

Instruction Manual

43BA ¼" 0.4cc High-frequency Coupler Kit

43BA-1 ¼" 0.4cc High-frequency Coupler Kit

43BA-2 ¼" 0.4cc CCP High-frequency Coupler Kit

43BA-3 ¼" 0.4cc CCP High-frequency Coupler Kit, High Sensitivity



Revision History

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

Revision	Date	Description
1	11 December 2013	First publication

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Contents

Introduction and Description	4
Design.....	4
Performance.....	5
Delivered Items.....	7
Assembling the Coupler	9
Mounting and Dismounting the Microphone	10
Calibration	10
Ordering Information	11
Specifications and Warranty	13
Specifications	13
Calibration.....	14
Service and Repairs.....	14

Introduction and Description

The G.R.A.S. 43BA is a ¼" 0.4cc High-Frequency coupler made for and with the hearing aid industry. Compared to the reference 2cc coupler it has a smaller volume and a ¼" microphone. It retains the advantages of the 2cc coupler, but adds the capability of delivering differentiated and precise data up to 16 kHz because of the combination of the smaller volume and the ¼" microphone.

The 0.4cc coupler body fits all G.R.A.S. ½" 2cc standard ear mould and tube adapters. Therefore, the 0.4cc coupler can be used for the same type of tests as the traditional 2cc coupler, but with the added benefit of a wider frequency range. It is designed for repetitive use and is equally suited for research, quality assurance and production test applications.

Design

The coupler housing is dimensioned to accommodate the ear mould and tube adapters normally used with the 2cc coupler, but the inner volume is only 0.4cc.

Its 0.4cc volume is a well defined cylinder where the diaphragm of the microphone is flush with the bottom of the cylinder. The cylinder is machined to within $\pm 2\%$ of the nominal 0.4cc volume. The exact volume of each individual coupler is stated in the accompanying calibration chart. The performance of the 0.4cc coupler can therefore be accurately simulated, and it can easily be a part of a complete simulation model.

The microphone-preamplifier set is kept firmly in position by a very precise locking mechanism, which automatically centers and locks the microphone at the same time, eliminating the risk of measurement errors caused by incorrect positioning of the microphone. An O-ring ensures a tight sealing of the microphone. The microphone can easily be removed for sensitivity calibration without the use of tools.

Performance

An important benefit of the small volume and the ¼" microphone is the fact that the resonance frequency at 30 kHz is so high that it does not interfere with measurements in the audible frequency range. Therefore it can be used for measurements up to 16 kHz, one octave higher than achievable with the reference 2cc coupler.

Because of the small volume, the measured sound level from the coupler is about 13.5 dB higher than with the 2cc coupler. This effect raises the measured signal with respect to the noise floor and thus improves the signal-to-noise ratio. This difference of signal levels is shown in Fig. 1.

Therefore, the signal-to-noise ratio obtainable with the 0.4cc coupler and a ¼" microphone with a sensitivity of about 1.5mV/Pa is almost as good as that of a 2cc coupler using a ½" microphone with a sensitivity of 12.5mV/Pa. The 43BA-1 has a sensitivity of 1.5 mV/Pa and the noise floor is 39dB(A), the 43BA-2 has a sensitivity of 1.45 mV and the noise floor 44dB(A).

When used with a high-sensitivity microphone (18 mV/Pa), the 0.4cc is very close to the 2cc coupler in this respect. With the 43BA-3 high sensitivity version, the noise floor is 25dB(A).

Refer to page 13 for more information about the 43BA's specifications.

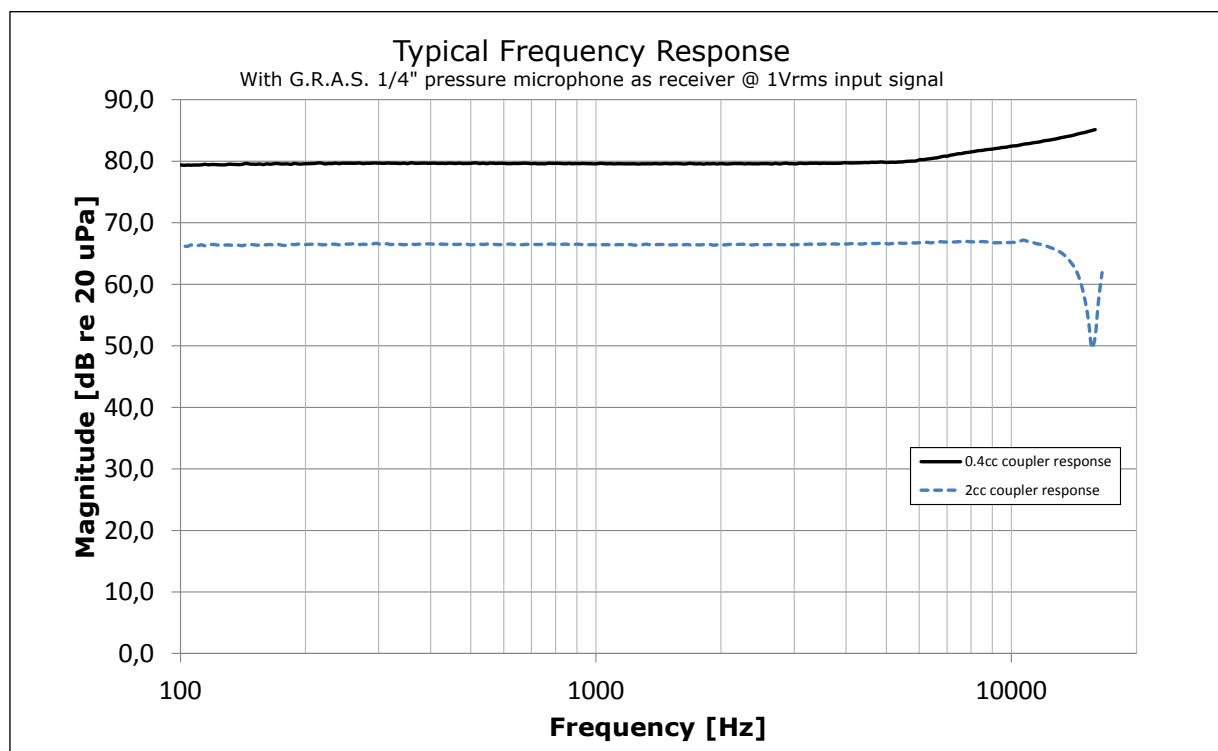


Fig. 1. 0.4cc coupler compared to the reference 2cc coupler, with a ¼" microphone used as receiver.

As can be seen in Fig. 1, the 0.4cc coupler does not produce the very sharp resonance at about 12 kHz typical of the 2cc coupler (dotted line). The 0.4cc coupler's high frequency behavior is much more linear and does therefore not degrade the reproducibility of high frequency measurements.

A typical receiver response is shown in Fig. 2.

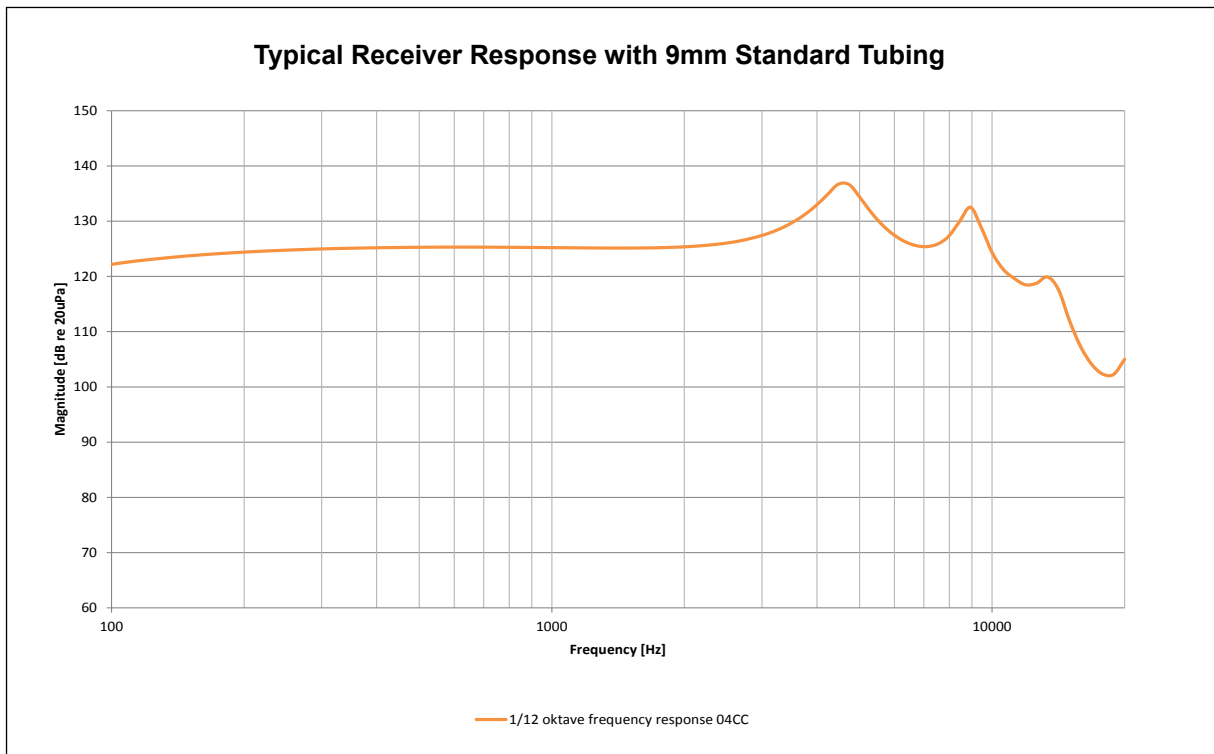















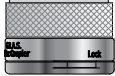







Fig. 2. Typical receiver response with 9 mm standard tubing.

Delivered Items

Delivered Items			
G.R.A.S. 43BA-1 ¼" LEMO 0.4cc High-frequency Coupler Kit			
	¼" Ext. Polarized Pressure Microphone 40BP	¼" LEMO Preamplifier with Integrated Cable, Very Short 26AS	
	0.4cc Coupler RA0252	Tube Adapter, Large RA0271	
	Ear-mould Adapter RA0270	In-ear Adapter RA0272	
G.R.A.S. 43BA-2 ¼" CCP 0.4cc High-frequency Coupler Kit			
	¼" Prepolarized Pressure Microphone 40BD	¼" CCP Preamplifier with Microdot Connector, Very Short 26CS	
	0.4cc Coupler RA0252	Tube Adapter, Large RA0271	
	Ear-mould Adapter RA0270	In-ear Adapter RA0272	
	3 m Cable Microdot-BNC AA0070		

Delivered Items			
G.R.A.S. 43BA-3 1/4" CCP 0.4cc High-frequency Coupler Kit, High Sensitivity			
	1/4" Ext. Polarized Pressure Microphone, High Sensitivity 40BL	1/4" CCP Preamplifier with Microdot Connector, Very Short 26CS	
	0.4cc Coupler RA0252	Tube Adapter, Large RA0271	
	Ear-mould Adapter RA0270	In-ear Adapter RA0272	
	3 m Cable Microdot-BNC AA0070		
G.R.A.S. 1/4" 0.4cc Coupler - Non configured			
	0.4cc Coupler RA0252		

Assembling the Coupler

You can assemble the coupler to suit the type of hearing aids you want to test.

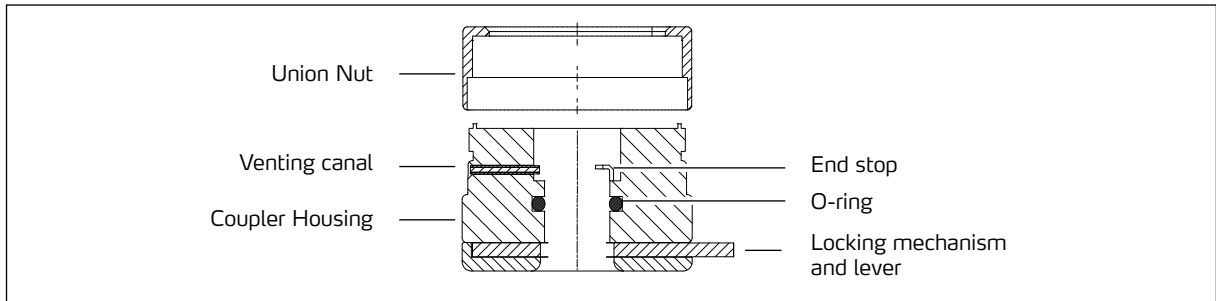


Fig. 3. Cross section of the RA0252 coupler without adapter.

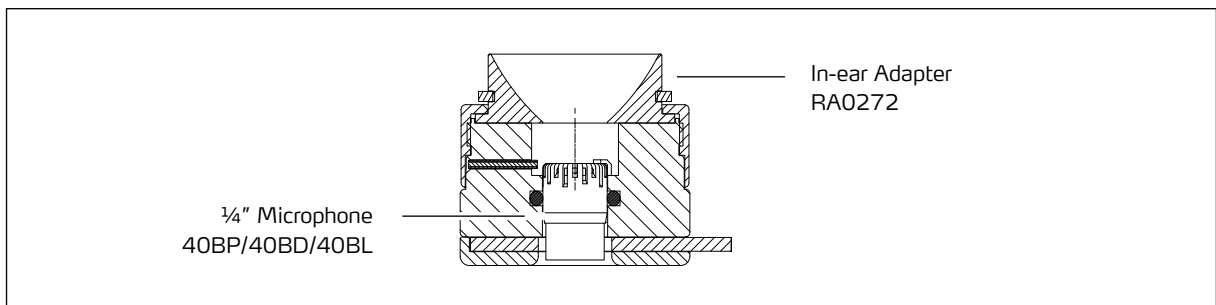


Fig. 4. 43BA mounted with microphone and RA0272 In-ear Adapter.

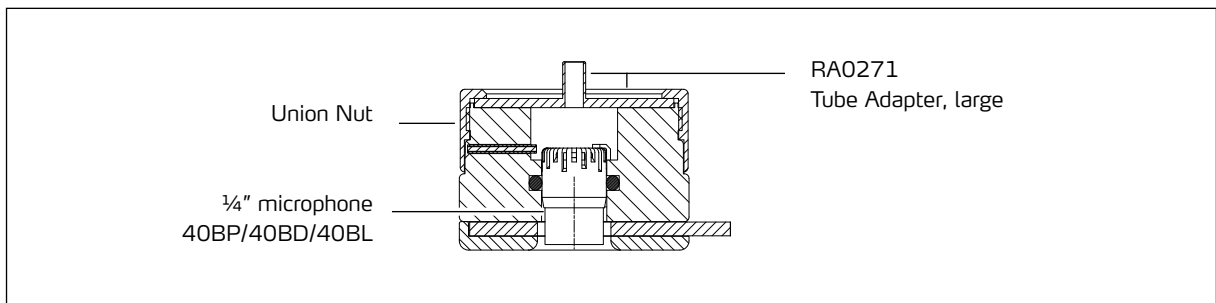


Fig. 5. 43BA mounted with microphone and RA0271 Tube Adapter.

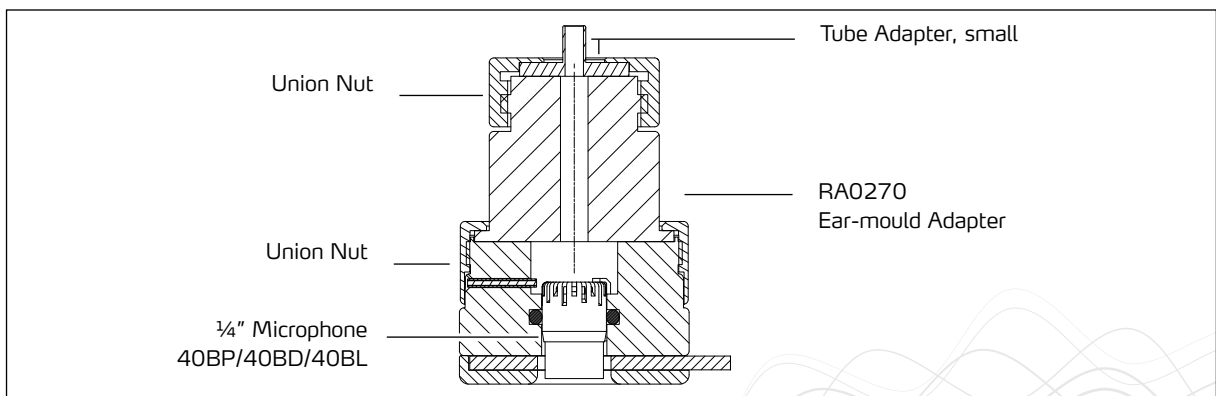


Fig. 6. 43BA mounted with microphone and the RA0270 Ear-mould Adapter (which includes Union Nut and Tube Adapter).

Mounting and Dismounting the Microphone

The microphone can easily be inserted and removed using the locking mechanism lever on the side of the coupler body.

1. Ensure that the locking mechanism is unlocked.
2. Gently push in the microphone assembly until it touches the end stop and will go no further.
3. Push the locking mechanism lever to its forward position (See Fig. 7).

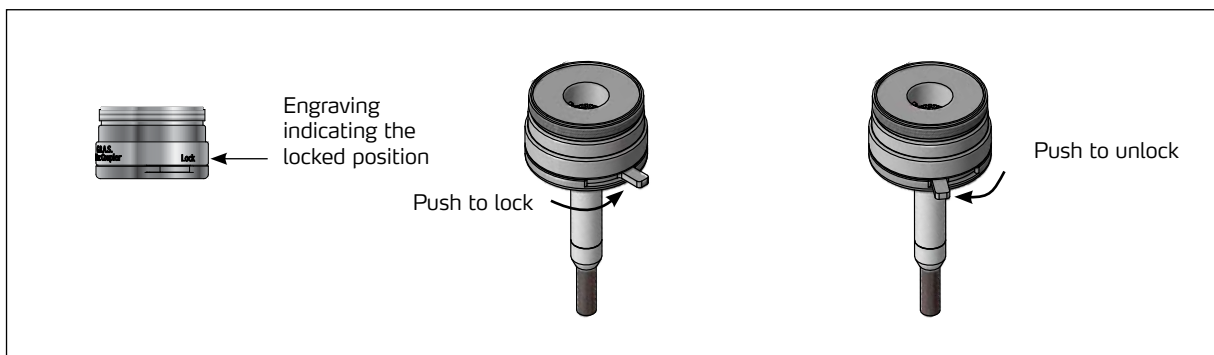


Fig. 7. Locking and unlocking the microphone.

Calibration

You must remove the microphone/preamplifier when you need to calibrate it. Proceed as follows:

1. Unlock the locking mechanism by pushing it, as shown in Fig. 7.
2. Gently pull out the microphone set.

For proper sensitivity calibration (114 dB at 250 Hz), we recommend the 42AP Intelligent Pistonphone, but the 42AA Pistonphone can also be used. Refer to the respective manuals for instructions.

Ordering Information

G.R.A.S ¼" 0.4cc High-Frequency Coupler

Included Items	Part Number
0.4cc Coupler including Union Nut	RA0252

G.R.A.S. 43BA-1 ¼" LEMO 0.4cc High-frequency Coupler Kit

Included Items	Part Number
0.4cc Coupler including Union Nut	RA0252
¼" Ext. Polarized Pressure Microphone	40BP
¼" Standard Preamplifier with 3 m Integrated Cable, Very Short	26AS
Ear-mould Adapter Kit for RA0038 / RA0252 Couplers	RA0270
In-ear Adapter for RA0038 / RA0252 Couplers	RA0272
Tube Adapter for RA0038 / RA0252 Couplers	RA0271

G.R.A.S. 43BA-2 ¼" CCP 0.4cc High-frequency Coupler Kit

Included Items	Part Number
0.4cc Coupler including Union Nut	RA0252
¼" Prepolarized Pressure Microphone	40BD
¼" CCP Preamplifier, Very Short	26CS
Ear-mould Adapter Kit for RA0038 / RA0252 Couplers	RA0270
In-ear Adapter for RA0038 / RA0252 Couplers	RA0272
Tube Adapter for RA0038 / RA0252 Couplers	RA0271
3 m Cable Microdot - BNC	AA0070

G.R.A.S. 43BA-3 ¼" CCP 0.4cc High-frequency Coupler Kit, High Sensitivity

Included Items	Part Number
0.4cc Coupler Housing, including Union Nut	RA0252
¼" Prepolarized Pressure Microphone, High Sensitivity	40BL
¼" CCP Preamplifier, Very Short	26CS
Ear-mould Adapter Kit for RA0038 / RA0252 Couplers	RA0270
In-ear Adapter for RA0038 / RA0252 Couplers	RA0272
Tube Adapter for RA0038 / RA0252 Couplers	RA0271
3 m Cable Microdot - BNC	AA0070

Optional Accessories	Part Number
7-pin LEMO-LEMO, 3 m	AA0008
BNC-BNC, 3 m	AA0035

For calibration

Pistonphone with built-in barometer and thermometer (114 dB at 250 Hz)	42AP
Pistonphone (114 dB at 250 Hz)	42AA

Specifications and Warranty

Specifications

RA0252 Coupler

Volume	400 mm ³ ±2%
Resonance Frequency	30 kHz
Weight, g	42

43BA-1

Microphone Set	40BP + 26AS
Set sensitivity mv/Pa	1.5
dB re 1 V/Pa	-56.5
Resonance frequency	30 kHz
Theoretical dynamic range with 40BP + 26AS	39 dB(A) to 172 dB
Temperature range, °C	-30 to 60
Temperature coefficient (@250Hz, °C/dB)	-0.01
Humidity range (% RH) , non condensing	0 to 95
Connector	LEMO

43BA-2

Microphone Set	40BD + 26CS
Set sensitivity mv/Pa	1.45
dB re 1 V/Pa	-57
Resonance frequency	30 kHz
Theoretical dynamic range with 40BD + 26CS	44 dB(A) to 168 dB
Temperature range, °C	-30 to 60
Temperature coefficient (@250Hz, °C/dB)	-0.01
Humidity range (% RH) , non condensing	0 to 95
Connector	Microdot 10/32-BNC

43BA-3

Microphone Set	40BL + 26CS
Set sensitivity mv/Pa	18
dB re 1 V/Pa	-35
Resonance frequency	30 kHz
Theoretical dynamic range with 40BL + 26CS	25 dB(A) to 147 dB
Temperature range, °C	-30 to 60
Temperature coefficient (@250Hz, °C/dB)	-0.01
Humidity range (% RH) , non condensing	0 to 95
Connector	Microdot 10/32-BNC

Calibration

The 43BA is delivered with

- a calibration chart specifying its exact volume.
- a calibration chart for the microphone/preamplifier combination.

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

Warranty

All G.R.A.S. products are made of high-quality materials that will ensure life-long stability and robustness. 43BA is delivered with a 5-year warranty. Damaged diaphragms in microphones can be replaced.

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

The warranty for cables is 6 months.

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. Contact your local G.R.A.S partner for further information. 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

