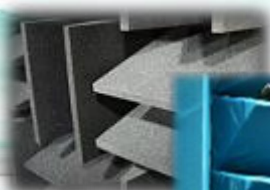
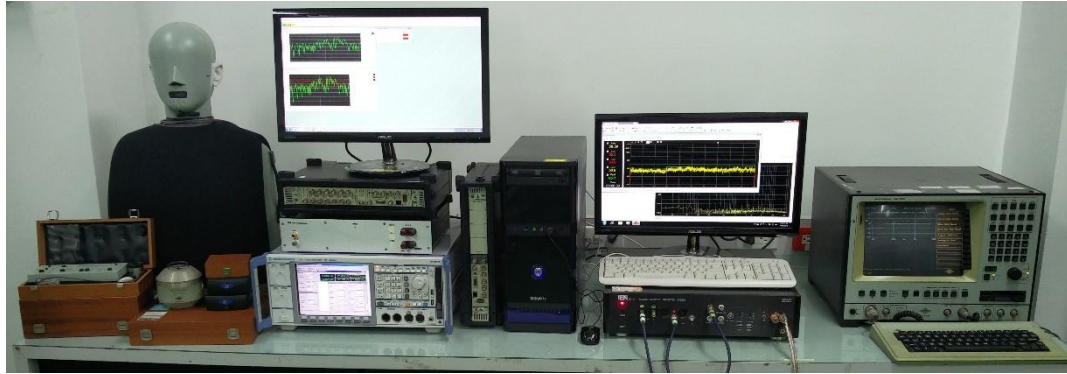


# OBO Pro.2 INC. OBO Electro-Acoustic Laboratory Profile



# OBOPro.2 Anechoic Chamber



# OBO Pro.2 Anechoic Chamber Certificated

## 無響室檢驗報告 Anechoic Chamber Test Report

委託單位(Entrusts by):  
啓弘電子股份有限公司  
OBO PRO.2 INC.

測試單位(Test by):  
易緯達科技有限公司

IEA Electro-Acoustic Technology Co., Ltd.

監督單位: 國立台北科技大學 劉興華 教授

### Test and Measurements Report 測量報告

Report No. 報告編號: AC-18827A	Page 頁次: 1 of 11		
EQ. NO. 儀器編號:	Anechoic Chamber 無響室	Applicant Dept. 申請者/部門: OBO PRO.2 INC. 啓弘電子股份有限公司	
Use Description 使用儀器名稱:	LEA-2 with CLEO Measurement System 2; B&K 4231 Sound Level Calibrator; 3. GRAS 40HL Low Noise Free Field Microphone 4. GRAS 46AE Free Field Microphone		
Manufacturer 製造商:	易緯達科技有限公司	Serial No. 序號: None	
Measurement Date 測試日期: May/26/2015	Start/End Date 測試日期: NONE	Procedure Used 測試標準: ISO-3744	
Conditions of measurement 測試環境條件:	Temp. 溫度: 25 ± 1 °C	Humidity 相對濕度: 55 ± 5%	
Equipment No. 儀器編號:	MFG Model No. 製造商/型號:	Description 儀器名稱:	S/N 序號:
GRAS 40HL	GRAS 40HL	1/2 inch Low Noise Microphone	122499
GRAS 46AE	GRAS 46AE	1/2 inch Standard Microphone	196039 & 212248
B&K 4231	B&K 4231	Sound Level Calibrator	2498806
IEA EA-2	IEA EA-2	Electro-Acoustic Measurement System	2106131437
B&K 5935L	B&K 5935L	Microphone Power Supply	1628043
Tannoy System 800	Tannoy System 800	Loudspeaker	1231365
Measurement Parameters 測量參數:	Calibration Source 校正機構:	Cal. Report No. 校正報告號碼:	S/N and Model 序號與型號:
AC Voltage True-rms	PINK Technology	P211064-C	34401A
Frequency	PINK Technology	P211063	MY470630072 33210A MY48011316

說明:  
1. This test report certifies that equipment noted here in has been compared with the above listed standards. The standards used to perform this calibration are traceable to PINK Technology ISO-17025 TAF Laboratory.  
本測試報告內記載之受校儀器已與上列標準機構比較校正, 所以該受校之標準儀器可追溯至品客科技ISO-17025 TAF實驗室。  
2. This test report is valid only to the items calibrated. Reproduced calibration report in partials not effective. 本測試報告僅適用於受校儀器之測試項目有效, 且本報告部份複製無效。

Tested by: TAF-17025 No. TAF-CNLA-ZY96121 Dept. Manager: TAF-17025 No. TAF-QM99024-C-05  
測試者: 陸泰忠 測試主管: 劉興華

### Test and Measurements Report 測量報告

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3.1 Anechoic Chamber Inside Background Noise:  
Test Position Statement:

### Test and Measurements Report 測量報告

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Test Result:

Test Position	Measurement dB SPL (A-Weighting) LEQ 30 sec
Test Position-C	11.47
Test Position-1	11.66
Test Position-2	11.84
Test Position-3	11.26
Test Position-4	11.60
Overall Average	11.67

Test Position-C: 11.47 dB SPL (A-Weighting)

### Test and Measurements Report 測量報告

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3.2 Acoustical Isolation Ability

80.70 dB SPL - 29.24 dBA = 51.46 dBA (≥ 50 dBA)

A. Reference Sound Source Pink Noise Spectrum Level 80.70 dB SPL  
B. Close Door Inside Background Noise Level 29.24 dBA

### Test and Measurements Report 測量報告

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3.3 Satisfy the inverse square.

Satisfy the inverse square of the frequency range (150Hz ~20kHz), the table is specified in ISO 3745 free field allowable deviation range, the maximum deviation is within the standard permit.

Test Type	1/3 Octave Center Frequency	Allowable Deviation
Anechoic Chamber	≤ 630Hz	±1.5
	800-5000	±1.0
	≥ 6200	±1.5

Inside space(L*W*H)	241*241*197cm
Outside space(L*W*H)	362*361*386cm
Satisfy to inverse square range	150Hz~20kHz
Integrated Isolation Ability (When 80dB Pink Noise Outside)	≥50dB (B&K/GRAS Low Noise System measurement)
Background noise(outside environment noise≤70dB(A))	≤20dB(A)
Cut off frequency	≤150Hz
Frequency of float floor	≤10Hz

# International Standard List

- **IEC-Standard**

- IEC 60268-1, Sound system equipment – Part 1: General.
- IEC 60268-3, Sound system equipment – Part 3: Amplifiers
- IEC 60268-4, Sound system equipment – Part 4: Microphones
- IEC 60268-5, Sound system equipment – Part 5: Loudspeakers

- **BSI-Standard**

- EN50332-1:2000
- General method for “one package equipment.
- EN50332-2:2003
- Matching of sets with headphones if either or both are offered separately.

- **ISO-Standard**

- 7779:2010
- specifies procedures for measuring and reporting the noise emission of information technology and telecommunications equipment.

- **ITU-T-Standard**

- ITU-T P.800, Methods For Subjective Determination of Transmission Quality
- ITU-T P.862, Perceptual evaluation of speech quality (PESQ): An objective method for end-to-end speech quality assessment of narrow-band telephone networks and speech codecs

# Brüel & Kjær PULSE Type 3560-C Portable Data Acquisition Unit

- **B&K PULSE Type 3560-C** is a portable data acquisition system with a battery/DC powered Type 2827 power supply unit. It can hold any combination of 1 Controller Module and 1 Input/Output Module (see Fig. 1 and Table 1). The controller module handles communication with the PC while the input/output module handles measurement input and provides a sample clock. As an example, a Type 3560-C fitted with a 5/1-ch. Input/Output Controller Module Type 7537 and a 12-ch. Input Module Type 3038 can measure up to 17 input channels.



050151

- **Features**

- Houses one input/output module and one controller module
- Robust casing for industrial and hard everyday use
- Rain cover for front panel allows passage of cables
- Battery operated or DC powered (10-32 V)
- Cooling fans can be turned off for silent operation (will automatically restart if too hot)
- Synchronous sampling with other PULSE front-ends

# Brüel & Kjær 2012 - Audio Analyzer

## • Uses

- Development and quality control testing of electroacoustic and vibration transducers: loudspeakers, telephones, headphones, microphones, hearing-aids, hydrophones, accelerometers
- Linear and non-linear system analysis
- Propagation path identification
- Acoustical measurements in rooms and vehicles



## • Features

- Transducer workstation combining the most advanced sine sweep and FFT techniques
- 12" high-resolution colour monitor displays up to 36 curves simultaneously
- Frequency range: 1Hz to 40kHz
- Distortion and noise: <-80 dB re full scale input
- Fast time selective measurement of complex frequency and impulse response
- Steady-state response measurements as a function of swept frequency or level

# IEA EA-2 Electro - Acoustic Integrated System(CLIO)

- **EA-2, by IEA Electro-acoustic Technology Co., Ltd, is the new exciting measurement.** Software combined for the NEW System from Audiomatica CLIO system. The System is the easiest and less expensive way to measure:
  - Transducer analysis
  - Electrical networks
  - Electronic equipment
  - Loudspeaker systems
  - Telephones & hearing aids
  - Environmental noise
  - Rooms acoustics
  - Quality of production lines



- **EA-2 Basic on a High Performance PC computer includes driving the measurement.** Hardware and accessories supplied by IEA & DSP from Italy; the power, precision and reliability of the resulting instrument is 100% warranted.

# IEA EA-2 Electro - Acoustic Integrated System(CLIO)

## • GENERATOR

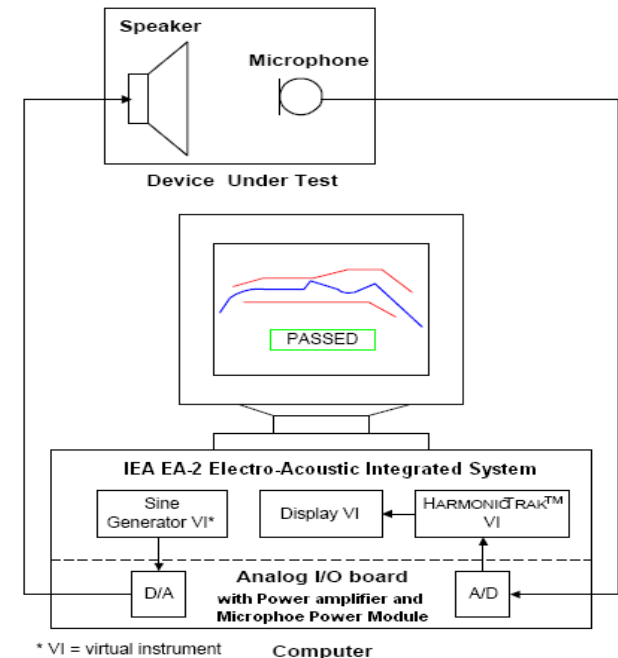
- Two channels 24 Bit sigma-delta D/A Converter
- Frequency range: 1Hz-90kHz
- Frequency accuracy: >0.01%
- Frequency resolution: 0.01Hz
- Output impedance: 660Ohm
- Max output level (Sine):17dBu (5.5Vrms)
- Attenuation: 0.1 dB steps to full mute
- THD+Noise(Sine):0.008%

## • ANALYZER

- Two channels 24 bit sigma-delta A/D Converter
- Input range: +40 ÷ -40dBV
- Max input acceptance: +40dBV (283Vpp)
- Input impedance: 128kOhm (5.6kOhm mic)
- Phantom power supply: 24V

## • MISCELLANEOUS

- Sampling frequency: 192kHz, 96kHz and 48kHz .
- Audio connections: 2 XLR combo analog input, 2 XLR plus 2 RCA analog output
- SPDIF Output x 1





# Metrico MUSE PESQ (MOS) Analyzer System

**Metrico Wireless Muse™** is a complete system for the evaluation of wireless handset voice quality performance. Muse is designed for effective use in the field. The system efficiently manages the repetitive audio sourcing and recording process and provides real-time audio quality scores using PESQ P862.1 MOS. Collected information is stored in a comma delimited file that contains GPS time and location information for each record.

Software included with the Muse system is used in the field (mobile) and landline (base) locations to provide real-time downlink and uplink voice quality performance information, as well as to summarize captured audio quality results.



# Brüel & Kjær 4226 - Multifunction acoustic calibrator

- **Multifunction Acoustic Calibrator Type 4226** enables simulated free-field calibration of microphones, sound level meters and other related instruments. Type 4226 generates accurate and stable sound pressure with a frequency varying from 31.5 Hz to 16 kHz in octave steps, plus a signal at 12.5 kHz.
- Using the coupler provided, the test signal can be applied to either ½-inch or ¼-inch microphones, or picked up from an electrical output. For ease of use, Type 4226 can also apply a very accurate inverse A-weighting correction.
- An external generator can be connected to Type 4226 if a frequency sweep or semi-automatic test is desired.

## • Uses

- Simulated free- and diffuse-field calibration of microphones
- Verification of ½" and ¼" microphone setups and acoustic instruments conforming to IEC 60651 and ANSI S 1.4-1983
- Verification of instruments according to parts of IEC 61672



## • Features

- Conforms to EN/IEC 942 1988 Class I and ANSI S 1.40 – 1984
- Wide frequency range: 31.5 Hz to 16 kHz in octave steps, plus 12.5 kHz signal
- Calibration levels of 94 dB, 104 dB and 114 dB
- Free-field simulation for most ½" Brüel & Kjær microphones
- Inverse A-weighting
- Recurrent pulses for time-weighting and burst signal checks

# G.R.A.S. RA0045 Externally Polarized Ear Simulator According to IEC 60318-4 (60711)

- **The G.R.A.S. RA0045** is an ear simulator with an input impedance closely resembling that of an average human ear. It includes a 40AG pressure microphone and each RA0045 is individually calibrated with this specific microphone.
- It meets the requirements of IEC 60318-4 "Occluded-ear simulator for the measurement of earphones coupled to the ear by ear inserts."
- It is measured and calibrated according to the ITU-T Recommendation P.57 (08/96) "Series P: Telephone transmission quality, Objective measuring apparatus: Artificial ears".
- The RA0045 is also part of the G.R.A.S. Artificial Ear Type 43AC. It can also be used with either of the Pinna Simulators RA0056 or RA0057 to simulate a complete ear for testing telephones and loudspeakers.



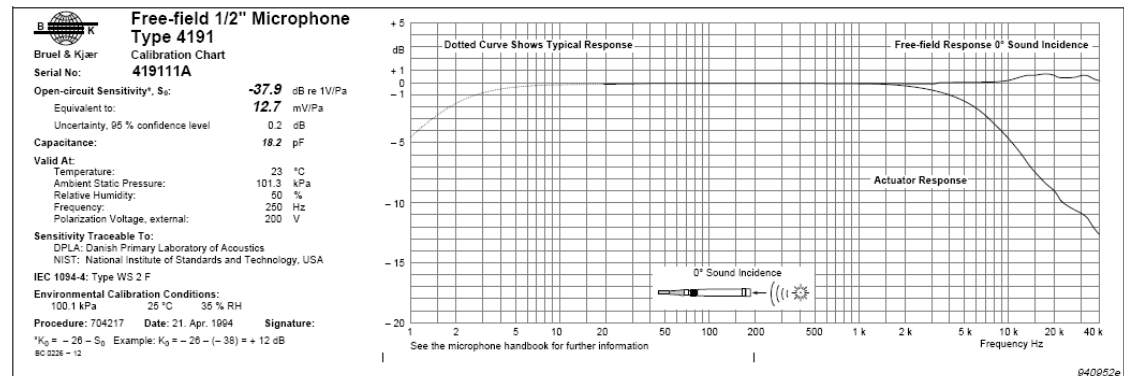
# Brüel & Kjær / G.R.A.S. Microphone System

- **Free-field 1/2 Microphone Type 4191**

- Has an extended frequency range which is from 3.15 Hz to 40 kHz. This makes it very well suited for electro-acoustic measurements on loudspeakers and microphones as well as for general precision sound measurements.

- **Free-field 1/2 Microphone GRAS 40HL**

- The 1/2" microphone is an externally-polarized free field microphone with a specially reduced inherent noise floor in order to achieve a high dynamic range and wide frequency range. Its diaphragm is specially tuned to yield high sensitivity coupled with low internal-noise



## Microphone Preamplifier — Type 2669

# Brüel & Kjær 2690 - Microphone Power Supply

## • Uses

- Specially suited for automotive use. Developed in association with major car manufacturers, for high-quality field and laboratory measurement systems
- Used with charge accelerometers, hydrophones, force transducers, condenser microphones, DeltaTron™ accelerometers, DeltaTron™ preamplifiers, voltage input and sound intensity probes
- Field recording of vibration and acoustic signals
- Specially suitable for applications where shocks and impulses occur such as gas turbine testing and munitions testing (Types 2692-C and -D only)



## • Features

- Highly flexible construction – 1, 2, 3 or 4 channel configurations, or a combination of acoustic and vibration transducer inputs is possible
- High input signal range. Low noise. Extensive overload facilities
- Supports transducers with TEDS according to IEEE 1451.4
- Available for: charge, microphone, sound intensity, DeltaTron™ and very high input
- Compact robust design and battery operation makes it suitable for use in the field (and in the laboratory)
- Serial control interface (RS-232) allows computer control of setups and test functions. A large number of amplifiers can be controlled from a single PC
- High accuracy due to reliable construction and a wide range of calibration options. Built-in patented Charge Injection Calibration (CIC) and patented Mounted Resonance Testing
- Wide range of filters that can be set up for specific tasks
- Rack-mounting fittings available

# Brüel & Kjær 4227 - Mouth Simulator

- **Mouth Simulator Type 4227** is designed to test telephone transmitters and other microphones where a sound field similar to the human voice field is required. Also used as accurate reference source for near field testing of handsets and microphones.
- Provision exists for fitting a microphone at the mouth opening, for use in a compressor loop to give constant sound pressure output. Accurate calibration is facilitated by a calibration jig provided with this product.

## • Uses

- Quality control testing of frequency response and distortion of telephone transmitters and close-talking microphones
- Sound source for acoustic measurements

## • Features

- Accurate simulation of human voice field
- Continuous SPL of 110 dB at 25 mm from lip ring
- Low distortion
- Built-in overload protection circuit
- Optional regulating microphone for very accurate frequency response control
- Calibration Jig included
- Conforms to Standards: IEEE 269, 661 and ITU-T Rec. P.51



# Brüel & Kjær 4128D - Head and Torso Simulator (HATS)

**Head and Torso Simulator (HATS) Type 4128D** is a manikin with built-in ear and mouth simulators that provides a realistic reproduction of the acoustic properties of an average adult human head and torso. It is designed to be used in-situ electro acoustics tests on, for example, telephone handsets, headsets, audio conference devices, microphones, headphones, hearing aids and hearing protectors.

- **Uses**

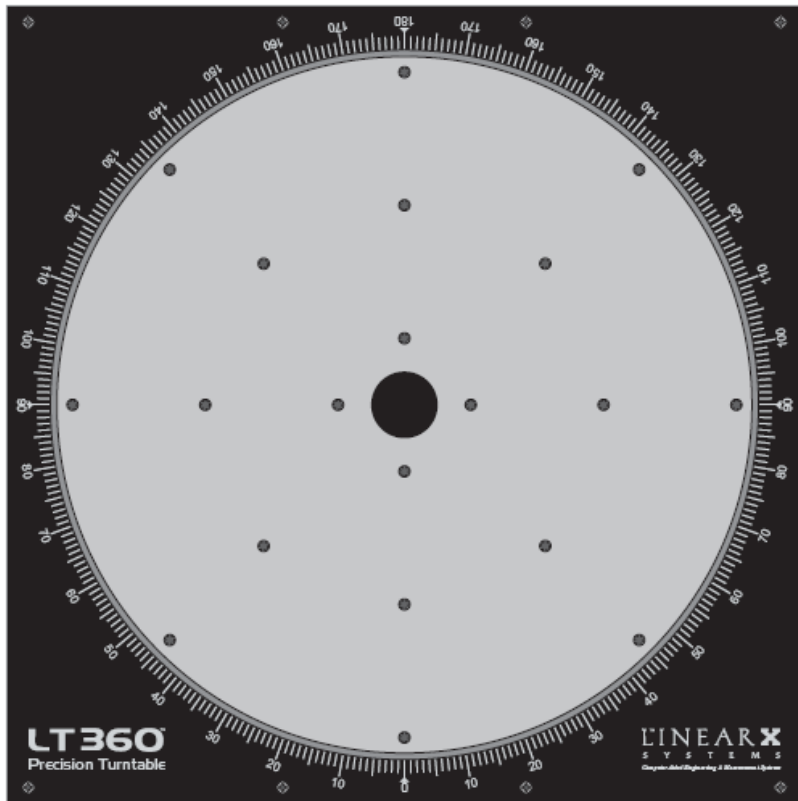
- Telephone handsets (including mobile and cordless)
- Headsets
- Audio conference devices
- Microphones
- Headphones
- Hearing aids
- Hearing protectors



- **Features**

- Complies with ITU-T Rec. P.58 and ANSI S3.36-1985
- Conforms to the acoustic specifications of IEC 60318-7
- Highly representative mouth simulator with overload protection
- Supplied standardised Right Ear Simulator Type 4158C fulfils ITU-T P.57 and IEC60318-4
- Optional Left Ear Simulator Type 4159C
- Adjustable neck angle for realistic hands-free telephone measurements
- Soft pinnas

# Precision Turntable System LT-360EX



## • Applications

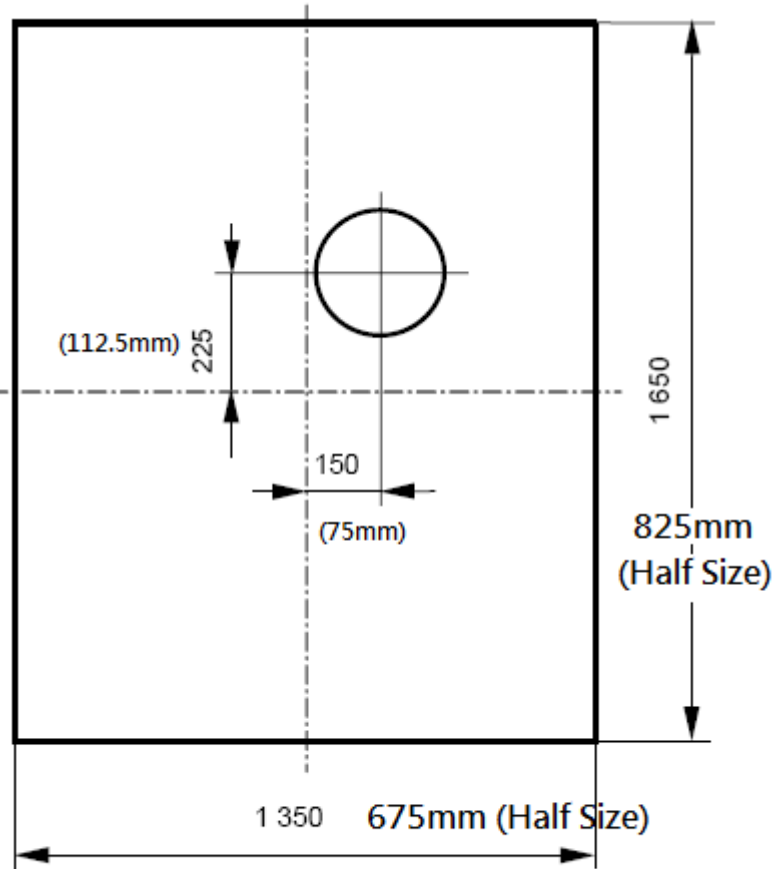
- Polar Field Acoustic Measurements  
Loudspeakers, Microphones, Enclosures
- Polar Field EM & RF Measurements Antennas,  
Radiated EMI Testing
- 3D Model Scanning, Laser positioning
- Industrial Automation & Process Control
- Sales/Marketing & Trade Show Displays

## • Features

- Heavy Duty, Rugged, Reliable Construction
- Precise, Repeatable, Rotational Control
- Resolution of  $0.1^\circ$ , Accuracy of  $0.05^\circ$
- Large Axial Bidirectional Load Handling
- Large Radial or Off-Center Load Handling
- High Torque with Programmable Capability
- Stable Low Profile Square Base Foot Print
- Machined Aluminum Cast Platter & Base
- Irreversible Drive, Platter Position Locked
- Programmable Velocity 0.3RPM - 3RPM
- Controlled Acceleration/Deceleration
- Precision Worm Gear Drive System
- Micro stepping Stepper Motor Control



# IEC-60268-5 Test Baffle Half Size



**Standard baffle, dimensions**  
*Dimensions are in millimetres*

Q&A  
Thank You