

SOUND QUALITY

Optimisation of Sound Quality has become an increasingly important activity in the design and development of all products that emit noise, for example, automobiles, trains, airplanes and all kinds of household appliances.

There are two distinct reasons for optimising sound quality – firstly, to optimise the sound to satisfy the specific customer group; secondly, to increase the product’s competitiveness and sales. Most products include a variety of individual components from different sub-suppliers. These must satisfy quality requirements including those for sound performance.

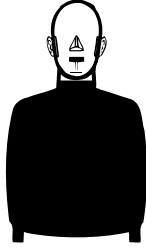
The optimisation process involves the following steps:

- Recording of sounds on site, e.g., in a car on a test track using a Head and Torso Simulator
- Analysing the sounds in a laboratory using both traditional methods and specific objective metrics such as Zwicker Loudness
- Simulating changes in the sounds using a number of edits
- Preparing and conducting subjective listening tests
- Creating product-specific Combination Metrics to cut development time and cost


Brüel & Kjær offers complete systems from the simplest to the most advanced




Picture Courtesy of Volvo




4100 or 4100 D
Sound Quality
Head and Torso
Simulator




UA 1324
Positioning Frame



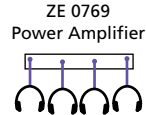
4101
Binaural Microphone




AO 1458 Stereo Jack Plug – 2 x BNC Male Cable (1m)
AO 1469 Mono Jack Plug – BNC Male Cable (1m)
JP 0352 Stereo Jack Plug – Stereo Mini Jack
JP 0070 Phono – BNC Connector
AO 0508 Mini Jack Male – 2 x Phono Male Cable



4231
Sound Level
Calibrator



ZE 0769
Power Amplifier



4189
Free-field 1/2-inch Microphone
with 2671 Preamplifier

020220

SOFTWARE OPTIONS

- BZ 5265** Zwicker Loudness Option
- BZ 5277** Order Analysis Option
- BZ 5301** Psychoacoustic Test Bench

MICROPHONES AND HATS

- 4189-L-021** Free-field 1/2-inch Microphone with 2671 Preamplifier

4100/4100 D Head and Torso Simulator

- 4101** Binaural Microphone
- UA 1324** Positioning Frame

CALIBRATORS

- 4231** Sound Level Calibrator

PLAYBACK SYSTEM

- ZE 0769** Power Amplifier
- HT 0012** Headphone
- ZE 0770-A** Sound Card

CABLES

- AO 1458** Stereo Jack Plug – 2 x BNC Male Cable (1 m)

AO 1469

Mono Jack Plug – BNC Male Cable (1 m)

JP 0352

Stereo Jack Plug – Stereo Mini Jack

JP 0070

Phono – BNC Connector

AO 0508

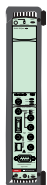
Mini Jack Male – 2 x Phono Male Cable AO 0508

TYPE 3560 C-S19

Sound Quality (1 In)

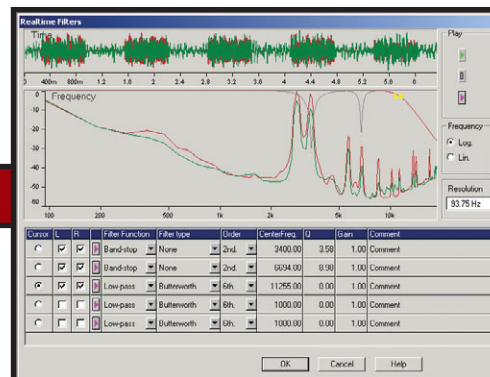
3560 C
7533
7701
7698
7700-N2
BZ 5265

- Low-cost solution for Sound Quality
- Uses a single free-field or diffuse field microphone for CCLD input
- Suitable as a starter configuration and with upgrade possibilities for more advanced solutions



* One year SW maintenance

There are 17 different ways to edit or modify sound signals. The real-time filter tool uses IIR filters. After a parameter change you can immediately listen to the change in sound by just using the cursor



TYPE 3560 C-S20

Sound Quality – Binaural Recording (2 In)

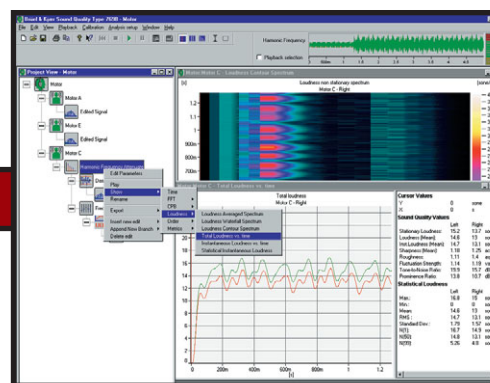
3560 C
7533
7701
7698
BZ 5265
3109
7700-N2

- Supports Zwicker Loudness and all related metrics
- Binaural recording using a Head And Torso Simulator (HATS) or the Binaural Microphone
- Recommended solution for serious Sound Quality work



* One year SW maintenance

With the Zwicker Loudness option a large number of metrics can be calculated and displayed. Here you see a non-stationary Loudness contour plot, a graph showing Total Loudness vs. Time and a table of calculated Metrics



TYPE 3560 C-S21

Sound Quality – Binaural Recording, Order Analysis (4 In)

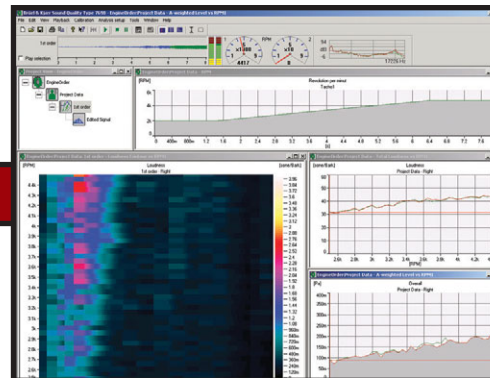
3560 C
BZ 5265
BZ 5277
BZ 5301
7533
3109
7701
7698
7700-N4

- Features input for two separate Tacho signals
- Tacho signal embedded in the 16th bit of the audio signal also possible
- Offers Order Attenuate and Order Pass Band editing facilities
- Metrics such as Loudness, Roughness, Fluctuation Strength, etc., can be displayed as functions of RPM



* One year SW maintenance

Here is an RPM profile vs. Time. Below a contour plot of Specific Loudness, graph of Total Loudness and A-weighted Level – all vs. RPM



OPTIONAL

Psychoacoustic Test Bench

BZ 5301

- Offers fully automated Subjective and Objective tests to calculate Combination Metrics
- Combination Metrics are formulas consisting of a selected set of individually weighted standard metrics. They very accurately describe (objectively) the preferences for a specific product and listener group
- This option requires Zwicker Loudness option



The use of Psychoacoustic Test Bench can create Combination Metrics with very good correlation between the actual preference and the calculated preference. Here's an example using 12 hairdryers

