

Acoustical headphone and headset testing requires dedicated simulators according to different standards. Following selection gives an overview on different kinds of simulators which are compatible to the Klippel RnD – and QC – Measurement System.

These sets are all equipped with IEPE standard conform constant current supply (CCP) mic preamplifiers, which could directly be connected to the Klippel measurement devices. All sets are complete with cables and accessories, ready to use with Klippel measurement devices.

Hints are given for selecting a certain simulator for different applications.

Other version e.g. with 200V polarized microphones or other options are on request.

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1 Mouth Simulators

1.1 G.R.A.S. 44AA Mouth Simulator, according to ITU-T Rec. P51 Set

Article Number: 2400-073

- Sound Source, which simulates the acoustic field close to the human mouth.
- Complies with standard:
 - IEEE 269, 661
 - ITU-T Rec. P51
- With built in amplifier
- Including:
 - G.R.A.S. AB0012 24V_{DC} PSU
 - 2m BNC-BNC cable
 - XLR female to BNC female adapter
- Suitable for RnD & QC System
- A defined and reproducible positioning of the DUT is required.
- Could directly be connected to Distortion Analyzer or Production Analyzer output.
- For detailed information see manufactures G.R.A.S. 44AA specification and manual.



1.2 G.R.A.S. 44AB Mouth Simulator, according to ITU-T Rec. P51 Set

Article Number: 2400-077

- Sound Source, which simulates the acoustic field close to the human mouth.
- Complies with standard:
 - IEEE 269, 661
 - ITU-T Rec. P51
- External amplifier and special input cable is needed
- Suitable for RnD & QC System
- A defined and reproducible positioning of the DUT is required.
- 44AA type with built in amplifier is recommended, for an easy system integration.
- For detailed information see manufactures G.R.A.S. 44AB specification and manual.



2 Headphone & Headset Test Fixtures

2.1 G.R.A.S. 45CC-2 Headphone Test Fixture

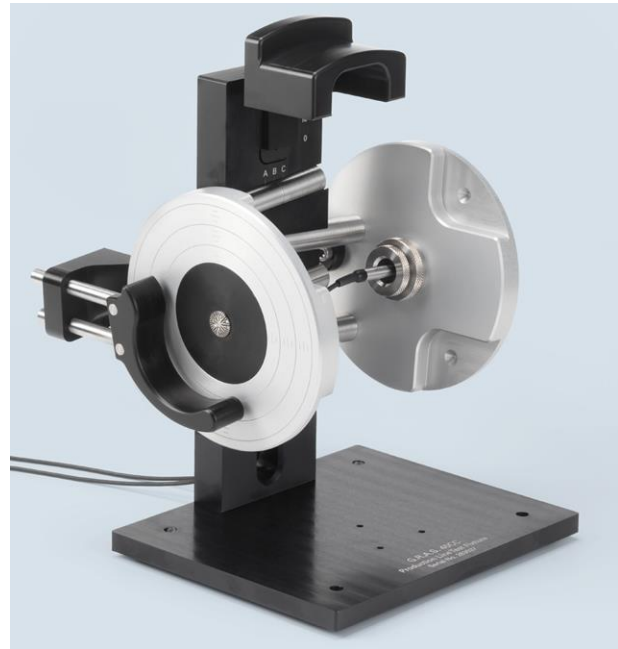
Two channel (Stereo) Test Fixture for On-Ear (supra-aural) and Over-Ear (circum-aural) Headphones

Article Number: 2400-079

A complete test jig for acoustical measurements for on-ear headphones.

Including:

- G.R.A.S. 45CC Test Fixture
- G.R.A.S. 69CC-2 IEPE Mic Set, comprising:
 - 2x G.R.A.S. 40AO ½" IEPE Microphone
 - 2x G.R.A.S. 26CK ½" IEPE Preamplifier
 - 2x G.R.A.S. AA0070 3m BNC-Microdot cable



Suitable for Klippel RnD & QC System

- Recommended for QC use. Defined and reproducible positioning assured by adjustable guidance.
- Allows testing Stereo earphones in one QC sequence.
- Allows testing the insertion-loss of circum-aural headphones and hearing-protectors (ear muffs). An external source is required for insertion-loss testing.
- In IEPE powered version it could be connected directly to Distortion Analyzer or Production Analyzer Mic input without additional accessories. (200V polarized version available on request.)

For detailed information a set of G.R.A.S. 45CC manufactures manual and specifications for all included components is available.

2.2 G.R.A.S. 45CC-6 Headset Test Fixture

Two channel (Stereo) Test Fixture for On-Ear (supra-aural) and Over-Ear (circum-aural) Headsets

Article Number: 2400-080

A complete test jig for acoustical measurements for on-ear headsets.

Combined with Sound Source, which simulates the acoustic field close to the human mouth.

Complies with standard:

- IEEE 269, 661
- ITU-T Rec. P51

Including:

- G.R.A.S. 45CC Test Fixture
- G.R.A.S. 69CC-2 IEPE Mic Set, comprising:
 - 2x G.R.A.S. 40AO ½" IEPE Microphone
 - 2x G.R.A.S. 26CK ½" IEPE Preamplifier
 - 2x G.R.A.S. AA0070 3m BNC-Microdot cable
- G.R.A.S. 44AA Mouth Simulator
- G.R.A.S. AB0012 24V_{DC} PSU
- G.R.A.S. AA0035 3m BNC-BNC cable
- XLR female to BNC female adapter



Suitable for Klippel RnD & QC System

- Recommended for QC use. Defined and reproducible positioning assured by adjustable guidance.
- Allows testing Stereo headsets in one QC sequence.
- Allows testing the insertion-loss of circum-aural headsets and hearing-protectors (ear muffs). An external source is required for insertion-loss testing.
- In IEPE powered version it could be connected directly to Distortion Analyzer or Production Analyzer Mic input without additional accessories. (200V polarized version available on request.)

For detailed information a set of G.R.A.S. 45CC manufactures manual and specifications for all included components is available.

3 Ear Simulator Kits

3.1 G.R.A.S. 43AC-S1 Ear Simulator Kit according to IEC 60318-4

Single channel (Mono) Ear Simulator Kit for In-Ear Headphones

Article Number: 2400-071

A complete test jig for acoustical measurements on earphones coupled to the ear by inserts such as tubes and ear moulds in accordance with:

- IEC 60318-4 (former IEC 60711)
- ITU-T Rec. P.57 (08/96)

Including:

- G.R.A.S. RA0045-S1 Ear Simulator (G.R.A.S. 40AO Mic incl. in RA0045-S1)
- G.R.A.S. 26CB ¼" IEPE Pre-amplifier
- G.R.A.S. RA0001 Right-angled Adapter
- G.R.A.S. RA0052 Test Jig
- G.R.A.S. AA0070 3m BNC-Microdot cable



Suitable for Klippel RnD & QC System

- Defined and reproducible positioning of the DUT is ensured by the coupler and adjustable spring loaded arm
- Testing Stereo earphones in one QC sequence requires two sets.
- In IEPE powered version it could be connected directly to Distortion Analyzer or Production Analyzer Mic input without additional accessories. (200V polarized version available on request.)

For detailed information a set of G.R.A.S. 43AC manufactures manual and specifications for all included components is available.

3.2 G.R.A.S. 43AA-S2 Ear Simulator Kit according to IEC 60318-1 & -2

Single channel (Mono) Ear Simulator Kit for On-Ear (supra-aural) and Over-Ear (circum-aural) Headphones

Article Number: 2400-075

A complete test jig for acoustical measurements on earphones and telephone handsets in accordance with:

- IEC 60318-1 & -2 (former IEC 60318)
- ITU-T Rec. P.57 (08/96)

Including:

- G.R.A.S. RA0052 Test Jig
- G.R.A.S. RA0039 Ear Simulator
- G.R.A.S. 40AO ½" IEPE Microphone
- G.R.A.S. 26CB ¼" IEPE Preamplifier
- G.R.A.S. RA0001 Right-angled Adapter
- G.R.A.S. AA0070 3m BNC-Microdot cable



Suitable for Klippel RnD & QC System

- Defined and reproducible positioning of the DUT is ensured by the coupler and adjustable spring loaded arm
- Testing Stereo earphones in one QC sequence requires two sets.
- In IEPE powered version it could be connected directly to Distortion Analyzer or Production Analyzer Mic input without additional accessories. (200V polarized version available on request.)

For detailed information a set of G.R.A.S. 43AA manufactures manual and specifications for all included components is available.

3.3 G.R.A.S. 43AE-S1 Ear Simulator according to ITU-T Rec. P57 Type 3.2

Single channel (Mono) Ear Simulator Kit for On-Ear (supra-aural) Headphones

Article Number: 2400-076

A complete test jig for acoustical measurements on supra aural earphones and telephone handsets in accordance with:

- ITU-T Rec. P.57 (08/96) Type 3.2

Including:

- G.R.A.S. RA0045-S1 Ear Simulator (G.R.A.S. 40AO Mic incl. in RA0045-S1)
- G.R.A.S. 26CB ¼" IEPE Preamplifier
- G.R.A.S. RA0056 Low-leak Pinna Simulator
- G.R.A.S. RA0057 High-leak Pinna Simulator
- G.R.A.S. RA0001 Right-angled Adapter
- G.R.A.S. AA0070 3m BNC-Microdot cable



Suitable for Klippel RnD & QC System

- Recommended for RnD use only, as defined and reproducible positioning of the DUT has to be ensured by the user. A reproducible positioning on a simplified pinna simulator is more complicated as on ear simulators.
- In IEPE powered version it could be connected directly to Distortion Analyzer or Production Analyzer Mic input without additional accessories. (200V polarized version available on request.)

For detailed information a set of G.R.A.S. 43AE-S1 manufactures manual and specifications for all included components is available.

3.4 G.R.A.S. 45CA-4 Ear Simulator Kit according to IEC 60318-1**Two channel (Stereo) Ear Simulator for On-Ear (supra-aural) and Over-Ear (circum-aural) Headphones**

Article Number: 2400-078

A complete test jig for acoustical measurements on earphones in accordance with:

- IEC 60318-1
- ITU-T Rec. P.57 (08/96)

Including:

- 2x G.R.A.S. RA0039 Ear-Simulator
- 2x G.R.A.S. 40AO ½" IEPE Microphone
- 2x G.R.A.S. 26CS ¼" IEPE Preamplifier
- 2x G.R.A.S. RA0176 Adapter for RA0039
- 2x G.R.A.S. AA0018 3m BNC-Microdot cable

Suitable for Klippel RnD & QC System

- Defined and reproducible positioning has to be ensured by the user
- Allows testing Stereo earphones in one QC sequence.
- Allows testing the insertion-loss of circum-aural headphones and hearing-protectors (ear muffs). An external source is required for insertion-loss testing.
- In IEPE powered version it could be connected directly to Distortion Analyzer or Production Analyzer Mic input without additional accessories. (200V polarized version available on request.)

For detailed information a set of G.R.A.S. 45CA manufactures manual and specifications for all included components is available.



3.5 G.R.A.S. 45CC-4 Ear Simulator Kit according to IEC 60318-1**Two channel (Stereo) Ear Simulator for On-Ear (supra-aural) and Over-Ear (circum-aural) Headphones**

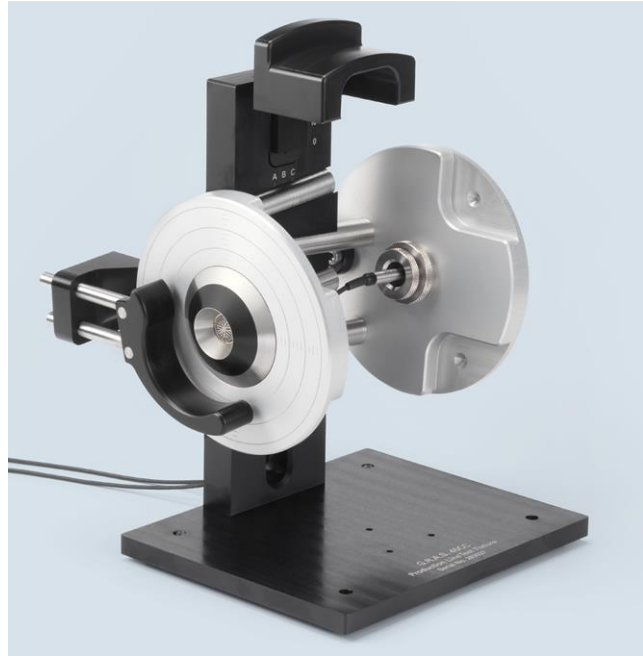
Article Number: 2400-081

A complete test jig for acoustical measurements on earphones in accordance with:

- IEC 60318-1

Including:

- G.R.A.S. 45CC Test Fixture
- 2x G.R.A.S. RA0039 Ear-Simulator
- G.R.A.S. 69CC-2 IEPE Mic Set, comprising:
 - 2x G.R.A.S. 40AO ½" IEPE Microphone
 - 2x G.R.A.S. 26CK ½" IEPE Preamplifier
- 2x G.R.A.S. AA0070 3m BNC-Microdot cable



Suitable for Klippel RnD & QC System

- Recommended for QC use. Defined and reproducible positioning assured by adjustable guidance.
- Allows testing Stereo headphones in one QC sequence.
- Allows testing the insertion-loss of circum-aural headsets and hearing-protectors (ear muffs). An external source is required for insertion-loss testing.
- In IEPE powered version it could be connected directly to Distortion Analyzer or Production Analyzer Mic input without additional accessories. (200V polarized version available on request.)

For detailed information a set of G.R.A.S. 45CC manufactures manual and specifications for all included components is available.

3.6 G.R.A.S. 45CC-8 Ear & Mouth Simulator Kit according to IEC 60318-1

Two channel (Stereo) Ear Simulator for On-Ear (supra-aural) and Over-Ear (circum-aural) Headsets

Article Number: 2400-082

A complete test jig for acoustical measurements on earphones in accordance with:

- IEC 60318-1
- ITU-T Rec. P51

Combined with Sound Source, which simulates the acoustic field close to the human mouth.

Complies with standard:

- IEEE 269, 661
- ITU-T Rec. P51

Including:

- G.R.A.S. 45CC Test Fixture
- 2x G.R.A.S. RA0039 Ear-Simulator
- G.R.A.S. 69CC-2 IEPE Mic Set, comprising:
 - 2x G.R.A.S. 40AO ½" IEPE Microphone
 - 2x G.R.A.S. 26CK ½" IEPE Pre-amplifier
- 2x G.R.A.S. AA0070 3m BNC-Microdot cable
- G.R.A.S. 44AA Mouth Simulator
- G.R.A.S. AB0012 24V_{DC} PSU
- G.R.A.S. AA0035 3m BNC-BNC cable
- XLR female to BNC female adapter



Suitable for Klippel RnD & QC System

- Recommended for QC use. Defined and reproducible positioning assured by adjustable guidance.
- Allows testing Stereo headsets in one QC sequence.
- Allows testing the insertion-loss of circum-aural headsets and hearing-protectors (ear muffs). An external source is required for insertion-loss testing.
- In IEPE powered version it could be connected directly to Distortion Analyzer or Production Analyzer Mic input without additional accessories. (200V polarized version available on request.)

For detailed information a set of G.R.A.S. 45CC manufactures manual and specifications for all included components is available.

4 Ear & Cheek Simulator Kits with Pinna

4.1 G.R.A.S. 43AG-2 Ear & Cheek Simulator Kit with Pinna acc. to IEC 60711-4 & -7

Single channel (Mono) Ear & Cheek Simulator Kit for earphones of various types

Article Number: 2400-072

A complete test jig for acoustical measurements on earphones of various types in accordance with:

- 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

Including:

- G.R.A.S. RA0052 Test Jig
- G.R.A.S. RA0045-S1 Ear Simulator (G.R.A.S. 40AO Mic incl. in RA0045-S1)
- G.R.A.S. 26CB ¼" IEPE Pre-amplifier
- G.R.A.S. RA0314 Cheek Plate
- G.R.A.S. RA0199 Finger Simulator
- G.R.A.S. KB0065 Large Right Ear Shore 55-00 (Optional left, small or softer (Shore 35-00), VA-style Ears available)
- G.R.A.S. RA0001 Right-angled Adapter
- G.R.A.S. AA0070 3m BNC-Microdot cable



Suitable for Klippel RnD & QC System

- Recommended for RnD use only, as defined and reproducible positioning of the DUT has to be ensured by the user. A reproducible position on or in a pinna simulator is more complicated as on ear simulators.
- If the properties of the left and right earphones requires testing on a left and right pinna, two sets with left and right pinna are needed or the pinna has to be exchanged for left and right testing.
- In IEPE powered version it could be connected directly to Distortion Analyzer or Production Analyzer Mic input without additional accessories. (200V polarized version available on request.)

For detailed information a set of G.R.A.S. 43AG manufactures manual and specifications for all included components is available.

4.2 G.R.A.S. 45CA-6 Ear & Cheek Simulator Kit with Pinna according to IEC 60711-4

Two channel (Stereo) Ear & Cheek Simulator Kit for earphones of various types

Article Number: 2400-070

A complete test jig for acoustical measurements on earphones of various types in accordance with:

- 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

Including:

- 1x G.R.A.S. 45CA Test Fixture
- 2x G.R.A.S. RA0045-S1 Ear Simulator (2x G.R.A.S. 40AO Mic incl. in RA0045-S1)
- 2x G.R.A.S. 26CS ¼" IEPE Preamplifier
- 2x G.R.A.S. RA0172 Pinna Mounting Kit
- 1x G.R.A.S. KB0070 Large Right Ear Shore 55-00
- 1x G.R.A.S. KB0071 Large Left Ear Shore 55-00 (Optional Small Ears available)
- 2x G.R.A.S. AA0018 3m BNC-Microdot cable

Suitable for Klippel RnD & QC System

- Recommended for RnD use only, as defined and reproducible positioning of the DUT has to be ensured by the user. A reproducible position on or in a pinna simulator is more complicated as on ear simulators.
- Allows testing Stereo earphones in one sequence.
- Allows testing the insertion-loss of all types of headphones and hearing-protectors (ear muffs, ear buds). An external source is required for insertion-loss testing.
- In IEPE powered version it could be connected directly to Distortion Analyzer or Production Analyzer Mic input without additional accessories. (200V polarized version available on request.)



For detailed information a set of G.R.A.S. 45CA manufactures manual and specifications for all included components is available.

5 Head and Torso Simulators

5.1 G.R.A.S. 45BB-10 KEMAR with Anthropometric Pinna for Ear- and Headphone Test

Two channel (Stereo) Head- & Torso Simulator Kit for earphones of various types

Article Number: 2400-083

A complete Head- & Torso Simulator for acoustical measurements on earphones of various types in accordance with:

- IEC 60318-4 (former IEC 60711)
- ITU-T Rec. P.57 Type 3.3 based on ITU-T Rec. P.58
- ANSI: S3.25, S3.36

Including:

- 1x G.R.A.S. 45BB KEMAR Head & Torso
- 2x G.R.A.S. RA0045-S1 Ear Simulator (2x G.R.A.S. 40AO Mic incl. in RA0045-S1)
- 2x G.R.A.S. 26CS ¼" IEPE Preamplifier
- 2x G.R.A.S. GR1874 Ear Simulator Holder
- 2x G.R.A.S. GR0408 External Ear Canal
- 2x G.R.A.S. GR0409 Union Nut
- 1x G.R.A.S. KB5000 Large Right Anthropometric Pinna, Shore 35-00
- 1x G.R.A.S. KB5001 Large Left Anthropometric Pinna, Shore 35-00 (Optional non-anthropometric, small, softer Shore 55-00 or VA-style Ears available)
- 2x G.R.A.S. RA0001 Right-angled Adapter
- 2x G.R.A.S. AA0018-S Microdot-BNC cable 35cm (inside KEMAR)
- 2x G.R.A.S. AA0035 BNC-BNC cable 3m



Suitable for Klippel RnD & QC System

- Recommended for RnD use only, as defined and reproducible positioning of the DUT has to be ensured by the user. A reproducible position on the head simulator is more complicated as on ear simulators.
- Allows testing Stereo earphones in one sequence.
- Allows testing the insertion-loss of all types of headphones and hearing-protectors (ear muffs). An external source is required for insertion-loss testing.
- In IEPE powered version it could be connected directly to Distortion Analyzer or Production Analyzer Mic input without additional accessories. (200V polarized version available on request.)

For detailed information a set of G.R.A.S. 45BB manufactures manual and specifications for all included components is available.

5.2 G.R.A.S. 45BC-10 KEMAR with Mouth Simulator, Anthropometric Pinna for Headset Test

Two channel (Stereo) Head- & Torso Simulator Kit with Mouth Simulator for headset of various types

Article Number: 2400-084

A complete Mouth, Head- & Torso Simulator for acoustical measurements on headsets of various types in accordance with:

- IEC 60318-4 (former IEC 60711)
- ITU-T Rec. P.57 Type 3.3 based on ITU-T Rec. P.58
- ANSI: S3.25, S3.36

Including:

- 1x G.R.A.S. 45BC KEMAR Head & Torso (Incl. Mouth Simulator with G.R.A.S. AB0012 power supply)
- 2x G.R.A.S. RA0045-S1 Ear Simulator (2x G.R.A.S. 40AO Mic incl. in RA0045-S1)
- 2x G.R.A.S. 26CS ¼" IEPE Preamplifier
- 1x 46BD ¼" IEPE Mic set (for Mouth calibration)
- 2x G.R.A.S. GR1874 Ear Simulator Holder
- 2x G.R.A.S. GR0408 External Ear Canal
- 2x G.R.A.S. GR0409 Union Nut
- 1x G.R.A.S. KB5000 Large Right Anthropometric Pinna, Shore 35-00
- 1x G.R.A.S. KB5001 Large Left Anthropometric Pinna, Shore 35-00 (Optional non-anthropometric, small, softer Shore 55-00 or VA-style Ears available)
- 2x G.R.A.S. RA0001 Right-angled Adapter
- 2x G.R.A.S. AA0018-S Microdot-BNC cable 35cm (inside KEMAR) (1x G.R.A.S. AA0032 BNC-BNC 50cm included in 45BC for Mouth Simulator, inside KEMAR)
- 2x G.R.A.S. AA0035 BNC-BNC cable 3m (add. 1x G.R.A.S. AA0035 BNC-BNC cable 3m included in 45BC for Mouth Simulator)
- 1x XLR female to BNC female adapter for Mouth Simulator
- 1x G.R.A.S. AA0070 Microdot-BNC cable 3m for 46BD Mic set



Suitable for Klippel RnD & QC System

- Recommended for RnD use only, as defined and reproducible positioning of the DUT has to be ensured by the user. A reproducible position on the head simulator is more complicated as on ear simulators.
- Allows testing Stereo earphones in one sequence.
- Allows testing the insertion-loss of all types of headphones and hearing-protectors (ear muffs). An external source is required for insertion-loss testing. (Using the internal mouth simulator is not recommended.)
- In IEPE powered version it could be connected directly to Distortion Analyzer or Production Analyzer Mic input without additional accessories. (200V polarized version available on request.)

For detailed information a set of G.R.A.S. 45BC manufactures manual and specifications for all included components is available.

6 Add-Ons

Following Add-On packages are not complete measurement sets. The Add-Ons can be used to modify an existing Simulator Kit into another Simulator Kit if the test requirements have changed. Some add-ons require an additional microphone cartridge as it has to be calibrated to its related coupler and should not be removed from the coupler. For a permanent modification the add-ons could be meaningful. For alternating usage an additional Simulator Kit will be the better choice in most cases.

6.1 Add-On: G.R.A.S. 43AC-S1 modified to 43AA-S2

**Single channel (Mono) Ear Simulator Kit for In-Ear Headphones
modified to**

Single channel (Mono) Ear Simulator for On-Ear (supra-aural) and Over-Ear (circum-aural) Headphones

Article Number: 2400-085

By adding:

- G.R.A.S. RA0039 Ear Simulator
- G.R.A.S. 40AO Mic

To above described G.R.A.S. [43AC-S1 Kit](#), it could be modified to G.R.A.S. [43AA-S2 Kit](#).

The add-on includes a G.R.A.S. 40AO mic cartridge which will be required because the 40AO included in the RA0045-S1 Ear Simulator should not be removed from its related coupler.

It is not recommended to modify it frequently for alternating usage!



6.2 Add-On: G.R.A.S. 43AC-S1 modified to 43AE-S1

**Single channel (Mono) Ear Simulator Kit for In-Ear Headphones
modified to**

Single channel (Mono) Ear Simulator for On-Ear (supra-aural) and Over-Ear (circum-aural) Headphones

Article Number: 2400-086

By adding:

- G.R.A.S. RA0056 Low-leak simplified Pinna Simulator
- G.R.A.S. RA0057 High-leak simplified Pinna Simulator
- G.R.A.S. GR0010 1/2" mic to 1/4" preamp adapter

To above described G.R.A.S. [43AC-S1 Kit](#), it could be modified to G.R.A.S. [43AE-S1 Kit](#).

It is not recommended to modify it frequently for alternating usage!



6.3 Add-On: G.R.A.S. 43AC-S1 modified to 43AG-2

Single channel (Mono) Ear Simulator Kit for In-Ear Headphones
modified to
Single channel (Mono) Ear & Cheek Simulator Kit for earphones of various types

Article Number: 2400-087

By adding:

- G.R.A.S. RA0314 Cheek Plate
- G.R.A.S. RA0199 Finger Simulator
- G.R.A.S. KB1065 Large Right Ear Shore 35-00 (Optional left, small or harder (Shore 55-00), VA-style Ears available)

To above described G.R.A.S. [43AC-S1 Kit](#), it could be modified to G.R.A.S. [43AG-2 Kit](#).



6.4 Add-On: G.R.A.S. 43AA-S2 modified to 43AC-S1

Single channel (Mono) Ear Simulator Kit for In-Ear Headphones
modified to
Single channel (Mono) Ear Simulator for In-Ear Headphones

Article Number: 2400-055

By adding:

- G.R.A.S. RA0045-S1 Ear Simulator

To above described G.R.A.S. [43AA-S2 Kit](#), it could be modified to G.R.A.S. [43AC-S1 Kit](#).

The add-on includes a G.R.A.S. 40AO mic cartridge which will be required because the 40AO included in the RA0045-S1 Ear Simulator should not be removed from its related coupler.

It is not recommended to modify it frequently for alternating usage!



6.5 Add-On: G.R.A.S. 45CA-4 modified to 45CA-6

**Two channel (Stereo) Ear Simulator for On-Ear (supra-aural) and Over-Ear (circum-aural) Headphones
modified to
Two channel (Stereo) Ear & Cheek Simulator Kit for earphones of various types**

Article Number: 2400-088

By adding:

- 2x G.R.A.S. RA0045-S1 Ear Simulator (2x G.R.A.S. 40AO Mic incl. in RA0045-S1)
- 2x G.R.A.S. RA0172 Pinna Mounting Kit
- 1x G.R.A.S. KB0070 Large Right Ear Shore 55-00
- 1x G.R.A.S. KB0071 Large Left Ear Shore 55-00 (Optional Small Ears available)

To above described G.R.A.S. [45CA-4 Kit](#), it could be modified to G.R.A.S. [45CA-6 Kit](#) with Pinna.

It is not recommended to modify it frequently for alternating usage!



6.6 Add-On: G.R.A.S. 45CA-6 modified to 45CA-4

**Two channel (Stereo) Ear & Cheek Simulator Kit for earphones of various types
modified to
Two channel (Stereo) Ear Simulator for On-Ear (supra-aural) and Over-Ear (circum-aural) Headphones**

Article Number: 2400-089

By adding:

- 2x G.R.A.S. RA0039 Ear-Simulator
- 2x G.R.A.S. 40AO 1/2" IEPE Microphone
- 2x G.R.A.S. RA0176 Adapter for RA0039
- 2x G.R.A.S. GR0010 1/2" – 1/4" Adapter

To above described G.R.A.S. [45CA-6 Kit](#), it could be modified to G.R.A.S. [45CA-4 Kit](#).

It is not recommended to modify it frequently for alternating usage!



6.7 Add-On: G.R.A.S. 45BB-10 / 45BC-10 modified to 45BB-6 / 45BC-6

**Two channel (Stereo) Head- & Torso Simulator Kit for earphones of various types or
Two channel (Stereo) Head- & Torso Simulator Kit with Mouth Simulator for headset of various types
modified to
Two channel (Stereo) Head- & Torso Simulator Kit for earphones of various types or
Two channel (Stereo) Head- & Torso Simulator Kit with Mouth Simulator for headsets of various types**

Article Number: 2400-090

By adding:

- 1x G.R.A.S. RA0237 Straight Ear Canal Extension Kit
- 1x G.R.A.S. KB0065 Large Right Shore 55-00
- 1x G.R.A.S. KB0066 Large Left Shore 55-00

G.R.A.S. 45BB-10 or 45BC-10 could be modified to non-anthropometric G.R.A.S. 45BB-6 or 45BC-6.

(Optional available Pinna Simulators:

- G.R.A.S. KB0060 Small Right Shore 55-00
- G.R.A.S. KB0061 Small Left Shore 55-00
- G.R.A.S. KB1060 Small Right Shore 35-00
- G.R.A.S. KB1061 Small Left Shore 35-00
- G.R.A.S. KB1065 Large Right Ear Shore 35-00
- G.R.A.S. KB1066 Large Left Ear Shore 35-00
- G.R.A.S. KB0090 Large Right Ear VA-Style/SQ Shore 55-00
- G.R.A.S. KB0091 Large Left Ear VA-Style/SQ Shore 55-00
- G.R.A.S. KB1090 Large Right Ear VA-Style Shore 35-00
- G.R.A.S. KB1091 Large Left Ear VA-Style Shore 35-00

6.8 Add-On: G.R.A.S. 45CC-2 / 45CC-4 modified to 45CC-6 / 45CC-8

**Two channel (Stereo) Test Fixture for On-Ear (supra-aural) and Over-Ear (circum-aural) Headphones or
Two channel (Stereo) Ear Simulator for On-Ear (supra-aural) and Over-Ear (circum-aural) Headphones
modified to
Two channel (Stereo) Test Fixture for On-Ear (supra-aural) and Over-Ear (circum-aural) Headsets or
Two channel (Stereo) Ear Simulator for On-Ear (supra-aural) and Over-Ear (circum-aural) Headsets**

Article Number: 2400-073

By adding:

- G.R.A.S. 44AA Mouth Simulator
- Including:
 - G.R.A.S. AB0012 24V_{DC} PSU
 - 2m BNC-BNC cable
 - XLR female to BNC female adapter



6.9 Add-On: G.R.A.S. 45CC-2 / 45CC-6 modified to 45CC-4 / 45CC-8

**Two channel (Stereo) Test Fixture for On-Ear (supra-aural) and Over-Ear (circum-aural) Headphones or
Two channel (Stereo) Test Fixture for On-Ear (supra-aural) and Over-Ear (circum-aural) Headsets
modified to**

**Two channel (Stereo) Ear Simulator for On-Ear (supra-aural) and Over-Ear (circum-aural) Headphones
Two channel (Stereo) Ear Simulator for On-Ear (supra-aural) and Over-Ear (circum-aural) Headsets**

Article Number: 2400-091

By adding:

- 2x G.R.A.S. RA0039 Ear Simulator



Find explanations for symbols at:

<http://www.klippel.de/know-how/literature.html>

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