

Established in 1998, BSWA Technology is becoming the preferred supplier for acoustical measurements. With headquarter located in Beijing, BSWA currently employs over 100 staffs with branch offices in Shanghai, Guangzhou and Chengdu. BSWA's products are distributed in over 40 countries through our sales partners.

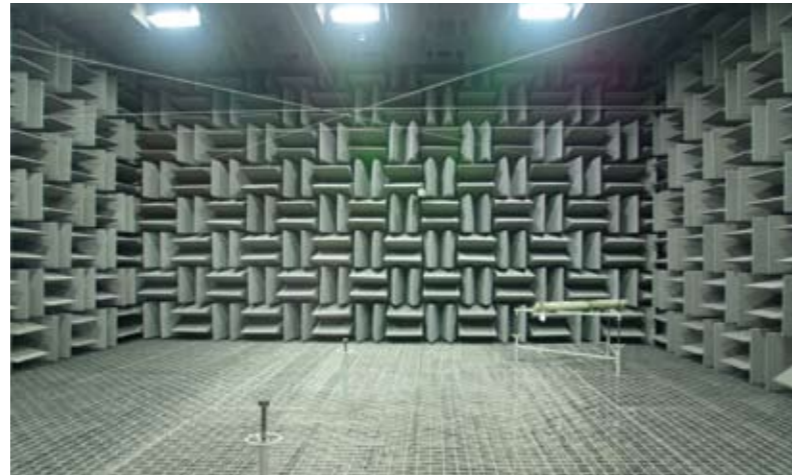
BSWA is fully committed to the Total Quality Management ensuring that every product meets strict standards in performance. BSWA continues to invest in new machine tools, new calibration equipment, and new control methods to further microphone and related equipment technology while reducing manufacturing costs. BSWA was awarded ISO9001 Certificate from TÜV in 2009.

The **Architectural Acoustics Solutions Catalog** reflects BSWA over 10 years experience in room and building acoustic measurements. Rich experiences make BSWA stand out in both manufacturing acoustic products and mapping out complete professional solutions for the customers.

This catalog focuses on the Architectural Acoustics measurement products developed and manufactured by BSWA. The products include VA-Lab analyzer, microphones, Impedance tube, sound level meter, microphones and sound sources.

BSWA manufactures a full range of acoustic measurement products. More information and other products can be found at:

[www.bswa-tech.com](http://www.bswa-tech.com)



## Problems in Architectural Acoustics

Architectural acoustics deals with problems in room acoustics and building acoustics. Typically, room acoustics is related to the quality of sound, e.g. concert hall acoustics, while building acoustics is more related to unwanted sound, i.e. when you want to hear as little as possible of what is going on in adjacent rooms. To deal with such problems, the typical measurements required in architectural acoustics are outlined as below:

### Reverberation Time and Other Parameters

The reverberation time is the most important parameter for the room acoustics. It is very important to design a room with a reverberation time matching the use of the room. A reverberation time too long makes speech intelligibility difficult. ISO 3382 specifies how to measure the reverberation time accurately. The measurement includes the noise-interrupted method and the impulse response method. Although the reverberation time must match the use of the room, this criterion alone is not enough to create what is often referred to as good acoustics. ISO 3382 also specifies the other room parameters, such as EDT, IACC, and G factor.

### Sound Absorption Coefficient of Material

It is necessary for architects to know the sound absorption coefficients of the material when they design the rooms. The coefficients can be tested in an impedance tube according to ISO 10534, or tested in a reverberation chamber according to ISO 354.

### Sound Distribution

A simple measurement of the reverberation time is not sufficient to determine if the acoustics conditions are adequate for the intended use of the room. Sound distribution applies to large rooms where there may be significant differences in the sound quality about the room. The simplest way of looking into sound distribution is by putting up a sound source in the position and then measuring the sound pressure levels at various positions about the room. More sophisticated analysis will include time-domain measurements in order to look for echoes and how the sound is distributed both as a function of time & frequency and as a function of position.

### Sound Insulation

In building acoustics where we concentrate on the noise from the adjacent rooms (or outside) an important parameter is the sound insulation. ISO 140 standards provide details of sound insulation measurement methods for building elements. Both airborne and impact sound insulation are covered by the standards. The sound intensity method can be also used to measure the sound insulation of the material according to ISO 15186.

### Background Noise

The background noise in a room is decided by the sound insulation of the windows and the sound insulation between the rooms. The measurement of background noise includes the dBA, NC and the NR curve. The spectrum analysis is needed in the measurement.

**BSWA Architectural Acoustics Solutions provide the products for your measurement needs.**

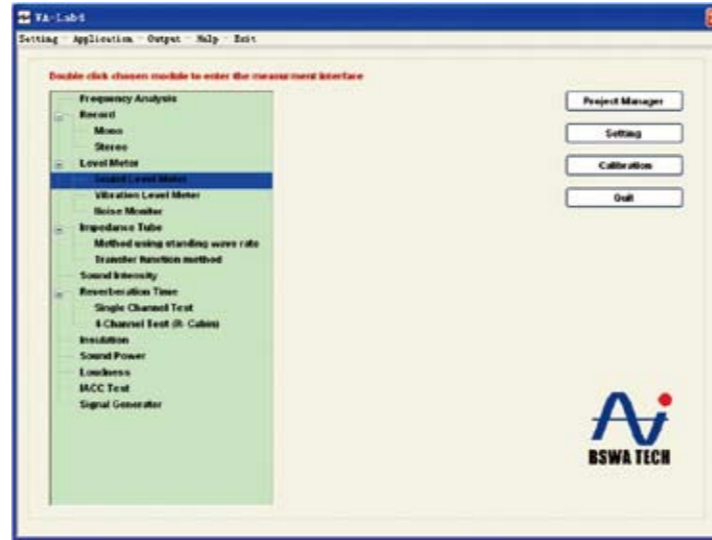
## VA-Lab Software

VA-Lab is acoustical measurement software developed by BSWA. VA-Lab takes the advantage of computer power and performs all signal analysis within the computer. With BSWA Data Acquisition Hardware and Microphones, VA-Lab represents the most cost-effective solution for all your needs in acoustic measurement and analysis.

VA-Lab is developed based on the international standards and BSWA experiences in acoustics. These experiences span from environmental, architectural, material to industrial measurements. VA-Lab has module design with the special applications according to ISO standard requirements, such as Sound Power, Sound Insulation, and Impedance Measurements.

### The VA-Lab Software Modules:

- **BASIC:** FFT based signal analysis for acoustics, including 1/24 ;1/12; 1/3;1/1 Octave; two channel FFT functions; Transfer Function; Cross spectrum; Coherence and Complex FFT; sound recording and playback
- **ENV:** Sound pressure level and environment noise measurements
- **IMP:** Two or four microphone methods for absorption and TL measurements in Impedance tube according to ISO 10534
- **SI:** Sound intensity measurements according to ISO 9614 and ISO 15186
- **REV:** Reverberation time measurements according to ISO 3382
- **TL:** Sound Insulation measurements for building material according to ISO 140
- **POWER:** Sound Power Measurements according to ISO 3745. It supports 2 channels to 20 channels measurement systems. It also supports National Instruments PXI hardware
- **LOUDNESS:** Calculate the loudness according ISO 532 and ANSI S3.4
- **IACC:** Calculate IACC value based on impulse measurements using BSWA BHead230 artificial head



VA-Lab



MC3122



MC3642

## Hardware

### MC3122

MC3122 is a classical Plug-N-Play 2-channel USB data acquisition hardware with two ICCP input channels and two output channels. It is developed for the acoustic measurement in laboratory and field applications. With BSWA VA-Lab software, MC3122 can be used in environmental noise, architectural acoustics, audio test, Impedance testing and sound quality evaluation. MC3122 is developed based on the sound card technology. Each input channel has ICCP power and a gain of  $\times 0.1$ ,  $\times 1$ , and  $\times 10$ .

### MC3642

MC3642 is with four input channels and 2 output channels. It has  $\times 1$ ,  $\times 10$ , and  $\times 100$  gains and with a low background at 18 dBA. MC3642 is connected to a computer via an USB connector.

## SPECIFICATIONS

ARCHITECTURAL ACOUSTICS MEASUREMENT HARDWARE		
Model	MC3122	MC3642
Num. of Input Channels	2	4
Max Input Voltage (Vrms)	2	3.6
ICCP (mA)	4	4
Num. of Output Channels	2	2
Max Output Voltage (Vrms)	1	1
Frequency Response	IEC 61672 Type 2	IEC 61672 Type 1
Type of Input Channel	BNC	BNC
A/D Converter	16 bits	24 bits
Max. Sampling Frequency (Hz)	44.1k	51.2k
Gains	$\times 0.1$ , $\times 1$ , $\times 10$	$\times 1$ , $\times 10$ , $\times 100$ ,
Internal Noise (dBA)	18	18
Range of Frequency Response (Hz)	20 ~ 20k	20 ~ 20k
Measurement Range (MP201) (dBA)	18 ~ 146	18 ~ 130
Connector with Computer	USB	USB
Power Supply	Internal Rechargeable Battery / 220V (with power adaptor)	220V (with power adaptor)

### VA-Lab TL

VA-Lab TL module is developed based on ISO 140 standards. It supports airborne sound insulation measurements between the rooms and partitions. It also supports impact sound insulation measurements using tapping machine (TM002). It can be used with BSWA MF701 to perform spatial average in the room.

#### FEATURES

- Complied with ISO 140 Standards for airborne and impact sound insulation measurements in lab and field
- Build-in pink noise generator
- Automatically Corrected for reverberation time and background noise
- Calculating single value of TL, RW, C, and Ctr according to the standard formulas
- Rating airborne and impact sound insulation according to ISO 717
- Averaging results for multi-samples testing complied with ISO 140 standards

### VA-Lab REV

VA-Lab REV module is developed for Reverberation Time measurements according to ISO 3382. It supports the Interrupted noise method and impulse response method. It also supports ISO 354 standards for measurements of sound absorption in reverberation rooms.

#### FEATURES

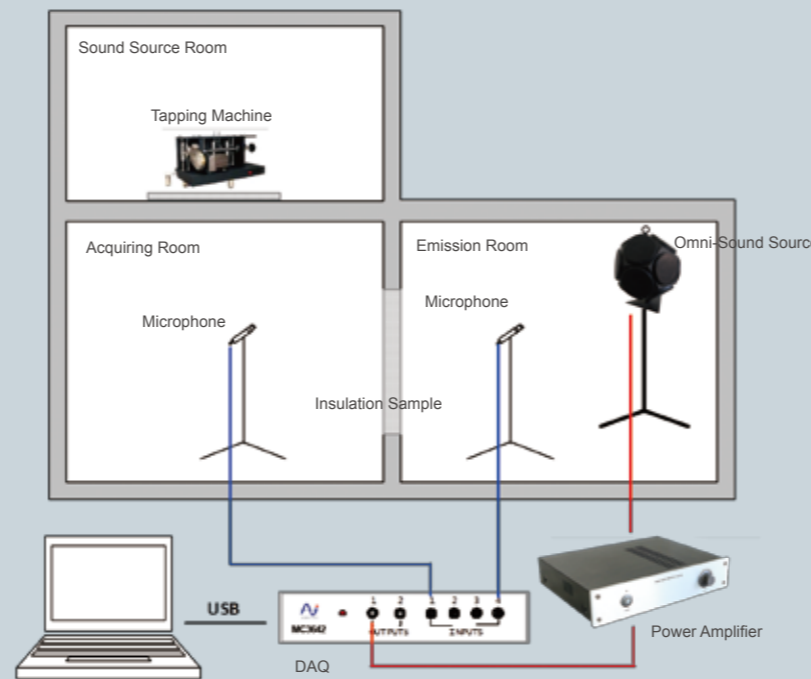
- Complied with the ISO 3382 standards
- Build-in pink noise generator
- Measurement of the reverberation time with 1/1-octave or 1/3-octave
- Automatically calculate the spatial average
- TL calculation based on T30, T20 or user-defined decay rate
- Display the decay curves
- Calculating the sound absorption of the building materials using reverberation time method according to ISO 354



BHead230/248



SI512



Applications

### VA-Lab ENV

VA-Lab ENV module has a powerful sound level meter functions. It supports maximum 10 channel sound pressure level measurements at 10 locations. Each channel can perform multi-task analysis such as statistical levels, 1/3 octave, and levels vs. time.

VA-Lab ENV has built-in data logger function, it can continuously log the overall and spectral data into the memory.

#### FEATURES

- Simultaneously measuring SPL, RMS, MAX, MIN, PEAK, LEQ, SEL, L10, L50, and L90
- A, C, and Z weighting and Fast, Slow, and Impulse
- Graphic display of SPL and spectrum vs. time
- Long time monitoring of sound pressure levels and stored the data in the memory

### VA-Lab SI

VA-Lab SI module is designed to perform Sound Intensity according to ISO 9614. It supports BSWA SI512 Intensity Probe for remote controlled measurements. It supports sound insulation measurements using sound intensity method according to ISO 15186. It also can be used for noise source identifications using sound intensity methods.

VA-Lab SI module provides a simple system for sound intensity measurements. The system requires two-channel hardware and intensity probe SI512. With BSWA VA-Lab SI module, the measurements of sound intensity become very easy task.

#### FEATURES

- Simultaneously measuring the sound intensity and the sound pressure level
- Simultaneously measuring the 1/1-octave and 1/3-octave
- User-defined spacing between the microphones to satisfy the different frequency range
- Automatically calculate the sound power by using sound intensity

### VA-Lab IACC

VA-Lab IACC module is developed for measuring IACC value according to ISO 3382. It requires BSWA BHead230 Artificial Head to provide binaural recordings of the impulse responses in the rooms. The IACC values will be calculated according to ISO 3382.

### Impedance Tubes

BSWA SW series Impedance Tubes can accurately measure sound absorption coefficients and impedance according to ISO10534-2. They also support the sound transmission loss measurements based on the Transfer Function Method. The Transfer Function Method separates the incident and reflected energy from the measured transfer function, and then estimates the acoustic properties of the tested sample installed in the tube.

The SW series Impedance Tubes are specially designed not only to work with the cut samples, but also for direct use in the field. The small size and durable aluminum construction make it easy to be transported and used for estimating the properties of walls, ceilings, installed building materials, road surfaces, different ground surfaces, interiors of vehicles, and etc.

BSWA offers the complete set of Impedance Tube system, which includes: the tubes, microphones; DAQ hardware and measurement software.

BSWA 1/4" microphones MPA416, which have excellent phase matches, are ideal for impedance applications. The microphones are directly connected to optional 2-channel MC3242 or 4-channel MC3642 data acquisition hardware. PA50 power amplifier is used to drive the loud speaker in the impedance tube. The BSWA VA-Lab software provides all measurement functions for sound absorption and transmission loss testing.



### Material Testing System

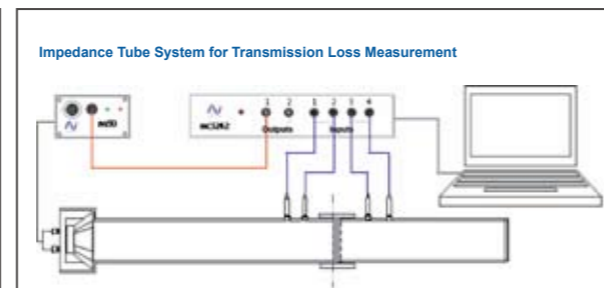
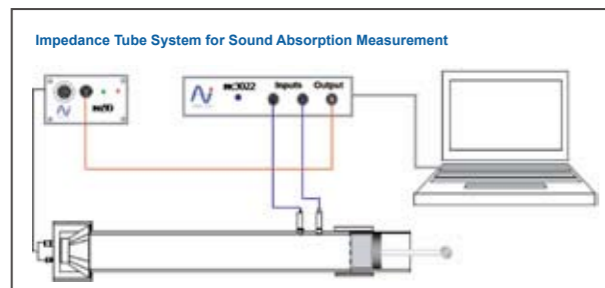
VA-Lab IMP module is developed for impedance tube measurements. It supports sound absorption and sound insulation measurement for BSWA SW series impedance tubes. The software works with BSWA MC3122, MC3242 and MC3642 hardware for data acquisition and analysis.

#### FEATURES

- Supporting Standing Wave Ratio (ISO10534-1) and Transfer Function Method (ISO10534-2)
- Build-in single-frequency noise generator (Standing Wave Ratio) and multi-frequency noise generator (Transfer Function Method)
- Environmental coefficients correction
- Supporting BSWA impedance tubes and user-defined impedance tubes
- Simultaneous measurements of sound absorption, impedance and other parameters in narrow band; 1/3 and 1/1 octave.
- Measurements of sound transmission loss in narrow band, 1/3 and 1/1 Octave.
- Saving and averaging results and report generation.
- Curve fitting the results from large and small tubes.

### SPECIFICATIONS

IMPEDANCE TUBES						
Model	SW230	SW260	SW420	SW470	SW422	SW477
Value to be Measured	Sound Absorption Coefficient ( $\alpha$ )				Sound Absorption Coefficient ( $\alpha$ ) and Transmission Loss(TL)	
Standard	ISO10534-2, 1998				Sound Absorption Standard: ISO10534-2, 1998; Transmission Loss(TL) Standard in Discussion	
Frequency Range (Hz)	125 ~ 3150	125 ~ 6300	63 ~ 1800	800 ~ 6300	63 ~ 1800	800 ~ 6300
Inner Diameter of Testing Tube	60 mm	30 & 60 mm	100 mm	30 mm	100 mm	30 mm
Loud speaker	4 " in diameter, 20 Watts, 8 Ohm					
OPTIONAL ITEMS						
1/4" Microphone	MPA416					
Data Acquisition Card	MC3022+PA50 or MC3522			MC3242 / MC3642		
Power Amplifier	PA50					
Software	VA-Lab2 Basic + VA-Lab2 IMP-A			VA-Lab4 Basic + VA-Lab4 IMP-AT		



### BSWA308

BSWA308 is a low cost Class 1 integrating sound level meter. It complies with the IEC61672 standards. The instrument features an industrially designed housing and offers a high level of comfort and style. The 1/2" measurement microphone (MP231 with MA231T ICCP preamplifier) is equipped with a TNC connector and can be operated or detached from the unit via microphone extension cable.

The BSWA308 has a dynamic range of 102 dB and always measure noise from 29 dBA to 131 dBA in single range. It can measure three parameters simultaneously with the A, C, and Z frequency weightings and with F, S, and I time weightings. In addition, the equivalent continuous sound pressure level, maximum and minimum values are calculated. The integration time for integral sound quantities can be set.

The BSWA308 is ideal sound level sound for general purposes of noise measurements where the Class 1 accuracy is required.



### SPECIFICATIONS

SOUND LEVEL METER BSWA308	
Standard	IEC 61672 Class I JJG Class I
Level Meter	SPL, LEQ, PEAK, MAX, MIN, Simultaneous measuring three profiles with independent sets of filters and detector time constants
Weighting Filters	A, C, Linear
RMS Detector	Fast, Slow, Impulse
Electrical Noise	21 dBA
Measurement Range	29 dBA~131 dBA
Frequency Range	20 Hz~20k Hz
Dynamic Range	102 dB
Input	ICCP type, TNC connector
Display	160 x 160 LCD With backlighting
Power supply	4 AA batteries
Operating Temperature	-10°C ~ 50°C
Humidity	Up to 90%
Size	300 x 70 x 36 mm
Weight	About 620 g

## MPA Series Microphones

BSWA has been engaging in the manufacturing and marketing of microphones for over 12 years. All microphones are hand built and individually tested to meet BSWA's high standards in quality and performance.

### MPA231

MPA231 is the 1/2" prepolarized free-field microphone complied with the IEC61672 Class 1 standard. Its measurement range runs from 17 dB to 136 dB. This model is widely used in the field and lab measurements.

### MPA401

MPA401 is the 1/4" prepolarized free-field microphone, satisfying the IEC61672 standard for Class 1. Its frequency response runs from 20Hz to 70k Hz. MPA401 can measure the sound pressure level up to 155 dB. The small size of MPA401 can reduce microphone's effect on the sound field.

## SPECIFICATIONS

MEASUREMENT MICROPHONES		
Model	MPA231	MPA401
Microphones	MP231	MP401
Polarization Voltage	0 V	0 V
Preamplifiers	MA231	MA401
TEDS functions	Optional	Optional
Standards (IEC61672)	Class 1	Class 1
Optimized	Free Field	Free Field
Diameter	1/2"	1/4"
Frequency Response	20 Hz ~ 20k Hz	20 Hz ~ 70k Hz
Sensitivity	40 mV/Pa	5 mV/Pa
Dynamic Range(3% Distortion Limit)	136 dB	155 dB
Inherent Noise	<17 dBA	<35 dBA
Output Impedance	110 ohms	
Operating Temperature Range	-30°C ~ 80°C	-20°C ~ 80°C
Operating Humidity Range	0 ~ 95% RH	0 ~ 98% RH
Input Connector	BNC	SMB
Power Supply	ICCP	



CA111



MPA231



MPA401

## Sound Calibrators

**CA111/CA114/CA115** is small sound source for calibrating measurement microphones, sound level meters, and other sound measurement equipments. The calibrator can be used on 1/2-inch and 1/4-inch microphones with adaptor.

CA111 conforms to IEC 60942:2003 Class 1, ANSI S1.40-1984 and GB/T 15173-1994.

CA114/115 conforms to IEC 60942:2003 Class 2 standards.

## APPLICATIONS

- Calibration of measurement microphones, sound level meters, and other sound measurement equipments.
- Checking the linearity of equipments.

## SPECIFICATIONS

SOUND CALIBRATORS		
Model	CA111	CA114/CA115
Standard	IEC60942:2003 Class 1, ANSI S1.40-1984	IEC60942:2003 Class 2, ANSI S1.40-1984
Sound Pressure Level	94.0 dB ±0.3 dB and 114.0 dB ±0.3 dB	94.0dB/114.0 dB ±0.4dB
Harmonic Distortion	< 3%	< 4%
Frequency	1000Hz ±0.5%	
Microphone Diameter	According to IEC61094-4: 1/2" & 1/4"	
Stabilization Time	<10 s	
Equivalent Free-field Level	-0.2 dB for 1/2" Microphones	
Equivalent Random Incidence Level	+0.0 dB for 1/2", 1/4"	
Reference Conditions	Ambient Temperature: 25°C (77°F) / Ambient Pressure: 101.3 kPa / Humidity: 55% RH / Effective Load Volume: 250 mm3	
Environmental Conditions	Temperature: -10°C-50°C (14°F -122°F) Pressure: 65 kPa to 108 kPa Humidity: 10 to 90%RH (non-condensing)	
Power Supply	Batteries: 1.5 V LR6 (AA battery) × 2 Lifetime: Typically 40 hours with alkaline batteries at 25°C (77°F)	
Dimension	48*70*70mm	
Weight	180 g, including batteries	

## Omni-Sound Source

### OS002

Omni Sound Source uses 12 matched loudspeakers in a dodecahedral configuration to achieve a spherical distribution pattern satisfying ISO 140-3 and ISO 3382 requirements. When connected to the SWA100 Power Amplifier, OS002 can deliver the remarkable output power of 115 dB.

All 12 specially selected speakers are connected in a series-parallel network to ensure both in-phase operation and matching impedance to the SWA100 Power Amplifier. The OS002 is compact and less than 12" (30 cm) in diameter. With its high output power, it is an ideal choice for sound insulation, acoustic reciprocity, and many other sound source measurements.



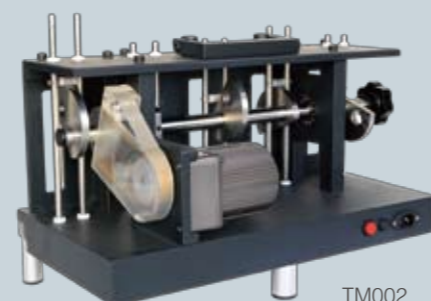
OS002



SWA100



PA50



TM002



MF701

## Power Amplifier

### SWA100

Power Amplifier produces an amazing 100W per channel at 8 Ω for its incredibly compact size and low weight. Its two channels can be used independently of each other. The SWA100 is specially designed to use passive cooling removing the need (and noise) of a cooling fan.

### PA50

PA50 is a single-channel power amplifier with a power at 20W. Designed to be light weighted, PA50 is equipped with protection circuit that other power amplifiers of higher price have. The PA50 is ideal unit for impedance tube.

## SPECIFICATIONS

OMNI-SOUND SOURCE OS002	
Standards	ISO130-3; ISO3382; DIN52210
Nominal Impedance	6 Ω
Power Handling	200 W continuous
Frequency Range	125 Hz ~ 4 kHz
Sound Power Level	115 dB Pink Noise
Connector	Audio Connector
Loudspeaker Units	4" Diameter; 8 Ω; 25 W
Diameter	300 mm
Weight	10 kg
Carrying Case Dimensions	320 x 320 x 320 mm

POWER AMPLIFIER PA50	
Audio Power	20 W
Power Supply	220 V/110 V
Dimensions	270 x 220 x 120 mm
Weight	3.5 kg

POWER AMPLIFIER SWA100	
Audio Power	100 W
Power Supply	220 V/110 V
Dimensions(including case)	495 x 430 x 150mm
Weight	12 kg

TAPPING MACHINE TM002	
Standards	ISO 140, BS5821, GBJ75, ASTM492, EN 20140
Hammers	Five in line, 100 mm between each hammer, single hammer weight 500±10g
Impact Frequency	Each hammer operates at 2Hz; tapping frequency for unit is 10±0.3Hz
Impact Forces	Equivalent free-fall height of hammers 40 mm
Motor	220 V, 50 Hz AC Main, Or 110 V, 60 Hz AC Main Rating Power: 25 W
Dimensions	466 × 250 × 275 mm
Carrying Case	601 × 250 × 275 mm
Net Weight	18 kg (25 kg including the case)
Power supply	110 V or 220 V AC
Fuse	0.5A
Operating Temperature	-10°C ~ 50°C
Operating Humidity	0 ~ 98% RH

STANDARD ITEMS INCLUDED IN TM002	
TM 002	1
Power Cable	1 (Please specify the power plus, UK, USA, Japan, Germany, Australia)
Carrying Case	1
User's Manual	1

## Tapping Machine

### TM002

TM002 Tapping Machine is a rugged, self-contained sound source for making footfall noise measurements to the latest international standards (ISO140, EN 20140, ASTM E492, GB J75-84, etc.).

## FEATURES

- Ergonomic case for easy transportation
- Five 500 g hammers with 40 mm falling heights
- 10 impacts per second
- Solid aluminum base for stable operation
- Reduced machine noise via belt drive
- Long lasting industrial drive motor
- No metal-to-metal moving parts resulting in less wear and smooth operation
- Both 220V AC and 110V AC powered units available

## Rotation Stand for Microphone

### MF701

MF701 is a microphone rotation stand designed according to ISO140 and B19889. It is used for measuring space-averaged sound pressure level in the reverberation rooms. The MF701 rotates the microphones in the cycle motion. The microphones can be fixed on the arm in the MF701. The rotation speed is adjustable from 1 to 10 Rev/min.