

PRODUCT DATA

Protector Type 7825

PC Software for calculating Personal Noise Exposure: Protector™ is a Windows®-based software package for post-processing, simulating and archiving noise exposure data. Designed to work with the family of Brüel & Kjær sound level meters and noise dose meters, Protector allows you to download sample noise profiles for specific locations or persons. Protector can use this data to calculate noise exposure for people or positions under investigation.

For situations where only work-point noise measurements are available, and workers move about, Protector can combine work-point measurements with information about a person's movements and daily work routine, to simulate their personal noise exposure.

Additionally, using Protector you can include the effect of personal hearing protection on workers' noise exposure. The software supports both single number ratings as well as the HML (High, Mid, Low) methods for taking attenuation of earmuffs and earplugs into account, and you can build up and maintain your personal database of preferred hearing protectors.



Uses and Features

Uses

- Download, archive and report single measurements
- Extract data to get noise profile for individual work points/tasks
- Combine work points and tasks to simulate a worker's daily noise exposure
- Identify high-exposure areas, jobs and tasks for planning noise-reduction measures
- Include the effect of specific hearing protection in simulations/exposure assessment
- Compare measured, calculated, and permitted noise exposure values
- As corporate database for all occupational health matters related to noise exposure

Features

- Import of measurements in common data format from Brüel & Kjær sound level meters, noise dose meters and noise processing software
- Data presented in both graphical and tabular formats, exportable to spreadsheet programs or Windows® clipboard
- Noise sources assignable to workers according to their daily routine
- Drag-and-drop transfer of data between calculation sheets
- Customisable hearing protector database

Noise Exposure at Work

The effects of noise in the workplace on the well being of workers are well known. Older legislation concerning noise exposure concentrated on noise levels for particular tasks and machinery at specific locations, but neglected the effects on workers moving around the workplace and being exposed to noise at different locations throughout the day.

Today's standards provide guidance on the calculation of noise exposure for an 8-hour period based on sampling techniques and direct measurement. This allows more realistic noise exposure values to be calculated. Employers and local authorities need to ensure that their noise exposure calculations have been done in accordance with these standards.

Protector Type 7825 software, used in conjunction with a Brüel & Kjær sound level meter or noise dose meter, is the ideal tool for this job – designed specifically for monitoring, calculating, reporting and archiving noise-exposure levels experienced by workers.

Simulation Model

A work point is the place where a person works, typically close to a piece of machinery or plant, but can also represent a task where the person moves around. Any number of work points and people can be included in a Protector project. A work point can be associated with more than one person, allowing the noise sample from a representative machine or task to be used with many workers.

Protector simulates the daily work-pattern of a person by combining work-point noise level measurements (L_{Aeq} , L_{Av} , E or Dose) with the work duration at each work point. From this, the personal noise exposure ($L_{EX,T}$, E, Dose) is found.

If the noise level at a work point changes, all people that are associated with that point automatically have their noise exposure updated accordingly.

Data Input

Protector is one of a range of software packages from Brüel & Kjær for environmental noise measurement. Integrating fully with the range of Brüel & Kjær environmental noise measuring tools it can import data from sound level meters and noise dose meters.

Sound Level Meters/Analyzers

The sound level meters supported by Protector are Types 2236, 2237, 2238, 2250, 2250 Light, 2260 and 2270.

Types 2236 and 2237 are precision integrating sound level meters, the main differences being that Type 2237 is a Type 2 instrument and has no time history logging options.

Types 2238, 2250, 2250-L, 2260 and 2270 are all Type 1 precision integrating sound level meters, all have CPB and logging options, and some also let you record sound (see "Sound Recording" below). Combined with Protector, they are ideal for making work-point measurements and other fixed location measurements.

During a measurement session, a Type 2250, for example, equipped with the logging option produces profiles (time history log, for example, one set of measured data per second) and an overall results table. The profile is displayed by Protector as a graph, from which a representative noise sample can be captured and made available to work-point folders or directly to person folders.

To download data, you can connect your Brüel & Kjær sound level meter (except Type 2250, 2250 Light or 2270) or noise dose meter directly to a PC running Protector via a serial interface cable.

Use Measurement Partner Suite BZ-5503 to transfer data from Type 2250, 2250-L or 2270 to an archive on your PC, then export data from the archive directly to Protector.

Noise Dose Meters (Dosimeters)

Types 4436, 4442, 4443, 4444, 4445, 4445-E and 4448 are noise dose meters designed specifically to be worn by a worker to gather noise data as the person moves from one work point to another. Time history data is available from Type 4443, 4445, 4445-E or 4448, allowing logging of data without interfering with the worker's routine, and identification of individual parts of the working day. Noise data for specific machines can be extracted from this information and be used as samples for other workers at similar machines. This saves time and provides a simple procedure for gathering information for different tasks, locations and situations.

Sound Recording

To help with documentation of a sound occurrence, and to be sure of what had caused a marked event, you can record sound directly on Type 2250, 2250-L or 2270 while measuring.

With Protector installed on your PC, you can use 2238 Mediator or Type 2260 to record sound on the hard disk while measuring.

Sound recordings can be tagged to one or more markers. Recordings are time-stamped and after transferring the measurement data to Protector, the data is automatically merged with the sound recordings. The sound recordings are then marked in the profile display and can be replayed. You use the cursor position in the profile display to decide which part of the recording you want to hear.

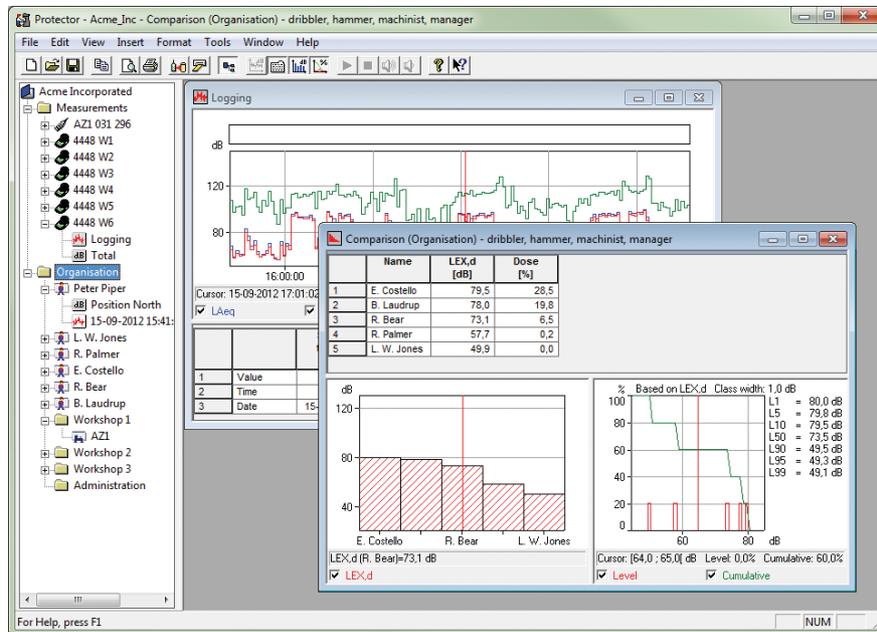
Project Database

Protector Type 7825 is a combination of spreadsheet and database routines tailored by Brüel & Kjær for calculating personal noise exposure. The spreadsheet part is used to determine and present the results of noise exposure calculations. The database manages all the work point and personnel data belonging to a Protector project.

The Project

A project is the complete collection of Protector files in which all personal noise exposure data belonging to one organisation are stored. A Protector project has two main folders: Measurement and Organisation (see Fig. 1).

Fig. 1
The main Protector window showing a project tree and graphs of measured data



Measurement Folder

The Measurement Folder is used to pool data read into Protector from field measurements. The measurements can be viewed on the screen as:

- Time history graphs
- Noise profile graphs
- Overall results
- Spectra*
- Cumulative and level distribution*

After you have inspected the data, you can select relevant parts for inclusion in work-point or person files in the Organisation Folder.

* Dependent on data source

Organisation Folder

The Organisation Folder is the part of a Protector project tree where the layout of the company/site is modelled.

Fig. 1 shows a typical Protector project tree. You can see that the Organisation Folder has sub-folders attached to it. Some of these folders refer to buildings and others refer to people. Typically, work points are grouped into the buildings in which they are situated and workers are grouped according to their trade. Unlimited levels of folders are possible, meaning that a whole factory site, or indeed all the sites belonging to one company, can be grouped into one Project tree.

Work-point and Person Files

Each work point or person in a Protector project has a record associated with it. This record, usually named after the work point or person it refers to, contains all the attributes of the person or work point, including:

- Activity percentage
- Effective duration
- Noise dose/Exposure
- Keywords

While you are building the Organisational Folder up, you can assign the time spent at particular work points to each person. This produces the work-pattern profile, from which $L_{EX, T}$, Dose and/or E is calculated. Once the work-pattern has been established, the worker and work-point data remain dynamically linked ensuring automatic updating of the files if something is changed.

Data Extraction

One of Protector's powerful features is its ability to sort data into categories before making statistical calculations. Sorting is based on keywords.

Keywords are user-defined labels that can be attached to any record, and records can have any number of keywords. For example, you might define a keyword to be "over 45 years old". You would then assign this keyword to all workers over that age, even though they are likely to be in different work groups, for example tool-cutters and lathe workers.

When you ask Protector to do an analysis, you could specify to only include workers over 45. Protector would then extract only these people from the database.

This means you are not tied to analysing data in only one folder at a time.

Sampling

Sampling is an attractive solution to noise measurement since the need for full-day measurements is removed, allowing more measurements to be made within a given time.

In essence, the sampling technique allows you to take a number of random samples of short duration at a work point, from which a full 8-hour L_{Aeq} is calculated. Since all 8 hours are not measured, there is a degree of uncertainty with the calculated L_{Aeq} .

Protector calculates the uncertainty. This information indicates if a work point's noise level lies well above the noise limit, well below it, or is borderline. Borderline noise levels need further investigation to find the actual L_{Aeq} value, but those work points well above and well below do not. Thus a great deal of field testing time is saved.

Statistical Calculations

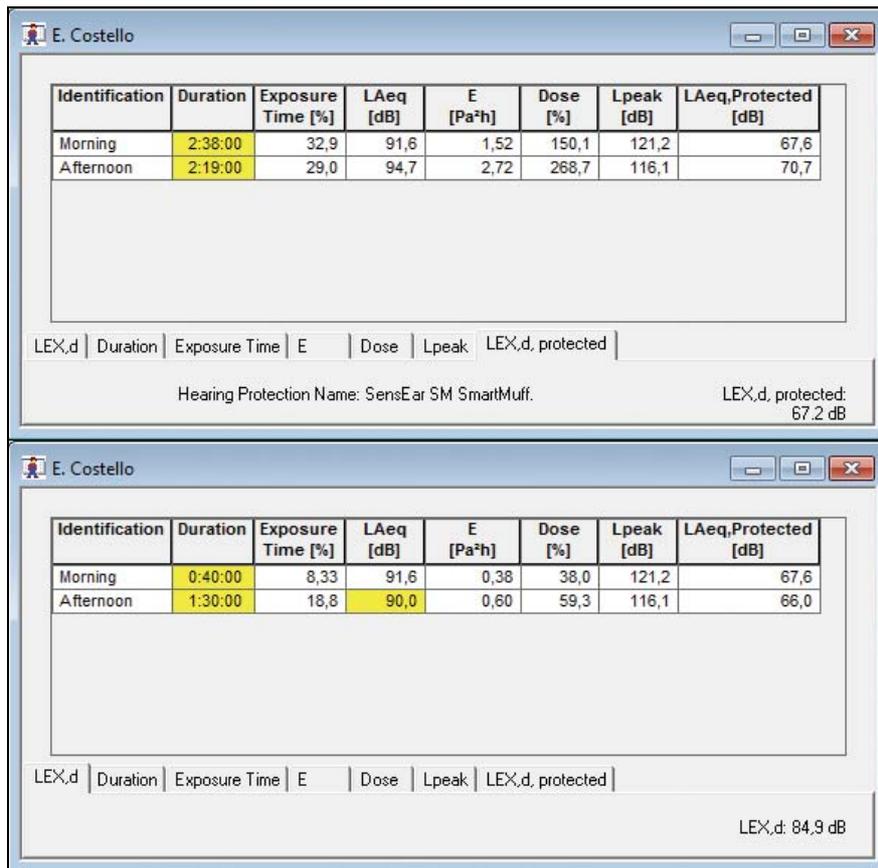
The bar chart in Fig. 1 clearly identifies the people subject to more than the allowed daily noise dose. By presenting the data in this way, you can easily see the magnitude of the problem. The cumulative and distribution curves show the same data, but plotted in a different way. Here you can see how Protector shows you the number of people that are affected.

The "after" case in Fig. 2 shows the result of noise reduction for one worker. By reducing the exposure time and the exposure level, the daily exposure drops below the threshold level.

By regularly updating work-point noise level data, you can continually monitor the personal noise level exposures for all workers.

Fig. 2

Two screen pictures with the same personal data but with different work-point noise levels. This shows how Protector helps you identify noise problems by offering “before and after” scenarios



Hearing Protection

Reduction of noise exposure by reducing noise emission at the source and/or improving the room acoustics is not always feasible or requires a long time to implement. In such cases, personal hearing protection must be used to attenuate the noise to a safe level and prevent hearing damage for each worker individually.

A wide range of products is available, starting from simple disposable earplugs and standard earmuffs to custom shaped plugs and hearing protectors with built-in radio communication systems. For each of these products, the manufacturer will declare the attenuation performance. It can be given as a single number rating, with three values for the high, mid and low frequency range effect, and in full detail as attenuation per octave band for each range.

With Protector you can collect attenuation information for personal hearing protectors in a customisable database – a simple Excel[®] file, making it easy to edit and maintain your list of preferred protectors. In Protector, you then chose from which file data should be taken.

Which of these ratings to apply depends on the measured data available. To use the single rating numbers you only need a single L_{Aeq} or L_{Ceq} value. The HML method already requires both L_{Aeq} and L_{Ceq} to be measured simultaneously. Application of the most detailed attenuation performance values requires octave band measurements.

Currently, Protector supports the calculation of L_{Aeq,protected} based on the single rating number and HML methods. However, the database is already prepared for the octave band methods so that you can utilize them as soon as the methods are available in the software.

Output

Data in Protector is presented in either tabular or graphical form, both of which can be printed or copied to the Windows[®] clipboard. Copying allows you to include Protector results in other programs such as Microsoft[®] Word or PowerPoint[®].

Specifications – Protector Type 7825 (ver. 4.9)

STANDARDS

Conforms with the following:

- ISO 9612 (1997)
- French NF S 31-084, 1987
- German DIN 45 645, part 2, draft 1991

LANGUAGE VERSIONS

English, French, German, Italian, Slovenian and Spanish

PLATFORM

32-bit software for 32- or 64-bit versions of Windows® 2000, Windows® XP, Windows Vista®, Windows® 7 or Windows® 8

DATA INPUT

Transfer of measurement data via RS–232 from the following Brüel & Kjær instruments:

- Total measurement and Profile data from Type 2236
- Total measurement data from Type 2237
- Total measurement, Profiles and spectra from Type 2238
- Total measurement, Profiles and spectra from Type 2260 with BZ-7210, BZ-7201, BZ-7202, BZ-7203, BZ-7206 or BZ-7219
- Total measurement and Profile data from Noise Dose Meter Types 4436, 4442, 4443, 4444, 4445, 4445-E

Transfer of measurement data using Measurement Partner Suite BZ-5503 from the following Brüel & Kjær instruments:

- Total measurement, Profiles and spectra from Type 2250 and 2270 with BZ-7222/23/24/25/26
- Total measurement, Profiles and spectra from Type 2250-L with BZ-7130/31/32/33

Transfer of measurement data via IR USB from the following Brüel & Kjær instruments:

- Total measurement and Profile data from Noise Dose Meter Types 4448

Import of measurement data from Brüel & Kjær software:

- Reporter Type 7694
- Evidence Type 7696
- Dose Reporter Type 7697
- Application Software BZ-7028
- Measurement Partner Suite BZ-5503

SOUND RECORDING USING TYPES 2238 AND 2260

Input: Audio

Control: From 2238 Mediator, Type 2260 or directly from Protector

Output Format: .wav

Display: As marker

Replay: Controlled by profile cursor

Recording Quality: High (86 kbyte/s/ch.), Medium (43 kbyte/s/ch.), Low (21.5 kbyte/s/ch.)

Input Selector Left: Line, Microphone, or None

Input Selector Right: Line, Microphone, or None

SOUND RECORDING USING TYPES 2250, 2250-L AND 2270

Sound recordings made with:

- 2250 or 2270 Logging or Enhanced Logging software
- 2250-L Logging software

are integrated in profile

Recording Quality:

Sampling Rate (kHz)	Maximum Pre-recording (s) 16 bit	Maximum Pre-recording (s) 24 bit	Memory (KB/s) 16 bit	Memory (KB/s) 24 bit
8	470	310	16	24
16	230	150	32	48
24	150	96	48	72
48	70	43	96	144

DATA STORAGE

Data is stored in a project containing a hierarchical tree based on measurements and corporate organisation

Measurements: Contains measurement data (Profiles, overall results, spectra and statistics)

Organisation: Contains any number of folders, work-point records and person records.

Folders can also contain folders, work-point records and person records. There are no limits to the number of levels in the hierarchy

PROFILE (TIME HISTORY) CONTRIBUTIONS

Display: A Profile of all logged parameters, up to 4 at the same time, shown graphically as a function of time

Classification: Segments of the Profile can be marked to be excluded or attributed to one of five user-defined classes

WORK-POINT RECORDS

Definition: A work-point record combines a number of contributions into an overall noise level for a place where a person works, for example in front of a machine.

Number: Only limited by hard disk space

Contributions: Total measurements or Profile classes

Calculation results:

- L_{Aeq} , L_{Ceq} , L_{Av} (S or F)
- Uncertainty of L_{Aeq} (sampling technique only)

- L_{pk}
- L_{Aeq} , protected

PERSON RECORDS

Definition: A person record combines a number of contributions into an overall personal noise exposure taking the work-pattern of this person into account

Number: Only limited by hard disk space

Contributions: Total measurements, Profile classes or work-point record results

Calculation results:

- $L_{EX,T}$ with user-definable T
- Exposure Time
- E
- Dose
- L_{pk}
- L_{Aeq} , protected

DATA COMPARISON

Comparison of data at and below user-defined hierarchic level of organisation

Display:

- Level distribution
- Level versus work point/person

Filter: Keywords can be defined and assigned to each person or work point allowing quick comparison of user-defined data using keyword searches

OUTPUT

On Screen: Results displayed in tabular or graphical from

Windows® Clipboard: Tables and screen pictures can be copied to Windows® clipboard for inclusion in other Windows® programs

Export: To Excel® spreadsheets in .xls or tab-separated ASCII format

Printing: Graphs and tables to all standard Windows® output devices

HELP

On-line context-sensitive help

MINIMUM COMPUTER CONFIGURATION

Pentium® III (or equivalent) PC, 256 MB RAM, SVGA graphics display/adaptor, sound card, CD ROM drive, mouse, USB and Windows® XP

Note:

- A PC-card slot is necessary to make PC-card data transfers
- A USB port is necessary for data transfer from Type 4448
- A serial port RS–232 or RS–232 to USB adaptor is necessary to transfer data from Types 4436, 4442, 4443, 4444, 4445, 4445-E, 2236, 2237, 2238, 2260

Ordering Information

Type 7825 Protector

OPTIONAL ACCESSORIES

For use with Types 2236, 2237, 2238 and 2260:

AO-1442 9-pin to 25-pin Interface Cable

For use with Types 4448:

AO-1492 Infrared to USB Cable

For use with Types 4436, 4442, 4443, 4444, 4445, 4445-E, 2236, 2237, 2238, 2260:

UL-0250 Adaptor, USB 2.0 (M) to RS-232 Serial Sub-D 9-pin (M)
with Extension Cable USB (M) to (F)

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