

# GRAS RA0045-S4

Externally Polarized Ear Simulator Based on IEC 60318-4 (60711), High Sensitivity



Standards: IEC 60318-4 (based on), ITU-T P.57

Eff vol: 1260 mm<sup>3</sup> @ 500 Hz

Res freq: 13.5 kHz  $\pm$ 1 kHz

The GRAS RA0045-S4 Ear Simulator is an ear simulator with an acoustic input impedance closely resembling that of an average human ear. The RA0045-S4 includes a 40AP pressure microphone and each RA0045-S4 is individually calibrated with this specific microphone.

## Introduction

The RA0045-S4 Ext Pol Ear Simulator is a special type of ear simulator for making low level acoustic measurements on earphones coupled to the human ear by ear inserts such as tubes, ear moulds, or ear tips. It has an input impedance closely resembling that of an average human ear, and, as a result, loads a sound source in very much the same way.

It is based on the following international requirements:

- IEC 60318-4: Occluded-ear simulator for the measurement of earphones coupled to the ear by ear inserts.
- ITU-T Recommendations P.57 (08/96) Series P: Telephone transmission quality, Objective measuring apparatus: Artificial ears.

It is measured and calibrated according to the ITU-T Recommendation P.57.

## Design

The RA0045-S4 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.

It includes a [GRAS 40AP](#) 1/2" Ext. Polarized Pressure Microphone, High Sensitivity and each RA0045-S4 is individually calibrated with this specific microphone.

## Typical Applications and Use

The RA0045-S4 is for measurements on earphones and hearing aids coupled to the human ear by ear inserts such as tubes, ear moulds, or ear tips.

In accordance with ITU-T Recommendation P.57, it can be used with the following GRAS pinna

simulators for testing telephones:

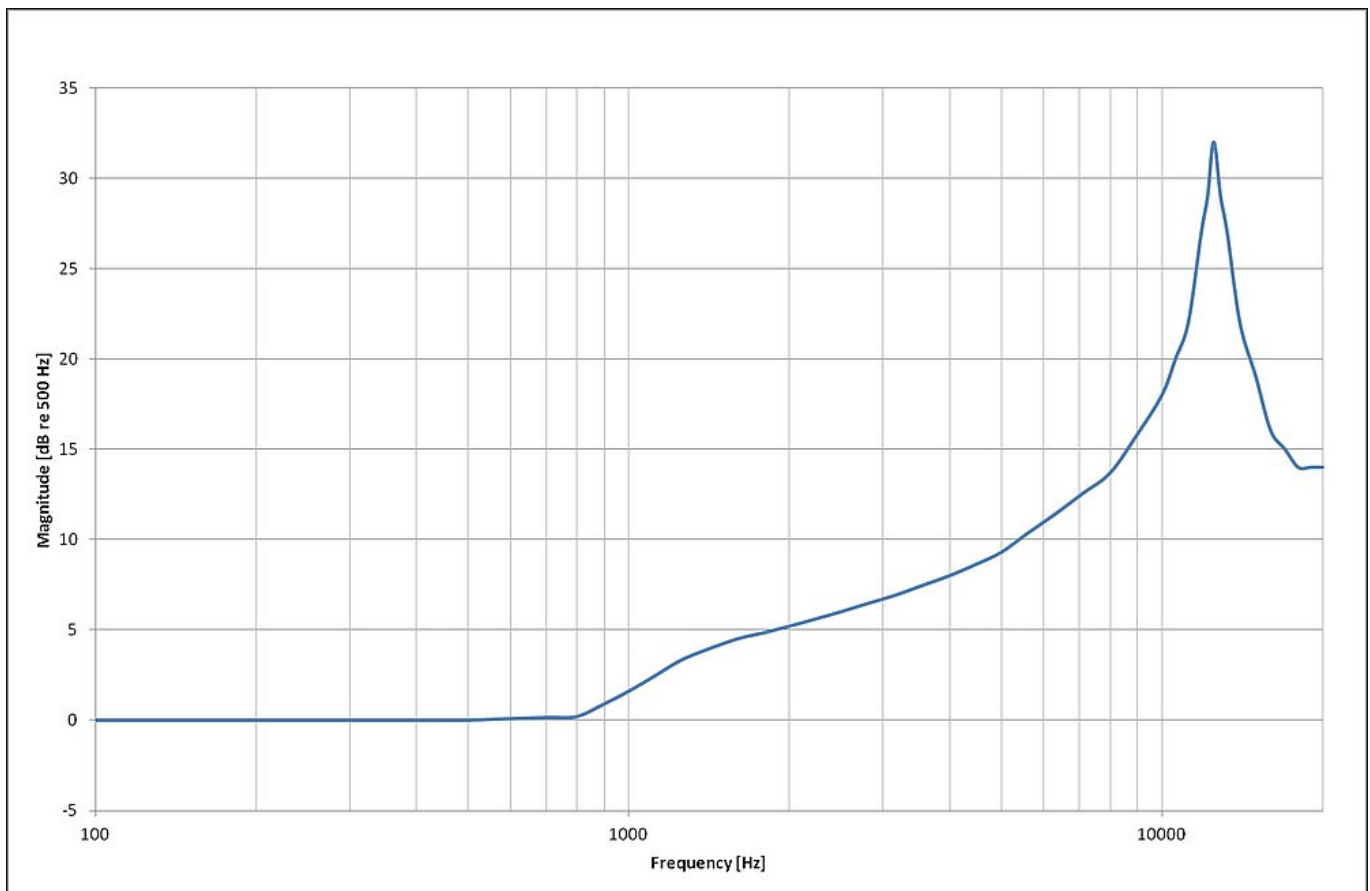
- [GRAS RA0056](#) Low-leak Pinna Simulator
- [GRAS RA0057](#) High-leak Pinna Simulator

A comprehensive range of accessories for making measurements in accordance with IEC 60318-4 are available. See the tab Ordering info.

## Compatibility

The RA0045-S4 can be used with a standard LEMO preamplifier, e.g. the [GRAS 26AK](#) 1/2" Preamplifier or the [GRAS 26AC-1](#) 1/4" Preamplifier fitted with an adapter. For the 1/4" preamplifier, use either the straight RA0003 Adapter or the right-angled RA0001 Adapter.

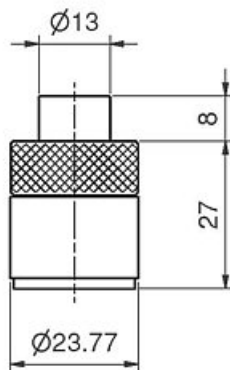
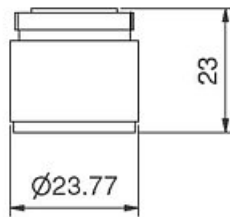
Polarization/Connection		200 V / Traditional
Theoretical dynamic range lower limit with GRAS preamplifier	dB(A)	18
Theoretical dynamic range upper limit with GRAS preamplifier @ +28 V / ±14 V power supply	dB	149
Resonance frequency	kHz	13.5
Coupler volume	mm <sup>3</sup>	1260 @ 500 Hz
Temperature coefficient @250 Hz	dB/°C / dB/°F	0.05
Humidity range non condensing	% RH	0 to 75
ANSI standard		S3.7
IEC standard		Based on 60318-4
ITU-T recommendations		P.57 Type 2
CE/RoHS compliant/WEEE registered		Yes/Yes, Yes
Weight	g / oz	52 / 1.8



Typical frequency response

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

Dimensions in mm



GS0076  
RA0045

## Optional items

<a href="#">GRAS RA0088</a>	In Ear Adapter
GRAS GR0433	Calibration Adapter
GRAS GR0434	Stop Washer
GRAS GR0436	Tube Adapter
GRAS GR0437	Ear-mould Simulator
GRAS GR0438	Retention Ring
GRAS GR0440	Tube Adapter
<a href="#">GRAS RA0056</a>	Low-leak Pinna Simulator
<a href="#">GRAS RA0057</a>	High-leak Pinna Simulator
<a href="#">GRAS 26AK</a>	26AK 1/2" Standard Preampifier with Integrated Connector
<a href="#">GRAS 26AC-1</a>	26AC-1 1/4" Standard Preampifier with 3 m Integrated Cable
GRAS RA0001	Right-angled Adapter for 1/2" microphone and 1/4" preampifier
GRAS RA0525	Foam insert for 60318-4 coupler, 10 pcs
GRAS RA0003	Adapter for 1/2" microphone and 1/4" preampifier

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

# 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)

[grasacoustics.com](http://grasacoustics.com)

**GRAS**  
An Axiometrix Solutions Brand