GRAS 43AG

Ear & Cheek Simulator

ANSI: S3.7
IEC: 60318-4
Other specs: Refer to the ear simulator included in the specific configuration

The GRAS 43AG Ear and Cheek Simulator represents the section of a head most important for realistic reproduction of the acoustic properties of the ear of an average human head. It allows the use of an ITU-T type 3.3 pinna or an Anthropometric Pinna, either with an IEC 60318-4 Ear Simulator, a Low-Noise Ear Simulator system, a High-Frequency Ear Simulator or a Hi-Res Ear Simulator.

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Introduction

The GRAS 43AG Ear and Cheek Simulator is a unique, multi-faceted and multi-purpose tool that helps you accomplish the job effectively. We call it the table-top KEMAR as it offers you much of the KEMAR capability in a convenient and portable package.

Our vision for the 43AG is to assist you in all facets of the product development cycle: From R&D testing to the final test and approval of the finished product. As your product is put together, your team needs to ensure that individual changes do not conflict with your overall vision. Much of this validation work can be accomplished at their desks, in real-time, making you comfortable and giving you the stamp of approval of the final product.

Additionally, very few manufacturers have their entire production vertically integrated and are therefore highly dependent on the quality delivered by their sub-suppliers. To ensure the quality of the complete product, GRAS offers a variety of mobile test platforms that can easily be deployed at your supplier and in your incoming control department. The 43AG Ear and Cheek Simulator by GRAS provides that comfort and security: The parts comply with the highest standards: Yours.

TEDS Compatibility

All CCP-based configurations (-2, -4, -7, and -9) 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.

Typical applications and use

The 43AG is a multi-purpose tool and can, for example, be used to verify frequency response, distortion, isolation, and leakage.

Its versatility means that it can be used for testing both concha and insert types earphones. It can also be used for headphone and headset testing, both circumaural and supra-aural types. Also, all common types of hearing aids and telephone handset can be tested with the 43AG.

To make ordering and decision making easier, we have made 43AG available in a number of configurations. Except for a few simple steps, they are fully assembled, calibrated and ready for use.

The following configurations are available:

43AG-1 and -2

43AG-1 Ear and Cheek Simulator, LEMO is configured with an Externally Polarized Ear Simulator According to IEC 60318-4 and a large KEMAR Right Pinna 55 Shore 00.

43AG-2 Ear and Cheek Simulator, CCP is configured with a Prepolarized Ear Simulator According to IEC 60318-4 and a large KEMAR Right Pinna 55 Shore 00.

With these configurations, tests can be performed according to the following standards:

- IEC 60959
- IEC 60318-4 (former IEC 60711)
- ITU-T Rec. P.57 Type 2 Artificial Ear
- ITU-T Rec. P.57 Type 3.3 Pinna Simulator

43AG-3 and -4

43AG-3 Ear and Cheek Simulator w Anthropometric Pinna, LEMO is configured with an Externally Polarized Ear Simulator According to IEC 60318-4 and a large KEMAR Right Anthropometric Pinna 35 Shore 00.

43AG-4 Ear and Cheek Simulator w Anthropometric

Pinna, CCP is configured with a Prepolarized Ear Simulator According to IEC 60318-4 and a large KEMAR Right Anthropometric Pinna 35 Shore 00.

The anthropometric pinna has anatomically shaped concha and ear canal, resulting in Improved fit and repeatability. The outer pinna has improved collapsibility. In addition to the traditional push mounting from the outside, the pinna is secured with two screws from the inside. These two screws ensure that the pinna is held firmly in place. Therefore, it seals perfectly against the ear simulator and the cheek plate, and it is therefore possible to mount and dismount DUTs repeatedly without compromising the seal. The outer shape of the anthropometric pinna conforms with ITU-T Type 3.3. Read more about the anthropometric pinna here.

Choose one of these configurations if you need to test insert type earphones, or if you want the benefits of the improved collapsibility of the new pinna when testing circum-aural and supra-aural earphones.

43AG-5

43AG-5 Ear and Cheek Simulator, Low-noise, is configured with a 43BB Low-noise Ear Simulator System and a large KEMAR Right Anthropometric Pinna 35 Shore 00.

The anthropometric pinna has anatomically shaped concha and ear canal and offers better fit, placement, and seal, resulting in improved low-frequency testing and better low-noise testing. Also, the more realistic ear canal combined with a more flexible pinna provides greater repeatability in measurements of in-ear, circum-aural or supra-aural headphones. The outer shape of the anthropometric pinna conforms with ITU-T Type 3.3. Read more about the advantages of the anthropometric pinna here.

The reduced noise floor of the 43BB low-noise system results in very good correlation to subjective listening results. Read more about the 43BB Low-noise Ear Simulator System here.

43AG-6 and -7

43AG-6 Ear and Cheek Simulator, with High-Frequency Ear Simulator, LEMO is configured with an externally polarized High-Frequency Ear Simulator and a large KEMAR Right Anthropometric Pinna 35 Shore 00.

43AG-7 Ear and Cheek Simulator, with High-Frequency Ear Simulator, CCP is configured with a prepolarized High-Frequency Ear Simulator and a large KEMAR Right Anthropometric Pinna 35 Shore 00.

The GRAS RA0401 is an externally polarized high-frequency version of the well-known standardized 60318-4 ear simulator, RA0402 is the prepolarized equivalent. They comply with IEC60318-4, but extend the useful frequency range to 20 kHz within a narrow tolerance band. Read more about the RA0401 here, and the RA0402 here.

The anthropometric pinna has anatomically shaped concha and ear canal and offers better fit, placement and seal, resulting in improved low and high frequency testing. Also, the more realistic ear canal combined with a more flexible pinna provides greater repeatability in measurements of in-ear, circum-aural or supra-aural headphones. The outer shape of the anthropometric pinna conforms with ITU-T Type 3.3. Read more about the advantages of the anthropometric pinna here.

43AG-8 and -9

43AG-8 Ear and Cheek Simulator, with Hi-Res Ear Simulator, LEMO is configured with an externally polarized Hi-Res Ear Simulator and a large KEMAR Right Anthropometric Pinna 35 Shore 00.

43AG-9 Ear and Cheek Simulator, with Hi-Res Ear Simulator, CCP is configured with a prepolarized Hi-Res Ear Simulator and a large KEMAR Right Anthropometric Pinna 35 Shore 00.

The GRAS RA0403 is an externally polarized hi-res version of the well-known standardized 60318-4 ear simulator, RA0404 is the prepolarized equivalent. They comply with IEC60318-4. The use of 1/4" microphones extend the useful frequency range to 50 kHz within a narrow tolerance band. Read more about the RA0403 here, and the RA0404 here.

The anthropometric pinna has anatomically shaped concha and ear canal and offers better fit, placement and seal, resulting in improved low and high frequency testing. Also, the more realistic ear canal combined with a more flexible pinna provides greater repeatability in measurements of in-ear, circum-aural or supra-aural headphones. The outer shape of the anthropometric pinna conforms with ITU-T Type 3.3. Read more about the advantages of the anthropometric pinna here.

The contents of each of these configurations are listed in the tab Ordering info.

Compatibility

KEMAR pinnae are available for the 43AG: small and large in "soft" and "normal" versions. VA-Style as well as anthropometric pinnae are available. To ensure that the base of the pinna is flush with the cheek plate, only right pinnae should be used.

System verification

For sensitivity calibration, we recommend using a pistonphone like GRAS 42AP Intelligent Pistonphone or the GRAS 42AA Pistonphone.

Quality and warranty

All GRAS Ear Simulators are made of high-quality materials that will ensure life-long stability and robustness. The microphones inside the Ear Simulators are all assembled in verified clean-room environments by skilled and dedicated operators with many years of expertise in this field.

The microphone diaphragm, body, and improved protection grid are made of high-grade stainless steel, which makes the microphone resistant to physical damage, as well as corrosion caused by aggressive air or gasses.

This, combined with the reinforced gold-plated microphone terminal which guarantees a highly reliable connection, enables GRAS to offer 5 years warranty against defective materials and workmanship.

Service

If you accidentally damage the Ear Simulator and the microphone inside the Ear Simulator, we can — in most cases — replace and repair it at a very reasonable cost and with short turn-around time. This not only protects your investment but also pleases your quality assurance department because you don’t have to worry about new serial numbers, etc.

Calibration

Before leaving the factory, all GRAS products are calibrated in a controlled laboratory environment using traceable calibration equipment.

Depending on the use, measurement environment, and internal quality control programs, we recommend recalibrating the microphone at least once a year.

Theoretical dynamic range lower limit with GRAS preamplifier	dB(A)	25
Theoretical dynamic range upper limit with GRAS preamplifier @ +28 V / ±14 V power supply	dB	153
Theoretical dynamic range upper limit with GRAS preamplifier @ +120 V / ±60 V power supply	dB	164
Set sensitivity @ 250 Hz (±2 dB)	mV/Pa	12.5
Set sensitivity @ 250 Hz (±2 dB)	dB re 1V/Pa	-38.1
Coupler volume	mm^3	1260 @ 500 Hz
Resonance frequency	kHz	13.5 (ear sim)
Temperature range, operation	°C / °F	-30 to 60 / -22 to 140
Temperature coefficient @250 Hz	dB/°C / dB/°F	- 0.01 / -0.006
Humidity range non condensing	% RH	0 to 75
ANSI standard		S3.7
IEC standard		60318-4 (former 60711)
CE/RoHS compliant/WEEE registered		Yes/Yes/Yes
Weight	g / oz	1.95 kg / 68.784

Specifications are the common specifications for all 43AG-configurations.

Further specifications can be found at the product pages for the ear simulators included.

43AG-1 and 43AG-3: RA0045		
Sensitivity	mV/Pa	12.5
Dynamic range lower limit	dB(A)	25
Dynamic range upper limit	dB	164
Frequency range	Hz	100-20000
43AG-2 and 43AG-4: RA0045-S1		
Sensitivity	mV/Pa	12.5
Dynamic range lower limit	dB(A)	25
Dynamic range upper limit	dB	150
Frequency range	Hz	100-20000

43AG-5: 43BB Low-noise Ear Simulator System		
Sensitivity	mv/Pa	800
Dynamic range lower limit	dB(A)	10.5
Dynamic range upper limit	dB	113
Frequency range	Hz	100-20000
43AG-6/43AG-7: RA0401/RA0402 High-Frequency Ear Simulator		
Sensitivity	mV/Pa	12.5
Dynamic range lower limit	dB(A)	25
Dynamic range upper limit, RA0401	dB	164
Dynamic range upper limit, RA0402	dB	153
Frequency range	Hz	100-20000
43AG-8/43AG-9: RA0403/RA0404 Hi-Res Ear Simulator		
Sensitivity	mV/Pa	1.6
Dynamic range lower limit	dB(A)	44
Dynamic range upper limit, RA0403	dB	169
Dynamic range upper limit, RA0404	dB	166
Frequency range	Hz	100-50000

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

Included

43AG-1 Ear and Cheek Simulator LEMO

GRAS RA0052	Test Jig with mounting base and adjustable force clamp
GRAS RA0314	Cheek plate
GRAS KB0065	KEMAR Large Right Pinna 55 Shore 00
GRAS GR0917	Ear Canal Extension
GRAS RA0045	Externally polarized Ear Simulator According to IEC 60318-4
GRAS RA0001	Right-angled 1/2" to 1/4" Adapter
GRAS 26AC-1	1/4" Preamplifier with 3 m integrated cable
GRAS RA0199	Finger Simulator
GRAS GR0408	External Ear Canal
GRAS GR0409	Union Nut

43AG-2 Ear and Cheek Simulator CCP

GRAS RA0052	Test Jig with mounting base and adjustable force clamp
GRAS RA0314	Cheek plate
GRAS KB0065	KEMAR Large Right Pinna 55 Shore 00
GRAS GR0917	Ear Canal Extension
GRAS RA0045-S1	Prepolarized Ear Simulator According to IEC 60318-4
GRAS RA0001	Right-angled 1/2" to 1/4" Adapter
GRAS 26CB	1/4" Preamplifier
GRAS AA0070	Microdot to BNC Cable, 3 m
GRAS RA0199	Finger Simulator
GRAS GR0408	External Ear Canal
GRAS GR0409	Union Nut

43AG-3 Ear and Cheek Simulator w Anthropometric Pinna, LEMO

GRAS RA0052	Test Jig with mounting base and adjustable force clamp
GRAS RA0314	Cheek plate
GRAS KB5000	KEMAR Large Right Anthropometric Pinna 35 Shore 00
GRAS GR1874	Ear Simulator Holder
GRAS RA0045	Externally Polarized Ear Simulator According to IEC 60318-4
GRAS RA0001	Right-angled 1/2" to 1/4" Adapter
GRAS 26AC-1	1/4" Preamplifier with 3 m integrated cable
GRAS RA0199	Finger Simulator
GRAS GR0408	External Ear Canal
GRAS GR0409	Union Nut

43AG-4 Ear and Cheek Simulator w Anthropometric Pinna, CCP

GRAS RA0052	Test Jig with mounting base and adjustable force clamp
GRAS RA0314	Cheek plate
GRAS KB5000	KEMAR Large Right Anthropometric Pinna 35 Shore 00
GRAS GR1874	Ear Simulator Holder
GRAS RA0045-S1	Pre-polarized Ear Simulator According to IEC 60318-4
GRAS RA0001	Right-angled 1/2" to 1/4" Adapter
GRAS 26CB	1/4" Preamplifier
GRAS AA0070	Microdot to BNC Cable, 3 m
GRAS RA0199	Finger Simulator
GRAS GR0408	External Ear Canal
GRAS GR0409	Union Nut

43AG-5 Ear and Cheek Simulator, Low-noise

GRAS RA0052	Test Jig with mounting base and adjustable force clamp
GRAS RA0314	Cheek plate
GRAS KB5000	Large Right Anthropometric Pinna 35 Shore 00
GRAS GR1874	Ear Simulator Holder
GRAS RA0001	Right Angled 1/2" to 1/4" Adapter
GRAS 43BB	Low-noise Ear Simulator System
GRAS AA0059	LEMO 7-pin to 7-pin cable, 1 m
GRAS GR0408	External Ear Canal
GRAS GR0409	Union Nut
GRAS RA0199	Finger Simulator
GRAS 12HF	Power Module for Low-noise Systems

43AG-6 Ear and Cheek Simulator w High-Frequency Ear Simulator, LEMO

GRAS RA0052	Test Jig with mounting base and adjustable force clamp
GRAS RA0314	Cheek plate
GRAS KB5000	KEMAR Large Right Anthropometric Pinna 35 Shore 00
GRAS GR1874	Ear Simulator Holder
GRAS RA0401	Externally Polarized High-Frequency Ear Simulator
GRAS RA0001	Right-angled 1/2" to 1/4" Adapter
GRAS 26AC-1	1/4" Preamplifier with 3 m integrated cable
GRAS RA0199	Finger Simulator
GRAS GR0408	External Ear Canal
GRAS GR0409	Union Nut

43AG-7 Ear and Cheek Simulator w High-Frequency Ear Simulator, CCP

GRAS RA0052	Test Jig with mounting base and adjustable force clamp
GRAS RA0314	Cheek plate
GRAS KB5000	KEMAR Large Right Anthropometric Pinna 35 Shore 00
GRAS GR1874	Ear Simulator Holder
GRAS RA0402	Pre-polarized High-Frequency Ear Simulator
GRAS RA0001	Right-angled 1/2" to 1/4" Adapter
GRAS 26CB	1/4" Preamplifier
GRAS AA0070	Microdot to BNC Cable, 3 m
GRAS RA0199	Finger Simulator
GRAS GR0408	External Ear Canal
GRAS GR0409	Union Nut

43AG-8 Ear and Cheek Simulator w Hi-Res Ear Simulator, LEMO

GRAS RA0052	Test Jig with mounting base and adjustable force clamp
GRAS RA0314	Cheek plate
GRAS KB5000	KEMAR Large Right Anthropometric Pinna 35 Shore 00
GRAS GR1874	Ear Simulator Holder
GRAS RA0403	Externally Polarized Hi-Res Ear Simulator
GRAS RA0001	Right-angled 1/4" to 1/4" Adapter
GRAS 26AC-1	1/4" Preamplifier with 3 m integrated cable
GRAS RA0199	Finger Simulator
GRAS GR0408	External Ear Canal
GRAS GR0409	Union Nut

43AG-9 Ear and Cheek Simulator w Hi-Res Ear Simulator, CCP

GRAS RA0052	Test Jig with mounting base and adjustable force clamp
GRAS RA0314	Cheek plate
GRAS KB5000	KEMAR Large Right Anthropometric Pinna 35 Shore 00
GRAS GR1874	Ear Simulator Holder
GRAS RA0404	Pre-polarized Hi-Res Ear Simulator
GRAS RA0001	Right-angled 1/4" to 1/4" Adapter
GRAS 26CB	1/4" Preamplifier
GRAS AA0070	Microdot to BNC Cable, 3 m
GRAS RA0199	Finger Simulator
GRAS GR0408	External Ear Canal
GRAS GR0409	Union Nut

Optional

Power Supply & Signal Conditioning

GRAS 12AQ	For both externally and prepolarized configurations: Power Module, dual-channel
GRAS 12AK	For externally polarized configurations, Power Module, single-channel

Pinna Simulators

GRAS KB0060	KEMAR Small Right Pinna 55 Shore 00
GRAS KB0065	KEMAR Large Right Pinna 55 Shore 00
GRAS KB1060	KEMAR Small Right Pinna 35 Shore 00
GRAS KB1065	KEMAR Large Right Pinna 35 Shore 00
GRAS KB0090	KEMAR Large Right Pinna (VA-Style/SQ) 55 Shore 00

GRAS KB1090	KEMAR Large Right Pinna (VA-Style) 35 Shore 00
GRAS KB5000	Right Anthropometric Pinna
GRAS KB5001	Left Anthropometric Pinna

Calibration Equipment

GRAS RA0184	Force Gauge (0 - 25 N)
GRAS RA0157	1/2" Calibration Adapter for KEMAR pinnae (required for an 60318-4 (711) Configuration)
GRAS 42AP	Pistonphone with built-in precision barometer (250 Hz or 251.2 Hz, 114 dB ±0.05 dB) (recommended)
GRAS 42AA	Pistonphone (250 Hz, 114 dB ±0.08 dB)
GRAS RA0090	94 dB Pistonphone Coupler for calibration of low-noise system
GRAS 42AG	Multifunction Sound Calibrator, Class 1

Cables

GRAS AA0008	3 m Extension cable, 7-pin LEMO to 7-pin LEMO for connection to power module

Miscellaneous

GRAS RA0196	High-tension Spring Kit (only relevant for 43AG delivered before summer 2014 and only if higher tension is required).

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

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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 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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