

# 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, noise dose meters and sound level analyzers, Protector allows you to quickly download sample noise profiles for specific locations or persons. Protector can use this data to calculate noise exposure for people or positions under investigation. Protector calculates noise exposure according to ISO 9612.2.

For situations where only work point noise measurements are available, and workers move about, Protector can combine workpoint measurements with a profile of a persons movements, to simulate their personal noise exposure.



## USES AND FEATURES

### USES

- Making comparisons between measured, calculated, and permitted noise exposure values
- Corporate database for all occupational health matters related to noise exposure
- Identifying high-exposure areas and jobs for planning noise-reduction measures

### FEATURES

- Import of measurements in common data format from Brüel & Kjær sound level 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
- Fulfils ISO 9612 (1997), including sampling method

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## Noise Exposure at Work

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The effects of noise in the workplace on the well being of workers is 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.

ISO 9612 (1997) provides 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 this standard.

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

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## Simulation Model

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

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

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

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## Data Input

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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/analyzers and noise dose meters.

### Sound Level Meters/Analyzers

The sound level meters supported by Protector are Types 2236, 2237, 2238, 2250 and Sound Level Analyzer Type 2260.

Types 2236, 2238, 2250 and 2260 are Type 1 precision integrating sound level meters designed for general use. Combined with Protector, they are ideal for making working point measurements and other fixed location measurements.

Type 2237 has similar functionality to Type 2236, the main differences being that it is a Type 2 instrument and has no time history logging options.

During a measurement session, a Type 2250, for example, equipped with the logging option produces profiles (time history log, e.g., 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 working point folders.

You can connect your Brüel & Kjær sound level meter/analyzer (except Type 2250) or dosimeter directly to a PC running Protector via a serial interface cable.

Use Utility Software for Hand-Held Analyzers BZ-5503 to transfer data from Type 2250 to an archive on your PC, then export data from the archive directly to Protector.

### **Noise Dose Meter (Dosimeter)**

Types 4444, 4445 and 4445-E are noise dose meters designed specifically to be worn by a worker and acquire noise data. Using these noise dose meters with Protector allows you to gather noise data as the person moves from one working point to another. Time history data is available from Type 4445, allowing individual parts of a persons working day to be identified. Noise data for specific machines can be extracted from this information and be used as samples for other workers at similar machines. This reduces the number of people and working points that have to be measured to obtain a complete set of samples.

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## **Sound Recording**

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To help with documentation of a sound occurrence, and to be sure of what had caused a marked event, you can record sound directly onto your PC's hard drive.

With Protector installed on your PC, you can use 2238 Mediator or Type 2260 to control sound recording on the hard disk while making measurements. The only limit to duration is the size of the hard disk.

Sound recording can be tagged to one or more markers. There is a 60 s sound buffer in the PC to permit editing of markers up to 1 minute after the occurrence has taken place. Recordings are time-stamped and stored as .wav files. After transferring the measurement data from 2238 Mediator or Type 2260 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.

Sound recordings made with 2250 Logging or Enhanced Logging Software are fully integrated in Protector.

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## **Project Database**

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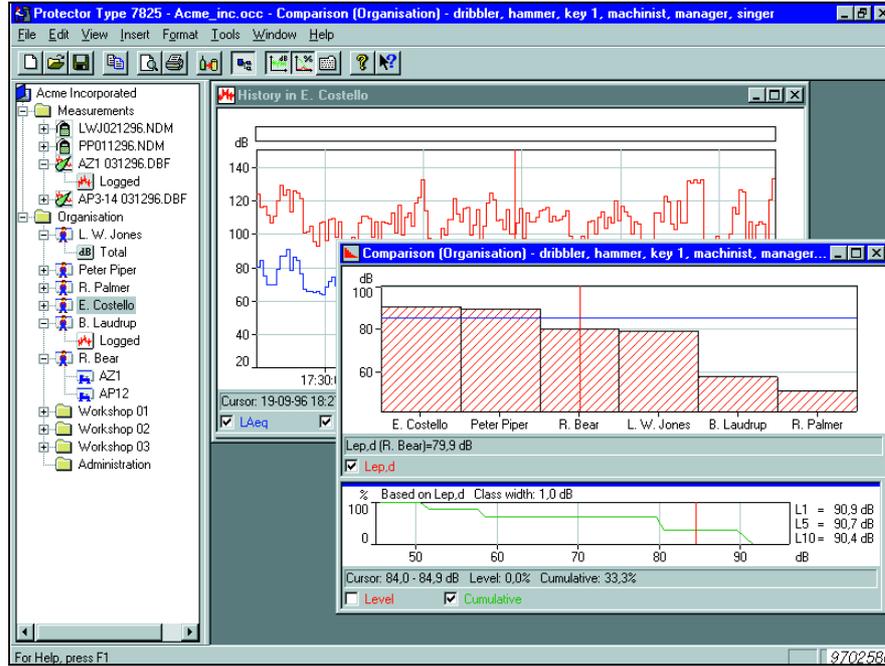
Protector Type 7825 is a combination of spreadsheet and database routines tailored by Brüel & Kjær for calculating personal noise exposure. The spreadsheet part is used to determine and present the results of noise exposure calculations. The database manages all the working point and personnel data belonging 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<sup>a</sup>
- Cumulative and level distribution<sup>a</sup>

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

### 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, working 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.

### Working Point and Person Files

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

- Activity percentage
- Effective duration
- Noise dose
- Keywords

While you are building the Organisational Folder up, you can assign the time spent at particular working points to each person. This produces the work-pattern profile, from which the  $L_{EX,T}$

a. Dependent on data source

is calculated. Once the work-pattern has been established, the worker and working point data remain dynamically linked ensuring automatic updating of the files if something is changed.

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## Data Extraction

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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 by the 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.

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## Sampling

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Protector fulfils ISO 9612 (1997), part of which describes a sampling method for determining the uncertainty with which a working point's noise level is calculated. Sampling is an attractive solution to noise measurement since the need for long sampling periods is removed, allowing more measurements to be made within a given time.

In essence, the sampling technique allows you to take five or more random samples of short duration at a working 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 working 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 working points well above and well below need no further investigation. Thus a great deal of field testing time is saved.

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## Statistical Calculations

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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.

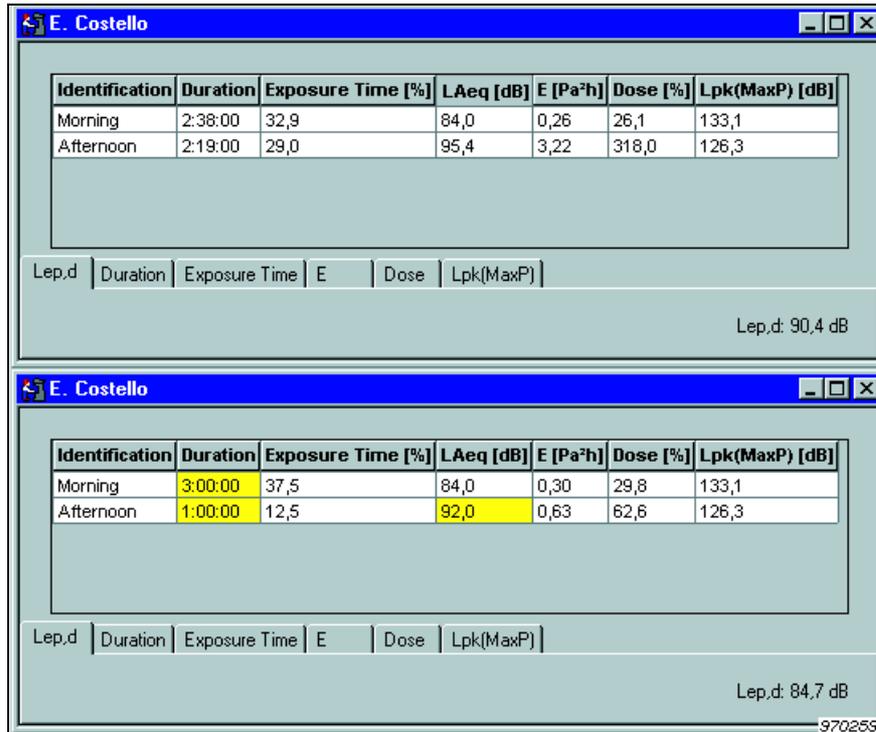
The cumulative and distribution curves show the same data, but plotted in a different way. Here you can see how Protector shows you the number of people that are affected.

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 working 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 working point noise levels. This shows how Protector helps you identify noise problems by offering “before and after” scenarios



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## Output

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

Protector also has a print function that prints tables and graphs directly to the Windows® system printer.

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## User Interface

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Protector Type 7825's Windows® type user interface makes it familiar to most PC users, with its extensive on-line and context-sensitive help, providing immediate guidance on any queries.

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## Specifications – Protector Type 7825 (ver. 4.9)

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### 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 Windows<sup>®</sup> 2000/XP

### DATA INPUT

Transfer of measurement data via RS232 from the following Brüel & Kjær instruments:

- Total measurement and Profile data from Precision Integrating Sound Level Meter Type 2236
- Total measurement data from Integrating Sound Level Meter Type 2237
- Total measurement, Profiles and spectra from Type 2238 Mediator
- Total measurement, Profiles and spectra from Type 2260 with BZ-7210, BZ-7201, BZ-7202, BZ-7203, BZ-7206 or BZ-7219
- Total measurement, Profiles and spectra from Type 2250 with BZ-7222/23/24/25/26 via BZ-5503
- Total measurement and Profile data from Noise Dose Meter Types 4436, 4442, 4443, 4444, 4445, 4445-E

Import of measurement data from Brüel & Kjær software:

- Reporter Type 7694
- Evidence Type 7696
- Dose Reporter Type 7697
- Application Software BZ-7028

### 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 TYPE 2250

Sound recordings made with 2250 Logging or Enhanced Logging Software are integrated in profile

### 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, working point records and person records.

Folders can also contain folders, working 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 measured parameters (including  $L_{Aeq}$  and  $L_{peak}$ ) 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

### WORKING POINT RECORDS

**Definition:** A working 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:**

- $L_{Aeq}$
- Uncertainty of  $L_{Aeq}$  (sampling technique only)
- $L_{pk}$

### 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 working point record results

**Calculation results:**

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

### DATA COMPARISON

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

**Display:**

- Level distribution
- Level versus working point/person

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

### OUTPUT

**On Screen:** Results displayed in tabular or graphical form

**Windows<sup>®</sup> Clipboard:** Tables and screen pictures can be copied to Windows<sup>®</sup> clipboard for inclusion in other Windows programs

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

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

### HELP

On-line context-sensitive help

### RECOMMENDED COMPUTER CONFIGURATION

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

**Note:** A PC-card slot is necessary to make PC-card data transfers

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## Ordering Information

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Type 7825 Protector

### OPTIONAL ACCESSORIES

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

AO-1442-Y-XXX<sup>a</sup> 9-pin to 25-pin Interface Cable

- a. Cables are available in different lengths, specified by Y-XXX, where:  
Y = D (decimetres) or M (metres)  
XXX is the length in the given units  
Please specify



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