G.R.A.S.
SOUND & VIBRATION

Instruction Manual

43AB 1/2" 2cc Coupler Kit According to IEC 60318-5

Revision History

Any feedback or questions about this document are welcome at **gras@gras.dk**.

Revision	Date	Description
1	17 August 2017	Extracted from Earbook as separate document

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Trademarks

Contents

Introduction

The 43AB **½**" 2cc Coupler Kit According to IEC 60318-5 is a complete test jig for acoustically testing insert type hearing aids and complies with the following international and national requirements:

- IEC 60318-5 (formerly IEC 126)reference coupler for the measurement of hearing aids using earphones coupled to the ear by means of ear inserts
- ANSI S3.7 American National Standard for Coupler Calibration of Earphones

Components

The 43AB comprises the following main components:

- RA0038 2cm^3 Coupler (see also page 12)
- 40AG ½" Pressure Microphone
- 26AC ¼" Preamplifier (used with Adapter RA0001 instead of GR0010)
- RA0052 Test Jig

When assembled as shown in Fig. 1, it is ready for testing insert type hearing aids. Fig. 5 shows an exploded view of its user-serviceable components.

Tube Adapters are also provided with the coupler for holding in place the tube carrying the signal from the acoustic output of the hearing aid.

Additional Equipment

The following additional equipment is required for making the necessary measurements:

1) Power supply for the 26AC ¼" Preamplifier, e.g. the G.R.A.S. 12AK Power Module
2) Calibration source for the microphone, e.g. the G.R.A.S. 42AA or 42AP Pistonphone which produces 114 dB re. 20 µPa (10 Pa) at 250 Hz.

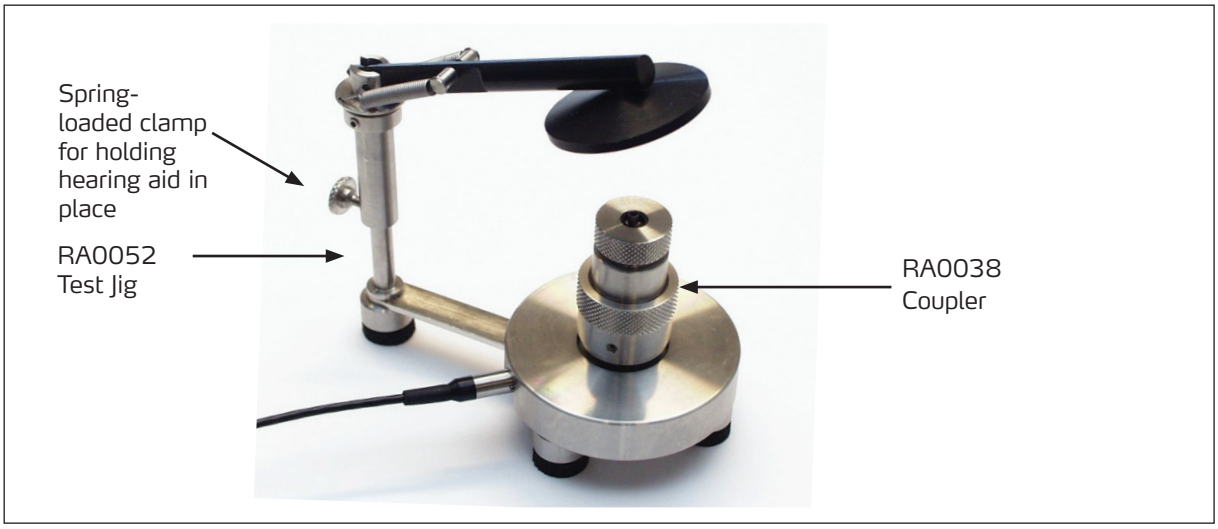

Fig. 1. *Assembled 43AB 1/2" 2cc Coupler Kit According to IEC 60318-5*

3) Audio signal generator capable of generating one or more of the following within the audio frequency range[1]:
   - logarithmically swept tones
   - pink noise

This audio signal is fed (directly or indirectly) to the hearing aid.

4) Audio frequency analyser capable of one or both of the following:
   - wide band measurement
   - ⅓ octave-band measurement

The audio analyser receives, via the 12AK, the signal picked up by 43AB, and, depending on whether this is a swept tone or pink noise, will:

a) measure the response of the earphone to the swept tone

or

b) measure the response of the earphone to the pink noise in terms of ⅓ octave bands

Items 3 and 4 could be combined in the same unit, e.g. a computer fitted with suitable hardware and software for A/D and D/A conversions in order to simulate both a signal generator and an analyser. Fig. 2 shows a block diagram of a possible set-up for making tests.

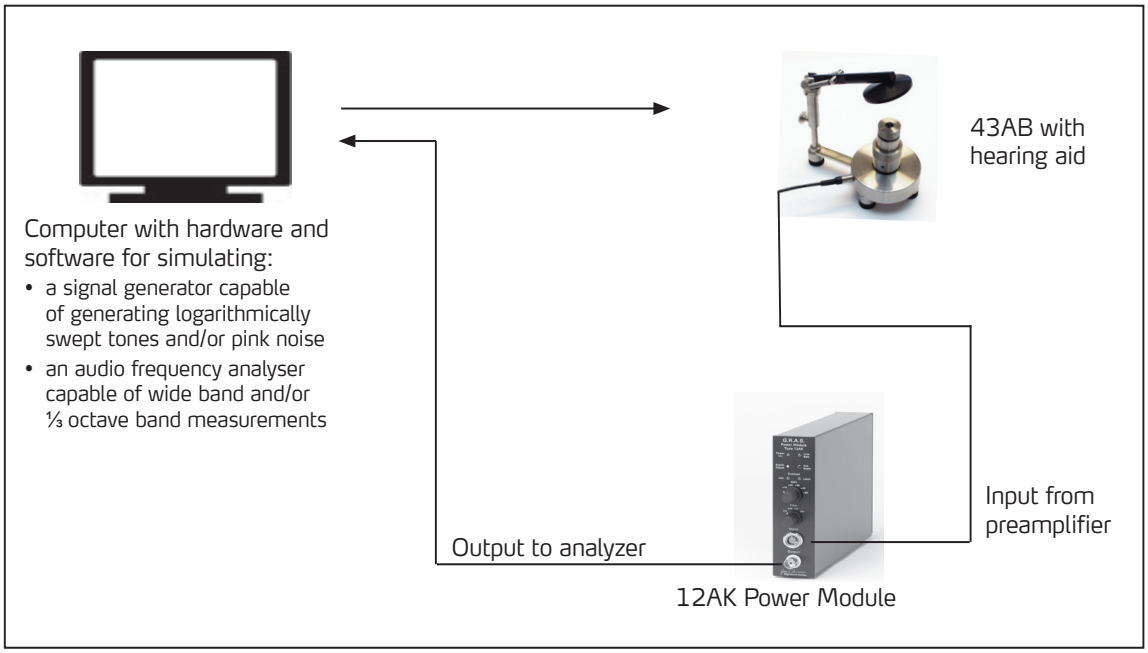

Fig. 2. *Block diagram of a complete set-up for making tests*

[1] For example from 50 Hz to 10 kHz

Test Procedure

The 4 stages of the Test Procedure

The basic stages in the test procedure are:

1) Setting up the test jig, e.g. as shown in Fig. 2.
2) Calibration using the G.R.A.S. 42AA or 42AP Pistonphone
3) Mounting the hearing aid on the test jig.
4) Applying a signal to the hearing aid and analysing the output from the Ear Simulator.

   Depending on requirements, the signal applied to the hearing aid could be:
   - a swept tone, e.g. under laboratory conditions
   - pink noise, e.g. during mass production of hearing aids

   Pink noise testing is usually quicker, and more economical, than using swept tones.

The following sections deal in more detail with each stage of the test procedure.

1: Setting up the Test Jig

Note: the terms generator and analyzer refer to a set up which simultaneously sends the test signal to the hearing aid and analyses the signal picked up by the Ear Simulator. With the RA0038 2cc Coupler assembled as shown in one of the examples in Fig. 4 and everything switched on, proceed as follows:

1) 12AK Power Module
   - Connect the free end of the preamplifier cable to the Lemo **Input** socket.
   - Connect, via a suitable cable, the BNC **Output** to the input of the analyser.
   - Select **Lin**.
   - Select a **Gain** that is within the input range of the hearing aid.
2) Hearing aid
   - Connect the hearing aid to the signal output of the generator.
3) Adjust the signal output level from the generator to lie within the normal working range of the hearing aid.

2: Calibration

For calibration, access to the microphone is necessary. This means partially dismantling the test jig.

1) Snap the spring-loaded clamp (see Fig. 1) to its upright position, or remove it.
2) Remove the Coupler from the test jig. The microphone is now accessible.
3) Unscrew the collar of the Pistonphone and remove the O-ring (see Fig. 3).

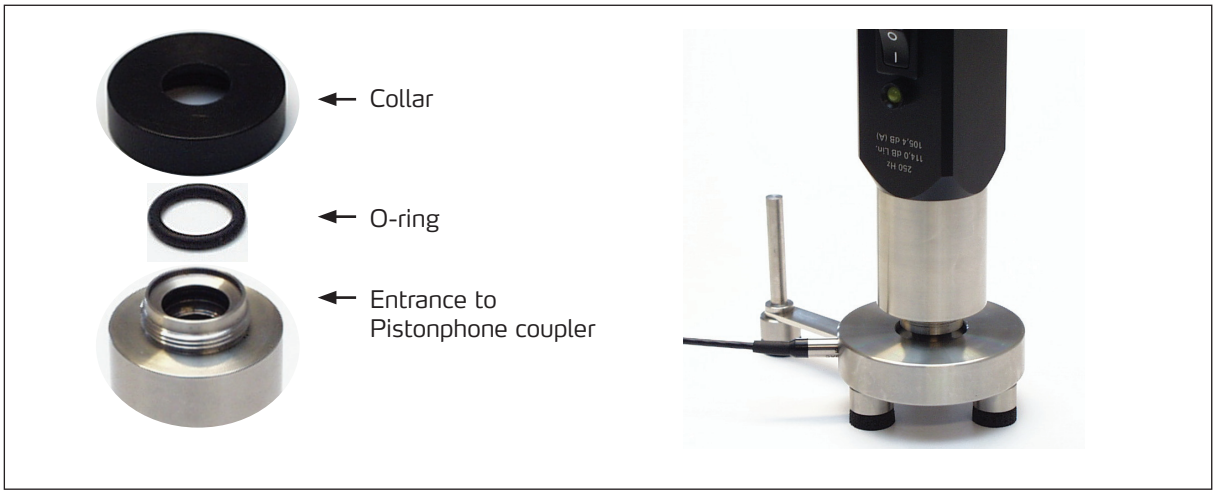

Fig. 3. *Calibration using the Pistonphone*
a) Unscrew Pistonphone collar and remove O-ring.
b) Place coupler over microphone, push gently down to microphone stop
c) Switch on

4) Place the coupler of the Pistonphone over the microphone, push it gently down to the microphone stop and switch on.
5) Set the analyser to either wide band or to the ⅓ octave band whose centre frequency is 250 Hz.
6) When conditions are stable, adjust the analyser so that it correctly gauges the Pistonphone signal (nominally 114 dB re. 20 µPa). See Pistonphone manual for making barometric corrections.
7) Switch the Pistonphone off and remove it from the microphone.
8) Replace the Coupler back in the test jig.
9) Re-assemble the Pistonphone.

3: Mounting the Hearing Aid

You can assemble the coupler in various other ways depending on what type of hearing aid is to be tested. See also “Appendix
The RA0038 ½” 2cc Coupler IEC 60318-5” on page 12.

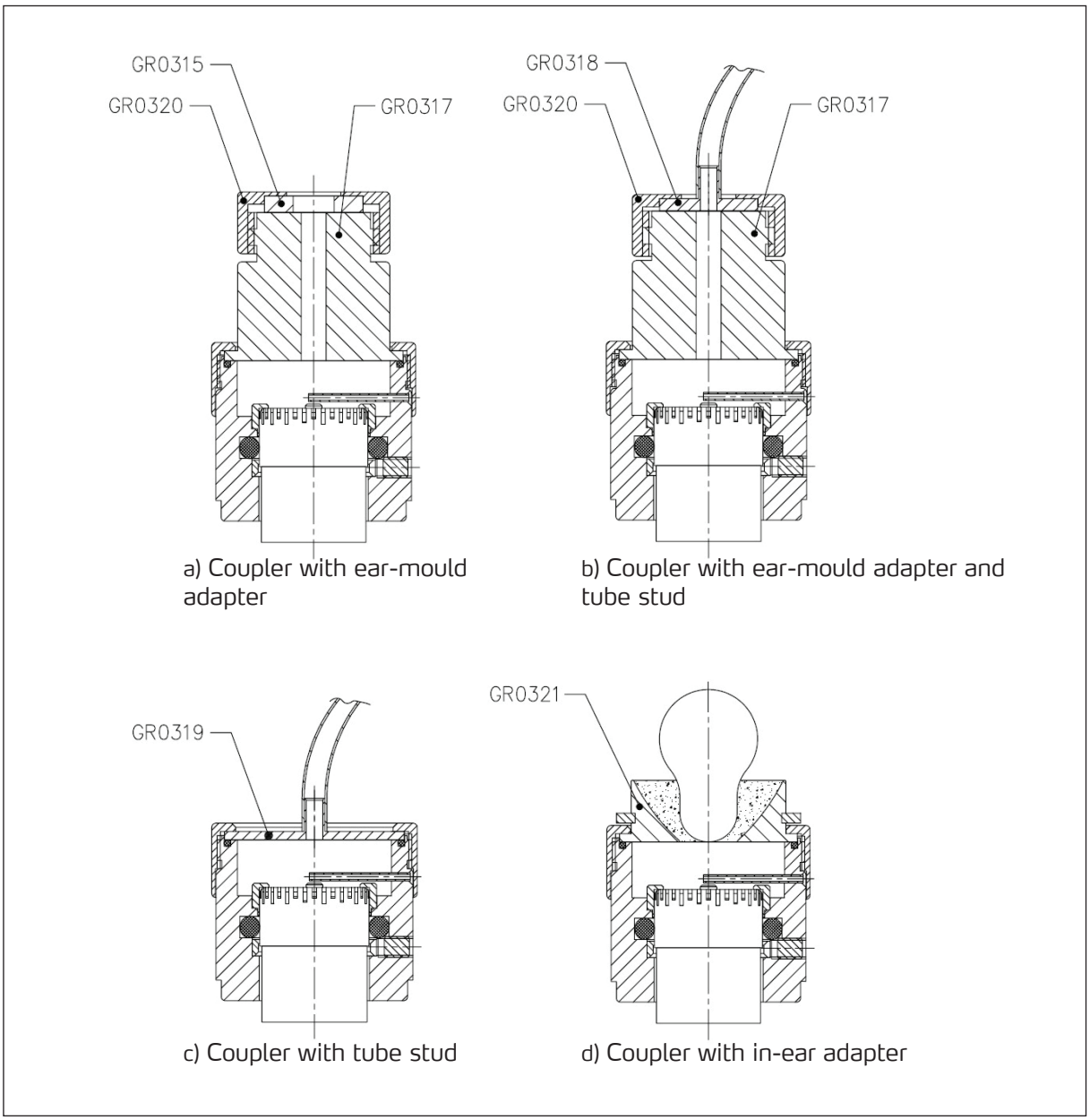

Fig. 4. *Various ways of assembling the RA0038*

4: Applying the Test Signal

The following describes typical procedures for applying:

a) a swept signal
b) pink noise

In both cases, it is assumed that the generator and analyser work to produce constant-confidence results (i.e. maintaining a constant β T product) in real time throughout the frequency range of interest and make the measurement data available graphically and numerically.

Swept Signal

With everything set up as described above, proceed as follows:

a) set the generator to oscillator mode
b) set the analyser to flat response
c) initiate a constant-level logarithmic sweep [2] on the generator.
   The analyser will follow the response of the Ear Simulator to the hearing aid throughout the sweep and record and display the results accordingly.

Pink Noise

With everything set up as described above, proceed as follows:

a) set the generator to pink noise mode and start generating.
b) set the analyser to ⅓ octave-band mode [2] and wait until conditions are stable.
c) start the analyser.
   The analyser will record the response of the Ear Simulator to the earphone for each ⅓ octave band and record and display the results accordingly.

In both cases, curves showing the upper and lower tolerance levels for the frequency range of interest could be superimposed on the graphical displays.

[2] For example from 50 Hz to 10 kHz

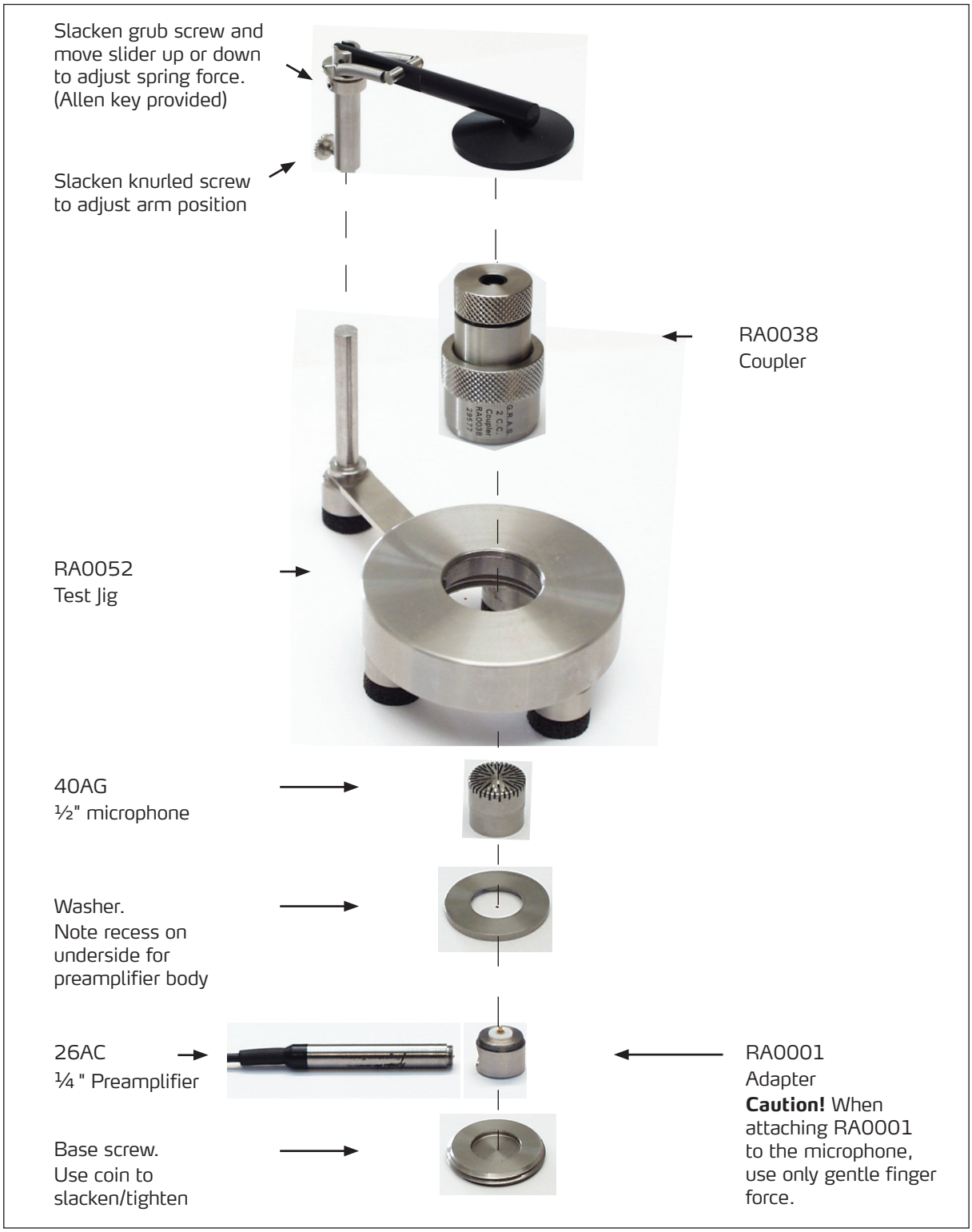

Fig. 5. *Exploded view of the user-serviceable components of the 43AB 2cc Coupler Kit*

Warranty, Service and Repair

Calibration

Before leaving the factory, all G.R.A.S. products are calibrated in a controlled laboratory environment using traceable calibration equipment.

We recommend a yearly recalibration at minimum, depending on the use, measurement environment, and internal quality control programs.

We recommend calibration prior to each use to ensure the accuracy of your measurements.

Warranty

Damaged diaphragms in microphones can be replaced. 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 G.R.A.S. to offer 5 years warranty against defective materials and workmanship.

The warranty does not cover products that are damaged due to negligent use, an incorrect power supply, or an incorrect connection to the equipment.

Service and Repairs

All repairs are made at G.R.A.S. International Support Center located in Denmark. Our Support Center is equipped with the newest test equipment and staffed with dedicated and highly skilled engineers. Upon request, we make cost estimates based on fixed repair categories. If a product covered by warranty is sent for service, it is repaired free of charge, unless the damage is the result of negligent use or other violations of the warranty. All repairs are delivered with a service report, as well as an updated calibration chart.

Manufactured to conform with:

CE marking directive:
93/68/EEC

WEEE directive:
2002/96/EC

RoHS directive:
2002/95/EC

G.R.A.S. Sound & Vibration continually strives to improve the quality of our products for our customers; therefore, the specifications and accessories are subject to change.

Appendix

The RA0038 ½" 2cc Coupler IEC 60318-5

Introduction

The RA0038 Coupler is a 2cm^3 coupler which uses a ½" microphone, e.g. the G.R.A.S. 40AG. There is no need to remove the microphone's protection grid and expose the microphone to accidental damage.

Components

The RA0038 comprises the components shown in Fig. 6. An ansembled RA0038 is shown in Fig. 7 on page 13.

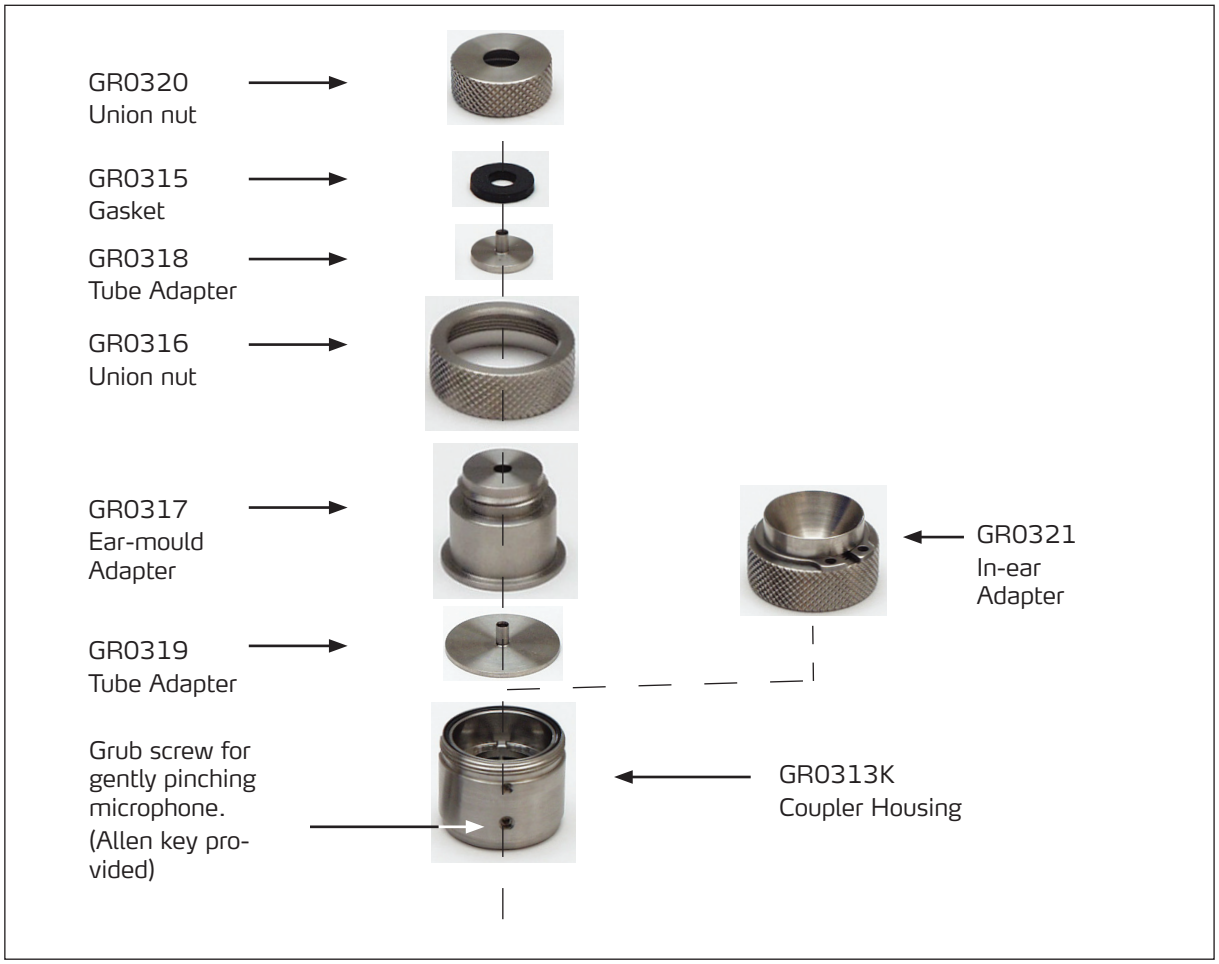

Fig. 6. *Exploded view of all the user-serviceable components of the RA0038*

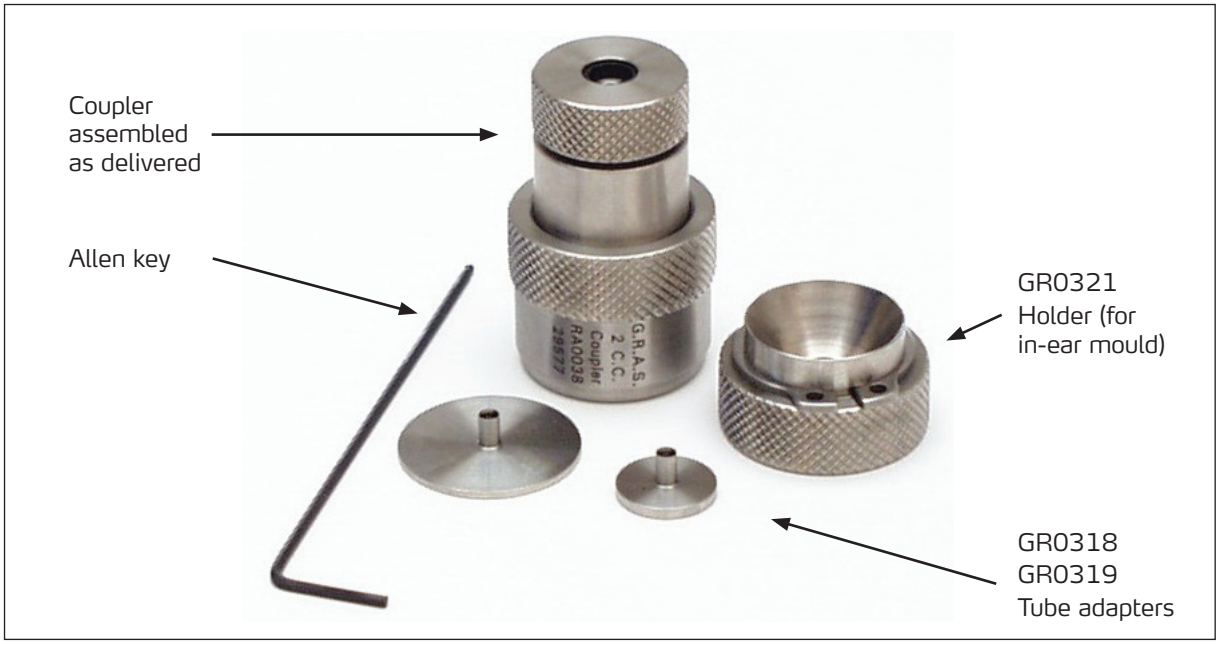

Fig. 7. *RA0038 assembled as delivered*