PRODUCT DATA

Noise Dose Meter — Type 4436

Type 4436 satisfies a wide range of noise exposure standards. It calculates, amongst other things, the Sound Exposure (Pa^2h) and the Daily Personal Noise Exposure Level ($L_{EP,d}$) as recommended by recent, influential standards.

It doubles as a Type 2 Integrating Sound Level Meter and is available as an intrinsically safe version (4436I).

4436

Brüel & Kjær

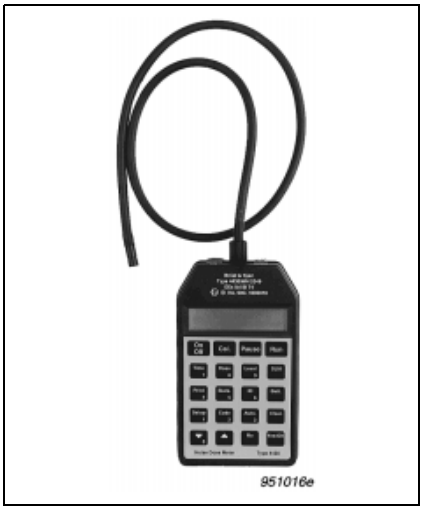
USES

- ❍ Evaluating personal noise exposure
- ❍ Assessing area noise in the workplace
- ❍ Serving as Type 2 Sound Level Meter (IEC 804 and IEC 651)

FEATURES

- ❍ Powerful
- ❍ Easy to use
- ❍ Sturdy

Powerful



Type 4436 retains measurement data, even when turned off. You can transfer the data to a printer or personal computer.

A Wide Range of Standards

Type 4436 has 40 fixed setups. Each contains a set of six measurement parameters with variable settings (see Table below). When you choose a setup, Type 4436 will work in accordance with the parameters contained in that setup. You can easily change from one setup to another. A user setup lets you choose a combination of parameters not covered by any of the other setups.

Setup Number	1	2	3	4	5	6	7	8	9	10
Microphone	Int.	Int.	Int.	Int.	Int.	Int.	Int.	Int.	Int.	Int.
Time Weighting	Slow	Slow	Slow	Slow	Slow	Slow	Slow	Slow	Slow	Slow
Peak Filter	Lin.	Lin.	Lin.	Lin.	Lin.	Lin.	Lin.	Lin.	Lin.	Lin.
8 h 100% Level dB	85	90	85	90	90	90	84	85	90	90
Threshold dB	off	off	75	75	80	off	80	off	80	90
Exchange Rate	3	3	3	3	3	4	4	5	5	5

Setup numbers 1 to 10 (11 to 20, Time Weighting is Fast; 21 to 30, Microphone is External; 31 to 40, Time Weighting is Fast and Microphone is External)

Statistics and Time History

Type 4436 calculates the SPL and L_{eq} every second (sampling rate: 16 times a second). From these calculations, it works out the Distribution and Cumulative Distribution of recorded noise levels, and also produces a Time History of your measurement results.

The Distribution and Cumulative Distribution are measured at 1 dB intervals, and can be viewed at either 1 dB or 5 dB intervals. With the Time History, Type 4436 presents the 1-minute L_{eq}, MaxL and MaxP values, which can be viewed at 1-minute or 10-minute intervals.

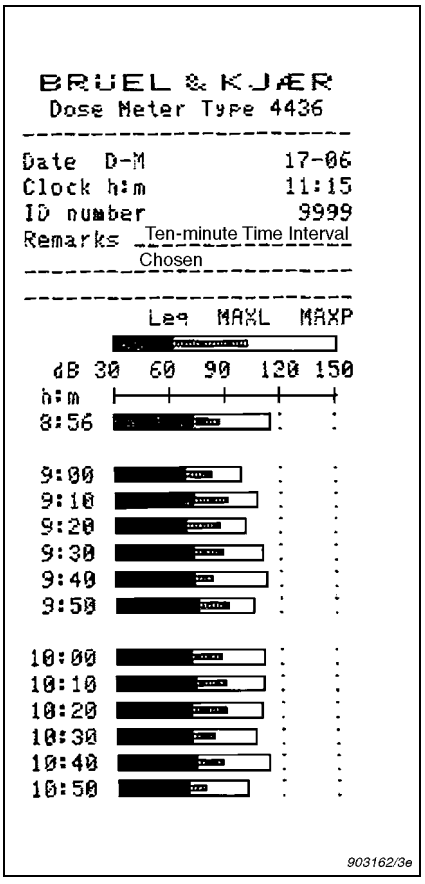
Digital Output

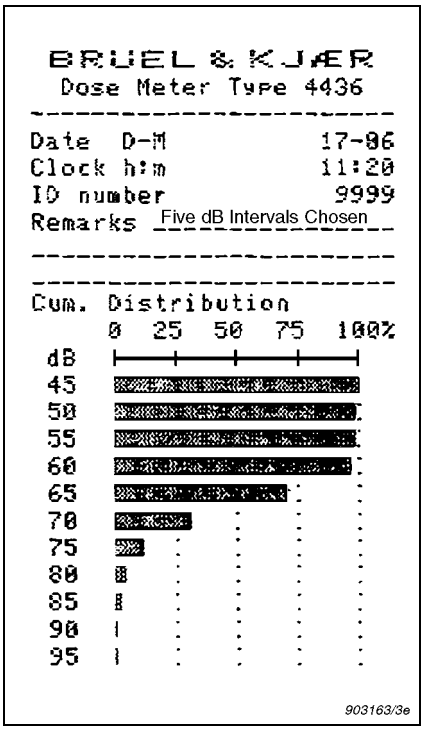
For print-outs, Brüel & Kjær's Graphics Printer Type 2318 is especially suitable, though ordinary RS–232–C serial printers can also be used. Type 2318 produces informative graphs and tables of Type 4436's Status, a Time History of measurement results, and Statistical Information (Distribution and Cumulative Distribution). Fig. 1 shows examples of such print-outs, and also illustrates what information is offered by the Statistics, Time History and Status functions.

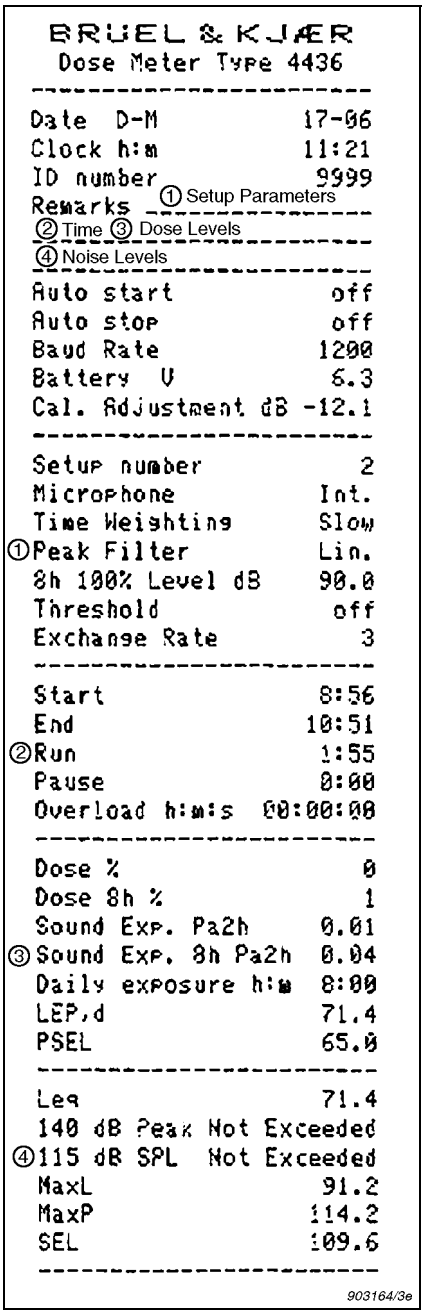
With a PC, you have three output modes: PC Transfer, PC DATA LOG and PC Dump. PC Transfer sends the Status, Time History and Statistics

to an appropriate communications program. With PC DATA LOG, the 1-second L_{eq}, MaxL and MaxP values are sent to a PC. For Noise Explorer and Protector software mentioned below, the third mode named PC Dump is used.

Fig. 1 Examples of print-outs. From left to right: Time History, Cumulative Distribution and Status







A Choice of Microphones

Type 4436's internal microphone ($^1/_4$-inch, prepolarized), serves most measurement purposes, with a level range of 55 to 140 dB (A) and 90 to 143 dB (Peak). When Preamplifier Type 2642 and Prepolarized Microphone Type 4176 are used, the measurement floor of the noise dose meter is shifted downwards to 40 dB.

Sound Level Meter (SLM)

Type 4436 is both a noise dose meter and a SLM, and fulfils, where relevant, IEC 804 (Integrating SLM Type 2) and IEC 651 (SLMs Type 2). The “SLM” display shows the SPL (A) and Peak (A or Lin). While you use the SLM function, all other parameters are calculated as usual. A supplied SLM Adaptor lets you make hand-held measurements. Portable Tripod UA 0801 can be connected to the adaptor when you measure area noise exposure levels.

Easy to Use

Handy Setups

Getting from one setup to another is simple, yet changes, at a stroke, the combination of parameters upon which measurement calculations are based. The instrument, even when off, retains a chosen setup until you choose another. The display constantly reminds you what setup you are using. See Fig. 2.

Calibration

Calibration should be performed with Brüel & Kjær’s Sound Level Calibrator Type 4231 or Multifunction Acoustic Calibrator Type 4226. Once the calibration procedure is started, it continues automatically. See Fig. 2.

Simultaneous RMS and Peak

Type 4436’s two detectors simultaneously measure RMS and Peak. This saves time – no need to measure RMS and then measure Peak. It also means that RMS and Peak measurements, and all related values, stem from the same sound signals.

Looking at Results

You can view results after measurements or during them (without disturbing measurements). This is true whether you read the results from the display, print them or send them to a computer.

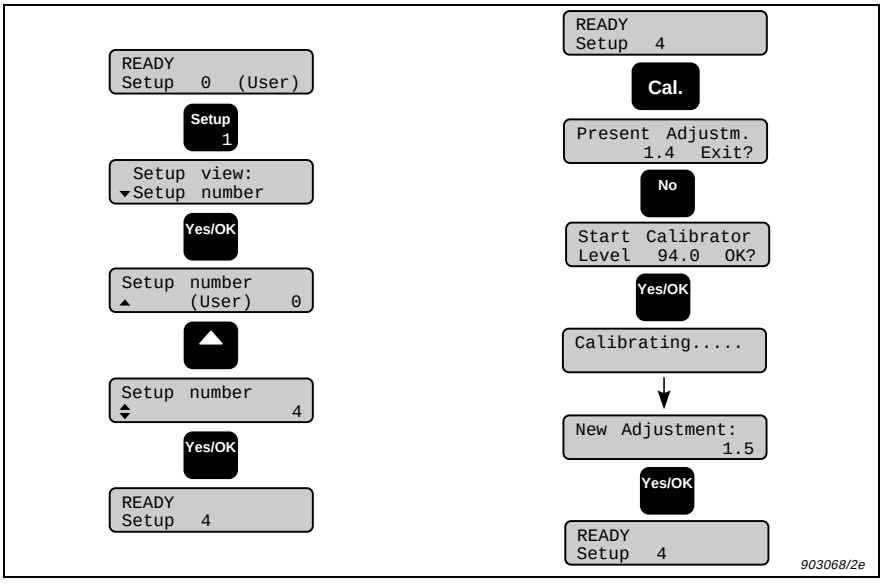


Fig. 2 Pushkey sequences for changing Setup and for Calibration

Sturdy

With most noise dose meters, the microphone is exposed, and thus vulnerable to the hazards common in the workplace. Replacing damaged microphones is costly and time-consuming.

Protected Microphone

Type 4436's microphone is protected inside the instrument's casing, where the hazards of the workplace cannot reach it. A strong, flexible rubber tube, attached to Type 4436, guides sounds to the microphone. The design ensures that the sensitivity and fidelity of the microphone system fulfil Brüel & Kjær's high standards.

Built to Last

The body of the Type 4436 is made of a tough and lasting polycarbonate resin. It is well-sealed, and its curved edges make the instrument both sturdy and comfortable to wear.

Protecting Measurements

Type 4436's pushkeys can be disabled, ensuring that accidental pushes of the keys will not corrupt ongoing measurements. The keys can be re-activated by entering a code ("4436").

Noise Explorer™

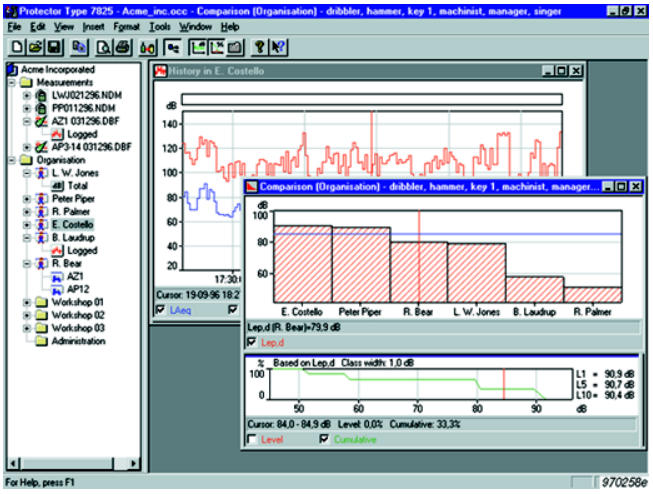
Use Noise Explorer PC software to view, print and save the data stored in Type 4436. This Windows® software accepts data from Brüel & Kjær sound level meters as well as Type 4436. View the data in detail, including statistics, tables and setup information, and print it out as required. You can also export data to various word processors, spreadsheets or other Brüel & Kjær programs. The data transfer is managed using a capture wizard that guides you step by step through the process for an easy transfer.

Protector™

In addition to the functions of Noise Explorer, Protector PC software is an unique tool to help structure and analyse the data to solve noise exposure problems. Each piece of data is assigned to a working point, and for each person the exposure is assigned in terms of working points and exposure duration. Next the program calculates the total noise exposure for each person, for comparison with regulations.

Working points and persons are illustrated using folders in a tree structure. Comparison views are provided to identify persons or working points that need attention to reduce exposure. The comparisons may be applied to a selected group using keywords previously assigned, based, for example, on work location or work group. To estimate the effect of noise reduction measures, levels and exposure times may be entered and the "what if?" results observed.

Fig. 3 (Left) Protector window showing tree structure of measurement and organisation, a measurement graph and a comparison of noise exposure. (Right) Protector lets you enter changes in noise levels and exposure times to evaluate noise reduction measures. Changes are clearly identified by a different cell background colour



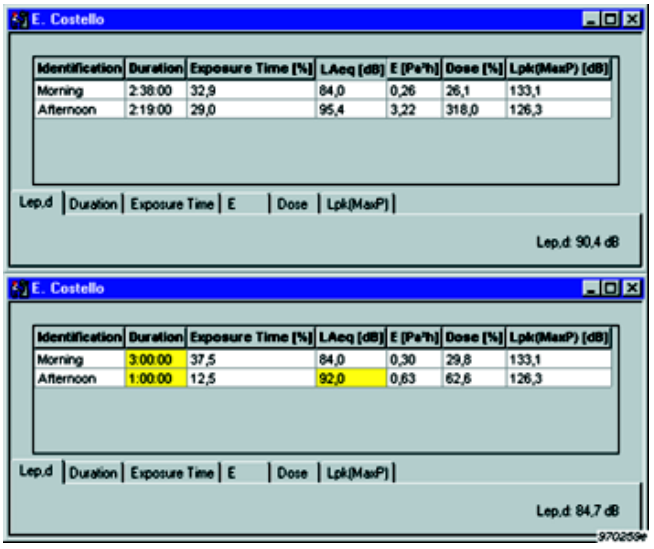
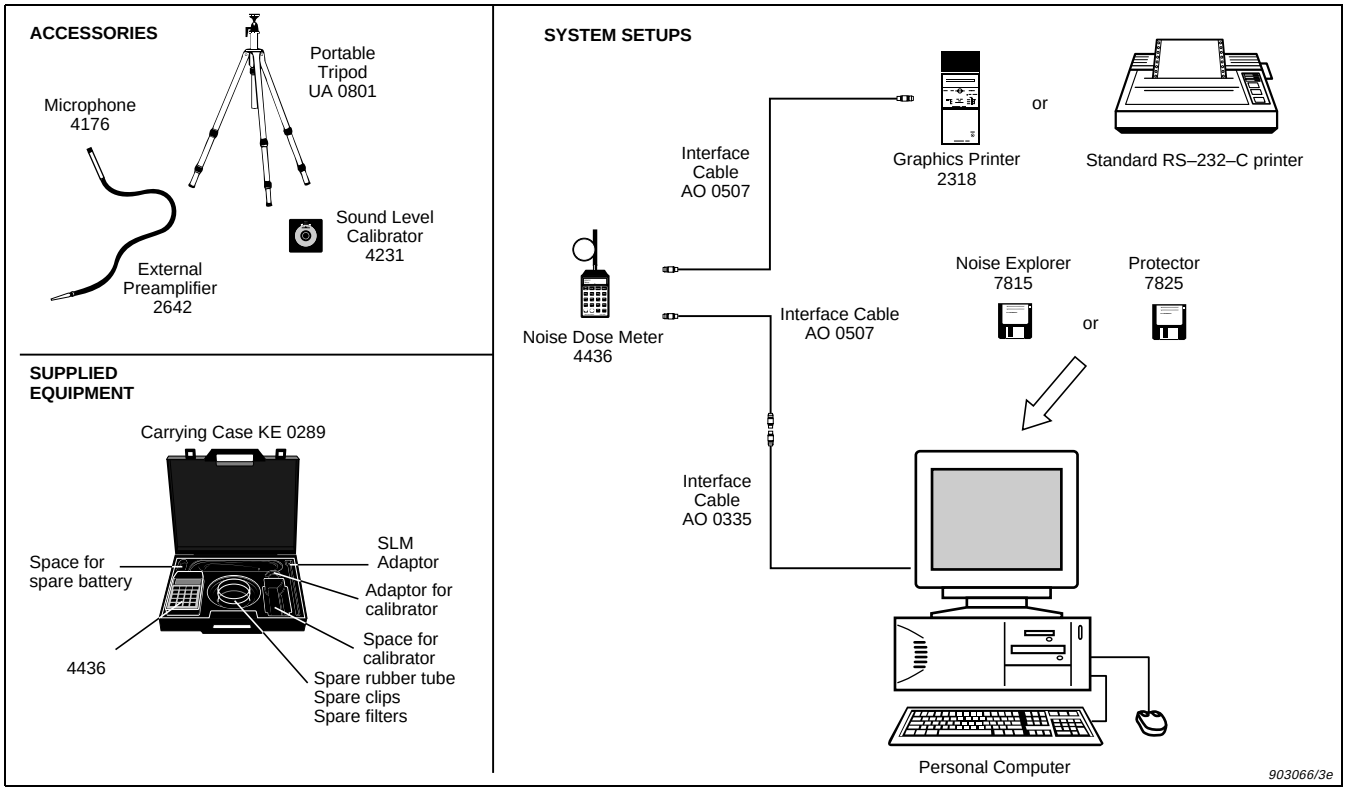


Fig. 4 System setups with accessories



Specifications Type 4436

STANDARDS SATISFIED BY TYPE 4436
EEC Directive 86/188/EEC; BS 6402:1983;
Draft IEC Standard; ANSI S1.25 Draft 1986;
IEC 1252 1993, IEC 651; IEC 804 1985; ANSI S1.43 1986;
OSHA and DoD Requirements

MICROPHONE
Internal: $^1/_4$-inch prepolarized condenser microphone, set within the instrument – 70 cm rubber tube conveys sounds to microphone
External: 5-pin socket for Preamplifier Type 2642, with Prepolarized Microphone Type 4176 (both to be ordered separately)

RANGES AND WEIGHTINGS
Frequency Range: 20 Hz to 8 kHz
Dynamic range (internal microphone):
55 dB noise floor to 140 dB(A) (SPL)
90 to 143 dB (Peak)
(With external microphone, 40 to 125 dB(A) (SPL) and 80 to 128 dB (Peak))
Frequency Weighting (filter):
Peak – A or Lin weighting
L_{eq} and SPL – A weighting
Time Weighting (Detectors):
SPL – Slow or Fast; **Peak** – 100µs
RMS and Peak are measured simultaneously

SAMPLING RATE
16 times per second for SPL and L_{eq}

CALIBRATION
Calibration, once started, is automatic

SETUP
Microphone: Internal or External
Time Weighting (SPL): Slow or Fast
Filter (Peak): A or Lin
Threshold Values: off, 75, 80, 85 or 90 dB
100% 8h Levels: 80, 84, 85 or 90 dB
Exchange Rate (q): 3, 4 or 5
Setup numbers:
0: User chooses setup parameters
1–40: Standard combinations of parameters

DOSE AND LEVEL DISPLAYS
Dose Displays:
Dose % and 8h Dose %: 0.00% to 9999%
Sound Exposure and 8h Sound Exposure:
0.00 Pa^2h to 99.99 Pa^2h
$L_{EP,d}$ and PSEL: 0.1 dB resolution
Level Displays: 140 dB (Peak) and 115 dB (SPL) exceeded; MaxL; MaxP; L_{eq} (L_{av}); SEL; Overload; Overload Duration

DISTRIBUTION/CUMULATIVE DISTRIBUTION
Measured in 1 dB intervals
Displayed in 1 dB or 5 dB intervals

TIME HISTORY (Digital output only)
One-minute L_{eq} (L_{av}), MaxL, MaxP values

SOUND LEVEL METER (0.1dB resolution):
IEC Classification: Type 2
SPL/Peak (max.) displayed each second
Adaptor for hand-held/tripod operation

AUTOMATIC START/STOP
Presets Start and Stop times of measurement

PUSHKEYS
20 keys, membrane type

DISPLAY (liquid crystal)
2 lines, 16 alphanumeric character spaces in each line each consisting of 5 × 8 dot matrix

CLOCK
Accuracy better than one minute per 24 hours
Displayed Times:
Current: hours:minutes day-month
Measurement: start, end, duration, pause, overload

MEMORY
Capacity: All data recorded during battery life
Constant Memory: When off, Type 4436 retains setup/measurement data (if battery flat or removed, data retained for at least 1 hour)

USING WITH PRINTER/COMPUTER (RS–232–C)
Output: 5-pin socket with ±5 V signal
Baud Rates: 300, 1200, 2400, 4800 and 9600
Handshake: Ready/Busy hardwire
Transfer to Printer (text and graphics):
To Graphics Printer Type 2318 or standard RS–232–C printer
3 output formats – Status, History, Statistics
Transfer to Computer (IBM®-compatible):
3 output formats as given in table
Optional Application Programs: 7815 Noise Explorer, 7825 Protector

ENVIRONMENT
Magnetic Field: Unaffected at 100 A/m
Vibration: 90 dB max. at 480 Hz and 1 m/s^2
Warm-up Time: 20 seconds max.

BATTERY
9 V alkaline battery – IEC 6LF22 or 6LR61
Life of Battery: At least 20 hours at 23°C (73°F); at least 8 hours at –5°C (23°F)
Life Indicator: Displays battery voltage and estimate, in hours, of its remaining life
Warnings: 'Battery low' and 'Battery flat'
Battery flat, Type 4436 turns off automatically

PHYSICAL
Bodywork: Polycarbonate
Dimensions: 137 × 79 × 22 mm
(5.4 × 3.1 × 0.87 in)
Weight: 250 g (8.8 oz.) with battery

Mode	PC Transfer	PC DATA LOG	PC Dump (7815, 7825)
Active during measurement?	Yes (9600 Baud)	Yes (dose meas. suspended)	No
Transfer rate (Baud)	Up to 9600	9600	9600
Transferred data	All stored data	1 s L_{eq}, MaxL & MaxP	All stored data

Compliance with Environmental Standards

CE	CE-mark indicates compliance with: EMC Directive and Low Voltage Directive.
Safety	EN 61010–1 and IEC 1010–1: Safety requirements for electrical equipment for measurement, control and laboratory use.
EMC Emission	EN 50081–1: Generic emission standard. Part 1: Residential, commercial and light industry. EN 50081–2: Generic emission standard. Part 2: Industrial environment. CISPR 22: Radio disturbance characteristics of information technology equipment. Class B Limits. FCC Rules, Part 15: Complies with the limits for a Class B digital device.
EMC Immunity	EN 50082–1: Generic immunity standard. Part 1: Residential, commercial and light industry. EN 50082–2: Generic immunity standard. Part 2: Industrial environment. Maximum influence on readings caused by electromagnetic interference in industrial environment: Used with internal microphone: Measurements in the range from 140 dB down to 80 dB are affected by no more than ± 1 dB Used with external microphone (Preamplifier Type 2642 with CE approval): Measurements in the range from 125 dB down to 70 dB are affected by no more than ± 1 dB **Note:** The above is guaranteed using accessories listed in this Product Data sheet only.
Temperature	IEC 68–2–1 & IEC 68–2–2: Environmental Testing. Cold and Dry Heat. Operating Temperature: –10 to +50°C (14 to 122°F) Storage Temperature: –20 to +70°C (–4 to 158°F) (with batteries removed)
Humidity	IEC 68–2–3: Damp Heat: 90% RH (non-condensing at 40°C (104°F))
Mechanical	Non-operating: IEC 68–2–6: Vibration: 0.3 mm, 20 m/s^2, 10–500 Hz IEC 68–2–27: Shock: 1000 m/s^2 IEC 68–2–29: Bump: 1000 bumps at 250 m/s^2

Ordering Information

Type 4436 Noise Dose Meter
Includes following accessories:

DP 0781	$^1/_4$-inch Adaptor for Type 4230
AF 0119	Spare Rubber Tube
UA 1135	2× Clips for Rubber Tube
DD 0456	5× Filters for Rubber Tube
FE 0035	8× Dustcaps for LEMO Sockets
DP 0769	SLM Adaptor
KE 0289	Carrying Case
DS 0891	Moulded Inlay for Case
QB 0016	2× 9.0 V Alkaline Batteries

Optional Accessories

FOR CALIBRATION

Type 4231	Sound Level Calibrator
Type 4226	Multifunction Acoustic Calibrator

FOR USE WITH EXTERNAL MICROPHONE

Type 2642	Preamplifier
Type 4176	$^1/_2$-inch Prepolarized Microphone

FOR PRINTING MEASUREMENT DATA

Type 2318	Graphics Printer
AO 0507	Serial Interface Cable

FOR USE WITH A COMPUTER

AO 0335	RS–232–C Serial Interface Cable
AO 0507	Serial Interface Cable
WL 1146	4436 to 25-pole Serial Interface Cable
WL 1149	4436 to 9-pole Serial Interface Cable
Type 7815–001	Noise Explorer software, English
Type 7815–002	Noise Explorer software, French
Type 7815–003	Noise Explorer software, German
Type 7825–001	Protector, English
Type 7825–002	Protector, French
Type 7825–003	Protector, German

FOR ASSESSING AREA NOISE

UA 0801	Portable Tripod

Intrinsically Safe Version (4436I):
Please see Product Data (BP 1468)

Brüel & Kjær reserves the right to change specifications and accessories without notice

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BP 1004–14

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