GRAS 45CB

Acoustic Test Fixture

ANSI: S12.42

The GRAS 45CB Acoustic Test Fixture is specified and designed for measuring sound isolation of hearing-protectors and ear- and headphones according to the ANSI/ASA S12.42 standard. For testing in accordance with the ISO 4869-3 standard, choose GRAS 45CA.
The GRAS 45CB test fixture can also be used as a measurement platform for the Defence Standard 23-015 (Land System Certification Part 03: Noise) from UK's Ministry of Defence.
DEF STAN: 23-015 Part 03 Issue 1

GRAS Sound & Vibration
Skovlytoften 33, 2840 Holte, Denmark
www.grasacoustics.com

Introduction

The GRAS 45CB Acoustic Test Fixture is designed and specified to comply with the ANSI/ASA S12.42 standard. With this test fixture, you can test all types of hearing-protectors in the most realistic way - both in the acoustic lab and in the field. Compliance with ANSI/ASA S12.42 assures technicians, decision-makers, and authorities of repeatable and transparent data when developing and verifying hearing protectors.

The 45CB's robust design is ideally suited for binaural testing of active and passive earplugs, as well as circumaural hearing protectors. It is designed for portability, which gives you flexibility for your testing setups. The large base plates of the pinna simulators can accommodate all types of circumaural ear muffs. The silicone-rubber lining of the plates ensures leakage-free mounting, as well as higher repeatability and reliability. All the silicone-rubber parts of the 45CB can be heated to body temperature to give the most realistic testing of in-situ performance of ear-plugs. The heating unit of the system is set by default to 37 degrees Celsius. The modified IEC 60318-4 ear simulators have a 14-mm long ear canal extension is designed to let you also test all types of earplugs. The silicone-rubber lining of the extension enables leakage-free mounting of both foam plugs and customized molded types.

The 45CB has a self insertion-loss better than 65 dB, which means you are actually measuring the insertion loss of your hearing protector and not the fixture. Calibration is easy with the 45CB. You only need a pistonphone to quickly verify the full measurement chain within minutes and not waste valuable time and resources on a non-calibrated setup.

To transport and store the acoustic test fixture, a dedicated case, with an option for wheels, is included.

The 45CB is delivered in three different configurations with different ear simulators.

GRAS 45CB Acoustic Test Fixture according to ANSI S12.42

The 45CB is configured with RA0045-S7 Ear Simulators which are equipped with 40BP 1/4" ext. pol. pressure microphones. Its sensitivity is 1.5 mV and the dynamic range is from 50 dB(A) to 169 dB.

GRAS 45CB-S1 Acoustic Test Fixture according to ANSI S12.42, high sensitivity

45CB-S1 is a high-sensitivity version. It is configured with RA0045-S8 Ear Simulators that are equipped with 40AG 1/2" ext. pol. pressure microphones. Its sensitivity is 12.5 mV and the dynamic range is from 27 dB(A) to 164 dB.

GRAS 45CB-S2 Acoustic Test Fixture according to ANSI S12.42, high pressure

45CB-S2 is a high-pressure version. It is configured with RA0045-S9 Ear Simulators that are equipped with 40BH 1/4" ext. pol. pressure microphones. Its sensitivity is 0.4 mV and the dynamic range is from 62 dB(A) to 193 dB.

GRAS 45CB-S4 Acoustic Test Fixture according to ANSI S12.42, low noise

45CB-S4 is a Low noise version. It is configured with 43BB-4 Low Noise Ear Simulator Systems that are equipped with a 40HT ½" Lownoise Microphone System for Confined Spaces. Its sensitivity is 750 mV and the dynamic range is from 10.5 dB(A) to 113 dB. The 43BB-4 Low-noise Ear Simulator System offers the same specifications as the 43BB and 43BB-1 models. Its distinguishing feature is an 8-

degree angled adapter positioned between the ear simulator's microphone and the 1/4" preamplifier, enabling it to fit seamlessly into the 45CB test fixture. Each 43BB-4 Low-noise Ear Simulator supplied with the 45CB-S4 includes a 12HF Power Module designed for Low-noise Systems.

Typical applications and use

The GRAS 45CB Acoustic Test Fixture according to ANSI S12.42 is developed for testing of both ear-muffs and ear-plugs.

For testing ear-muffs, special attention was put on those types that are integrated into helmets. The result is head dimensions that reflect the average user of today's available headgear. For testing ear-plugs, the focus was put on the mounting repeatability and damping as a function of the body temperature. The result is a longer, silicone-lined ear-canal that can be heated to body temperature.

Today's use of hearing protectors ranges from construction sites to heavy industries, to civil as well as military aviation and to surveillance activities and combat scenes.

For that reason, the 45CB is designed for tests at very high levels without compromising its self-insertion loss or losing data.

Because the 45CB is built to comply with, or exceed, the ANSI S12.42 standard, it can cope with demands such as testing in the field and withstanding high-pressure levels like explosions. It can help manufacturers improve the quality of their products to meet the markets' and the standards' growing needs for design, quality assurance, and verified compliance to stricter regulations.

Tests at high sound levels with the 45CB include

- Measuring the insertion loss and sound pressure levels of
  - Active and passive earplugs
  - Circumaural earmuffs
  - Combined communication and hearing protection devices
- Testing with continuous or impulsive signals
- Testing in the laboratory or in the field

Technical Details

- The pinnae for the 45CB are the same standardized KEMAR pinnae, but with a large base plate to comply with the requirements of the ANSI S12.42 for correct circumaural testing. This large base plate reduces or eliminates the risk of leakage.
- The ear extension has been extended into a 14 mm long and 7.5 mm wide ear canal with a heatable silicone rubber lining. The ear extension can accommodate all sizes of earplugs, including the deep-insert type.
- The removable ear simulators are based on the IEC 60318-4 standard, but are modified with an extra back volume to support the high self-insertion loss of the 45CB.
- The control unit in the base of the 45CB is for setting and monitoring the temperature during tests. The control unit heats the silicone rubber lining of the ear canal extension to body temperature for realistic measurements of the properties and damping effects of earplugs.

The 45CB includes two plugs for measuring self-insertion loss in a closed ear.

Easy Calibration

We recommend calibration prior to each use to ensure the accuracy of your measurements. The design of the 45CB makes this task very easy. The 42AP Intelligent Pistonphone or 42AA Pistonphone are ideally suited for this task.

Compatibility

The 45CB requires a 200 V polarization voltage for its externally polarized microphones.

System verification

For daily verification and check of your measurement setup, we recommend using a calibrator like GRAS 42AG Multifunction Sound Level Calibrator.

For proper sensitivity calibration, we recommend using a pistonphone like GRAS 42AP Intelligent Pistonphone.

Warranty

GRAS offers 5 years warranty against defective materials and workmanship.

Service

If you accidentally damage the diaphragm on a GRAS microphone, we can—in most cases—replace it at a very reasonable cost and with short turn-around time. This not only protects your investment but also pleases your quality assurance department because you don’t have to worry about new serial numbers, etc.

Calibration

Before leaving the factory, all GRAS microphones are calibrated in a controlled laboratory environment using traceable calibration equipment.

Depending on the use, measurement environment, and internal quality control programs, we recommend recalibrating the microphone at least once a year.

Connector type		7-pin LEMO (FGG.1B.307)
Polarization/Connection		200 V / Traditional
Temperature range, operation	°C / °F	-40 to 65 / -40 to 149
Humidity range non condensing	% RH	0 to 90
ANSI standard		S12.42
CE/RoHS compliant/WEEE registered		Yes/Yes/Yes
Weight	g / oz	14750 / 520.29

Self Insertion Loss

Self Insertion Loss, Measured with closed ear simulators: 100 Hz – 8 kHz >74 dB
Self Insertion Loss, Measured with closed ear simulators: 80 Hz – 12.5 kHz >65 dB

The self insertion loss is the same for all three configurations.

Sensitivity and Dynamic Range

45CB (with RA0045-S7 Ear Simulator)		
Sensitivity	mv/Pa	1.5
Dynamic range lower limit	dB(A)	50
Dynamic range upper limit	dB	172
45CB-S1 (with RA0045-S8 Ear Simulator)		
Sensitivity	mv/Pa	12.5
Dynamic range lower limit	dB(A)	27
Dynamic range upper limit	dB	164
45CB-S2 (with RA0045-S9 Ear Simulator)		
Sensitivity	mv/Pa	0.4
Dynamic range lower limit	dB(A)	62
Dynamic range upper limit	dB	193
45CB-S4 (with 43BB-4 Low Noise Ear Simulator System)		
Sensitivity	mv/Pa	750
Dynamic range lower limit	dB(A)	10.5
Dynamic range upper limit	dB	113

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

Included

GRAS RA0045-XX	Ear Simulators, each with an ear canal extension and pressure microphone, depending on configuration 45CB: 2 x RA0045-S7 45CB-S1: 2 x RA0045-S8 45CB-S2: 2 x RA0045-S9 45CB-S4: 2 x 43BB-4
GRAS GR1407	Plugs (two) for self-insertion loss verification
GRAS KE0129	Heating control panel, including connectors for the ear simulators and heating elements
GRAS KB0077	Left pinna for 45CB
GRAS KB0078	Right pinna for 45CB
GRAS AB0016	Power supply for the heating system
GRAS YY0023	Hex key, 2.5 mm
GRAS KM0082	Flight case with removable wheels

Optional

GRAS 12AA	2-Channel LEMO Power Module with gain, filters, and SysCheck generator
GRAS 12AQ	2-Channel CCP/LEMO Power Module with Signal Conditioning and Computer Interface
GRAS 42AP	Intelligent pistonphone
GRAS 67SB	Blast Probe according to ANSI S12.42
GRAS RA0157	½” Calibration adapter for KEMAR pinnae
GRAS AA0008	3-m LEMO extension cable
GRAS AA0009	10-m LEMO extension cable
GRAS AA0035	3-m BNC-to-BNC
GRAS AA0037	10-m BNC-to-BNC

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

GRAS Worldwide

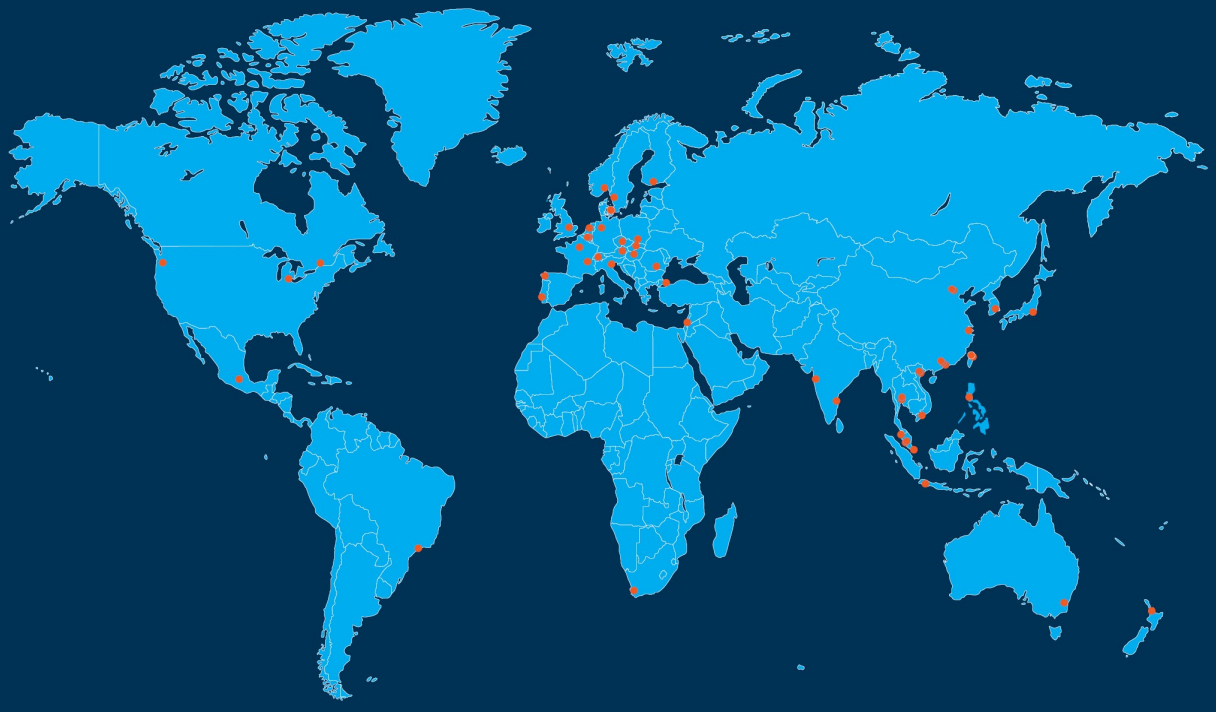
Subsidiaries and distributors in more than 40 countries

HEAD OFFICE, DENMARK
GRAS SOUND & VIBRATION
Skovlytoften 33
2840 Holte
Denmark
Tel: +45 4566 4046
www.GRASacoustics.com
gras@grasacoustics.com

USA
GRAS SOUND & VIBRATION
9290 SW Nimbus Avenue
Beaverton, OR 97008
Tel: 503-627-0832
Toll Free: 800-231-7350
www.GRASacoustics.com
sales-usa@grasacoustics.com

UK
GRAS SOUND & VIBRATION
Unit 115, Gibson House,
Ermine Business Park, Huntingdon,
Cambridgeshire, PE29 6XU
Tel: +44 (0)7762 584 202
www.GRASacoustics.com
sales-uk@grasacoustics.com

CHINA
GRAS SOUND & VIBRATION
Room 502, Building T1,
No.1398 Ali Center
Shenchang Road,
Minhang District,
Shanghai, China, 201107
Tel: +86 21 400-888-9826
www.GRASacoustics.cn
cnsales@grasacoustics.com



About GRAS Sound & Vibration

GRAS is a worldwide leader in the sound and vibration industry. We develop and manufacture state-of-the-art measurement microphones to industries where acoustic measuring accuracy and repeatability is of utmost importance in R&D, QA and production. This includes applications and solutions for customers within the fields of aerospace, automotive, audiology, and consumer electronics. GRAS microphones are designed to live up to the high quality, durability and accuracy that our customers have come to expect and trust.

GRAS Sound & Vibration is represented through subsidiaries and distributors in more than 40 countries and is part of Axiometrix Solutions, a leading test solutions provider comprised of globally recognized measurement brands. Read more at www.GRASacoustics.com

www.GRASacoustics.com

GRAS

An Axiometrix Solutions Brand