

GRAS 45BD

AutoKEMAR 汽车声学测试人工头



GRAS 45BD AutoKEMAR 是知名 GRAS KEMAR 系列的专用版本，专为汽车声学测试而设计。凭借其兼容 ISOFIX 的座椅安装系统 AutoKEMAR 可稳固地安装在汽车座椅上，确保车内测量结果的精确性和可重复性。该测试装置采用灵活的设计，具备全面的调节功能，包括颈部旋转、高度、座椅距离、前后倾斜以及视角调节，从而实现逼真的定位和多样的测量方式。

AutoKEMAR 非常适合进行真实的车内声学测量，可支持多种研究和测试场景。该设备支持用户自行重新配置，允许升级或更换仿真耳、传声器和耳廓组件，以适应不同的应用。

可选配的仿真嘴适用于语音相关测试，使 AutoKEMAR 成为一套完整且灵活的汽车声学评估解决方案。

该系统提供多种预配置版本，开箱即用，可满足各种测试需求。

简介

如今的驾驶者不仅追求卓越的性能，更期待静谧、精致的驾乘体验以及身临其境的音响效果。无论搭载传统内燃机还是电动动力系统，车内声学品质已成为现代汽车设计的关键因素。

无论是对高端音响系统进行基准测试和调校，还是进行音质测试，抑或是降低杂音并优化NVH（噪声、振动与粗糙度）性能，要达到卓越水平，都需要精准、可重复且符合实际的声学测量。

AutoKEMAR 具备类人声学特性，使工程师能够进行精准的车内测量，真实再现声音在实际乘员周围的传播情况。由此获得的数据值得信赖，有助于优化音响系统设计、提升降噪效果，并带来更卓越的驾驶体验。

主要特点

- 卓越的定位灵活性与运动范围。
- 提供多种配置。
- 用户可自行配置：一台设备 -> 多种应用。
- 提供多种类型的传声器、仿真耳和耳廓。
- 精确定位, & 高精度: 确保测量结果的一致性和可重复性。
- 类人声学特性：模仿人体头部和躯干，实现精准的声音模拟。
- 提供仿真嘴选项（可后期加装）。
- 提供低底噪版本 (11.5 dBA)
- 易于操作的电缆连接面板。
- 支持 ISOFIX 接口，安装更稳固。
- 适用于不兼容 ISOFIX 的汽车安全座椅的绑带固定系统。
- 运行时无异响（静态、台架、道路测试）。
- 兼容 TEDS
- 可选均衡曲线：自由场、扩散场和方向无关。

常见应用

汽车座舱声学：

- 音响系统性能与调校
- 声品质与声音设计
- 信息娱乐系统与DSP测试
- 语音可懂度与音质

- 免提通话
- 车内 NVH
- 风洞测试

其他：

- 车辆外部声响/噪音
- eVTOL 火车，飞机机舱等
- 任何能受益于 HATS 的应用（消费电子产品：耳机、头戴式耳机、智能音箱、助听器测试）



活动范围广

GRAS 45BD AutoKEMAR 凭借其巧妙的座椅安装设计，提供了业内更宽广、更灵活的调节范围。

这款先进的测试设备能够精确模拟头部和躯干的动作，轻松实现对所有标准乘坐和驾驶姿势的覆盖，甚至涵盖更极端或非常规的坐姿，例如身材娇小或高大的乘员，以及放松倚靠的姿势。

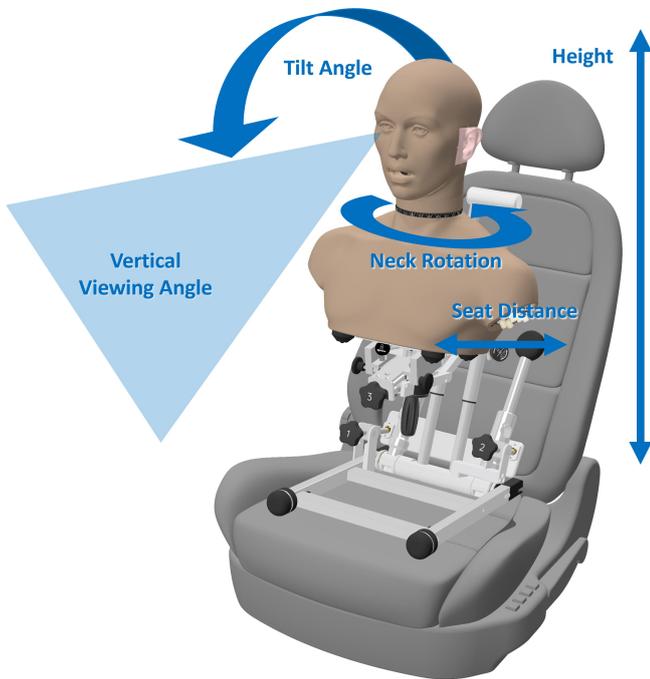
通过适配如此广泛的真实人体姿势 AutoKEMAR 能够实现全面且极具代表性的车内声学测试，确保每一个相关的听音位置都能被精确评估，从而将汽车声学提升至全新水平。



得益于其卡扣式安装系统，用户可以快速拆卸和更换仿真耳、传声器及耳廓，从而轻松地将该装置适应于不同的测试配置或测量需求。提供多种耳廓类型，以适应各种声学条件。

这种灵活性使得不同团队能够使用同一台 AutoKEMAR 设备，满足从音质基准测试、语音质量评估到车内通信测试等广泛的应用需求。

只需使用随手可得的备件，即可在短短几分钟内对每台 AutoKEMAR 进行升级或重新配置，确保您的投资经得起未来考验，并能适应不断变化的汽车声学需求。



AutoKEMAR 支持多种手动调节角度：

- 颈部旋转
- 高度
- 座椅间距
- 前后倾斜角度
- 垂直角度

用户可重新配置：一台 AutoKEMAR 多种应用

AutoKEMAR 基于与 GRAS KEMAR 相同的成熟平台打造，设计上注重易于重新配置和最大程度的灵活性。

ISOFIX 兼容性

GRAS 45BD AutoKEMAR 配备了与 ISOFIX 完全兼容的座椅安装系统，可将其牢固地固定在汽车座椅上，从而实现车内测量结果的稳定性和可重复性。当使用 ISOFIX 进行安装时 AutoKEMAR 能达到最佳的稳定性和精度，在保持与座椅紧密贴合、无振动的同时，确保尽可能大的运动范围。



没有 ISOFIX 也没问题

对于未配备集成式 ISOFIX 锚点的车辆或测试装置，可使用标准或定制的 ISOFIX 适配器以确保安装稳固。此外，每套 AutoKEMAR 均配备伸缩臂和棘轮式绑带，即使在没有 ISOFIX 的情况下，也能将座椅支架牢固固定。



仿真嘴选项

GRAS 45BD AutoKEMAR 可选配仿真嘴，从而能在车厢内进行逼真的语音和发声测试。该仿真嘴作为位于头部内部的声学声源，通过 AutoKEMAR 的开口发出音频信号。



配备仿真嘴后 AutoKEMAR 便成为车内麦克风测试、语音可懂度测量以及语音控制和免提通信系统评估的全面解决方案。

它可以在订购时选配仿真嘴，也可后期通过改装进行升级。

无异响设计

GRAS 45BD AutoKEMAR 的每个部件，从头部和躯干到座椅安装组件，均经过精心设计，确保运行时无异响。

这种坚固耐用的设计确保了设备即使在严苛的测试环境下也能稳定、静音地运行。因此 AutoKEMAR 不仅适用于车内静态测量，还可用于动力测功机测试，甚至在通过 ISOFIX 固定装置或棘轮捆绑带系统固定后，还能进行轻度的路试评估。

凭借其抗振动结构 AutoKEMAR 能在真实测试环境下提供一致且高保真的声学数据。

兼容性

GRAS 45BD AutoKEMAR 提供多种配置，配备各种传声器、耳廓、仿真耳和仿真嘴的组合，以满足具体的测试需求。

AutoKEMAR 的两只“耳朵”捕获的声学信号会以模拟电压信号的形式输出，其大小与测得的声压成正比。传声器和仿真耳需要恒流电源 CCP 也称为 IEPE ICP 或 CCLD 而 AutoKEMAR 与所有这些标准均完全兼容。

如果您的数据采集 DAQ 系统未提供 CCP 电源，可以使用外部 CCP 电源模块。此外 AutoKEMAR 的内置传声器在配合 GRAS AG0003 等适配器使用时，也可通

过+48V 幻象电源供电。

对于包含仿真嘴的系统 AutoKEMAR 需要外部信号发生器提供的模拟信号。仿真嘴既可在被动模式（外部驱动）下使用，也可在主动模式（内置放大器）下使用。

质保

GRAS 45BD AutoKEMAR 采用源自 GRAS 标准产品系列的优质组件制造，所有部件均选用高品质材料并经过精密加工，以确保长期稳定性、耐用性和卓越性能。

每台设备均经过严格的质量控制，以满足 GRAS 在可靠性和可重复性方面的严苛标准。正是这种对卓越品质的追求，使我们能够提供为期两年的保修服务，涵盖材料和工艺方面的缺陷。

例外情况：

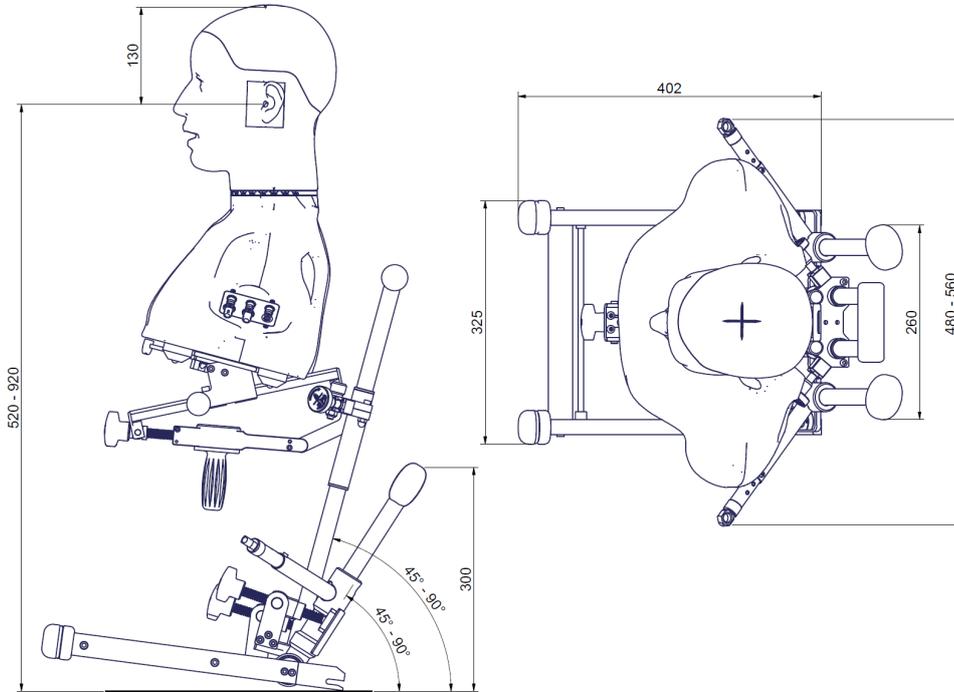
- AutoKEMAR 随附的传声器享有五年保修。
- 线缆享有六个月的保修期。

Part no		45BD-01	45BD-02	45BD-07	45BD-09	45BD-10	45BD-15
Configuration	-	Sound Quality	Sound Quality, Low Noise	Hi-Freq Ear Simulators	Sound Quality	Sound Quality, Low Noise	Hi-Freq Ear Simulators
Mouth Simulator	-		No			Yes	
Output Channels (Ears)	-			2			
Ear Simulators	-	No		RA0402 (69C-C-8 kit)	No		RA0402 (69C-C-8 kit)
Microphone Type	-	40AO (46AO-S2 kit)	40CH (46CH kit)	40AO (inside RA0402)	40AO (46AO-S2 kit)	40CH (46CH kit)	40AO (inside RA0402)
Pinnae Type	-	KB0090/1 Sound Quality	KB0090/1 Sound Quality	KB5000/1 Anthropometric	KB0090/1 Sound Quality	KB0090/1 Sound Quality	KB5000/1 Anthropometric
Ear Canal	-	No		Yes	No		Yes
Connector Type	-			BNC			
Set Sensitivity @ 250 Hz (±2 dB)	mV/Pa	12.5	70	12.5	12.5	70	12.5
Set Sensitivity @ 250 Hz (±2 dB)	dB (ref 1V/Pa)	-38	-23	-38	-38	-23	-38
Dynamic Range Lower Limit	dB(A)	25	11,5	25	25	11,5	25
Dynamic Range Upper Limit - Max SPL	dB	150	113	150	150	113	150
Temperature Range, operation	°C/°F			-30 to 60 / -22 to 140			
Temperature Range, storage	°C/°F			-40 to 65 / -40 to 149			
Humidity Range, noncondensing	%RH			0 to 95			

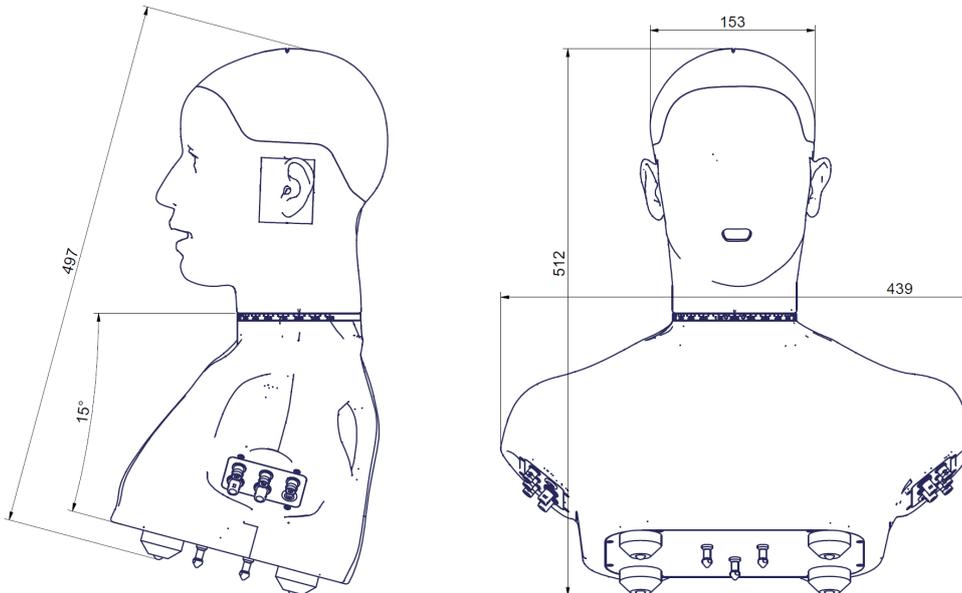
Part no		45BD-01	45BD-02	45BD-07	45BD-09	45BD-10	45BD-15
Configuration	-	Sound Quality	Sound Quality, Low Noise	Hi-Freq Ear Simulators	Sound Quality	Sound Quality, Low Noise	Hi-Freq Ear Simulators
Seat Mount Weight	kg	9 / 9.75 (with arms and ratchet lashing strap)					
Head and Torso Weight	kg	6 (without mouth) / 6.35 (with mouth)					
Total Weight	kg	15 – 16.1					
Seat Fixation	-	ISOFIX or Ratchet Lashing Strap					
Head Rotation Range	°	-120 to +120					
Max Safe Acceleration Exposure	g (g-force)	1					
Mouth Input Impedance	Ω					8 (without PSU)	
Mouth Maximum Power, continuous	W					10	
Mouth Maximum Power, pulsed 2 sec.	W	No Mouth Simulator				50	
Mouth Input Impedance	kΩ					20 (with PSU)	
Mouth Gain	dB					10	
Mouth Input Signal, max.	V _{pp}					2 (with PSU)	
Mouth Power Supply (PSU), external	V DC					24	

All dimensions in mm.

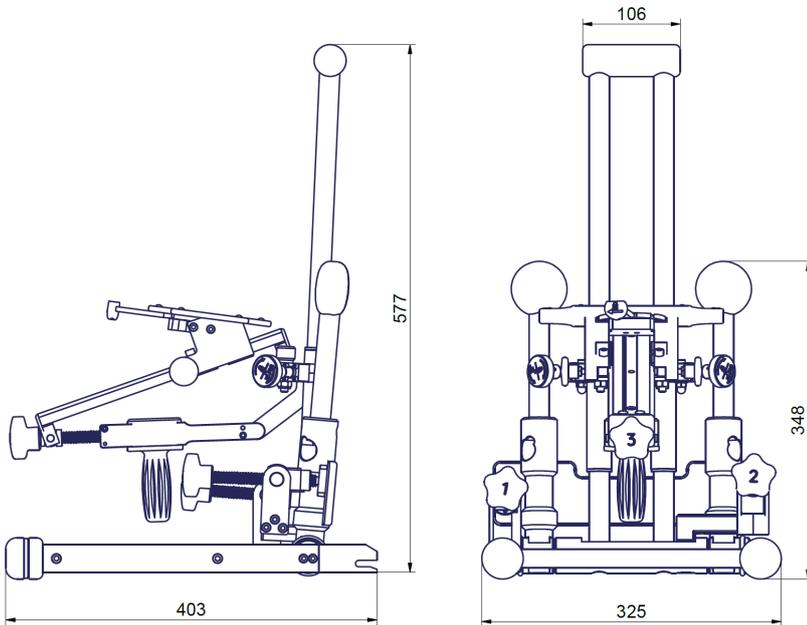
AutoKEMAR



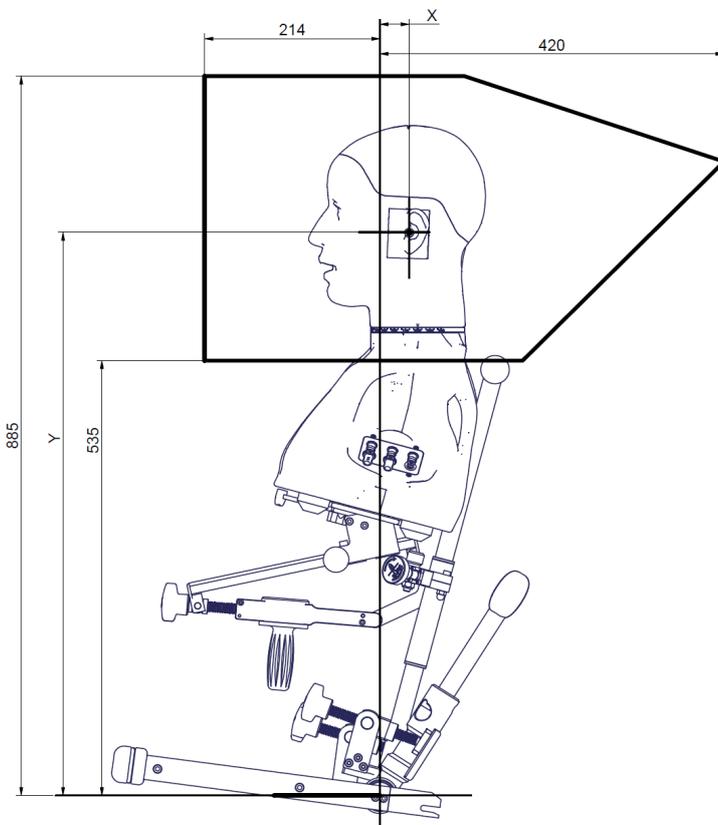
HATS



Seat Mount



Range of Movement



标配

GRAS 45BD-01 AutoKEMAR Sound Quality, 2-Ch CCP

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)
GRAS YY0018	2 mm Allen Key
GRAS YY0028	3 mm Allen Key
GRAS YY0013	4 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

GRAS 45BD-02 AutoKEMAR Low-Noise Sound Quality, 2-Ch CCP

GRAS AL0040	Seat Mount for AutoKEMAR
GRAS 46CH x2	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 x2	35 cm Cable Microdot – BNC (in use for L-R ears)

GRAS YY0018	2 mm Allen Key
GRAS YY0028	3 mm Allen Key
GRAS YY0013	4 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

GRAS 45BD-07 AutoKEMAR High-Frequency Coupler, Anthr. Pinna, 2-Ch CCP

GRAS AL0040	Seat Mount for AutoKEMAR
GRAS 69CC-8 x2	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 x2	35 cm Cable Microdot – BNC (in use for L-R ears)
GRAS YY0018	2 mm Allen Key
GRAS YY0028	3 mm Allen Key
GRAS YY0013	4 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

GRAS 45BD-09 AutoKEMAR Sound Quality, w. Mouth, 2-Ch CCP

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)
GRAS YY0018	2 mm Allen Key
GRAS YY0028	3 mm Allen Key
GRAS YY0013	4 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

GRAS 45BD-10 AutoKEMAR Low-Noise Sound Quality, w. Mouth, 2-Ch CCP

GRAS AL0040	Seat Mount for AutoKEMAR
GRAS 46CH x2	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 x2	35 cm Cable Microdot – BNC (in use for L-R ears)
GRAS YY0018	2 mm Allen Key
GRAS YY0028	3 mm Allen Key
GRAS YY0013	4 mm Allen Key
AA0035 x3	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
UP0001	AutoKEMAR Mouth Upgrade
-	Mouth Simulator Power Supply
GRAS 40PM-1	EQset Microphone
GRAS RA0577	MRP Positioning fixture for AutoKEMAR
AA0027	3 m SMB – BNC Cable

GRAS 45BD-15 AutoKEMAR High-Frequency Coupler, Anthr. Pinna, w. Mouth, 2-Ch CCP

GRAS AL0040	Seat Mount for AutoKEMAR
GRAS 69CC-8 x2	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 x2	35 cm Cable Microdot – BNC (in use for L-R ears)
GRAS YY0018	2 mm Allen Key
GRAS YY0028	3 mm Allen Key
GRAS YY0013	4 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

选配

如果您需要重新配置现有的 AutoKEMAR 请参阅产品手册中的“**AUTOKEMAR 重新配置指南**”。

Ear Simulators and Microphones

GRAS RA0045-S1	Prepolarized Ear Simulator According to IEC 60318-4 (60711)
GRAS RA0402	Prepolarized High-Frequency Ear Simulator
GRAS RA0404	Prepolarized Hi-Res Ear Simulator
GRAS 40AO	Prepolarized Pressure Microphone

Preamplifiers

GRAS 26CB	1/4" CCP Standard Preamplifier for Microphone with Microdot Connector
GRAS 26CK	1/2" CCP Standard Preamplifier with Microdot Connector, Very Short

Mouth Simulators

GRAS UP0001	45BD AutoKEMAR Mouth Simulator Upgrade
GRAS RA0577	MRP Positioning fixture for AutoKEMAR

Microphones for Mouth Simulator Calibration using RA0577 positioning fixture

GRAS 40PM-1	EQset Minuature Pressure Microphone
GRAS 40PM	EQset Minuature Pressure Microphone

Standard Pinnae, SOFT

GRAS KB1060	Small Right Pinna, 35 Shore 00
GRAS KB1061	Small Left Pinna, 35 Shore 00
GRAS KB1065	Large Right Pinna, 35 Shore 00
GRAS KB1066	Large Left Pinna, 35 Shore 00

Standard Pinnae, HARD

GRAS KB0060	Small Right Pinna, 55 Shore 00
GRAS KB0061	Small Left Pinna, 55 Shore 00
GRAS KB0065	Large Right Pinna, 55 Shore 00
GRAS KB0066	Large Left Pinna, 55 Shore 00

Anthropometric Pinnae

GRAS KB5000	Large Right Anthro. Pinna, 35 Shore 00
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GRAS KB5001	Large Left Anthro. Pinna, 35 Shore 00
GRAS KB5002	Large Right (mirrored left) Anthro. Pinna, 35 Shore 00

Sound Quality Pinnae, SOFT

GRAS KB1068	Small Right Pinna, 35 Shore 00
GRAS KB1069	Small Left Pinna, 35 Shore 00
GRAS KB1090	Large Right Pinna, 35 Shore 00
GRAS KB1091	Large Left Pinna, 35 Shore 00

Sound Quality Pinnae, HARD

GRAS KB0068	Small Right Pinna, 55 Shore 00
GRAS KB0069	Small Left Pinna, 55 Shore 00
GRAS KB0090	Large Right Pinna, 55 Shore 00
GRAS KB0091	Large Left Pinna, 55 Shore 00

Ear Simulator / Microphone Holders

GRAS RA0240	Holder for long 1/2" microphone kit
GRAS RA0241	Holder for short 1/2" microphone kit
GRAS RA0517	Kit with GR1874 Ear simulator holder ring for anthropometric pinna
GRAS RA0237	Straight ear canal extension kit

Microphone to Preamplifier Adapter

GRAS RA0001	Right-angled (90°) Adapter for 1/2" microphone and 1/4" preamplifier
GRAS RA0002	Right-angled adjustable adapter for 1/2" mic/1/4" preamp
GRAS RA0003	Adapter for 1/2" microphone and 1/4" preamplifier
GRAS RA0412	Kit of 8 degr. angular adapters 1/2" to 1/4"

Power Modules for Pre-polarized Ear Simulators and Microphones

GRAS 12BE	2-channel CCP Power Module with TEDS Support
GRAS 12AQ	GRAS 12AQ 2-Channel Universal Power Module with signal conditioning and PC interface
GRAS 12AL	1-Channel CCP Power Module with A-weighting filter

Flight Case

GRAS KM0113K	Optional Flight Case for AutoKEMAR
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For Calibration

GRAS 42AG	Multifunction Sound Calibrator, Class 1
GRAS 42AP	Intelligent Pistonphone, Class 0
GRAS RA0579	Calibration Adapter for Sound Quality AutoKEMAR

Stand for KEMAR

GRAS AL0041	Tripod Adapter for AutoKEMAR
GRAS AL0026	Tripod Stand (Requires AL0041 Tripod Adapter)

Cables

GRAS AA0032	0.5 m BNC-BNC cable
GRAS AA0033	1 m BNC-BNC cable
GRAS AA0034	2 m BNC-BNC cable
GRAS AA0035	3 m BNC-BNC cable
GRAS AA0036	5 m BNC-BNC cable
GRAS AA0037	10 m BNC-BNC cable
GRAS AA0038	30 m BNC-BNC cable
GRAS AA0018-S	35 cm Microdot-BNC cable
GRAS AA0070	3 m Microdot-BNC cable
GRAS AA0071	5 m Microdot-BNC cable
GRAS AA0072	10 m Microdot-BNC cable

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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 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

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