

# GRAS 45BD

AutoKEMAR



## Automotive Head and Torso Simulator

The GRAS 45BD AutoKEMAR is a specialized version of the renowned GRAS KEMAR, designed specifically for automotive acoustic testing. With its seat-mount system compatible with ISOFIX, the AutoKEMAR can be securely positioned in a car seat, ensuring precise and repeatable in-car measurements. The fixture's flexible design allows for comprehensive adjustability, including neck rotation, height, seat distance, forward and backward tilt, and viewing angle, providing true-to-life positioning and measurement versatility.

The AutoKEMAR is ideal for realistic in-car acoustic measurements, supporting a wide range of research and testing scenarios. It is user-reconfigurable, allowing for upgrades and replacements of ear simulators, microphones, and pinnae to suit different applications. An optional mouth simulator is available for speech-related testing, making AutoKEMAR a complete and adaptable solution for automotive acoustic evaluation. The system is offered in multiple pre-configured versions, ready to meet diverse testing needs right out of the box.

## Introduction

Today's drivers expect more than performance, they demand a quiet, refined ride and an immersive audio experience. Whether powered by a traditional combustion engine or an electric drivetrain, in-cabin acoustic quality has become a defining factor in modern automotive design.

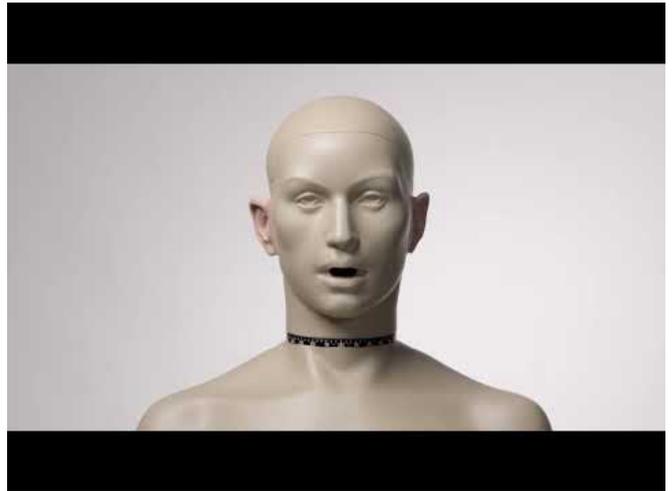
From benchmarking and tuning premium sound systems to sound quality testing, or minimizing unwanted noise and optimizing NVH (Noise, Vibration, and Harshness) performance, achieving excellence requires precise, repeatable, and realistic acoustic measurements.

AutoKEMAR's human-like acoustic properties allow engineers to perform accurate in-cabin measurements that closely replicate how sound behaves around a real occupant. The result is data you can trust, enabling better sound system design, more effective noise control, and a superior driving experience.

## Key Features

- Widest and most flexible positioning capabilities and motion range in the market.
- Available in multiple configurations,
- User reconfigurable: One unit à Multiple applications
- Multiple types of microphones, ear simulators and pinnae available.
- Accurate positioning, & Precision: Ensures consistent and repeatable measurements.
- Human-Like Acoustics: Mimics human head and torso for accurate sound simulation.
- Mouth simulator option available (can be retrofitted)
- Low-noise version available (11.5 dBA)
- Easy-access cable connector panel.
- ISOFIX-compatible for secure mounting.
- Lashing Strap secure mounting system for non-ISOFIX compatible car seats.

- Rattle free operation Rattle free operation (Static, Dyno, On-road Tests).
- TEDS compatible.
- Equalization curves available: Free-field, Diffuse-field and Direction Independent.



## Typical Applications and Use

### Automotive in-cabin acoustics:

- Audio system performance & tuning
- Sound Quality & Sound Design
- Infotainment and DSP testing
- Speech intelligibility and voice quality
- Hands-free communication
- In-cabin NVH
- Wind tunnel measurements

### Other:

- Vehicles Exterior Sound / Noise
- eVTOL, Trains, Airplane cabins, etc.
- Any applications that will benefit from HATS (consumer electronics: headphones, headsets. Hearing aids testing)

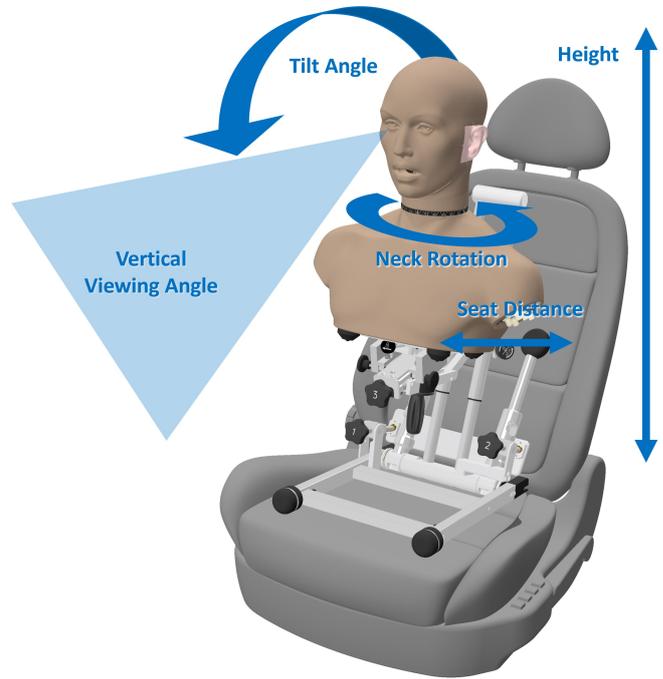


## Wide range of movement

Thanks to its ingenious seat-mount design, the GRAS 45BD AutoKEMAR offers the widest and most flexible range of motion available on the market.

This advanced fixture allows precise head and torso movement across all typical seating and driving positions, and even more extreme or unconventional setups, such as those representing very short or tall occupants, or relaxed resting positions.

By accommodating this broad range of realistic body postures, AutoKEMAR enables comprehensive and highly representative in-cabin acoustic testing, ensuring that every relevant listening position can be evaluated to take vehicle acoustics to the next level.



AutoKEMAR allows for multiple degrees of manual movement:

- Neck Rotation
- Height
- Seat Distance
- Tilt Angle Frontwards and Backwards
- Vertical Viewing Angle

## User-Reconfigurable: One AutoKEMAR - Multiple applications

Built on the same proven platform as the original GRAS KEMAR, the AutoKEMAR is designed for easy reconfiguration and maximum versatility.

Thanks to its snap-fit system, users can quickly remove and replace ear simulators, microphones, and pinnae, making it simple to adapt the fixture to different test setups or measurement needs. Multiple pinna types are available to match a variety of acoustic conditions.

This flexibility allows different teams to use the same AutoKEMAR for a wide range of applications, from sound-quality benchmarking and voice-quality evaluation to telecommunications testing inside the vehicle.

Each AutoKEMAR can be upgraded or reconfigured in just minutes using readily available spare parts, ensuring that your investment stays future-proof and adaptable to evolving automotive acoustics needs.



## No ISOFIX? No Problem

For vehicles or test setups without integrated ISOFIX anchor points, standard or custom ISOFIX adapters can be used to ensure a secure installation. In addition, every AutoKEMAR includes telescopic arms and a ratchet lashing strap system, allowing the Seat Mount to be firmly secured even when ISOFIX is not available.



## ISOFIX Compatibility

The GRAS 45BD AutoKEMAR features a seat-mount system fully compatible with ISOFIX, allowing it to be securely fastened to a car seat for stable and repeatable in-cabin measurements. When mounted using ISOFIX, AutoKEMAR achieves maximum stability and precision, ensuring the widest possible range of movement while maintaining a firm, vibration-free position against the seat.

## Mouth Simulator Option

The GRAS 45BD AutoKEMAR can be equipped with an optional mouth simulator, enabling realistic speech and voice testing inside the vehicle cabin. The mouth simulator acts as an acoustic sound source located inside the head, emitting audio signals through AutoKEMAR's mouth opening.



When equipped with a mouth simulator, the AutoKEMAR is a comprehensive solution for in-car microphone testing, speech intelligibility measurements, and evaluation of voice-control and hands-free communication systems.

It can be ordered with a mouth simulator or upgraded later through a retrofit option.

### Rattle free design

Every component of the GRAS 45BD AutoKEMAR, from the head and torso to the seat-mount assembly, is engineered for rattle-free performance.

This robust design ensures stable and noise-free operation, even in demanding test environments. As a result, AutoKEMAR is suitable not only for static in-cabin measurements, but also for tests conducted on dynamometers and even light on-road evaluations when secured with the ISOFIX mount or the Ratchet Lashing Strap system.

With its vibration-resistant construction, AutoKEMAR delivers consistent, high-fidelity acoustic data under real-world testing conditions.

### Compatibility

The GRAS 45BD AutoKEMAR is available in multiple configurations, featuring various combinations of microphones, pinnae, ear simulators, and mouth simulators to meet specific testing needs.

The acoustic signals captured by AutoKEMAR's two

“ears” are output as analog voltage signals proportional to the measured sound pressure. The microphones and ear simulators require a CCP (Constant Current Power) supply, also known as IEPE, ICP, or CCLD, and AutoKEMAR is fully compatible with all these standards.

If your data acquisition (DAQ) system does not provide a CCP supply, an external CCP power module can be used. Alternatively, AutoKEMAR's internal microphones can operate from a +48V Phantom Power supply when paired with an adapter such as the GRAS AG0003.

For setups including a mouth simulator, AutoKEMAR requires an analog signal from an external signal generator. The mouth simulator can be used in either passive mode (driven externally) or active mode (with a built-in amplifier).

### Quality & Warranty

The GRAS 45BD AutoKEMAR is built from premium components sourced from the GRAS standard portfolio, all manufactured with high-quality materials and precision-engineered parts to ensure long-term stability, durability, and performance.

Every unit undergoes rigorous quality control to meet GRAS's exacting standards for reliability and repeatability. This commitment to excellence allows us to offer a two-year warranty covering defects in materials and workmanship.

### Exceptions:

- Microphones supplied with AutoKEMAR are covered by a five-year warranty.
- Cables carry a six-month warranty.

### Configurations

Type Number	Description	Mouth Simulator?	Pinna Type	Ear Canal?	Ear simulator?	Microphone type
<b>45BD-01</b>	Sound Quality	No	KB0090/1	No	No	40AO
<b>45BD-02</b>	Sound Quality, High Sensitivity	No	KB0090/1	No	No	40CH
<b>45BD-07</b>	High-Frequency Ear Simulators	No	KB5000/1	Yes (realistic)	Yes (RA0402)	40AO (inside ear simulator)
<b>45BD-09</b>	Sound Quality	Yes	KB0090/1	No	No	40AO
<b>45BD-10</b>	Sound Quality, High Sensitivity	Yes	KB0090/1	No	No	40CH
<b>45BD-15</b>	High-Frequency Ear Simulators	Yes	KB5000/1	Yes (realistic)	Yes (RA0402)	40AO (inside ear simulator)

Part no		45BD-01	45BD-02	45BD-07	45BD-09	45BD-10	45BD-15
<b>Configuration</b>	-	Sound Quality	Sound Quality, Low Noise	Hi-Freq Ear Simulators	Sound Quality	Sound Quality, Low Noise	Hi-Freq Ear Simulators
<b>Mouth Simulator</b>	-	No			Yes		
<b>Output Channels (Ears)</b>	-	2					
<b>Ear Simulators</b>	-	No		Yes	No		Yes
<b>Microphone Type</b>		40AO (46AO-S2 kit)	40CH (46CH kit)	40AO (inside RA0402)	40AO (46AO-S2 kit)	40CH (46CH kit)	40AO (inside RA0402)
<b>Pinnae Type</b>		KB0090/1 Sound Quality	KB0090/1 Sound Quality	KB5000/1 Anthropometric	KB0090/1 Sound Quality	KB0090/1 Sound Quality	KB5000/1 Anthropometric
<b>Ear Canal</b>		No		Yes	No		Yes
<b>Connector type</b>	-	BNC					
<b>Set sensitivity @ 250 Hz (±2 dB)</b>	mV/Pa	12.5	70	12.5	12.5	70	12.5
<b>Set sensitivity @ 250 Hz (±2 dB)</b>	dB (ref 1V/Pa)	-38	-23	-38	-38	-23	-38

If you are looking to reconfigure an existing AutoKEMAR, use the “AUTOKEMAR RECONFIGURATION GUIDE” available in the product manual.

## Included items

### 45BD-01 (Sound Quality)

-	AutoKEMAR Automotive Head and Torso Simulator, non-configured
GRAS AL0040	Seat Mount for AutoKEMAR
GRAS 46A0-S2 <b>x2</b>	1/2" CCP Pressure Microphone Set. Includes 40A0 microphone and 26CK preamplifier
GRAS RA0241	Holder for short 1/2" microphone kit (includes 2 units)
GRAS KB0090	KEMAR Large Right Ear, 00 Shore55 (VA/SQ)
GRAS KB0091	KEMAR Large Left Ear, 00 Shore 55 (VA/SQ)
AA0018-S <b>x2</b>	35 cm Cable Microdot – BNC (in use for L-R ears)
YY0028	3 mm Allen Key
AA0035 <b>x2</b>	3 m BNC - BNC Cable (spare for connection to DAQ)
AL0038	Inclinometer
RA0578	Ratchet Lashing Strap for AutoKEMAR
-	Product Manual
-	Calibration Certificate
-	USB Stick with AutoKEMAR data

### 45BD-02 (Sound Quality, High Sensitivity)

-	AutoKEMAR Automotive Head and Torso Simulator, non-configured
GRAS AL0040	Seat Mount for AutoKEMAR

GRAS 46CH <b>x2</b>	Low noise sound quality microphone set. Includes 40CH microphone, RA0240 holder, RA0412 adapter and 26CB preamplifier
GRAS KB0090	KEMAR Large Right Ear, 00 Shore55 (VA/SQ)
GRAS KB0091	KEMAR Large Left Ear, 00 Shore 55 (VA/SQ)
AA0018-S <b>x2</b>	35 cm Cable Microdot – BNC (in use for L-R ears)
YY0028	3 mm Allen Key
AA0035 <b>x2</b>	3 m BNC - BNC Cable (spare for connection to DAQ)
AL0038	Inclinometer
RA0578	Ratchet Lashing Strap for AutoKEMAR
-	Product Manual
-	Calibration Certificate
-	USB Stick with AutoKEMAR data

## 45BD-07 (High Frequency Ear Simulators)

-	AutoKEMAR Automotive Head and Torso Simulator, non-configured
GRAS AL0040	Seat Mount for AutoKEMAR
GRAS 69CC-8 <b>x2</b>	Prepol Hi-freq 711 Ear Sim incl. angle adaptor and preamp. Includes RA0402 ear simulator, 26CB preamplifier and RA0002 adapter
GRAS KB5000	Large Right Anthropometric Pinna Shore 00-35
GRAS KB5001	Large Left Anthropometric Pinna Shore 00-35
AA0018-S <b>x2</b>	35 cm Cable Microdot – BNC (in use for L-R ears)
YY0028	3 mm Allen Key
AA0035 <b>x2</b>	3 m BNC - BNC Cable (spare for connection to DAQ)
AL0038	Inclinometer

RA0578	Ratchet Lashing Strap for AutoKEMAR
-	Product Manual
-	Calibration Certificate
-	USB Stick with AutoKEMAR data

## 45BD-09 (Sound Quality w/ mouth simulator)

-	AutoKEMAR Automotive Head and Torso Simulator, non-configured
GRAS AL0040	Seat Mount for AutoKEMAR
GRAS 46A0-S2 x2	1/2" CCP Pressure Microphone Set. Includes 40A0 microphone and 26CK preamplifier
GRAS RA0241	Holder for short 1/2" microphone kit (includes 2 units)
GRAS KB0090	KEMAR Large Right Ear, 00 Shore55 (VA/SQ)
GRAS KB0091	KEMAR Large Left Ear, 00 Shore 55 (VA/SQ)
AA0018-S x2	35 cm Cable Microdot – BNC (in use for L-R ears)
YY0028	3 mm Allen Key
AA0035 x2	3 m BNC - BNC Cable (spare for connection to DAQ)
AL0038	Inclinometer
RA0578	Ratchet Lashing Strap for AutoKEMAR
-	Product Manual
-	Calibration Certificate
-	USB Stick with AutoKEMAR data
-	Mouth Simulator
-	Mouth Simulator Power Supply
GRAS 40PM-1	EQset Microphone
GRAS RA0577	MRP Positioning fixture for AutoKEMAR

AA0027

3 m SMB - BNC Cable

## 45BD-10 (Sound Quality, High Sensitivity w/ mouth simulator)

-	AutoKEMAR Automotive Head and Torso Simulator, non-configured
GRAS AL0040	Seat Mount for AutoKEMAR
GRAS 46CH <b>x2</b>	Low noise sound quality microphone set. Includes 40CH microphone, RA0240 holder, RA0412 adapter and 26CB preamplifier
GRAS KB0090	KEMAR Large Right Ear, 00 Shore55 (VA/SQ)
GRAS KB0091	KEMAR Large Left Ear, 00 Shore 55 (VA/SQ)
AA0018-S <b>x2</b>	35 cm Cable Microdot – BNC (in use for L-R ears)
YY0028	3 mm Allen Key
AA0035 <b>x3</b>	3 m BNC - BNC Cable (spare for connection to DAQ)
AL0038	Inclinometer
RA0578	Ratchet Lashing Strap for AutoKEMAR
-	Product Manual
-	Calibration Certificate
-	USB Stick with AutoKEMAR data
-	Mouth Simulator
-	Mouth Simulator Power Supply
GRAS 40PM-1	EQset Microphone
GRAS RA0577	MRP Positioning fixture for AutoKEMAR
AA0027	3 m SMB - BNC Cable

## 45BD-15 (High Frequency Ear Simulators w/ mouth simulator)

-	AutoKEMAR Automotive Head and Torso Simulator, non-configured
GRAS AL0040	Seat Mount for AutoKEMAR
GRAS 69CC-8 <b>x2</b>	Prepol Hi-freq 711 Ear Sim incl. angle adaptor and preamp. Includes RA0402 ear simulator, 26CB preamplifier and RA0002 adapter
GRAS KB5000	Large Right Anthropometric Pinna Shore 00-35
GRAS KB5001	Large Left Anthropometric Pinna Shore 00-35
AA0018-S <b>x2</b>	35 cm Cable Microdot – BNC (in use for L-R ears)
YY0028	3 mm Allen Key
AA0035 <b>x2</b>	3 m BNC - BNC Cable (spare for connection to DAQ)
AL0038	Inclinometer
RA0578	Ratchet Lashing Strap for AutoKEMAR
-	Product Manual
-	Calibration Certificate
-	USB Stick with AutoKEMAR data
-	Mouth Simulator
-	Mouth Simulator Power Supply
GRAS 40PM-1	EQset Microphone
GRAS RA0577	MRP Positioning fixture for AutoKEMAR
AA0027	3 m SMB - BNC Cable

## Optional items

### Ear Simulators and Microphones

<a href="#">GRAS RA0045-S1</a>	Prepolarized Ear Simulator According to IEC 60318-4 (60711)
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<a href="#">GRAS RA0402</a>	Prepolarized High-Frequency Ear Simulator
<a href="#">GRAS RA0404</a>	Prepolarized Hi-Res Ear Simulator
<a href="#">GRAS 40AO</a>	Prepolarized Pressure Microphone

# 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 502, Building T1,  
No.1398 Ali Center  
Shenchang Road,  
Minhang District,  
Shanghai, China, 201107  
Tel: +86 21 400-888-9826  
[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 to industries where acoustic measuring accuracy and repeatability is of utmost importance in R&D, QA and production. This includes applications and solutions for customers within the fields of aerospace, automotive, audiology, and consumer electronics. GRAS microphones are designed to live up to the high quality, durability and accuracy that our customers have come to expect and trust.

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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An Axiometrix Solutions Brand