |

## Optional items

### Power Modules for Pre-polarized Ear Simulators and Microphones

|                           |  |
|---------------------------|--|
| <a href="#">GRAS 12AL</a> | 1-Channel CCP Power Module with A-weighting filter                         |
| <a href="#">GRAS 12AQ</a> | 2-Channel Universal Power Module with signal conditioning and PC interface |

## For Ear Simulator Calibration

|                             |  |
|-----------------------------|--|
| <a href="#">GRAS 42AP</a>   | Intelligent Pistonphone (250 Hz or 251.2 Hz, 114 dB +/- 0.05 dB) |
| <a href="#">GRAS 42AA</a>   | Pistonphone (250 Hz, 114 dB +/- 0.08 dB)                         |
| <a href="#">GRAS RA0157</a> | 1/2" Calibration Adapter for KEMAR Pinna                         |

## Pinna Simulators

|                                    |   |
|------------------------------------|---|
| <a href="#"><u>GRAS KB0060</u></a> | KEMAR Small Right Ear 55 Shore 00               |
| <a href="#"><u>GRAS KB0061</u></a> | KEMAR Small Left Ear 55 Shore 00                |
| <a href="#"><u>GRAS KB0065</u></a> | KEMAR Large Right Ear 55 Shore 00               |
| <a href="#"><u>GRAS KB0066</u></a> | KEMAR Large Left Ear 55 Shore 00                |
| <a href="#"><u>GRAS KB1060</u></a> | KEMAR Small Right Ear, 35 Shore 00              |
| <a href="#"><u>GRAS KB1061</u></a> | KEMAR Small Left Ear 35 Shore 00                |
| <a href="#"><u>GRAS KB1065</u></a> | KEMAR Large Right Ear 35 Shore 00               |
| <a href="#"><u>GRAS KB1066</u></a> | KEMAR Large Left Ear 35 Shore 00                |
| <a href="#"><u>GRAS KB0090</u></a> | KEMAR Large Right Ear (VA-Style/SQ) 55 Shore 00 |
| <a href="#"><u>GRAS KB0091</u></a> | KEMAR Large Left Ear (VA-Style/SQ) 55 Shore 00  |
| <a href="#"><u>GRAS KB1090</u></a> | KEMAR Large Right Ear (VA-Style) 35 Shore 00    |
| <a href="#"><u>GRAS KB1091</u></a> | KEMAR Large Left Ear (VA-Style) 35 Shore 00     |

## Ear Mould Simulators

|                                    |  |
|------------------------------------|--|
| <a href="#"><u>GRAS KB0110</u></a> | Ear Mould Simulator for 2 mm Inner diameter tubing |
| <a href="#"><u>GRAS KB0111</u></a> | Ear Mould Simulator for 3 mm Inner diameter tubing |

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

|                                    |  |
|------------------------------------|--|
| <a href="#"><u>GRAS RA0237</u></a> | Straight Ear Canal Extension Kit for KEMAR   |
| <a href="#"><u>GRAS RA0238</u></a> | VA-tapered Ear Canal Extension Kit for KEMAR   |
| <a href="#"><u>GRAS RA0239</u></a> | Ear canal Extension Kit w. silicone lining for KEMAR                                   |
| <a href="#"><u>GRAS RA0240</u></a> | Holder for long 1/2" microphone Kit for KEMAR  |
| <a href="#"><u>GRAS RA0241</u></a> | Holder for short 1/2" microphone Kit for KEMAR   |
| <a href="#"><u>GRAS RA0243</u></a> | Holder for 1/2" microphone Kit for KEMAR   |
| <a href="#"><u>GRAS RA0244</u></a> | O-ring kit for KEMAR, 2 pcs.   |
| <a href="#"><u>GRAS RA0249</u></a> | Straight Ear Canal Extension Kit for KEMAR, made of POM, for binaural hearing aid test |
| <a href="#"><u>GRAS RA0250</u></a> | 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 AA0034                 | BNC-BNC Cable, 2 m  |
| <a href="#">GRAS AA0035</a> | BNC-BNC Cable, 3 m  |
| GRAS AA0036                 | BNC-BNC Cable, 5 m  |
| <a href="#">GRAS AA0037</a> | BNC-BNC Cable, 10 m |

## 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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# 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](http://www.GRASacoustics.com)  
[gras@grasacoustics.com](mailto: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](http://www.GRASacoustics.com)  
[sales-usa@grasacoustics.com](mailto: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](http://www.GRASacoustics.com)  
[sales-uk@grasacoustics.com](mailto: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](http://www.GRASacoustics.cn)  
[cnsales@grasacoustics.com](mailto: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](http://www.grasacoustics.com)

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