PRODUCT DATA

Sound Quality Head and Torso Simulator Types 4100 and 4100-D

Uses

- In-vehicle NVH recordings using Sonoscout™ System Type 3663
- Recording vehicle noise for sound quality evaluation and testing
- Recording noise from domestic appliances, office equipment, etc., for sound quality optimisation
- Recording noise from sub-suppliers' products and components to evaluate and optimise their sound quality
- Evaluation of headphones/hearing protectors where a blocked ear canal is desired
- Binaural sound and music recording

Features

- Directivity optimised for sound-image localisation
- Type 4100 includes Preamplifier Type 2669-L with CIC facility
- Type 4100-D includes CCLD Preamplifier Type 2671
- High sensitivity, low noise, ½″ free-field microphones
- IEEE P1451.4-capable transducers with Transducer Electronic Data Sheet (TEDS)
- Manikin with surfaces and pinnae modelling the geometry of the average adult head and torso
- ITU–T compliance with the acoustic requirements of ITU–T Rec. P.58, IEC 60318-7 and ANSI S3.36-1985, except for exclusion of the ear canal
- Adjustable neck angle
- Light and robust
- Accredited calibration available

Description

Sound Quality Head and Torso Simulators Types 4100 and 4100-D are manikins designed for sound quality testing.

Two microphones, positioned at the entrances to the ear canals on the manikin's head, simulate the spatial separation from ear to ear of a human head and ensure a signal that includes the interference patterns caused by the head and upper body. This gives an extremely accurate three-dimensional recording.

Two moulded-silicone pinna simulators encase the microphones to provide directivity patterns similar to the human ear.

The simulator has a sound-dampening fabric cover which slips easily over the manikin's neck. This assists in changing the reflections from the body and shoulders to obtain the correct directivity.

The HATS Car Seat Fixture WA-1647 ensures that the simulator is in the correct position in the seat and the position of the head can also be adjusted by turning the neck ring so that the head looks straight forward, or slightly down at an angle of 17°.

Microphones are easily installed or removed by screwing or unscrewing them from the ear cavities.

Types 4100 and 4100-D contain IEEE P1451.4-capable transducers with standardised TEDS. This feature allows automatic front-end and analyzer setup, based on information stored in the transducer. This information includes, for example, sensitivity, serial number, manufacturer and calibration date.

Sound Quality

The sound quality of the noise from a product, as perceived by a human being, is an increasingly important factor when assessing the total quality of the product.

This applies to all forms of transport: vehicles, aircraft, trains and ships. Household and office machinery products are also increasingly subject to the optimisation of their sound quality.

Sub-suppliers of products and components to the above-mentioned industries are often required to include an acceptable sound quality as a part of the product specifications.

Brüel & Kjær

Subjective Listening Tests

The final evaluation of the sound quality of a product is normally made using a selected group of people – a jury in a listening test.

To have the jury listen to the sound in reality, for example each jury member driving a car and then reporting on the sound quality, is very time-consuming and costly. To overcome this, Type 4100 can be used to make a high-quality binaural recording of the product's noise, which can be saved to a mobile device or PC. This can then be simultaneously presented to all members of the jury off-site.

To avoid bias errors in this process, it is important that the acoustic properties of the recording and playback are as accurate as possible. Types 4100 and 4100-D have therefore been designed to have a frequency response to sounds coming from all directions which closely approximates the direction-dependent human response, and to have inter-aural time differences very close to those of the average person.

System for Sound Quality Optimisation

Quite often, the first sound quality evaluation of a product, as perceived by a jury, is not satisfactory. Therefore, the recorded signals from Types 4100 and 4100-D can be modified using a wide range of time/frequency domain editing techniques using a sound quality software program, such as Sonoscout System Type 3663 (NVH recording system). The modified signals can then be compared with the original, by the jury, in a listening test. If the modified signal is preferred, information on the changes in the noise can be used by the product designer to obtain – by physical changes – improved sound quality.

Specifications – Types 4100 and 4100-D

Type 4100

MICROPHONES AND PREAMPLIFIERS

Two Type 4190-L-002 microphone/preamplifier assemblies with built-in TEDS, each comprising a ½″ Free-field Microphone Type 4190* placed in the bottom of the concha, and Preamplifier Type 2669-L* with charge injection calibration (CIC) facility and LEMO connector

Microphone Sensitivity: 50 mV/Pa. Individually calibrated

Upper Limit of Dynamic Range: 148 dB SPL at 3% distortion

Max. Sound Pressure Level:

159 dB peak with Preamplifier Type 2669-L and mains driven power supplies

138 dB peak with Preamplifier Type 2669-L and battery power supplies

Preamp. Lower Limiting Frequency: <2 Hz (–3 dB)

*See Product Data BP 2211 (Type 4190), BP 1422 (Type 2669), BP 2210 (Type 4189) and BP 1446 (Type 2671) for details

Type 4100-D

MICROPHONES AND PREAMPLIFIERS

Two Type 4189-A-002 microphone/preamplifier assemblies with built-in TEDS, each comprising a ½″ Free-field Microphone Type 4189* placed in the bottom of the concha and a CCLD Preamplifier Type 2671* with BNC connector

Microphone Sensitivity: 50 mV/Pa. Individually calibrated

Upper Limit of Dynamic Range: 146 dB SPL at 3% distortion

Max. Sound Pressure Level: 138 dB peak with CCLD Preamplifier Type 2671

Preamp. Lower Limiting Frequency: <12 Hz (–3 dB)

Common Specifications – Types 4100 and 4100-D

PINNA SIMULATOR

Dimensions similar to those specified in ITU–T Rec. P.58, IEC 60318-7 and ANSI S3.36-1985, except for the ear canal extensions

HEAD AND TORSO SHAPES

The main dimensions comply with the dimensional requirements of ITU–T Rec. P.58 and the reports from IEC 60318-7 and ANSI S3.36-1985

SHOULDER DAMPING FABRIC

The shoulders, chest and back are covered with a damping fabric to adjust diffraction. The fabric has a minimum of 10% absorption in the range of 100 Hz to 20 kHz

LEFT/RIGHT EAR TRACKING

±1 dB up to 5 kHz

±3 dB up to 8 kHz

CALIBRATION

Sensitivity calibration can be made using a calibrator or pistonphone with Calibration Adaptor DP-0887

DIMENSIONS AND WEIGHT

Head Height: 700 mm (27.6″)

Torso: 480 × 440 × 210 mm (18.9 × 17.3 × 8.3″)

Weight: 7.9 kg (17.4 lb.)

CE Compliance with EMC Directive and Low Voltage Directive of the EU

Compliance with the EMC requirements of Australia and New Zealand

Ordering Information

Type 4100 includes the following accessories:

- BC-0200: Calibration Chart
- DP-0887: Calibration Adaptor
- UA-1043: Support Leg
- UA-1052: Handle
- UC-5290: Tripod Mounting Adaptor
- 2 × Type 4190-L-002 Microphone/ Preamplifier Assembly

Type 4100-D includes the following accessories:

- BC-0200: Calibration Chart
- DP-0887: Calibration Adaptor
- UA-1043: Support Leg
- UA-1052: Handle
- UC-5290: Tripod Mounting Adaptor
- 2 × Type 4189-A-002 Microphone/ Preamplifier Assembly

OPTIONAL ACCESSORIES

WA-1647	HATS Car Seat Fixture
WQ-2701	Heavy Duty Tripod
Type 3663	Sonoscout System
Type 7698	PULSE Sound Quality

CALIBRATION OPTIONS

CAI-4100	Accredited Initial Calibration
CAI-4100-D	Accredited Initial Calibration
CAF-4100	Accredited Calibration
CAF-4100-D	Accredited Calibration
TCF-4100	Conformance Test
TCF-4100-D	Conformance Test

BP 1436–14 2013-04

Local representatives and service organisations worldwide

Brüel & Kjær