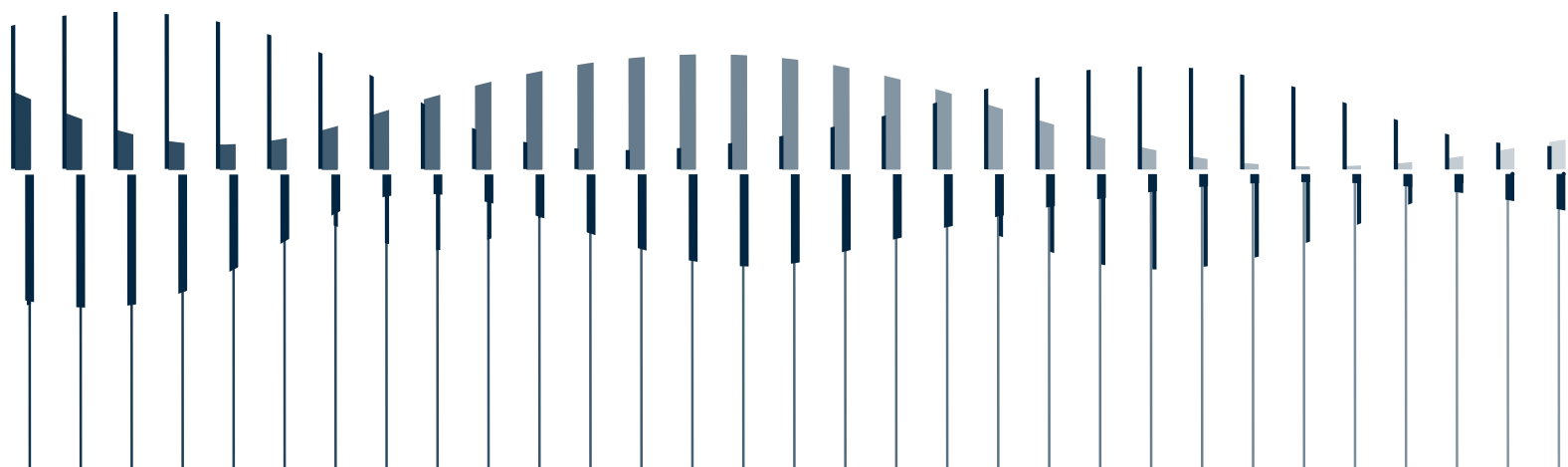


Instruction Manual

GRAS 45CC Headphone Test Fixture

45CC-1 to -4, -9, -10 and -14 to -19



Revision History

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

Revision	Date	Description
1	23 June 2016	Preliminary release
2	16 September 2016	First publication
3	2 March 2018	45CC-9 to 45CC-12 configurations added, specs for 69CC-3 and 69CC-4 added. Microphone assembly part numbers updated (p. 7-14)
4	3 March 2022	Remove Mouth Simulator configurations (5-8, 11 and 12) and add new IEC 60318-4 and High-frequency configurations (14-17) The mouth simulator is now an option for all configurations
5	22 April 2022	Update pinna mounting procedure
6	24 June 2022	Add High-resolution configurations (-18 and -19) and section on TEDS capabilities
7	26 April 2022	Update mouth simulator nomenclature
8	1 December 2023	Updated procedure: Mounting the Anthropometric Pinna

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Quick Assembly Guide

GRAS 45CC configurations come fully assembled and tested, however the **Ear Plate Assemblies** must be mounted after unpacking. For those who do not need a detailed instruction, the illustration below should be enough to get started.

1. Slide the ear plate assembly's **Rods** into the **Slots** on the 45CC.
2. When they are located at the desired position, secure them with the screws on the back.

For further information, see "General Description" on page 22 and "Assembling the 45CC" on page 26.

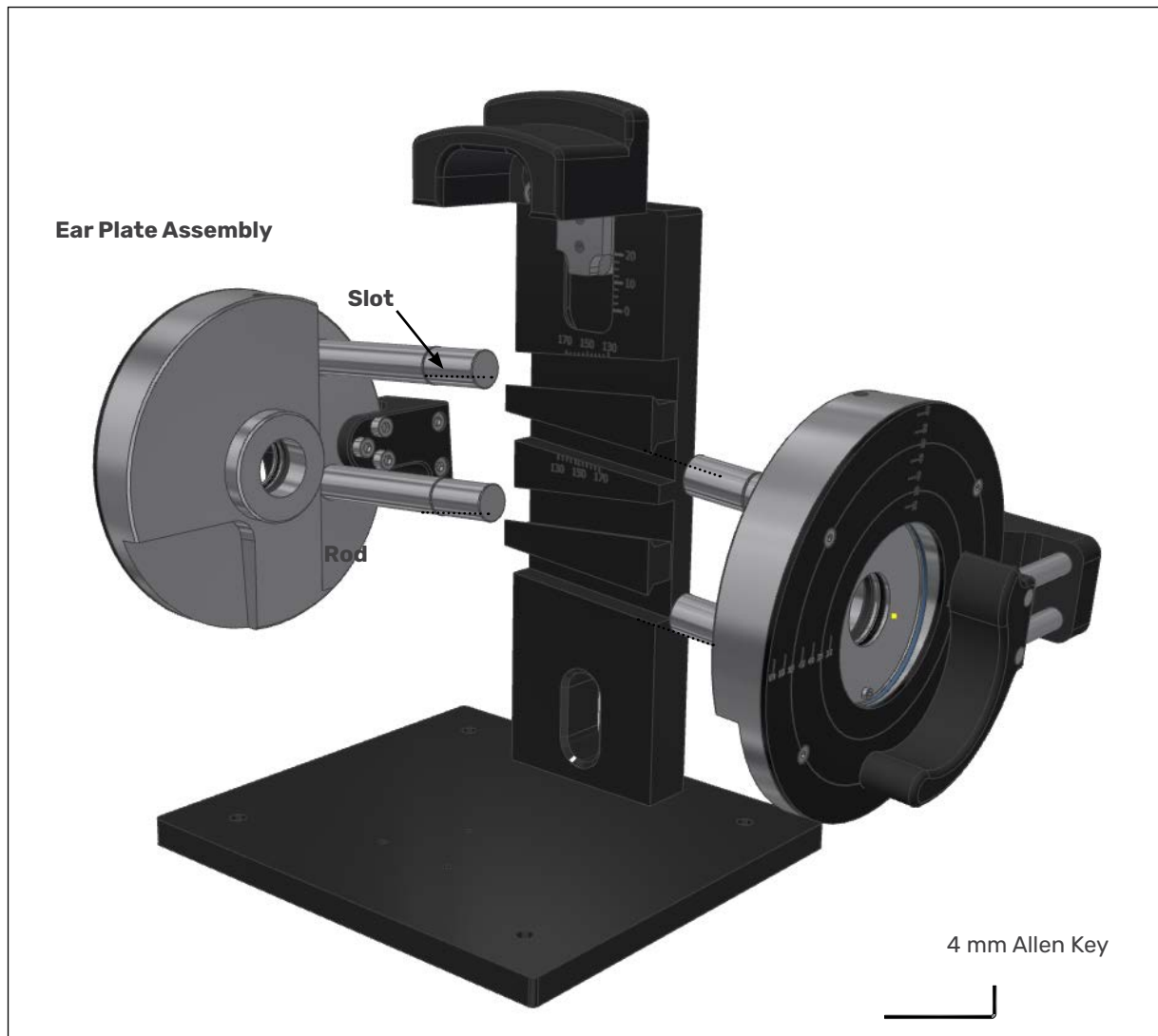


Fig. 1. Mounting the ear plate assemblies in the 45CC

Introduction

Overview

The 45CC Headphone Test Fixture is for testing of headphones (around ear, on ear, in ear and inserts) and headsets. With a focus on accurate and reproducible test results, the test fixture can easily be adapted to many different headphone/headset designs and sizes.

- Adjustable head dimensions:
 - Distance between ears adjustable from 130 to 170 mm
 - Headband Holder height adjustable from 75 to 135 mm
- Reproducible device under test (DUT) positioning with 45CC's unique Positioning Guides. All adjustments can be done in seconds.
- The microphones/ear simulators can easily be dismounted for calibration.

All adjustments to headband position and height as well as distance between ear plates can be done quickly and very accurately. Precise scales make it easy to document all settings: headband position, width between ears, position of positioning guide. This also makes it easy to set up other 45CCs to mirror the original setup.

Once the test fixture has been adjusted to fit a certain headphone, the design of headband holder, ear plates and the unique positioning system ensures that when testing identical headphones you will get the same positioning and fit from one test to the next.

TEDS Compatibility

All 45CC test fixtures 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.

About This Manual

This manual consists of the following main sections:

- **Quick Assembly Guide** on page 5 provides very basic assembly help.
- **45CC Configurations** details the 10 45CC pre-configurations. The contents of these configurations are listed in detail in the following section, **Delivered Items**.
- **Delivered Items** lists the items that are delivered with each configuration. This section can be used as a reference to check your delivery and help identify items mentioned in this manual.
- **General Description** explains how the 45CC is designed and what adjustments are available.
- **Assembly and Adjustments** explains the assembly and adjustment procedures necessary to prepare the 45CC for use.
- **Calibration** shows how to dismantle a microphone for calibration. For specific information about how to calibrate, refer to the documentation for your calibration equipment.

The 45CC Configurations

For your convenience, we have made 45CC available in 12 different pre-configurations.

Except for the mounting of the ear plate assemblies and optional mouth simulator, they come fully assembled and tested from the factory.

A mounting kit for the optional mouth simulator is included with all configurations.

45CC Configured with flat ear plates and ½" Microphones

45CC-1 with Externally Polarized ½" Microphones

45CC-2 with Prepolarized ½" Microphones

45CC configured with ½" externally polarized or prepolarized microphones is primarily intended as a tool for Quality Control (QC) and Production Line (PL) testing of on- and around-ear headphones.

45CC Configured with Ear Simulators

45CC-3 with IEC 60318-1 Ear Simulators and Ext. Polarized ½" Microphones

45CC-4 with IEC 60318-1 Ear Simulators and Prepolarized ½" Microphones

45CC configured with IEC 60318-1 ear simulators and ½" externally polarized or prepolarized microphones is primarily intended as a tool for QC and PL testing of on- and around-ear headphones. Where the acoustical load from an ear simulator is required, the use of the IEC 60318-1 ear simulators also mean that testing according to IEC 60318-1, IEC 60268-7 and ITU-T Recommendations P.57 Type 1 is possible.

45CC Configured with with flat ear plates and ¼" Microphones

45CC-9 with Externally Polarized ¼" Microphones

45CC-10 with Prepolarized ¼" Microphones

45CC configured with ¼" externally polarized or prepolarized microphones extends the frequency range to 70 kHz for high-frequency testing of on- and around-ear headphones.

45CC Configured with IEC 60318-4 Ear Simulators, Human-like Pinnae and Microphones

45CC-14 with IEC 60318-4 Ear Simulators, Anthropometric Pinnae and Externally Polarized Microphones

45CC-15 with IEC 60318-4 Ear Simulators, Anthropometric Pinnae and Prepolarized Microphones

GRAS 45CC Headphone Test Fixture configurations with IEC60318-4 ear simulators and realistic pinnae with accurate ear geometry are available with externally polarized or prepolarized microphones. They are primarily intended as tools for QC and Production Engineering (PE) when testing according to IEC 60318-4 and ITU-T Rec. P.57 Type 3.3 and the acoustical load from an ear simulator is required. These configurations can be used to test any style of headphone or headset (with the optional GRAS 44AA or 44AB Mouth Simulator), including in-ear and insert earphones.

45CC Configured with High-frequency Ear Simulators, Human-like Pinnae and Microphones

45CC-16 with High-frequency Ear Simulators, Anthropometric Pinnae and Externally Polarized Microphones

45CC-17 with High-frequency Ear Simulators, Anthropometric Pinnae and Prepolarized Microphones

GRAS 45CC Headphone Test Fixture configurations with IEC60318-4 ear simulators and realistic pinnae with accurate ear geometry are available with externally polarized or prepolarized microphones. They are primarily intended as tools for high-frequency testing in QC and PE when testing according to IEC 60318-4 and ITU-T Rec. P.57 Type 3.3 and the acoustical load from an ear simulator is required. These configurations can be used to test any style of headphone or headset (with the optional GRAS 44AA or 44AB Mouth Simulator), including in-ear and insert earphones.

45CC Configured with High-resolution Ear Simulators, Human-like Pinnae and Microphones

45CC-18 with High-resolution Ear Simulators, Anthropometric Pinnae and Externally Polarized Microphones

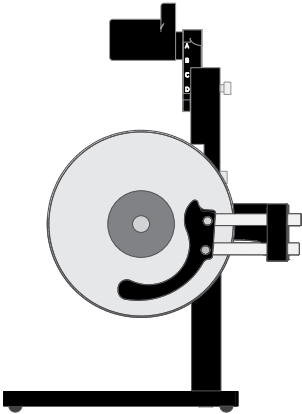

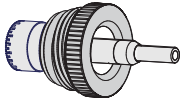




45CC-19 with High-frequency Ear Simulators, Anthropometric Pinnae and Prepolarized Microphones

GRAS 45CC Headphone Test Fixture configurations with IEC60318-4 ear simulators and realistic pinnae with accurate ear geometry are available with externally polarized or prepolarized microphones. They are primarily intended as tools for high-resolution testing in QC and PE when testing according to IEC 60318-4 and ITU-T Rec. P.57 Type 3.3 and the acoustical load from an ear simulator is required. These configurations can be used to test any style of headphone or headset (with the optional GRAS 44AA or 44AB Mouth Simulator), including in-ear and insert earphones.

Delivered Items

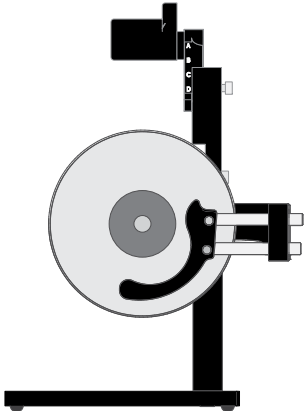


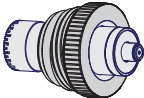



This section lists the main components that are delivered with each configuration. It can be used to verify your delivery and to identify parts that are mentioned in this manual.

45CC-1 Externally Polarized 1/2" Microphones

Included Items		
	Headphone Test Fixture	45CC
	Allen Key, 4 mm	YY0013
	1/2" Microphone Assembly*	2 x 69CC-1
Each 69CC-1 is pre-assembled and not available separately. Each unit consists of the following:		
	1/2" Externally Polarized Microphone: Specifications match those of 40AG	
	1/4" Preamplifier with 3 m integrated cable: Specifications match those of 26AC-1	
	1/2" to 1/4" Adapter	
	1/2" Microphone Holder	

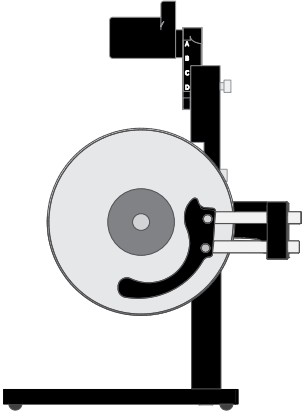


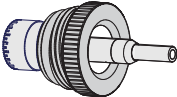




*The parts are glued together and must not be disassembled

45CC-2 Prepolarized 1/2" Microphones

Included Items		
	Headphone Test Fixture	45CC
	Allen Key, 4 mm	YY0013
	Microdot-BNC Cable	2 x AA0070
	1/2" Microphone Assembly*	2 x 69CC-2
Each 69CC-2 is pre-assembled and not available separately. Each unit consists of the following:		
	1/2" Prepolarized Microphone Specifications match those of 40A0	
	1/2" CCP Standard Preamp with TEDS and Microdot Connector, Very Short Specifications match those of 26CK	
	1/2" Microphone Holder	

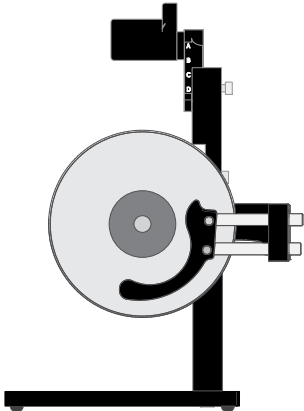



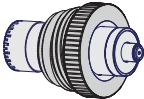



*The parts are glued together and must not be disassembled

45CC-3 IEC 60318-1 Ear Simulators and Externally Polarized ½" Microphones

Included Items		
	Headphone Test Fixture	45CC
	60318-1 Ear Simulator	2 x RA0039
	Allen Key, 4 mm	YY0013
	½" Microphone Assembly*	2 x 69CC-1
Each 69CC-1 is pre-assembled and not available separately. Each unit consists of the following:		
	½" Externally Polarized Microphone: Specifications match those of 40AG	
	¼" Preamplifier with 3 m integrated cable: Specifications match those of 26AC-1	
	½" to ¼" Adapter	
	½" Microphone Holder	

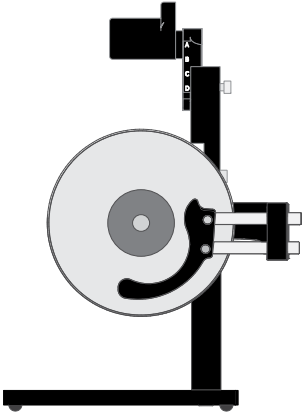


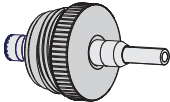


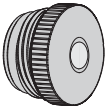
*The parts are glued together and must not be disassembled

45CC-4 IEC 60318-1 Ear Simulators and Prepolarized 1/2" Microphones

Included Items		
	Headphone Test Fixture	45CC
	60318-1 Ear Simulator	2 x RA0039
	Allen Key, 4 mm	YY0013
	Microdot-BNC Cable	2 x AA0070
	1/2" Microphone Assembly*	2 x 69CC-2
Each 69CC-2 is pre-assembled and not available separately. Each unit consists of the following:		
	1/2" Prepolarized Microphone Specifications match those of 40AO	
	1/2" CCP Standard Preamplifier with TEDS and Microdot Connector, Very Short Specifications match those of 26CK	
	1/2" Microphone Holder	

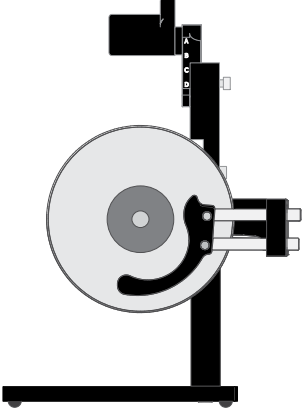



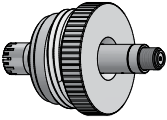


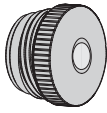
*The parts are glued together and must not be disassembled

45CC-9 Externally Polarized ¼" Microphones

Included Items		
	Headphone Test Fixture	45CC
	Allen Key, 4 mm	YY0013
	¼" Calibration Adapter	RA0331
	¼" Microphone Assembly*	2 x 69CC-3
Each 69CC-3 is pre-assembled and not available separately. Each unit consists of the following:		
	¼" Externally polarized Microphone: Specifications match those of 40BP	
	¼" Preamplifier with 3 m integrated Cable: Specifications match those of 26AC-1	
	¼" Microphone Holder	

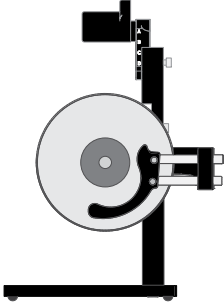
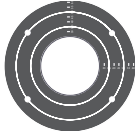
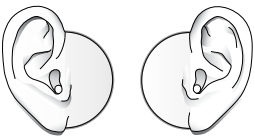










*The parts are glued together and must not be disassembled

45CC-10 Prepolarized 1/4" Microphones

Included Items		
	Headphone Test Fixture	45CC
	Allen Key, 4 mm	YY0013
	Microdot-BNC Cable	2 x AA0070
	1/4" Calibration Adapter	RA0331
	1/4" Microphone Assembly*	2 x 69CC-4
Each 69CC-4 is pre-assembled and not available separately. Each unit consists of the following:		
	1/4" Prepolarized Microphone: Specifications match those of 40BD	
	1/4" CCP Standard Preamplifier with TEDS, Very Short: Specifications match those of 26CS	
	1/4" Microphone Holder	

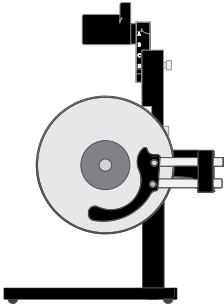
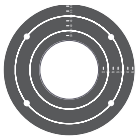
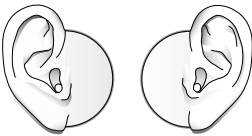










*The parts are glued together and must not be disassembled

45CC-14 IEC 60318-4 Ear Simulators, Anthropometric Pinnae and Ext. Pol. Microphones

Included Items		
	Headphone Test Fixture	45CC
	Pinna Holder Plate	2 x GR1075
	Large right and left anthropometric pinnae	Right: KB5010 Left: KB5011
	Allen Key, 4 mm	YY0013
	Allen Key, 2.5 mm	YY0016
	Allen Key, 2 mm	YY0018
	5-pin LEMO to 7-pin LEMO	2 x AA0091
	Ear Simulator Assembly*	2 x 69CC-5
Each 69CC-5 is pre-assembled and not available separately. Each unit consists of the following:		
	60318-4 Ear Simulator: See "Technical Specifications" on page 38	
	1/4" Preamplifier with TEDS: Specifications match those of 26AC-1	
	Right-angled adjustable adapter for 1/2" mic/ 1/4" preamp.	
	Exterior Ear Canal for Ear Simulator	
	Union Nut for Ear Simulator	

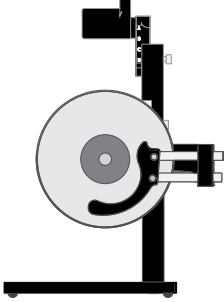
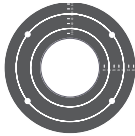
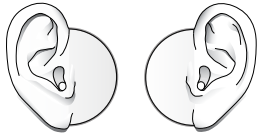

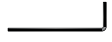
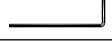







*The parts are glued together and must not be disassembled

45CC-15 IEC 60318-4 Ear Simulators, Anthropometric Pinnae and Prepolarized Microphones

Included Items		
	Headphone Test Fixture	45CC
	Pinna Holder Plate	2 x GR1075
	Large right and left anthropometric pinnae	Right: KB5010 Left: KB5011
	Allen Key, 4 mm	YY0013
	Allen Key, 2.5 mm	YY0016
	Allen Key, 2 mm	YY0018
	Microdot-BNC Cable	2 x AA0070
	Ear Simulator Assembly*	2 x 69CC-6
Each 69CC-6 is pre-assembled and not available separately. Each unit consists of the following:		
	60318-4 Ear Simulator: See "Technical Specifications" on page 38	
	1/4" CCP Preamplifier with TEDS: Specifications match those of 26CB	
	Right-angled adjustable adapter for 1/2" mic/ 1/4" preamp.	
	Exterior Ear Canal for Ear Simulator	
	Union Nut for Ear Simulator	

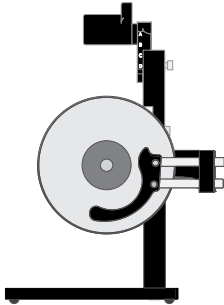
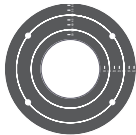
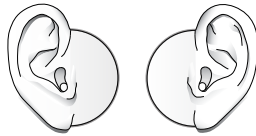










*The parts are glued together and must not be disassembled

45CC-16 High-frequency Ear Simulators, Anthropometric Pinnae and Ext. Pol. Microphones

Included Items		
	Headphone Test Fixture	45CC
	Pinna Holder Plate	2 x GR1075
	Large right and left anthropometric pinnae	Right: KB5010 Left: KB5011
	Allen Key, 4 mm	YY0013
	Allen Key, 2.5 mm	YY0016
	Allen Key, 2 mm	YY0018
	5-pin LEMO to 7-pin LEMO	2 x AA0091
	Ear Simulator Assembly*	2 x 69CC-7
Each 69CC-7 is pre-assembled and not available separately. Each unit consists of the following:		
	60318-4 High-frequency Ear Simulator: See "Technical Specifications" on page 38	
	1/4" Preamplifier with TEDS: Specifications match those of 26AC-1	
	Right-angled adjustable adapter for 1/2" mic/ 1/4" preamp.	
	Exterior Ear Canal for Ear Simulator	
	Union Nut for Ear Simulator	

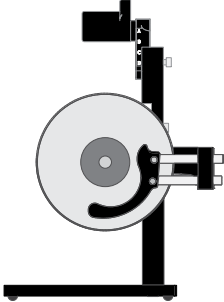
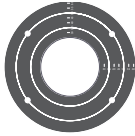
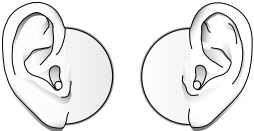

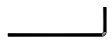
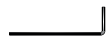







*The parts are glued together and must not be disassembled

45CC-17 High-frequency Ear Simulators, Anthropometric Pinnae and Prepolarized Microphones

Included Items		
	Headphone Test Fixture	45CC
	Pinna Holder Plate	2 x GR1075
	Large right and left anthropometric pinnae	Right: KB5010 Left: KB5011
	Allen Key, 4 mm	YY0013
	Allen Key, 2.5 mm	YY0016
	Allen Key, 2 mm	YY0018
	Microdot-BNC Cable	2 x AA0070
	Ear Simulator Assembly*	2 x 69CC-8
Each 69CC-8 is pre-assembled and not available separately. Each unit consists of the following:		
	60318-4 High-frequency Ear Simulator: See "Technical Specifications" on page 38	
	1/4" CCP Preamplifier with TEDS: Specifications match those of 26CB	
	Right-angled adjustable adapter for 1/2" mic/ 1/4" preamp.	
	Exterior Ear Canal for RA0045	
	Union Nut for RA0045	

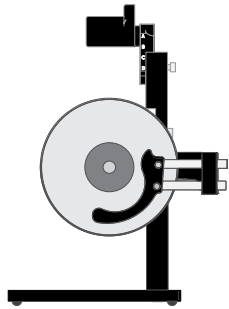
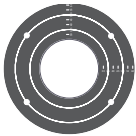
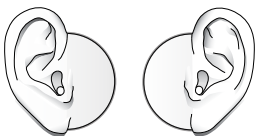


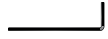







*The parts are glued together and must not be disassembled

45CC-18 High-resolution Ear Simulators, Anthropometric Pinnae and Ext. Pol. Microphones

Included Items		
	Headphone Test Fixture	45CC
	Pinna Holder Plate	2 x GR1075
	Large right and left anthropometric pinnae	Right: KB5010 Left: KB5011
	Allen Key, 4 mm	YY0013
	Allen Key, 2.5 mm	YY0016
	Allen Key, 2 mm	YY0018
	5-pin LEMO to 7-pin LEMO	2 x AA0091
	Ear Simulator Assembly*	2 x 69CC-9
Each 69CC-9 is pre-assembled and not available separately. Each unit consists of the following:		
	60318-4 High-resolution Ear Simulator: See "Technical Specifications" on page 38	
	1/4" Preamplifier with TEDS: Specifications match those of 26AC-1	
	Right-angled adjustable adapter for 1/2" mic/ 1/4" preamp.	
	Exterior Ear Canal for Ear Simulator	
	Union Nut for Ear Simulator	

*The parts are glued together and must not be disassembled

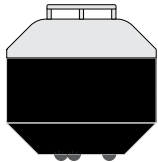
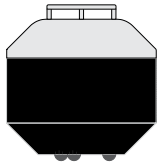
45CC-19 High-resolution Ear Simulators, Anthropometric Pinnae and Prepolarized Microphones

Included Items		
	Headphone Test Fixture	45CC
	Pinna Holder Plate	2 x GR1075
	Large right and left anthropometric pinnae	Right: KB5010 Left: KB5011
	Allen Key, 4 mm	YY0013
	Allen Key, 2.5 mm	YY0016
	Allen Key, 2 mm	YY0018
	Microdot-BNC Cable	2 x AA0070
	Ear Simulator Assembly*	2 x 69CC-10
Each 69CC-10 is pre-assembled and not available separately. Each unit consists of the following:		
	60318-4 High-resolution Ear Simulator: See "Technical Specifications" on page 38	
	1/4" CCP Preamplifier with TEDS: Specifications match those of 26CB	
	Right-angled adjustable adapter for 1/2" mic/ 1/4" preamp.	
	Exterior Ear Canal for Ear Simulator	
	Union Nut for Ear Simulator	

*The parts are glued together and must not be disassembled

Optional Mouth Simulators

All 45CC configurations can be used with a GRAS mouth simulator. For more information on the mouth simulators, see their respective Instruction Manual. All configurations have the mouth simulator mouth holder included, see below.

Included Items		
	Mouth Simulator according to ITU-T Rec. P51 with built-in power amplifier	44AA-1
	Mouth Simulator according to ITU-T Rec. P51	44AB-1

Mouth Simulator Holder Kit

The mouth simulator holder kit is included with the 45CC configuration, not the mouth simulator, The kit comprises one mounting plate (incl. stand-off nuts), three M3 bolts (2.5 mm hex), and one 3/8" mounting bolt (12 mm). The kit and assembly instructions are shown in Fig. 15 on page 31

General Description

This section describes how the 45CC is designed. Instructions on how to assemble and make adjustments are given in the section “Assembly and Adjustments” on page 26 onwards.

Front View

Fig. 2 shows the main height and width adjustments possible with the 45CC. The **Headband Holder** has four fixed positions on the vertical **Neck** superimposed on a continuous adjustment of 20 mm for any position within 60 mm from bottom to top position. The top position is 135 mm over the center of the Ear Plates, the lowest position is 60 mm below the top position.

The distance between the **Ear Plates** can be adjusted from 130 to 170 mm, in compliance with ANSI S12.42 and IEC 60318-7.

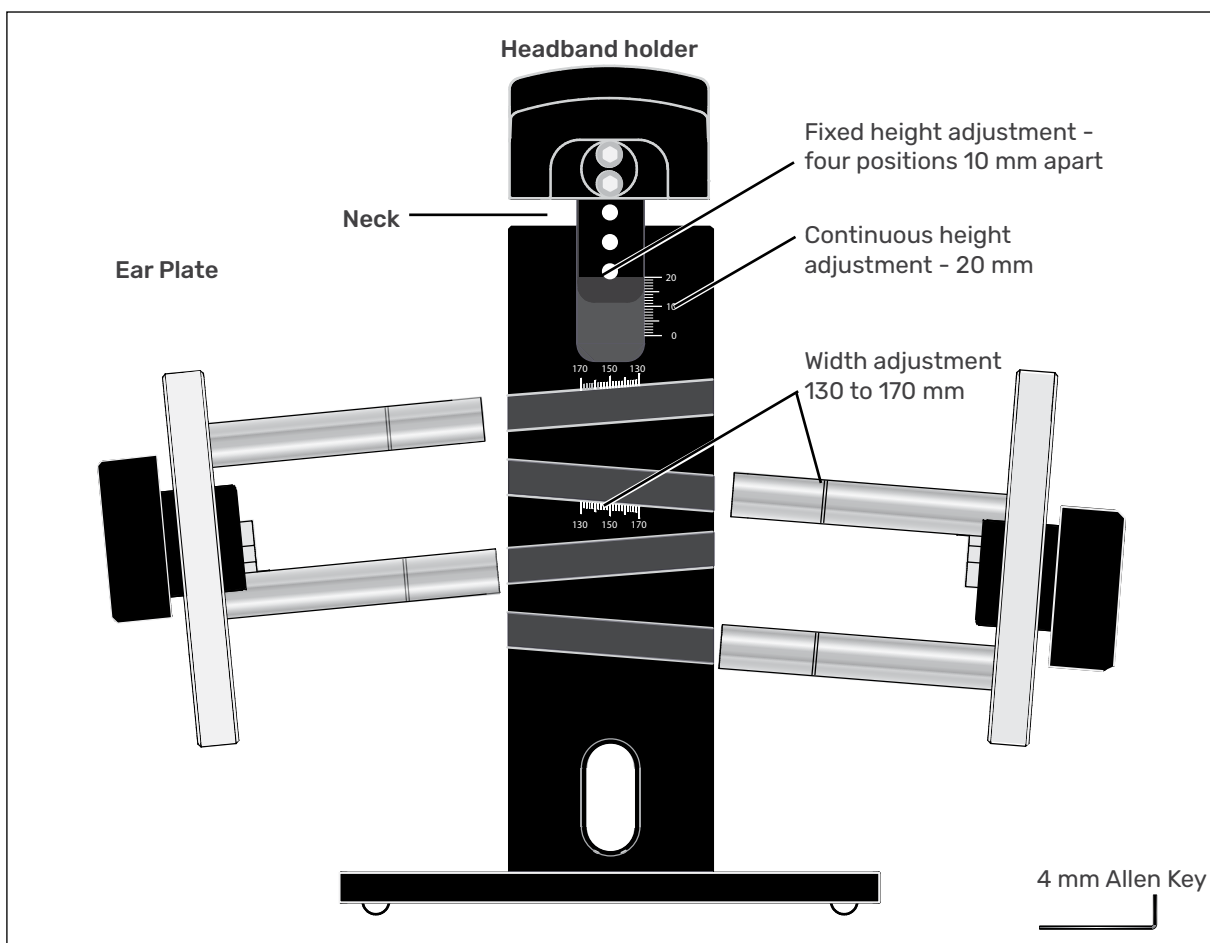


Fig. 2. Front view of 45CC.

Side View

Below, a side view of the 45CC configured with a **44AA-1 Mouth Simulator** is shown. The **Headband Holder** can be adjusted relative to the **Ear Plates**, both horizontally and vertically. Horizontally it can be fixed in three positions, the adjustment range is 10 mm. This makes it possible to test headphones with narrow, mid-sized or wide headbands. The vertical adjustment is 60 mm from top to bottom. See page 32 for instruction on how to make these adjustments.

The **Positioning Guide** is described in detail on page 26, and how to adjust it for different headphone sizes is shown on page 33.

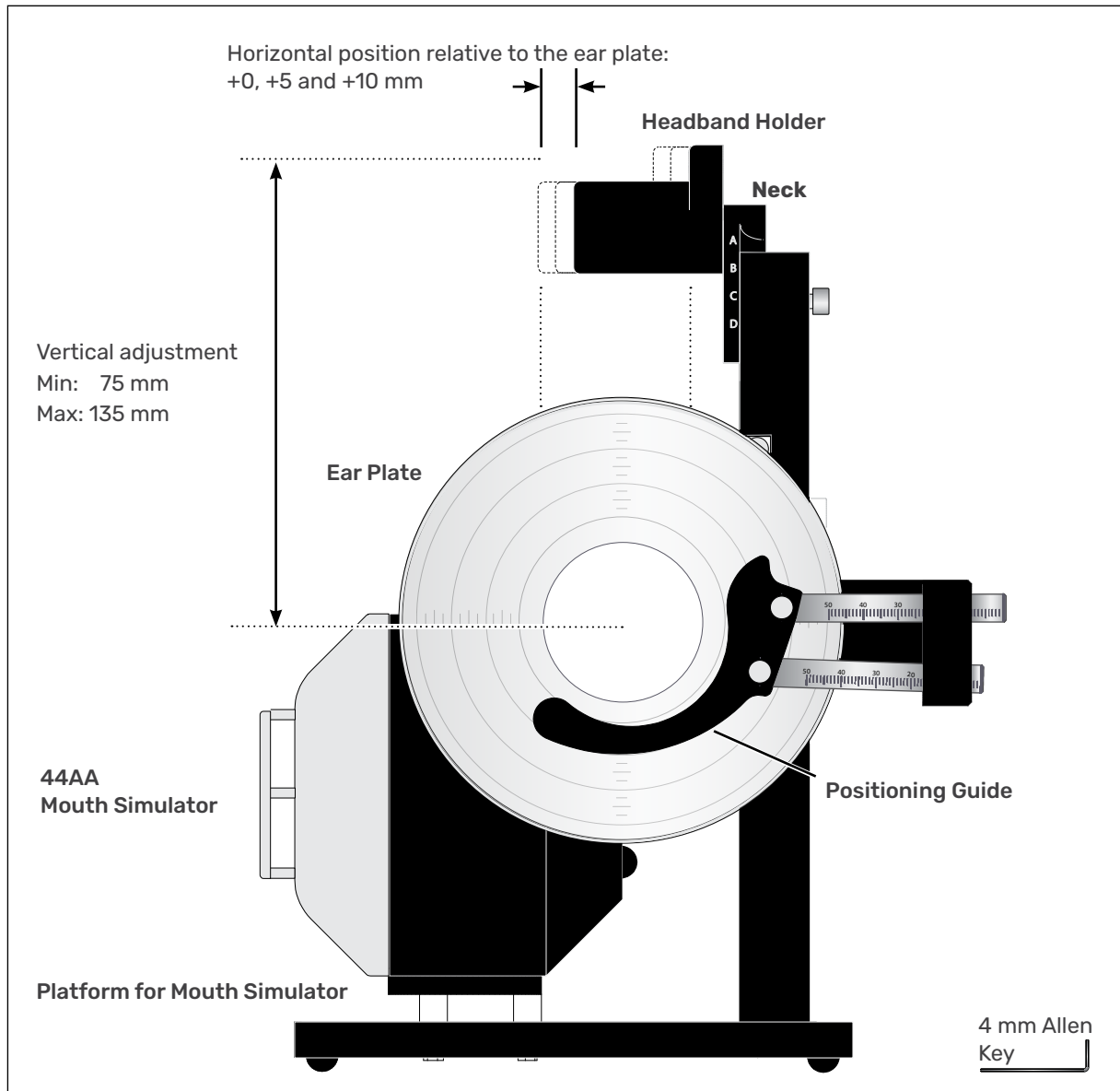


Fig. 3. Side view—with optional mouth simulator.

Rear View

Fig. 4 shows a rear view of 45CC without configuration-specific parts. The screws needed for adjustment of the width between the **Ear Plate Assemblies** and the 20 mm continuous adjustment of the **Headband Holder** height are all accessed on the rear.

Note also the screws for adjusting the **Positioning Guides**. See the section “Adjusting the Positioning Guides” on page 33 for instructions on how to adjust the Positioning Guides to fit different sizes of headphones.

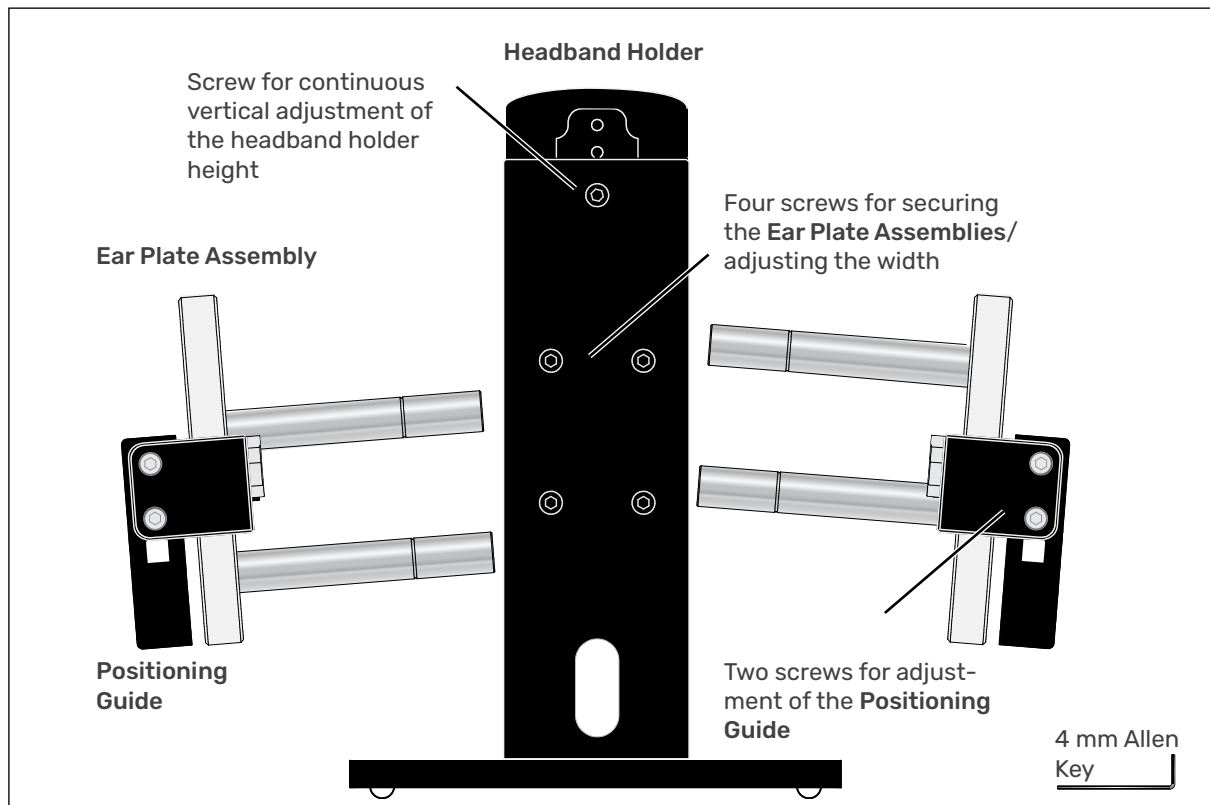


Fig. 4. Rear view of the 45CC with the screws for adjustment of width between **Ear Plates** and vertical adjustment of the **Headband Holder**.

Ear Plate Assemblies

On the inside of the Ear Plates, the Fittings for 60218-1 Ear Simulator and Flanges for ½" and ¼" microphones are mounted as shown in Fig. 5. On the outside a positioning system for holding the cups of the headphones are mounted. This is shown in Fig. 7 on page 26.

The Fittings for Microphone Mounting

As can be seen from Fig. 5 below, the microphones are mounted from the inside. The **Ear Plate** can accommodate the Ear Simulator or the Flanges for ½" or ¼" microphones. These have the same outer dimensions and are mounted the same way, with three screws and fasteners. Therefore, it is fairly easy to reconfigure a 45CC, for example from a version with ½" microphones to IEC 60318-1 ear simulators.

The **Holder** (below) is used with the RA0039 Ear Simulator only, as the thread it provides is an integral part of the two flanges.

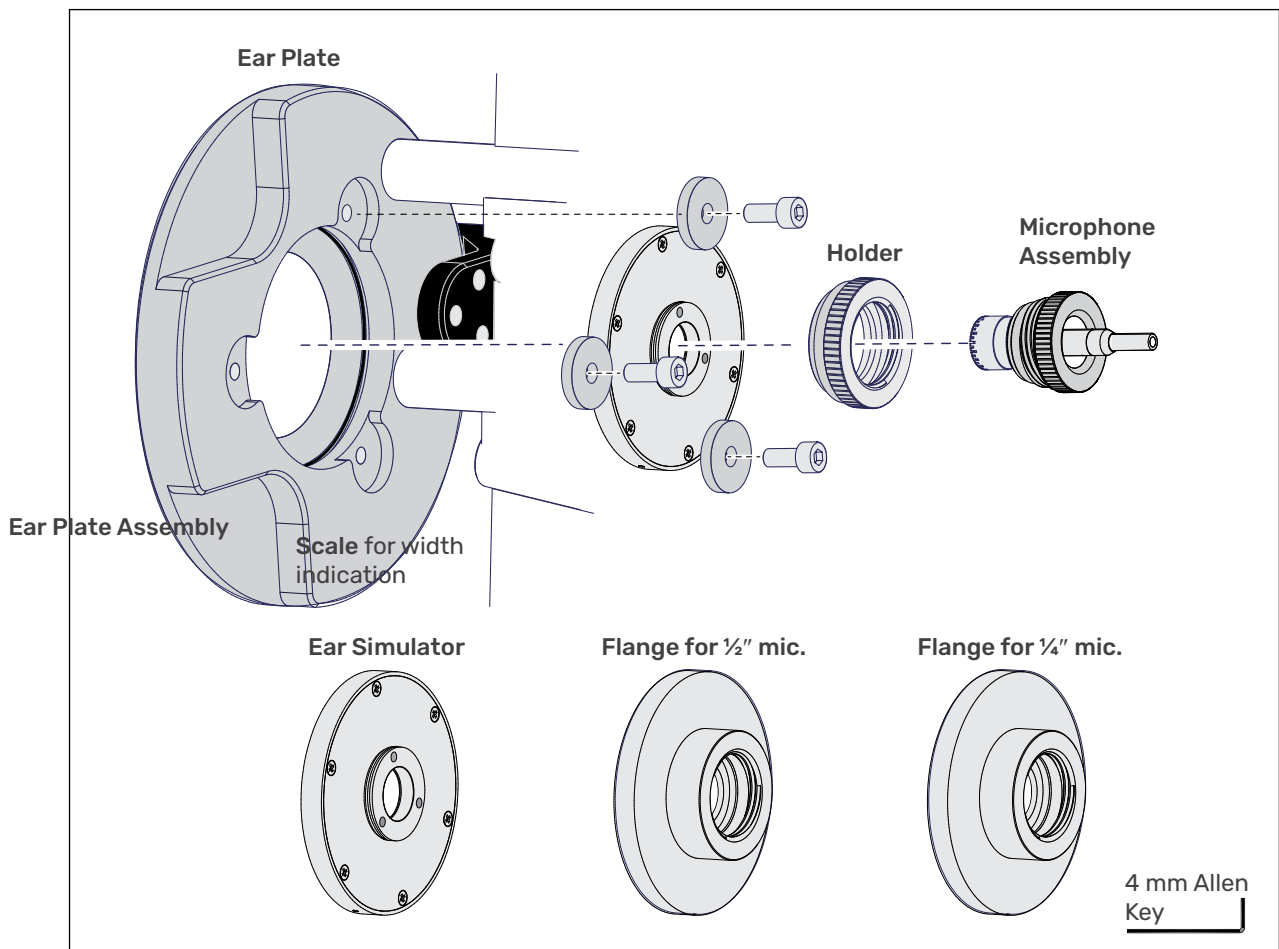


Fig. 5. Detailed view of the fittings for ear simulator mounting. The mounting of the 1/2" and 1/4" Microphone Flanges is similar, except that the Holder in the middle is an integral part of the two flanges.

The Microphone Holder

The microphone and preamplifier are already assembled in the microphone holder that is used for mounting in the 45CC. They are calibrated as a whole, and each assembly has its serial number engraved on the rear face of the holder. (The engraving is not shown below).

Important. These parts are glued together and must not be disassembled.

How this assembly is mounted in the ear plate assembly is shown in Fig. 5. When you need to calibrate, simply remove it from the ear plate by turning it half a turn.

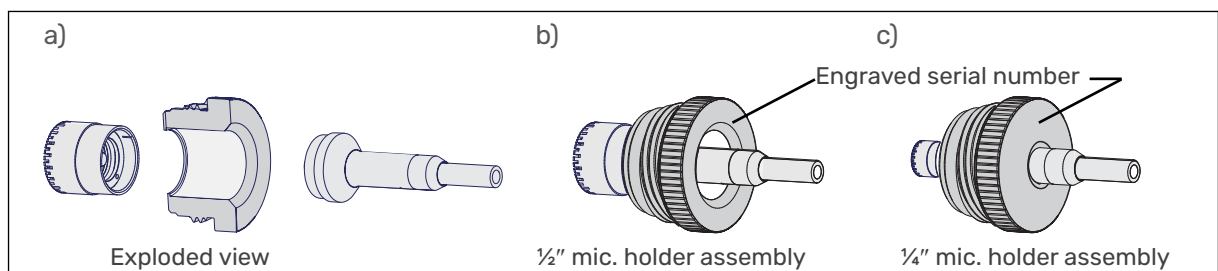


Fig. 6. 1/2" and 1/4" microphone mounted in microphone holder. Do not disassemble as shown in a).

The Positioning Guide

The **Positioning Guide** can accommodate headphones of much different sizes. Engraved Scales on the **Ear Plates** make it easy to center the headphone over the microphone, scales on the **Positioning Guide Rods** help set up and reproduce distance and angle for the **Positioning Guide**.

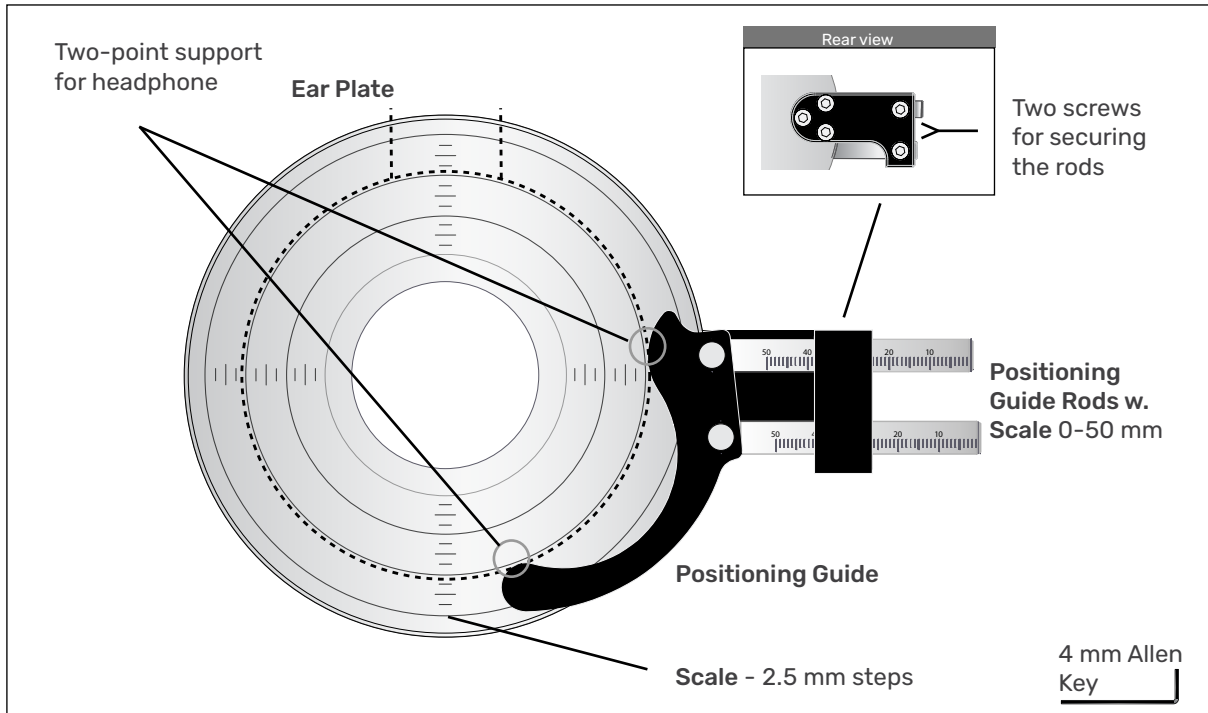


Fig. 7. Positioning guide with adjustments for horizontal and vertical alignment of headphone.

Assembly and Adjustments

Assembling the 45CC

The test fixture is partially assembled at the factory, but the user needs to mount the two **Ear Plate Assemblies** in **Slots** in the fixture. As shown in Fig. 8 below, the ear plates have two long Rods that can be pushed into the **Slots** and secured each with two screws from the rear.

Mounting the Ear Plate Assemblies

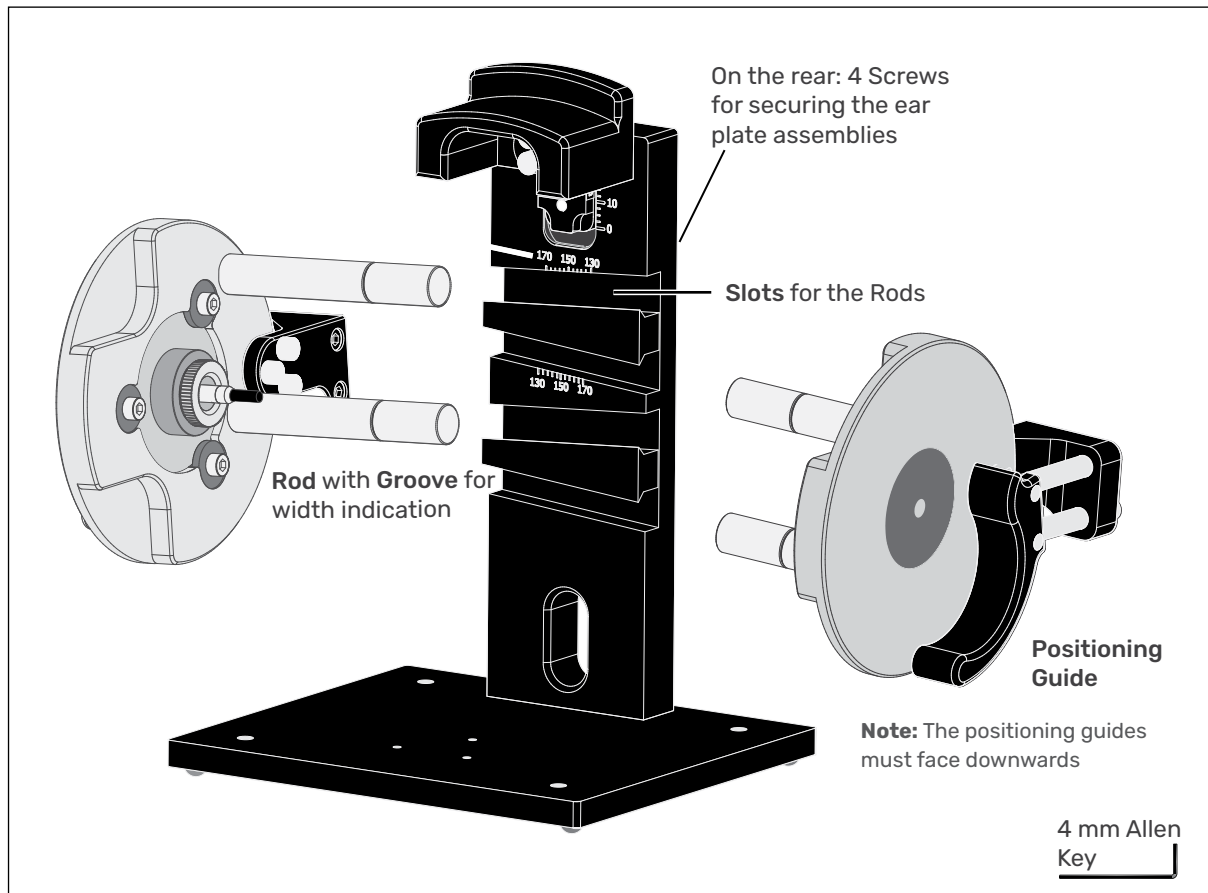


Fig. 8. Mounting the ear plate assemblies in the test fixture.

If necessary, loosen the four screws on the back of the fixture. These are shown Fig. 4 on page 24. The distance between the ear plates can be adjusted from 130 to 170 mm. Two millimeter **Scales** on the fixture and a **Groove** on each of the rods are used to set the position.

Slide in the **Ear Plate Assemblies** with the headphone Positioning Guides facing downwards.

Note: Remember to tighten the four screws on the back of the unit.

Mounting and Unmounting the Anthropometric Pinnae

Mounting the Anthropometric Pinnae

Two anthropometric pinnae are available:

Right Pinna Shore 35 KB5010

Left Pinna Shore 35 KB5011

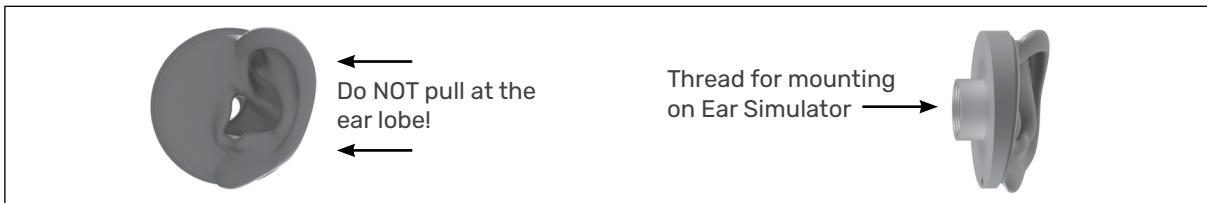


Fig. 9. Side and front view of a left anthropometric pinna.

Mounting the Anthropometric Pinna:

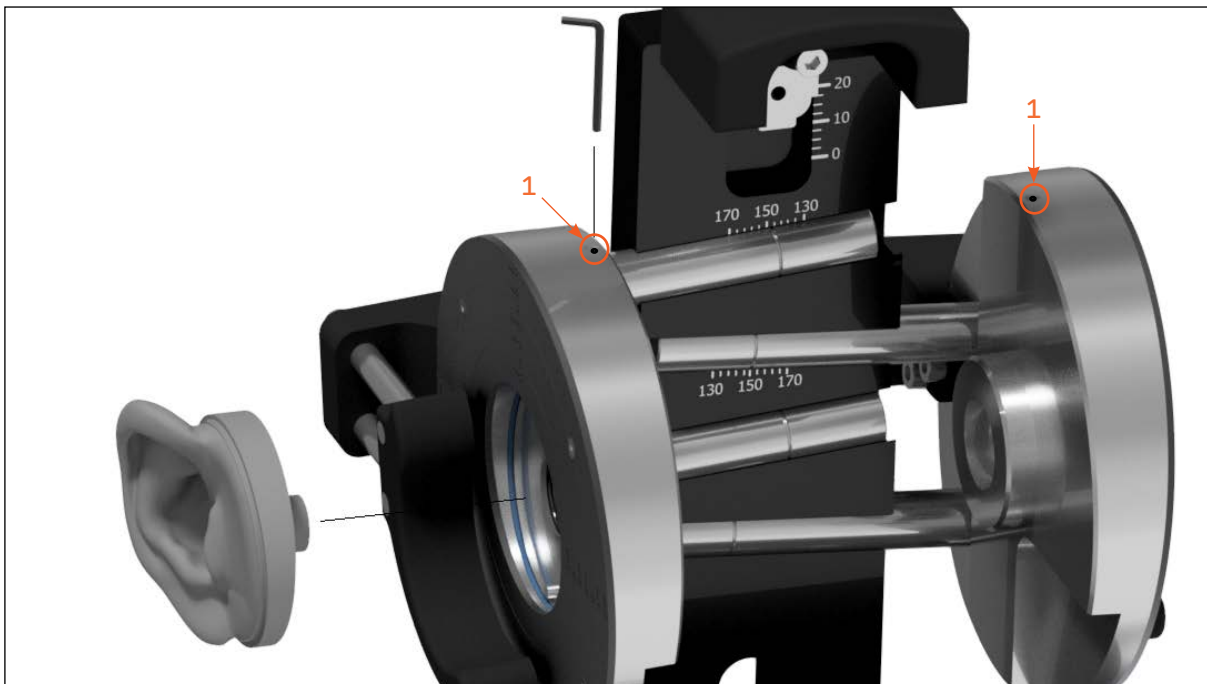


Fig. 10. Showing the screws locations for locking the ear simulator. Loosen the locking screw (1) holding the ear simulator with the Allen Key YY0016.

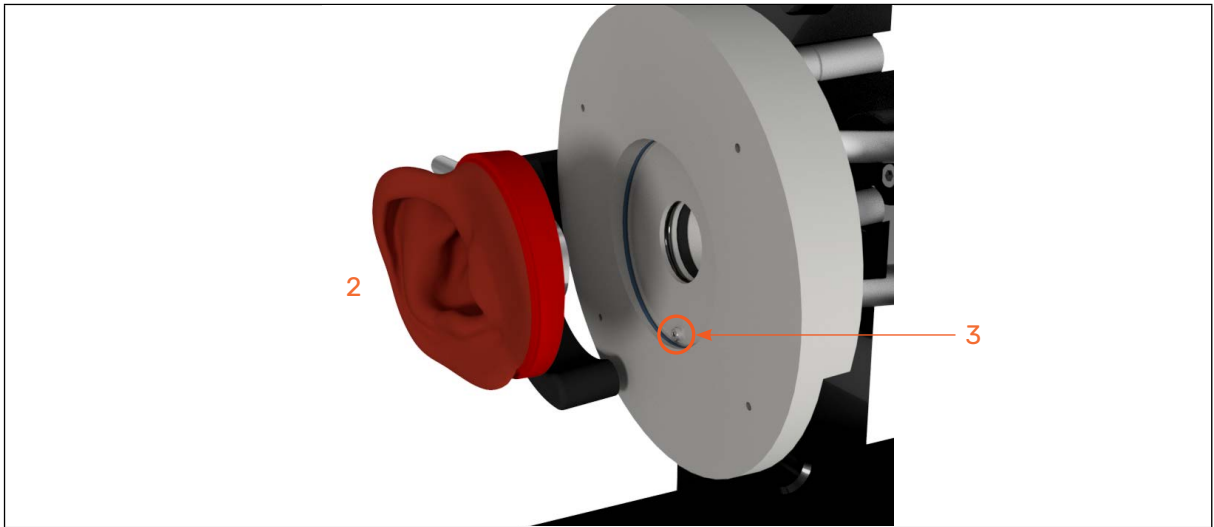


Fig. 11. Insert the pinna simulator (2) into the ear holder as far as it will go. Align the pinna simulator with the screw head (3) and make sure the screw head (3) slots into the receiving slot on the pinna simulator. This ensures that the pinna is tilted correctly (as described in the standard IEC 60318-7).

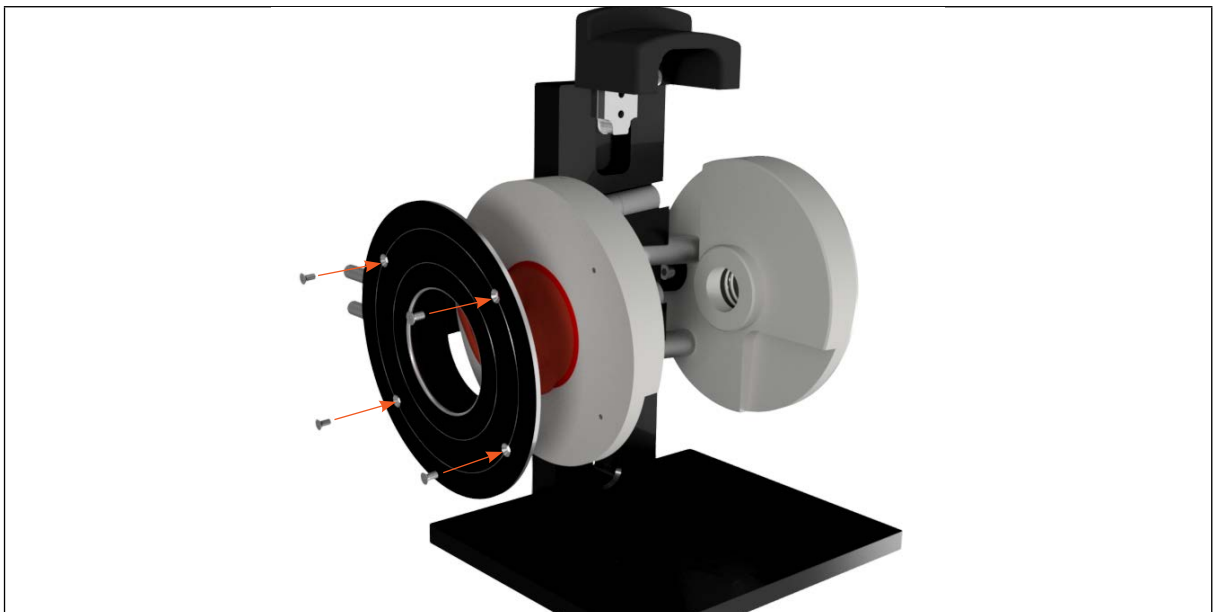


Fig. 12. Attach the ear plate using 4 x SK1505 screws and the 2mm YY0018 Allen Key. The pinna simulator is now held firmly in place by the ear plate.

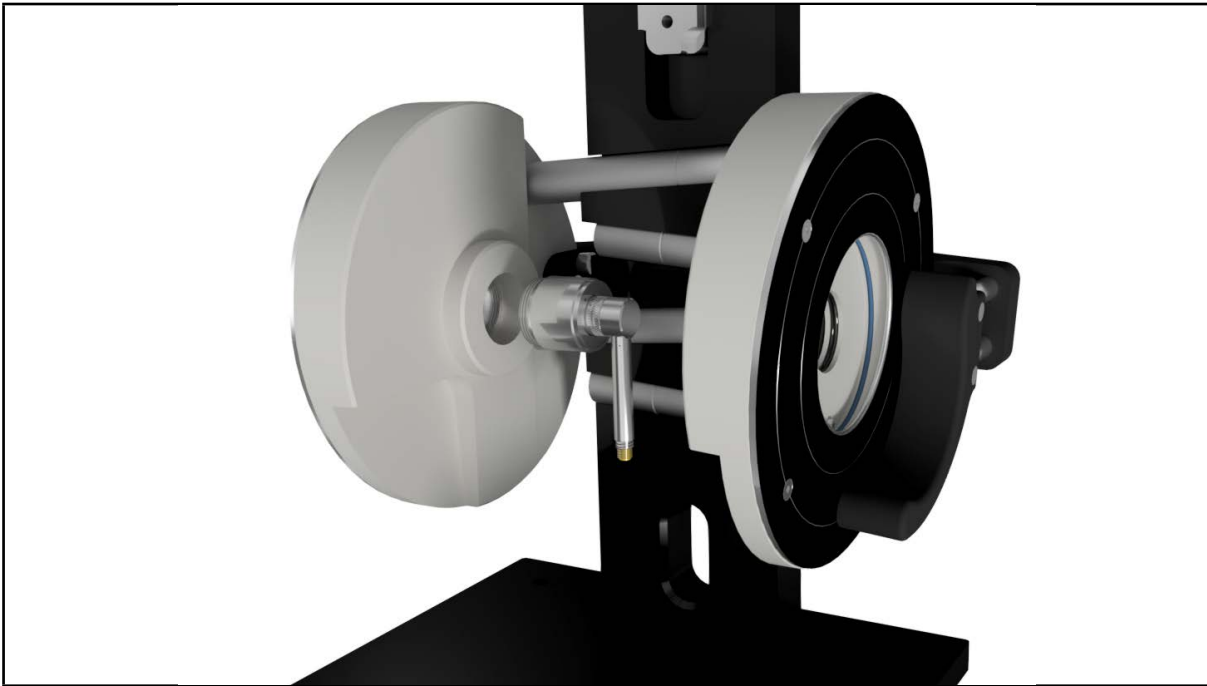


Fig. 13. Screw mount the Ear Simulator including the right-angled adjustable adapter (69CC-5, -6, -7, -8, -9 & -10) from the inside of the test fixture. The angle adapter moves independently of the Ear Simulator, giving you freedom to run the cable as it suits your setup.

Once you're satisfied with your setup, use the 2.5 mm locking screw (1) (Fig. 10.) to keep everything securely in place.

Removing the Anthropometric Pinna

As the Anthropometric Pinna is screw-mounted onto the Ear Simulator, this assembly must be removed from the 45CC before the pinna can be separated from the Ear Simulator.

Repeat process in reverse order.

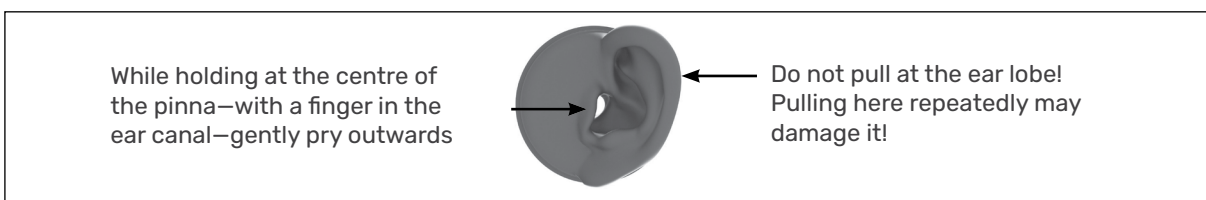


Fig. 14. Showing where to pull when removing the ear simulator+ anthropometric pinna from 45CA.

Mounting the Mouth Simulator

The **44AA-1 Mouth Simulator** assembly is attached to the 45CC with three Nuts that are fastened from the underside of the 45CC's Base plate.

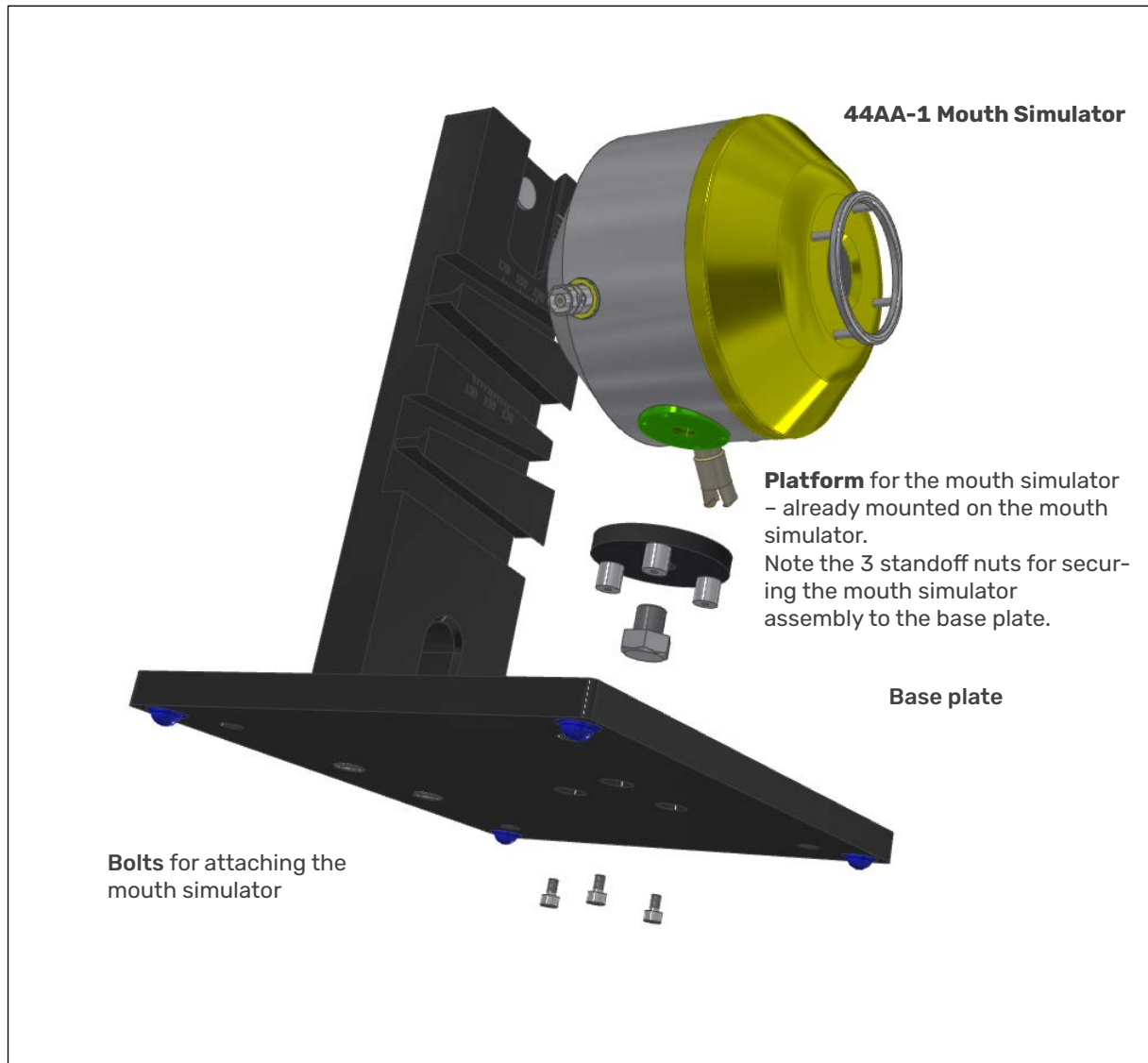


Fig. 15. Mounting the mouth simulator using the included RA0320 Mounting Kit for 45CC.

1. Place the 45CC in a way that lets you access the **Base plate** ("foot") from the underside.
2. Guide the three **Bolts** through the three holes in the base plate.
3. Fasten the **Bolts** using the YY0034 socket screwdriver.

Adjusting the Headband Holder Height

The **Headband Holder** is mounted on a sliding bar (“neck”) that allows for a continuous height adjustment of 20 mm. In addition to this, the headband holder can be mounted at four different positions on the bar, adding up to another 40 mm to the adjustment range. In the lower position, the distance to the center of the ear plate assembly is 75 mm, in the top position it is 135 mm.

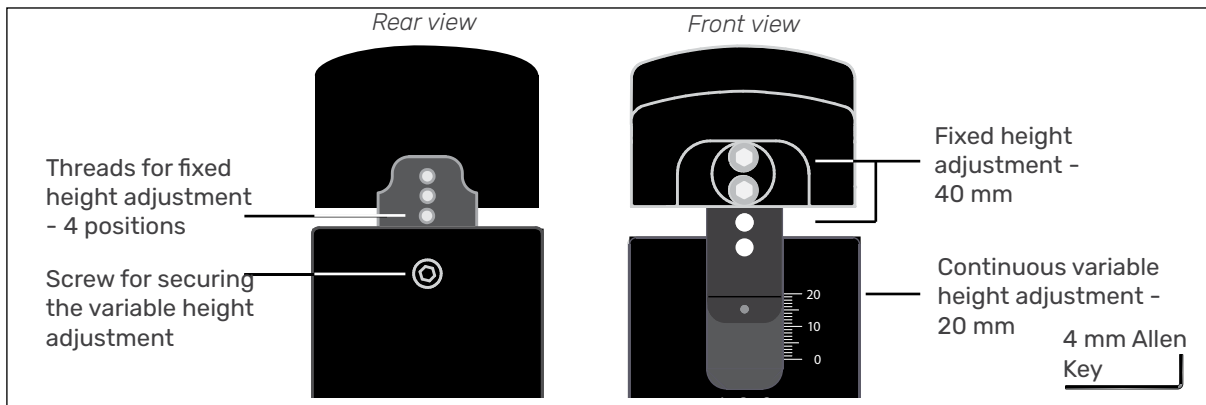


Fig. 16. The height adjustment of the headband holder – here it is shown in its top position.

Adjusting the Horizontal Position

The head band holder’s horizontal position can be adjusted by 0, +5 mm or + 10 mm relative to the neck/the center of the ear plate. This is done by changing the position of two 5 mm spacers, as illustrated below.

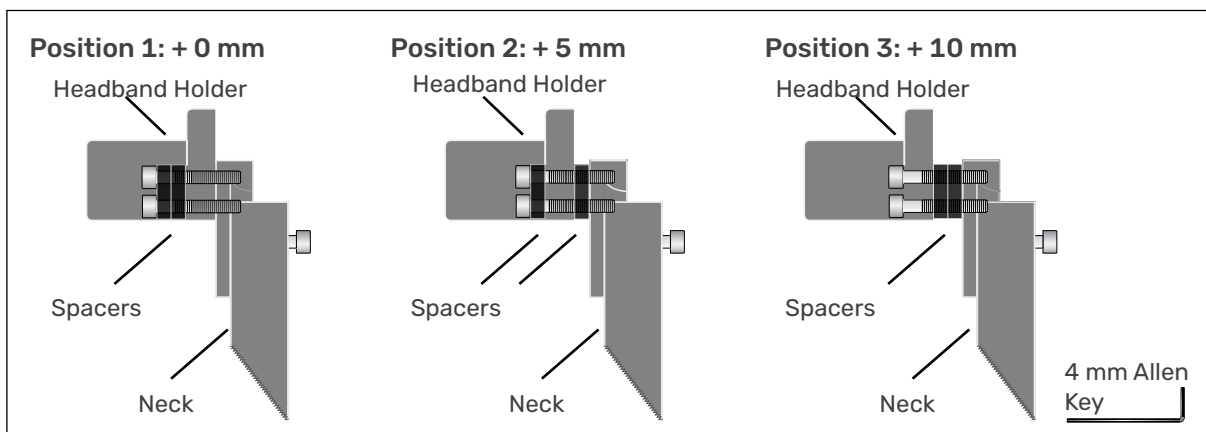


Fig. 17. The 3 horizontal positions of the headband holder.

Position 1: + 0 mm. In this position the headband holder is attached directly to the neck. The two spacers are used to ensure that the length of the two screws fit the depth of the threads.

Position 2: + 5 mm. One spacer is used between headband holder and neck, the other is used to ensure that the length of the two screws fit the depth of the thread in the neck.

Position 3: + 10 mm. Both spacers are used between headband holder and neck.

Adjusting the Positioning Guides

To help position the headphones, the ear plate assemblies are furnished with an adjustable positioning system. Engraved scales on the ear plates can help you center the headphones accurately over the microphone.

As shown in Fig. 18, the positioning system can be adjusted to support virtually all headphone sizes.

The positioning system is described in detail in Fig. 7 on page 26.

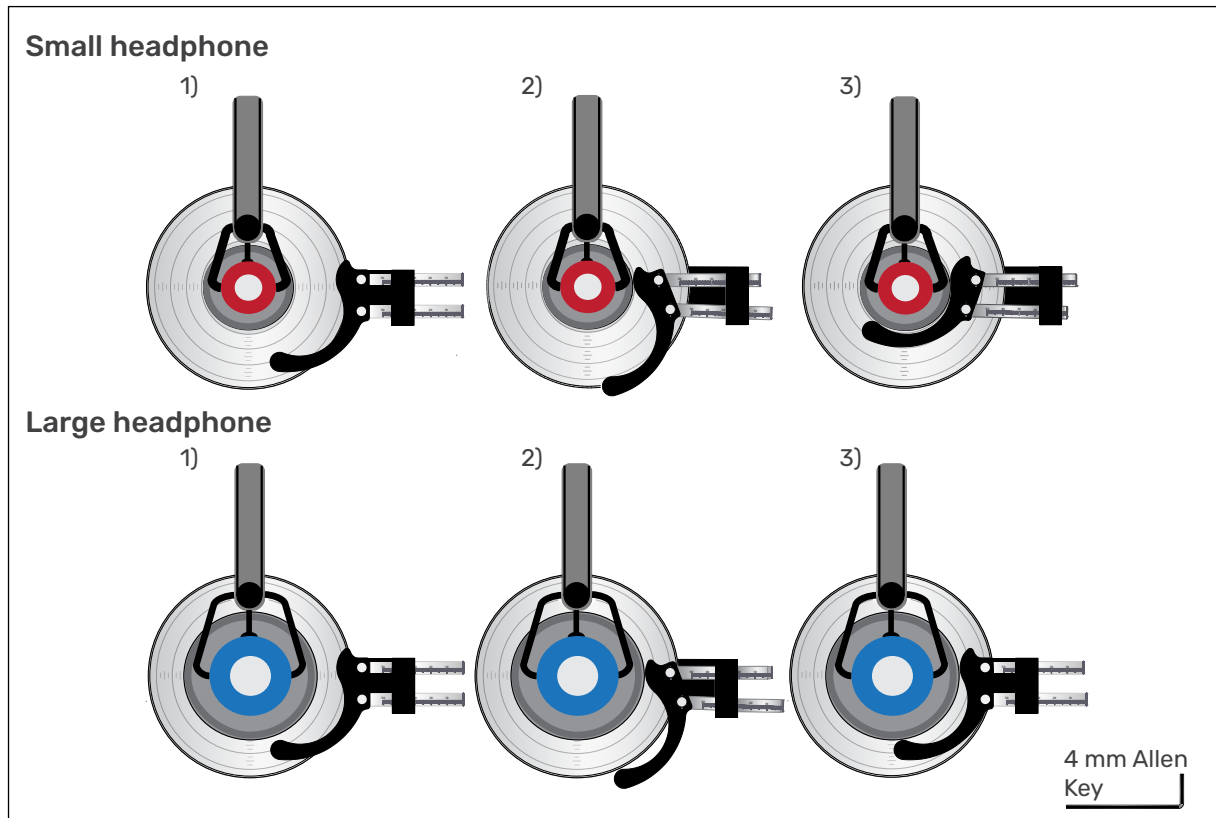


Fig. 18. Example of positioning of a headphone using the 45CC's positioning system.

1. Position the headphone so it is centered over the microphone.
2. Push the upper part of the guide until it touches the headphone, without dislocating it, as shown in 2), and secure the position by fastening the screw on the rear.
3. Push the lower part of the guide until it supports the Device Under Test, as shown in 3), and fasten.

The scales on the two rods do not indicate the distance to the DUT. They are meant as a means to make it easy to document and repeat the settings onto more 45CC Headphone Test Fixtures.

Calibration and Verification

All 45CC configurations can be calibrated and verified. A full sensitivity calibration at one or two frequencies as well as a frequency calibration covering the entire frequency range for the unit is normally performed at a calibration lab. Verification/daily calibration is a sensitivity check at one or two frequencies, often carried out by an operator with a pistonphone or a sound level calibrator. The following describes a verification, or daily calibration check, of the measurement system.

45CC-1 to -4, -9 and -10 Microphone Calibration/Verification

1. To calibrate the microphones in 45CC-1 to -4, -9 and -10, you must first remove them from the ear plates as shown in Fig. 19.

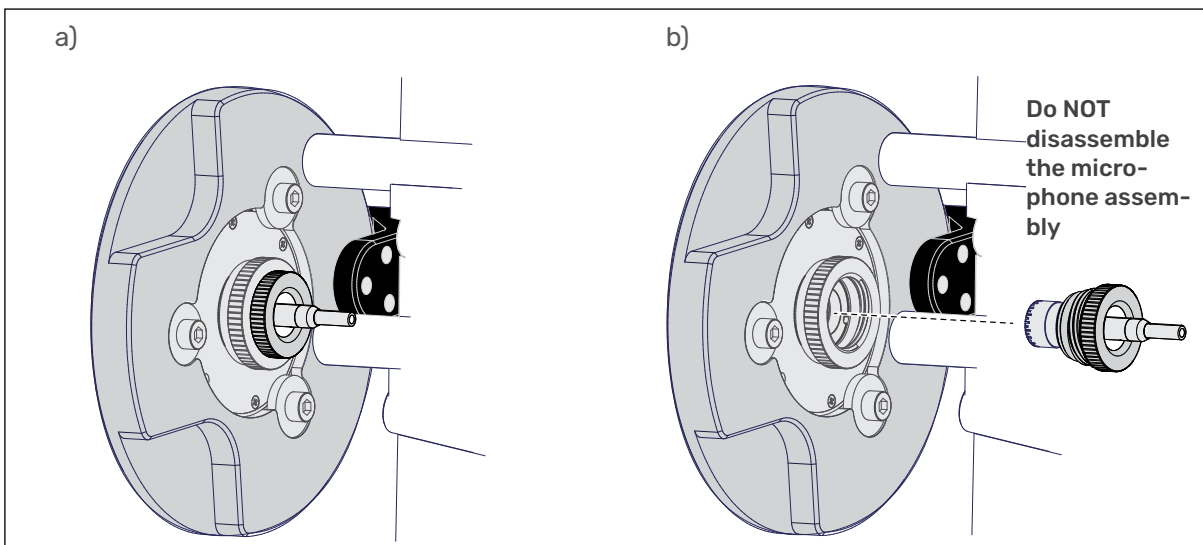


Fig. 19. Removing a microphone assembly for calibration. When removed from the assembly (b), it is ready for calibration.

Important. The parts of the microphone assembly—microphone, microphone holder, $\frac{1}{2}$ " to $\frac{1}{4}$ " adapter and preamplifier—are glued together and should under no circumstances be disassembled. If a need for this arises, the unit must be returned to GRAS for service.

Calibrating/verifying 45CC-1 to -4 (½" microphones) with a pistonphone

2. Loosen the pistonphone Collar Ring by turning it counterclockwise (Fig. 20).
3. Insert the microphone into the Pistonphone.
4. Tighten the Collar Ring
5. Switch On the Pistonphone
6. Wait 60 s and note the sensitivity level.
7. If necessary, adjust the acquisition system to the new sensitivity level. *
8. Loosen the Collar Ring and reassemble the 45CC.

* The sensitivity should be within ± 0.2 dB of the sensitivity given on the microphone's Calibration Chart, when the Pistonphone has been corrected for static pressure, etc.
See Pistonphone manual.



Fig. 20. Loosening or removing the Collar Ring.

Verifying 45CC-1 to -4 (½" microphones) with a sound calibrator

2. Insert RA0297 ½" Calibration Adapter into the Sound Calibrator
3. Insert the microphone into the adapter
4. Switch On the Sound Calibrator
5. Wait 60 s and note the sensitivity level.
6. If necessary, adjust the acquisition system to the new sensitivity level.
7. Reassemble the 45CC.

For further information, see the manual for your Sound Calibrator.

Calibrating/verifying 45CC-9 and -10 (¼" microphones) with a pistonphone

For ¼" microphones, calibration may be performed in situ using the RA0331 ¼" Calibration Adapter (included with your pistonphone), or for more accuracy, the microphone assembly should be removed from the ear plate and used with the RA0049 ¼" Calibration Adapter (included with 45CC ¼" microphone configurations).

Important. It is important that the adapter is pushed as far down into the pistonphone as it will go. To ensure this, you must either tighten the pistonphone's collar to ensure that it is in its lowest possible position, or remove it entirely, as shown below.

In situ verification

2. Remove the pistonphone Collar Ring by turning it counterclockwise (Fig. 20).
3. Mount the RA0331 In Situ adapter in the Pistophone.
4. Tighten the Collar Ring
5. Switch On the Pistophone
6. Hold the Pistophone tightly to the Ear Plate, wait 60 s and note the sensitivity level.
7. If necessary, adjust the acquisition system to the new sensitivity level.*

Dissassembled calibration/verification

2. Loosen the pistonphone Collar Ring by turning it counterclockwise (Fig. 20).
3. Insert the ¼" Adapter RA0049 into the Pistophone.
4. Tighten the Collar Ring.
5. Insert the microphone into the Adapter.
6. Switch On the Pistophone.
7. Wait 60 s and note the sensitivity level.
8. If necessary, adjust the acquisition system to the new sensitivity level.
9. Reassemble the 45CC.

Verifying 45CC-9 and -10 (¼" microphones) with a sound calibrator

For ¼" microphones, calibration may be performed in situ using the RA0331 ¼" Calibration Adapter (included with your pistonphone), or for more accuracy, the microphone assembly should be removed from the ear plate and used with the RA0049 ¼" Calibration Adapter (included with 45CC ¼" microphone configurations).

Important. It is important that the adapter is pushed as far down into the pistonphone as it will go. To ensure this, you must either tighten the pistonphone's collar to ensure that it is in its lowest possible position, or remove it entirely, as shown below.

In situ verification

2. Mount the RA0331 In Situ adapter on the Sound Calibrator.
3. Insert the microphone into the Sound Calibrator.
4. Switch On the Sound Calibrator.
5. Hold the Sound Calibrator tightly to the Ear Plate, wait 60 s and note the sensitivity level.
6. If necessary, adjust the acquisition system to the new sensitivity level.*

* The sensitivity should be within ± 0.3 dB of the sensitivity given on the Calibration Chart for the microphone when the Piston phone has been corrected for static pressure, etc. See Pistophone manual.

Dissassembled calibration/verification

2. Insert the ¼" Adapter RA0049 into the Sound Calibrator.
3. Insert the microphone into the Adapter.
4. Switch On the Sound Calibrator.
5. Wait 60 s and note the sensitivity level.
6. If necessary, adjust the aquisition system to the new sensitivity level.
7. Reassemble the 45CC.

45CC-14 to -19

1. Remove the Ear Simulators as described on page 28

Important. Do NOT pull at the ear lobe.

2. Mount the external ear canal with the union nut onto the ear simulator as shown in Fig. 21.

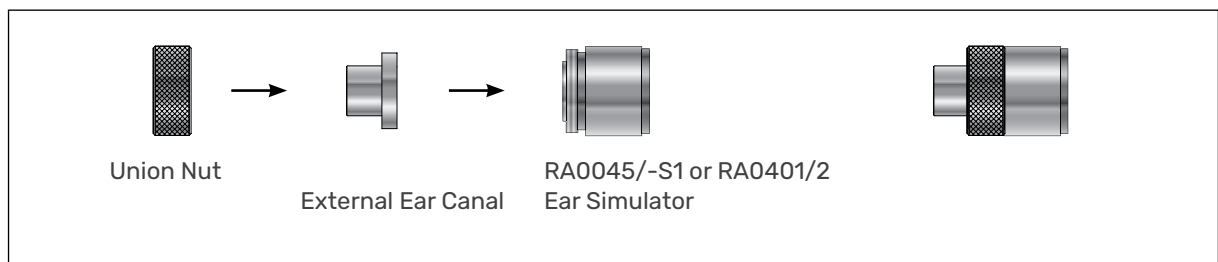


Fig. 21. Showing the External Ear Canal and Union Nut. For clarity, preamplifier and cable are not shown.

3. Insert the Ear Simulator into the adapter
4. Switch On the Pistonphone or Sound Calibrator
5. Wait 60 s and note the sensitivity level.
6. If necessary, adjust the aquisition system to the new sensitivity level.
7. Reassemble the 45CC.

For further information, see the manual for your Pistonphone or Sound Calibrator.

Correction Factors for Configurations -14 to -19

The correction factors for the various calibration options are listed below. The correction factors are needed because the different calibration options introduce varying effective volumes.

The correction factors have nothing to do with the different pinnae used.

45CC- - -14, through -19 with Standard Ear Simulator (RA0045-series and RA040X-series)		
	Accessory	Correction factor
42AP and 42AA	GR0408	-1.03 dB
42AG @250 Hz, 114 dB	GR0408	-0.09 dB
42AG @250 Hz, 94 dB	GR0408	-0.09 dB
42AG @1KHz, 114 dB	GR0408	-0.2 dB
42AG @1KHz, 114 dB	GR0408	-0.2 dB

Level Calibration with a Sound Calibrator

Level calibration for all configurations require a calibration adapter.

- For ½" microphones, the microphone assembly must be removed from the ear plates, and the RA0297 ½" Calibration Adapter (included with your pistonphone) must be used.
- For ¼" microphones, calibration may be performed in situ using the RA0331 ¼" Calibration Adapter (included with your pistonphone), or for more accuracy, the microphone assembly should be removed from the ear plate and used with the RA0049 ¼" Calibration Adapter (included with 45CC ¼" microphone configurations).

For further information, see the manual for your calibrator.

Technical Specifications

45CC	
Width between ears	Adjustable from 130 to 170 mm
Height of headband holder (measured from plane between ears)	Adjustable from 75 to 135 mm
Ear plate angle	4.5° (ISO 4869-3)
Diameter of ear plate	128 mm
Microphones	IEC 61094-4 ½" WS2P pressure microphones in the ear plate plane IEC 60318-1 ear simulators in the ear plate plane IEC 61094-4 ¼" WS3P pressure microphones in the ear plate plane

Input dynamic range	69CC-1	25 dB (A) - 164 dB (ext. polarized)	3.15 Hz - 20 kHz
	69CC-2	25 dB (A) - 150 dB (prepolarized)	3.15 Hz - 20 kHz
	69CC-3	39 dB (A) - 169 dB (ext. polarized)	4 Hz - 70 kHz
	69CC-4	44 dB (A) - 166 dB (prepolarized)	4 Hz - 70 kHz
	69CC-5	25 dB (A) - 164 dB (ext. polarized)	100 Hz - 10 kHz
	69CC-6	25 dB (A) - 150 dB (prepolarized)	100 Hz - 20 kHz
	69CC-7	25 dB (A) - 164 dB (ext. polarized)	100 Hz - 10 kHz
	69CC-8	25 dB (A) - 150 dB (prepolarized)	100 Hz - 20 kHz
	69CC-9	44 dB (A) - 169 dB (ext. polarized)	100 Hz - 50 kHz
	69CC-10	44 dB (A) - 166 dB (prepolarized)	100 Hz - 50 kHz
Sound source	Mouth Simulator According to ITU-T P51. Placed in accordance with ITU-T P58 See Mouth Simulator Instruction Manual		
Cross feed damping	28 dB (20-500 Hz) >45 dB (500 - 20 kHz)		
Weight (without microphones or mouth simulator)	3 kg		

Full specifications for microphones and mouth simulator can be found at GRASacoustics.com

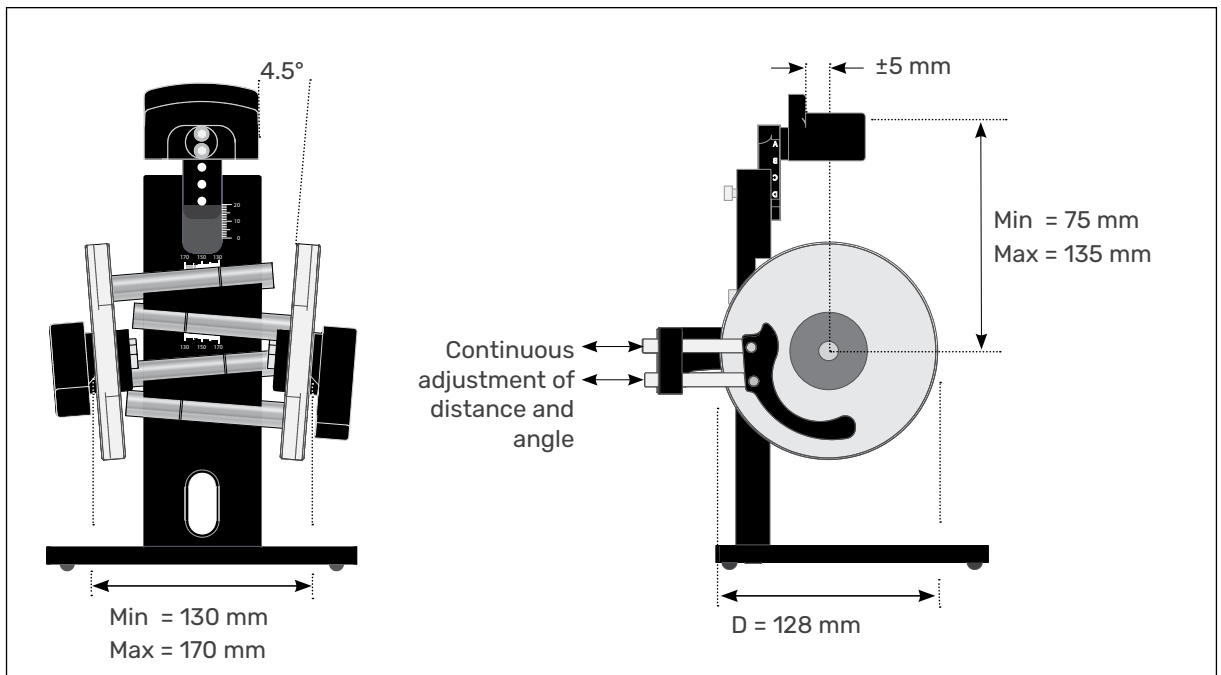


Fig. 22. 45CC's key adjustments for different headphone sizes

Warranty, Service and Repair

Calibration

Before leaving the factory, all GRAS 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 GRAS to offer a five-year 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 GRAS International Service Center located in Denmark. Our Service 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



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